CASE IH
AGRICULTURE

SERVICE MANUAL



Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

84172758A 0 06/02/2009

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INTRODUCTION

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Foreword

Technical Information

This manual has been produced by a new technical information system. This new system is designed to deliver technical information electronically through CD-ROM and in paper manuals. A coding system called ICE has been developed to link the technical information to other Product Support functions e.g. Warranty.

Technical information is written to support the maintenance and service of the functions or systems on a customers machine. When a customer has a concern on his machine it is usually because a function or system on his machine is not working at all, is not working efficiently, or is not responding correctly to his commands. When you refer to the technical information in this manual to resolve that customers concern, you will find all the information classified using the new ICE coding, according to the functions or systems on that machine. Once you have located the technical information for that function or system then you will find all the mechanical, electrical or hydraulic devices, components, assemblies and sub assemblies for that function or system. You will also find all the types of information that have been written for that function or system, the technical data (specifications), the functional data (how it works), the diagnostic data (fault codes and troubleshooting) and the service data (remove, install adjust, etc.).

By integrating this new ICE coding into technical information , you will be able to search and retrieve just the right piece of technical information you need to resolve that customers concern on his machine. This is made possible by attaching 3 categories to each piece of technical information during the authoring process.

The first category is the Location, the second category is the Information Type and the third category is the Product:

- LOCATION - is the component or function on the machine, that the piece of technical information is going to describe e.g. Fuel tank.
- INFORMATION TYPE - is the piece of technical information that has been written for a particular component or function on the machine e.g. Capacity would be a type of Technical Data that would describe the amount of fuel held by the Fuel tank.
- PRODUCT - is the model that the piece of technical information is written for.

Every piece of technical information will have those 3 categories attached to it. You will be able to use any combination of those categories to find the right piece of technical information you need to resolve that customers concern on his machine.

That information could be:

- the description of how to remove the cylinder head
- a table of specifications for a hydraulic pump
- a fault code
- a troubleshooting table
- a special tool

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How to Use this Manual

This manual is divided into Sections. Each Section is then divided into Chapters. Contents pages are included at the beginning of the manual, then inside every Section and inside every Chapter. An alphabetical Index is included at the end of a Chapter. Page number references are included for every piece of technical information listed in the Chapter Contents or Chapter Index.

Each Chapter is divided into four Information types:

- Technical Data (specifications) for all the mechanical, electrical or hydraulic devices, components and, assemblies.
- Functional Data (how it works) for all the mechanical, electrical or hydraulic devices, components and assemblies.
- Diagnostic Data (fault codes, electrical and hydraulic troubleshooting) for all the mechanical, electrical or hydraulic devices, components and assemblies.
- Service data (remove disassembly, assemble, install) for all the mechanical, electrical or hydraulic devices, components and assemblies.

Sections

Sections are grouped according to the main functions or a systems on the machine. Each Section is identified by a letter A, B, C etc. The amount of Sections included in the manual will depend on the type and function of the machine that the manual is written for. Each Section has a Contents page listed in alphabetic/numeric order. This table illustrates which Sections could be included in a manual for a particular product.

	SECTION										
	A - Distribution Systems										
		B - Power Production									
			C - Power Train								
				D - Travelling							
					E - Body and Structure						
						F - Frame Positioning					
							G - Tool Positioning				
								H - Working Arm			
									J - Tools and Couplers		
										K - Crop Processing	
											L - Field Processing
PRODUCT											
Tractors	X	X	X	X	X	X		X	X		
Vehicles with working arms: backhoes, excavators, skid steers, ...	X	X	X	X	X	X	X	X	X		
Combines, forage harvesters, balers, ...	X	X	X	X	X	X	X	X	X	X	
Seeding, planting, floating, spraying equipment, ...	X	X	X	X	X	X	X		X		X
Mounted equipment and tools, ...					X	X	X		X		

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This manual contains these Sections. The contents of each Section are explained over the following pages.

Contents

INTRODUCTION	
DISTRIBUTION SYSTEMS	A
POWER PRODUCTION	B
POWER TRAIN	C
TRAVELLING	D
BODY AND STRUCTURE	E
TOOL POSITIONING	G
CROP PROCESSING	K

Section Contents

SECTION A, DISTRIBUTION SYSTEMS
This Section covers the main systems that interact with most of the functions of the product. It includes the central parts of the hydraulic, electrical, electronic, pneumatic, lighting and grease lubrication systems. The components that are dedicated to a specific function are listed in the Chapter where all the technical information for that function is included.

SECTION B, POWER PRODUCTION
This Section covers all the functions related to the production of power to move the machine and to drive various devices.

SECTION C, POWER TRAIN
This Section covers all the functions related to the transmission of power from the engine to the axles and to internal or external devices and additional Process Drive functions.

SECTION D, TRAVELLING
This Section covers all the functions related to moving the machine, including tracks, wheels, steering and braking. It covers all the axles both driven axles and non-driven axles, including any axle suspension.

SECTION E, BODY AND STRUCTURE
This Section covers all the main functions and systems related to the structure and body of the machine. Including the frame, the shields, the operator's cab and the platform.

SECTION G, TOOL POSITIONING
This Section covers all the functions related to the final and/or automatic positioning of the tool once the tool is positioned using the Working Arm or the machine frame.

SECTION K, CROP PROCESSING
This Section covers all the functions related to crop processing.

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Chapters

Each Chapter is identified by a letter and number combination e.g. Engine B.10.A The first letter is identical to the Section letter i.e. Chapter B.10 is inside Section B, Power Production.
CONTENTS
The Chapter Contents lists all the technical data (specifications), functional data (how it works), service data (remove, install adjust, etc..) and diagnostic data (fault codes and troubleshooting) that have been written in that Chapter for that function or system on the machine.

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CS6050
FUNCTIONAL DATA
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SERVICE
ENGINE - Remove (B.10.A - F.10.A.10)
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DIAGNOSTIC
ENGINE - Troubleshooting (B.10.A - G.40.A.10)
CS6050

INDEX
The Chapter Index lists in alphabetical order all the types of information (called Information Units) that have been written in that Chapter for that function or system on the machine.

Index

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ENGINE

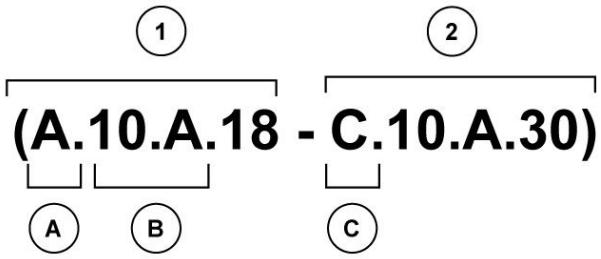
ENGINE - Dynamic description (B.10.A - C.30.A.10)
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Information Units and Information Search

Each chapter is composed of information units. Each information unit has the ICE code shown in parentheses which indicates the function and the type of information written in that information unit. Each information unit has a page reference within that Chapter. The information units provide a quick and easy way to find just the right piece of technical information you are looking for.

example information unit	Stack valve - Sectional View (A.10.A.18 - C.10.A.30)				
Information Unit ICE code	A	10.A	18	C	10.A.30
ICE code classification	Distribution systems	Primary hydraulic power	Stack valve	Functional data	Sectional view



CRIL03J033E01 1

Navigate to the correct information unit you are searching for by identifying the function and information type from the ICE code.

- **(1)** Function and **(2)** Information type.
- **(A)** corresponds to the sections of the repair manual.
  (B) corresponds to the chapters of the repair manual.
  (C) corresponds to the type of information listed in the chapter contents, Technical data, Functional Data, Diagnostic or Service.
  (A) and **(B)** are also shown in the page numbering on the page footer.
  THE REST OF THE CODING IS NOT LISTED IN ALPHANUMERIC ORDER IN THIS MANUAL.
- You will find a table of contents at the beginning and end of each section and chapter.
  You will find an alphabetical index at the end of each chapter.
- By referring to **(A)**, **(B)** and **(C)** of the coding, you can follow the contents or index (page numbers) and quickly find the information you are looking for.

Page Header and Footer

The page header will contain the following references:

- Section and Chapter description

The page footer will contain the following references:

- Publication number for that Manual, Section or Chapter.
- Version reference for that publication.
- Publication date
- Section, chapter and page reference e.g. A.10.A / 9

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Important information

All repair and maintenance works listed in this manual must be carried out only by staff belonging to the Case I H Service network, strictly complying with the instructions given and using, whenever required, the special tools.

Anyone who carries out the above operations without complying with the prescriptions shall be responsible for the subsequent damages.

The manufacturer and all the organizations of its distribution chain, including - without limitation - national, regional or local dealers, reject any responsibility for damages due to the anomalous behaviour of parts and/or components not approved by the manufacturer himself, including those used for the servicing or repair of the product manufactured or marketed by the Manufacturer. In any case, no warranty is given or attributed on the product manufactured or marketed by the Manufacturer in case of damages due to an anomalous behaviour of parts and/or components not approved by the Manufacturer.

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Safety rules

IMPORTANT NOTICE

All maintenance and repair operations described in this manual should be carried out exclusively by authorised workshops. All instructions should be carefully observed and special equipment where indicated should be used.
Anyone who carries out service operations described without carefully observing these instructions will be directly responsible for any damage caused.

NOTES FOR EQUIPMENT

Equipment shown in this manual is:

- designed expressly for use on these tractors;
- necessary to make a reliable repair;
- accurately built and strictly tested to offer efficient and long-lasting working life.

NOTICES

The words “front”, “rear”, “right hand”, and “left hand” refer to the different parts as seen from the operator’s seat oriented to the normal direction of movement of the tractor.

SAFETY RULES

PAY ATTENTION TO THIS SYMBOL



This warning symbol points out important messages involving personal safety. Carefully read the safety rules contained herein and follow advised precautions to avoid potential hazards and safeguard your safety.
In this manual you will find this symbol together with the following key-words:
WARNING -it gives warning about improper repair operations and potential consequences affecting the service technician’s personal safety.
DANGER - it gives specific warning about potential dangers for personal safety of the operator or other persons directly or indirectly involved in the operation.



TO PREVENT ACCIDENTS

Most accidents and personal injuries taking place in workshops are due from non-observance of some essential rules and safety precautions.

The possibility that an accident might occur with any type of machines should not be disregarded, no matter how well the machine in question was designed and built.

A wise and careful service technician is the best precautions against accidents.

Careful observance of this basic precaution would be enough to avoid many severe accidents.

⚠ DANGER ⚠

Never carry out any cleaning, lubrication or maintenance operations when the engine is running.

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SAFETY RULES

Generalities

- Carefully follow specified repair and maintenance procedures.

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- Do not wear rings, wristwatches, jewels, unbuttoned or flapping clothing such as ties, torn clothes, scarves, open jackets or shirts with open zips which could get caught on moving parts. Use approved safety clothing such as anti-slipping footwear, gloves, safety goggles, helmets, etc.
- Wear safety glasses with side guards when cleaning parts using compressed air.
- Damaged or frayed wires and chains are unreliable. Do not use them for lifting or towing.
- Wear suitable protection such as approved eye protection, helmets, special clothing, gloves and footwear whenever welding. All persons standing in the vicinity of the welding process should wear approved eye protection. NEVER LOOK AT THE WELDING ARC IF YOUR EYES ARE NOT SUITABLY PROTECTED.
- Never carry out any repair on the machine if someone is sitting on the operator's seat, except if they are qualified operators assisting in the operation to be carried out.
- Never operate the machine or use attachments from a place other than sitting at the operator's seat or at the side of the machine when operating the fender switches.
- Never carry out any operation on the machine when the engine is running, except when specifically indicated. Stop the engine and ensure that all pressure is relieved from hydraulic circuits before removing caps, covers, valves, etc.
- All repair and maintenance operations should be carried out with the greatest care and attention.
- Disconnect the batteries and label all controls to warn that the tractor is being serviced. Block the machine and all equipment which should be raised.
- Never check or fill fuel tanks or batteries, nor use starting liquid if you are smoking or near open flames as such fluids are flammable.
- The fuel filling gun should always remain in contact with the filler neck. Maintain this contact until the fuel stops flowing into the tank to avoid possible sparks due to static electricity build-up.
- To transfer a failed tractor, use a trailer or a low loading platform trolley if available.
- To load and unload the machine from the transportation means, select a flat area providing a firm support to the trailer or truck wheels. Firmly tie the machine to the truck or trailer platform and block wheels as required by the transporter.
- Always use lifting equipment of appropriate capacity to lift or move heavy components.
- Chains should always be safely fastened. Ensure that fastening device is strong enough to hold the load foreseen. No persons should stand near the fastening point.
- The working area should be always kept CLEAN and DRY. Immediately clean any spillage of water or oil.
- Never use gasoline, diesel oil or other flammable liquids as cleaning agents. Use non-flammable non-toxic proprietary solvents.
- Do not pile up grease or oil soaked rags, as they constitute a great fire hazard. Always place them into a metal container.

START UP

- Never run the engine in confined spaces which are not equipped with adequate ventilation for exhaust gas extraction.
- Never bring your head, body, arms, legs, feet, hands, fingers near fans or rotating belts.

ENGINE

- Always loosen the radiator cap very slowly before removing it to allow pressure in the system to dissipate. Coolant should be topped up only when the engine is stopped.
- Do not fill up fuel tank when the engine is running.
- Never adjust the fuel injection pump when the tractor is moving.
- Never lubricate the tractor when the engine is running.

ELECTRICAL SYSTEMS

- If it is necessary to use auxiliary batteries, cables must be connected at both sides as follows: (+) to (+) and (-) to (-). Avoid short-circuiting the terminals. GAS RELEASED FROM BATTERIES IS HIGHLY FLAMMABLE. During

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charging, leave the battery compartment uncovered to improve ventilation. Avoid sparks or flames near the battery area. Do no smoke.

- Do not charge batteries in confined spaces.
- Always disconnect the batteries before performing any type of service on the electrical system.

HYDRAULIC SYSTEMS

- Some fluid coming out from a very small port can be almost invisible and be strong enough to penetrate the skin. For this reason, NEVER USE YOUR HANDS TO CHECK FOR LEAKS, but use a piece of cardboard or a piece of wood for this purpose. If any fluid is injected into the skin, seek medical aid immediately. Lack of immediate medical attention may result in serious infections or dermatitis.
- Always take system pressure readings using the appropriate gauges.

WHEELS AND TYRES

- Check that the tyres are correctly inflated at the pressure specified by the manufacturer. Periodically check for possible damage to the rims and tyres.
- Stay at the tyre side when inflating.
- Check the pressure only when the tractor is unloaded and tyres are cold to avoid wrong readings due to over-pressure.
- Never cut, nor weld a rim with the inflated tyre assembled.
- To remove the wheels, block both front and rear tractor wheels. Raise the tractor and install safe and stable supports under the tractor in accordance with regulations in force.
- Deflate the tyre before removing any object caught into the tyre tread.
- Never inflate tyres using flammable gases as they may generate explosions and cause injuries to bystanders.

REMOVAL AND INSTALLATION

- Lift and handle all heavy components using lifting equipment of adequate capacity. Ensure that parts are supported by appropriate slings and hooks. Use lifting eyes provided to this purpose. Take care of the persons near the loads to be lifted.

HEALTH AND SAFETY

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HEALTH AND SAFETY PRECAUTIONS

Many of the procedures associated with vehicle maintenance and repair involve physical hazards or other risks to health. This section lists, alphabetically, some of these hazardous operations and the materials and equipment associated with them. The precautions necessary to avoid these hazards are identified.
The list is not exhaustive and all operations and procedures and the handling of materials, should be carried out with health and safety in mind.

ACIDS AND ALKALIS

see Battery acids, e.g. caustic soda, sulphuric acid.
Used in batteries and cleaning materials.

Irritant and corrosive to the skin, eyes, nose and throat. Causes burns.

Avoid splashes to the skin, eyes and clothing. Wear suitable protective gloves and goggles. Can destroy ordinary protective clothing. Do not breathe mists.
Ensure access to water and soap is readily available for splashing accidents.

ADHESIVES AND SEALERS

see Fire
Highly Flammable, Flammable, combustible.
Generally should be stored in “No Smoking” areas; cleanliness and tidiness in use should be observed, e.g. disposable paper covering benches; should be dispensed from applicators where possible; containers, including secondary containers, should be labelled.

Solvent based Adhesives/Sealers

See Solvents.
Follow manufacturers instructions.

Water based Adhesives/Sealers

Those based on polymer emulsions and rubber lattices may contain small amounts of volatile toxic and harmful chemicals. Skin and eye contact should be avoided and adequate ventilation provided during use.
Follow manufacturers instructions.

Resin based Adhesives/Sealers

e.g. epoxide and formaldehyde resin based.
Mixing should only be carried out in well ventilated areas as harmful or toxic volatile chemicals may be released.
Skin contact with uncured resins and hardeners can result in irritation; dermatitis and absorption of toxic or harmful chemicals through the skin. Splashes can damage the eyes.
Provide adequate ventilation and avoid skin and eye contact. Follow manufacturers instructions.

Anaerobic, Cyanoacrylate and other Acrylic Adhesives

Many are irritant, sensitizing or harmful to the skin. Some are eye irritants.

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Skin and eye contact should be avoided and the manufacturers instructions followed.
Cyanoacrylate adhesives (super-glues) must not contact the skin or eyes. If skin or eye tissue is bonded cover with a clean moist pad and get medical attention. do not attempt to pull tissue apart. Use in well ventilated areas as vapours can cause irritation of the nose and eyes.
For two-pack systems see Resin based adhesives/sealers.

Isocyanate (Polyurethane) Adhesives/ Sealers

see Resin based Adhesives.
Individuals suffering from asthma or respiratory allergies should not work with or near these materials as sensitivity reactions can occur.
Any spraying should preferably be carried out in exhaust ventilated booths removing vapours and spray droplets from the breathing zone. Individuals working with spray applications should wear supplied air respirators.

ANTIFREEZE

see Fire, Solvents e.g. Isopropanol, Ethylene Glycol, Methanol.
Highly Flammable, Flammable, Combustible.
Used in vehicle coolant systems, brake air pressure systems, screenwash solutions.
Vapours given off from coolant antifreeze (glycol) arise only when heated.
Antifreeze may be absorbed through the skin in toxic or harmful quantities. Antifreeze if swallowed is fatal and medical attention must be found immediately.

ARC WELDING

see Welding.

BATTERY ACIDS

see Acids and Alkalis.
Gases released during charging are explosive.
Never use naked flames or allow sparks near charging or recently charged batteries.

BRAKE AND CLUTCH FLUIDS (Polyalkylene Glycols)

see Fire.
Combustible.
Splashes to the skin and eyes are slightly irritating.
Avoid skin and eye contact as far as possible.
Inhalation of vapour hazards do not arise at ambient temperatures because of the very low vapour pressure.

BRAZING

see Welding.

CHEMICAL MATERIALS - GENERAL

see Legal Aspects.
Chemical materials such as solvents, sealers, adhesives, paints, resin foams, battery acids, antifreeze, brake fluids, oils and grease should always be used with caution and stored and handled with care. They may be toxic, harmful, corrosive, irritant or highly inflammable and give rise to hazardous fumes and dusts.
The effects of excessive exposure to chemicals may be immediate or delayed; briefly experienced or permanent; cumulative; superficial; life threatening; or may reduce life-expectancy.

DO'S

Do remove chemical materials from the skin and clothing as soon as practicable after soiling. Change heavily soiled clothing and have it cleaned.
Do carefully read and observe hazard and precaution warnings given on material containers (labels) and in any accompanying leaflets, poster or other instructions. Material health and safety data sheets can be obtained from Manufacturers.

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Do organise work practices and protective clothing to avoid soiling of the skin and eyes; breathing vapours/aerosols/dusts/fumes; inadequate container labelling; fire and explosion hazards.
Do wash before job breaks; before eating, smoking, drinking or using toilet facilities when handling chemical materials.
Do keep work areas clean, uncluttered and free of spills.
Do store according to national and local regulations.
Do keep chemical materials out of reach of children.

DO NOTS

Do Not mix chemical materials except under the manufacturers instructions; some chemicals can form other toxic or harmful chemicals; give off toxic or harmful fumes; be explosive when mixed together.
Do Not spray chemical materials, particularly those based on solvents, in confined spaces e.g. when people are inside a vehicle.
Do Not apply heat or flame to chemical materials except under the manufacturers' instructions. Some are highly inflammable and some may release toxic or harmful fumes.
Do Not leave containers open. Fumes given off can build up to toxic, harmful or explosive concentrations. Some fumes are heavier than air and will accumulate in confined areas, pits etc.
Do Not transfer chemical materials to unlabeled containers.
Do Not clean hands or clothing with chemical materials. Chemicals, particularly solvents and fuels will dry the skin and may cause irritation with dermatitis. Some can be absorbed through the skin in toxic or harmful quantities.
Do Not use emptied containers for other materials, except when they have been cleaned under supervised conditions.
Do Not sniff or smell chemical materials. Brief exposure to high concentrations of fumes can be toxic or harmful.

Clutch Fluids

see Brake and Clutch Fluids.

Clutch Linings and Pads

see Brake and Clutch Linings and Pads.

CORROSION PROTECTION MATERIALS

see Solvents, Fire.
Highly flammable, flammable.
These materials are varied and the manufacturers instructions should be followed. They may contain solvents, resins, petroleum products etc. Skin and eye contact should be avoided. They should only be sprayed in conditions of adequate ventilation and not in confined spaces.

Cutting

see Welding.

De-Waxing

see Solvents and Fuels (Kerosene).

DUSTS

Powder, dusts or clouds may be irritant, harmful or toxic. Avoid breathing dusts from powdery chemical materials or those arising from dry abrasion operations. Wear respiratory protection if ventilation is inadequate.

ELECTRIC SHOCK

Electric shocks can result from the use of faulty electrical equipment or from the misuse of equipment even in good condition.
Ensure that electrical equipment is maintained in good condition and frequently tested.
Ensure that flexes, cables, plugs and sockets are not frayed, kinked, cut, cracked or otherwise damaged.
Ensure that electric equipment is protected by the correct rated fuse.
Never misuse electrical equipment and never use equipment which is in any way faulty. The results could be fatal.
Use reduced voltage equipment (**110 volt**) for inspection and working lights where possible.

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Ensure that the cables of mobile electrical equipment cannot get trapped and damaged, such as in a vehicle hoist.
Use air operated mobile equipment where possible in preference to electrical equipment.

In cases of electrocution:-

- switch off electricity before approaching victim
- if this is not possible, push or drag victim from source of electricity using dry non-conductive material
- commence resuscitation if trained to do so
- SUMMON MEDICAL ASSISTANCE

EXHAUST FUMES

These contain asphyxiating, harmful and toxic chemicals and particles such as carbon oxides, nitrogen oxides, aldehydes, lead and aromatic hydrocarbons. Engines should only be run under conditions of adequate extraction or general ventilation and not in confined spaces.

Gasolene (Petrol) Engine

There may not be adequate warning properties of odour or irritation before immediate and delayed toxic or harmful effects arise.

Diesel Engine

Soot, discomfort and irritation usually give adequate warning of hazardous fume concentrations.

FIBRE INSULATION

see Dusts.
Used in noise and sound insulation.
The fibrous nature of surfaces and cut edges can cause skin irritation. This is usually a physical and not a chemical effect.
Precautions should be taken to avoid excessive skin contact through careful organisation of work practices and the use of gloves.

FIRE

see Welding, Foams, Legal Aspects.
Many of the materials found on or associated with the repair of vehicles are highly flammable. Some give off toxic or harmful fumes if burnt.
Observe strict fire safety when storing and handling flammable materials or solvents, particularly near electrical equipment or welding processes.
Ensure before using electrical or welding equipment but that there is no fire hazard present.
Have a suitable fire extinguisher available when using welding or heating equipment.

FIRST AID

Apart from meeting any legal requirements it is desirable for someone in the workshop to be trained in first aid procedures.
Splashes in the eye should be flushed with clean water for at least ten minutes.
Soiled skin should be washed with soap and water.
Inhalation affected individuals should be removed to fresh air immediately.
If swallowed or if effects persist consult a doctor with information (label) on material used.
Do not induce vomiting (unless indicated by manufacturer).

FOAMS - Polyurethane

see Fire.
Used in sound and noise insulation. Cured foams used in seat and trim cushioning.
Follow manufacturers instructions.
Unreacted components are irritating and may be harmful to the skin and eyes. Wear gloves and goggles.

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Individuals with chronic respiratory diseases, asthma, bronchial medical problems or histories of allergic diseases should not work with or near uncured materials.
The components, vapours, spray mists can cause direct irritation, sensitivity reactions and may be toxic or harmful.
Vapours and spray mists must not be breathed. These materials must be applied with adequate ventilation and respiratory protection. Do not remove respirator immediately after spraying, wait until vapour/ mists have cleared.
Burning of the uncured components and the cured foams can generate toxic and harmful fumes.
Smoking, open flames or the use of electrical equipment during foaming operations and until vapours/mists have cleared should not be allowed.
Any heat cutting of cured foams or partially cured foams should be conducted with extraction ventilation (see Body Section 44 Legal and Safety Aspects).

FUELS

see Fire, Legal Aspects, Chemicals - General, Solvents.
Used as fuels and cleaning agents.

Gasolene (Petrol).

Highly flammable.
Swallowing can result in mouth and throat irritation and absorption from the stomach can result in drowsiness and unconsciousness. Small amounts can be fatal to children. Aspiration of liquid into the lungs, e.g. through vomiting, is a very serious hazard.
Gasolene dries the skin and can cause irritation and dermatitis on prolonged or repeated contact. Liquid in the eye causes severe smarting.
Motor gasolene may contain appreciable quantities of benzene, which is toxic upon inhalation and the concentrations of gasolene vapours must be kept very low. High concentrations will cause eye, nose and throat irritation, nausea, headache, depression and symptoms of drunkenness. Very high concentrations will result in rapid loss of consciousness.
Ensure there is adequate ventilation when handling and using gasolene. Great care must be taken to avoid the serious consequences of inhalation in the event of vapour build up arising from spillages in confined spaces.
Special precautions apply to cleaning and maintenance operations on gasolene storage tanks.
Gasolene should not be used as a cleaning agent. It must not be siphoned by mouth.

Kerosene (Paraffin)

Used also as heating fuel, solvent and cleaning agent.
Flammable.
Irritation of the mouth and throat may result from swallowing. The main hazard from swallowing arises if liquid aspiration into the lungs occurs. Liquid contact dries the skin and can cause irritation or dermatitis. Splashes in the eye may be slightly irritating.
In normal circumstances the low volatility does not give rise to harmful vapours. Exposure to mists and vapours from kerosene at elevated temperatures should be avoided (mists may arise in de-waxing).
Avoid skin and eye contact and ensure there is adequate ventilation.

Gas-Oil (Diesel Fuel)

see Fuels (Kerosene).
Combustible.
Gross or prolonged skin contact with high boiling gas oils may also cause serious skin disorders including skin cancer.

GAS CYLINDERS

see Fire.
Gases such as oxygen, acetylene, carbon dioxide, argon and propane are normally stored in cylinders at pressures of up to **140 bar**(**2000 lb/in2**) and great care should be taken in handling these cylinders to avoid mechanical damage to them or to the valve gear attached. The contents of each cylinder should be clearly identified by appropriate markings.
Cylinders should be stored in well ventilated enclosures, and protected from ice and snow, or direct sunlight. Fuel gases (e.g. acetylene and propane) should not be stored in close proximity to oxygen cylinders.
Care should be exercised to prevent leaks from gas cylinders and lines, and to avoid sources of ignition.
Only trained personnel should undertake work involving gas cylinders.

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Gases

see Gas Cylinders.

Gas Shielded Welding

see Welding.

Gas Welding

see Welding.

GENERAL WORKSHOP TOOLS AND EQUIPMENT

It is essential that all tools and equipment are maintained in good condition and the correct safety equipment used where required.
Never use tools or equipment for any purpose other than that for which they were designed.
Never overload equipment such as hoists, jacks, axle and chassis stands or lifting slings. Damage caused by overloading is not always immediately apparent and may result in a fatal failure the next time that the equipment is used.
Do not use damaged or defective tools or equipment, particularly high speed equipment such as grinding wheels. A damaged grinding wheel can disintegrate without warning and cause serious injury.
Wear suitable eye protection when using grinding, chiselling or sand blasting equipment.
Wear a suitable breathing mask when using sand blasting equipment, working with asbestos based materials or using spraying equipment.

Glues

see Adhesives and Sealers.

High Pressure Air, Lubrication and Oil Test Equipment accordance with local regulations

see Lubricants and Greases.
Always keep high pressure equipment in good condition and regularly maintained, particularly at joints and unions.
Never direct a high pressure nozzle at the skin as the fluid may penetrate to the underlying tissue etc. and cause serious injury.

LEGAL ASPECTS

Many laws and regulations make requirements relating to health and safety in the use of materials and equipment in workshops. Always conform to the laws and regulations applicable to the country in which you are working.
Workshops should be familiar, in detail, with the associated laws and regulations. Consult the local factory inspectorate or appropriate authority if in any doubt.

LUBRICANTS AND GREASES

Avoid all prolonged and repeated contact with mineral oils, especially used oils. Used oils contaminated during service (e.g. routine service change sump oils) are more irritating and more likely to cause serious effects including skin cancer in the event of gross and prolonged skin contact.
Wash skin thoroughly after work involving oil. Proprietary hand cleaners may be of value provided they can be removed from the skin with water. Do not use petrol, paraffin or other solvents to remove oil from the skin.
Lubricants and greases may be slightly irritating to the eyes.
Repeated or prolonged skin contact should be avoided by wearing protective clothing if necessary. Particular care should be taken with used oils and greases containing lead. Do not allow work clothing to be contaminated with oil. Dry clean or launder such clothing at regular intervals. Discard oil soaked shoes.
Do not employ used engine oils as lubricants or for any application where appreciable skin contact is likely to occur.
Used oils may only be disposed of in accordance with local regulations.

Noise Insulation Materials

see Foams, Fibre Insulation.

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PAINTS

see Solvents and Chemical Materials - General.
Highly Flammable, Flammable.
One Pack. Can contain harmful or toxic pigments, driers and other components as well as solvents. Spraying should only be carried out with adequate ventilation.
Two Pack. Can also contain harmful and toxic unreacted resins and resin hardening agents. The manufacturers instructions should be followed and the section of page 5 on resin based adhesives, isocyanate containing Adhesives and Foams should be consulted.
Spraying should preferably be carried out in exhausted ventilated booths removing vapour and spray mists from the breathing zone. Individuals working in booths should wear respiratory protection. Those doing small scale repair work in the open shop should wear supplied air respirators.

Paint Thinners

see Solvents.

Petrol

see Fuels (Gasolene).

Pressurised Equipment

see High Pressure Air, Lubrication and Oil Test Equipment.

Resistance Welding

see Welding.

Sealers

see Adhesives and Sealers.

SOLDER

see Welding.
Solders are mixtures of metals such that the melting point of the mixture is below that of the constituent metals (normally lead and tin). Solder application does not normally give rise to toxic lead fumes, provided a gas/air flame is used. Oxy-acetylene flames should not be used, as they are much hotter and will cause lead fumes to be evolved.
Some fumes may be produced by the application of any flame to surfaces coated with grease etc. and inhalation of these should be avoided.
Removal of excess solder should be undertaken with care, to ensure that fine lead dust is not produced, which can give toxic effects if inhaled. Respiratory protection may be necessary.
Solder spillage and filing should be collected and removed promptly to prevent general air contamination by lead.
High standards of personal hygiene are necessary in order to avoid indigestion of lead or inhalation of solder dust from clothing.

SOLVENTS

see Chemical Materials - General Fuels (Kerosene), Fire.
e.g. Acetone, white spirit, toluene, xylene, trichlorethane.
Used in cleaning materials, de-waxing, paints, plastics, resins, thinners etc.
Highly Inflammable, Flammable.
Skin contact will degrease the skin and may result in irritation and dermatitis following repeated or prolonged contact.
Some can be absorbed through the skin in toxic or harmful quantities.
Splashes in the eye may cause severe irritation and could lead to loss of vision.
Brief exposure to high concentrations of vapours or mists will cause eye and throat irritation, drowsiness, dizziness, headaches and in the worst circumstances, unconsciousness.
Repeated or prolonged exposures to excessive but lower concentrations of vapours or mists, for which there might not be adequate warning indications, can cause more serious toxic or harmful effects.
Aspiration into the lungs (e.g. through vomiting) is the most serious consequence of swallowing.

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Avoid splashes to the skin, eyes and clothing. Wear protective gloves, goggles and clothing if necessary.
Ensure good ventilation when in use, avoid breathing fumes, vapours and spray mists and keep containers tightly sealed. Do not use in confined spaces.
When the spraying material contains solvents, e.g. paints, adhesives, coatings, use extraction ventilation or personal respiratory protection in the absence of adequate general ventilation.
Do not apply heat or flame except under specific and detailed manufacturers instructions.

Sound Insulation

see Fibre Insulation, Foams.

Spot Welding

see Welding.

SUSPENDED LOADS

There is always a danger when loads are lifted or suspended. Never work under an unsupported suspended or raised load, e.g. jacked up vehicle, suspended engine, etc.
Always ensure that lifting equipment such as jacks, hoists, axle stands, slings, etc. are adequate and suitable for the job, in good condition and regularly maintained.
Never improvise lifting tackle.

Underseal

see Corrosion Protection.

WELDING

see Fire, Electric Shock, Gas Cylinders.
Welding processes include Resistance Welding (Spot Welding), Arc Welding and Gas Welding.

Resistance Welding

This process may cause particles of molten metal to be emitted at high velocity and the eyes and skin must be protected.

Arc Welding

This process emits a high level of ultraviolet radiation which may cause eye and skin burns to the welder and to other persons nearby. Gas-shielded welding processes are particularly hazardous in this respect. Personal protection must be worn, and screens used to shield other people.
Metal spatter will also occur and appropriate eye and skin protection is necessary.
The heat of the welding arc will produce fumes and gases from the metals being welded and from any applied coatings or contamination on the surfaces being worked on. These gases and fumes may be toxic and inhalation should always be avoided. The use of extraction ventilation to remove the fumes from the working area may be necessary, particularly in cases where the general ventilation is poor, or where considerable welding work is anticipated. In extreme cases where adequate ventilation cannot be provided, supplied air respirators may be necessary.

Gas Welding

Oxy-acetylene torches may be used for welding and cutting and special care must be taken to prevent leakage of these gases, with consequent risk of fire and explosion.
The process will produce metal spatter and eye and skin protection is necessary.
The flame is bright and eye protection should be used, but the ultra-violet emission is much less than that from arc welding, and lighter filters may be used.
The process itself produces few toxic fumes, but such fumes and gases may be produced from coatings on the work, particularly during cutting away of damaged body parts and inhalation of the fumes should be avoided.
In brazing, toxic fumes may be evolved from the metals in the brazing rod, and a severe hazard may arise if brazing rods containing cadmium are used. In this event particular care must be taken to avoid inhalation of fumes and expert advice may be required.

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SPECIAL PRECAUTIONS MUST BE TAKEN BEFORE ANY WELDING OR CUTTING TAKES PLACE ON VESSELS WHICH HAVE CONTAINED COMBUSTIBLE MATERIALS, E.G. BOILING OR STEAMING OUT OF FUEL TANKS.

White Spirit

see Solvents.

ECOLOGY AND THE ENVIRONMENT

Soil, air and water are vital factors of agriculture and life in general. Where legislation does not yet rule the treatment of some of the substances which are required by advanced technology, common sense should govern the use and disposal of products of a chemical and petrochemical nature.

The following are recommendations which may be of assistance:

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.
- Where no legislation exists, obtain information from suppliers of oils, filters, batteries, fuels, anti freeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use and dispose of these substances. Agricultural consultants will, in many cases, be able to help you as well.

HELPFUL HINTS

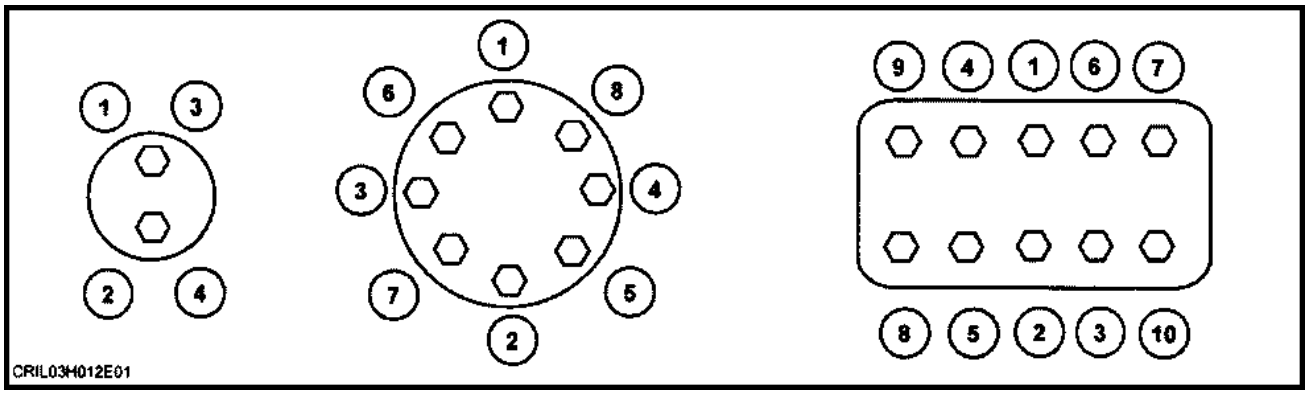
1. Avoid filling tanks using unsuitable containers or inappropriate pressurised fuel delivery systems which may cause considerable spillage.
2. In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them contain substances which can be harmful to your health.
3. Modern oils contain additives. Do not burn contaminated fuels and/or waste oils in ordinary heating systems.
4. Avoid spillage when draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
5. Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil but should be collected and disposed of safely.
6. Do not open the air-conditioning system yourself. It contains gases which should not be released into the atmosphere. Your dealer or air conditioning specialist has a special extractor for this purpose and will have to recharge the system anyway.
7. Repair any leaks or defects in the engine cooling or hydraulic system immediately.
8. Do not increase the pressure in a pressurised circuit as this may lead to the components exploding.
9. Protect hoses during welding as penetrating weld splatter may burn a hole or weaken them, causing the loss of oils, coolant, etc.

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Torque

Minimum hardware tightening torques for normal assembly applications unless otherwise stated

IMPORTANT: *Shown below is the suggested initial torque tightening sequences for general applications, tighten in sequence from item 1 through to the last item of the hardware.*



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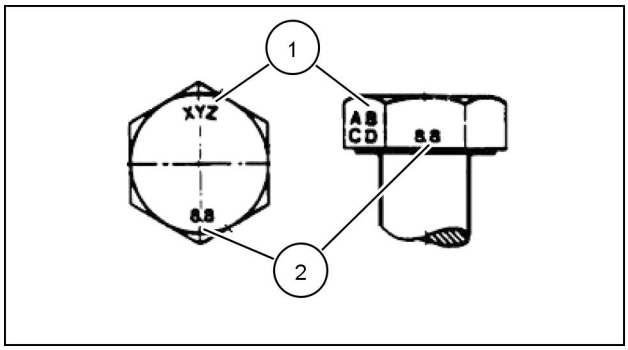
Imperial hardware

Nominal Size	SAE GRADE 2 Unplated or Silver plated	SAE GRADE 2 plated w/ZnCr GOLD	SAE GRADE 5 Unplated or Silver plated	SAE GRADE 5 plated w/ZnCr GOLD	SAE GRADE 8Unplated or Silver plated	SAE GRADE 8 plated w/ZnCr GOLD	LOCK-NUTS GR.B w/GR5 BOLT	LOCK-NUTS GR.B w/GR8 BOLT
1/4	**6.2 Nm 55 lb in**	**8.1 Nm 72 lb in**	**9.7 Nm 86 lb in**	**13 Nm 112 lb in**	**14 Nm 121 lb in**	**18 Nm 157 lb in**	**6.9 Nm 61 lb in**	**9.8 Nm 86 lb in**
5/16	**13 Nm 115 lb in**	**17 Nm 149 lb in**	**20 Nm 178 lb in**	**26 Nm 229 lb in**	**28 Nm 250 lb in**	**37 Nm 324 lb in**	**14 Nm 125 lb in**	**20 Nm 176 lb in**
3/8	**23 Nm 17 lb ft**	**30 Nm 22 lb ft**	**35 Nm 26 lb ft**	**46 Nm 34 lb ft**	**50 Nm 37 lb ft**	**65 Nm 48 lb ft**	**26 Nm 19 lb ft**	**35 Nm 26 lb ft**
7/16	**37 Nm 27 lb ft**	**47 Nm 35 lb ft**	**57 Nm 42 lb ft**	**73 Nm 54 lb ft**	**80 Nm 59 lb ft**	**104 Nm 77 lb ft**	**41 Nm 30 lb ft**	**57 Nm 42 lb ft**
1/2	**27 Nm 42 lb ft**	**73 Nm 54 lb ft**	**87 Nm 64 lb ft**	**113 Nm 83 lb ft**	**123 Nm 91 lb ft**	**159 Nm 117 lb ft**	**61 Nm 45 lb ft**	**88 Nm 64 lb ft**
9/16	**81 Nm 60 lb ft**	**104 Nm 77 lb ft**	**125 Nm 92 lb ft**	**163 Nm 120 lb ft**	**176 Nm 130 lb ft**	**229 Nm 169 lb ft**	**88 Nm 65 lb ft**	**125 Nm 92 lb ft**
5/8	**112 Nm 83 lb ft**	**145 Nm 107 lb ft**	**174 Nm 128 lb ft**	**224 Nm 165 lb ft**	**244 Nm 180 lb ft**	**316 Nm 233 lb ft**	**122 Nm 90 lb ft**	**172 Nm 127 lb ft**
3/4	**198 Nm 146 lb ft**	**256 Nm 189 lb ft**	**306 Nm 226 lb ft**	**397 Nm 293 lb ft**	**432 Nm 319 lb ft**	**560 Nm 413 lb ft**	**217 Nm 160 lb ft**	**305 Nm 226 lb ft**
7/8	**193 Nm 142 lb ft**	**248 Nm 183 lb ft**	**495 Nm 365 lb ft**	**641 Nm 473 lb ft**	**698 Nm 515 lb ft**	**904 Nm 667 lb ft**	**350 Nm 258 lb ft**	**494 Nm 364 lb ft**
1.0	**289 Nm 213 lb ft**	**373 Nm 275 lb ft**	**742 Nm 547 lb ft**	**960 Nm 708 lb ft**	**1048 Nm 773 lb ft**	**1356 Nm 1000 lb ft**	**523 Nm 386 lb ft**	**739 Nm 545 lb ft**

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Metric hardware

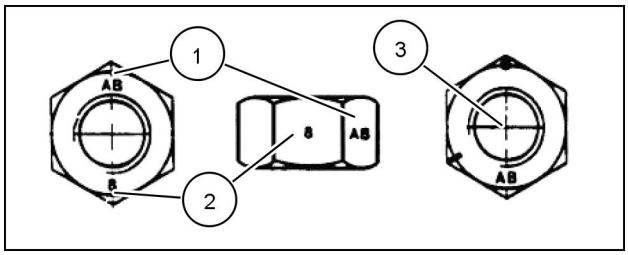
Nominal Size	CLASS 5.8 UNPLATED	CLASS 5.8 UNPLATED	CLASS 8.8 UNPLATED	CLASS 8.8 UNPLATED	CLASS 10.9 UNPLATED	CLASS 10.9 UNPLATED	LOCKNUT CL.8 w/CL8.8 BOLT
M4	**1.7 Nm 15 lb in**	**2.2 Nm 19 lb in**	**2.6 Nm 23 lb in**	**3.4 Nm 30 lb in**	**3.7 Nm 33 lb in**	**4.8 Nm 42 lb in**	**1.8 Nm 16 lb in**
M6	**5.8 Nm 51 lb in**	**7.6 Nm 67 lb in**	**8.9 Nm 79 lb in**	**12 Nm 102 lb in**	**13 Nm 115 lb in**	**17 Nm 150 lb in**	**6.3 Nm 56 lb in**
M8	**14 Nm 124 lb in**	**18 Nm 159 lb in**	**22 Nm 195 lb in**	**28 Nm 248 lb in**	**31 Nm 274 lb in**	**40 Nm 354 lb in**	**15 Nm 133 lb in**
M10	**28 Nm 21 lb ft**	**36 Nm 27 lb ft**	**43 Nm 32 lb ft**	**56 Nm 41 lb ft**	**61 Nm 45 lb ft**	**79 Nm 58 lb ft**	**30 Nm 22 lb ft**
M12	**49 Nm 36 lb ft**	**63 Nm 46 lb ft**	**75 Nm 55 lb ft**	**97 Nm 72 lb ft**	**107 Nm 79 lb ft**	**138 Nm 102 lb ft**	**53 Nm 39 lb ft**
M16	**121 Nm 89 lb ft**	**158 Nm 117 lb ft**	**186 Nm 137 lb ft**	**240 Nm 177 lb ft**	**266 Nm 196 lb ft**	**344 Nm 254 lb ft**	**131 Nm 97 lb ft**
M20	**237 Nm 175 lb ft**	**307 Nm 107 lb ft**	**375 Nm 277 lb ft**	**485 Nm 358 lb ft**	**519 Nm 383 lb ft**	**671 Nm 495 lb ft**	**265 Nm 195 lb ft**
M24	**411 Nm 303 lb ft**	**531 Nm 392 lb ft**	**648 Nm 478 lb ft**	**839 Nm 619 lb ft**	**897 Nm 662 lb ft**	**1160 Nm 855 lb ft**	**458 Nm 338 lb ft**



20083680 2

Identification - Hexagon cap screw and carriage bolts classes 5.6 and onwards

1.Manufacturers identification
2. Property class

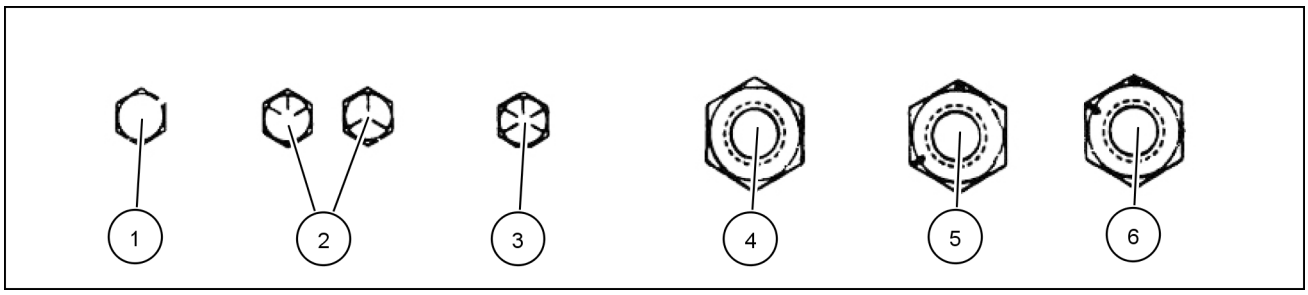


20083681 3

Identification - Hexagonal nuts and locknuts classes 05 onwards

1. Manufacturers identification
2. Property class
3. Clock marking

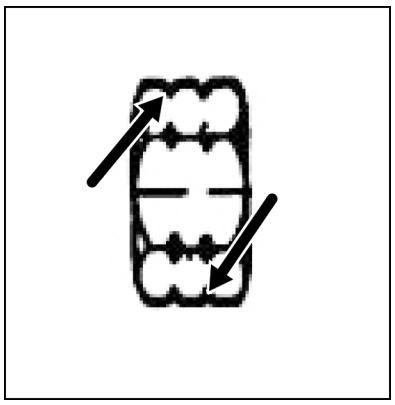
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20083682 4

Identification - Cap screws and carriage bolts

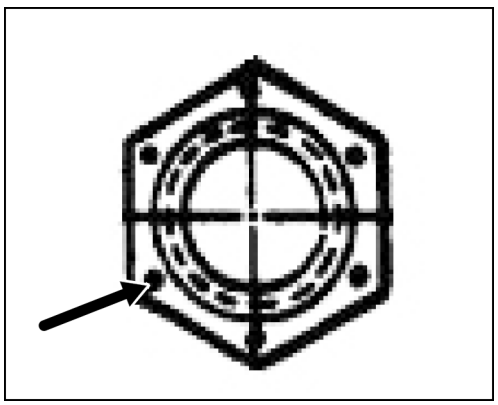
1. SAE grade 2
2. SAE grade 5
3. SAE grade 8
4. Regular nuts
5. SAE grade 5 hex nuts
6. SAE grade 8 hex nuts



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Locknuts - grade identification

Grade A : no notches
Grade B : one circumferential notch
Grade C : two circumferential notches

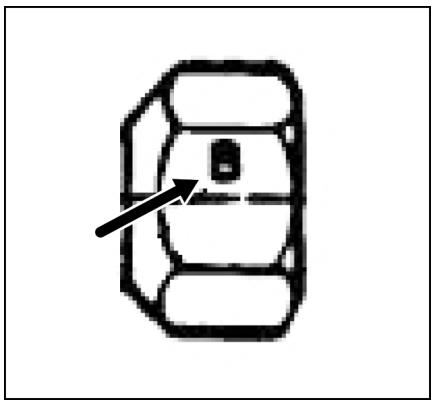


20083684 6

Locknuts - grade identification

Grade A : no marks
Grade B : three marks
Grade C : six marks

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20083685 7

Locknuts - grade identification

Grade A : no marks
Grade B : letter B
Grade C : letter C

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Torque Hydraulic connectors

IMPORTANT: *The following data is for general use on lightly oiled threads on standard hydraulic connectors, where the counter parts are made of steel.*

BSP Hydraulic adapter connections

Nominal size of nut	Tightening Torque
BSP SIZE	Nm (Lbsf/ft)
1/8	**17 Nm** (**12.5 lb ft**)
1/4	**34 Nm** (**25.1 lb ft**)
3/8	**47 Nm** (**34.7 lb ft**)
1/2	**102 Nm** (**75.2 lb ft**)
5/8	**122 Nm** (**90.0 lb ft**)
3/4	**149 Nm** (**109.9 lb ft**)
1	**203 Nm** (**149.7 lb ft**)
1-1/4	**305 Nm** (**225.0 lb ft**)
1-1/2	**305 Nm** (**225.0 lb ft**)
2	**400 Nm** (**295.0 lb ft**)

O.R.F.S Hydraulic connections

Nominal size of nut SAE Dash	Thread	Equivalent BSP size	Tightening torque NM (lbsf/ft)
-	9/16-18	1/8	**14 Nm** (**10.3 lb ft**)
-4	11/16-16	1/4	**24 Nm** (**17.7 lb ft**)
-6	13/16-16	3/8	**33 Nm** (**24.3 lb ft**)
-8	1-14	1/2	**44 Nm** (**32.5 lb ft**)
-10	1-3/16-12	5/8	**58 Nm** (**42.8 lb ft**)
-12	1-7/16-12	3/4	**84 Nm** (**62.0 lb ft**)
-16	1-11/16-12	1	**115 Nm** (**84.8 lb ft**)
-20	2-12	1-1/4	**189 Nm** (**139.4 lb ft**)
-24	-	1-1/2	**244 Nm** (**180.0 lb ft**)

Metric connections

Nominal size of nut	Tightening Torque
Metric nut	Nm (Lbsf/ft)
M10	**18 Nm** (**13 lb ft**).
M12	**20 Nm** (**15 lb ft**).
M14	**25 Nm** (**19 lb ft**).
M16	**45 Nm** (**33 lb ft**).
M18	**50 Nm** (**37 lb ft**).
M20	**70 Nm** (**52 lb ft**).
M22	**75 Nm** (**55 lb ft**).
M26	**110 Nm** (**81 lb ft**).
M33	**220 Nm** (**162 lb ft**).
M42	**230 Nm** (**170 lb ft**).
M48	**250 Nm** (**258 lb ft**).

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Metric

Nominal size of nut	Tightening torque NM (lbsf/ft)
5/16-24	**10 Nm** (**7 lb ft**).
3/8-24	**10 Nm** (**7 lb ft**).
7/16-20	**14 Nm** (**10 lb ft**).
1/2-20	**20 Nm** (**15 lb ft**).
9/16-18	**22 Nm** (**20 lb ft**).
5/8-18	**27 Nm** (**20 lb ft**).
3/4-16	**48 Nm** (**35 lb ft**).
7/8-14	**81 Nm** (**60 lb ft**).
1-1/16-12	**108 Nm** (**79 lb ft**).
1-3/16-12	**136 Nm** (**100 lb ft**).
1-5/16-12	**148 Nm** (**108 lb ft**).
1-5/8-12	**173 Nm** (**127 lb ft**).
1-7/8-12	**216 Nm** (**158 lb ft**).
2-1/2-12	**334 Nm** (**245 lb ft**).

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CASE IH AGRICULTURE

SERVICE MANUAL

DISTRIBUTION SYSTEMS



Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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PRIMARY HYDRAULIC POWER SYSTEM - Torque

Variable flow closed centre hydraulic pump	**135 Nm** (**99.6 lb ft**)
Vane pump	**60 Nm** (**44.3 lb ft**)
Priority valve	**50 Nm** (**36.9 lb ft**)
Pressure compensating valve	**15.5 Nm** (**11.4 lb ft**)
Main suction filter housing	**40 Nm** (**29.5 lb ft**)

PRIMARY HYDRAULIC POWER SYSTEM - Special tools

DESCRIPTION	PART NUMBER
Tee adaptor 11/16 ORFS female x 11/16 ORFS male x 7/16 UNF female	380000570*
Tee adaptor 7/16 JIC female x 7/16 JIC male x 7/16 UNF female	380000571*
Adaptor M10 banjo x 7/16 UNF female	380000572*
Tee adaptor 9/16 ORFS female x 9/16 ORFS male x 7/16 UNF female	380000572*
Blanking Cap 9/16 ORFS	380000573*
Blanking Cap 7/16 ORFS	380000575*
Adaptor 7/16 UNF female x 1/2 BSP male	380000576*
Adaptor 7/16 UNF female x M12 x 1.5p male	380000577*
Adaptor 7/16 UNF female x M14 x 1.5p male	380000578*
Adaptor M14 banjo x M14 x 1.5p female	380000579*
Tee adaptor 7/16 UNF female x 1/4 BSP hose tail x 1/2 hose	380000580*
7/16 UNF male Quick release adaptor	**380000492***
Adaptor M10 x 1.0p x 7/16 UNF female	**380000493***
Tee adaptor 1” ORFS female x 1” ORFS male x 7/16 UNF female	380000517
Blanking Cap 11/16 ORFS	380000599*
Pressure Gauge 0–10 bar	380000551#
Pressure Gauge 0–40 bar (5 off)	**380000552#**
Pressure Gauge 0–250 bar	380000553#
Remote valve coupling	380000554#
Quick release adaptor	**380000543**
Pressure gauge hose	**380000545#**
1/8 NPT fitting to attach hose 292246 to gauge	**380000544#**
Adaptor M10 x 1.0p x 7/16 JIC male (enables use of gauges with 7/16 JIC hoses if used)	**380000494**
diagnostic switch	**380000488**
Bypass connector	**380000561**
Trailer brake fitting	**380000550#**
Flow Meter **120 l/min**)	
* Part of hydraulic adaptor kit **380000464**	
# Part of hydraulic pressure test kit **380000240**	
Remote valve check valve removal tool	**380002720**

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Charge pump pressure test adaptor	**380200015**
Lift ram pressure test tee piece 13/16 ORFS	**380200012**
Oil cooler pressure test adaptor	**380200006**
Hydraulic pump pressure test adaptor	**380200090**
Lube pressure test adaptor	**380200091**

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Hydraulic pump Variable displacement pump - General specification

Charge Pump

Type	Internal rotor gear pump
Charge Pump displacement	**90 cm³/rev**
Output @ engine speed **2200 RPM** Standard flow	**250 l/min** (**66 US gpm**)
Output @ engine speed **2200 RPM** Hi flow	**250 l/min** (**66 US gpm**)
Charge pressure filter dump valve : Crack open Fully open	 **10 bar** (**145.0 psi**) **15 bar** (**217.5 psi**)
Charge pressure	**2 - 4 bar** (**29.0 - 58.0 psi**)
Charge pressure switch closes	**1 bar** (**14.5 psi**)

Variable displacement pump

Type	Variable Displacement Closed Centre Load Sensing Piston Pump
Rotation	Clockwise
Pump speed @ engine speed **2400 RPM** maximum rated speed (Theoretical)	**3000 RPM**
Pump speed @ engine speed **2200 RPM**	**2750 RPM**
Output @ engine speed **2200 RPM** (Standard flow)	**150 l/min** (**39.6 US gpm**)
Output @ engine speed **2200 RPM**(High flow)	**170 l/min** (**44.9 US gpm**)
Piston Pump displacement (Standard flow)	**56 cm³/rev**
Piston Pump displacement (High flow)	**63 cm³/rev**
Low Standby Pressure	**26 bar** (**377.0 psi**) ± **1 bar** (**14.5 psi**)
Low Standby Pressure (with Italian trailer brakes)	**36 bar** (**522.0 psi**)
High Standby Pressure	**210 bar** (**3045.00 psi**) ± **5 bar** (**72.5 psi**)
Maximum system pressure	**245 bar** (**3552.5 psi**)± **5 bar** (**72.5 psi**)
Cooler By Pass valve	**5.8 bar** (**84.1 psi**).

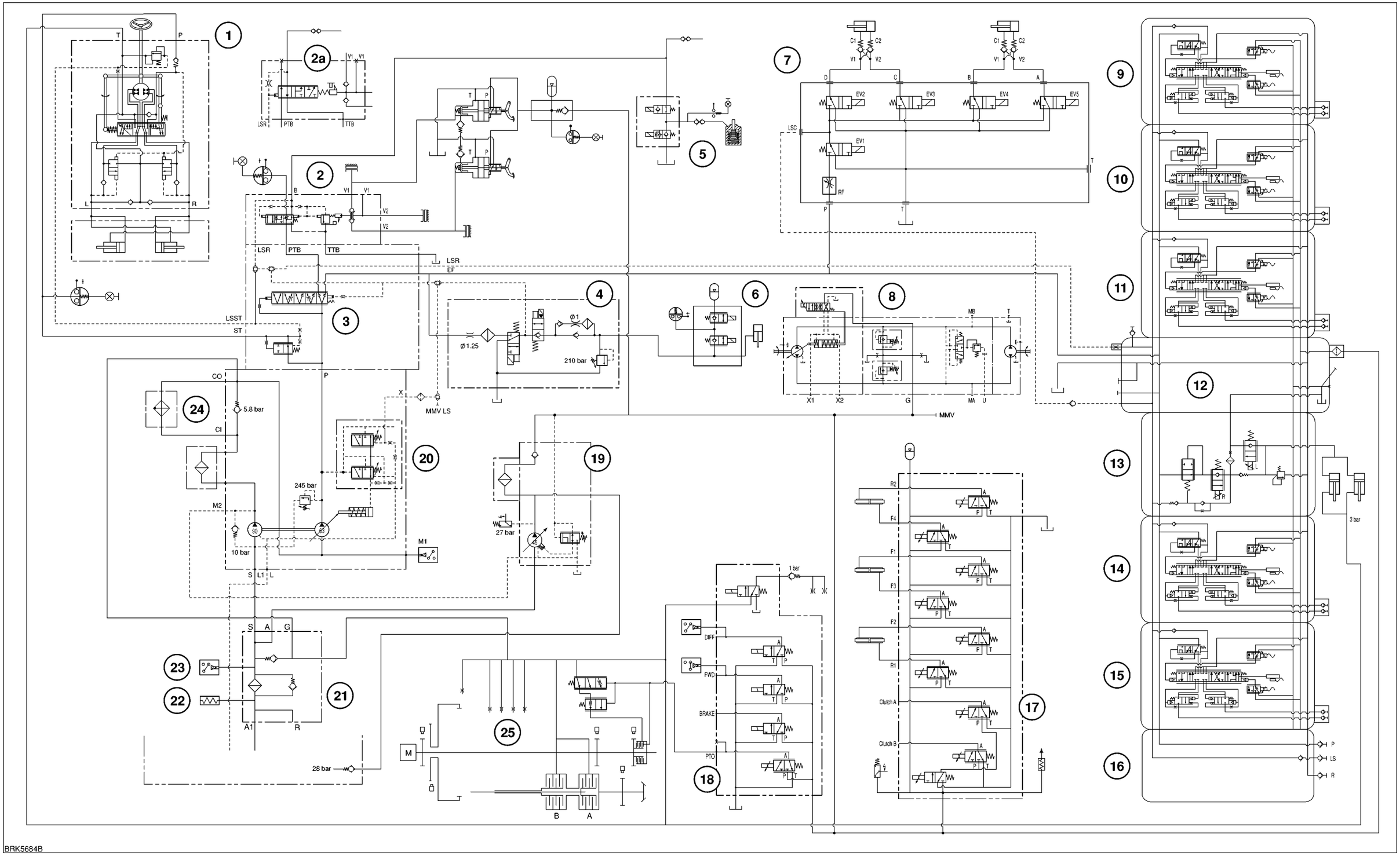
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PRIMARY HYDRAULIC POWER SYSTEM - Hydraulic schema

1. Steering motor
2. Trailer brake valve (Italian)
2a. Trailer brake valve (Universal)
3. Priority valve (refer to **Priority valve - Dynamic description (A.14.A)**
4. Load levelling valve
5. Italian trailer brake Manifold
6. Suspension control valve
7. Hydraulic top link and right hand link diverter valve
8. Hydrostatic motor
9. Electro-hydraulic remote valve
10. Electro-hydraulic remote valve
11. Electro-hydraulic remote valve
12. Distribution manifold
13. Electronic draft control valve
14. Electro-hydraulic remote valve
15. Electro-hydraulic remote valve
16. Power beyond manifold
17. CVT control manifold
18. Low pressure distribution Manifold
19. Vane pump (low pressure supply- **22 - 25 bar** (**319.0 - 362.5 psi**) (refer to **Hydraulic pump - Dynamic description (A.12.A)**
20. Variable displacement closed centre load sensing pump (refer to **Hydraulic pump Variable displacement pump - Dynamic description (A.10.A)**
21. Suction filter
22. Vacuum switch
23. Temperature switch
24. Cooler
25. Lubrication

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PRIMARY HYDRAULIC POWER SYSTEM - Static description

The hydraulic systems can be separated into the following circuits : -

High pressure circuit

Rear hydraulic lift with electronic draft control including external control
Remote control valves
Trailer brake (where fitted)
Suspended front axle (where fitted)

Steering circuit

Steering motor and cylinders
Turn assist Valve (where fitted)
Autoguidance valve (where fitted)

Low pressure circuit

(Supplied by vane pump)

Rear power take off (PTO) and brakes
Differential lock
Front wheel drive engagement
Transmission clutch and synchroniser engagement
Front axle brake booster unit
Power boosted master cylinder
Front P.T.O (Where Fitted)

Lubrication circuit

(Supplied by vane pump)

PTO clutch plates
Transmission clutch plates
Transmission shaft pressure lube
Pump drive gear bearing
Hydraulic lift cross shaft
The high pressure circuit is a closed centre load sensing design.

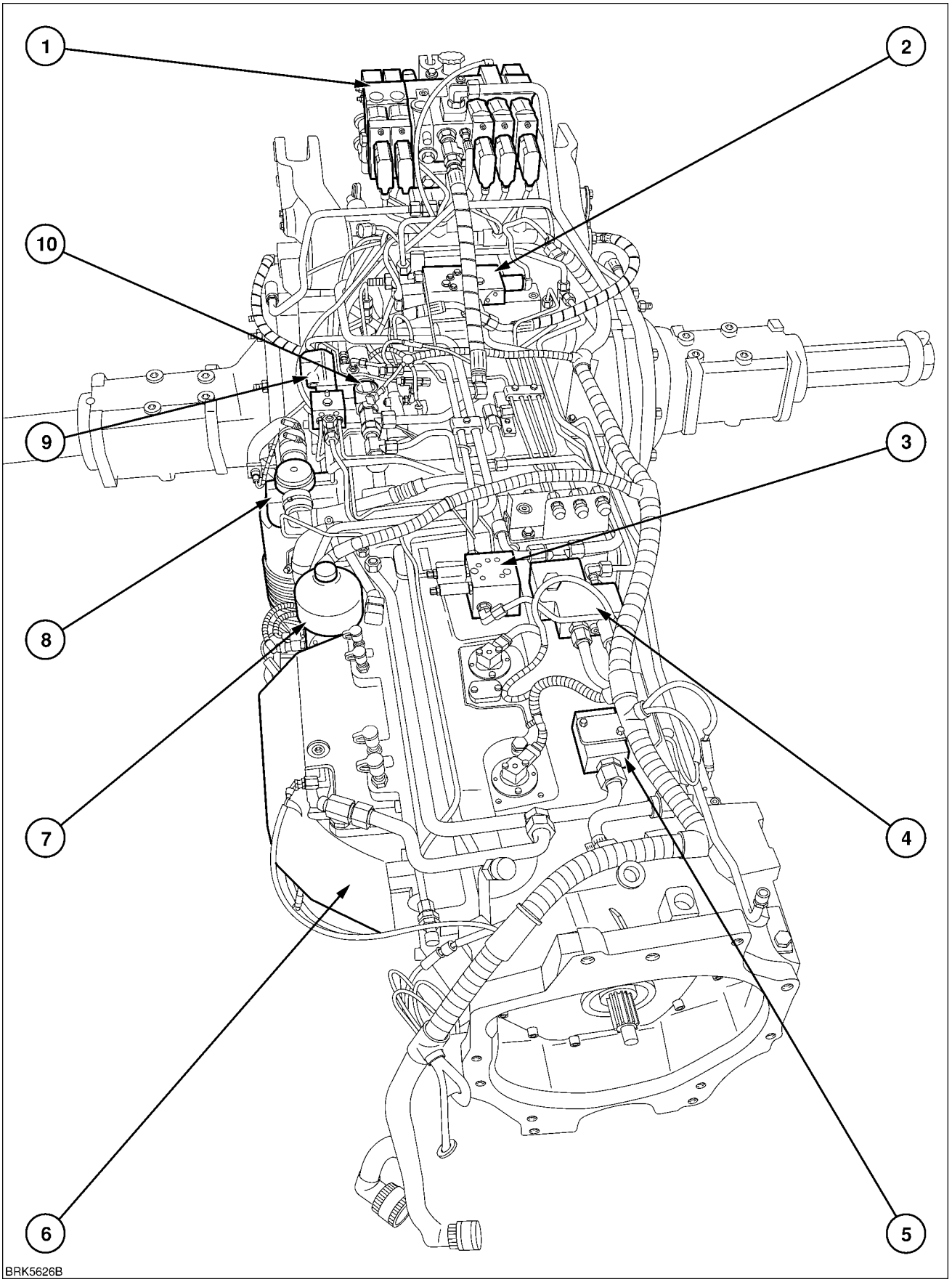
Transmission	High pressure hydraulic system	Hydraulic pump	Hydraulic power lift	Remote valves
Continuously Variable Transmission	Closed system	**120 l/min** CCLS variable displacement pump **150 l/min**Hi flow CCLS variable displacement pump	Electronic power lift control	Closed system

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Main hydraulic components

1.Remote valve assembly
2.Low pressure distribution valve
3.Load levelling valve (Suspension models only)
4.Brake Lubrication manifold
5.Low pressure system relief valve (no longer used)
6.Hydrostatic unit for CVT transmission
7.Transmission valve manifold and accumulator
8.Hydraulic pump and filter assembly
9.Trailer brake valve (where fitted)
10.Priority valve manifold

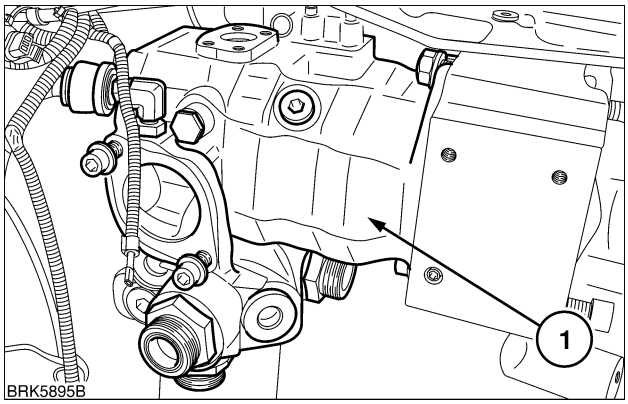
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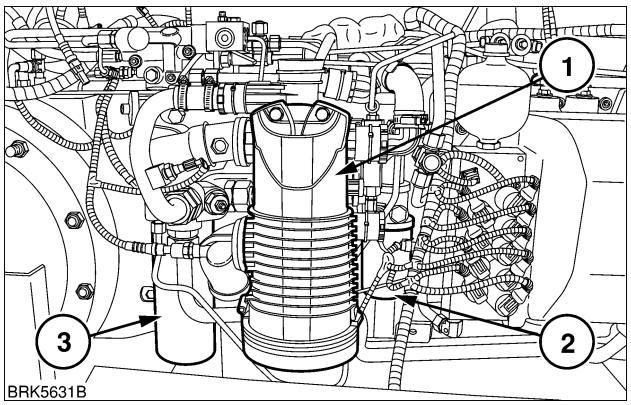
Hydraulic pump assembly



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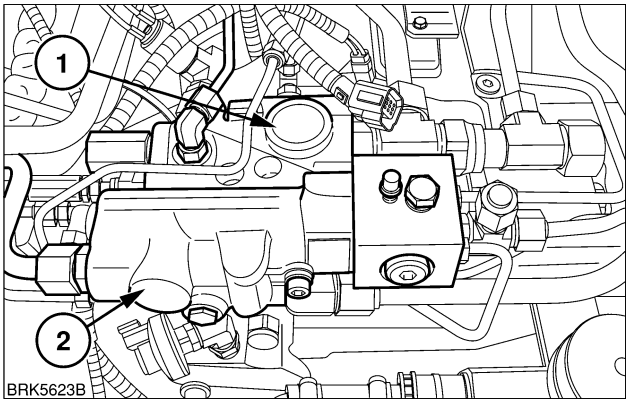
The variable flow closed centre load sensing hydraulic pump assembly is mounted on the right hand side of the rear axle centre housing and contains within its body two hydraulic pumps. A charge pump of the gear type to supply oil at a charge pressure of **10 bar** (**145.0 psi**) to a variable flow closed centre load sensing hydraulic piston pump and a variable flow closed centre load sensing piston type hydraulic pump supplying oil to the high pressure circuit (Refer to **Hydraulic pump Variable displacement pump - Static description (A.10.A)**).

There are 3 filters attached to the hydraulic pump assembly. The main suction filter **(1)**, the vane pump filter **(2)**, and the charge filter **(3)**.



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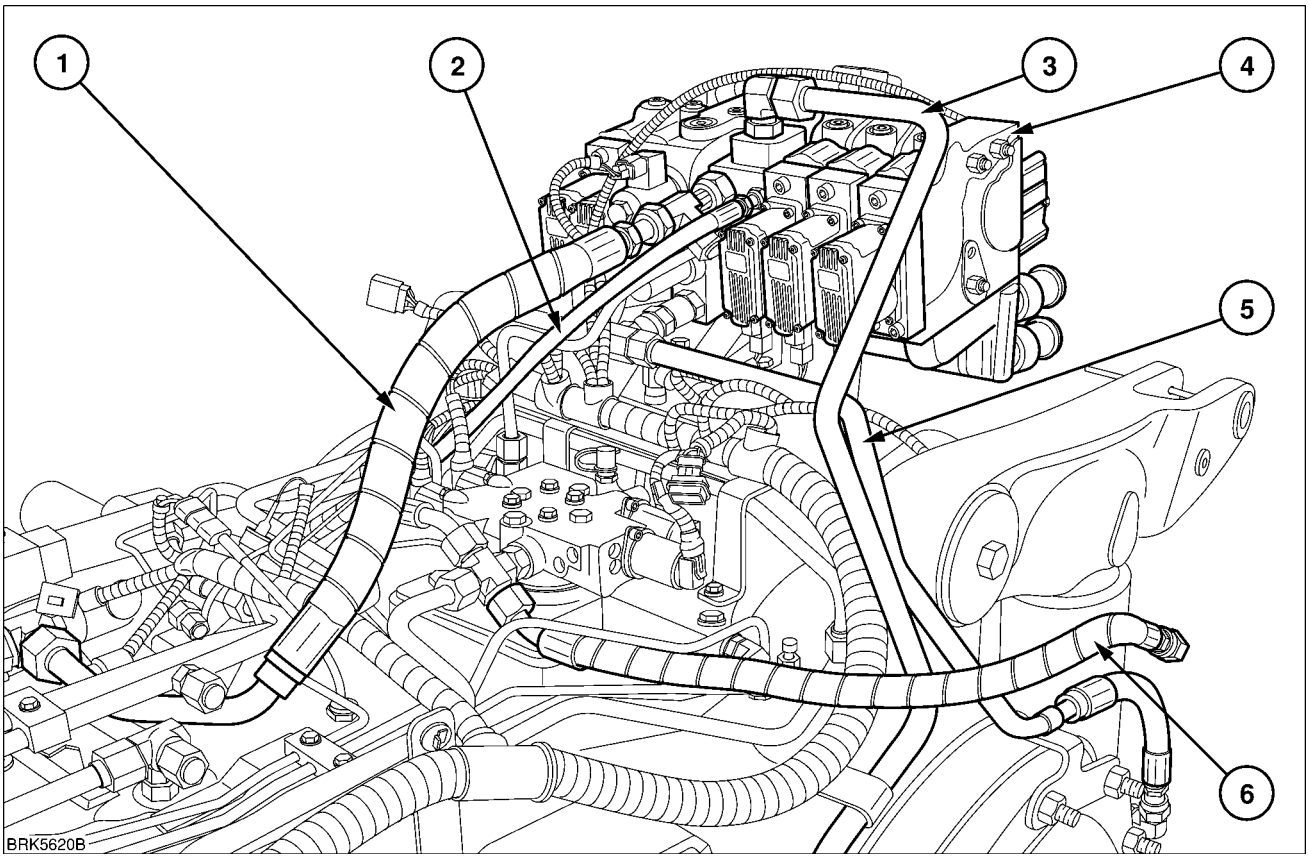
The priority valve **(1)** located on the top of the main pump diverts high pressure oil to the steering, the trailer brake valve (where fitted) **(2)** and high pressure circuit. (Refer to **Priority valve - Dynamic description (A.14.A)**)



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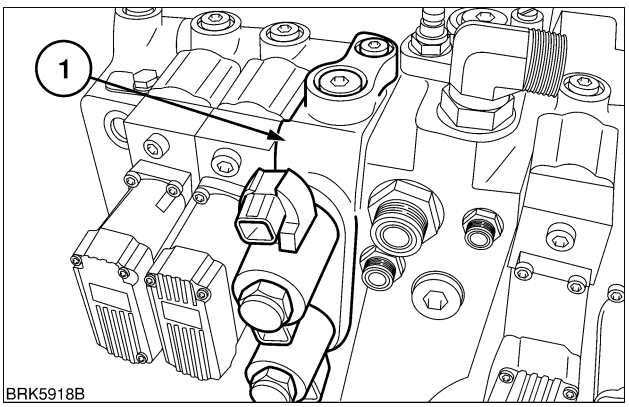
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High pressure circuit



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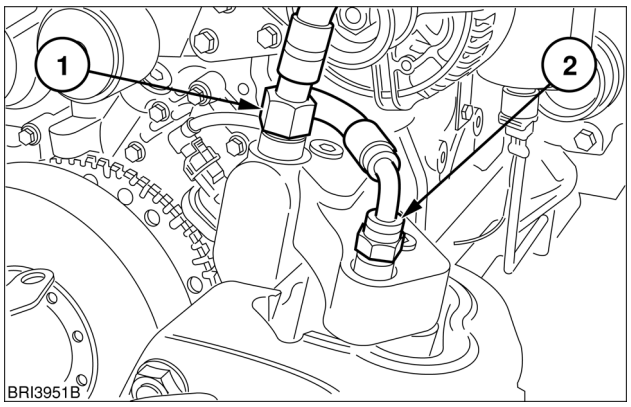
1. Pump feed to electro-hydraulic remotes and electronic draft control
2. Load sensing line
3. Return pipe
4. Remote valve
5. Feed to lift cylinders



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Electronic draft control valve (1)

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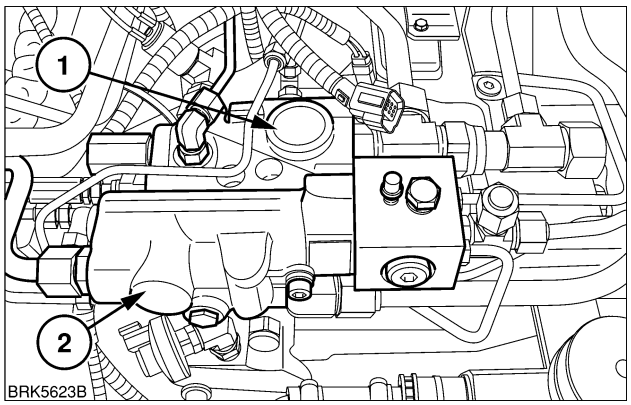


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Suspension (where fitted)

Trailer brake valve

The trailer brake valve **(2)** is located above the hydraulic pump and is connected directly to the priority valve **(1)**.



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PRIMARY HYDRAULIC POWER SYSTEM - Static description Pressure testing

⚠ WARNING ⚠

Hydraulic oil or diesel fuel leaking under pressure can penetrate the skin and cause infection or other injury. To Prevent Personal Injury: Relieve all pressure, before disconnecting fluid lines or performing work on the hydraulic system. Before applying pressure, make sure all connections are tight and components are in good condition. Never use your hand to check for suspected leaks under pressure. Use a piece of cardboard or wood for this purpose. If injured by leaking fluid, see your doctor immediately.

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⚠ WARNING ⚠

Before carrying out any servicing or repairs on tractors equipped with Independent Front Suspension make sure the keyswitch is in the OFF position, the suspension ON/OFF switch is in the OFF position and the axle is fully lowered to the bottom mechanical stop. Failure to do this may result in serious injury.

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To determine if the hydraulic system and the various hydraulic components are working correctly several tests are required. These can be separated into pressure tests and flow tests. The tools required for these tests are listed in **PRIMARY HYDRAULIC POWER SYSTEM - Special tools (A.10.A)** and have been specifically developed for use with these tractors.

Specifications for the hydraulic components can be found in the relevant Chapters :
Hydraulic pump Variable displacement pump - General specification (A.10.A)
Hydraulic pump - General specification (A.12.A)
Priority valve - General specification (A.14.A)
TRANSMISSION Continuously Variable Transmission (CVT) - General specification (C.20.G)
Hydrostat - General specification (C.20.G)

IMPORTANT: *Before performing any pressure or flow testing operate the tractor until the oil in the rear axle is at normal operating temperature.* ***65 °C*** *(* ***145 °F****).*

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Tests

Type of test	Range	Tool or gauge required	Accuracy	Purpose
Pressure test	See location table : **2**			
(a) High pressure test	**200 - 250 bar** (**2900 - 3625 psi**)	**300 - 400 bar** (**4350 - 5800 psi**)	**4 %**	Full high pressure system test
(b) Reduced high pressure test	**135 - 200 bar** (**1958 - 2900 psi**)	**150 bar** (**2175 psi**) **250 bar** (**3625 psi**) **300 bar** (**4350 psi**)	**4 %**	Reduced high pressure system test
(c) Low pressure test	**20 - 30 bar** (**290 - 435 psi**)	**30 bar** (**435 psi**) **40 bar** (**580 psi**)	**8 %**	Low pressure standby is the system pressure maintained by the pump when high pressure hydraulic components are not being operated.
(d) Lubrication or charge test	**4 - 20 bar** (**58 - 290 psi**)	**20 bar** (**290 psi**) **30 bar** (**435 psi**)	**8 %**	This test determines if the charge pressure filter dump valve or the charge pressure valve are operating correctly, or whether the charge pump components are worn or damaged.
Flow tests				
(e) High pressure flow test	**0 - 200 l/min** (**0 - 53 US gpm**)	1 x **200 l/min** or 2 x **100 l/min @ 200 bar**		High pressure pump and circuits flow
(f) Low pressure flow test	**0 - 270 l/min** (**0 - 71 US gpm**)	1 x **300 l/min** or 2 x **150 l/min @ 30 bar**		Low pressure, charge pump and circuits flow
(g) Efficiency test	**0 - 270 l/min** (**0 - 71 US gpm**)	1 x **300 l/min** or 2 x **150 l/min @ 30 bar** or **200 bar**		Output comparison at increased pressures

Table 1

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Locations

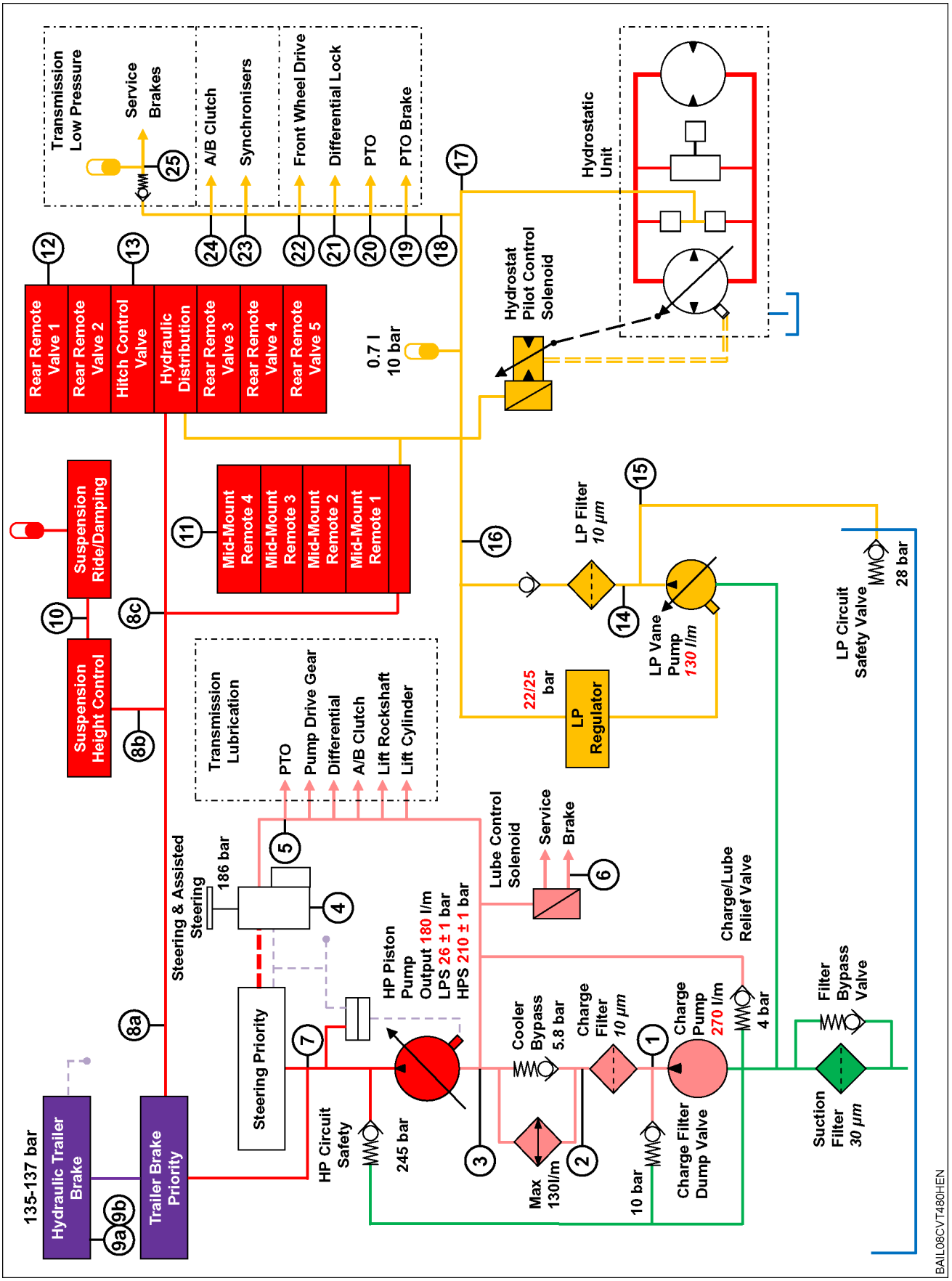
Location	Type of test See table: 1	Tools required	Purpose
(1)	**(d)**	**380200015 380000545 380000543 380001145**	Check output of charge pump (Charge and lubrication)
	(f)	Flowmeter	
(2)	**(d)**	380200006, **380001145 380000543 380000545**	Cooler by pass test
	(f)	Flowmeter	Cooler/charge flow
	(g)	Flowmeter	
(3)	**(d)**		Check output of charge pump
(4)	**(b)**	**380000492 380000545 380000543**	Check steering circuit pressure
	(a)		Check shock valve circuit
(5)	**(d)**	See **(1)**	Check output of charge pump
(6)	**(d)**		Check lubrication pressure
(7)	**(a)**		Check high pressure output
(8a)	**(a)**		Check High pressure output from priority valve
(8b)	**(a)**		Check high pressure output to suspension
(8c)	**(a)**		Check high pressure output to remote valve assembly
(9a)	**(b)**	**380000550 380000552**	Check universal trailer brake valve
(9b)	**(b)**		Check Italian trailer brake valve
(10)	**(a)**		Check suspension (where fitted). *See warning message.
(11)	**(a)**		Check Mid mount valve output
(12)	**(a)**	380000553, **380000492 380000543 380000545**	Rear remote output (high pressure standby)
	(c)	380000554, 380000576, **380000552 380000492 380000543 380000545**	Low pressure standby
	(e)	**200 l/min** flowmeter	Check volume flow of variable displacement pump
(13)	**(a)**		Check Electronic draft control valve
(14)	**(a)**	380000577, **380000552 380000492 380000543 380000545**	Check low pressure output
	(f)	Flowmeter	Check volume flow of variable displacement pump
(15)	**(c)**		Check low pressure relief valve
(16)	**(c)**		Check low pressure flow

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Location	Type of test See table: 1	Tools required	Purpose
(17)	**(a)**		Check low pressure output
(18)	**(a)**		Check low pressure output (low pressure warning switch)
(19)	**(c)**	**380000492 380000552 380000543 380000545**	Check PTO brake lubrication
(20)	**(c)**	See **(19)**	Check PTO lubrication
(21)	**(c)**	See **(19)**	Check differential lock lubrication
(22)	**(c)**	See **(19)**	Check front wheel drive supply
(23)	**(c)**		Check pressure to synchronisers
(24)	**(c)**		Check supply to A/B clutch
(25)	**(c)**	380000577, **380000492 380000552 380000543 380000545**	Check brake boost pressure

Table 2

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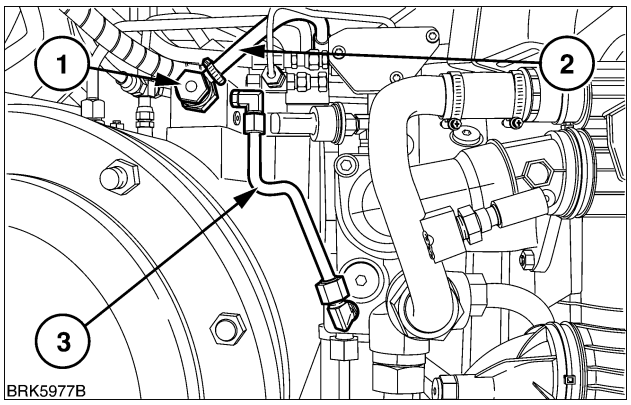


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NOTE: *Other tests may be carried out at the positions indicated. The tests listed are normal at the locations shown*

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Relief valve - Static description Air bleed relief valve



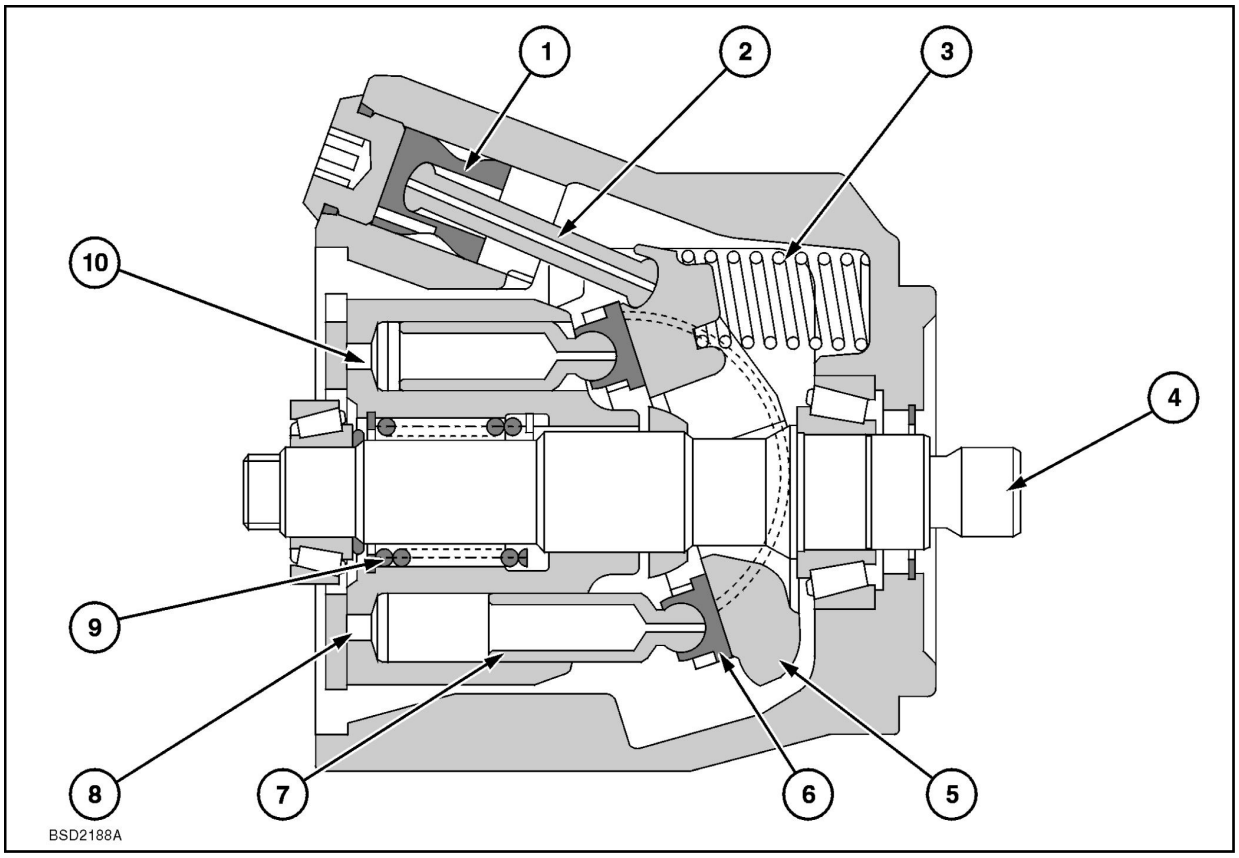
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To reduce air ingress an air bleed relief valve is used in the charge pump hydraulic circuit. Oil at charge pump pressure is drawn up to the valve through pipe **(3)**. The valve **(1)** directs excess oil back to sump by a tube and pipe assembly **(2)** on the top of the transmission housing. The valve has an internal piston and spring assembly . When normal charge pressure is supplied the piston is forced against spring pressure. An orifice at the side of the piston allows any air to leak to the inside of the piston and out through to hose **(2)**. The excess air is vented back into the top of the transmission housing.

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Hydraulic pump Variable displacement pump - Dynamic description

The operating principal of a variable flow piston pump is to provide oil flow on demand and minimise the engine power absorbed in driving the hydraulic pump when the hydraulic circuits do not require maximum pump flow. The variable flow piston pump in hydraulic systems therefore has distinct power loss advantages over fixed displacement gear type pumps, which continually provide oil flow and absorb engine power even when the hydraulic circuits do not require the total pump output.



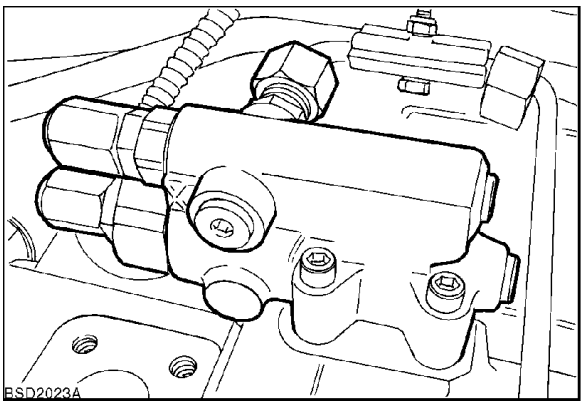
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1.Stroke Control Piston
2.Rod
3.Swash Plate Return Spring
4.Driveshaft
5.Swash Plate
6.Slipper (Quantity 9)
7.Piston and Barrel (Quantity 9)
8.Inlet Port
9.Shaft Pre-Load Spring
10.Outlet Port

The major components of the variable flow piston pump with closed centre load sensing are :-

- A nine element pumping head.
- A plate mechanism (swash plate) to adjust piston stroke and corresponding pump output.
- A load sensing valve which monitors the requirements of the hydraulic circuits and signals the pump to increase or decrease hydraulic oil flow accordingly.

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The nine element pumping head is cylindrical in shape and has nine barrels, into each of which, is installed a piston **(7)**. On the end of each piston is pressed a slipper **(6)** which always remains in contact with the face of the swash plate **(5)** located at the front of the pumping head.

The drive shaft **(4)**, which is driven by the pump drive gear, rotates the pumping head. As the pumping head rotates, the pistons move in and out of their barrels, following the contour of the swash plate. For every revolution of the drive shaft each piston completes one pumping cycle.

The swash plate, which does not rotate but pivots about the front of the pumping head, is the control mechanism that limits the stroke of each piston and works in conjunction with the pressure and flow compensating valves in the load sensing line.

As the pumping head rotates each barrel passes over the inlet **(8)** and then the outlet ports **(10)** of the pump. During the inlet cycle for each piston and barrel, oil is pumped into the barrel pushing the piston forward so that it always remains in contact with the swash plate. The stroke of each piston and volume of oil charged into its barrel is therefore dependent on the angle of the swash plate.

After a piston and barrel has completed the inlet stroke, further rotation of the head aligns the barrel with the outlet port. **(10)** Oil within the barrel is then forcibly ejected by the piston through the exhaust port to the hydraulic circuits.

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Hydraulic pump Variable displacement pump - Static description

The variable flow closed centre load sensing hydraulic pump assembly is mounted on the right hand side of the rear axle centre housing and contains within its body two hydraulic pumps See Figure **1**.

- A charge pump of the gear type to supply oil at a charge pressure of **10 bar** (**145.0 psi**) to a variable flow closed centre load sensing hydraulic piston pump.
- A variable flow closed centre load sensing piston type hydraulic pump supplying oil to the high pressure circuits for operation of:-
  Trailer Brake (Where fitted)
  Hydraulic Lift Assembly
  Remote Control Valves
  Front Axle Suspension (Where fitted)
  Front Lift (Where fitted)
  Mid Mount remote valves (Where fitted)

Principal of Operation

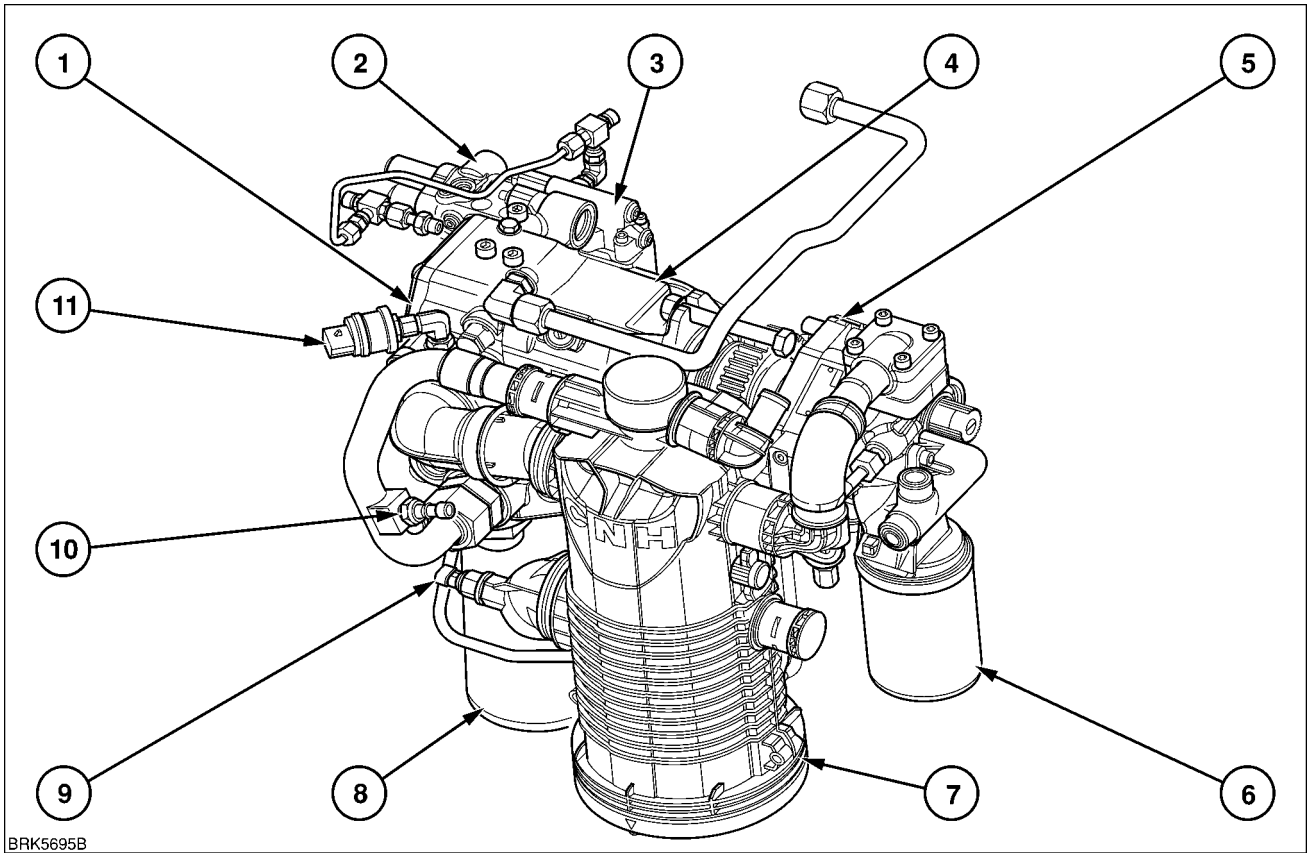
Both pumping elements are driven by a 'live' drive gear train directly connected to the PTO clutch input drive shaft and driven by the engine flywheel.
The operating principal of the fixed displacement gear pump is to provide a constant oil flow directly related to the rotation speed of the pump.
The operating principal of a variable flow piston pump is to provide oil flow on demand and minimises the engine power absorbed in driving the hydraulic pump when the hydraulic circuits do not require maximum pump flow.
The variable flow piston pump in hydraulic systems therefore has distinct power loss advantages over fixed displacement gear type pumps, which continually provide oil flow and absorb engine power even when the hydraulic circuits do not require the total pump output.

Variable Displacement Piston Pump (Refer to **Hydraulic pump Variable displacement pump - Sectional view (A.10.A)**)
The major components of the variable flow piston pump with closed centre load sensing are:-

- A nine element pumping head.
- A plate mechanism (swash plate) to adjust piston stroke and corresponding pump output.
- A load sensing valve which monitors the requirements of the hydraulic circuits and signals the pump to increase or decrease hydraulic oil flow accordingly.

Refer to **Hydraulic pump Variable displacement pump - Dynamic description (A.10.A)** for pump functional description.

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Hydraulic pump and related components

1. Charge pump
2. Priority valve
3. Pressure and flow compensating valve
4. Variable displacement hydraulic pump
5. Vane pump
6. Vane pump filter
7. Suction filter assembly
8. Charge pump filter
9. Low oil temperature switch
10. Low charge pressure switch
11. Filter restriction switch

The location of the principal components in the hydraulic pump assembly are identified above. These items are shown on the hydraulic circuit diagram. (Refer to **PRIMARY HYDRAULIC POWER SYSTEM - Hydraulic schema (A.10.A)**). The principal function of the components are as follows:-

(1) Charge Pump

The charge pump (Refer to **Charge pump - Exploded view (A.10.A)** supplies oil at a charge pressure of **10 bar** (**145.0 psi**) to the variable flow closed centre load sensing pump.

(2) Priority valve

The priority valve is located on the top of the variable displacement pump and contains two valves. One ensures priority oil to the trailer brake system and the other controls priority of oil to the steering system. Once these systems are satisfied with the correct amount of oil, the high pressure system oil to the hydraulic power lift and remote control valves are supplied.

(3) Flow and Pressure Compensating Valves (Refer to **Compensator - Exploded view (A.10.A)**). These valves monitor the requirements of the hydraulic circuits and signal the pump to increase or decrease flow accordingly.

(4) Variable Displacement Piston Pump (Refer to **Hydraulic pump Variable displacement pump - Dynamic description (A.10.A)**)
The variable flow piston pump with closed centre load sensing provides oil flow on demand.

(5) Vane Pump

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This pump provides system oil pressure at **22 - 25 bar** (**319.0 - 362.5 psi**) for PWM's and oil for the CVT hydrostatic motor.

(6), **(7)**, and **(8)** Hydraulic filters .

These filters provide effective filtration for the hydraulic circuit. There is an audible warning and visual alarm if the filters become partially blocked.

(9) Low oil temperature switch

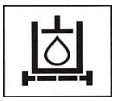
Because oil is more viscous (thicker) when cold and can falsely indicate that the filter requires servicing a low temperature oil switch is also used in the filter restriction circuit. This switch ensures that the warning light will not operate if the oil temperature is less than **40 °C**.

(10) Low charge pressure switch

The low charge pressure switch will cause a light to 'Flash' on the instrument cluster whenever the charge pressure is less than **0.75 bar** (**11 lbf/in2**)

(11) Intake Filter and Restriction Switch

Oil for both the charge and steering pump is drawn from the rear axle centre housing via the intake filter **(8)**. The filter incorporates a by-pass valve, which is an integral part of the replaceable filter and it is therefore essential that the correct filter is installed at every filter change.
When the filter is blocked the oil filter restriction vacuum switch **(11)** is activated and illuminates the oil filter restriction warning light on the instrument panel.



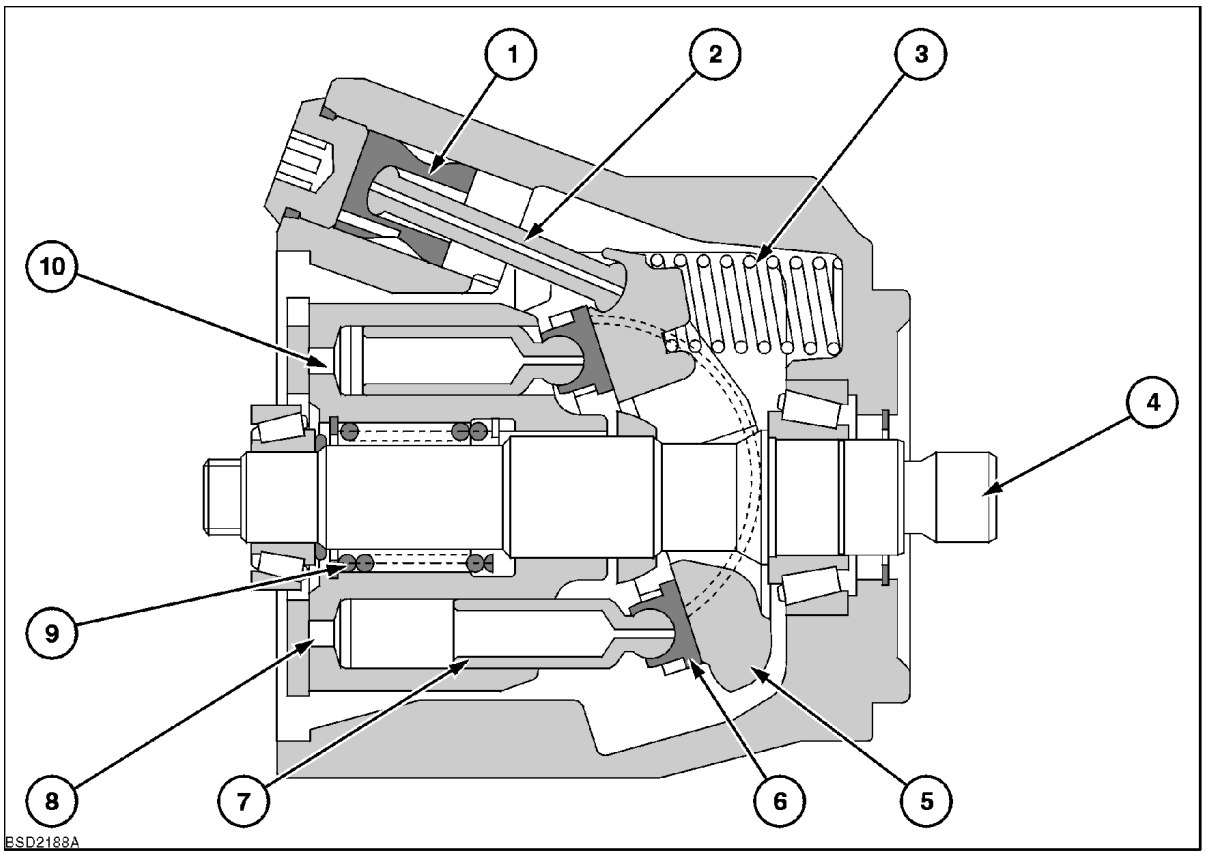
Charge Pressure Filter Dump Valve **Charge pump - Exploded view (A.10.A)**)

The charge pressure filter dump valve is a safety relief valve for relieving excess pressure on the charge pump should the filter be restricted. This valve will start to operate if the charge pressure exceeds **10 bar** (**145.0 psi**)).
Charge Pressure Bypass Valve
The charge pressure bypass valve diverts excess oil supplied by the charge pump and not required by the variable flow piston pump to vane pump.
This valve when fully open limits the charge pressure circuit oil to **4 bar** (**58.0 psi**)) .

Output from the variable flow piston pump is determined by adjusting the angle of the swash plate in the pump. The flow compensating valve senses the circuit operating pressure and adjusts the swash plate angle to control pump output.
If pump output and circuit pressure rises to **210 bar** (**3045.00 psi**) the pressure compensating valve overrides the flow compensating valve and adjusts the swash plate angle to limit maximum system pressure.

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Hydraulic pump Variable displacement pump - Sectional view



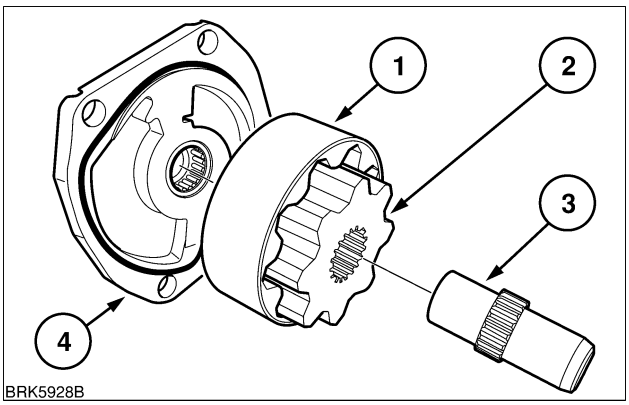
BSD2188A 1

Variable Displacement Piston Pump-Sectional Drawing

1 Stroke control piston
2 Rod
3 Swash plate return spring
4 Driveshaft
5 Swash plate
6 Slipper (Quantity 9)
7 Piston and barrel (Quantity 9)
8 Inlet port
9 Shaft pre-load spring
10 Outlet port

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Charge pump - Exploded view

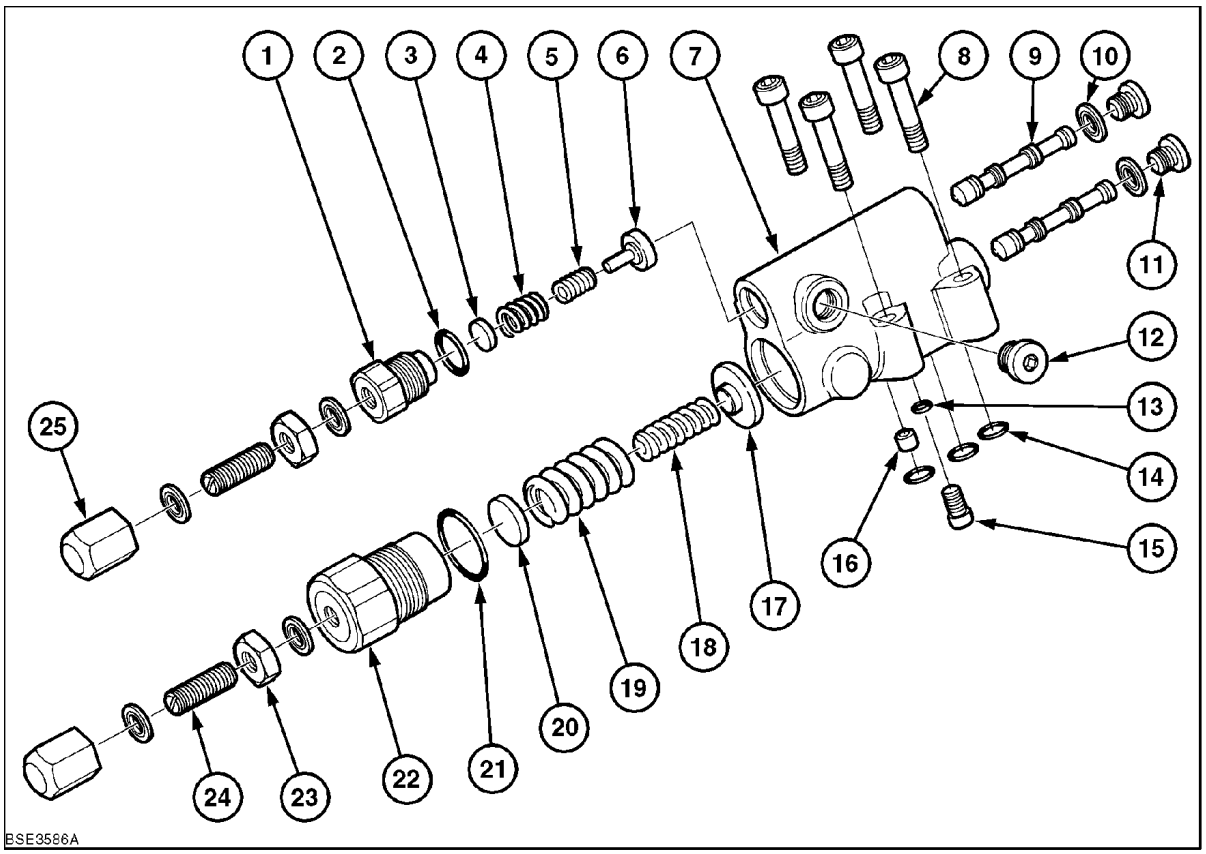


BAIL08CVT102ASA 1

1 Rotor housing
2 Rotor
3 Rotor shaft
4 End plate

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Compensator - Exploded view



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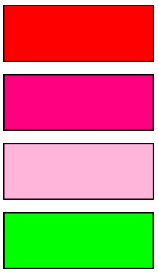
Flow and Pressure Compensating Valves

1 Plug
2 Seal
3 Disc
4 Spring
5 Spring
6 Seat
7 Housing
8 Screw
9 Spool
10 Snap-ring
11 Plug
12 Plug
13 Seal
14 Seal
15 Damper Screw
16 Nozzle
17 Seat
18 Spring
19 Spring
20 Disc
21 Seal
22 Plug
23 Nut
24 Screw
25 Locknut

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Hydraulic line - Overview

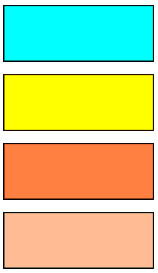


System pressure @ **210 bar** (**3045.00 psi**).

Load sensing pressure .

Lubrication and charge pressure

Suction



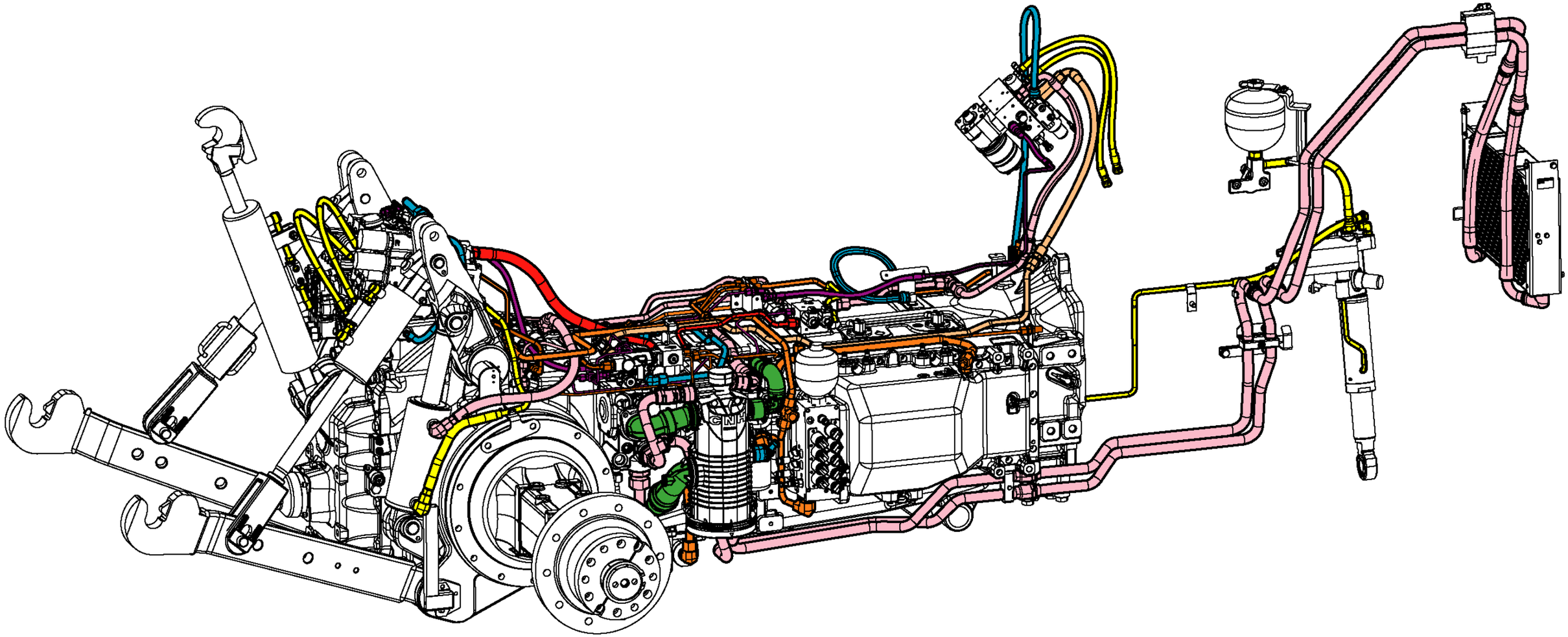
Return to reservoir

Trapped oil

Low Pressure @ **22 - 25 bar** (**319.0 - 362.5 psi**).

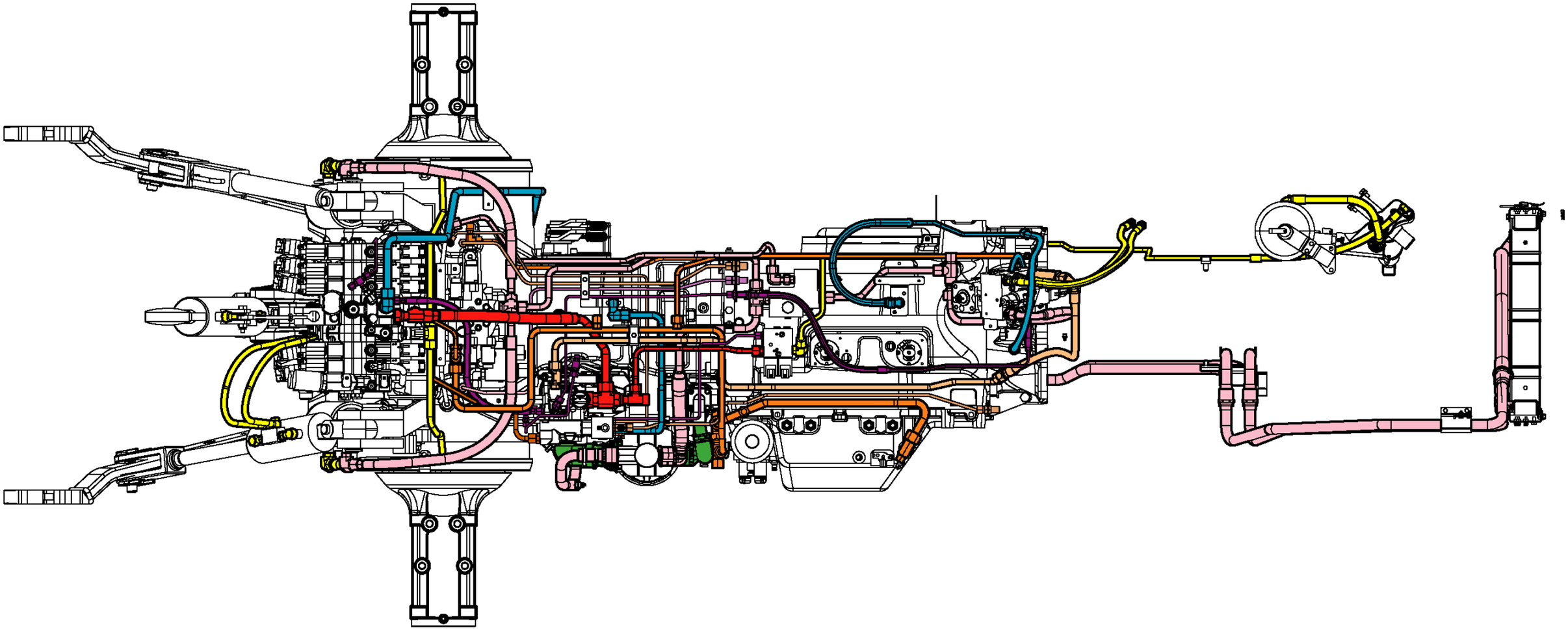
Lubrication Oil

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BAIL08CVT136FF 1

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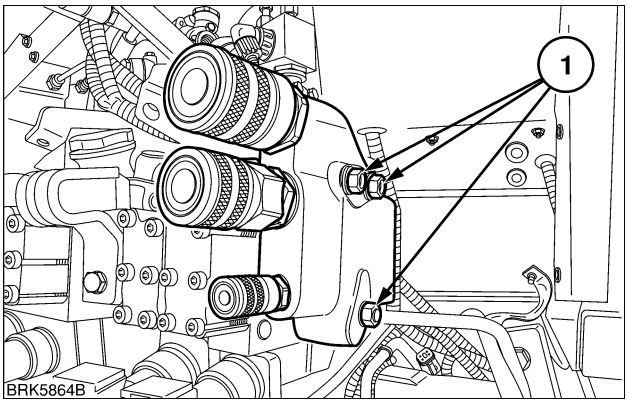


BAIL08CVT137FFA 2

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Power beyond - Remove

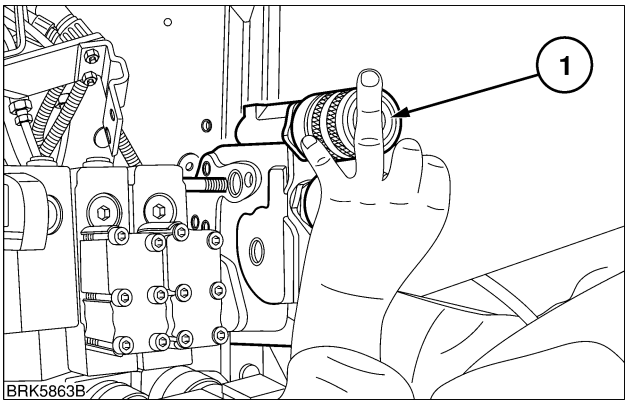
1. Remove pneumatic trailer brake valve bracket (Where fitted). Undo the three retaining nuts **(1)**.



BAIL08CVT065ASA 1

2. Remove the power beyond slice from the tie rods.

NOTE: *Ensure O-rings are not dislodged from the power beyond slice on removal.*

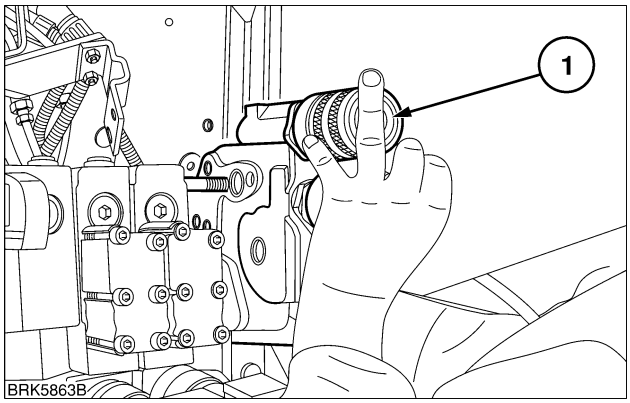


BAIL08CVT066ASA 2

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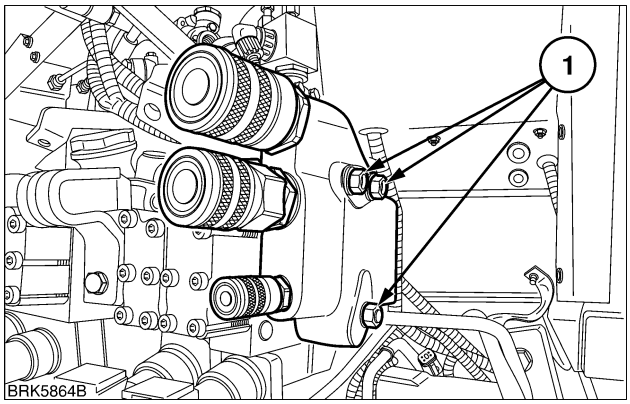
Power beyond - Install

1. Install the power beyond slice on the three tie rods. Ensure the O-rings are not dislodged during installation.



BAIL08CVT066ASA 1

2. Install the three retaining nuts and tighten to **45 Nm** (**33.2 lb ft**).



BAIL08CVT065ASA 2

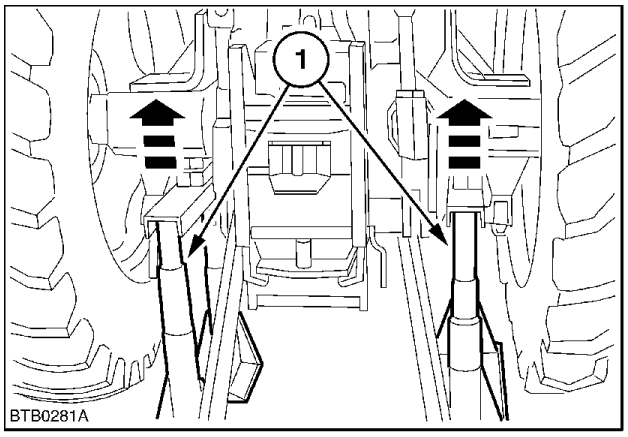
www.truck-freeworkshop.com

Hydraulic pump Variable displacement pump - Remove

Prior operation:
Battery - Disconnect (A.30.A)

1. Raise the rear of the tractor and place two suitable axle stands **(1)** under the final drive cases.

NOTE: *If required, detach the lift rods from the lower links.*



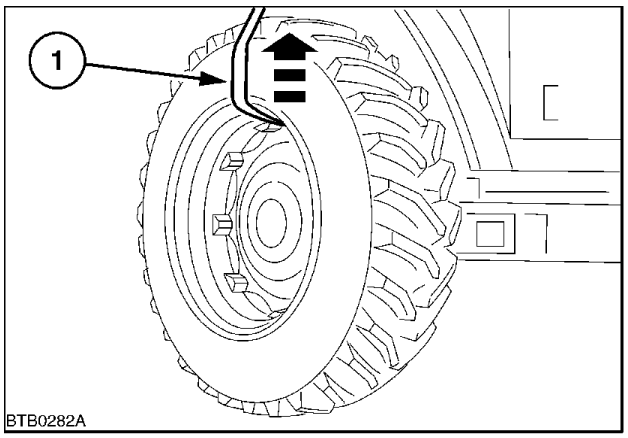
BTB0281A 1

2. Using a suitable sling **(1)** and hoist, or wheel removal tool, remove the rear right-hand wheel.

⚠ WARNING ⚠

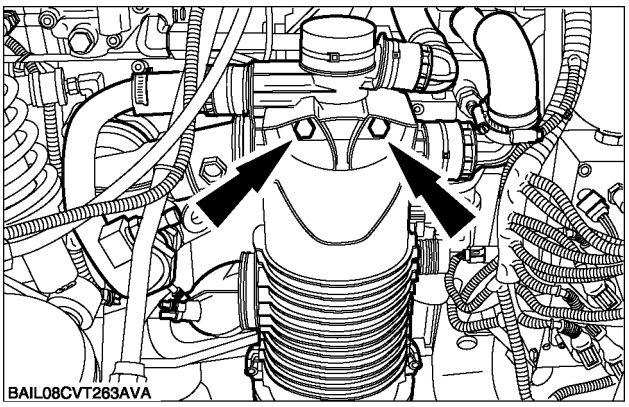
Tractor wheels are very heavy. Handle with care and ensure, when stored, that they cannot fall and cause injury. Never operate the tractor with a loose wheel rim or disc. Always tighten nuts to the specified torque and at the recommended intervals.

B105



BTB0282A 2

3. Disconnect the main filter fittings and remove the hydraulic oil filter

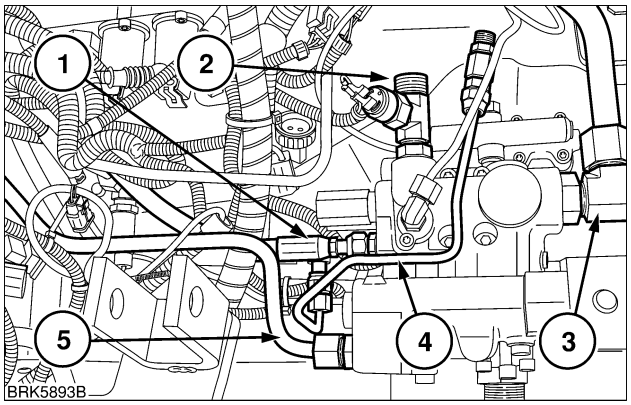


BAIL08CVT263AVA 3

NOTE: *Loosen the oil filter vent cap and leave for one minute to allow oil in the filters to drain into the sump.*

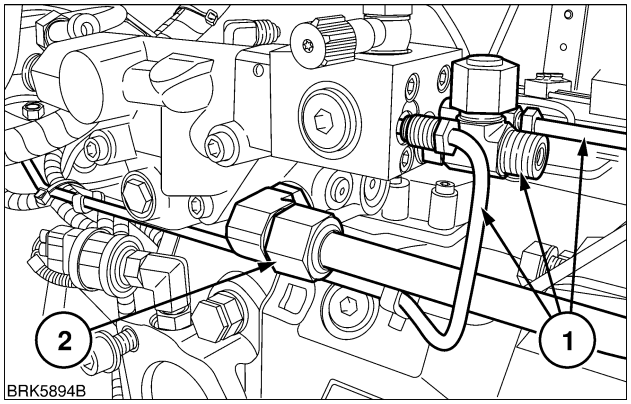
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4. Disconnect the load sensing line **(1)**, steering supply pipe **(2)**, high pressure supply pipe **(3)** , load sensing line, **(4)** and trailer brake coupler pipe **(5)**.



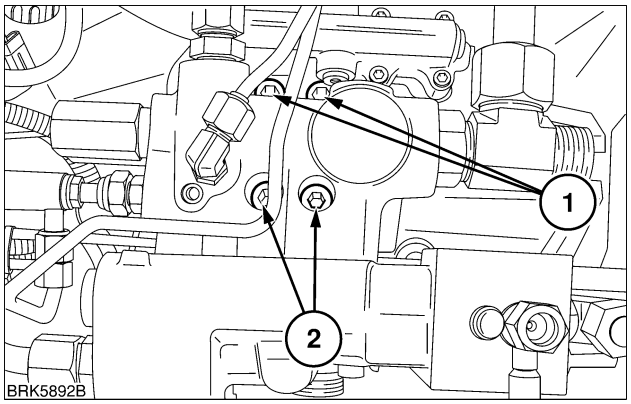
BAIL08CVT071ASA 4

5. Disconnect the brake pipes **(1)** and the trailer brake valve drain pipe **(2)**. If required remove trailer brake valve (where fitted).



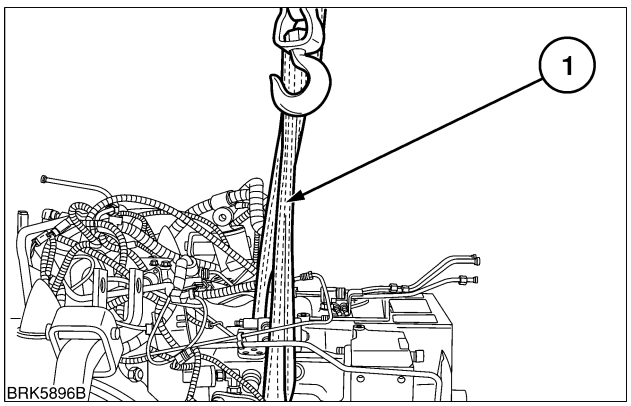
BAIL08CVT072ASA 5

6. Undo and remove priority valve retaining bolts **(1)** and **(2)** and remove the priority valve assembly.



BAIL08CVT073ASA 6

7. Using a suitable hoist and sling **(1)** support the pump.



BAIL08CVT074ASA 7

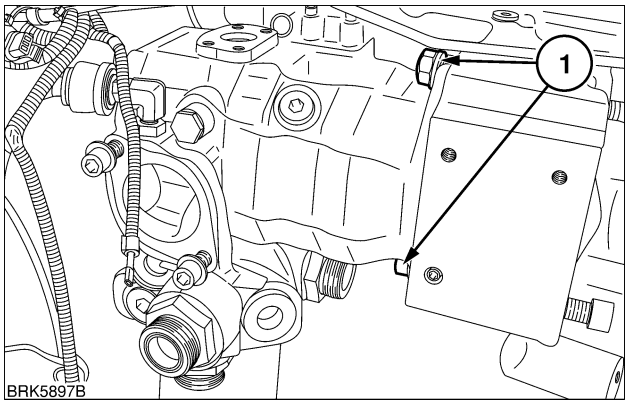
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8. Undo and remove the pump retaining nut and bolt **(1)** and remove the pump from the rear axle housing.

⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012



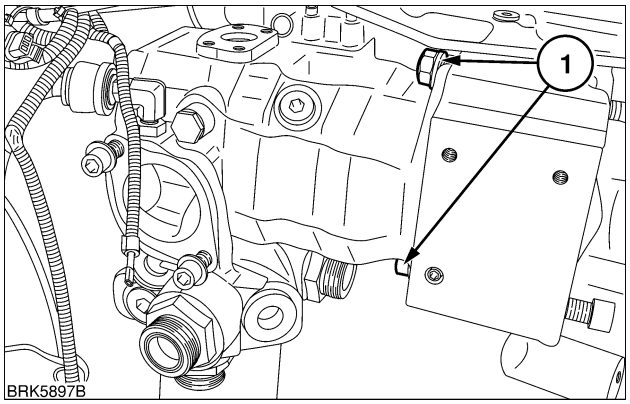
BAIL08CVT075ASA 8

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Hydraulic pump Variable displacement pump - Overhaul

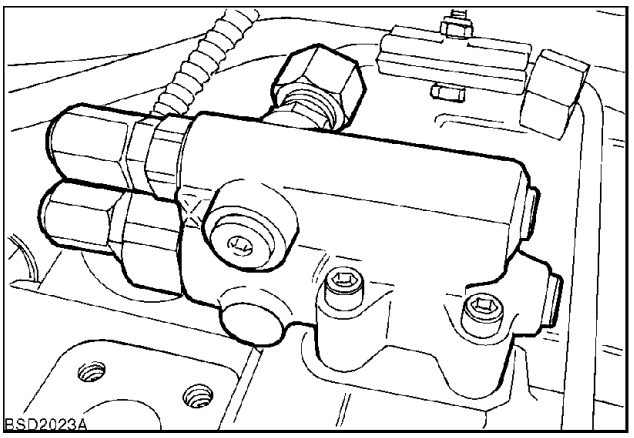
This procedure describes the overhaul of the Load Sensed Variable Displacement pump assembly when removed from the tractor. The following items however can be serviced with the pump installed on the tractor.
Blocked filter dump valve
Pressure and flow compensating valves
Steering flow control valve (Priority valve)
Steering pump assembly

1. Remove the pump. (Refer to **Hydraulic pump Variable displacement pump - Remove (A.10.A)**)



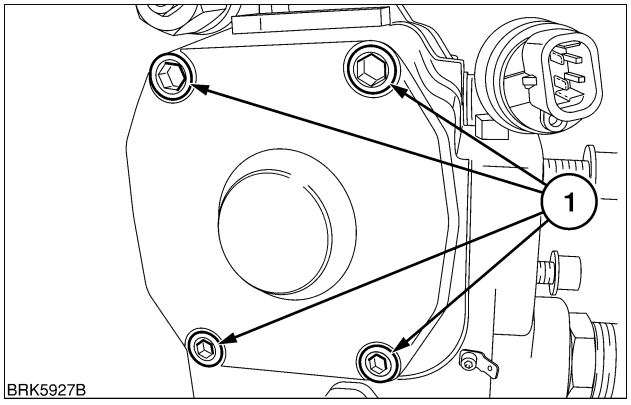
BAIL08CVT075ASA 1

2. Remove pressure and flow compensating valves assembly. Refer to **Compensator - Overhaul (A.10.A)**



BSD2023A 2

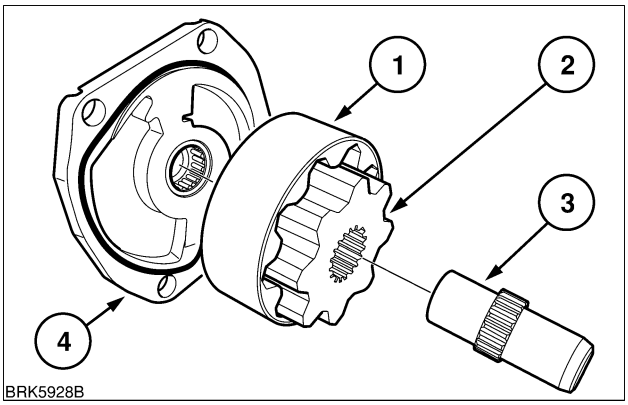
3. Undo the 4 retaining bolts **(1)** and remove the end plate. Remove circlip from opposite end of pump.



BAIL08101ASA 3

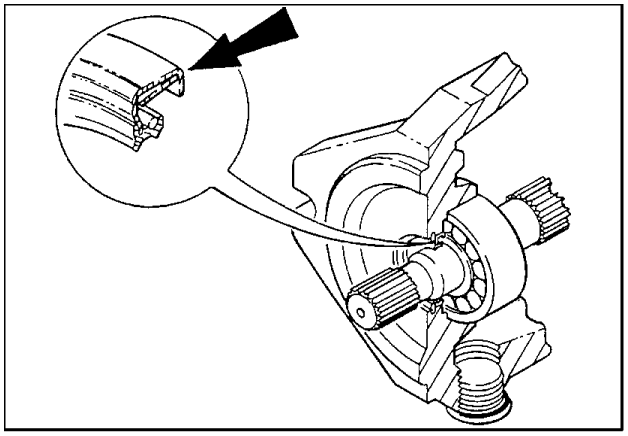
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4. Remove the charge pump components from main pump assembly.
   (1) Rotor housing
   (2) Rotor
   (3) Rotor shaft
   (4) End plate



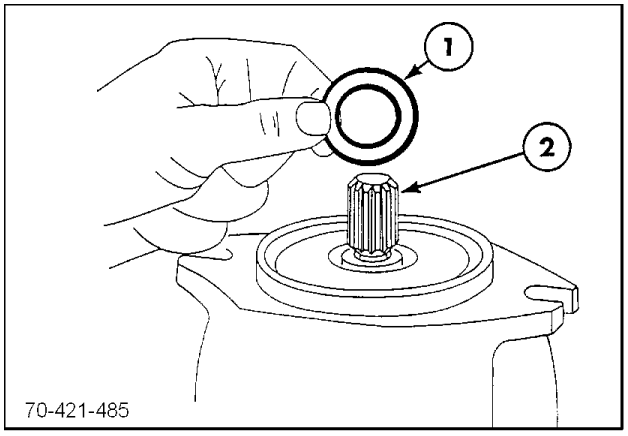
BAIL08CVT102ASA 4

5. When replacing the input shaft seal, make sure the pump housings mounting flange is clean. Use circlip pliers to remove the input shaft seal retaining ring.



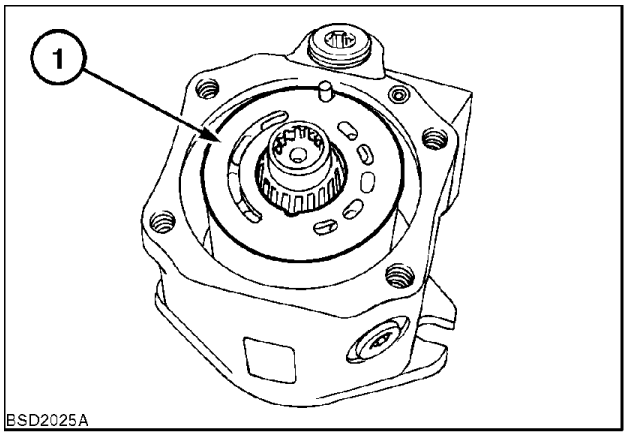
1b0o2004061061 5

6. With the retaining ring removed, use a punch or similar tool, and carefully pierce the top of the lip seal. Using the punch, pry the seal from its bore.



70-421-485 6

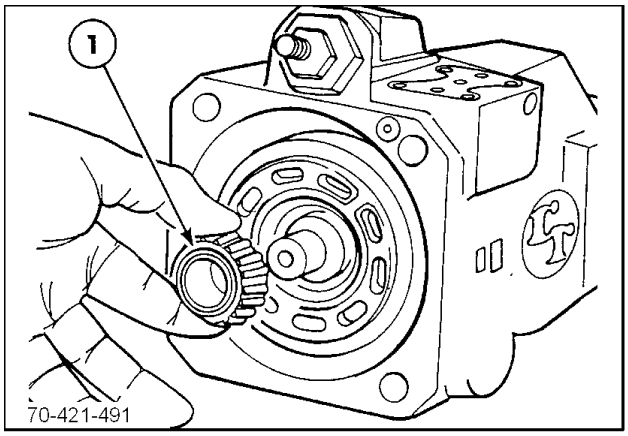
7. Examine valve plate **(1)**. Check to see if it is scored, nicked, warped or damaged by cavitation. Look for score marks or damage around the bearing surface area. Check the inlet and discharge port area for signs of contamination. This contamination may show as grooves starting in the feathering notch,



BSD2025A 7

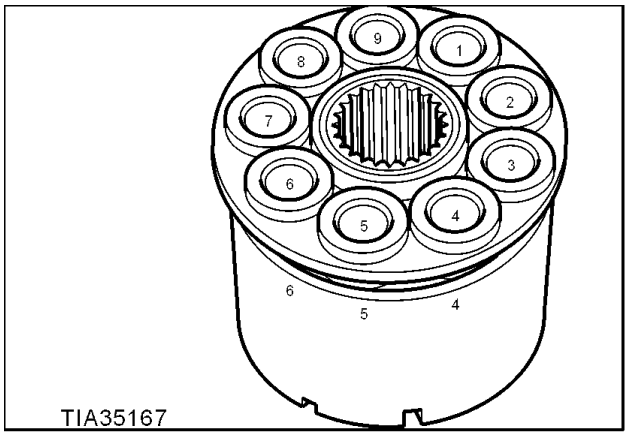
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8. Remove bearing cone **(1)** and splined connector.



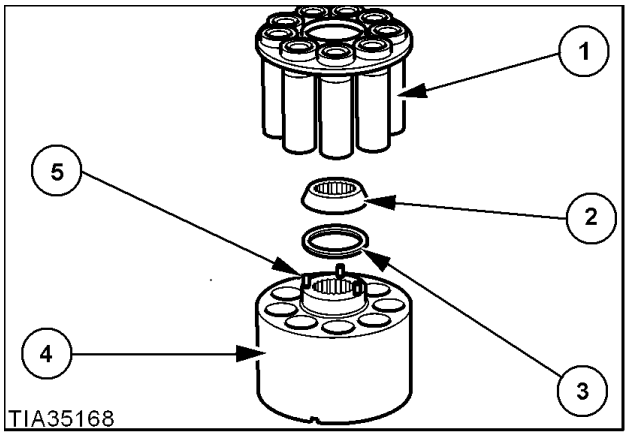
70-421-491 8

9. Remove preload spacer from driveshaft. Remove pumping head and piston from housing. Using a suitable marker identify each piston and slipper to their corresponding barrel in the pumping head.



TIA35167 9

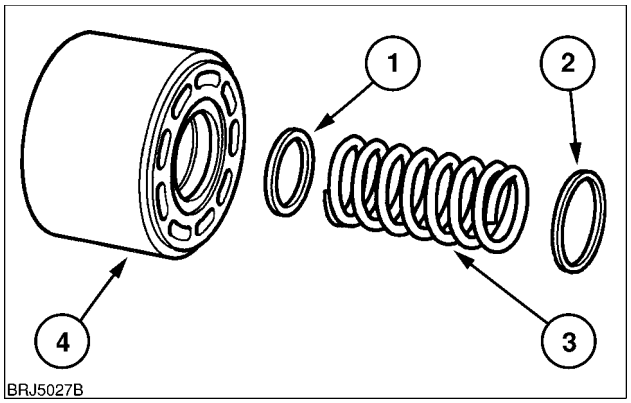
10. Separate pumping head and slipper assembly and inspect for damage. Where damage is identified the pumping element must be replaced.
Pumping head and slipper assembly
(1) Pistons and slippers
(2) Cone
(3) Washer
(4) Pumping head
(5) Pins (quantity 3)



TIA35168 10

11. If necessary disassemble pumping head spring assembly by compressing the retaining ring against the spring.
Pumping head spring assembly
(1) Washer
(2) Retaining ring
(3) Spring
(4) Pumping head

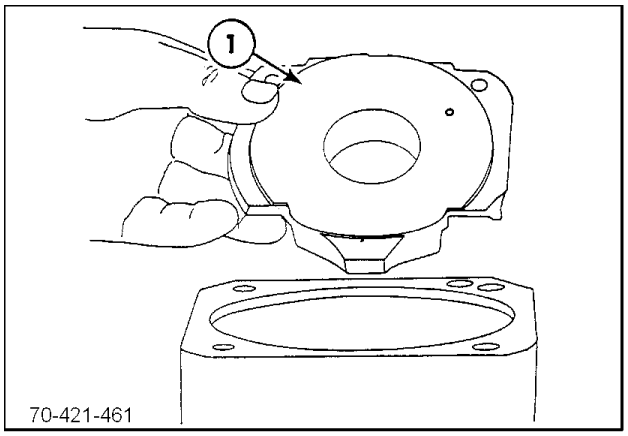
IMPORTANT: *Due to high spring pressure take care when removing retaining ring.*



BAIL07APH347ASA 11

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12. Remove swash plate **(1)** assembly.
Inspect components for wear and replace if damaged or worn.

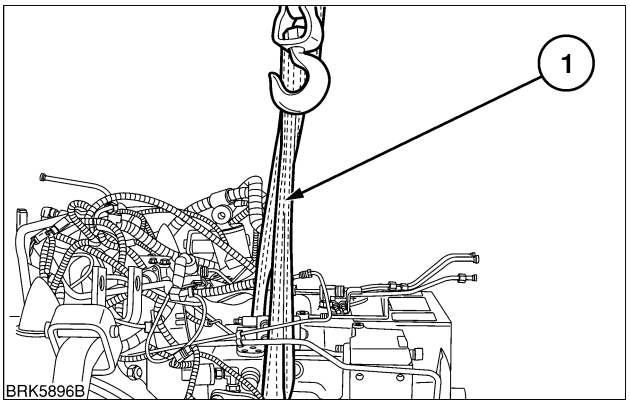


70-421-461 12

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Hydraulic pump Variable displacement pump - Install

1. Using a suitable hoist and sling **(1)** support the pump.



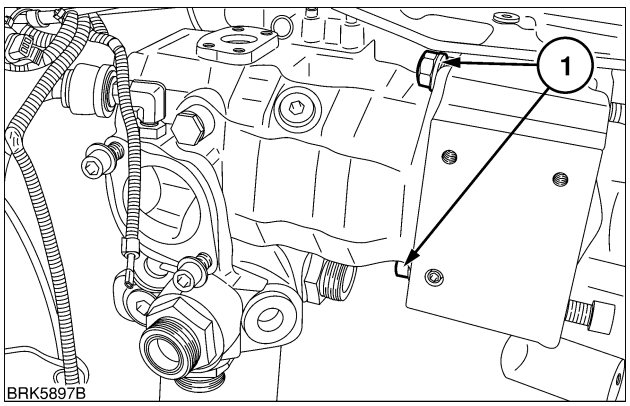
BAIL08CVT074ASA 1

⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

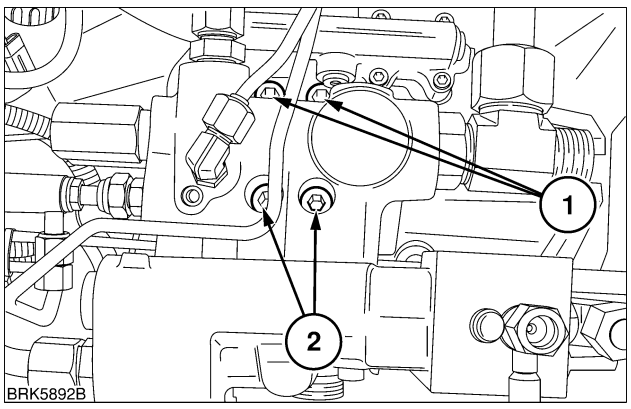
B012

2. Mate the pump drive shaft into the drive gear. Tighten the retaining nuts to **135 Nm** (**99.6 lb ft**).



BAIL08CVT075ASA 2

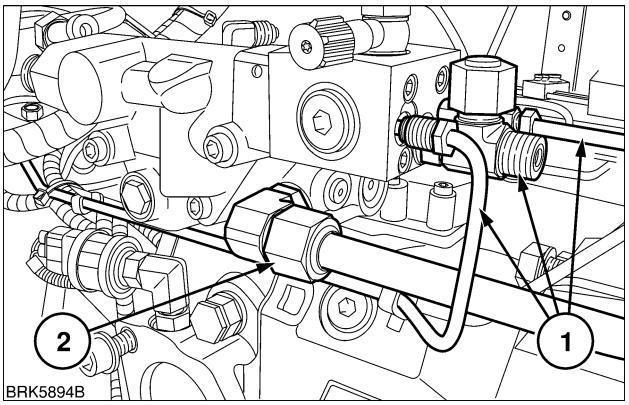
3. Install the priority and trailer brake valve assembly on the top of the pump. Tighten the retaining bolts.



BAIL08CVT073ASA 3

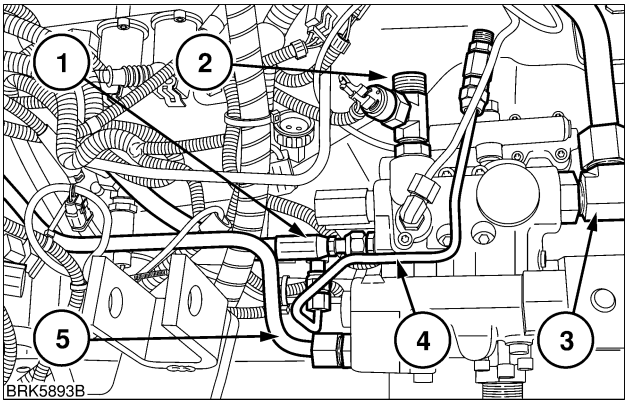
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4. Reconnect the brake pipes **(1)** and the trailer brake valve drain pipe **(2)**.



BAIL08CVT072ASA 4

5. Reconnect the load sensing line **(1)**, steering supply pipe **(2)**, high pressure supply pipe **(3)**, load sensing line **(4)**, and trailer brake coupling pipe **(5)**.



BAIL08CVT071ASA 5

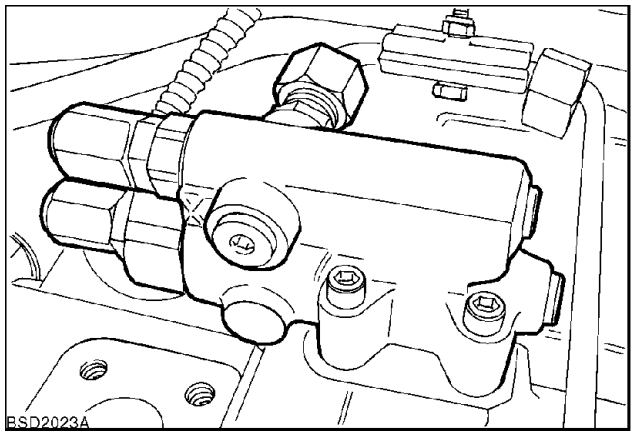
Next operation:
Filter - Install (A.10.A)

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Compensator - Overhaul

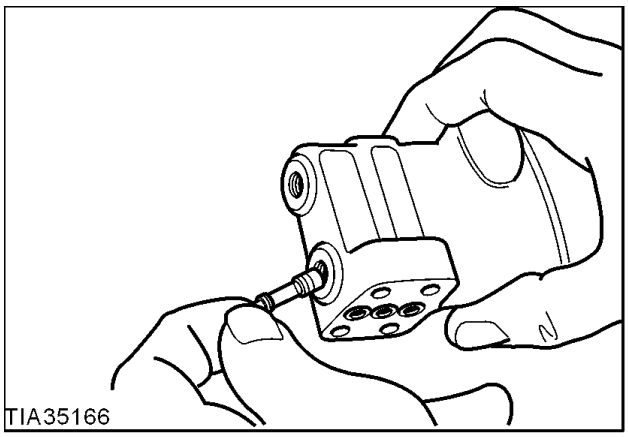
1. Disconnect load sense line connection and remove pressure and flow compensating valve assembly. Remove the tamper proof caps, carefully unscrew each adjuster and remove the component parts. Refer to **Compensator - Exploded view (A.10.A)** To ensure correct reassembly keep the component parts for each valve separate.

IMPORTANT: *Due to extreme spring pressure within valves DO NOT remove rear plugs until the adjusters have been removed.*



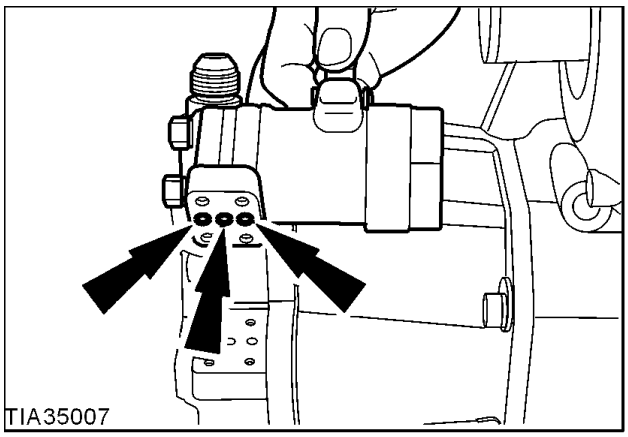
BSD2023A 1

2. Reassembly of the valves follows the removal procedure in reverse. On reassembly observe the following :-
Wash all components in a suitable solvent.
Examine all components for wear or damage. If the spools are damaged it is necessary to replace the complete valve assembly.
Lubricate all parts with clean hydraulic oil.
To aid reassembly of pressure and flow compensating valves, the spools should be inserted into the rear of the housing.
Tighten all plugs and locknuts to the correct torque as detailed in Specifications.



TIA35166 2

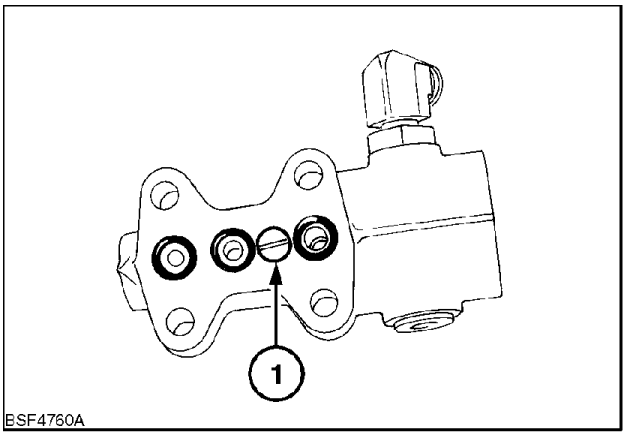
3. When installing valve on pump ensure all 'O' ring seals are correctly installed.
Pressure test the pump and adjust the pressure and flow compensating valves to the correct specification as detailed **Hydraulic pump - Pressure test (A.10.A)**.



TIA35007 3

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NOTE: *If the damper screw* ***(1)*** *is removed for any reason it should be reinstalled in alignment with the three ports and should be fixed into position using a suitable threadlock and seal.product. Failure to adjust this screw correctly could reduce the efficiency of the system.*



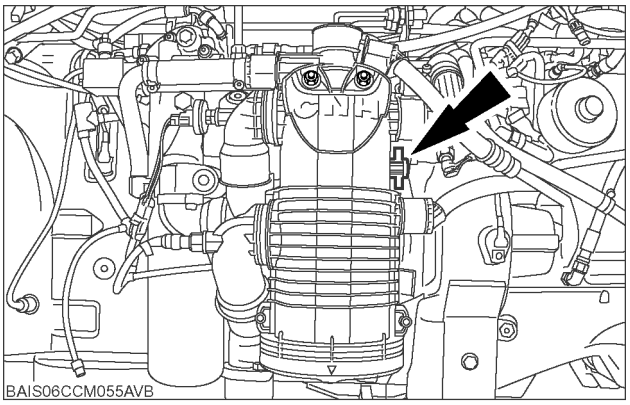
BSF4760A 4

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Filter - Remove

1. Loosen the oil filter vent cap and leave for one minute to allow oil in the filter to drain into the sump.

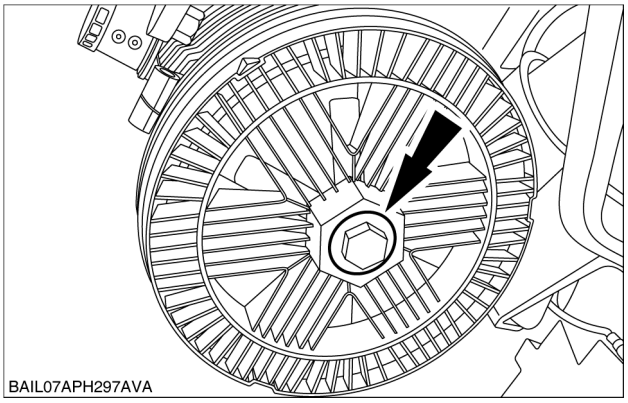
NOTE: *Remove rear wheel to enable full access to filter and pipes.*



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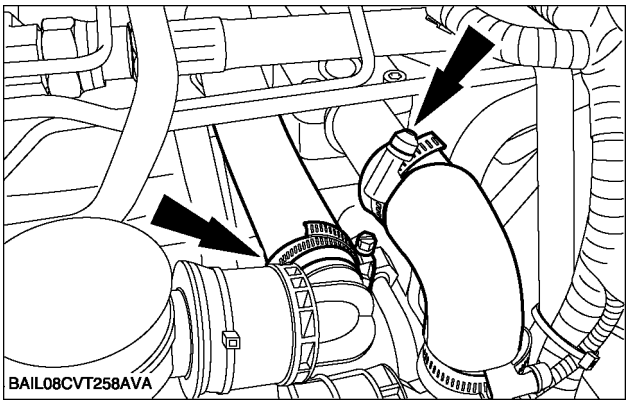
2. Remove the hydraulic oil pump filter housing drain plug.

NOTE: *Place a suitable container under the oil filter housing to collect the hydraulic oil.*



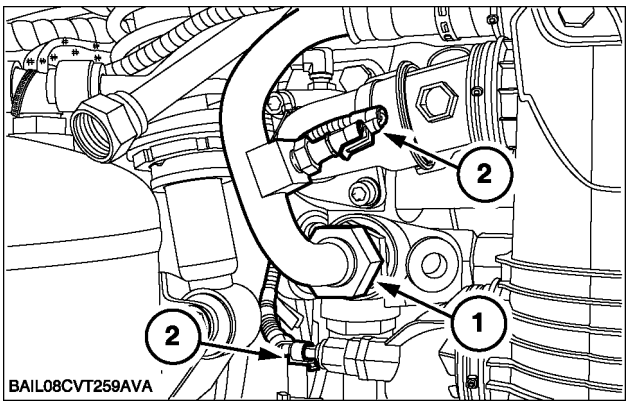
BAIL07APH297AVA 2

3. Disconnect the hydraulic oil pipes from the hydraulic oil pump and hydraulic oil pump filter housing.



BAIL08CVT258AVA 3

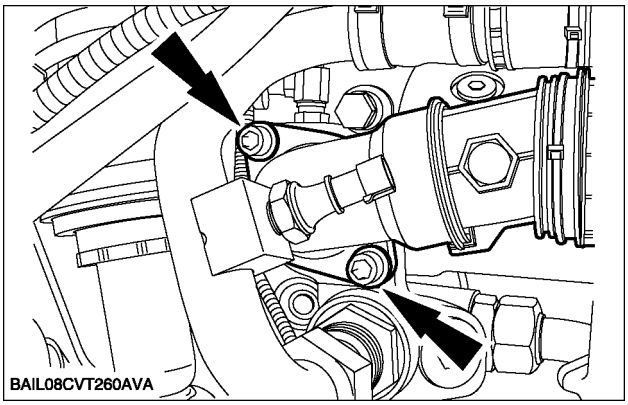
4. Disconnect the hydraulic charge pipe **(1)**.
Disconnect the electrical connectors **(2)**.



BAIL08CVT259AVA 4

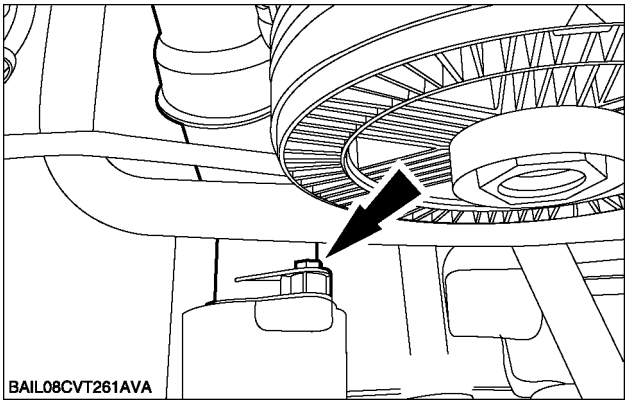
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5. Disconnect the hydraulic pipe.



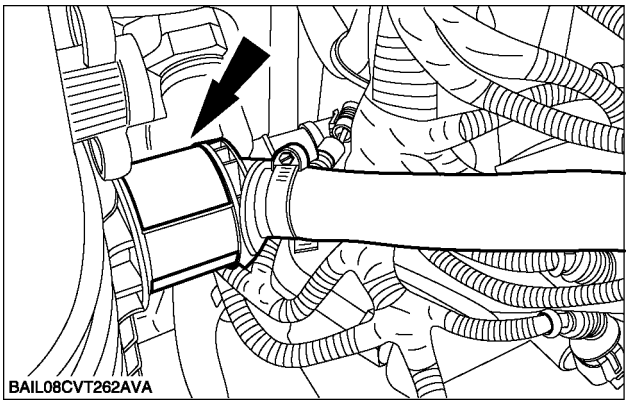
BAIL08CVT260AVA 5

6. Remove the retaining bolt from the rear axle housing.



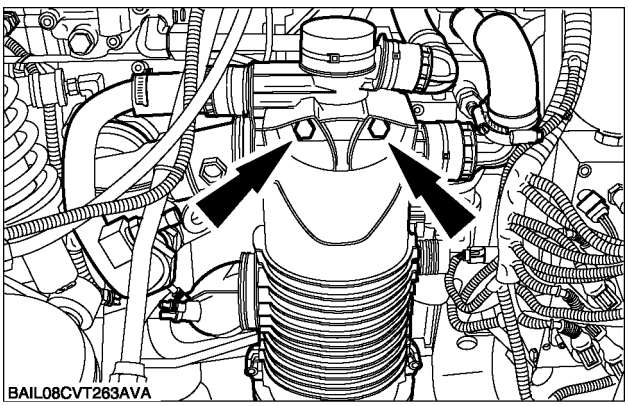
BAIL08CVT261AVA 6

7. Disconnect the mid mounted remote valve return hose (where fitted).



BAIL08CVT262AVA 7

8. Loosen the retaining bolts and remove the hydraulic oil pump filter housing.

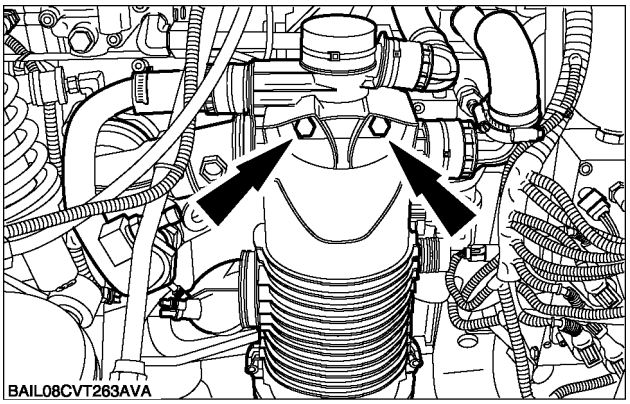


BAIL08CVT263AVA 8

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Filter - Install

1. Install the filter housing to the rear axle housing and tighten the retaining bolts to **40 Nm** (**29.5 lb ft**).
2. Connect all the relevant hoses and pipes. Ensure the filter oil filter vent cap is tightened.

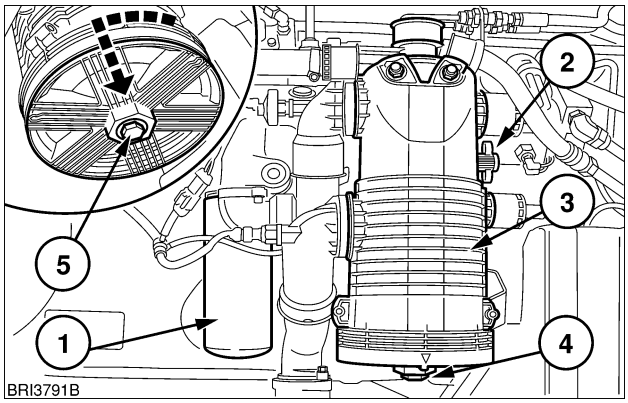


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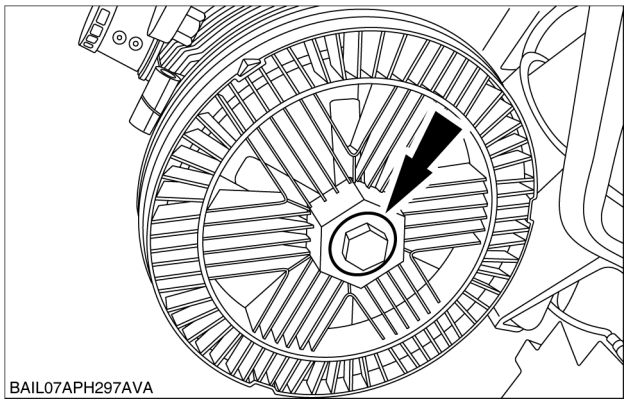
Filter - Replace

1. Before changing the main filter cartridge in housing **(3)** Figure **1** , release the air bleed valve **(2)** by unscrewing fully. This will allow air into the filter so that most of the oil can drain back to the reservoir. Wait a few moments and then remove the 19 mm plug **(5)** from the filter casing and allow the oil to drain out into a suitable container.



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2. Using as **41 mm** socket or ring spanner, remove the filter support plate by turning approximately **45 °** to the left. Remove filter and plate.



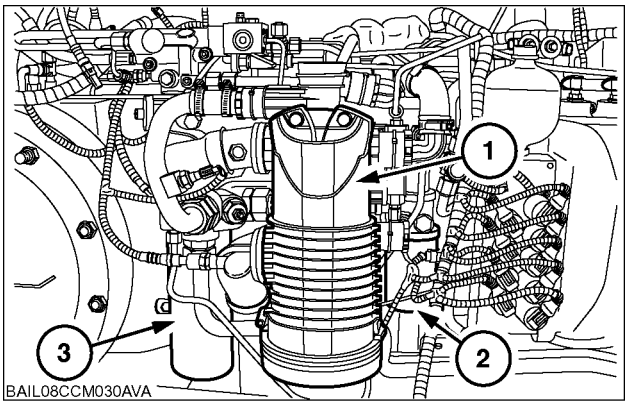
BAIL07APH297AVA 2

3. Ensure support plate is clean before installing the new cartridge. Lightly oil the sealing ring and refit the assembly to the filter housing, making sure that plate locks into place and the lug **(4)** (Figure **1**) aligns correctly with the arrow on the filter casing.

NOTE: *When replacing the main filter cartridge the bottom cover sealing ring must also be replaced.*

4. Unscrew the vane pump filter **(2)** and charge pump filter **(3)** and discard in an appropriate container.

5. Clean the inlet channel and the face of the filter mountings. Smear clean oil around the rubber seal of the new filters and install into the filter housings. Screw up until the faces just meet, then tighten a further 3/4 of a turn. Do not overtighten.



BAIL08CCM030AVA 3

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PRIMARY HYDRAULIC POWER SYSTEM - Troubleshooting

Problem	Possible Cause	Correction
Initial fault finding checks to be performed before proceeding to general diagnostic procedure	Error code identified by microprocessor Component malfunction	Refer to error code fault finding list or search using fault code search facility (interactive CD only)
	Rear axle oil level incorrect Oil level not checked and adjusted at appropriate service interval	Add oil to rear axle
	Oil contaminated with dirt, water, or antifreeze Filters not replaced at correct service interval	Replace all filters on pump. See **Filter - Replace (A.10.A)**
	Warning light displayed on instrument cluster Component not functioning correctly	Identify function not operating correctly and refer to the appropriate fault finding chart
Charge Pressure Light Flashing	Rear axle oil level incorrect Oil level not checked and adjusted at appropriate service interval	Add oil to rear axle
	If charge pressure is correct **2 - 4 bar** (**29.0 - 58.0 psi**) disconnect wiring to low charge pressure switch. If the light is not extinguished Short circuit to chassis in wire from instrument console connector and charge pressure switch **X473**	Locate and repair short circuit
	As above, but light is extinguished Blocked/contaminated filters	Replace charge pump and inlet filters Refer to **Filter - Replace (A.10.A)**
	If filters have been replaced and pressure is correct Faulty low charge pressure switch	Replace low charge pressure switch
	Filters changed but still pressure is incorrect Charge pressure filter dump valve and charge pressure valves sticking open	Replace valves
	Filters changed but still pressure is incorrect Worn charge pump	Replace pump. See **Hydraulic pump Variable displacement pump - Overhaul (A.10.A)**
Power Steering Not Working or Working Incorrectly	Steering pressure warning light is illuminated Incorrect pressure in the steering system	Pressure test the steering system as described in **STEERING Hydraulic - Pressure test (D.20.C)** .
	Steering pressure warning light is illuminated Hydraulic pump faulty or priority valve sticking	Remove pump and examine the drive to the pump, if O.K. repair or replace the pump assembly (refer to **Hydraulic pump Variable displacement pump - Remove (A.10.A)** and **Hydraulic pump Variable displacement pump - Overhaul (A.10.A)**). Check if priority valve spool is sticking . Refer to **Priority valve - Remove (A.14.A)**
	Pressure is correct up to the steering cylinders Mechanical fault in the steering components	If pump output is good but pressure to the cylinders is low or zero, suspect a faulty steering motor. See **Control valve - Remove (D.20.C)** and **Control valve - Overhaul (D.20.C)**for steering motor removal and overhaul.
Hydraulic Lift Not Working Correctly	In cab fast raise/work switch not in correct position	Move switch to work position
	Is hitch enabled symbol illuminated	Capture hitch Check position of controls on control panel

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Problem	Possible Cause	Correction
	Charge pressure light flashing Charge pump system problem	refer to charge pressure light flashing fault finding chart **Charge pump - Flash (A.10.A)**
	Electronic draft control error code identified	Refer to Electronic draft control fault codes in fault code chapter or search using fault code search facility (interactive CD only)
	Trailer brakes (if fitted) not working correctly. (Install a pressure gauge in the trailer brake coupler) Fault in the variable displacement pump	Pressure test the pump to determine the fault Refer to **Hydraulic pump - Pressure test (A.10.A)**
	Remote valves not operating correctly. (Install a pressure gauge in the remote valve coupler and check pressure and flow) Contaminated components in priority valve assembly	Inspect the priority valve assembly for sticking spool. dirt contamination or broken components. Rectify as required Refer to **Priority valve - Disassemble (A.14.A)**
	Hydraulic lift working erratically Circuit leak	Perform pump leak test to determine if fault relates to either internal leak or hydraulic circuit leak
	Lift arms locked in either fully raised or lowered position Sticking plunger in EDC valve raise or lower solenoid	Check EDC valve raise or lower solenoid for sticking plungers and rectify accordingly. Refer to **Control valve - Disassemble (H.10.D)**
	Perform low standby pressure test . If pressure is not **24 - 26 bar** (**348.0 - 377.0 psi**)) Flow compensating valve requires examination or adjustment	Adjust/examine flow compensating valve . Refer to **Compensator - Overhaul (A.10.A)**
	Perform standby pressure test . If pressure is not **24 - 26 bar** (**348.0 - 377.0 psi**)) Variable displacement pump swash plate sticking	Disassemble variable displacement and check swash plate piston for sticking. Refer to **Hydraulic pump Variable displacement pump - Overhaul (A.10.A)**
	Standby pressure is correct and whilst operating remotes at high pressure standby hydraulic lift operates correctly Fault in load sensing line from EDC valve	Investigate and rectify fault in load sensing line
	If the hydraulic lift does not operate correctly Sticking spools in EDC valve or leaking lift cylinder safety valve	Examine EDC valve for sticking spool and rectify or if lift cylinder safety valve is leaking replace.
	If the hydraulic lift does not operate correctly Lift arms leak down under pressure if heavy weight is placed on them	Overhaul lift cylinder
All of the EHR valves are inoperative	Isolator switch not activated	Press the switch to activate
	Faulty switch	Check operation of the switch using a suitable multi-meter and if faulty replace the switch
	EHR relay not operating	Replace the relay (Refer to **Fuse and relay box - General specification (A.30.A)**
	EHR CAN BUS wiring faulty	Disconnect one of the remote valve connectors and using a suitable multi-meter check the resistance of the CAN wiring between terminals 2 and 3 (blue and red). If the resistance is not approximately **120 Ω** Trace the fault in the wiring and repair If the resistance is approximately **120 Ω** reload the software into the XCM processor - RM Module If the EHR's are still inoperative replace the processor with one of known performance

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Problem	Possible Cause	Correction
One or more EHR valves do not operate	Error code 4*** displayed on instrument cluster	Refer to **Control module - Fault code index (A.50.A)**
	If hydraulic lift is not working this may indicate a high pressure system fault	Refer to **HITCH Electronic draft control - Not function (H.10.D)**
	If hydraulic lift is working flow compensating valve could be faulty	Operate and hold control lever to test maximum system pressure at each remote valve coupler. If pressure at each valve coupler is below **205 - 210 bar** (**2972.5 - 3045.0 psi**)) examine flow/pressure compensating valve for sticking Repair or replace the flow compensating valve
	Load Sensing valve between valve sections requires check	Operate all remote valve levers simultaneously and check if the pressure at the defective remote valve is **205 - 210 bar** (**2972.5 - 3045.0 psi**))
	Faulty remote valve	Operate all remote valve levers simultaneously and check if the pressure at the defective remote valve is not **205 - 210 bar** (**2972.5 - 3045.0 psi**)) overhaul remote valve which failed the pressure test - Refer to **PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Disassemble (A.10.C)**
Remote Control Valves Not Working - Electro-Hydraulic (EHR) Type	When the key start is switched on the EHR control lever solenoids cannot be heard to activate Faulty fuse (24)	Replace fuses if faulty. (Refer to **Fuse and relay box - General specification (A.30.A)**
	The EHR control lever solenoids can be heard to activate Hydraulic stop button not in the operating position	Activate switch to the operating position
	Hydraulic stop button is in operating position Hydraulic lift not working	Refer to 'Hydraulic lift not working' **HITCH Electronic draft control - Not function (H.10.D)**
	Hydraulic stop button is in operating position EHR enable relay faulty	Replace the relay
	Hydraulic stop button is in operating position EHR fault codes may be stored in the controller memory	Refer to the fault code chapter or search using the fault code search facility (interactive CD only)
	Hydraulic stop button is in operating position Components in low pressure system may not be operating correctly	Low pressure supply to remotes not available. Fault find the low-pressure system.
	Hydraulic lift and remote valve are operated simultaneously and pressure is registered from the remote coupler Fault in the load sense circuit or the compensating valve in the variable displacement pump	Identify and remedy fault
	Hydraulic lift and remote valve are operated simultaneously and pressure is not registered from the remote coupler Fault in the electrical system	Perform the EHR valve renumbering procedure **Control module - Configure (A.50.A)**. If the valves are still inoperative check the CAN BUS wiring between the remotes and the central controller. If the fault still persists reload the software into the central controller and if still inoperative replace the processor

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DISTRIBUTION SYSTEMS - A

PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - 10.C

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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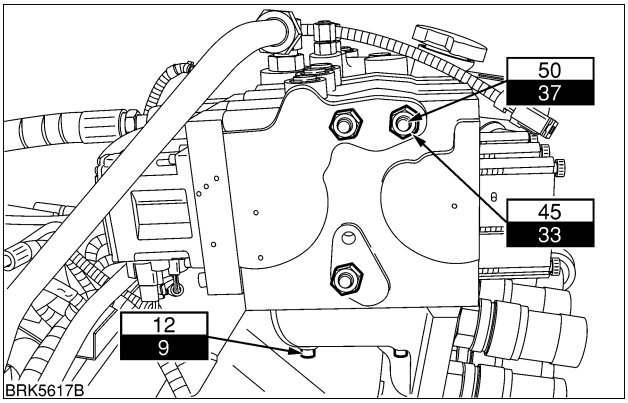
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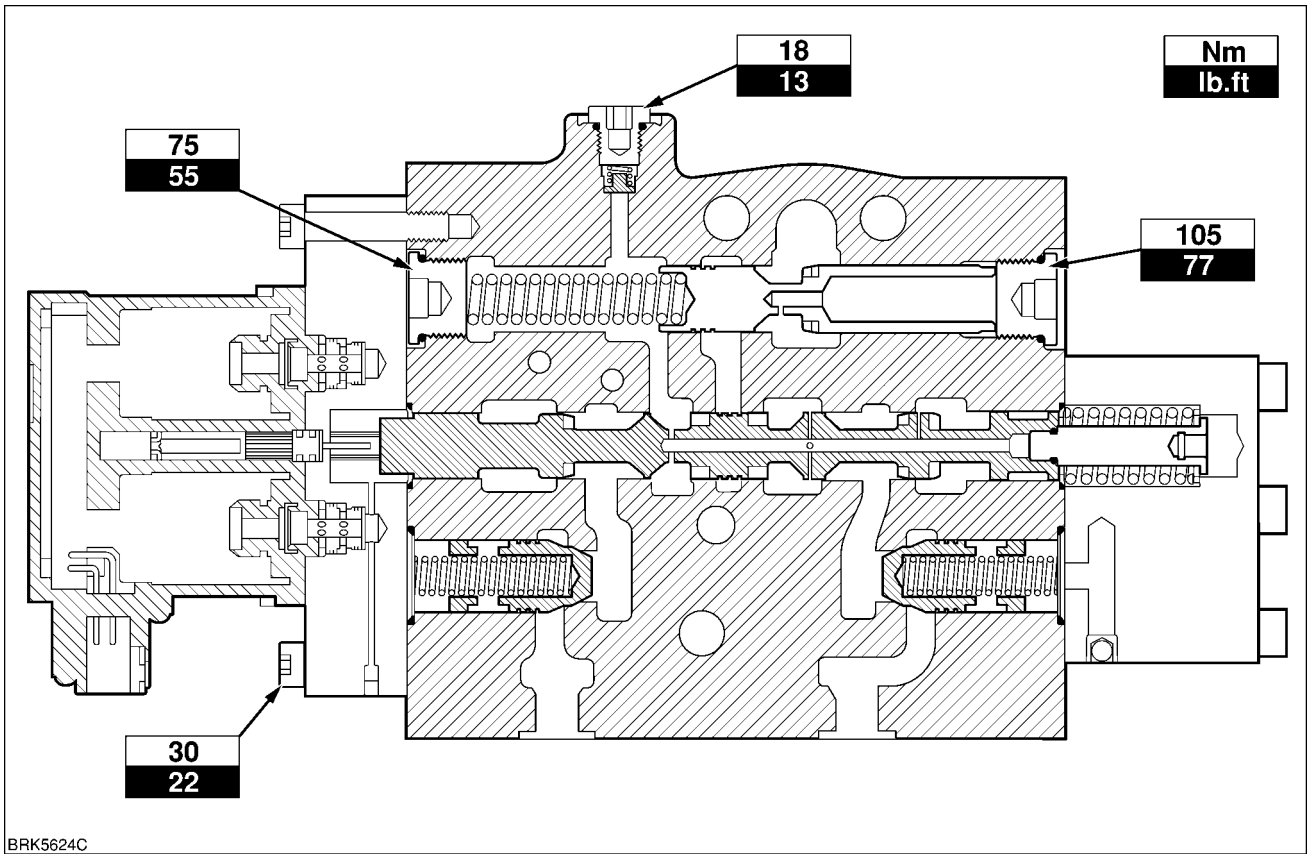
PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Torque



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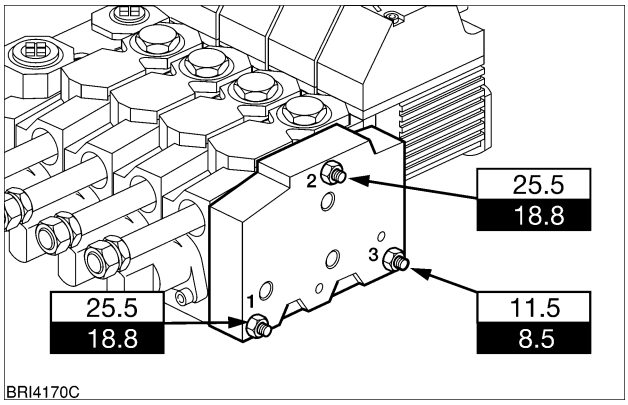
Remote control valve - Torque



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Mid-mount remote control valve - Torque

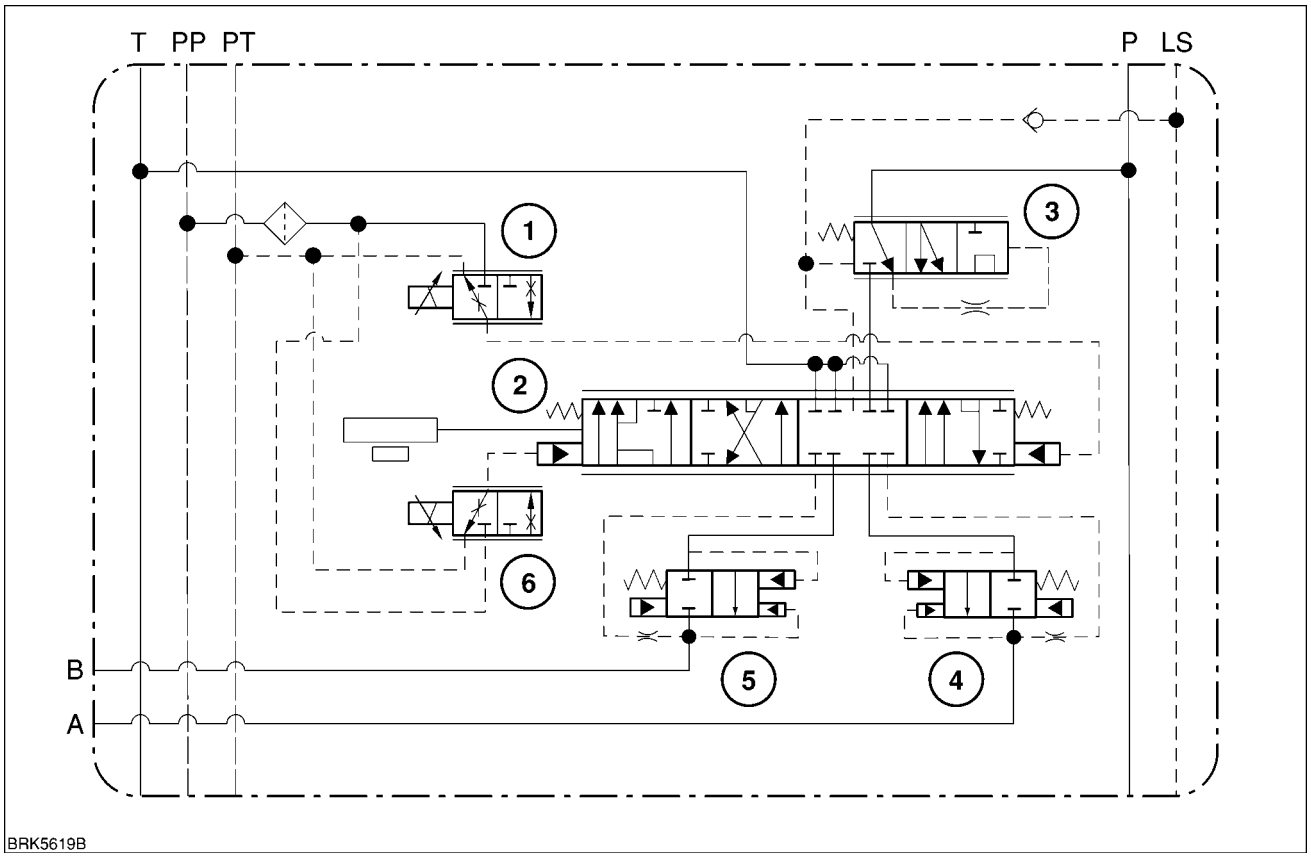


BAIL06CCM141ASA 1

Mid Mount Valve Assembly Torques showing tightening sequence
Refer to Mid-mount remote control valve - Assemble (A.10.C)

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PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Hydraulic schema



BAIL08CVT142FSA 1

1. Solenoid
2. Main spool
3. Pressure compensating spool
4. Check valve
5. Check valve
6. Solenoid

A Extend port
B Retract port
T Return to tank
PP Pilot pressure line
PT Pilot tank line
P Pressure line
LS Load sense line

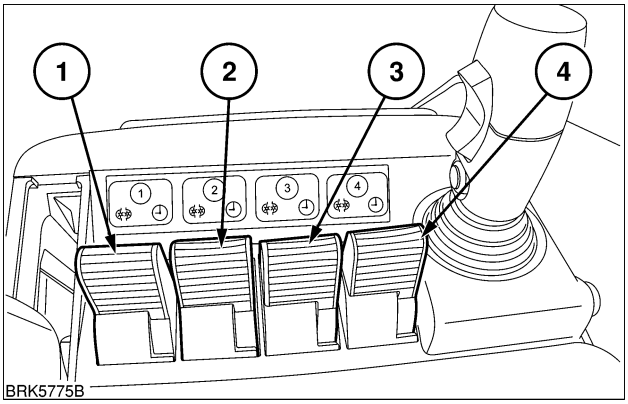
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PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Static description

Electro-hydraulic remote valves are standard on all models.
Each remote valve has its own built in micro processor which controls the oil flow through a solenoid activated valve, based on inputs received from the operator controlled switches. Maximum flow rate for each valve is **140 l/min** (**37 US gpm**).
Each remote valve is connected into the electrical CAN BUS system to the XCM processor , which is located in a panel behind the operators seat. Each remote valve can detect system faults and send a message to the processor which in turn sends a signal to allow a fault code to be displayed on the integrated control panel.

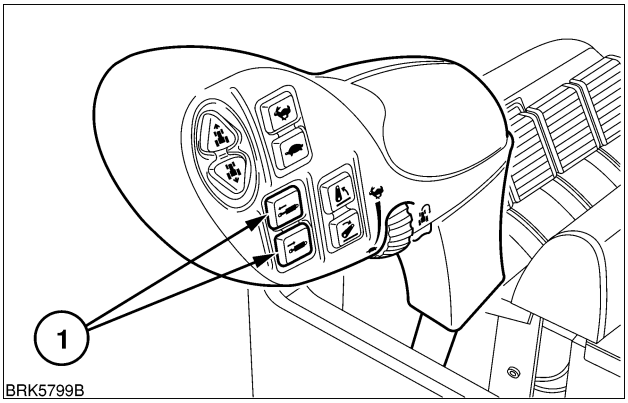
Controls

The controls for the remote valves are located on the right hand armrest unit of the operator seat. Remotes valves I to IV are operated by control levers **(1)**, **(2)**, **(3)**, and **(4)** in the right-hand console. Each control lever is numbered to correspond to the relevant remote valve. A maximum of five electro-hydraulic remote valves may be fitted.



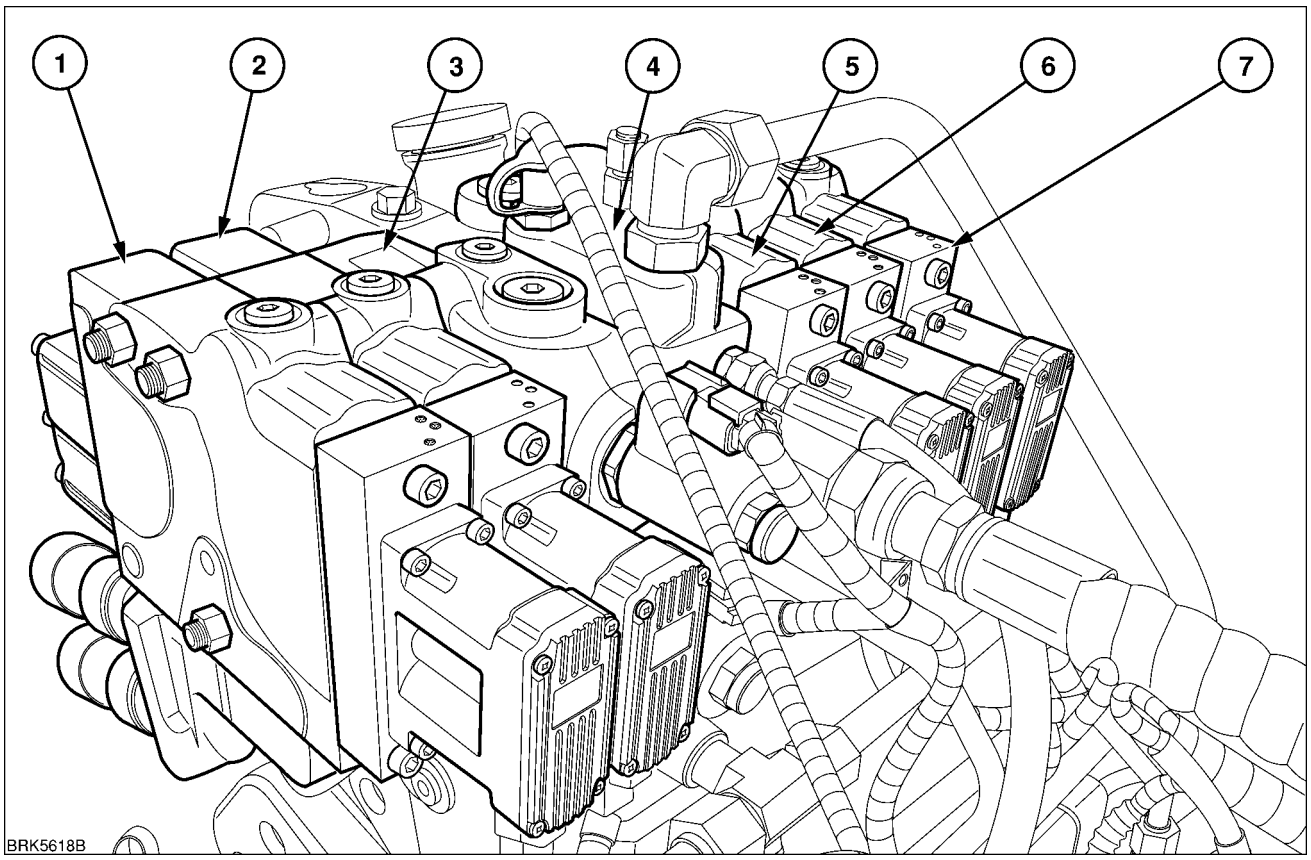
BAIL08CVT030ASA 1

The fifth valve is operated by a switch **(1)** situated on the multifunction control lever.



BAIL08CVT053ASA 2

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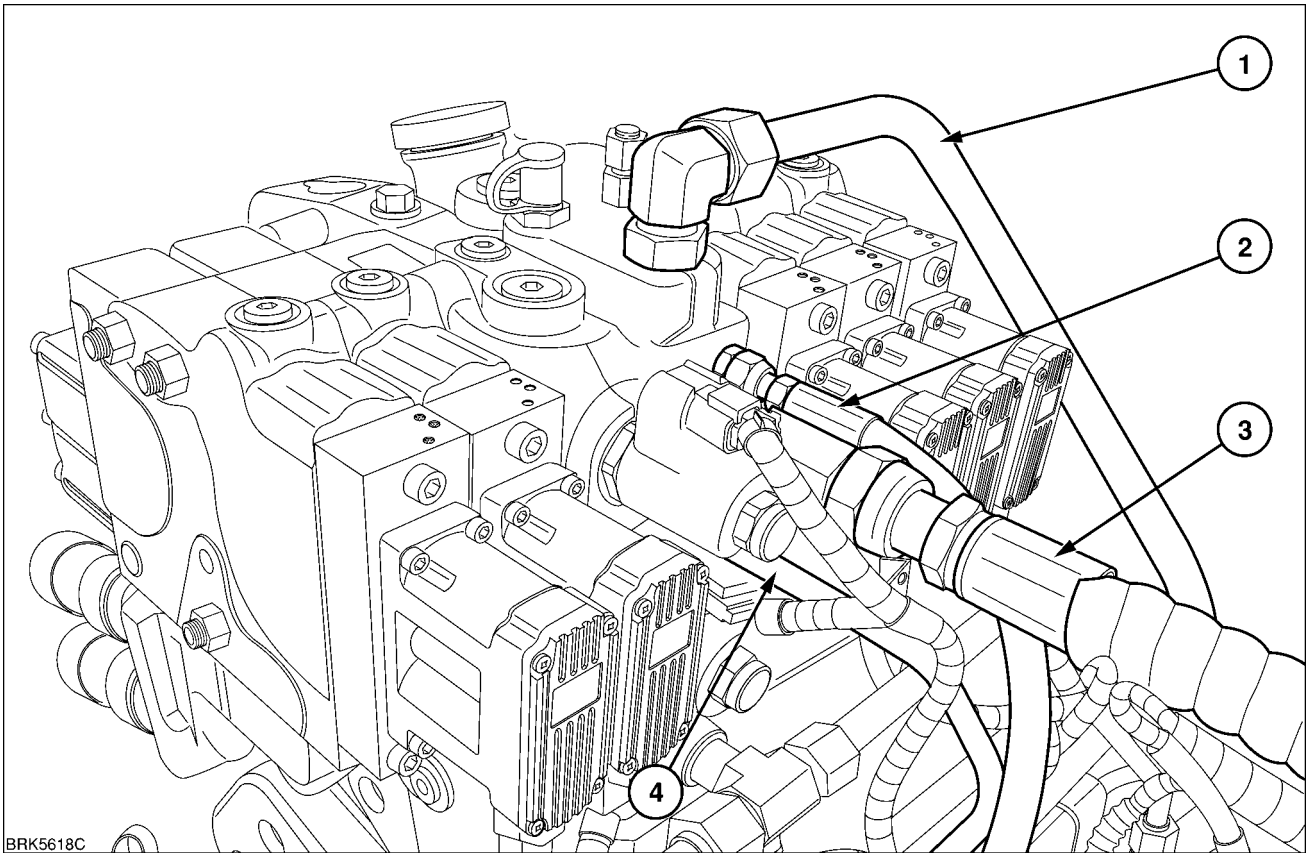


BAIL08CVT003FSA 3

Remote control valve layout

1.Remote valve No.1
2.Remote valve No.2
3.Electronic draft control valve
4.Manifold block
5.Remote valve No.3
6.Remote valve No.4
7.Remote valve No.5

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BAIL08CVT042C 4

Hydraulic connections

1.Return to tank pipe
2.Load sensing hose
3.Pressure feed Hose
4.Pilot supply hose

All valve sections have a common parallel inlet and return to reservoir gallery. The electro-hydraulic remote valve sections also have common galleries for the control valve pilot pressure and return oil.
The load sensing gallery passes through the centre of the valve stack and signals the pump to increase or decrease output according to demand.
The parallel gallery and load sensing system enables two or more valves to be operated simultaneously without loss of efficiency.
'O' ring seals **(1)** and load sense check valves **(2)** between each valve section ensure the highest circuit load sense pressure is transmitted to control output of the hydraulic pump.
The principal hydraulic components within each Electro-Hydraulic remote control valve section are:-

Solenoid valve assembly (refer to **PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Sectional view (A.10.C)**)

A signal to operate a solenoid activated valve is received from the operator control switches into the microprocessor of the control unit. The spool within the solenoid valve moves according to the forces of the solenoid which allows pilot oil pressure, regulated to **22 - 25 bar** (**319.0 - 362.5 psi**), to act on the control valve spool. The control unit is also able to accurately sense the position of the spool and can detect errors in the system, via the CAN BUS electric system. These errors will be displayed as fault codes which are in the 4000 range.

Pressure compensating spool.

Ensures that if more than one remote valve is operated that the available oil flow is proportionally distributed amongst the valves being operated depending on demand. The Pressure compensating spool senses the differential pressure within the valve and regulates the flow accordingly. Because each flow control spool individually senses the pressure in the remote valve being operated, two or more circuits working at different pressures can be controlled simultaneously.

Load sense check Valve

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The check valve prevents a back flow of pressure from the remote valve circuit when the control spool is operated and pump system pressure is less than the back pressure in the circuit.
This is explained by the following example:-
When a cylinder is holding a heavy load and the control valve spool is moved from the neutral to raise position, the pump system pressure may be less than the back pressure in the remote valve circuit. When this occurs the back pressure would cause oil in the circuit to flow backwards and the load to momentarily drop before pump system pressure has risen to hold and then raise the load further. The load sense check valve prevents this situation from occurring.

Lock Valve

The lock valve is located in the raise port of the remote valve and is closed whenever the remote valve is in neutral. The lock valve prevents leakdown of an implement should there be any leakage across the lands of the spool when in the neutral position. The lock valve is automatically opened whenever the control spool is moved from the neutral position.

Main control valve spool

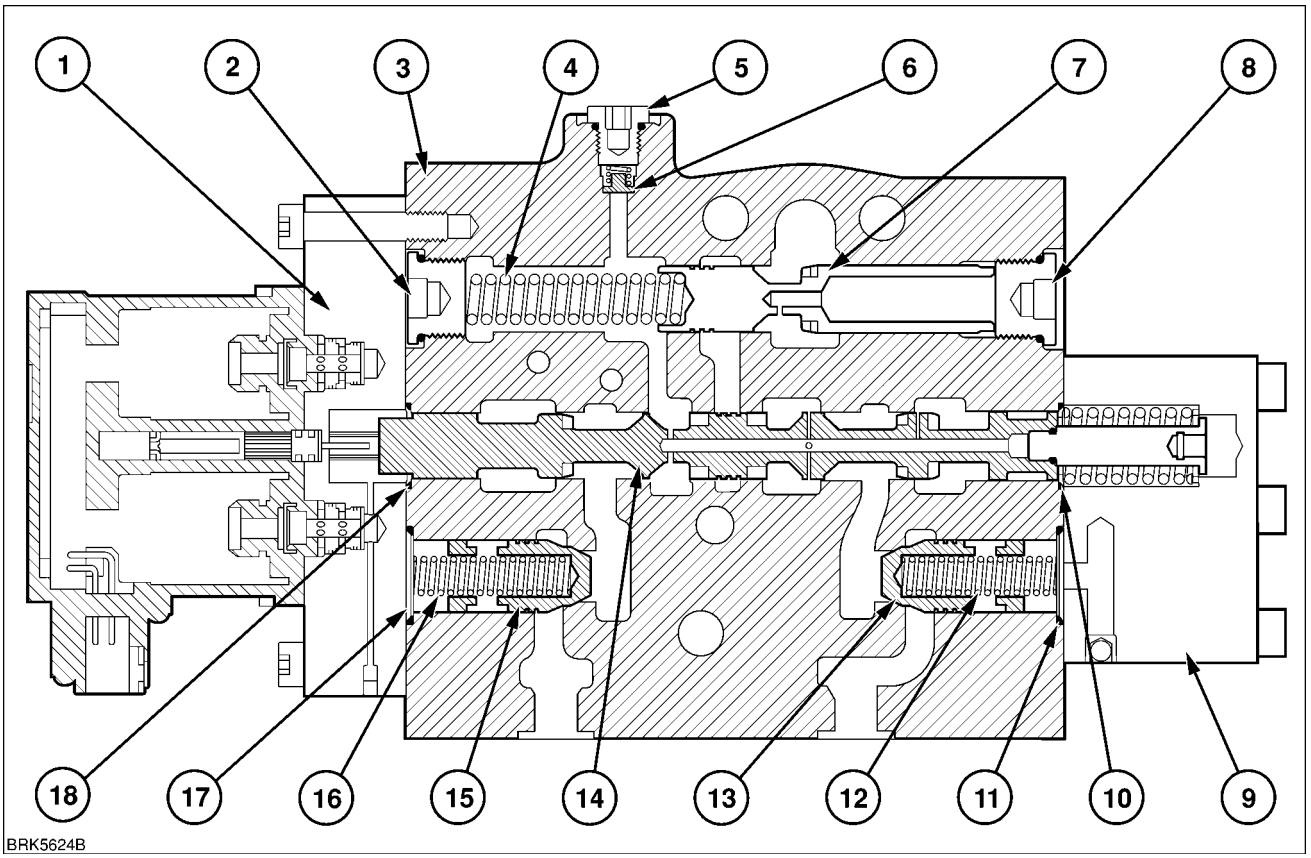
The control valve spool is spring centred to a neutral position and when moved by the regulated pilot pressure, via the solenoid control unit directs oil flow to the raise or lower ports of the control valve.

Spool Centering Spring

The spool centering mechanism spring loads the control valve spool to the neutral position.

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PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Sectional view

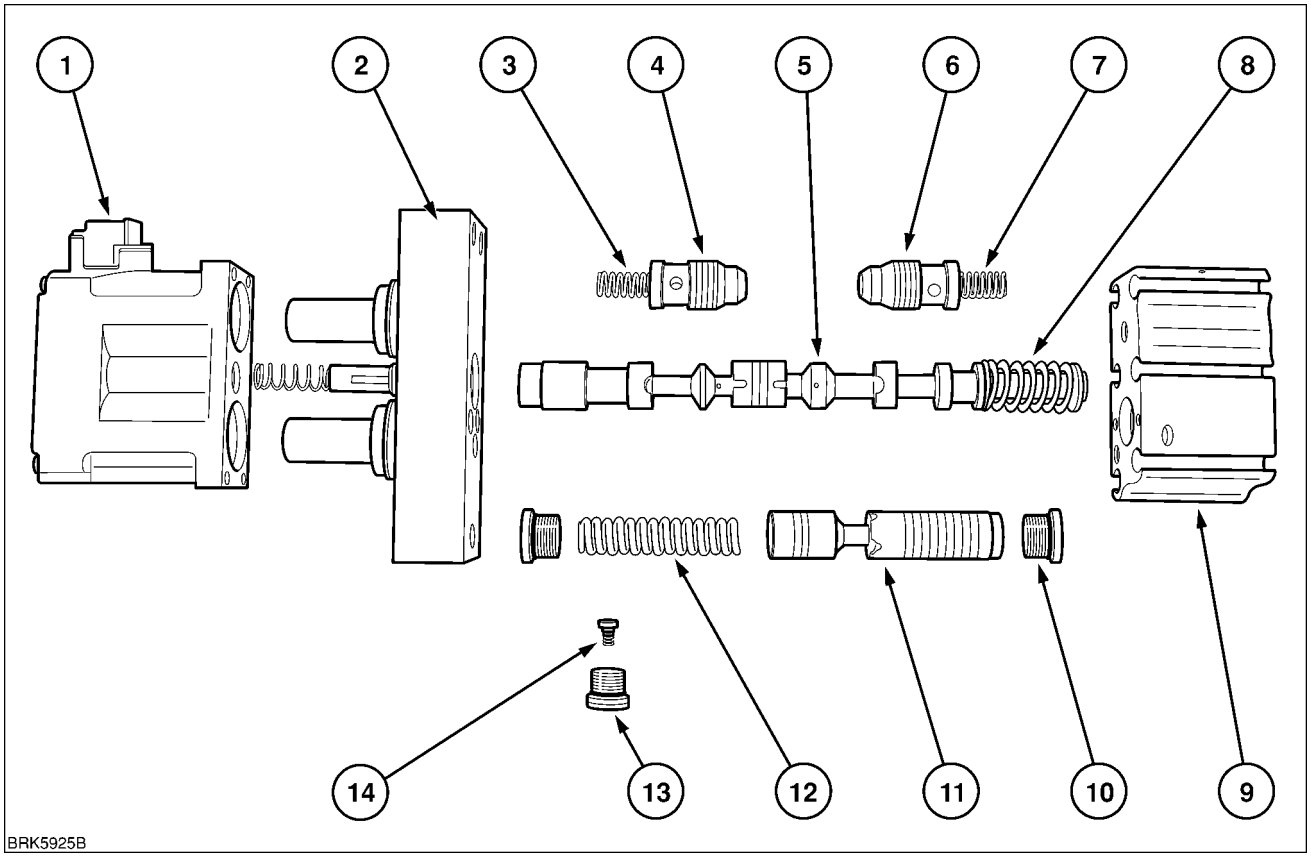


BAIL08CVT004FSA 1

1.Solenoid valve assembly
2.Plug
3.Valve body
4.Spring
5.Plug
6.Load sense check assembly
7.Pressure compensating spool
8.Plug
9.Pilot block assembly
10.Seal
11.Seal
12.Spring
13.Check lock poppet
14.Main spool
15.Check lock poppet
16.Spring
17.Seal
18.Seal

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PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Exploded view

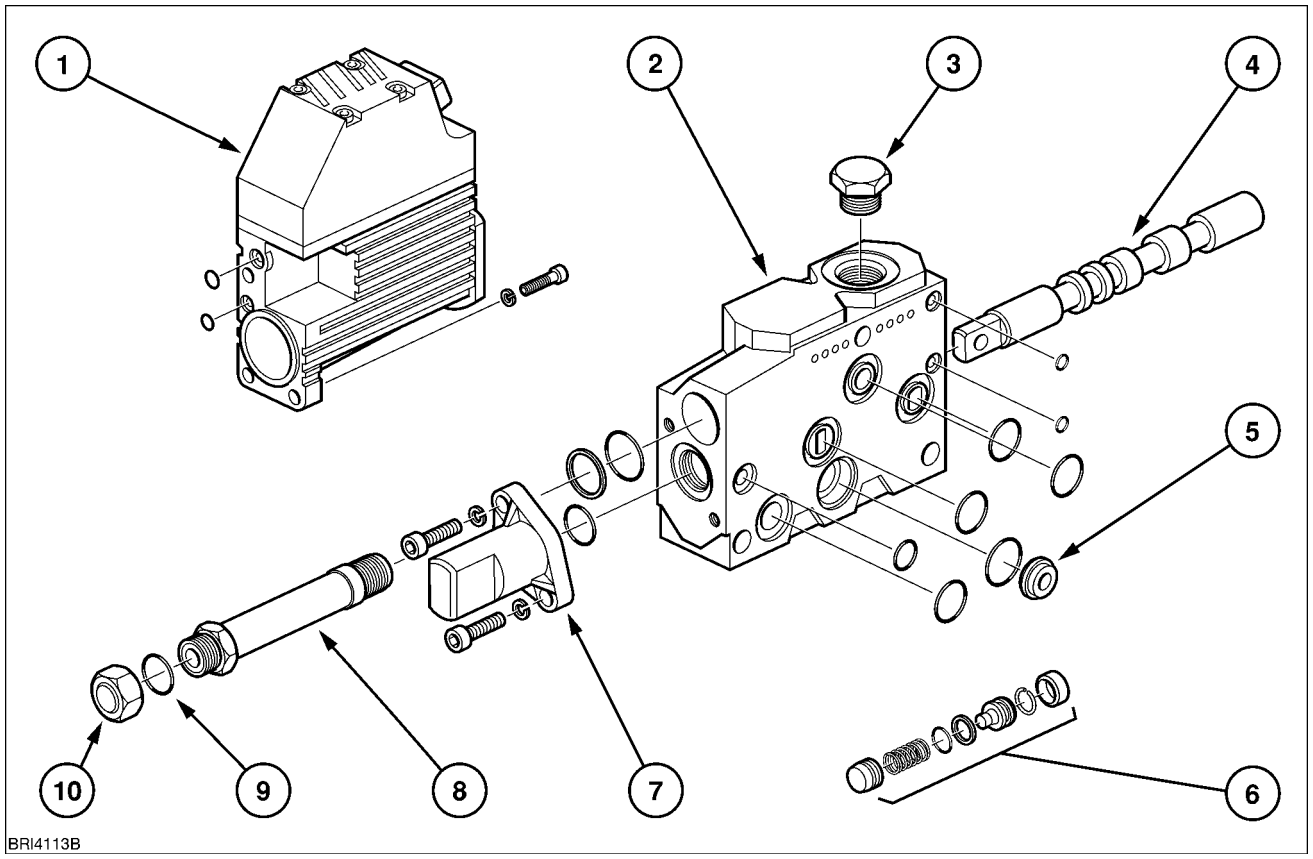


BAIL08CVT125FSA 1

1. Solenoid control unit
2. Solenoid valve manifold
3. Spring
4. Check lock poppet
5. Main spool
6. Check lock poppet
7. Spring
8. Centreing spring
9. Pilot block assembly
10. Plug
11. Pressure compensating spool
12. Spring
13. Plug
14. Load sense check valve

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Mid-mount remote control valve - Exploded view



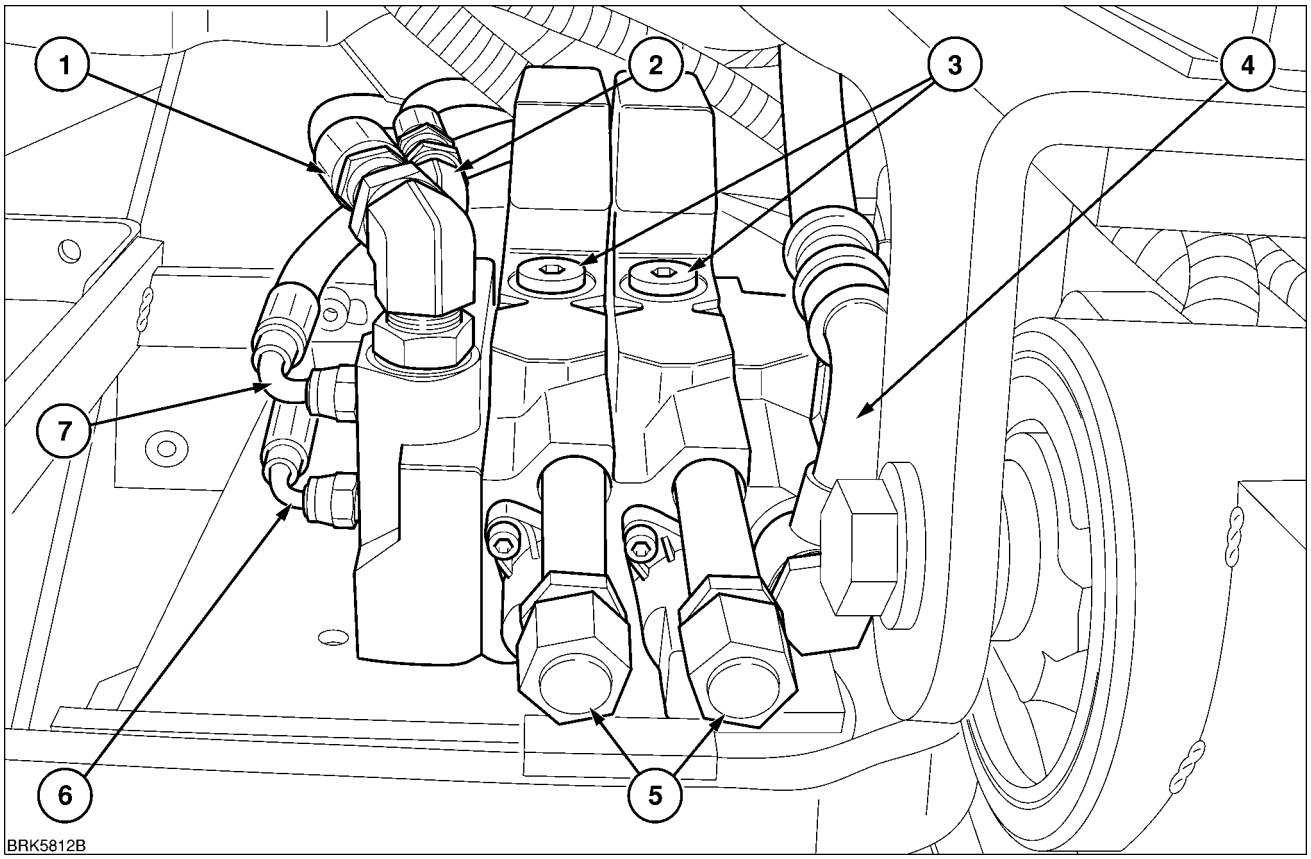
BAIL06CCM125FSA 1

Mid Mount Valve Components

1. Spool Control Unit
2. Valve slice
3. Plug
4. Spool Valve
5. Load Sensing Valve
6. Check Valve
7. End Cap
8. Connection port
9. 'O' Ring
10. Nut

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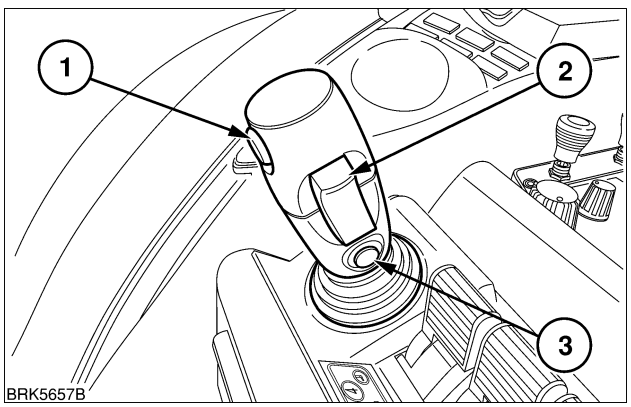
Mid-mount remote control valve - Static description



BRK5812B 1

1. High Pressure Supply Hose
2. Pilot Return Line
3. Loader Hose Pressure Port
4. Return Hose
5. Loader Hose Return Port
6. Load Sensing Hose
7. Pilot Line Pressure Hose

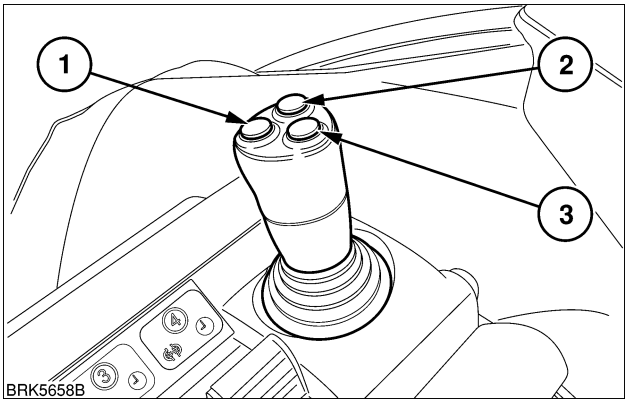
Tractors equipped with the Mid Mount Valve option are fitted with an armrest mounted joystick, a mid mount valve assembly, plumbing and loader mounting brackets ready for attaching the loader arms.
The Mid Mount Valve assembly is located underneath the cab on the right hand side. The base version has a two spool valve for raising and lowering the boom and tipping and curling the bucket when used with a loader. Three and four valve options are also available.
The valves are operated by means of a joystick control mounted on the right hand armrest of the seat. For front loader operation an electronic joystick is utilised with a push button switch **(1)** mounted on the top side of the handle and a proportional paddle switch **(2)** mounted on the side of the handle for EHR control.



BAIL08CVT039ASA 2

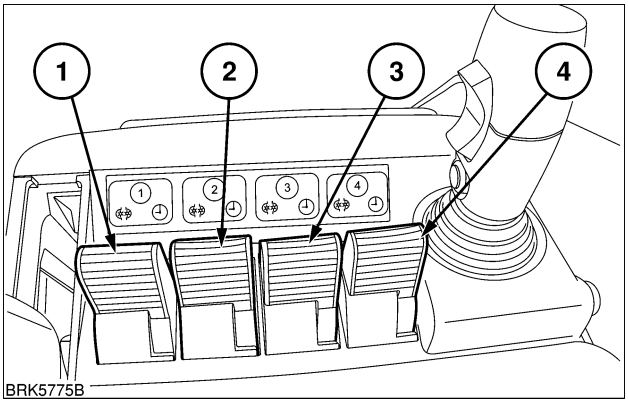
For front hitch operation a three button electronic joystick is used to control the mid mount valves.

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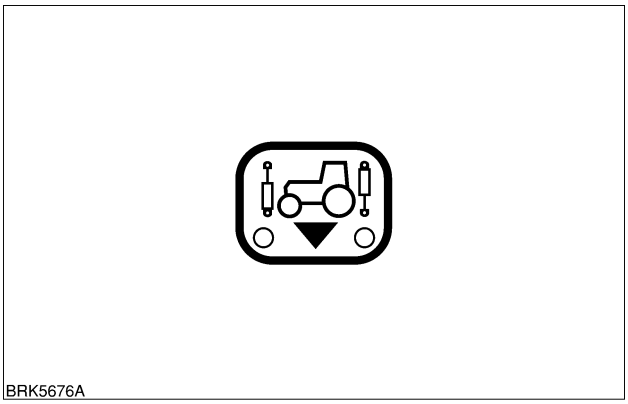
BAIL08CVT038ASA 3

The valves can also be operated by the remote levers also mounted on the armrest.



BAIL08CVT030ASA 4

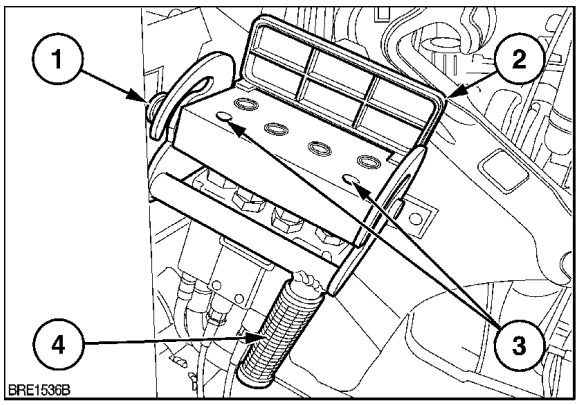
On tractors equipped with both mid and rear mounted valves, the joystick can be used to control either valve pack. At key-on, the joystick indicator lamps will not illuminate and the joystick remains disabled. To activate the joystick, momentarily depress the button **(1)**. The mid-mount valve indicator lamp will illuminate to confirm activation. A selector switch on the armrest console allows the operator to switch joystick control between the rear and mid-mount remote valves Refer to figure **5** .



BAIL08CVT027ASA 5

European loader ready options come complete with a “Multi-Quick" coupler. This allows the couplers to be connected and disconnected at once with the minimum of leakage.

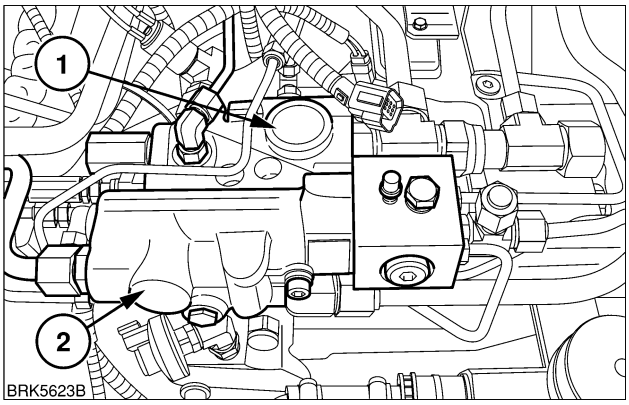
www.truck-freeworkshop.com



BRE1536B 6

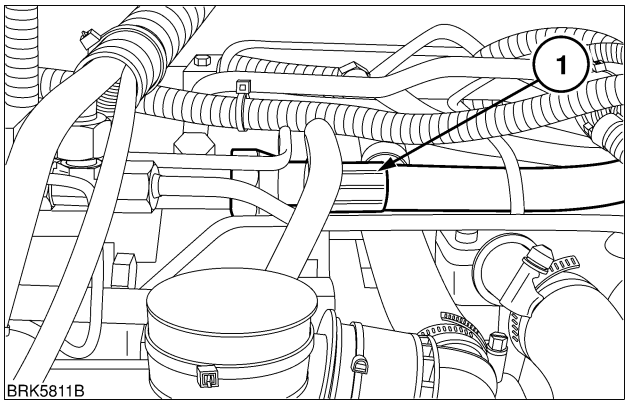
1. Lock Button
2. Protective Cover
3. Alignment Holes
4. Clamp Handle

The mid mount valves are fed high pressure oil from the variable displacement pump via a priority valve block **(1)** located on the rear axle housing on the right hand side.



BAIL08CVT007ASA 7

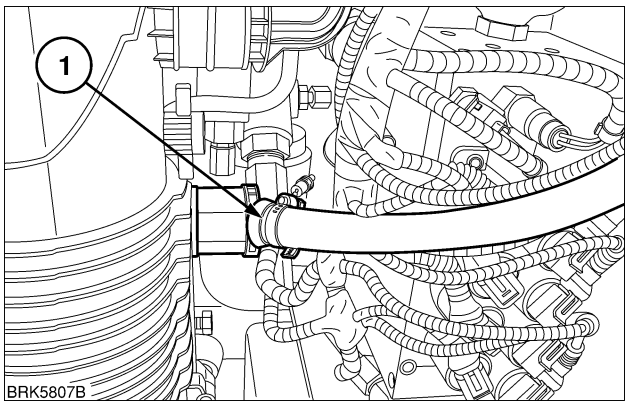
The high pressure oil is fed into the inlet manifold through hose **(1)** .



BAIL08CVT037ASA 8

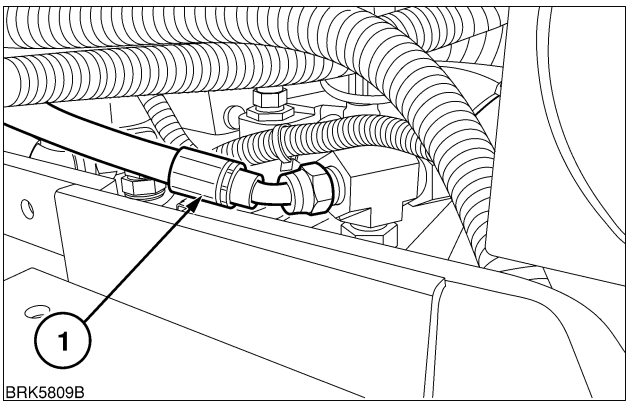
Return oil is fed back to tank via hose **(1)** to the suction filter

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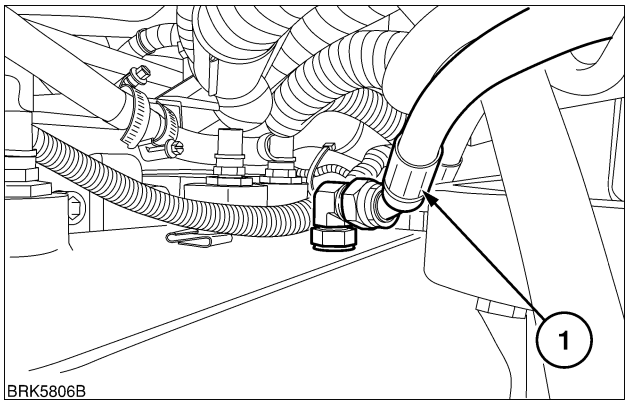
BAIL08CVT033ASA 9

Pilot line pressure is fed from the vane pump by a hose connected to a ‘T‘ connector on top of the hydrostatic motor housing.



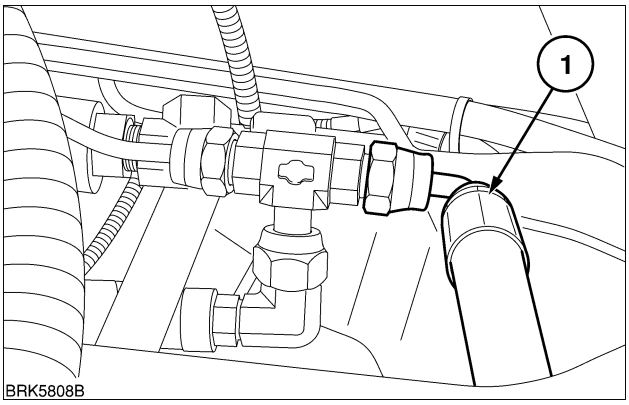
BAIL08CVT035ASA 10

Pilot line return oil is fed back to tank by a hose **(1)** connected to an elbow also on top of the hydrostatic motor housing.



BAIL08CVT032ASA 11

Load sensing oil is fed from a hose **(1)** connected by a ‘T‘ connector on top of the rear axle housing.



BAIL08CVT034ASA 12

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Pilot line pressure oil to operate the electronic solenoids is fed from the low pressure system from hose **(7)** (refer to figure **1**) to the inlet manifold . The load sensing hose **(6)** is also connected at the inlet manifold and feeds back to a 'T' connector on the priority valve block.

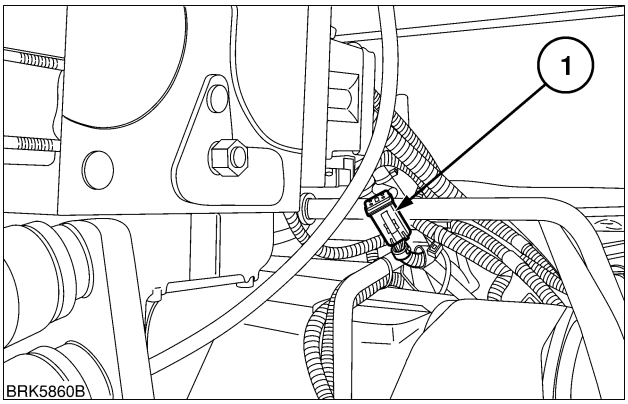
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PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Remove

Prior operation:
Battery - Disconnect (A.30.A)

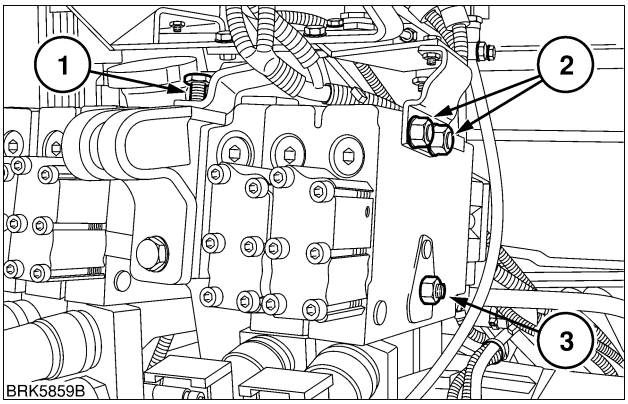
Removing valves 1 and 2

1. Disconnect the electrical connectors **(1)**.



BAIL08CVT055ASA 1

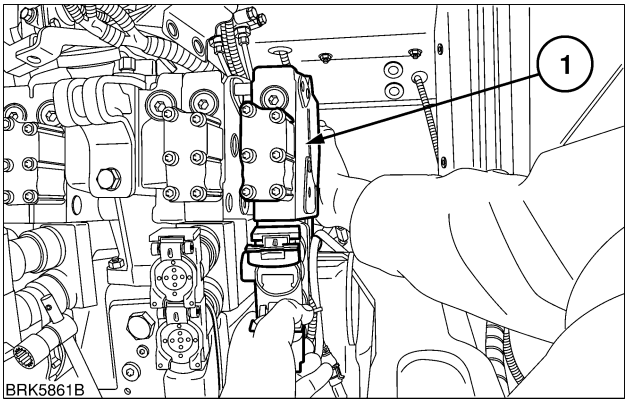
2. Remove pneumatic trailer brake bracket bolt from the top of the valve assembly **(1)**. Loosen and remove the top two retaining nuts on the side of the remote valve **(2)**. These also retain the trailer brake valve bracket (Where fitted). Undo and remove the remaining retaining nut at the lower part of the valve slice **(3)**.
3. Remove the oil collection bottles.



BAIL08CVT054ASA 2

4. Remove the end valve slice **(1)** from the tie rods.

NOTE: *There are O-rings situated between the valve slices. Take care when removing the valves not to dislodge the O-rings.*

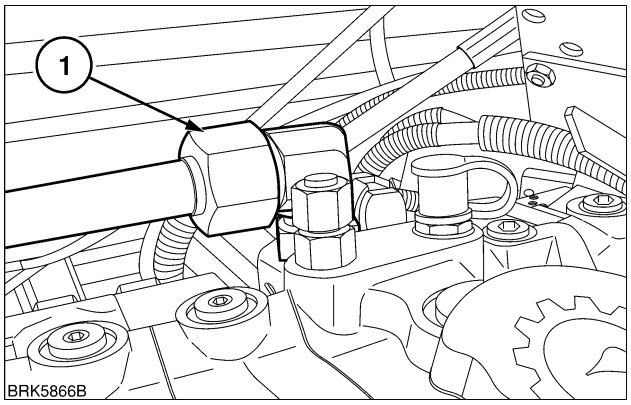


BAIL08CVT056ASA 3

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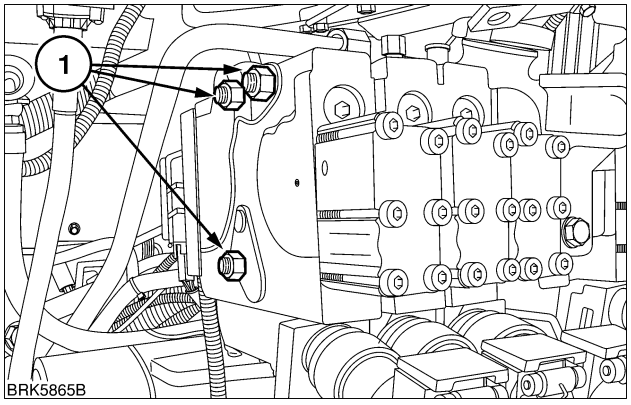
Removing valves 3, 4, and 5.(Where fitted)

5. If the machine is fitted with five valves it may be necessary to undo the return pipe from the central manifold in order to remove the fifth valve.



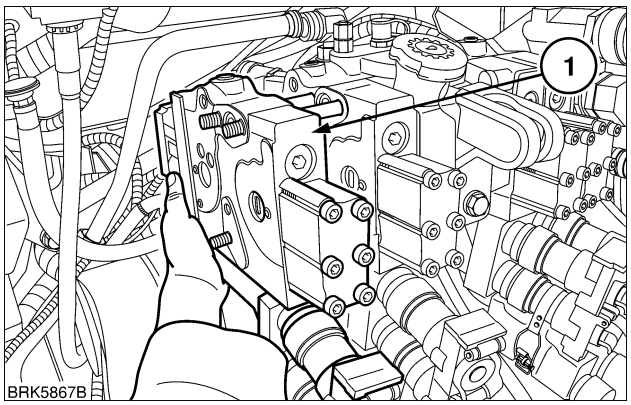
BAIL08CVT061ASA 4

6. Undo and remove the valve slice retaining nuts **(1)**.



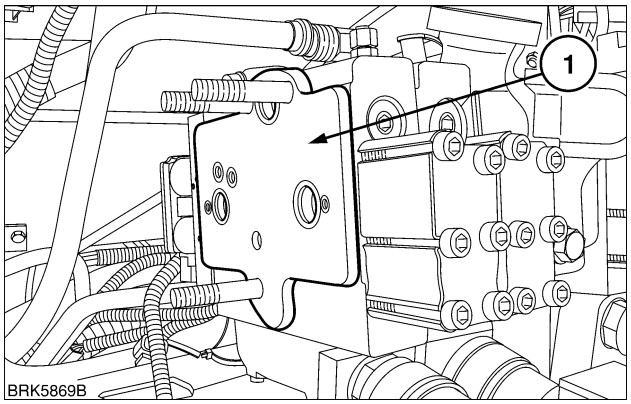
BAIL08CVT060ASA 5

7. Remove valve slice **(1)** from tie rods



BAIL08CVT062ASA 6

8. Remove spacer (where fitted)
9. Remove remaining valve slices



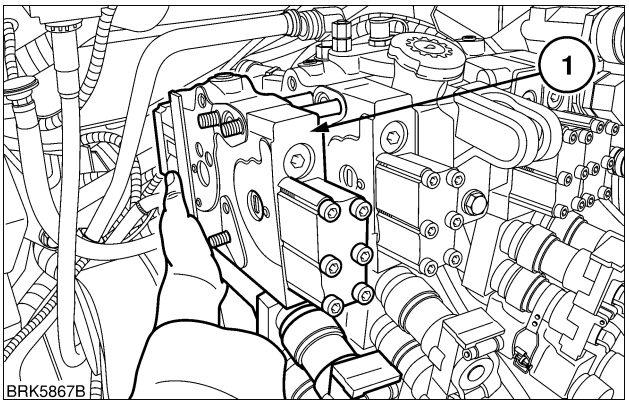
BAIL08CVT064ASA 7

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PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Install

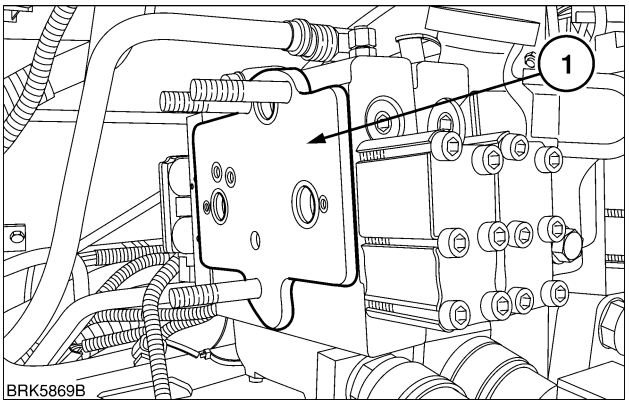
Valves 3, 4, and 5 (Where fitted)

1. Mount the valve **(1)** on the tie rods ensuring the O-rings are correctly installed.



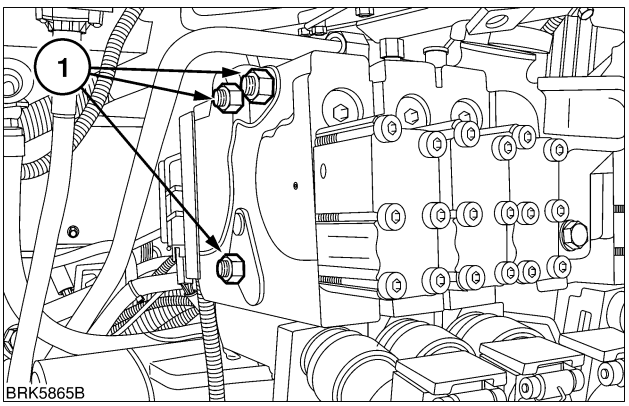
BAIL08CVT062ASA 1

2. Install the spacer **(1)** (if required)



BAIL08CVT064ASA 2

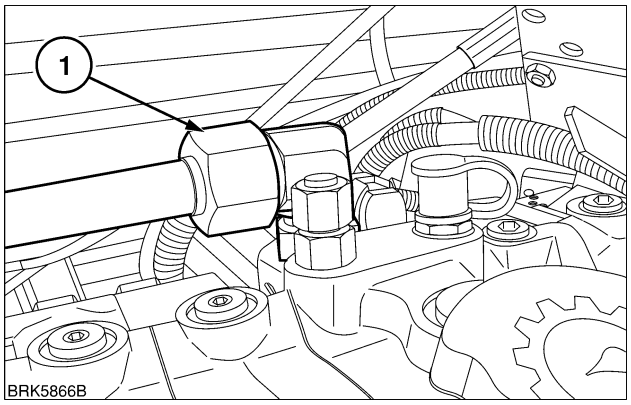
3. Install the end valve slice ensuring all O-rings are in place. Tighten the retaining nuts to **45 Nm** (**33.2 lb ft**).



BAIL08CVT060ASA 3

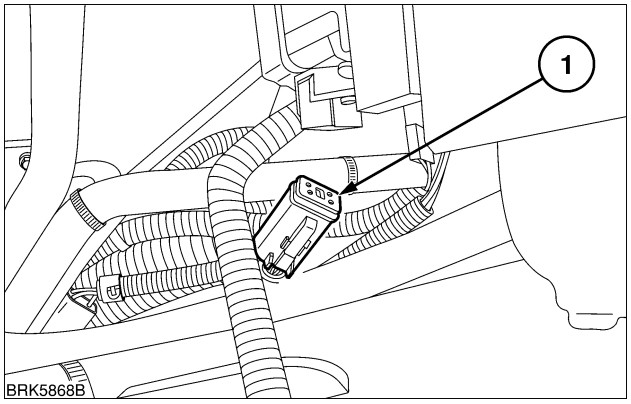
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4. Connect return pipe **(1)**.



BAIL08CVT061ASA 4

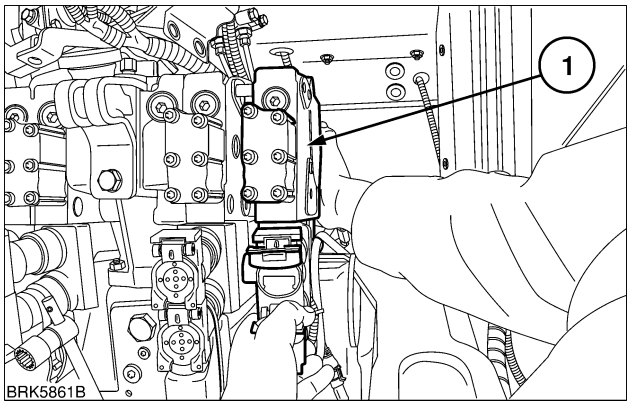
5. Reconnect electrical connectors **(1)** to the remote valve control modules.



BAIL08CVT063ASA 5

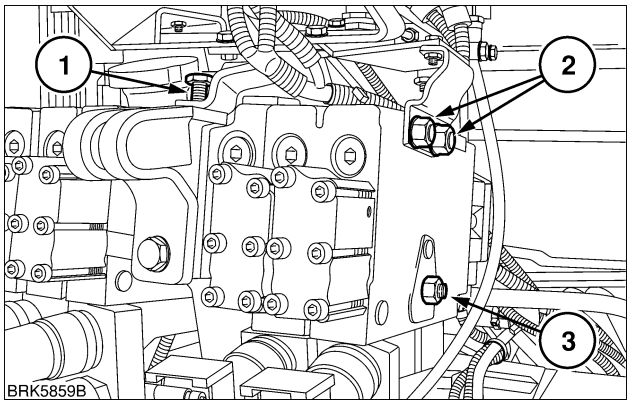
Valves 1 and 2

6. Mount valve 2 and then the end slice **(1)** onto the tie rods.



BAIL08CVT056ASA 6

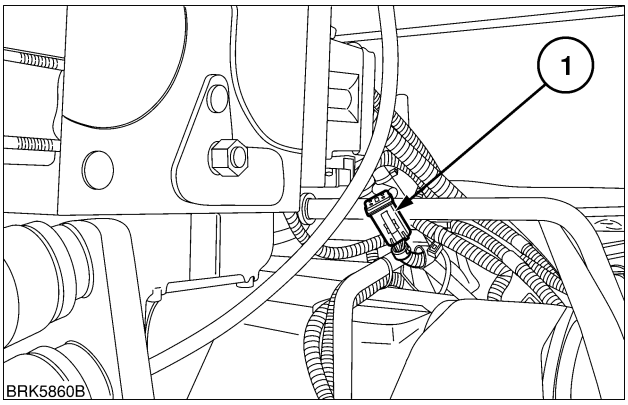
7. Install the pneumatic valve bracket to the valve assembly and tighten the top retaining bolt **(1)** to **85 Nm** (**62.7 lb ft**) and nuts **(2)** and **(3)** to **45 Nm** (**33.2 lb ft**).



BAIL08CVT054ASA 7

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8. Reconnect the electrical connectors **(1)** to the remote valve control modules.



BAIL08CVT055ASA 8

Next operation:
Refer to **Control module - Configure - Front Axle Suspension, Rear Electronic Hydraulic Remote Valves, Front PTO, Front Hitch (A.50.A)** for calibration and valve renumbering.

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PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Disassemble

NOTE: *If a valve bore shows heavy wear or damage, the valve section must be replaced. Discontinue disassembly and replace the valve section.*

NOTE: *Always replace parts which show heavy wear or damage. if the parts are not serviced separately, the entire valve or valve section must be replaced.*

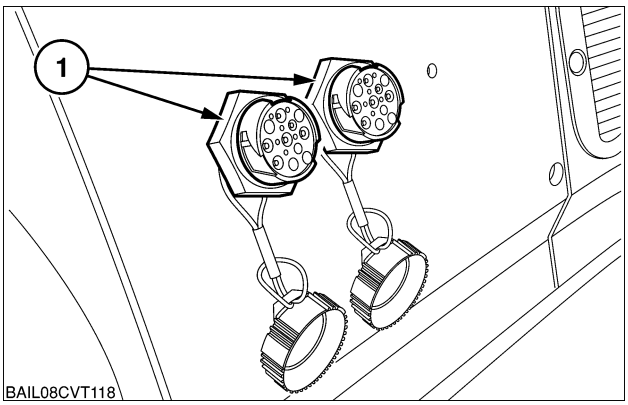
1. Thoroughly clean the valve section. Use a clean work surface to service the valve.
2. Remove the solenoid manifold from the valve body. See **PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Exploded view (A.10.C)** and **PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Sectional view (A.10.C)**
3. Remove the solenoid control unit and spring from the end of the solenoid manifold. Inspect the manifold and spring for damage.
4. Remove the main valve spool and spring. Mark which end of the spool is toward the solenoid for reference on reassembly. Inspect the spool and bore for heavy wear or damage. The spool must move freely within the bore.
5. Remove the pressure compensating spool and spring. Inspect the spool and bore for heavy wear or damage: the spool must move freely in the bore.
6. Remove the load sense check valve assembly. .
7. Remove the two signal check valves.

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PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Calibrate

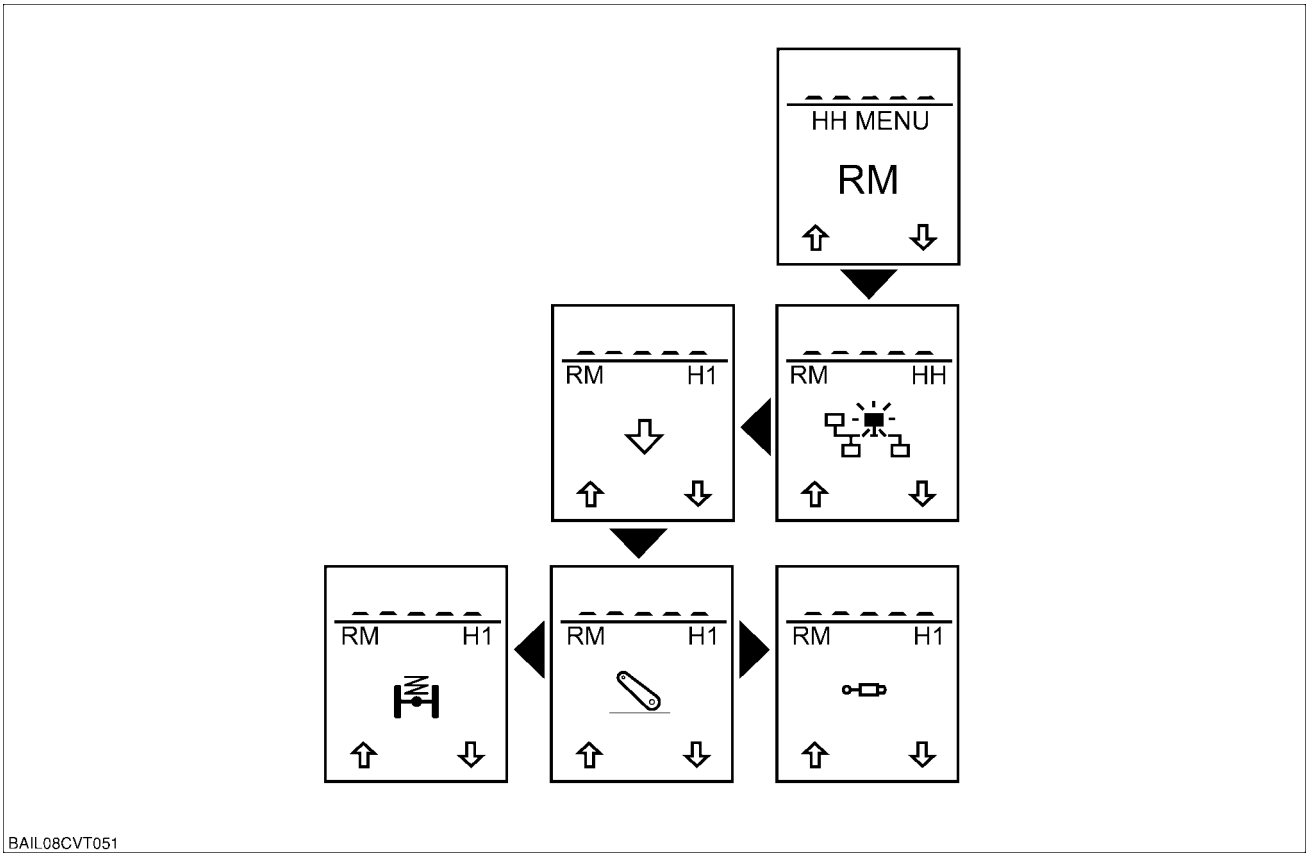
NOTE: *The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the wheels, front and rear. Check that the Ground speed display is Zero before commencing.*

1. Install the diagnostic connector **380000843** into the diagnostic socket **(1)**.



BAIL08CVT118B 1

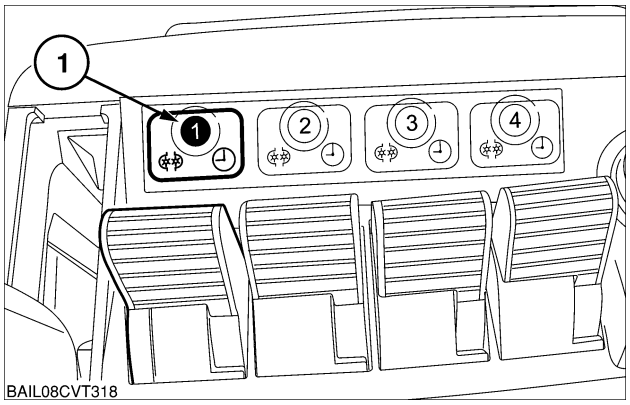
2. Disconnect all implements from the rear remotes.
3. Make sure all EHR program switches are in the OFF position.
4. Use the "up", "down" and "menu" keys on the ICU3 to navigate the HH menu's to H1 and the rear EHR symbol on the RM controller.
   The top section of the display will show "CAL".



BAIL08CVT051 2

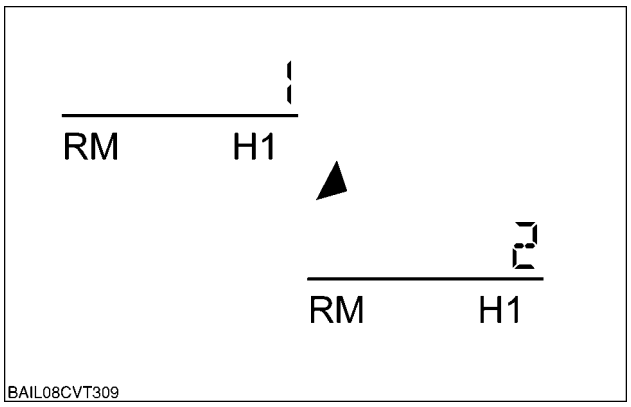
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5. Press and hold the program switch **(1)**,for lever No.1 for at least 2 seconds until the display changes.



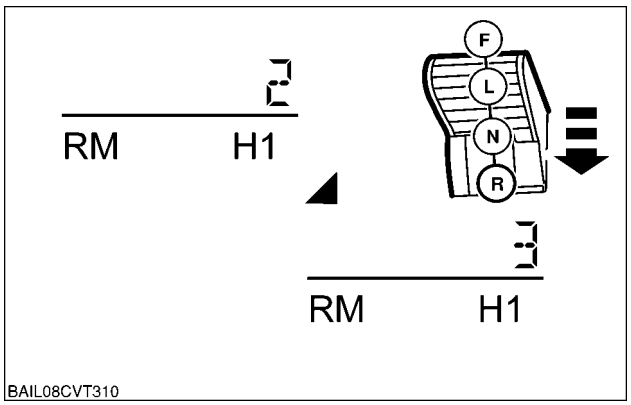
BAIL08CVT318 3

6. The calibration will proceed, the program lamp for EHR 1 will be illuminated and the top section of the display will show "1".
When the neutral position has been acquired and stored, the program lamp is turned off and the top section of the display will show "2".



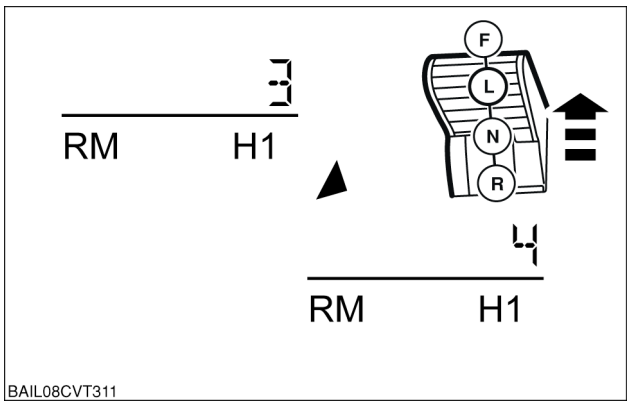
BAIL08CVT309 4

7. While 2 is displayed move the lever to the raise position, the program light will illuminate.
When movement is detected the program lamp for EHR 1 is turned off. After the raise position is established the top section of the display will change to 3, the program light will switch off.



BAIL08CVT310 5

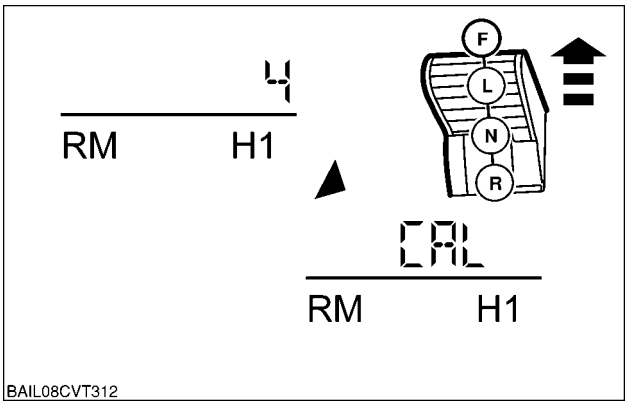
8. While 3 is displayed move the lever to the full flow lower position, the program light will illuminate.
When a stable value for the full flow lower position of the lever is seen it is recorded with the minimum flow rate value, the top section of the display will change to 4, the program light will switch off.



BAIL08CVT311 6

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9. While 4 is displayed move the lever to the float position, the program light will illuminate.
When a stable value for the float position of the lever is seen and recorded the top section of the display will change to "CAL" to indicate the calibration procedure is complete.



BAIL08CVT312 7

10. To calibrate the remaining EHR levers (2 to 4), repeat the steps 5 to 9.

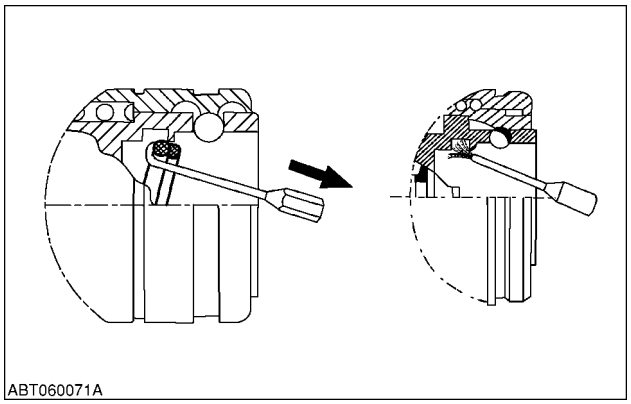
11. Key OFF to store the calibration values.

NOTE: *If a lever is not calibrated the program lamp is switched on regardless of the program switch state.*

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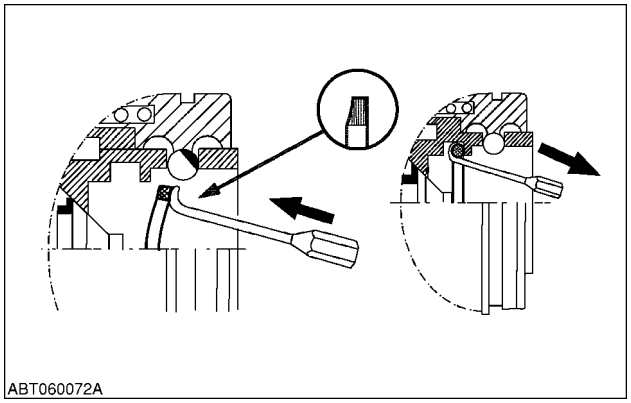
Coupler - Overhaul

1. Remove the 'O' ring and back up ring using a suitable hooked tool.
   Ensure the groove is clean



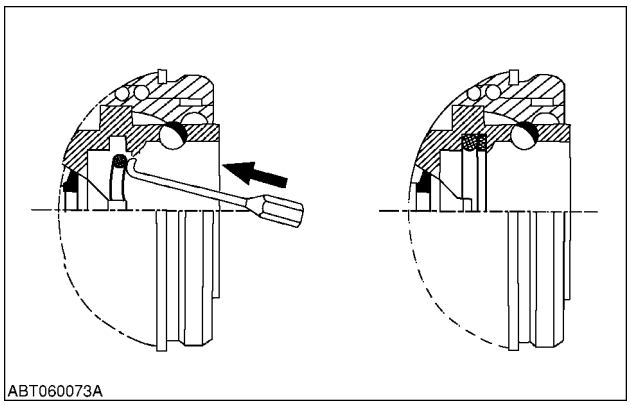
BAIL06CCM206ASA 1

2. Install the new back up ring ensuring that it is fully seated in the groove.



BAIL06CCM207ASA 2

3. Lubricate the new 'O' ring with clean transmission oil and insert into the groove.

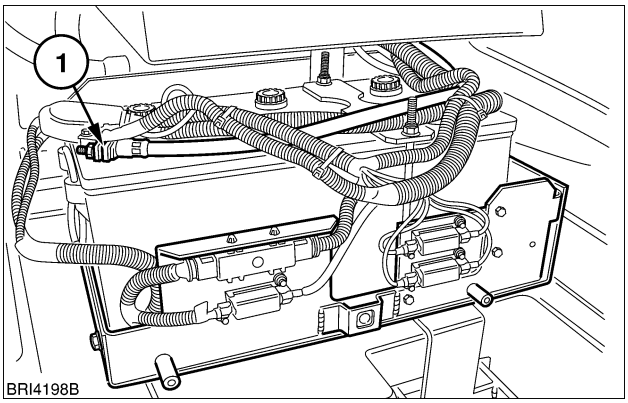


BAIL06CCM208ASA 3

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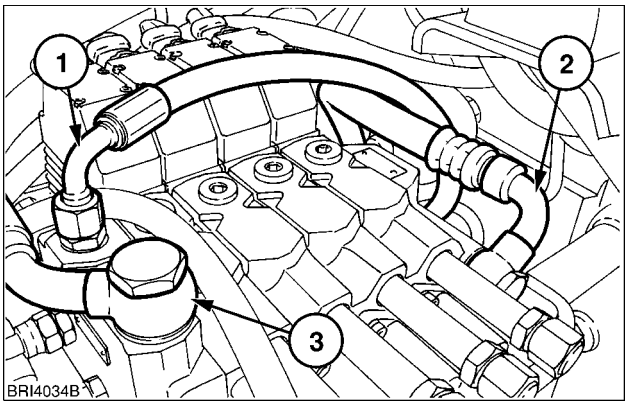
Mid-mount remote control valve - Remove

1. Disconnect the negative cable **(1)** from the battery and insulate. Refer to **Battery - Disconnect (A.30.A)**



BAIL06CCM151ASA 1

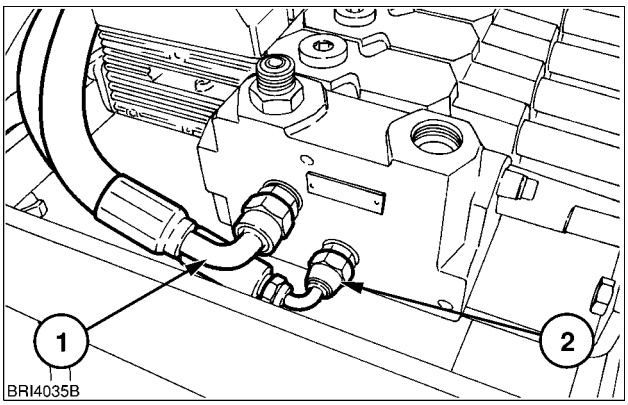
2. Disconnect the mid mount valve pilot return hose **(1)**, return hose **(2)**and supply hose **(3)** .



BAIL06CCM061ASA 2

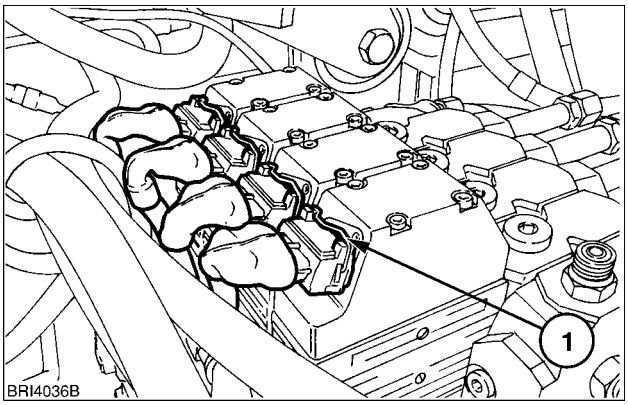
3. Disconnect the pilot line pressure hose **(1)** and the load sensing hose **(2)**

NOTE: *Drain all hoses into a suitable receptacle*



BAIL06CCM062ASA 3

4. Disconnect the electrical connectors **(1)** .



BAIL06CCM063ASA 4

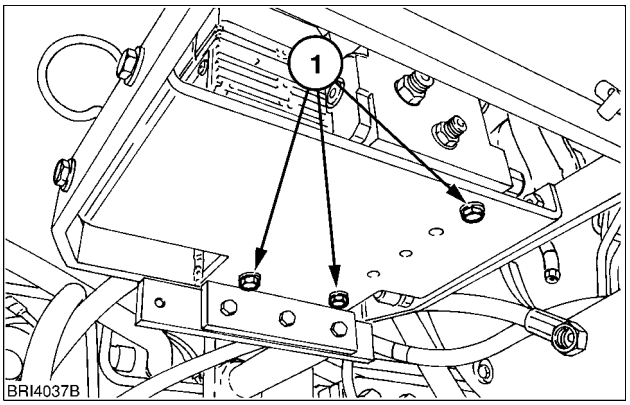
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5. Undo the mid mount valve stack retaining bolts. **(1)** . Remove valve stack from support.

⚠ WARNING ⚠

The remote valve assembly is heavy and must be removed under the complete control of the technician to prevent bodily injury.

M484



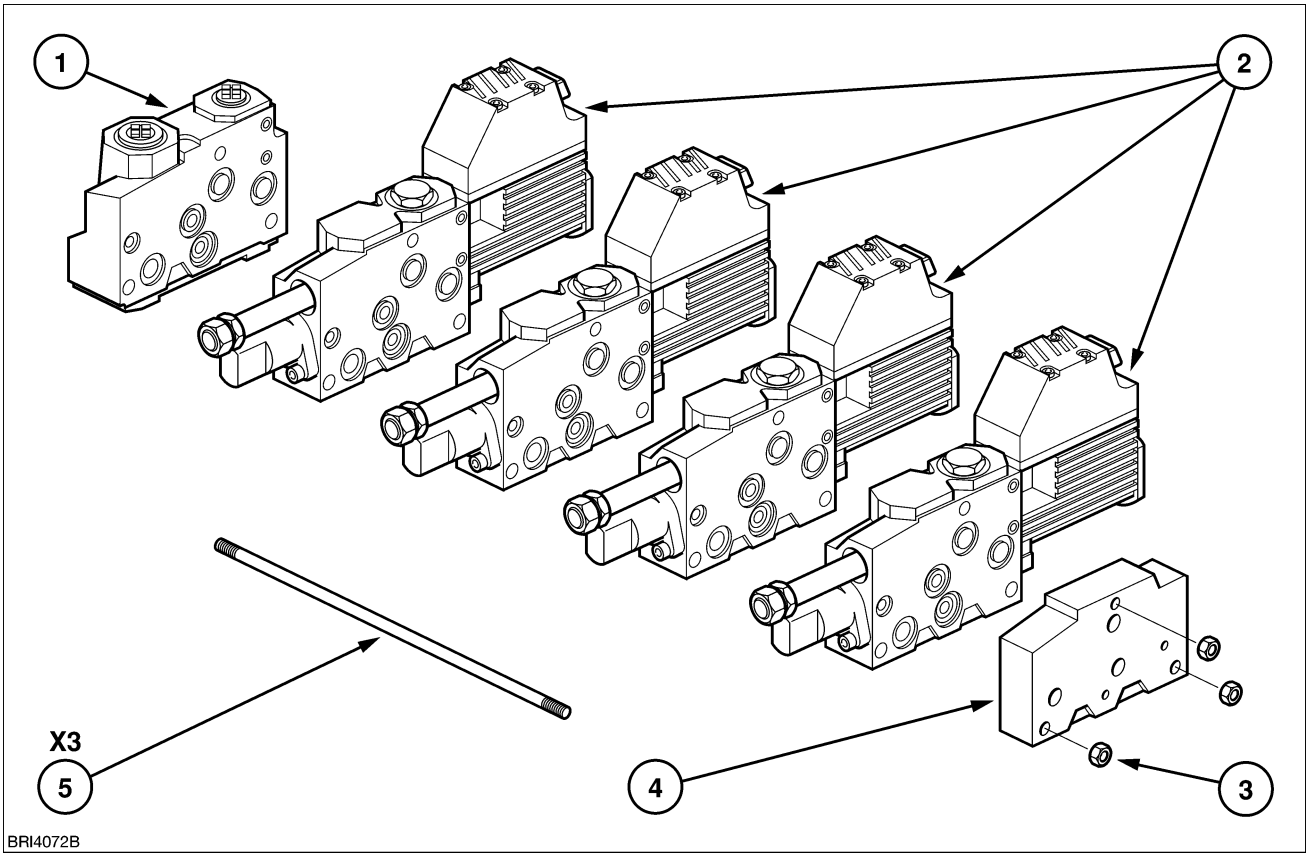
BAIL06CCM064ASA 5

Next operation:
Mid-mount remote control valve - Disassemble (A.10.C)

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Mid-mount remote control valve - Disassemble

Prior operation:
Mid-mount remote control valve - Remove (A.10.C)



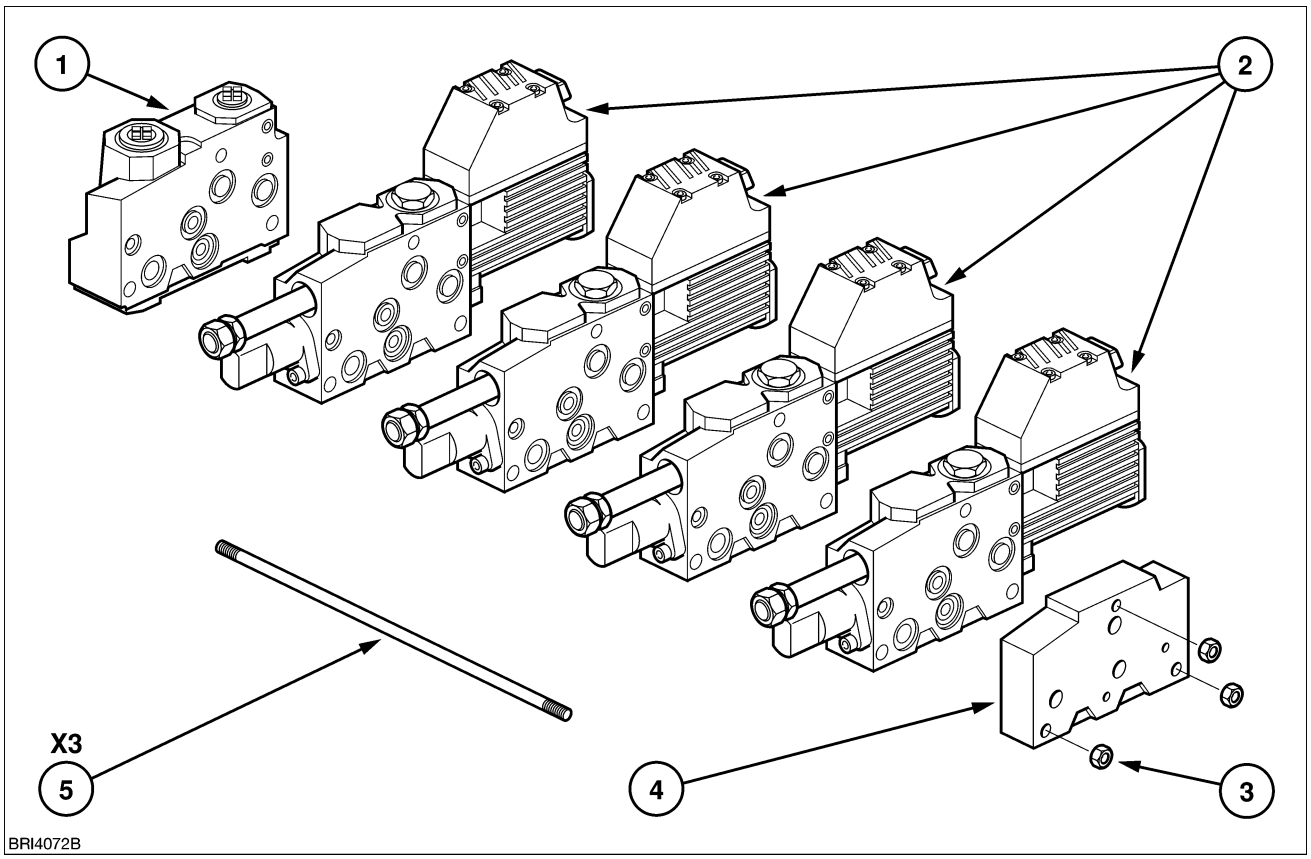
BAIL06CCM092FSA 1

1. Inlet Manifold
2. Electronic Remote Valves
3. Tie Rod Nuts
4. End Plate
5. Tie Rod

1. Loosen and remove the tie rod nuts **(3)** from the end plate **(4)** .
2. Remove the end plate .
3. Remove the remote valve slices **(2)** taking care not to dislodge the load sensing valves and 'O' rings seated in the valve face.
4. Unscrew the tie rod bolts from inlet manifold
5. Refer to **Mid-mount remote control valve - Exploded view (A.10.C)** to view valve components and **Mid-mount remote control valve - Assemble (A.10.C)** for reassembly.

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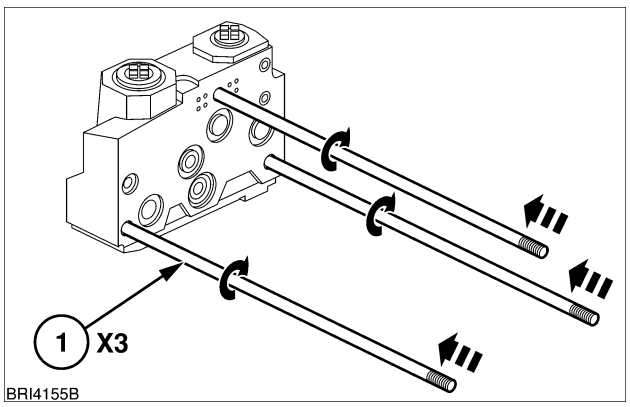
Mid-mount remote control valve - Assemble



BAIL06CCM092FSA 1

1.Inlet Manifold
2.Electronic Remote Valves
3.Tie Rod Nuts
4.End Plate
5.Tie Rod

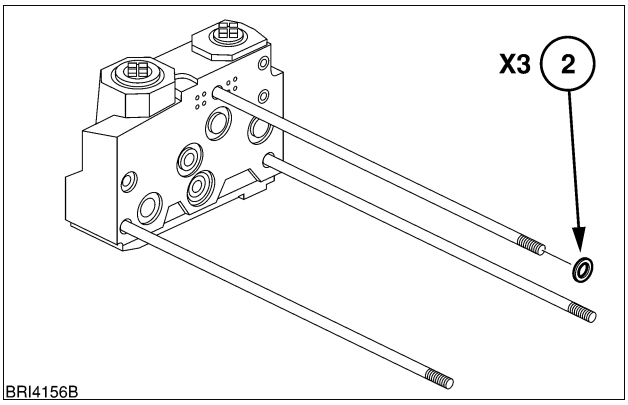
1. Insert the tie rods into the inlet manifold and screw in by hand as far as they will go.



BAIL06CCM128ASA 2

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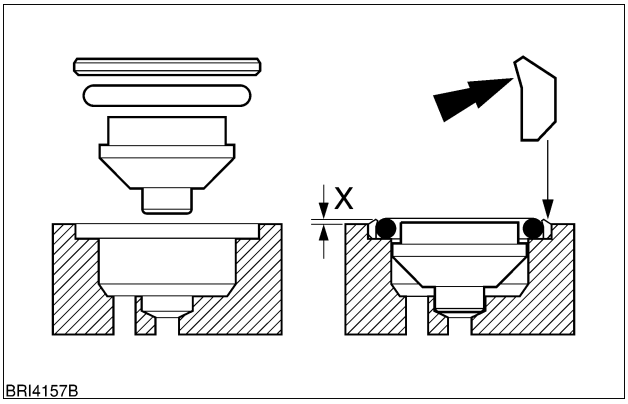
2. Push a shim onto the tie rods if any adhesive shims have been used previously.



BAIL06CCM129ASA 3

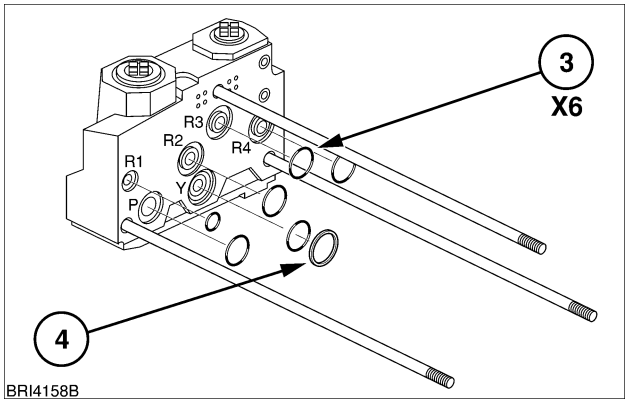
3. Insert load sensing shuttle valve along with the 'O' ring and support ring as shown in Figure **4** in port 'Y'. Figure **5**

NOTE: *Clearance X should be approximately* ***0.5 mm*** *from the flange face of the valve segment to the top edge of the inserted shuttle valve.*



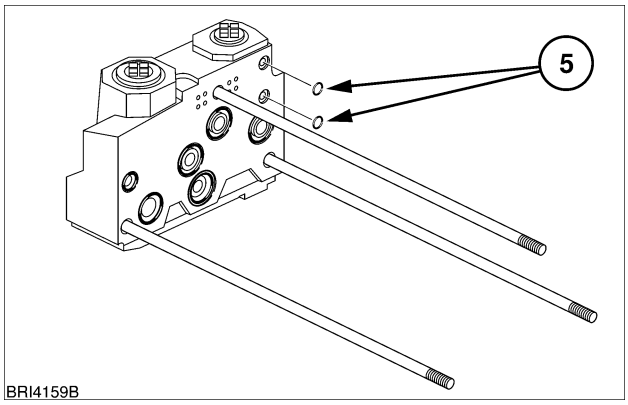
BAIL06CCM139ASA 4

4. Insert new 'O' Rings **(3)** into the pressure and return ports and also the load sense 'O Ring and support ring **(4)**.



BAIL06CCM131ASA 5

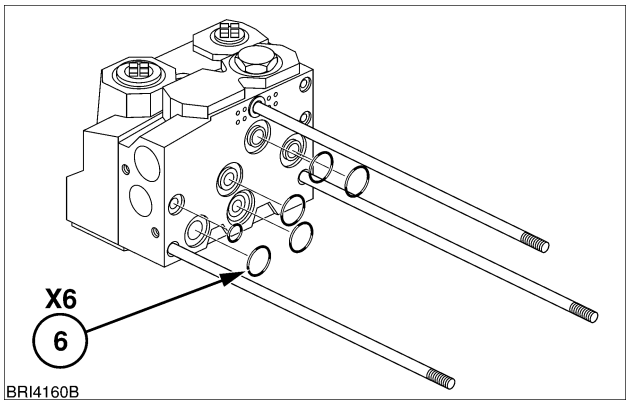
5. Insert new 'O' Rings **(5)** into pilot line oil holes



BAIL06CCM132ASA 6

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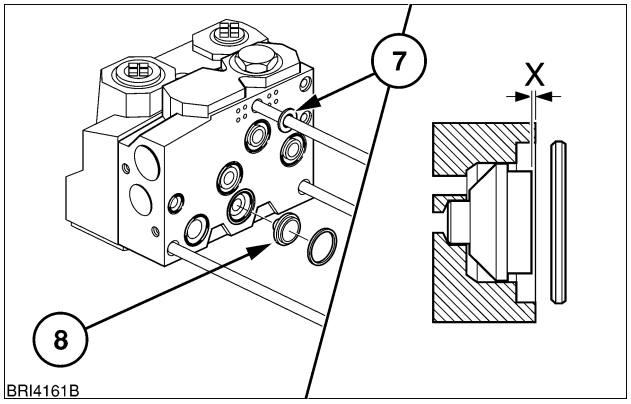
6. Place the first valve slice onto the tie rods and insert new 'O' rings **(6)** into the relevant ports.



BAILCCM133ASA 7

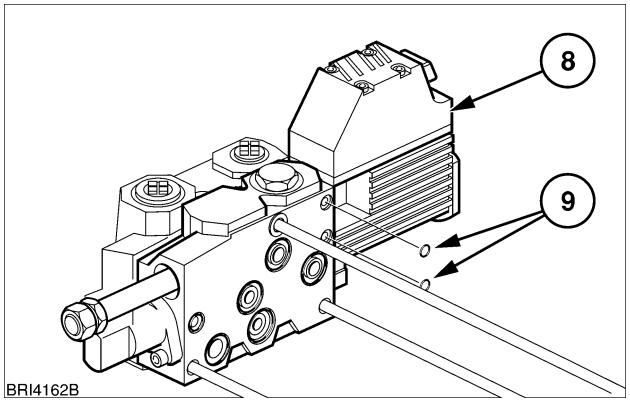
7. If the flange face has corrugations that have been smoothed with a dressing stone, one spacer **(7)** must be threaded onto each tie rod. Insert the load sense valve **(8)** and support ring as shown.

NOTE: *Clearance X should be approximately* ***0.5 mm*** *from the flange face of the valve segment to the top edge of the inserted shuttle valve.*



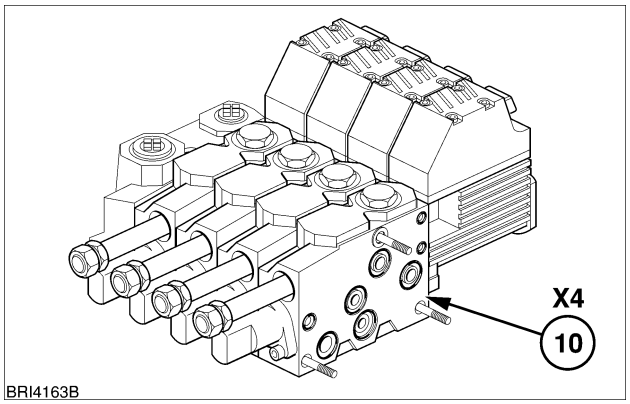
BAIL06CCM134ASA 8

8. Insert the 'O' rings **(9)** into the control oil holes.



BAIL06CCM135ASA 9

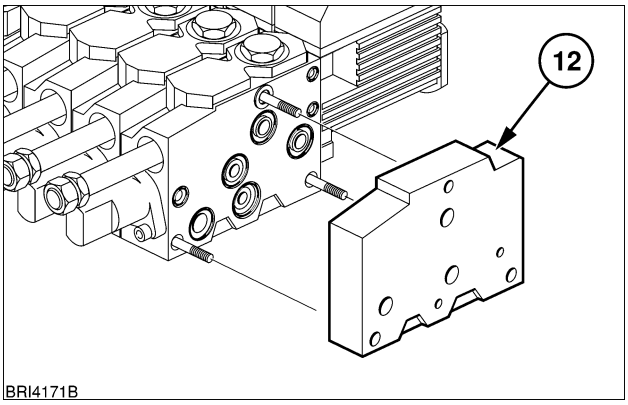
9. Push the last slice **(10)** onto the tie rods and insert the 'O' rings.



BAIL06CCM136ASA 10

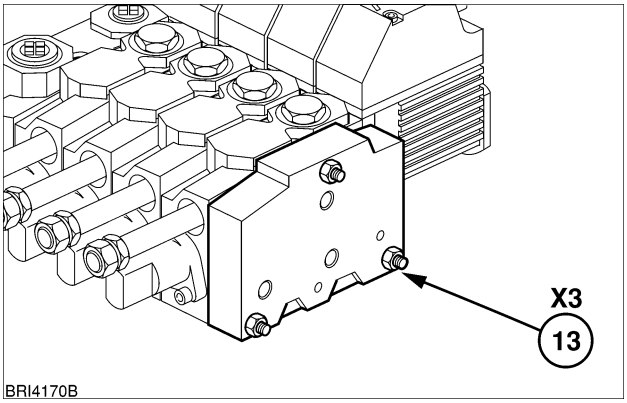
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10. Fit the end plate **(12)**.



BAIL06CCM138ASA 11

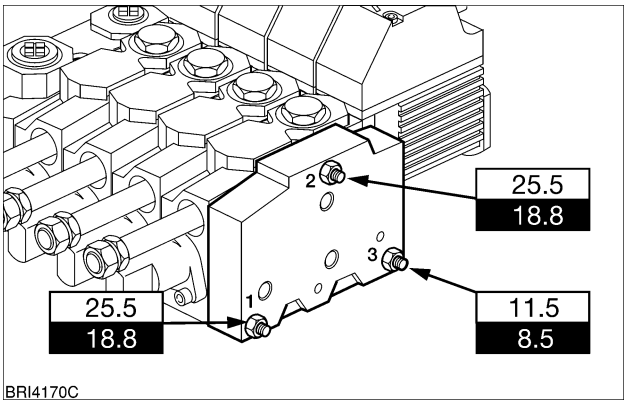
11. Push the end plate onto the tie rods and screw on the nuts **(13)** by hand



BAIL06CCM140ASA 12

12. Place the now assembled valve stack onto a level surface to correctly align the sections.

13. Tighten the nuts in the specified order and to the correct torque. See figure **13**



BAIL06CCM141ASA 13

Next operation:
Mid-mount remote control valve - Install (A.10.C)

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Mid-mount remote control valve - Install

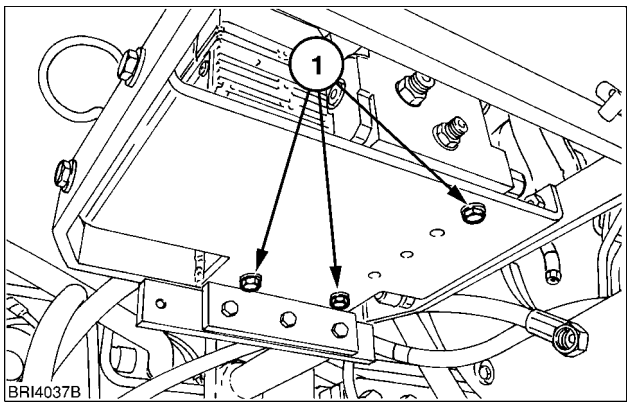
Prior operation:
Mid-mount remote control valve - Remove (A.10.C) Mid-mount remote control valve - Disassemble (A.10.C)

1. Place the remote valve assembly onto the support.

⚠ WARNING ⚠
The valve stack is very heavy DO NOT attempt to install without the use of lifting equipment.

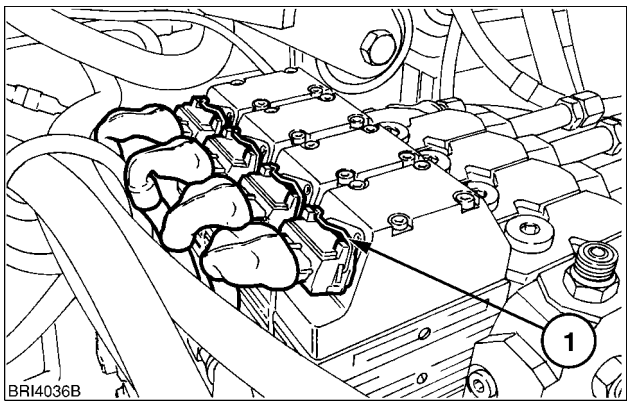
B037

2. Tighten retaining bolts **(1)** to **24 Nm 18 Foot pounds**.



BAIL06CCM064ASA 1

3. Connect the harness connectors **(1)** to the remote valve solenoids.



BAIL06CCM063ASA 2

4. Reconnect hoses as shown in **Mid-mount remote control valve - Static description (A.10.C)** Figure 1. .
5. If a new valve slice has been replaced or added it will be necessary to reprogram the number of the valves within the valve assembly. See **Control module - Configure (A.50.A)** ..

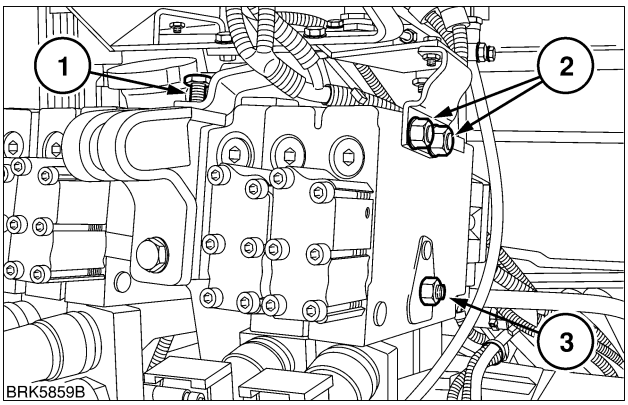
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Stack valve - Remove

Prior operation:
Battery - Disconnect (A.30.A)

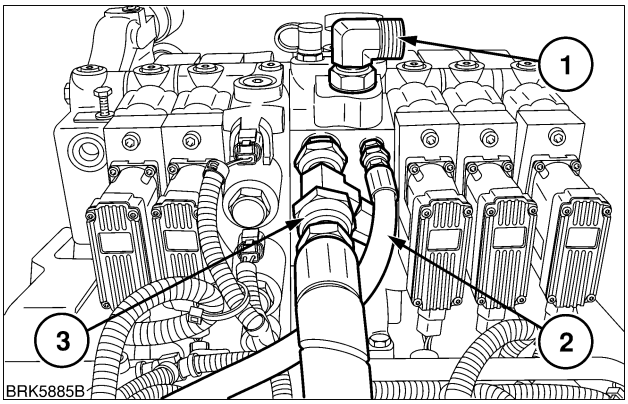
1. Remove the pneumatic trailer brake valve bracket assembly

NOTE: *The top right hand side retaining nuts are also the remote valve slice retaining nuts . Ensure these nuts are relocated on the valve assembly and retightened.*



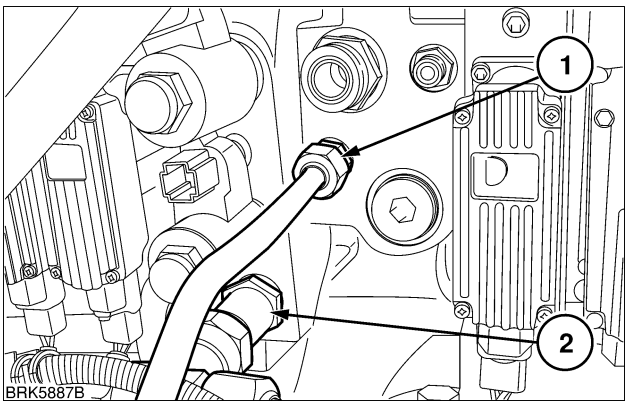
BAIL08CVT054ASA 1

2. Undo the return to tank pipe **(1)** from the top of the valve assembly and the load sensing hose **(2)** and main pressure feed hose **(3)** from the rear of the stack.



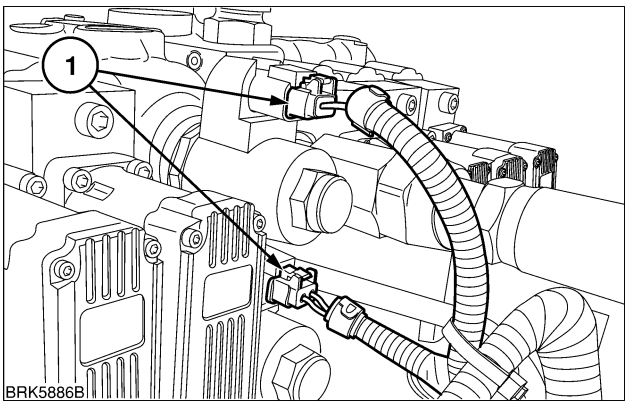
BAIL08CVT076ASA 2

3. Remove the pilot supply pipe **(1)** and the hydraulic lift pipe from **(2)** the EDC valve slice.



BAIL08CVT078ASA 3

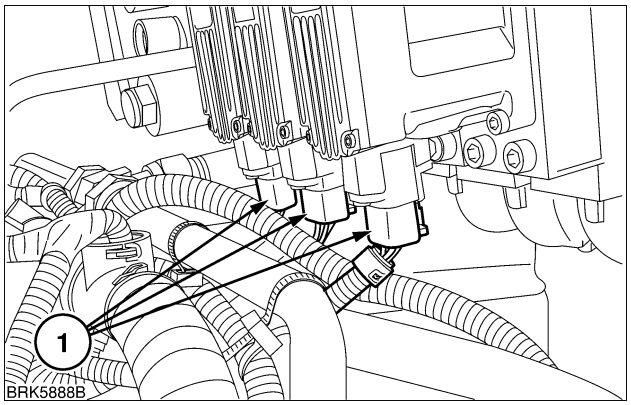
4. Remove connectors **(1)** from EDC solenoids.



BAIL08CVT077ASA 4

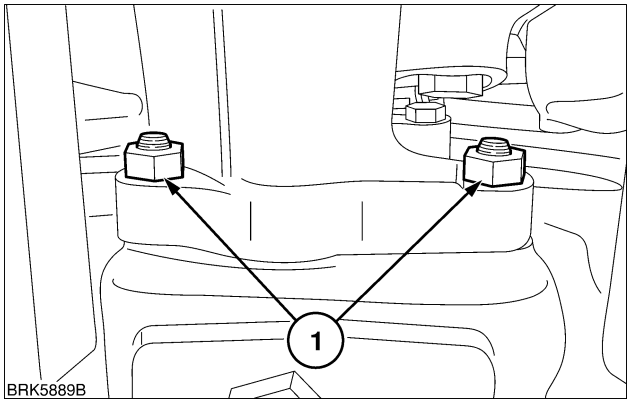
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5. Disconnect the electrical connectors **(1)** from the remote valve solenoids.



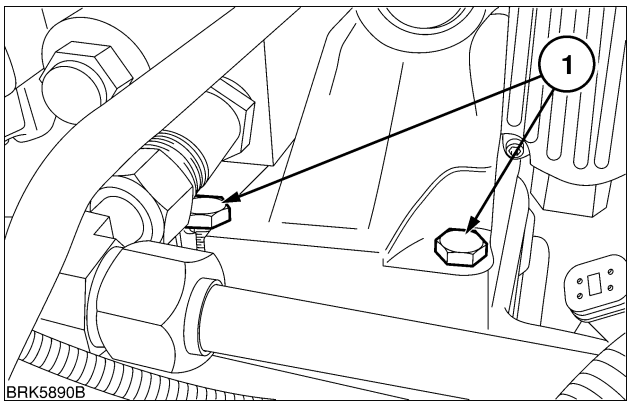
BAIL08CVT079ASA 5

6. Undo and remove the rear retaining nuts **(1)** at the base of the remote valve manifold.



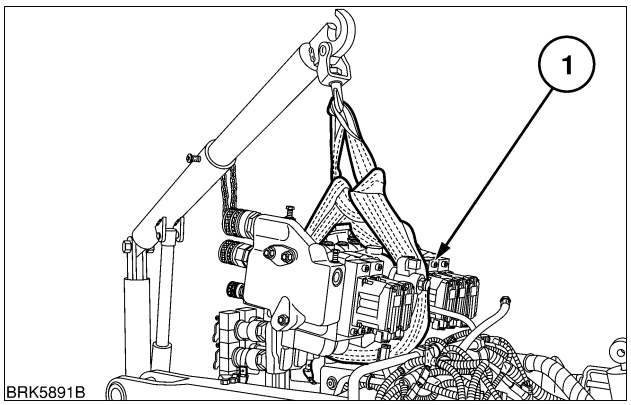
BAIL08CVT080ASA 6

7. Undo and remove the retaining bolts **(1)** at the front of the manifold. There is a slot where the right hand bolt is mounted to allow easier removal of the bolt due to the proximity of the EDC valve pipe.



BAIL08CVT081ASA 7

8. Using a suitable hoist and supports, lift the remote valve stack **(1)** clear of the rear axle housing. Place on a suitable support.

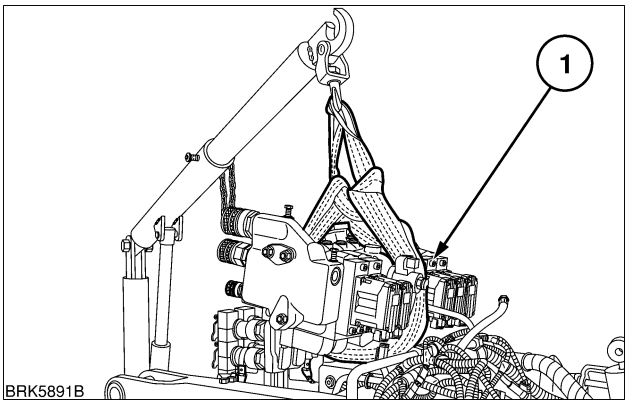


BAIL08CVT082ASA 8

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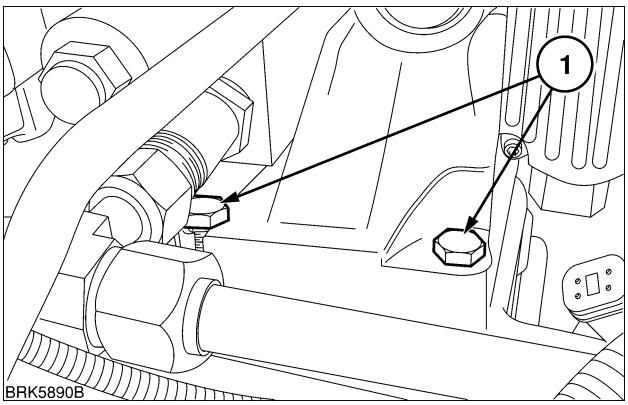
Stack valve - Install

1. Using a suitable hoist locate the valve stack assembly **(1)** on to the rear axle housing.



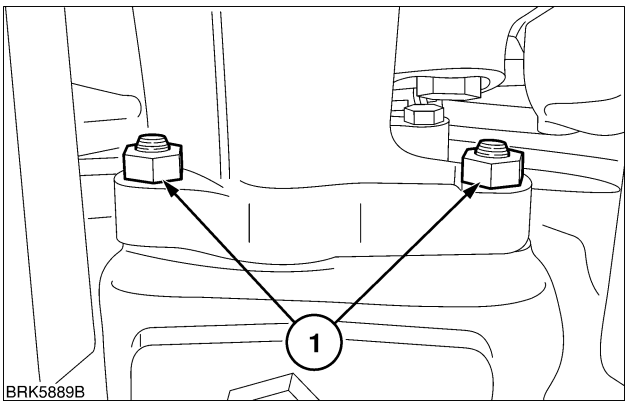
BAIL08CVT082ASA 1

2. Insert and tighten the retaining bolts **(1)** at the front of the manifold to **43 Nm** (**31.7 lb ft**).



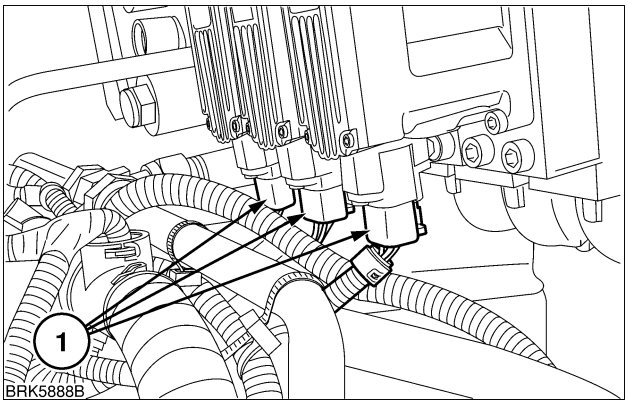
BAIL08CVT081ASA 2

3. Locate the retaining nuts at the rear of the manifold and tighten to **43 Nm** (**31.7 lb ft**).



BAIL08CVT080ASA 3

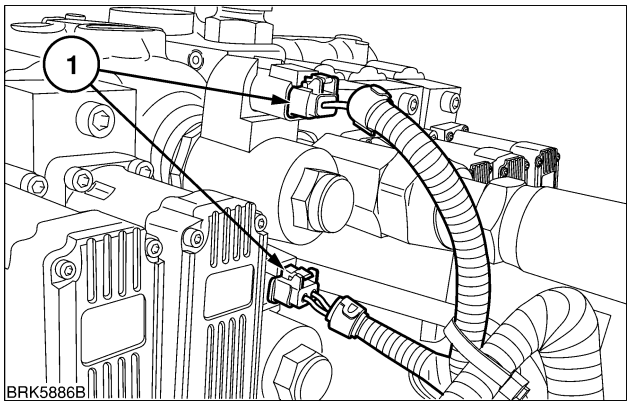
4. Connect the electrical connectors **(1)** to the remote valve solenoids.



BAIL08CVT079ASA 4

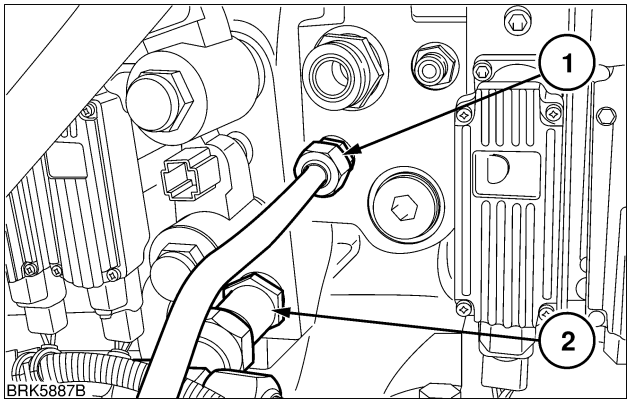
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5. Connect the wiring harness connectors **(1)** to the EDC solenoids.



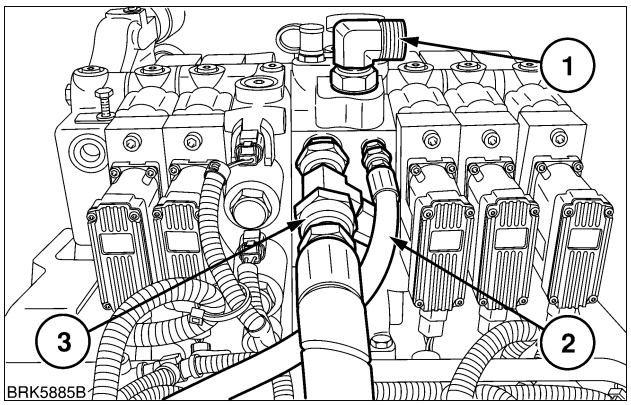
BAIL08CVT077ASA 5

6. Install the pilot supply pipe **(1)** and the EDC hydraulic lift pipe **(2)**.



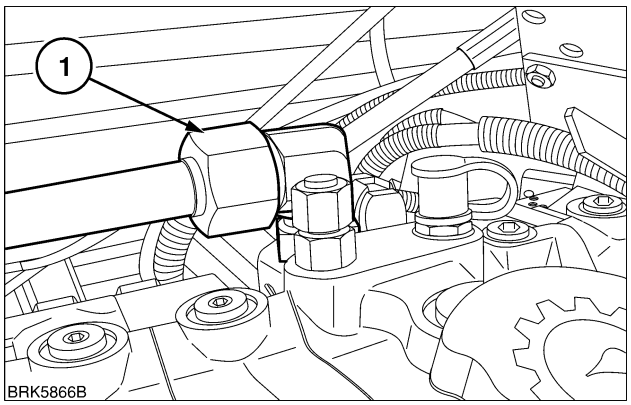
BAIL08CVT078ASA 6

7. Install the return to tank pipe connector **(1)** (if removed). Install the load sensing hose **(2)** and the main pressure feed hose **(3)**.



BAIL08CVT076ASA 7

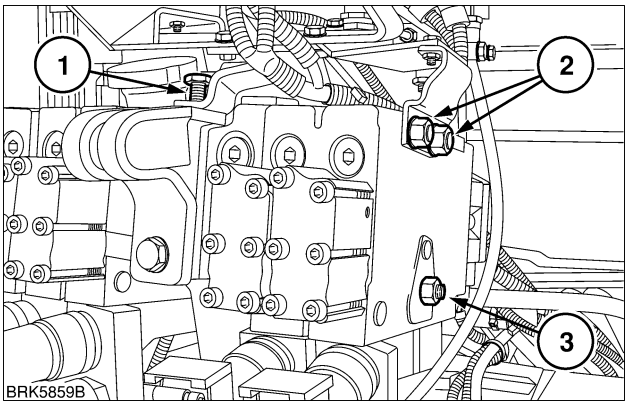
8. Connect the return pipe **(1)**.



BAIL08CVT061ASA 8

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9. Install the pneumatic valve bracket to the valve assembly and tighten the top retaining bolt **(1)** to **85 Nm** (**62.7 lb ft**) and nuts **(2)** and **(3)** to **45 Nm** (**33.2 lb ft**).



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DISTRIBUTION SYSTEMS - A

SECONDARY HYDRAULIC POWER SYSTEM - 12.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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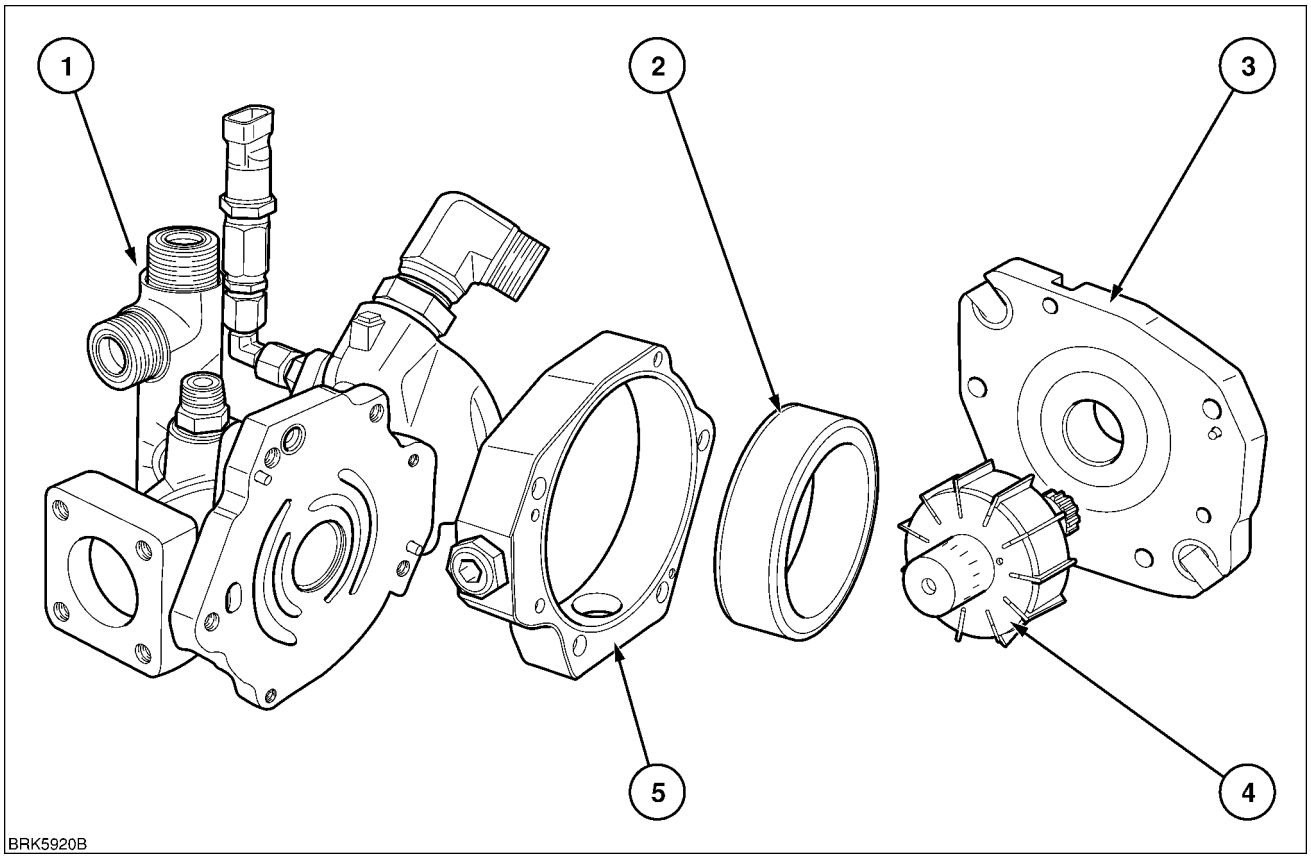
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Hydraulic pump - General specification Vane pump

Type	Vane pump
Output @ engine speed **2200 RPM**	**60 l/min** (**15.9 US gpm**)
Pressure filter relief valve	**28 bar** (**406.0 psi**)
Low pressure regulated	**22 - 25 bar** (**319.0 - 362.5 psi**)
Over pressure switch closes	**27 bar** (**391.5 psi**)

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Hydraulic pump - Exploded view

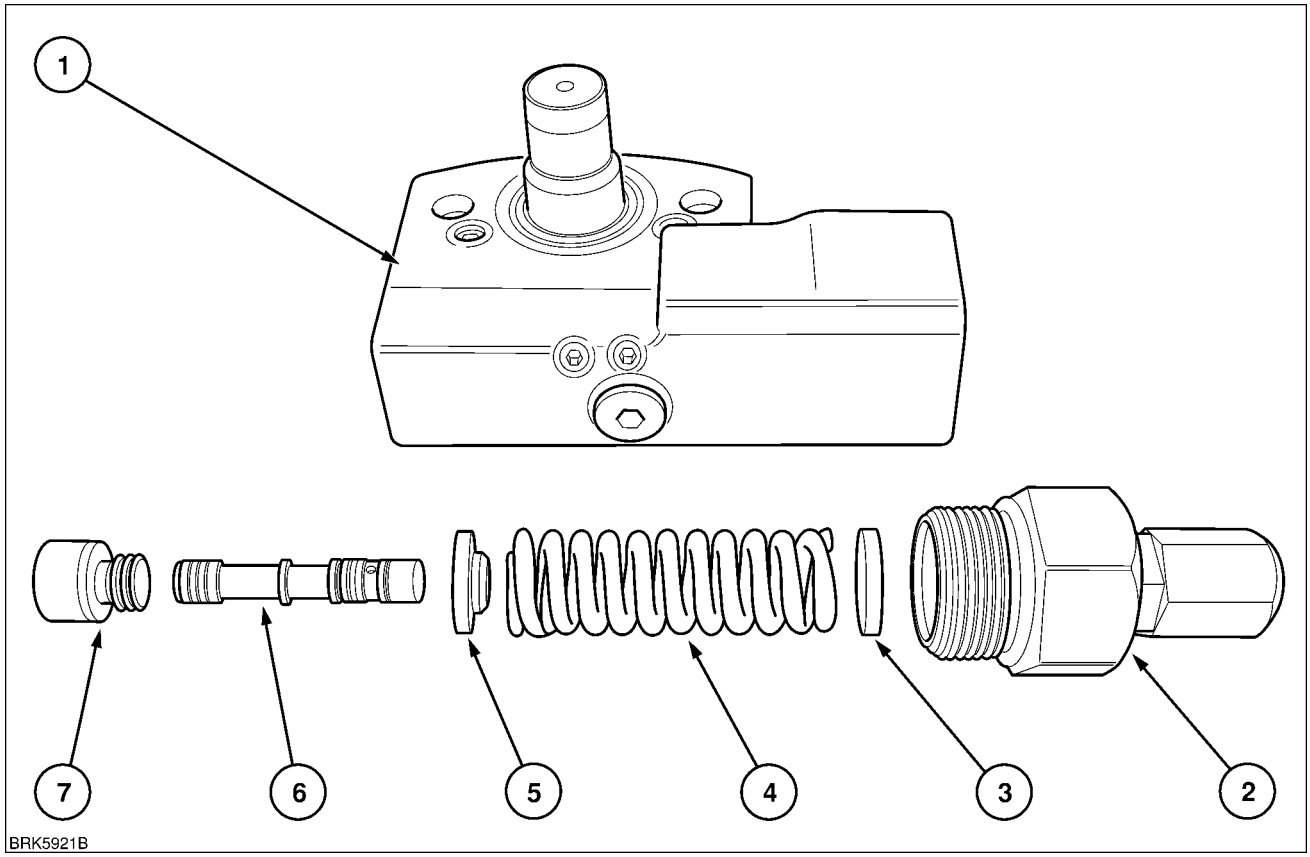


BAIL08CVT089FSA 1

Vane pump components

1. Valve body
2. Stator ring
3. Retaining plate
4. Rotor and vanes
5. Housing

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BAIL08CVT090ASA 2

Pressure controller components

1.Pressure controller manifold
2.Pressure controller adjuster
3.Retainer
4.Spring
5.Retainer
6.Control spool
7.Plug

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Hydraulic pump - Dynamic description Vane Pump

The vane pump is directly driven by an intermediate gear connected to the PTO shaft.
The pump comprises of the following components (Refer to **Hydraulic pump - Exploded view (A.12.A)** :
Housing
End plate
Rotor
Vanes
Stator ring
Control valve and stroking piston
Filter

Prestart

The stator ring is held in the full demand position by the stroking piston spring. This ensures that pumping occurs immediately at start up.
The control valve is also held in the full demand position by the pressure control spring.

Start up

Refer to figure **2**.

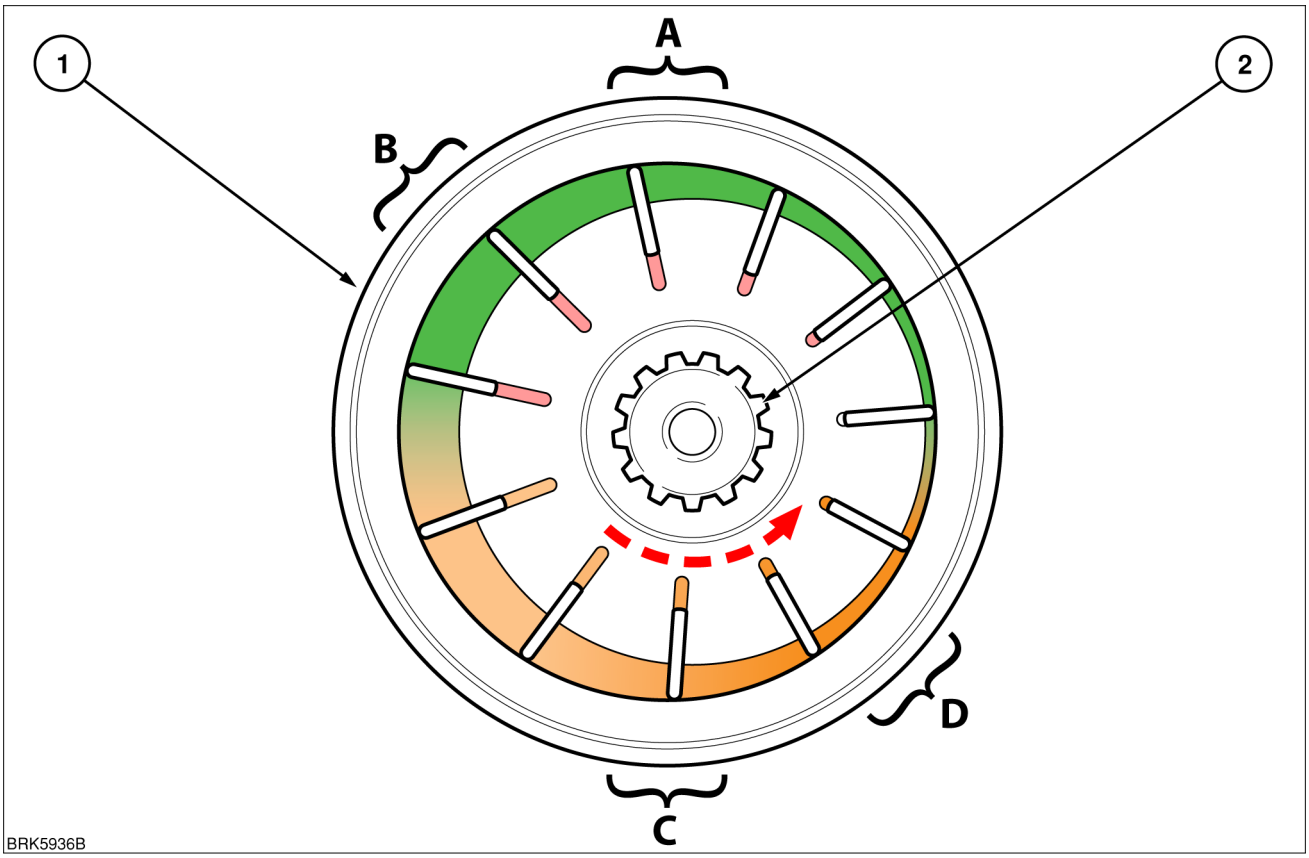
1. The engine is cranked and the PTO shaft and pump drive begin to rotate. All three pumps (charge gear, variable piston and variable vane) turn on the shaft.
2. Although the vane pump rotor turns it will not pump until the vanes are fully extended against the stator ring.
3. Pressure increases from the charge pump via the 'V' port and the pump gallery, and this pressure acts upon the back of the vanes forcing them outwards.
4. From the suction gallery to the bottom of the pump rotor the pumping volume increases and oil is drawn into the pumping chambers. At this position the 'V' gallery also ends and the vanes are now fed from the output pressure gallery 'Pv'.
5. From the bottom of the pump to the top, the pumping volume decreases and the oil exits the gallery through port 'P'.
6. From the main output of the pump, oil is delivered through the pressure filter to the low pressure circuits. Prior to the filter is a filter/system protection valve. After the filter, oil pressure is also fed via the control valve to the stroking piston to assist the spring on the stator ring.

Pump on demand

When "on demand", the pressure being created by the pump output flow is diverted to the control valve. The oil pressure passes through the control valve and on to the stroking piston. This assists the stroking spring to keep the pump on full demand/flow.

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Pressure variations within the pumping chamber.



BAIL08CVT100FSA 1

	Suction	1.Stator ring
	Low Pressure.	2.Rotor driveshaft
	Control Pressure	

The rotor is on a fixed axis and continually rotates if the engine is operating. The stator ring has a linear movement from top to bottom.
During pumping the pressure at **(C)** compared to **(A)** and also **(D)** compared to **(B)** is higher therefore the stator ring will be forced right and down against the thrust pin and piston, destroking the pump.

As the output pressure increases then so does the stroking pressure to a point where the control valve spring is overcome. This becomes the regulated pressure.

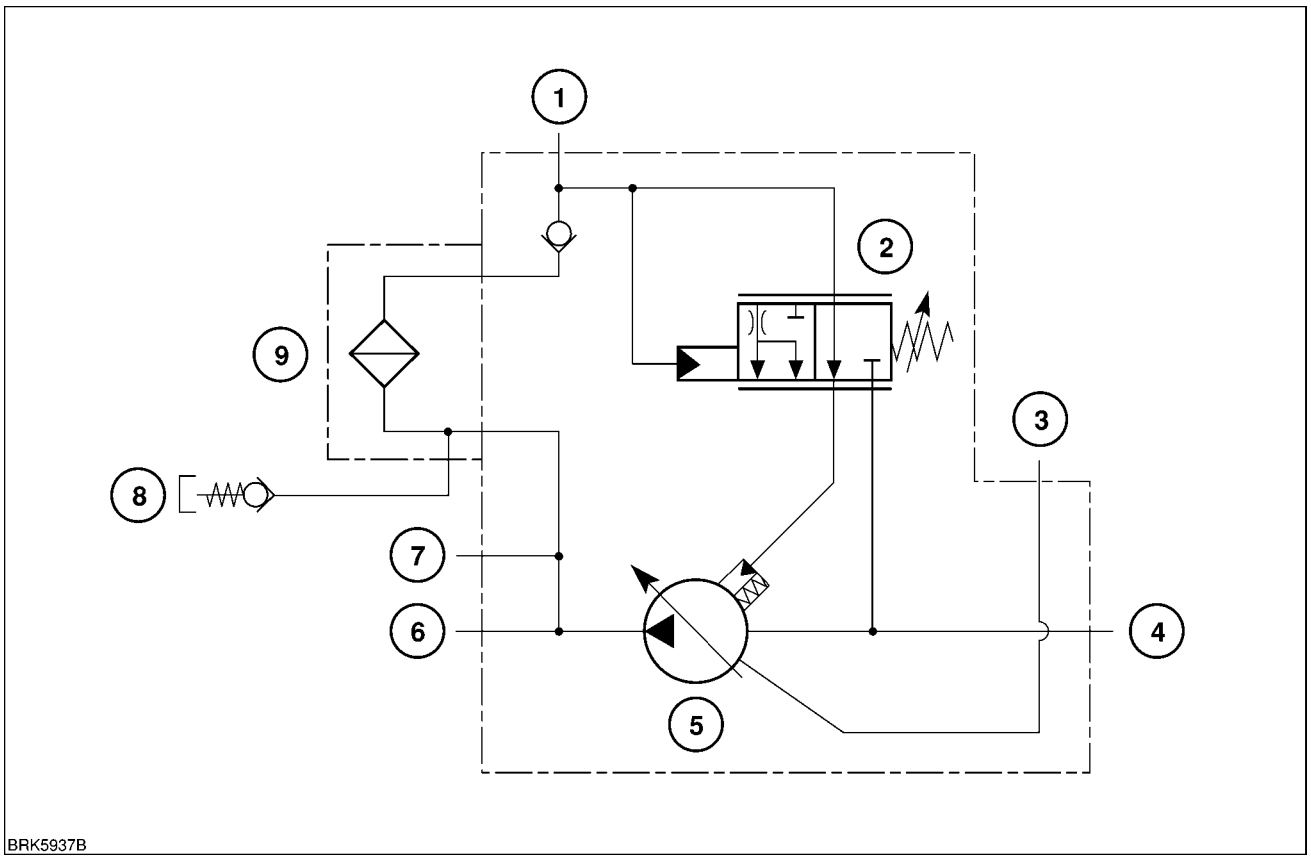
Pump off demand

As the pump delivers flow and self strokes to "On demand", the pressure continues to increase to the point where regulated pressure is reached. This point is determined by the spring rate of the control valve spring acting on the control valve spool.
When regulated pressure is reached, the spool moves towards the spring, and restricts the flow being delivered to the stroking piston also allowing the oil in this part of the circuit to be vented to the suction side of the pump (Refer to figure **1** and schematic Figure **2**).

Pump regulating

The pump is self regulating and fluctuates between ’on’ demand and ’off’ demand to deliver flow and a constant regulated pressure.

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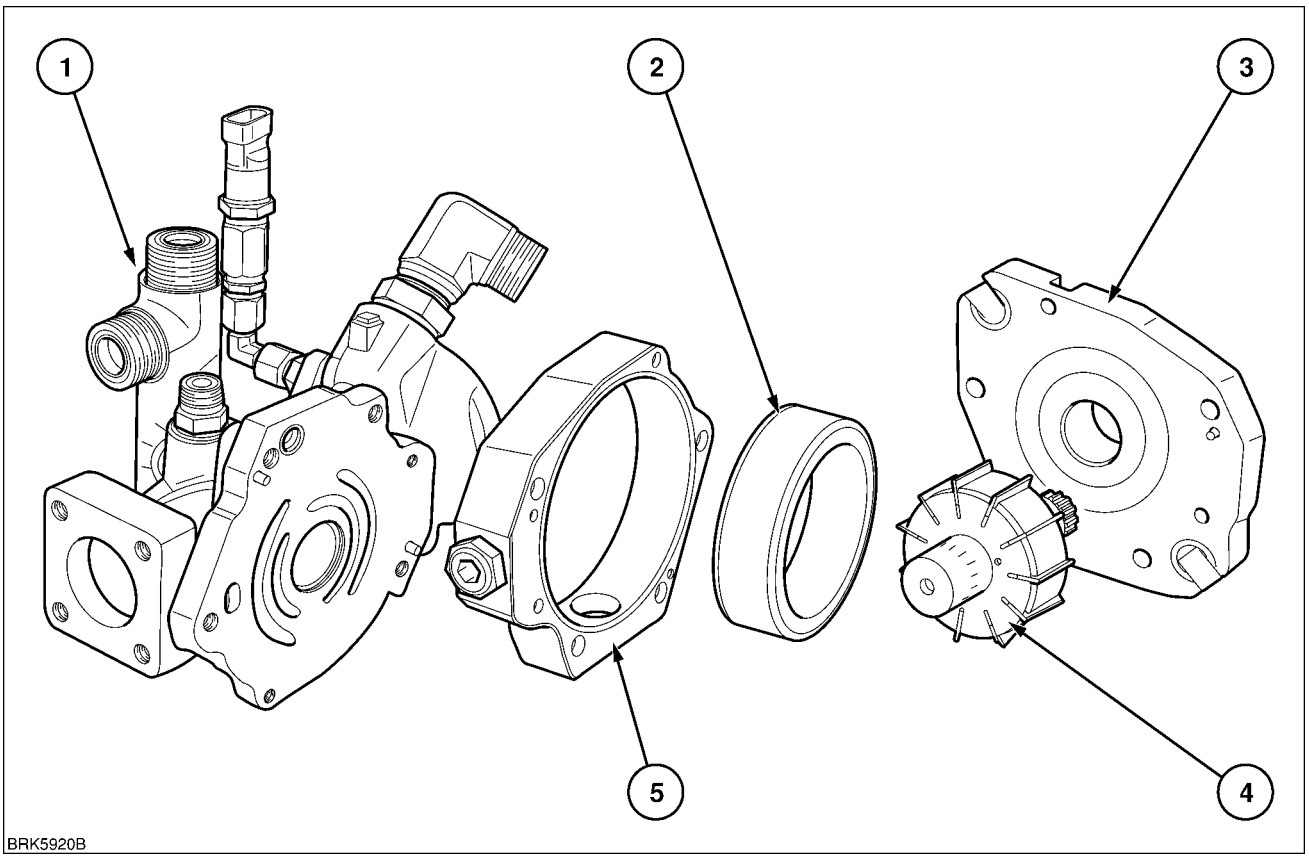
BAIL08CVT120FSA 2

Vane pump schematic

1. **(P)** Pressure port
2. Control spool
3. **(Pv)** Pressure vane
4. Return to tank
5. Vane pump
6. Suction
7. **(V)** port - Charge boost pressure
8. **28 bar** (**406.0 psi**) Filter relief valve
9. Filter

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Hydraulic pump - Static description Vane pump



BAIL08CVT089FSA 1

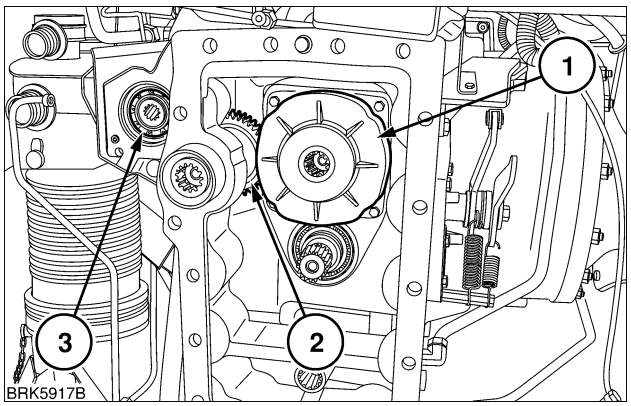
Valve body components

1. Pump body
2. Stator ring
3. Retaining plate
4. Rotor and vanes
5. Housing

The Vane pump is located on the right hand side of the rear axle housing and supplies low pressure oil to the following components:
Rear Power Take Off (PTO) and brake
Differential Lock
Front Wheel Drive engagement
Transmission Synchronisers
Transmission clutches
Servo Assisted Master cylinder
Remote Valve pilot pressure
Hydro replenishing and cooling.
Refer to **PRIMARY HYDRAULIC POWER SYSTEM - Hydraulic schema (A.10.A)**

The pump is driven from the PTO drive shaft **(1)** via an idler gear **(2)** and pump drive gear **(3)**.

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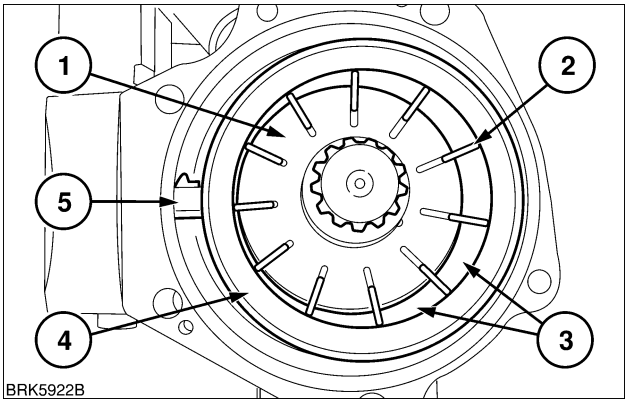


BAIL08CVT098ASA 2

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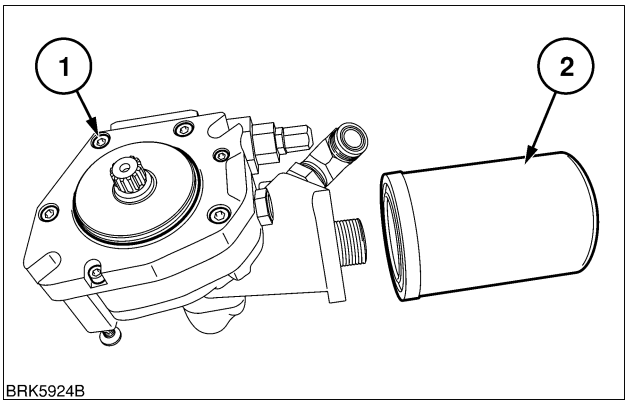
The vane pump assembly consists of six main component parts.

- Pump body
- Rotor and vanes
- Rotor or Stator ring
- Control valve and stroking piston (refer to **Hydraulic pump - Exploded view (A.12.A)**)
- Filter



BAIL08CVT099ASA 3

1. Rotor
2. Vane
3. Pump chamber
4. Stator ring
5. Stroking piston

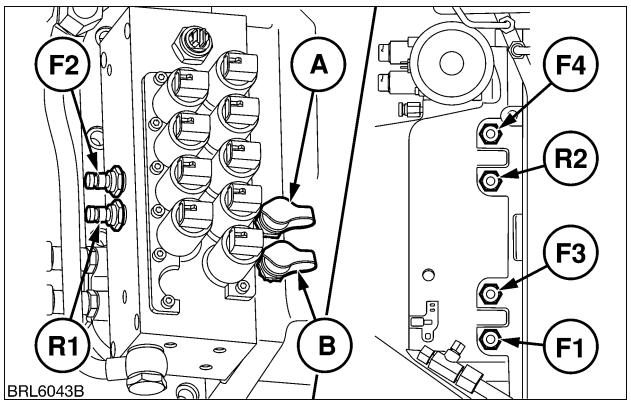


BAIL08CVT093ASA 4

1. Pump assembly
2. Filter

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Valve block - Static description



BRL6043B 1

(A) Clutch test port
(B) Clutch test port
(F1) (F2) (F3) (F4) (R1) (R2) Synchroniser test ports

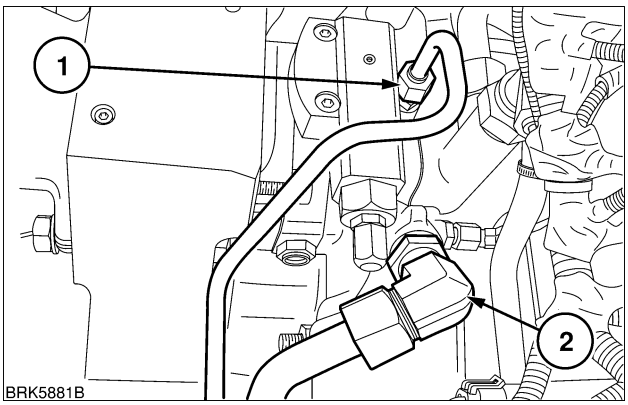
Refer to **PRIMARY HYDRAULIC POWER SYSTEM - Static description (A.10.A)**

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Hydraulic pump - Remove Vane Pump

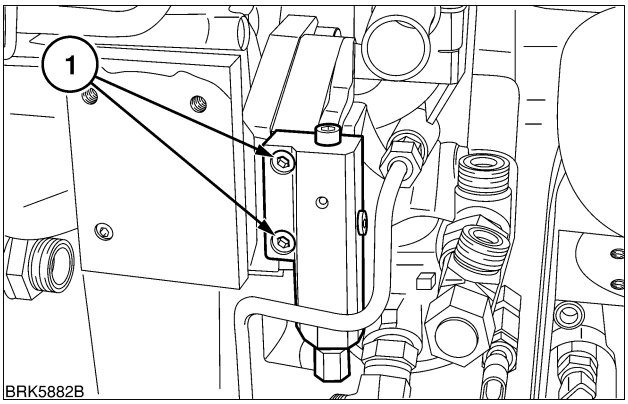
Prior operation:
Filter - Remove (A.10.A)

1. Remove pipe from charge pump **(1)** and pipe to sump **(2)**.



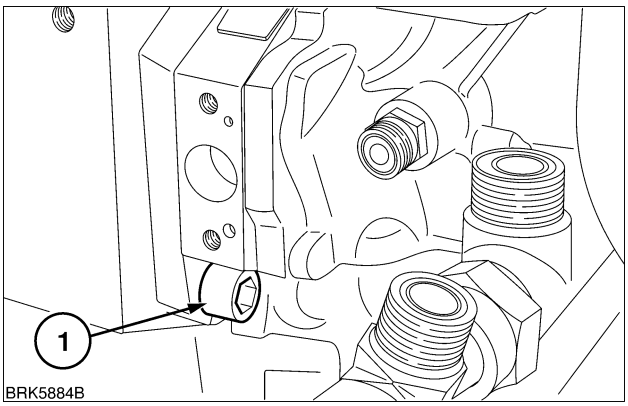
BAIL08CVT067ASA 1

2. Undo and remove the pump regulator screws **(1)** and remove pump regulator assembly from the pump.



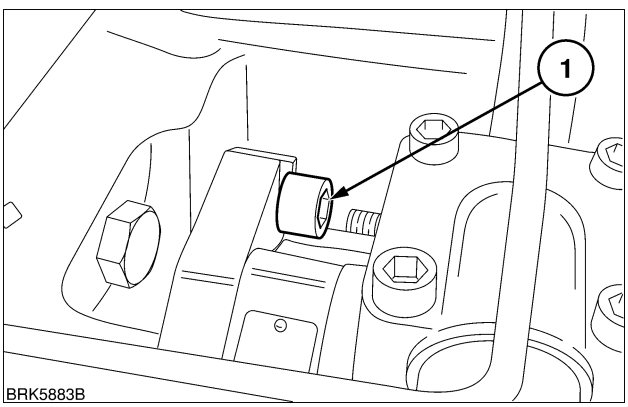
BAIL08CVT068ASA 2

3. Remove the lower retaining bolt **(1)**.



BAIL08CVT070ASA 3

4. Support the pump assembly and remove the upper bolt **(1)** from the pump and lift the pump from the rear axle housing.



BAIL08CVT069ASA 4

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⚠ WARNING ⚠

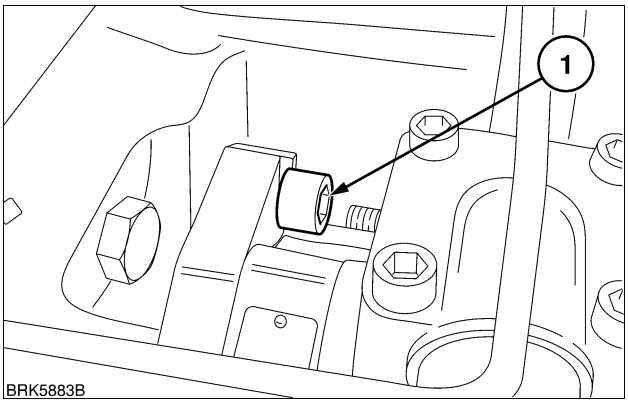
Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

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Hydraulic pump - Install Vane Pump

1. Support the pump assembly on the rear axle housing and locate the top retaining bolt **(1)** in the in the housing.



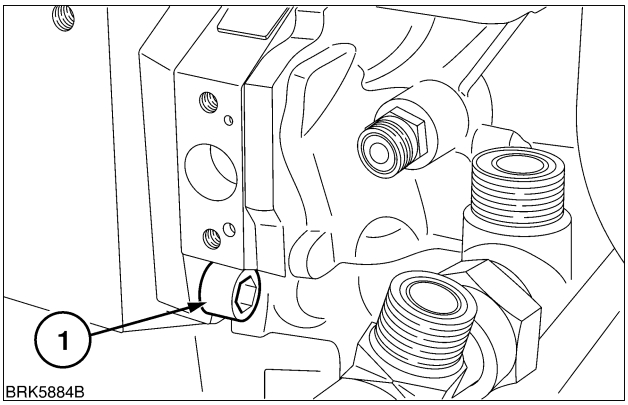
BAIL08CVT069ASA 1

⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

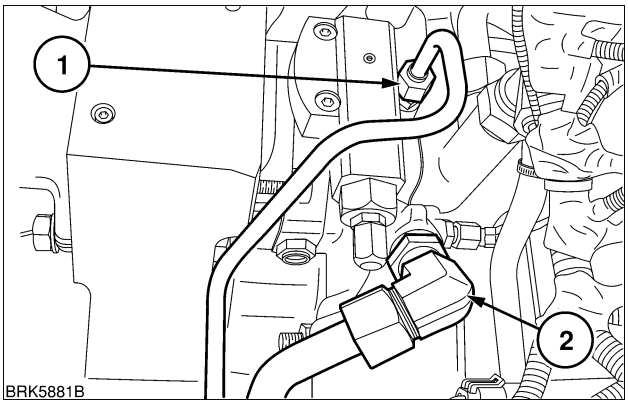
B012

2. Locate the lower retaining bolt **(1)** in the housing. Tighten to **60 Nm** (**44.3 lb ft**) .



BAIL08CVT070ASA 2

3. Attach the pipe from the rear axle sump **(2)** and the pipe to charge pump housing **(1)**.

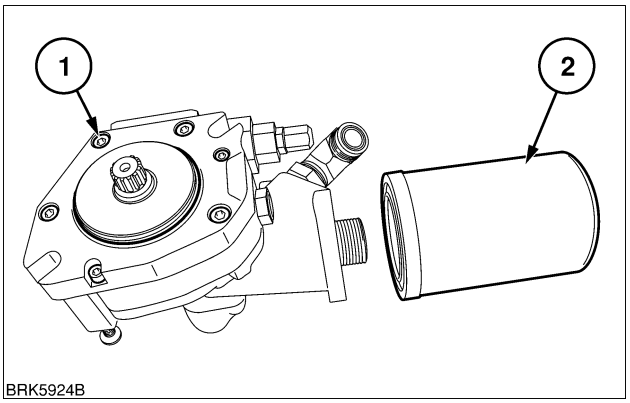


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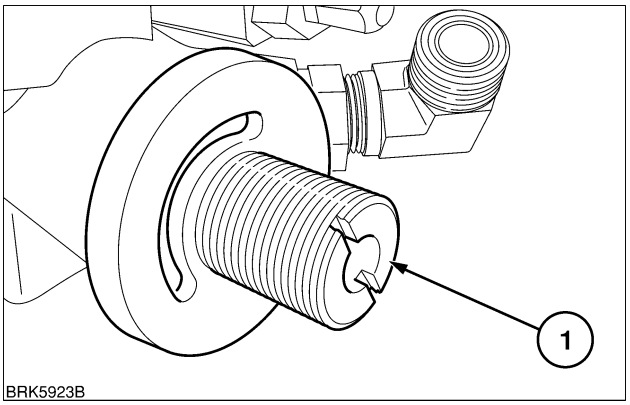
Hydraulic pump - Disassemble Vane Pump

1. Remove the filter **(2)** using a suitable tool. Undo and remove the hexagon headed screws **(1)** from the pump housing . Separate the components and place on a clean surface. (Refer to **Hydraulic pump - Exploded view (A.12.A)**) .



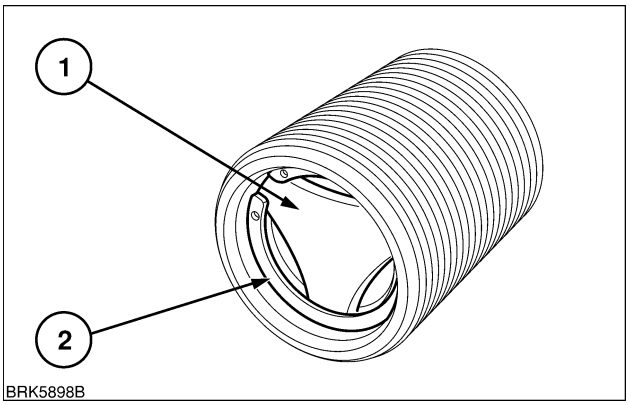
BAIL08CVT093ASA 1

2. Remove the filter mounting screw.



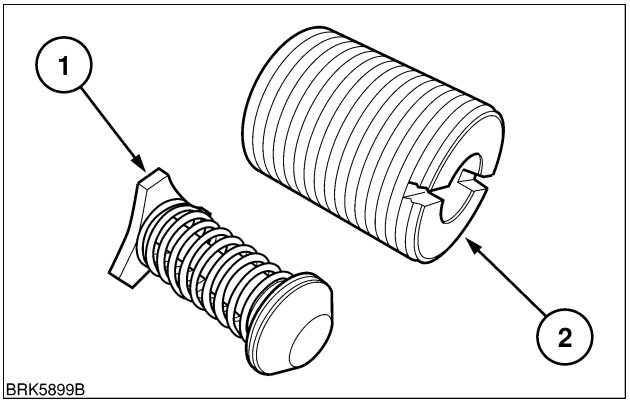
BAIL08CVT092ASA 2

3. Remove the retaining ring **(2)** and remove the regulator valve **(1)**.



BAIL08CVT087ASA 3

4. Regulator valve **(1)**.
Filter screw **(2)**



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DISTRIBUTION SYSTEMS - A

HYDRAULIC COMMAND SYSTEM - 14.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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Priority valve - General specification

Maximum inlet flow at port P	**165 l/min** (**43.59 US gpm**)
Maximum Pressure at port P	**250 bar** (**3625.00 psi**)
Master priority working pressure	**5.8 - 11.6 bar** (**84.1 - 168.2 psi**)
Steering compensator working pressure	**12.8 - 17.4 bar** (**185.6 - 252.3 psi**)

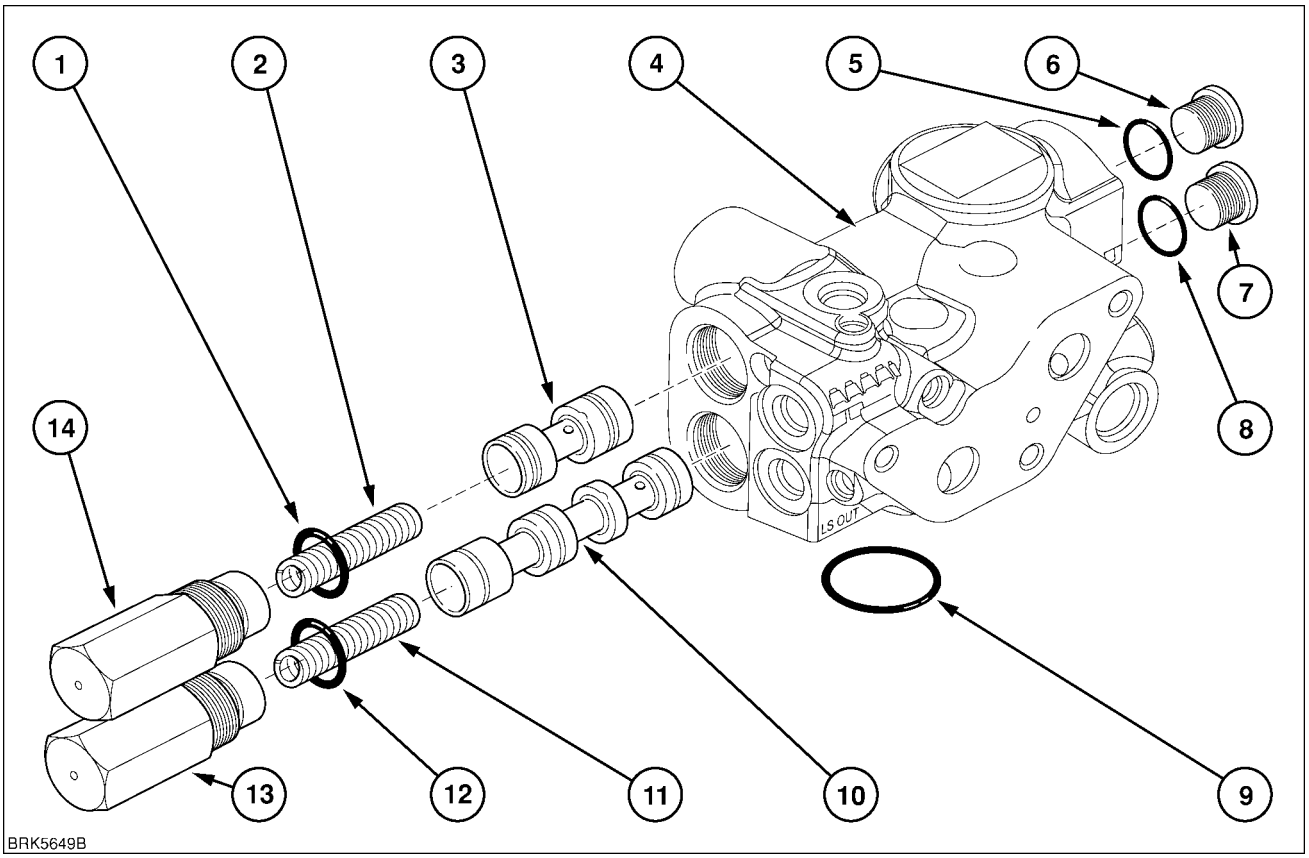
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Hydraulic pump - General specification Vane Pump

Maximum displacement	**45 cm³**
Direction of rotation (view on pump shaft)	Counter clockwise
Minimum continuous pump speed	**900 RPM**
Maximum continuous pump speed	**3000 RPM**
Maximum flow	**130 l/min** (**34.3 US gpm**)
Minimum flow requirement of pump at **22 bar**	**3 l/min** (**0.8 US gpm**)
Minimum suction pressure at cold start - **30 °C**, no function required, pump without damage	**0.3 bar** absolute
Nominal suction pressure range	**0.8 - 1.2 bar** (**11.6 - 17.4 psi**)
Normal working pressure	**22 - 25 bar** (**319.0 - 362.5 psi**)
Overpressure resistance	**80 bar** (**1160.0 psi**)

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Priority valve - Exploded view

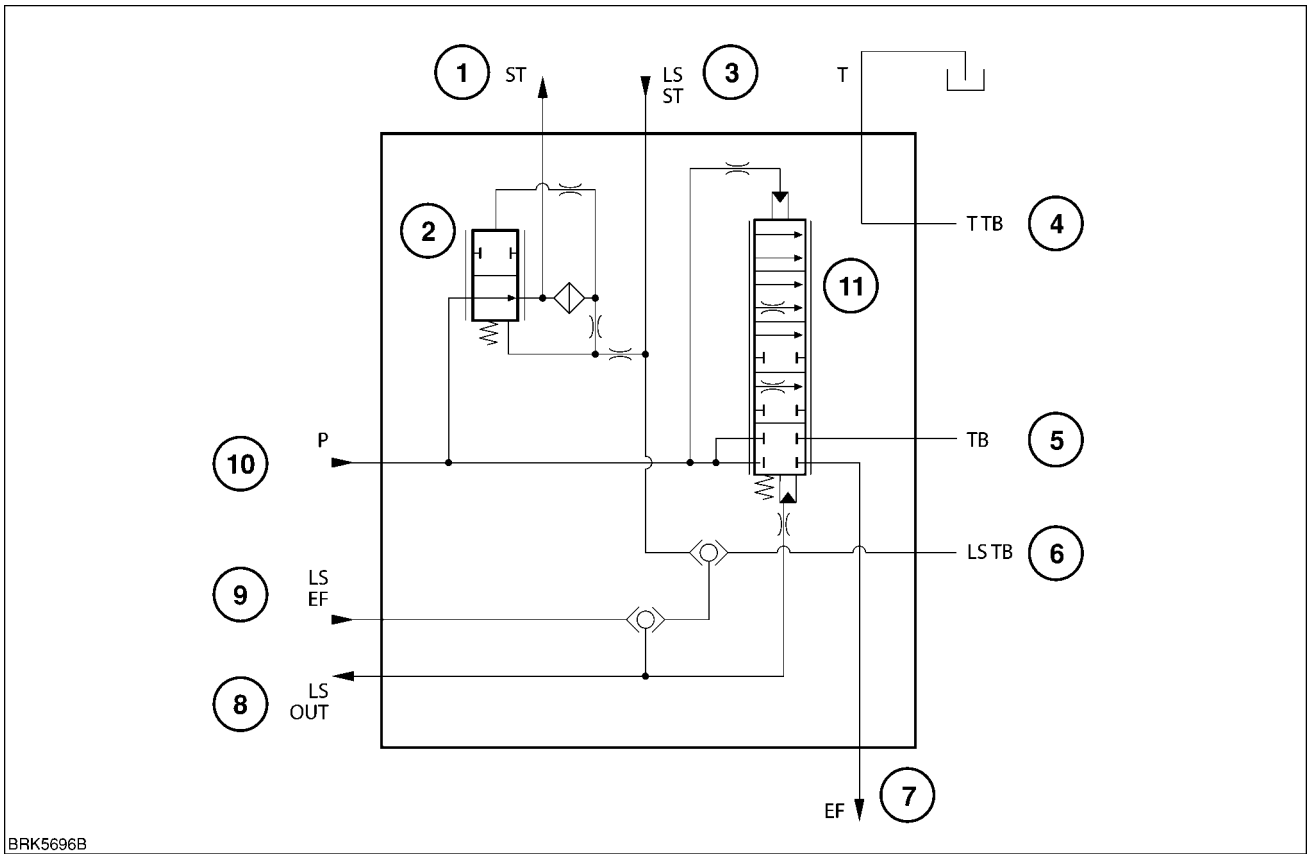


BAIL08CVT086FSA 1

1. Seal
2. Spring
3. Steering priority spool
4. Manifold body
5. Seal
6. Plug
7. Plug
8. Seal
9. Seal
10. Trailer brake priority valve Spool
11. Spring
12. Seal
13. Cap
14. Cap

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Priority valve - Hydraulic schema

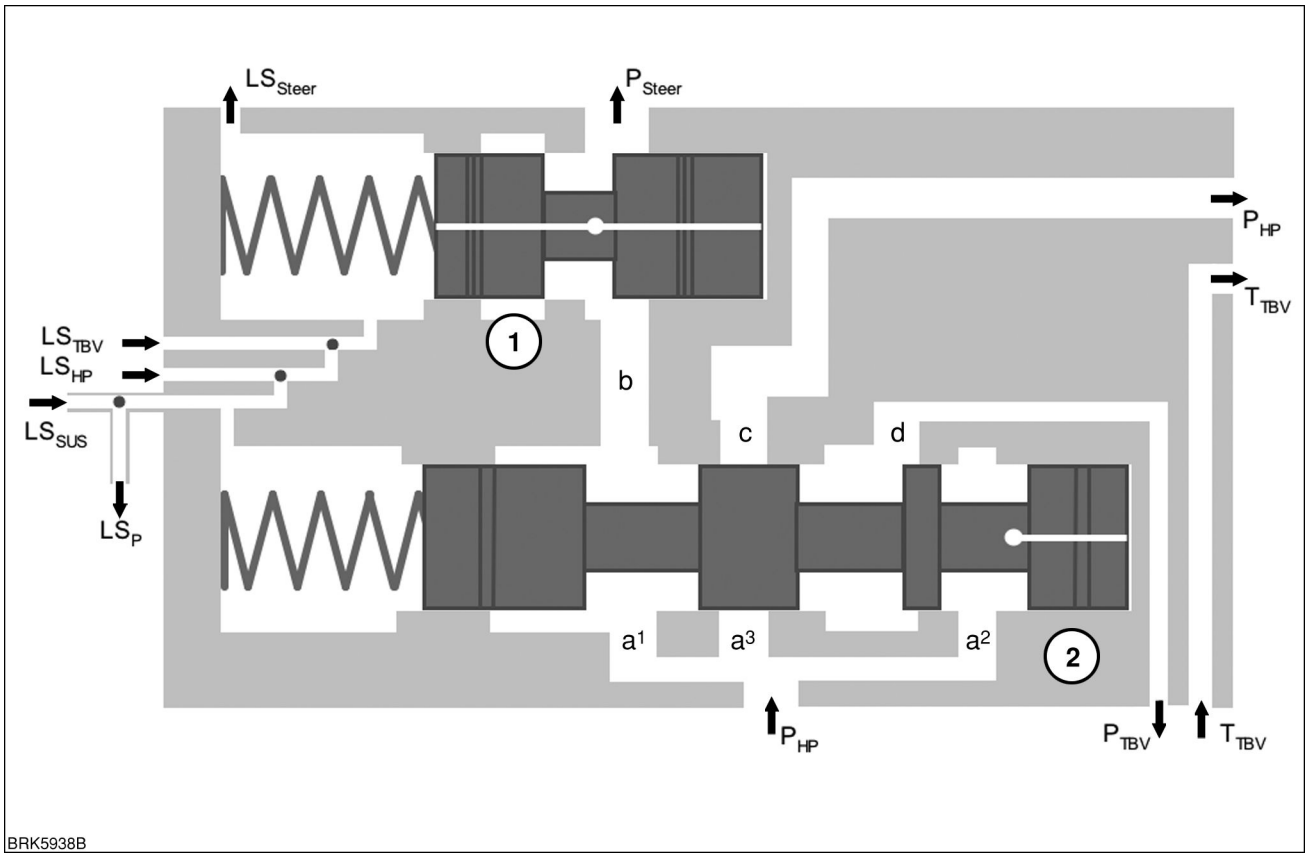


BAIL08CVT139FSA 1

1. Steering system line
2. Steering priority valve
3. Load sense line to steering
4. Trailer brake return to tank
5. Trailer brake pressure
6. Trailer brake load sensing line
7. Pressure to Remote valves
8. Load sensing line
9. Load sensing
10. High pressure from pump

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Priority valve - Dynamic description

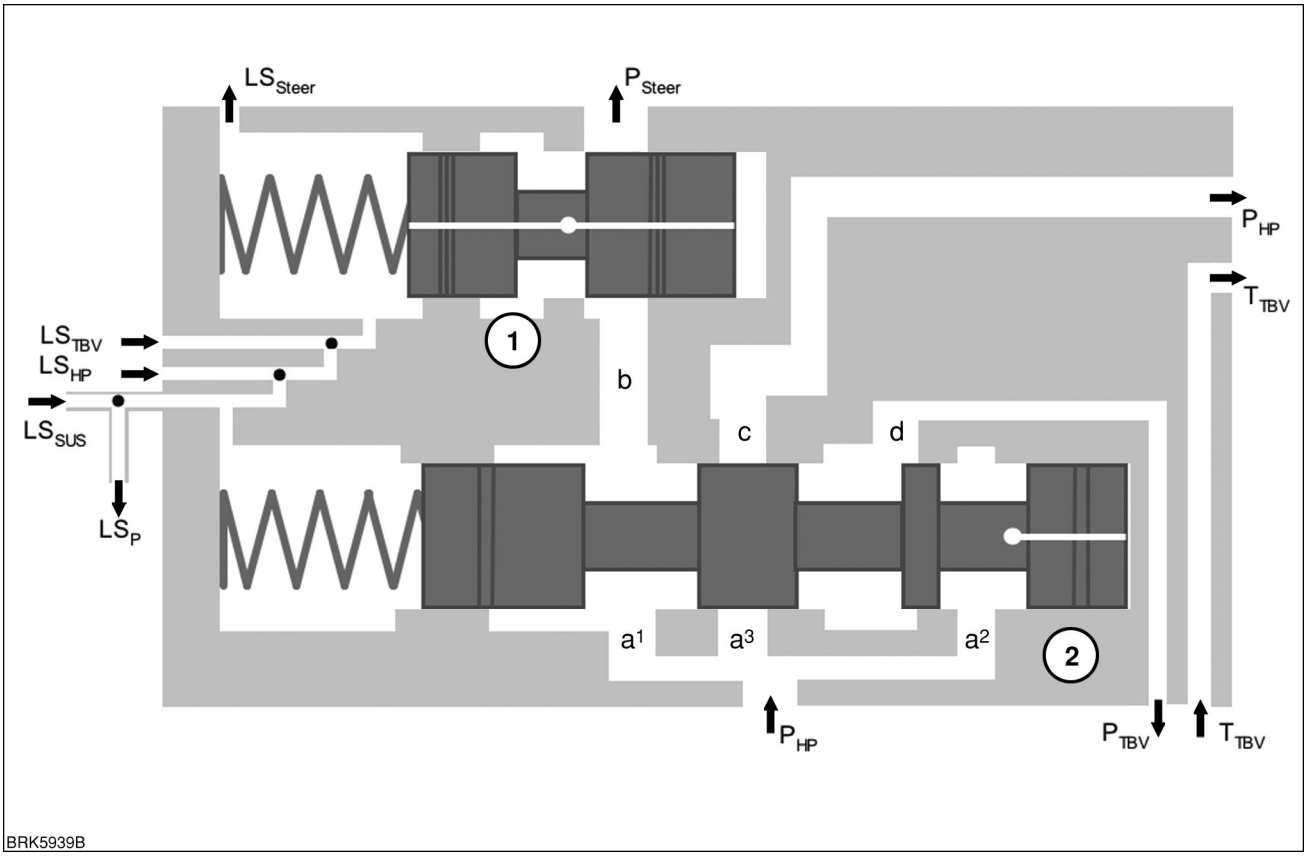


BAIL08CVT114FSA 1

No demand

Pump oil from the variable piston pump enters at Php and is delivered at, a¹ the steering supply; a² the trailer brake supply; and a³ the high pressure supply. Ports connect to the various tractor systems at PSteer, (steering); Ptbv, (trailer brake valve); and Php, (high pressure) circuits via galleries b, c, and d. Each system will transmit its pump requirements through the load sense lines LSsteer, (steering); LStbv (trailer brake valve); LSsus, (suspension); and LShp, high pressure lift and auxiliary remote valves. Sense line oil is fed to the pump compensating valves via LSp. A further gallery included is the trailer brake valve to tank TTBV for returning trailer brake oil.

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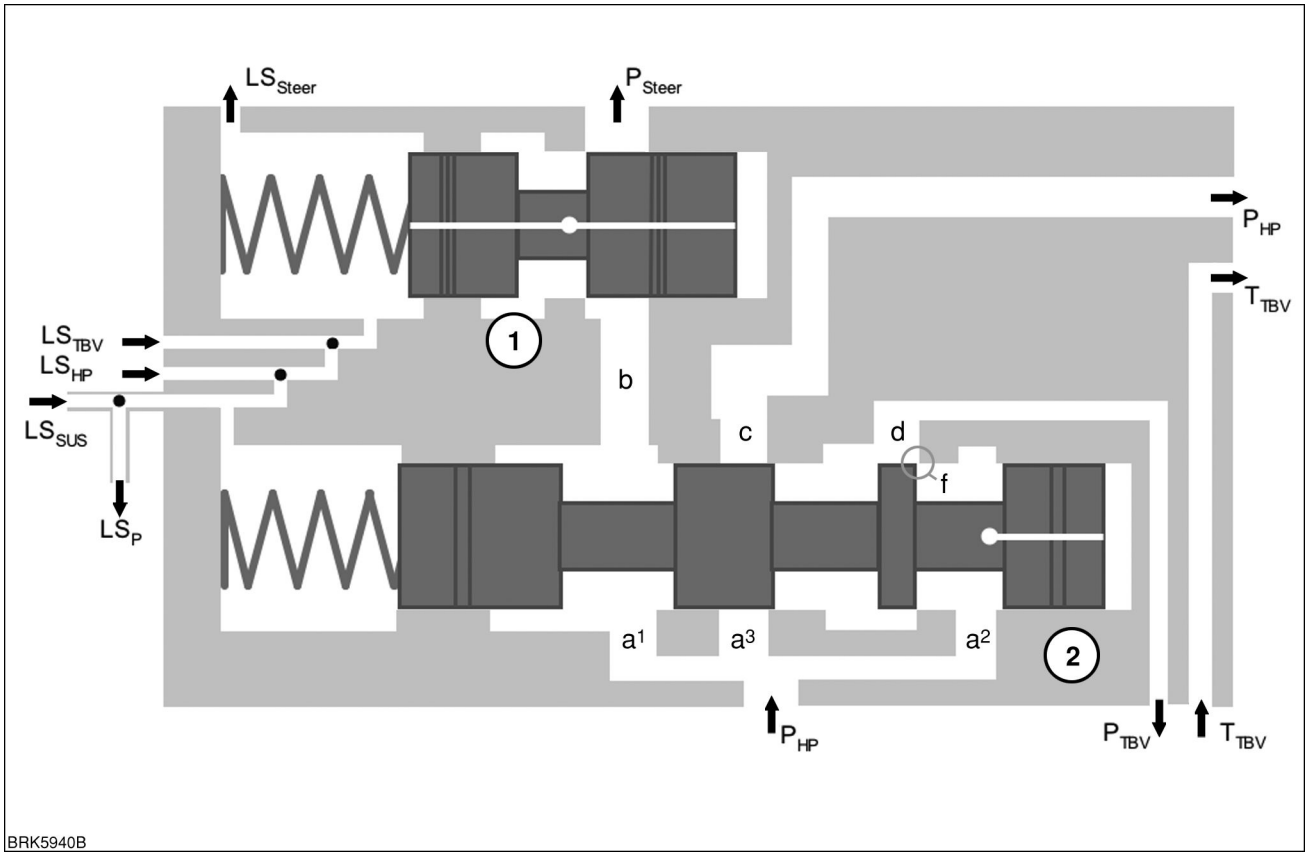


BAIL08CVT115FSA 2

Position 1

Pump oil passes a¹ to b then past the steering priority valve **(1)** then onto the steering orbital valve via PSteer. At the orbital valve the oil is capped and the pressure builds back through the circuit. Oil flows into the centre of the valve and out at each end via 2 restrictors. With the LSSteer port being open to tank at the orbital valve, less pressure can build on the spring side but can do so on the opposing side moving the valve **(1)** towards the spring causing a restriction. The reduced LS pressure is also seen at the pump flow compensating valve and adds pressure to the low pressure standby 'LPS' The pressure is now seen at gallery a² passes into the trailer brake priority valve **(2)** and acts on the end of the valve against the spring.

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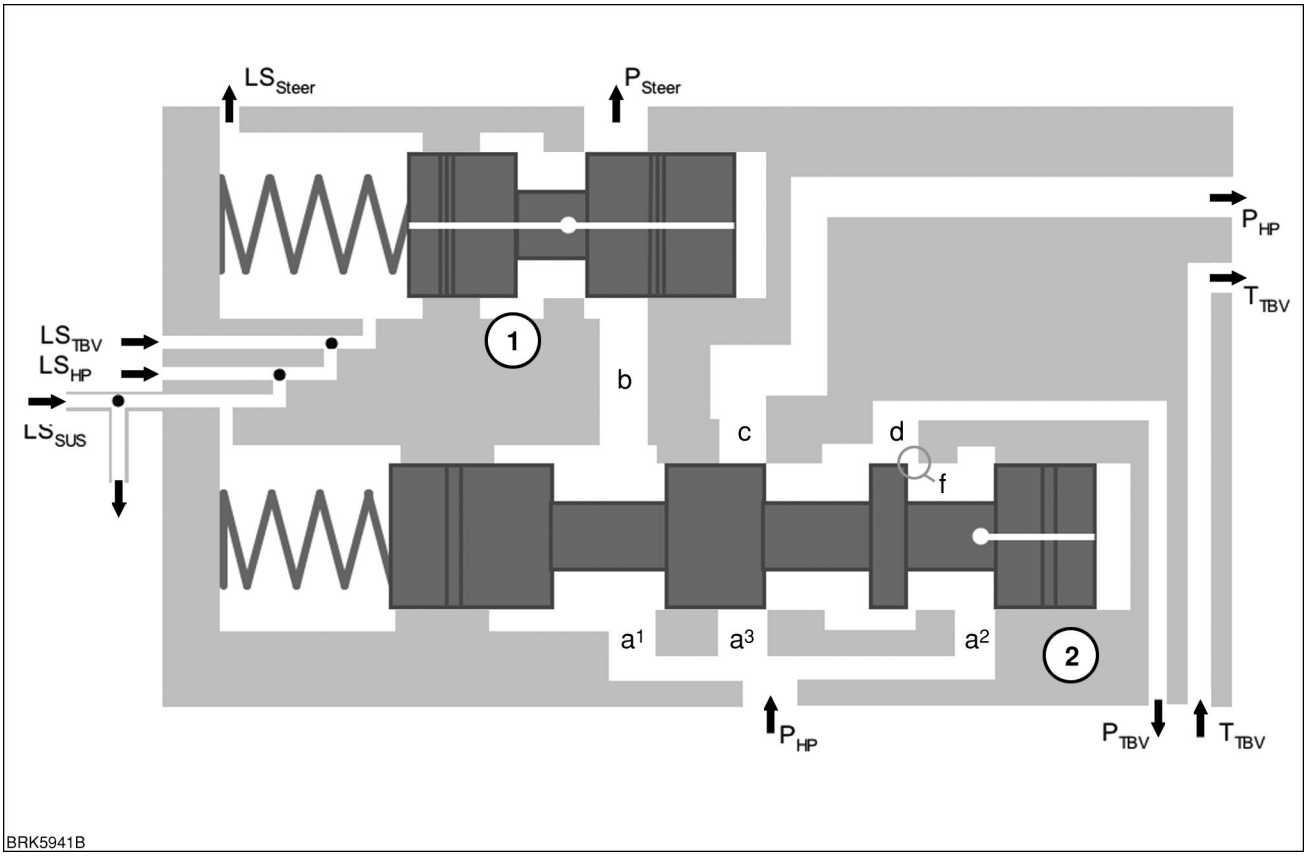


BAIL08CVT116FSA 3

Position 2

The valve moves to position 2. A restricted delivery is now being made to the trailer brake valve at ’f’.

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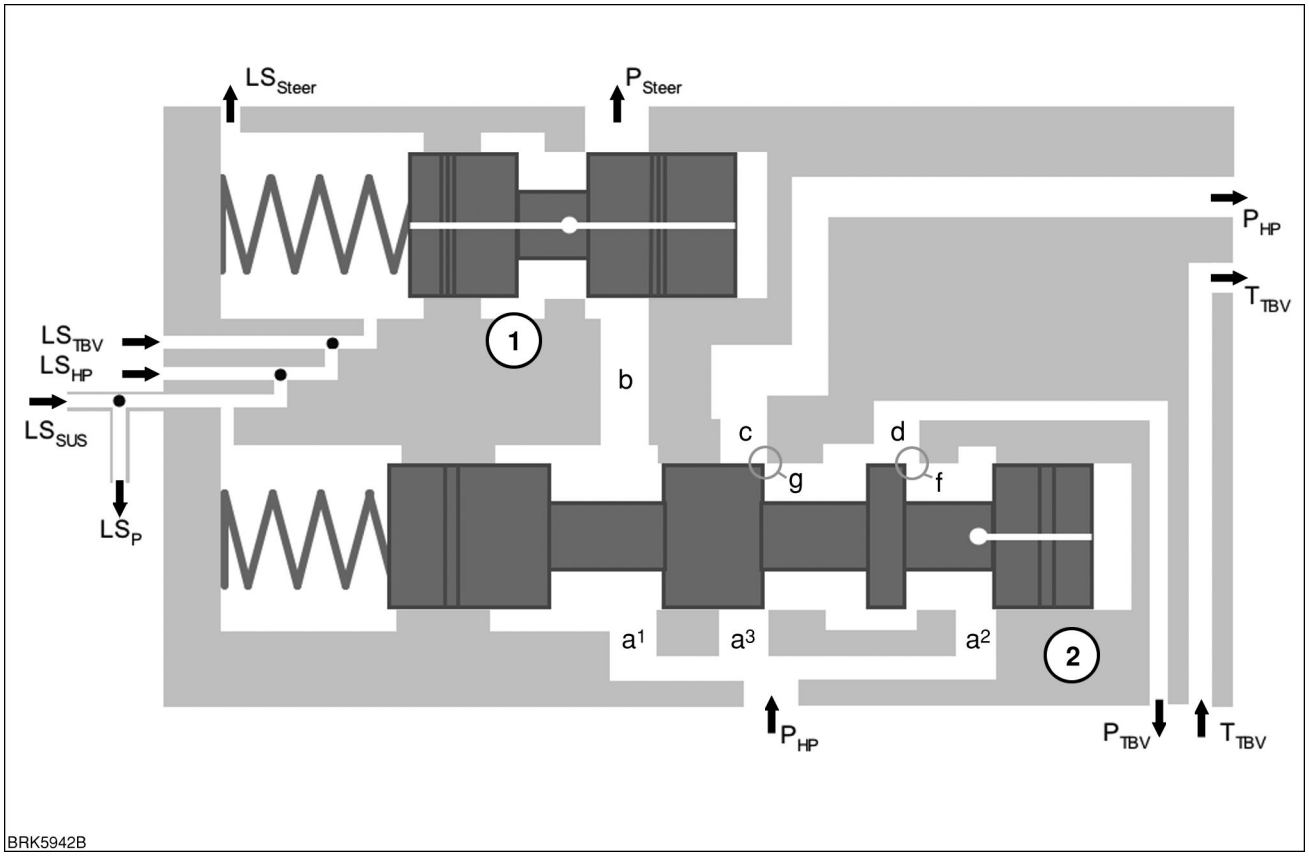


BAIL08CVT117FSA 4

Position 3

As pressure continues to rise against the spring the valve continues to move to position 3, with full delivery to the trailer brake valve at ’f’.

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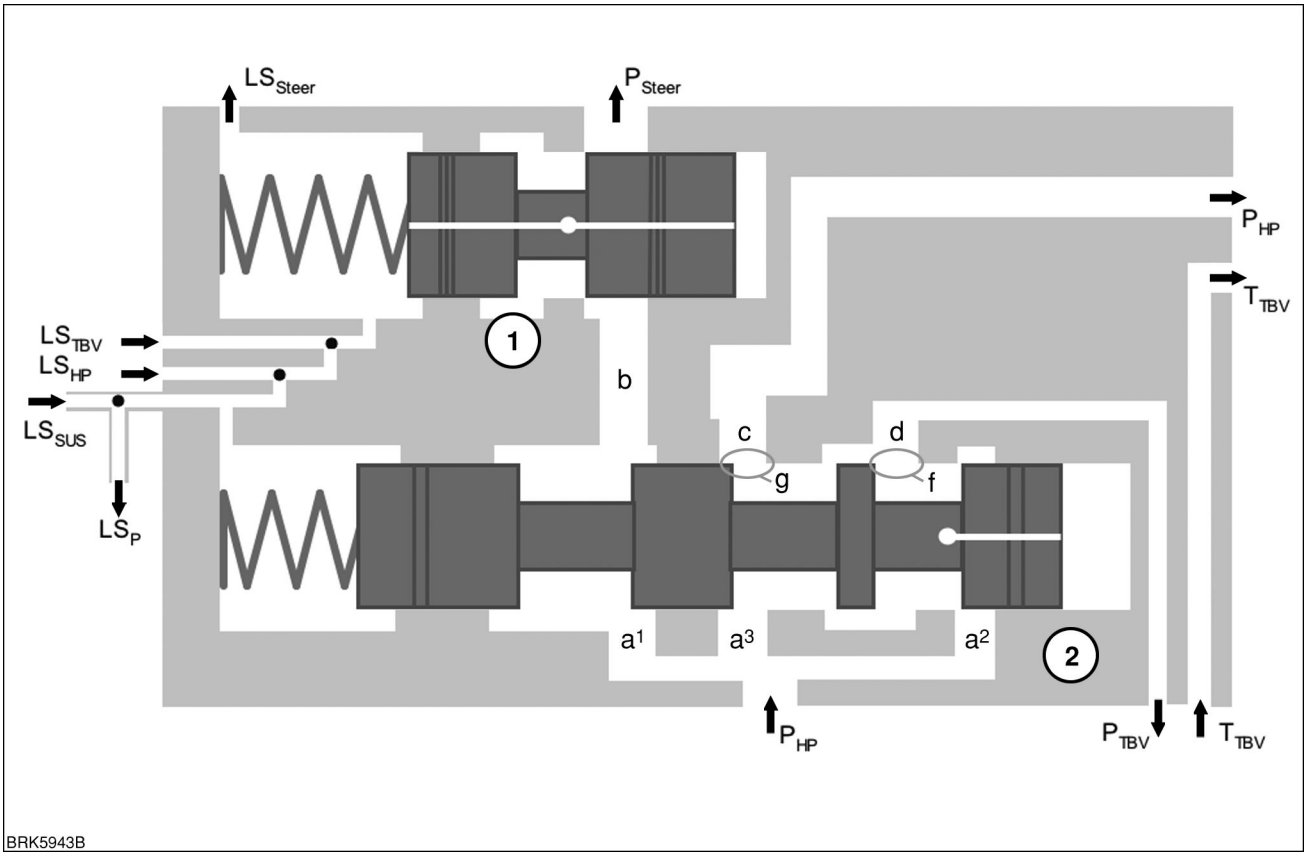


BAIL08CVT118FSA 5

Position 4

As pressure continues to rise against the spring, the valve now moves to position 4, full delivery to the trailer brake valve at ’f’, and a restricted delivery to the high pressure circuits at ’g’.

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BAIL08CVT119FSA 6

Position 5

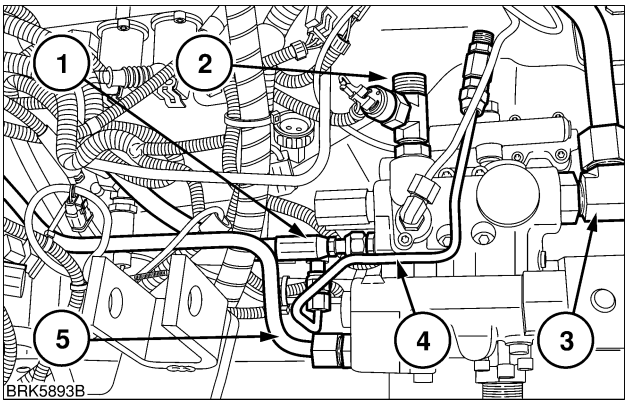
As all the circuits are satisfied and the pump meets the demands of tractor systems, pressure continues to rise against the spring, the valve continues to move to position 5, with full delivery to the trailer brake valve and the high pressure circuits. During steering, the LSSteer route to tank is stopped and pressure feed from the pump gallery of the orbital valve builds on the spring side of the valve **(1)** and also to the flow compensating valve. The priority valve moves with the spring allowing flow to the orbital valve and additional oil is provided by stroking the pump.

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Priority valve - Remove

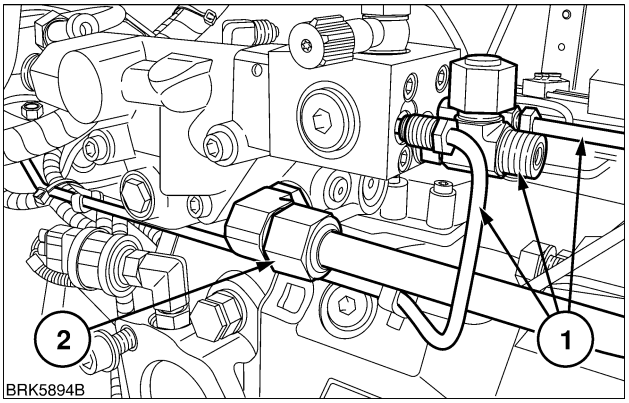
Prior operation:
Battery - Disconnect (A.30.A)

1. Remove trailer brake coupler pipe **(5)**
2. Disconnect the load sensing inlet pipe **(1)** and load sensing outlet pipe directly beneath (not shown).
3. Remove steering switch connectors. Disconnect steering pressure pipe from connector **(2)** and pipe to pressure compensator valve **(4)**
4. Disconnect high pressure feed to remote valves **(3)**.



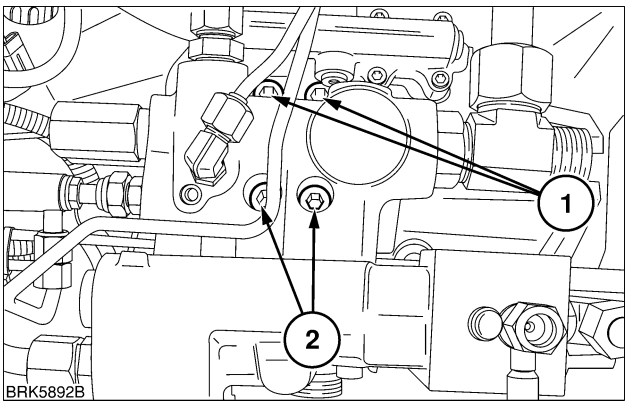
BAIL08CVT071ASA 1

5. Disconnect trailer brake return to tank pipe **(2)** and remove brake pipes **(1)** from pilot head.



BAIL08CVT072ASA 2

6. Undo the hexagon headed screws **(1)** and **(2)** and remove the assembly from the rear axle housing.

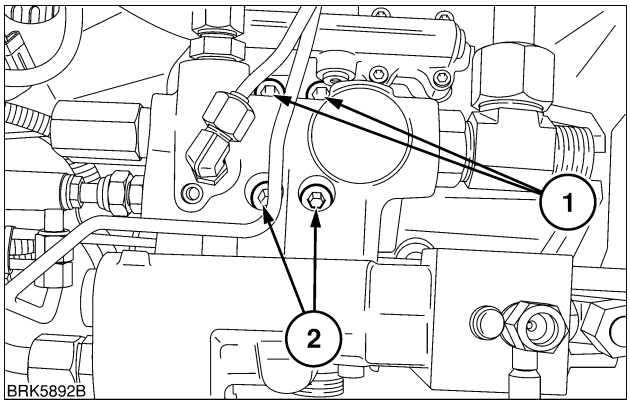


BAIL08CVT073ASA 3

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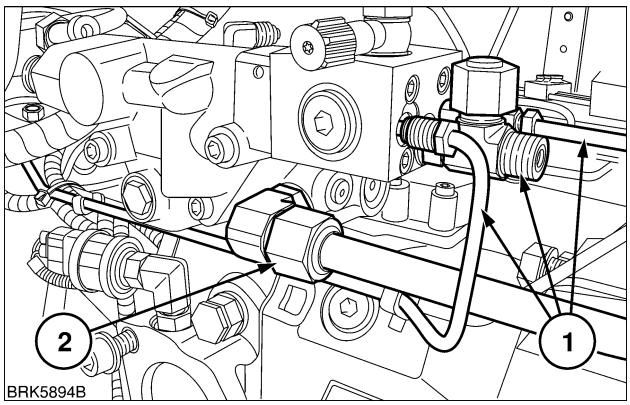
Priority valve - Install

1. Place the priority valve assembly on the hydraulic pump housing. Install the hexagon headed screws and tighten to **50 Nm** (**36.9 lb ft**) .



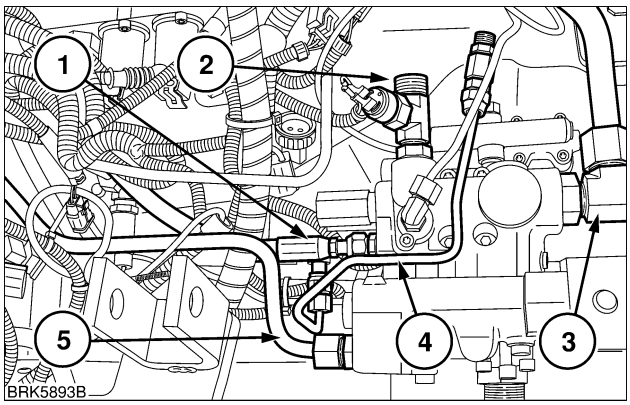
BAIL08CVT073ASA 1

2. Connect the brake pipes **(1)** to the pilot head and reconnect the trailer brake return pipe **(2)**.



BAIL08CVT072ASA 2

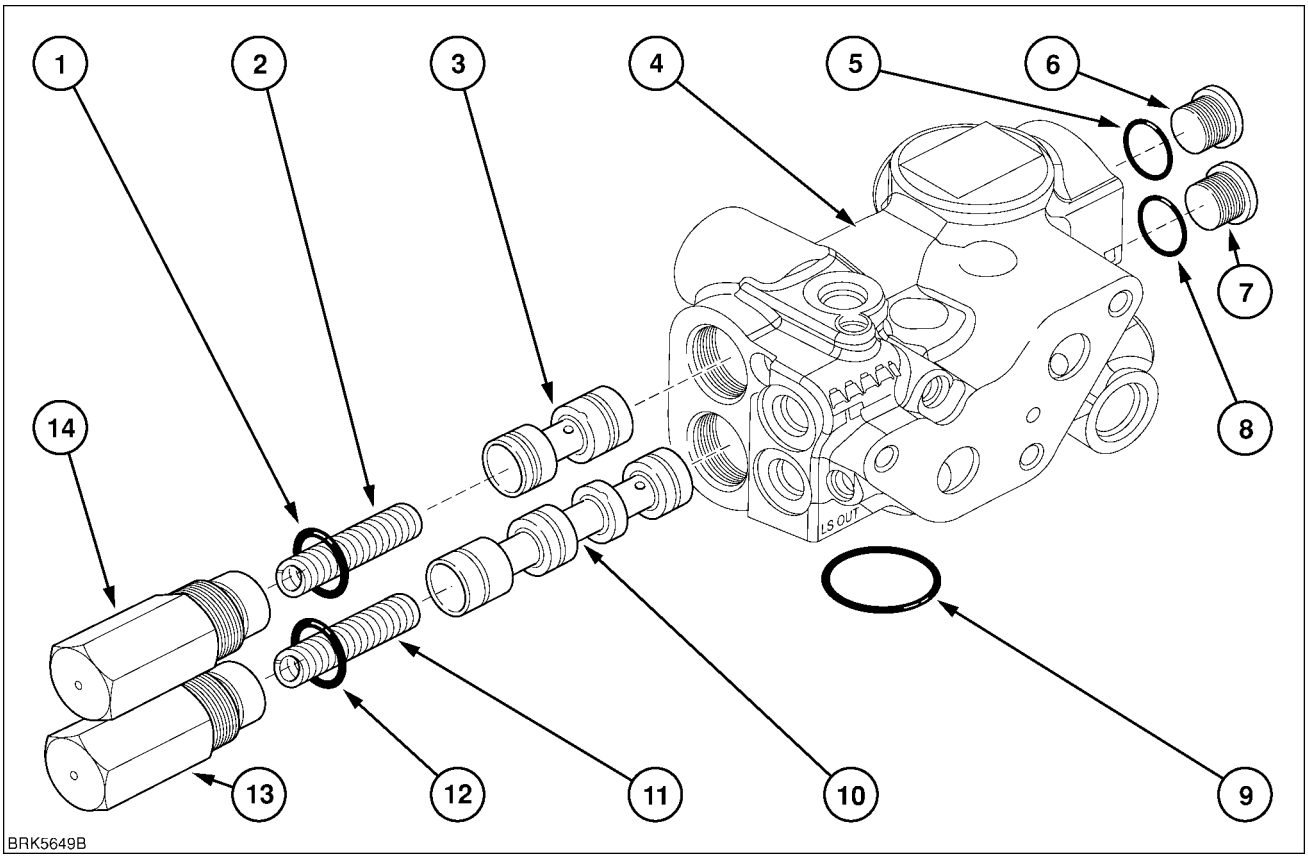
3. Connect load sensing pipe **(1)**.
4. Connect the steering pressure pipe **(2)** and the pipe to the pressure compensating valve. **(4)**.
5. Connect the high pressure feed pipe **(3)** and the trailer brake coupler pipe **(5)**.



BAIL08CVT071ASA 3

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Priority valve - Disassemble



BAIL08CVT086FSA 1

1. Seal
2. Spring
3. Steering priority spool
4. Manifold body
5. Seal
6. Plug
7. Plug
8. Seal
9. Seal
10. Trailer brake priority valve Spool
11. Spring
12. Seal
13. Cap
14. Cap

1. Remove steering spool retaining nut **(14)**.
2. Remove trailer brake priority spool retaining nut. **(13)**.

⚠ WARNING ⚠

The capscrew is under spring pressure. Hold the spring compressed while removing the capscrew.

SM204A

3. Withdraw the spools from the housing and inspect for damage.
4. If the spools or bores are damaged replace the valve assembly.

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DISTRIBUTION SYSTEMS - A

ELECTRICAL POWER SYSTEM - 30.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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ELECTRICAL POWER SYSTEM - General specification

Description	All Models
Alternator	ISKRA, **12 V**, **150 A** (optional with heated screen **200 A**)
Battery	Minimum maintenance **12 V** 176 Ah (1300 cca)
Starting motor	Positive engagement, solenoid operated **4.2 kW** - geared reduction
Cold starting aid	Optional inlet manifold grid heater (**80 A**) and fuel heater
Bulb rating and type	
- headlights	**60/55 W** - H4
- parking lights (front)	**5 W** - R**5 W**
- parking lights (rear)	**5 W** - P **21/5 W**
- work lights (hi-mount rear, on C-pillar and grabrail)	**12 V 55 W** - H3
- turn indicators (front)	**21 W** - PY**21 W**
- turn indicators (rear)	**21 W** - R**21 W** or PY**21 W**
- stop lights	**21 W** - P **21/5 W**
- licence plate lights	**5 W** - R**5 W**
- rotating beacon	**55 W** - H1
- interior / step light	**12 V** R **10 W**
- HID Xenon work lights rear roof	HID DIS **12 V 35 W**
- work lights hood	**12 V 50 W** - GE886
- SMV (slow moving vehicle) lights (N. America only) and extremity lights	**21 W**-P**21 W**
- intermediate front hood Xenon	HID DIS **12 V 35 W**
- roof front work lights	**12.8 V 50 W** - GE885

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Fuse and relay box - General specification

Description of the relays

Relay	Function
K001 / K002	Wiper Module Front & Rear
K003	Ignition Relay
K004	Lights Relay
K005	Starter Motor On
K006	Blower Motor
K007	Dipped Beam Headlamps
K008	Stop Lamps Relay
K009	Main Beam Headlamps
K010	Hydraulic Trailer Brake
K011	Electronic Park Brake
K012	Pneumatic Trailer Brake
K013	Engine Shutdown
K014	Get U Home
K015	Front Worklamps Hood
K016	Rear Worklamps C Pillar Relay
K017	Power Supply ECU
K018	EL.Battery Isolator
K019	Air Condition Clutch Relay
K020	El.Hydraulic Remote Lock Relay
K021	Timer Relay Battery Isolator
K022	Heated Mirror Timer Relay
K044	Front Screen Heater Relay
K045	Rear Screen Heater Relay
NOTE: The following relays are located outside the safety box!	
K023	Grid Heater Relay
K024	Fuel Heater Relay
K040	ISO Relay 1 Rear
K041	ISO Relay 2 Rear
K042	ISO Relay 1 Front
K043	ISO Relay 2 Front
K046	Reversible Fan Relay
K050	Relay Base Crank Isolate
K051	Relay Base Solenoid B
K052	Relay Base Solenoid A
K053	EL.Shiftable PTO Drive Upper Speed Relay
K054	EL.Shiftable PTO Drive Lower Speed Relay

Fuses

No.	Amps	Circuit
F001	10	Interior and step lighting and relay mirror heating
F002	25	Cigar lighter and power socket, cab (potential 30)
F003	10	Coupling of the A/C compressor
F004	10	Screw terminal red (potential 30)
F005	30	Blower motor
F006	10	Station memory and work lamp control unit
F007	20	Switch - Main headlights and hazard light switch
F008	20	Starter switch
F009	25	Front loader power
F010	30	Rear power socket (potential 15)
F011	15	Front windscreen wiper

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No.	Amps	Circuit
F012	10	Rear windscreen wiper / switch, windscreen washing system, front/rear
F013	15	Relay, brake lights
F014	15	Headlight switch and flasher
F015	20	Brake light switch and pedal lock
F016	15	Trailer brake
F017	25	Power socket, cab (potential 15)
F018	15	Air blower motor relay and driver's seat / Armrest adjust
F019	15	Heated mirrors
F020	10	Radar sensor, normal signal socket / keypad
F021	15	Water sensor for the fuel filter, brake fluid level switch
F022	15	Side marker lights, right
F023	15	Side marker lights, left / licence plate lights
F024	10	Illumination - Lighting / cigar lighter - ICU - VT - heated mirror switch - EHR-lock switch
F025	15	Dipped beam headlights relay, get you home
F026	15	Main beam headlights
F027	30	Front work lamp (bonnet)
F028	15	Work lamp control unit / Roof rear worklamps
F029	30	Work lamp control unit / Roof front worklamps + grabrail
F030	15	Work lamp (C-pillar)
F031	15	Rotating beacon (via work lamp control unit)
F032	15	Flasher unit
F033	25	Diagnostics plug 1/2
F034	10	ICU 3 and hand brake switch
F035	10	Potential 30 for electronics
F039		Not used
F040	10	Radio memory
F041		Not used
F042		Not used
F043	10	Engine electronics (potential 15)
F044	25	Front-mounted equipment socket (B+)
F045	25	Power supply - **8 A** socket (potential 15) C-pillar left
F046	15	Engine controller B+ supply
F047	10	Engine controller B+ supply
F048		Not Used
F049	15	Viscotronic fan, relay heater grid, relay fuel filter heater, exhaust brake
F050	15	Reversible fan
F051	25	Electronic park brake
F052	10	ICU 3 supply
F053	15	Transmission control supply (potential 15)
F054	10	PTO rear
F055	10	Supply Ignition Fast Steer / GARU / A/C pressure switch / ACU / CCU
F056	15	PTO front
F057	15	Supply Ignition / ACU - Front hitch
F058		Not Used
F059		Not Used
F060	10	Timer relay battery isolator - battery isolator control switch

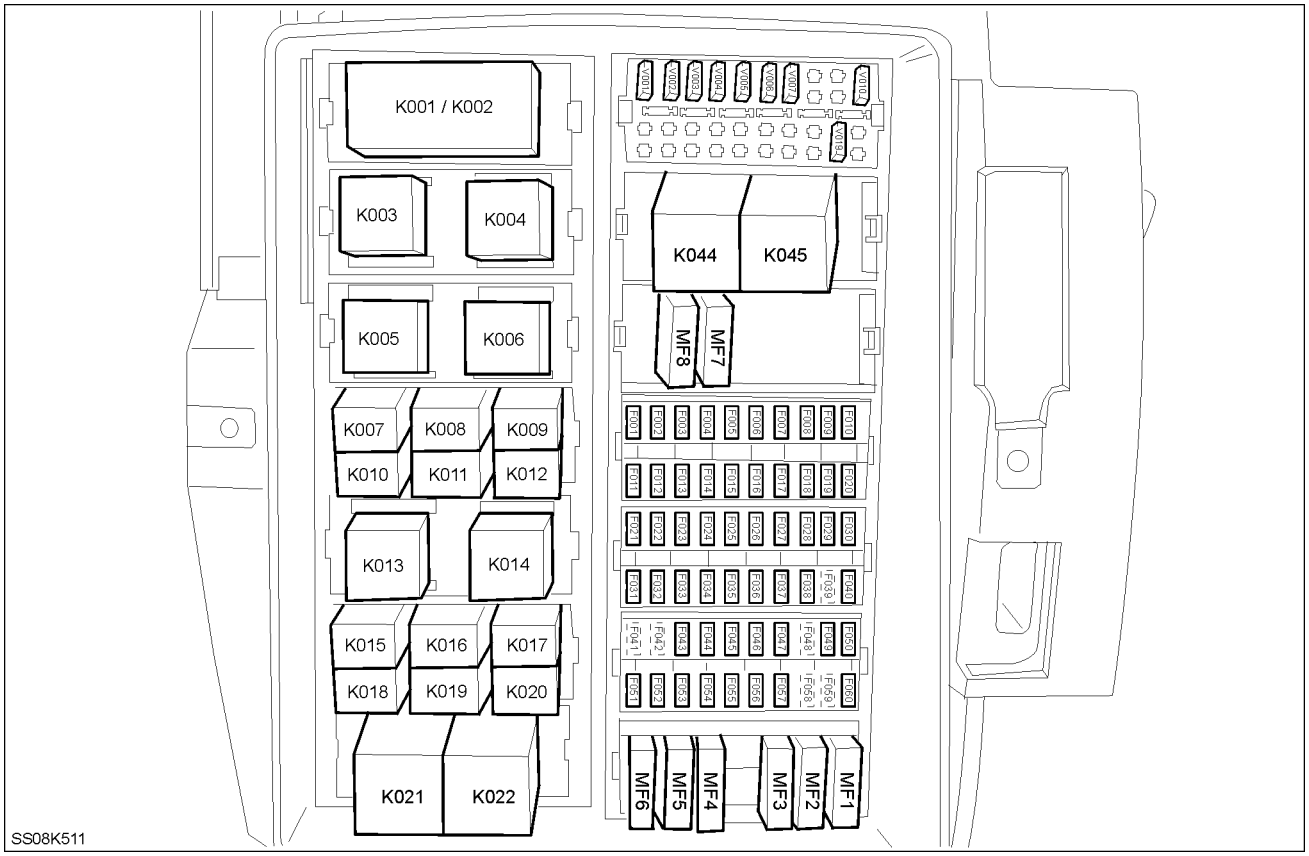
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Maxi Fuses

No.	Amps	Fused components
MF1	80	Supply to F009, F013, F018, F021, F045, F050
MF2	30	Supply to F006, F007, F008, F036, F037, F038
MF3	80	Supply to V019, F030, K005, K013
MF4	80	Supply to F027, K015
MF5	80	Supply to F026, F031, F051
MF6	80	Supply to F001, F002, F003, F004, F005, F044
MF7	30	Supply heated windscreen front
MF8	20	Supply heated screen rear

Diode

Diode	Function
V001	Get you home
V002	Get you home
V003	Get you home
V004	Dipped Beam Headlamps Diode
V005	Brake Light Diode
V006	Brake Light Diode
V007	El. Battery Isolator Diode
V019	Less El. Battery Isolator Diode
V020	With El. Battery Isolator Doide

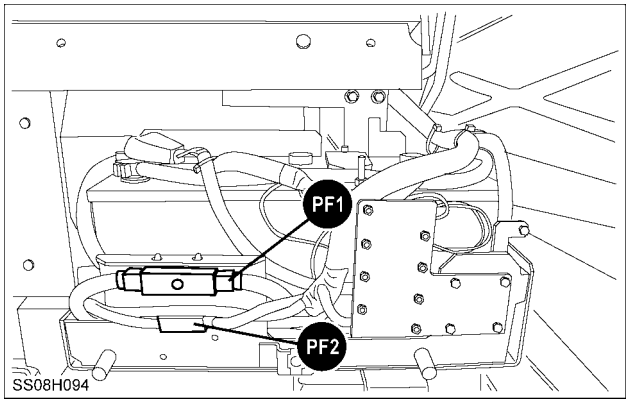


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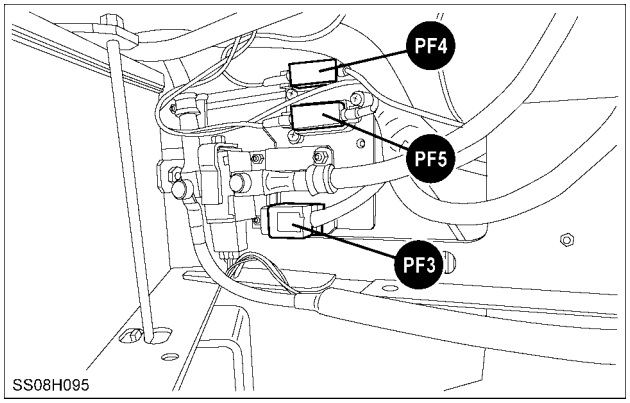
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Fuses for the electrical supply

Fuse No.	Amps	Fuse-protected power supply
PF1	250	Power Fuse, Main power supply B+ (250A)
PF2	30	Power Fuse, Power Supply CCU
PF3	30	Power Fuse, Power Supply Memory



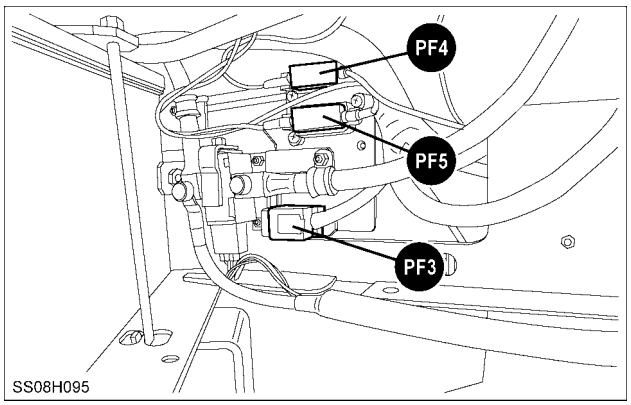
SS08H094 2



SS08H095 3

Main current fuses for the ISO BUS power supply (if installed)

Fuse No.	Amps	Fuse-protected power supply
PF4	30	Power Fuse, ISO Bus Rear
PF5	30	Power Fuse, ISO Bus Rear
PF6	30	Power Fuse, ISO Bus Front
PF7	30	Power Fuse, ISO Bus Front



SS08H095 4

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Alternator - Torque

	Value
Pulley Retaining Nut	**80 Nm** (**59.0 lb ft**)
Terminal Nut - B+	**12 Nm** (**8.9 lb ft**)
Terminal Nut - D+	**3.5 Nm** (**2.6 lb ft**)
Mounting Bolts	**25 Nm** (**18.4 lb ft**)

Alternator - General specification

Polarity	Negative Ground
Nominal Voltage	**14.0 V**
Maximum Rev/Min. - Permanent/Intermittent	15,000/18,000
Nominal Output	**150 A** / **200 A**
Regulator Controlled Voltage	**14.1 V +/- 0.15**
Rotor Field Winding Resistance	**2.7 Ω +/- 0.27 @ 23 °C** (**73.4 °F**) ± **5 °C** (**41.0 °F**) (at **150 A**) **2.9 Ω +/- 0.10 @ 23 °C** (**73.4 °F**) ± **5 °C** (**41.0 °F**) (at **200 A**)

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Battery - General specification

Temperature	Efficiency of a Fully Charged Battery
25.0 °C (**77.0 °F**)	**100 %**
-4.5 °C (**23.9 °F**)	**82 %**
-24.0 °C (**-11.2 °F**)	**64 %**
-27.5 °C (**-17.5 °F**)	**58 %**
-31.0 °C (**-23.8 °F**)	**50 %**
-34.5 °C (**-30.1 °F**)	**40 %**
-37.5 °C (**-35.5 °F**)	**33 %**

	176 Ah (**1300 cca**)
Slow Charge Programs	46 hours at **5 A**
	23 hours at **10 A**
Fast charge Program (emergencies only)	13 hours at **18 A**

Use the following table to determine the state of charge

State of Charge	Corrected Specific Gravity @ **15 °C** (**59.0 °F**)	Corrected Specific Gravity @ **25 °C** (**77.0 °F**)	Average Battery Voltage
100 %	1.295	1.287	12.76
75 %	1.253	1.246	12.52
50 %	1.217	1.210	12.30
25 %	1.177	1.170	12.06
Discharged	1.137	1.130	11.84

Specific Gravity	Fast charge up to :
1.150 SG or less	**60 minutes**
1.151 - 1.175 SG	**45 minutes**
1.176 - 1.200 SG	**30 minutes**
1.201 - 1.225 SG	**15 minutes**
	(Slow charge only)

Description	Battery Specification
Capacity (Ampere hour at 20 hour rate)	176
Cold Cranking Ampere Rating	1300
Voltage	12
Cells	6
Ground Terminal	Negative

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ELECTRICAL POWER SYSTEM - Static description PROTECTING THE ELECTRONIC AND ELECTRICAL SYSTEMS DURING BATTERY CHARGING OR WELDING

Precautions

To avoid damage to the electronic/electrical systems, always observe the following:

1. Never make or break any of the charging circuit connections, including the battery connections, when the engine is running.
2. Never short any of the charging components to earth.
3. Do not use a slave battery of higher than **12 V** nominal voltage.
4. Always observe correct polarity when installing the batteries or using a slave battery to jump start the engine. Follow the instructions in the operator's manual when jump starting the tractor. Connect positive to positive and negative to negative.
5. Always disconnect the earth cable from the batteries before carrying out arc welding on the tractor or on any implement attached to the tractor.
6. Position the welder earth cable clamp as close to the welding area as possible.
7. If welding is to be carried out in close proximity to a computer module, then the module should be removed from the tractor. It is recommended that this procedure be carried out by an authorised dealer.
8. Never allow welding cables to lay on, near or across any electrical wiring or electronic component while welding is in progress.
9. Always disconnect the negative cable from the batteries when charging the batteries in the tractor with a battery charger.

⚠ WARNING ⚠

Batteries contain sulphuric acid. In case of contact with skin, flush the affected area with water for five minutes. Seek medical attention immediately. Avoid contact with the skin, eyes or clothing. Wear eye protection when working near batteries.

B040

IMPORTANT: *Failure to disconnect the two earth cable connections at the battery prior to charging the batteries or welding on the tractor or attached implement will result in damage to the electronic and electrical systems.*

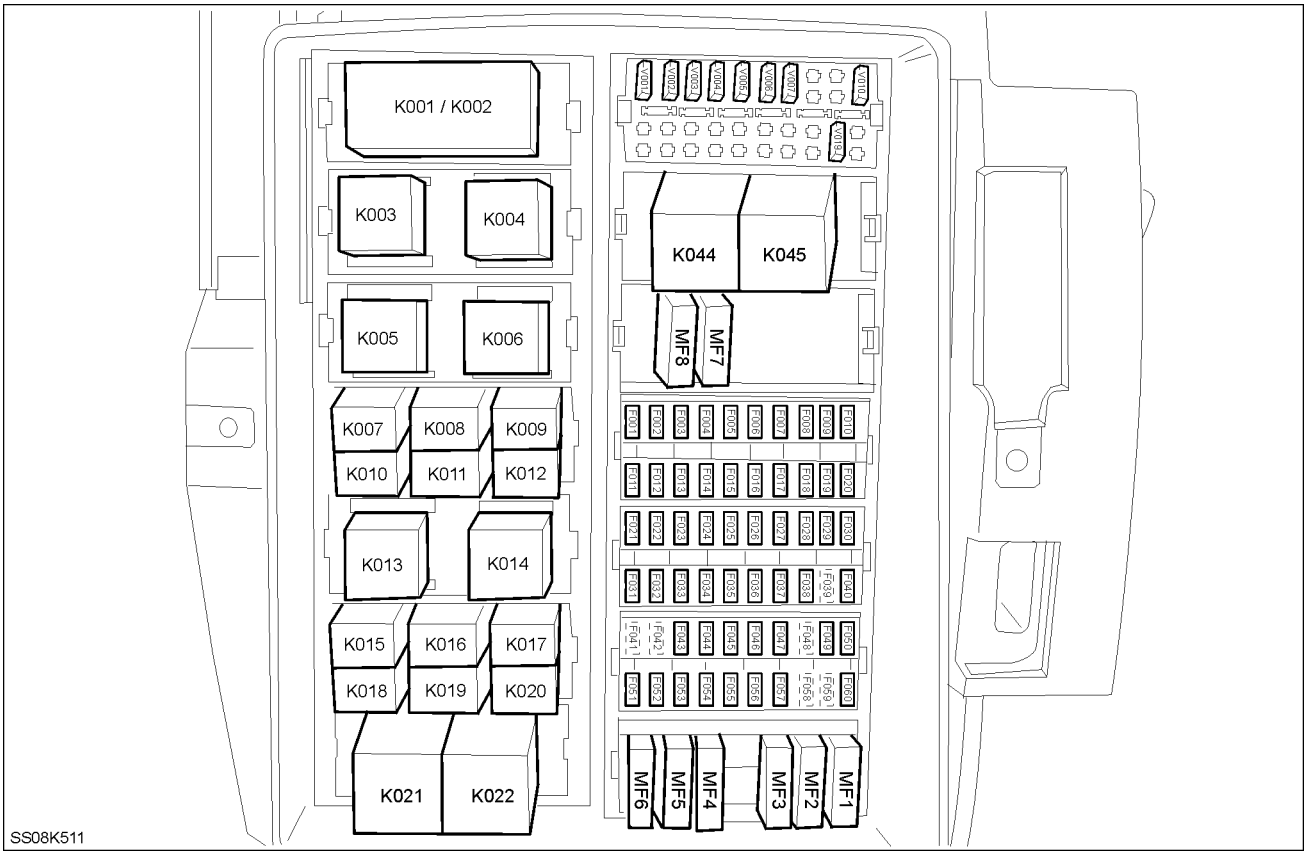
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Fuse and relay box - Static description

Fuses and Relays

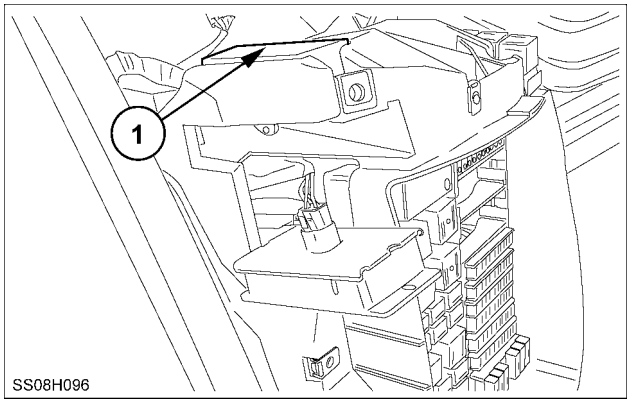
IMPORTANT: *Do not replace a blown fuse with another of a different rating.*

The fuse box and relay box is located behind a panel at the right-hand side.
To check or change fuses or relays, remove the two screws securing the panel to the console.
In addition to the main fuses there are additional 'Maxi' fuses which are provided to protect the main fuses and electrical circuit.
There is provision for 60 fuses although they may not all be fitted, depending on the specification of the tractor. The fuses are numbered and colour coded.
Refer to **Fuse and relay box - General specification (A.30.A)** for fuse positions and descriptions and for relay functions.



SS08K511 1

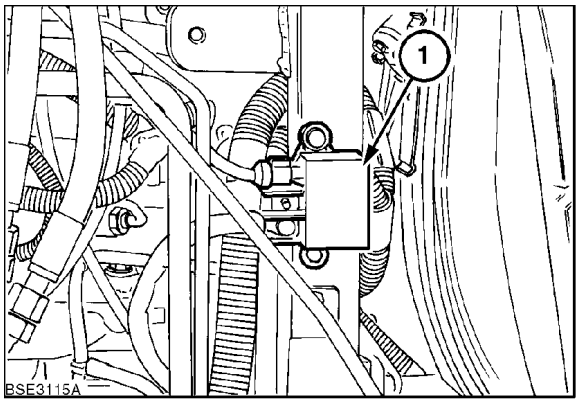
The flasher relay unit **(1)**, is located behind the right hand trim on the top of the fuse and relay box.



SS08H096 2

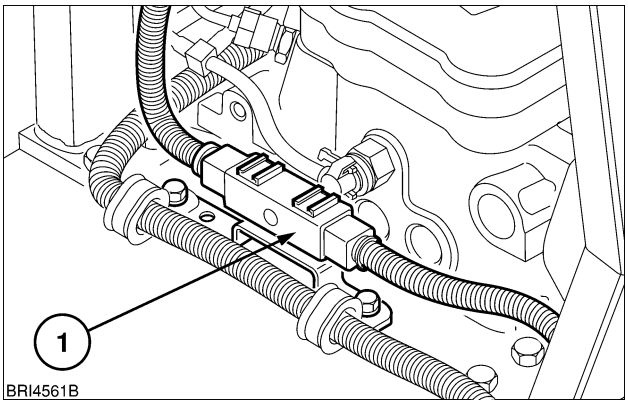
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Grid Heater relay **(1)**, located to the rear of the left hand side of the engine.



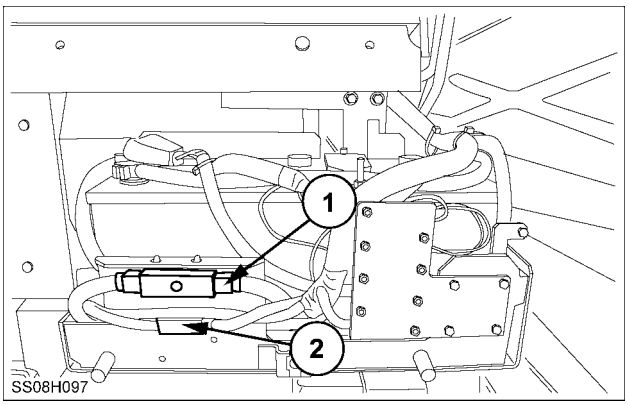
BSE3115A 3

Grid Heater Fuse (**125 A**) **(1)**, located on the right hand side of the engine near the starter motor.



BRI4561B 4

In addition to the fuses in the internal fuse box, there are also extra fuses located on the battery tray. A **250 A** 'MEGA' fuse **(1)** which protects the main electrical system and one **30 A** fuse **(2)** which protect the front lift electrical system, supply to the electronics system and implement ISO BUS circuit and battery isolator circuit (where fitted).

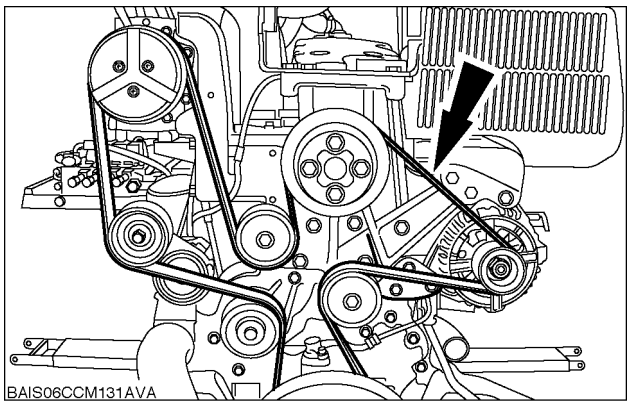


SS08H097 5

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Alternator - Static description

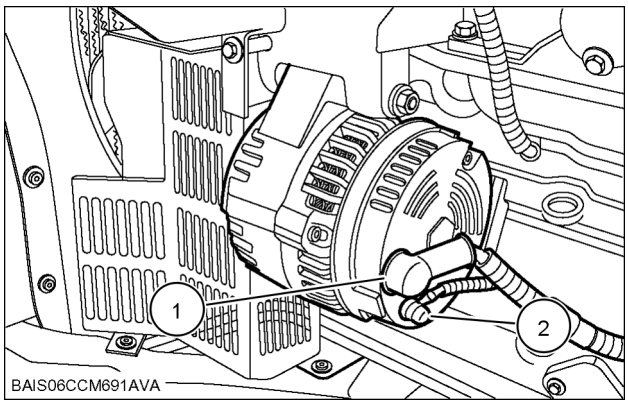
ISKRA **150 A** (optional with heated screen **200 A**) alternators are fitted to all models. They incorporate internal cooling fans and integral regulators. The alternator is mounted at the front on the left hand side of the engine and is driven from a crankshaft pulley via a 'poly vee' drive belt.



BAIS06CCM131AVA 1

Alternator Operation

Refer to **Wiring harness - Electrical schematic frame 08 Start/Charging (Start & Charging W/Isolator) (A.30.A)** for charging circuit schematic.
When the key start switch is turned on a small current flows from the battery through the rotor field wiring. The circuit is made via the charge indicator warning lamp, alternator terminal 'D+' the rotor field winding, the alternator regulator and ground.
At this stage the warning light is illuminated and the rotor partially magnetised.
When the engine is started and the partially magnetised rotor revolves within the stator windings a 3-phase alternating current is generated. A constant portion of the generated current is converted to direct current by the three field diodes incorporated in the rectifier pack.
This direct current is fed back to supplement the current flowing through the rotor field winding.
This action results in an ever increasing magnetic influence of the rotor along with an associated rapid rise in generated output current and voltage.
During the rise in generated output voltage (reflected at the 'D+' terminal) the brilliance of the warning lamp is reduced and when the voltage at the 'D+' terminal equates to that at the battery side of the warning light the lamp is extinguished.
The voltage continues to rise until the predetermined regulated voltage level is reached.
In the event of drive belt breakage the voltage will not build up within the alternator and so the charge indicator light will remain on to indicate failure.



BAIS06CCM691AVA 2

Alternator

1 Output Connection (B+ Terminal)
2 Warning Lamp (D+ terminal)

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Battery - Static description

All models use a single “low maintenance - hybrid" battery with negative ground of six cell construction and is located on the right hand side of the tractor behind the cab steps.

NOTE: *"Low maintenance" means that under normal charging conditions the battery may lose a small amount of water from the electrolyte. Conditions that may cause water loss include prolonged charging above* ***14.4 V*** *where gassing occurs as it approaches full charge. This can be caused by a faulty charging system or boost/recovery charging equipment.*

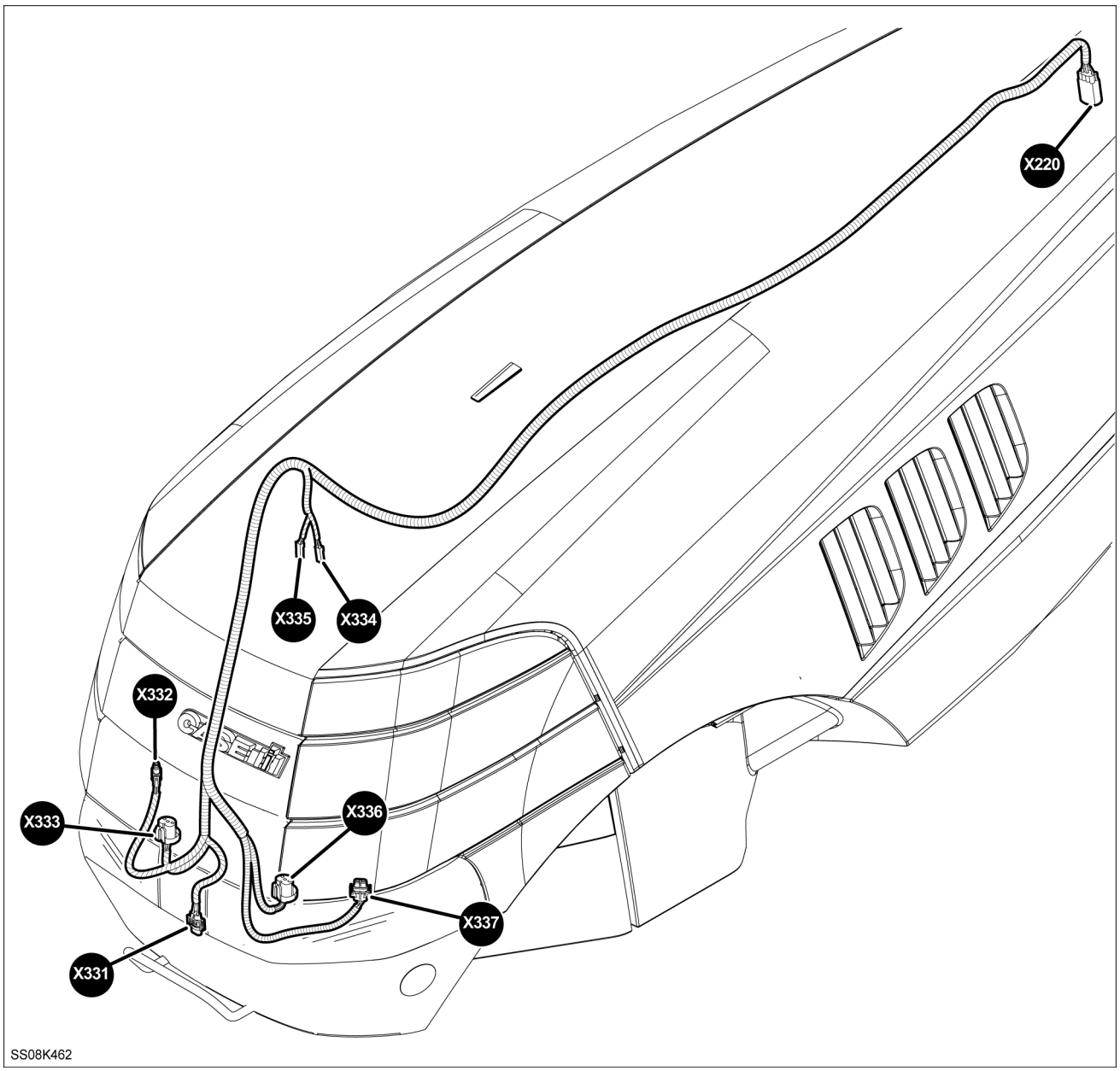
The battery has four major functions:

- To provide a source of current for starting, lighting and instrumentation.
- To help control the voltage in the electrical system.
- To furnish current when the electrical demands exceed the alternator output.
- To support quiescent loads from radio and micro processor memory.

The battery is constructed in such a manner that each cell contains positive and negative plates placed alternatively next to each other. Each positive plate is separated from a negative plate by a non-conducting porous envelope separator. If any of the positive plates should make contact with negative plates within a cell, the cell will short circuit and suffer irreparable damage. All of the positive plates are welded to a bus-bar, forming a positive terminal and all of the negative plates are welded to a similar bus-bar forming a negative terminal.
Each positive plate is composed of a lead grid with lead peroxide pasted into the grid openings. The negative plates are composed of a lead grid with spongy lead pasted into the grid openings.
The plates are submerged in a liquid electrolyte solution of diluted sulphuric acid.

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Connector - Overview Wiring Harness Hood

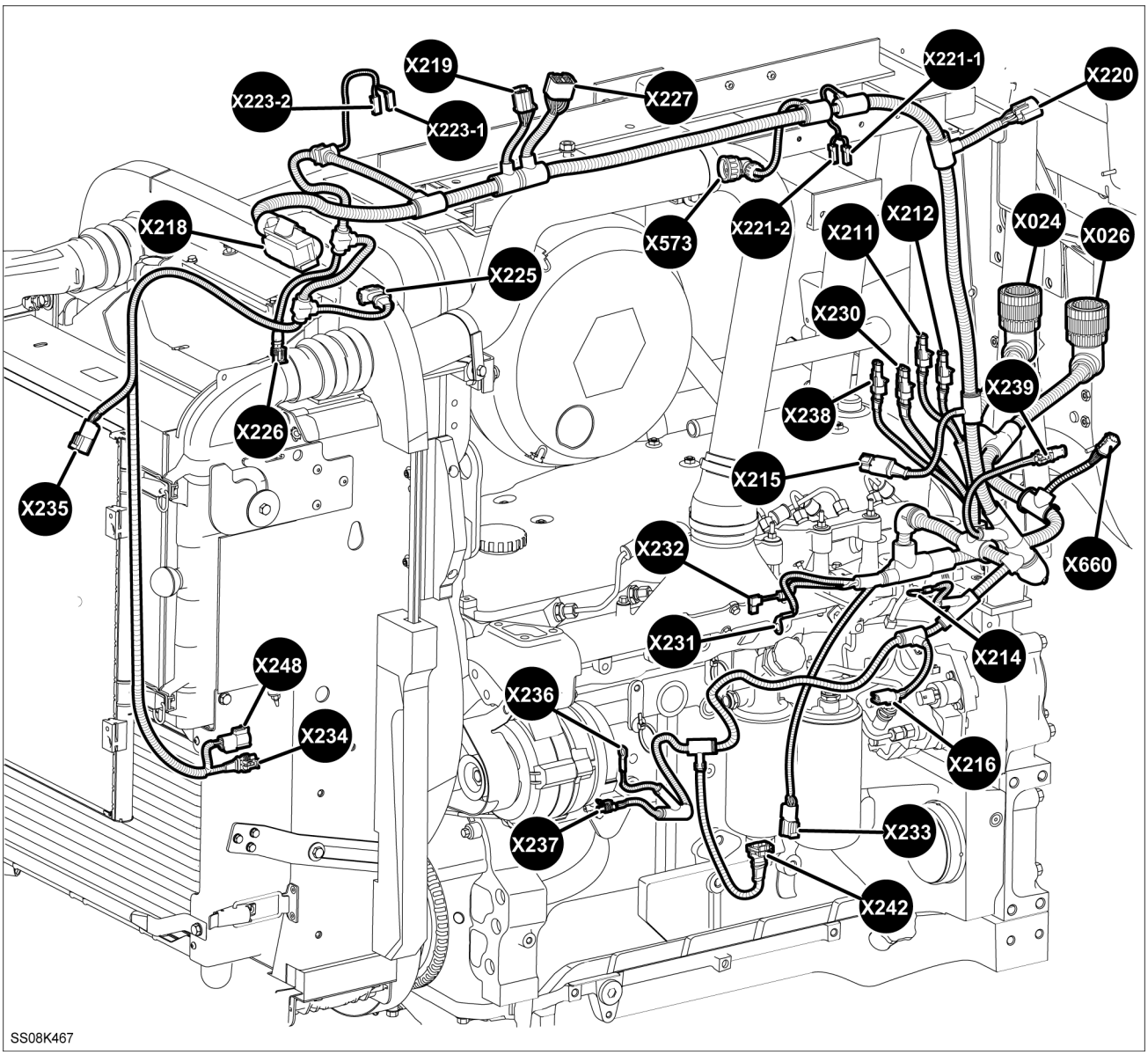


SS08K462 1

Con.	Description	Con.	Description
X220	Front Lamps	**X331**	Worklamp Right Hand
X332	Corner Lamp Right Hand	**X333**	Headlamp Right Hand
X334	Horn	**X335**	Horn
X336	Headlamp Left Hand	**X337**	Corner Lamp Left Hand

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Connector - Overview Wiring Harness Engine

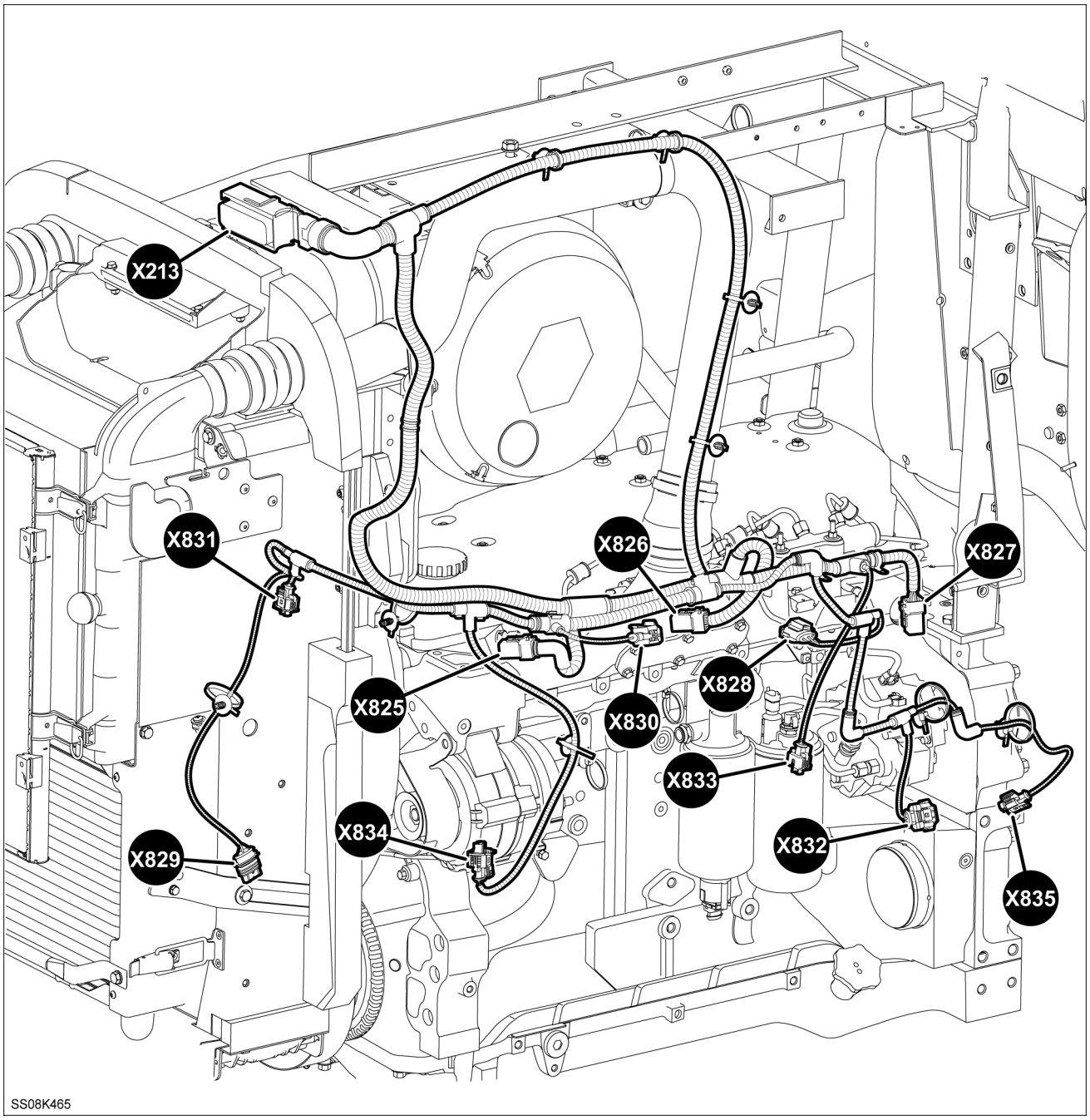


SS08K467 1

Con.	Description	Con.	Description
X024	Cab to Engine Main Connector E2	**X026**	Main Harness Connector - E1 - Engine to Cab
X211	Loader Valve Option A	**X212**	Loader Valve Option B
X214	Earth Point - Electronic Module	**X215**	Grid Heater Relay
X216	Fuel Heater Relay	**X218**	Engine Module Bosch EDC 16
X219	Visctronic Fan	**X220**	Front Lamps
X221	Brake Fluid Level (1/2)	**X223**	Air Cleaner Switch (1/2)
X225	A/C Pressure Switch	**X226**	A/C Clutch
X227	Front Hitch and Front PTO	**X230**	D.I.A Engine Inline
X231	Starter Solenoid B+	**X232**	Starter Solenoid 1
X233	Radar Gun	**X234**	Front Axle (Self Level)
X235	Steering Angle Sensor	**X236**	Alternator B+
X237	Alternator D+	**X238**	Battery Isolator
X239	Reversible Fan	**X242**	Water in Fuel Sensor
X248	Suspension Accelerometer	**X573**	Exhaust Brake Solenoid
X660	ISO Implement Connector		

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Wiring Harness IVECO Engine

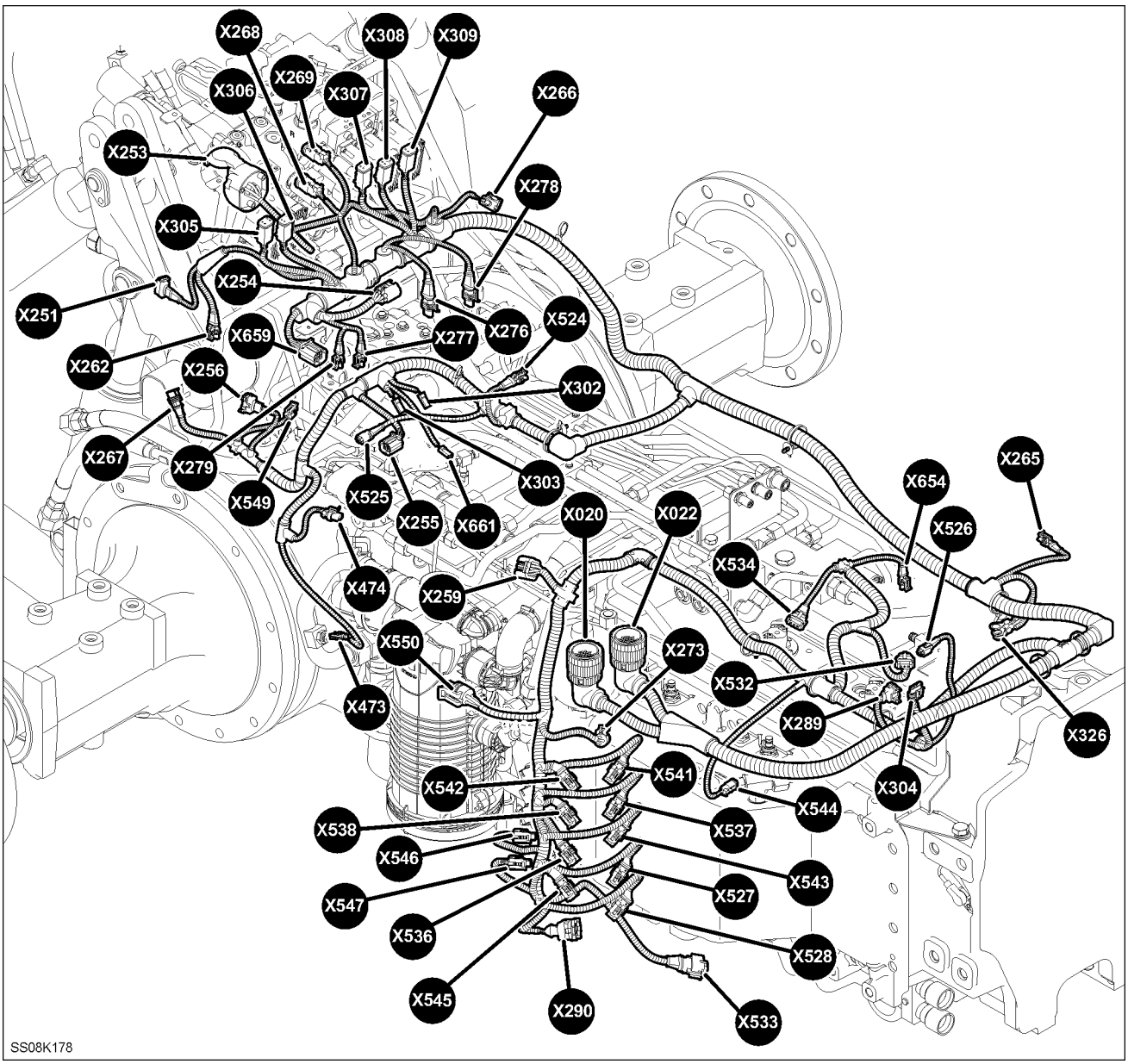


SS08K465 2

Con.	Description	Con.	Description
X213	Engine Control Unit A	**X825**	Injector Cylinder 1 & 2 (EDC16)
X826	Injector Cylinder 3 & 4 (EDC16)	**X827**	Injector Cylinder 5 & 6 (EDC16)
X828	Boost Pressure / Temperature Sensor (EDC16)	**X829**	Oil Pressure / Temperature Sensor (EDC16)
X830	Rail Pressure Sensor (EDC16)	**X831**	Coolant Temperature Sensor
X832	Fuel Temperature Sensor	**X833**	High Pressure Pump
X834	Increment Speed Sensor	**X835**	Camshaft Speed Sensor

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Connector - Overview Wiring Harness Drive Line



SS08K178 1

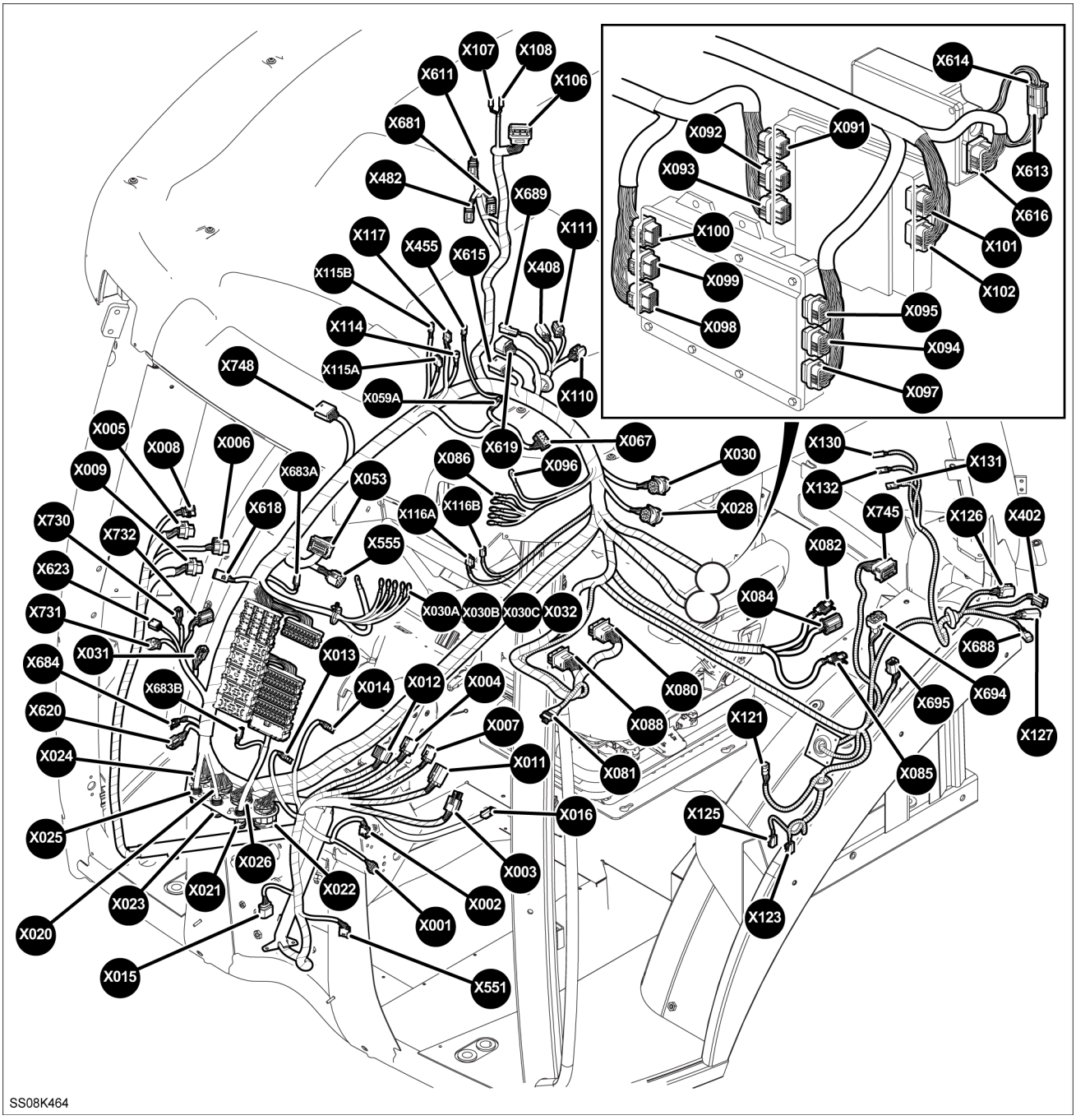
Con.	Description	Con.	Description
X020	Extension Harness Connector 2 (Cab)	**X022**	Extension Harness Connector 1 (Electronic)
X251	PTO Speed Sensor	**X253**	Trailer Socket
X254	Trailer Brakes - Air	**X255**	Trailer Brakes Hydraulic
X256	Draft Pin Right Hand	**X259**	Front Suspension Connector
X262	PTO Twist Sensor	**X265**	Fuel Tank Sensor
X266	Draft Pin Left Hand	**X267**	Rock Shaft Potentiometer
X268	EDC Valve Raise	**X269**	EDC Valve Lower
X273	Transmission Oil Pressure Sensor	**X276**	Diff. Lock Solenoid
X277	Rear PTO Brake Solenoid	**X278**	Rear PTO Solenoid
X279	4WD Solenoid	**X289**	Fly Wheel Speed Sensor
X290	Trans Oil Temperatur Sensor	**X302**	Power Steering Pressure Switch Pin 2
X303	Power Steering Pressure Switch Pin 1	**X304**	CAN Terminator Resistor
X305	EHR Valve Connector 1	**X306**	EHR Valve Connector 2
X307	EHR Valve Connector 3	**X308**	EHR Valve Connector 4
X309	EHR Valve Connector 5	**X326**	Earth Transmission

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Con.	Description	Con.	Description
X473	Low Hydro Charge Switch	**X474**	Hydraulic Filter Blocked (Vacuum Switch)
X524	Output Wheel Speed Sensor	**X525**	Hydrostat Input Speed Sensor
X526	Ring Speed Sensor	**X527**	Clutch Solenoid A
X528	Clutch Solenoid B	**X532**	Potentiometer Synchroniser F1 - F3
X533	Potentiometer Synchroniser F2 - R1	**X534**	Potentiometer Synchroniser F4 - R2
X536	Solenoid Valve R1	**X537**	Solenoid Valve F1
X538	Solenoid Valve F3	**X541**	Solenoid Valve R2
X542	Solenoid Valve F4	**X543**	Solenoid Valve F2
X544	Solenoid Valve Hydrostat 1	**X545**	Solenoid Valve Dump
X546	A Clutch Pressure Sensor	**X547**	B Clutch Pressure Sensor
X549	Brake Pressure Sensor	**X550**	Vane Pump Pressure Sensor
X654	Brake Lubrication Control Solenoid	**X659**	Link Level (External Connection)
X661	High Flow Pump (detection)		

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Connector - Overview Wiring Harness Main Cab



SS08K464 1

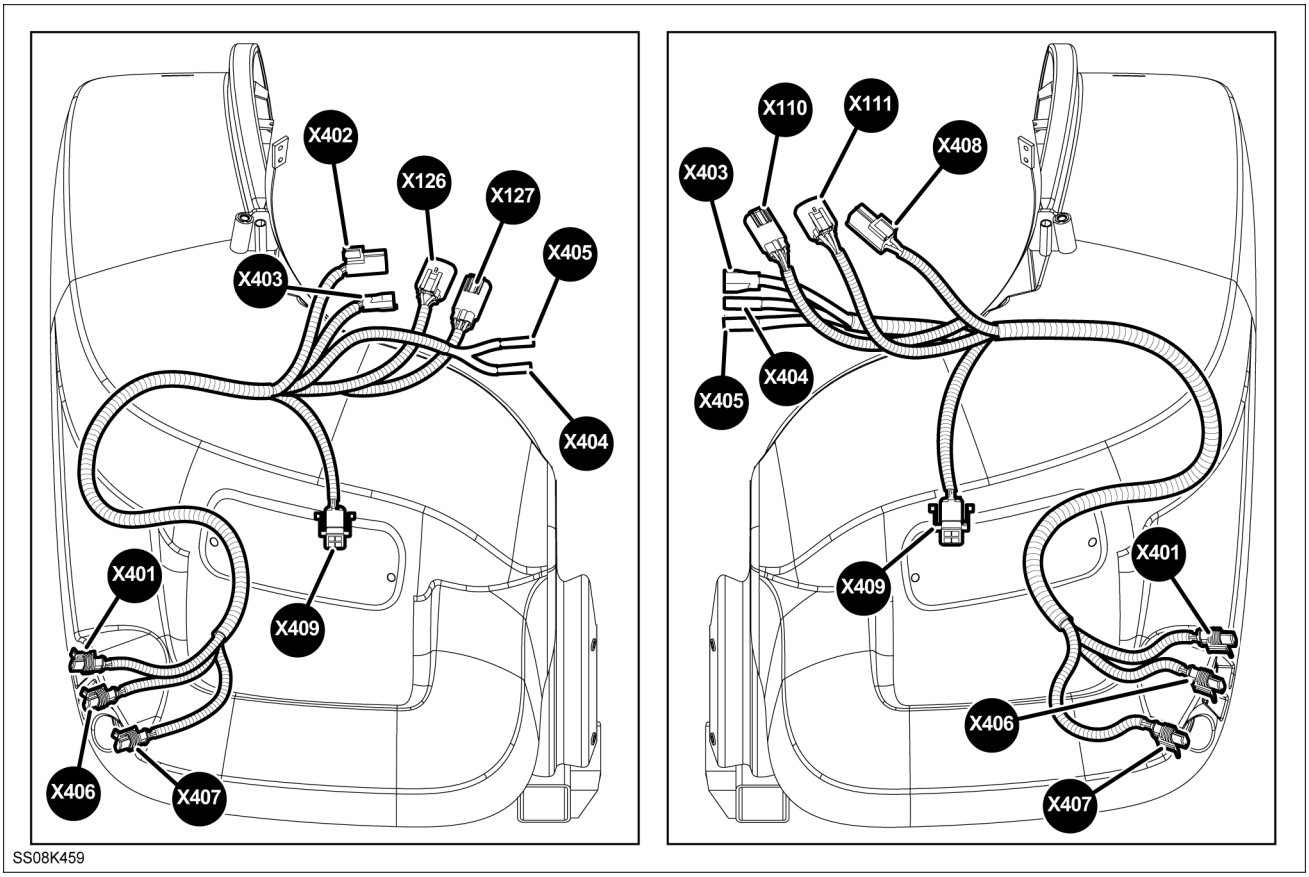
Con.	Description	Con.	Description
X001	Clutch Switch	**X002**	Clutch Potentiometer
X003	Starter Switch	**X004**	Main Light Switch
X005	Instrument Cluster Unit CN1	**X006**	Instrument Cluster Unit CN2
X007	Hazard Switch Harness	**X008**	Key Pad
X009	Instrument Cluster Unit CN3	**X011**	Front and Rear Wiper Switch
X012	Shuttle Lever	**X013**	Stop Lamp Switch Left
X014	Stop Lamp Switch Right	**X015**	Foot Throttle
X016	Brake Pedals Latched Switch	**X020**	Extension Harness Connector 2 (Cab)
X021	Main Power (Fuse) 1 Power B+	**X022**	Extension Harness Connector 1 (Electronic)
X023	Main Power (Fuse) 2 Power E	**X024**	Cab to Engine Main Connector E2
X025	Main Power (Fuse) 3 Power B-	**X026**	Main Harness Connector - E1 - Engine to Cab
X028	Diagnostic Connector 2	**X030**	Diagnostic Connector

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Con.	Description	Con.	Description
X030A	Earth Header 2	**X030B**	Earth Header 2
X030C	Earth Header 2	**X031**	ADIC Diagnostic Connector
X032A	Earth Header 2	**X032B**	Earth Header 2
X053	Flasher ECU	**X059A**	Lever Mounted PTO Brake Switch
X067	Rear PTO Brake Switch	**X080**	Armrest 1
X081	Seat Connector	**X082**	Loader Power
X084	Loader Valve 2	**X085**	Loader Valve 1
X086A	Earth Header 1	**X086B**	Earth Header 1
X086C	Earth Header 1	**X086D**	Earth Header 1
X088	Armrest 2	**X091**	CCM Central Control Unit (CN2)
X092	CCM Central Control Unit (CN1a)	**X093**	CCM Central Control Unit (CN1b)
X094	CCM Central Control Unit (CN3a)	**X095**	CCM Central Control Unit (CN3b)
X096	Case Earth CCM & ACU	**X097**	CCM Central Control Unit (CN4)
X098	ACU Auxiliary Control Unit (CN2)	**X099**	ACU Auxiliary Control Unit (CN1a)
X100	ACU Auxiliary Control Unit (CN1b)	**X101**	ACU Auxiliary Control Unit (CN3b)
X102	ACU Auxiliary Control Unit (CN3a)	**X106**	Roof to Cab Harness - Roof
X107	Aux Headlamp Switch	**X108**	Aux Headlamp Switch
X110	Right Hand Fender Connector 2 HPL Raise/Lower Switch	**X111**	Right Hand Fender Connector 1 Tail Lamp
X114	ISO 11786 Signal Socket	**X115A**	30A Power Socket Positiv
X115B	30A Power Socket Negativ	**X116A**	Rear Power Socket Implement Positive
X116B	Rear Power Socket Implement Negative	**X117**	Power Studs
X121	Hand Brake	**X123**	Washer Motor Rear
X125	Washer Motor Front	**X126**	Left Hand Fender Connector 1 Tail Lamp
X127	Left Hand Fender Connector 2 HPL Raise/Lower Switch	**X130**	Cigar Lighter (Illumination)
X131	Cigar Lighter (Power)	**X132**	8 Amp Socket
X402	Rear Fender 3rd Remote Left	**X408**	Rear Fender 3rd Remote Right
X455	Rev. Alarm H58	**X482**	Battery Isolator Control Switch
X551	Exhaust Brake Switch	**X555**	Additional Roof Headlamps
X611	Heated Mirror Switch	**X613**	TECU Power In/Out
X614	TECU By-Pass	**X615**	TECU VT / SWCD Input
X616	TECU Unit - CN1	**X618**	ISO BUS CAN Extension
X619	TECU VT / SWCD Output	**X620**	Front Break Away (Option)
X623	Fast Steer Connector	**X681**	Hydraulics Master Switch
X683A	Heated Screen B+	**X683B**	Heated Screen D+
X684	Front Hitch Detect	**X688**	Extremity Lamp Left Hand
X689	Extremity Lamp Right Hand	**X694**	Air Con Power
X695	Air Con Control	**X730**	Multi Control Option
X731	Multi Control Option	**X732**	Can Dog Power
X745	Electronic Park Brake Interface Connector	**X748**	Electric Shift PTO

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Connector - Overview Wiring Harness Fender

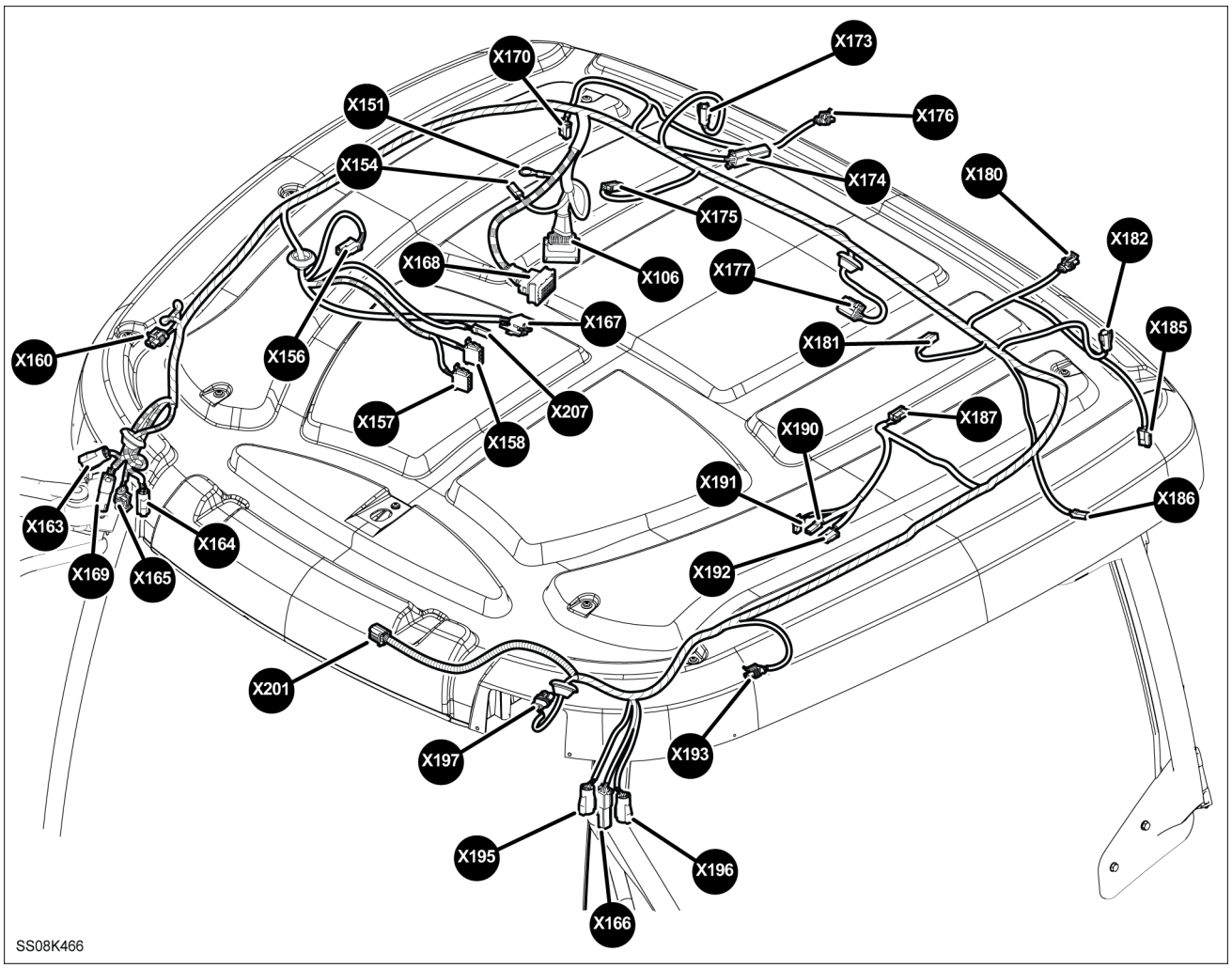


SS08K459 1

Con.	Description	Con.	Description
X110	Right Hand Fender Connector 2 HPL Raise/Lower Switch	**X111**	Right Hand Fender Connector 1 Tail Lamp
X126	Left Hand Fender Connector 1 Tail Lamp	**X127**	Left Hand Fender Connector 2 HPL Raise/Lower Switch
X401	EHR 3 Switch Fender Right and Left	**X402**	Rear Fender 3rd Remote Left
X403	Worklamp C - Pillar Right and Left	**X404**	License Lamp Right and Left
X405	License Lamp Right and Left	**X406**	Rear PTO Switch Right and Left
X407	HPL Switch Right and Left	**X408**	Rear Fender 3rd Remote Right
X409	Stop Tail Light Right and Left (LMP-018)		

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Connector - Overview Wiring Harness Roof



SS08K466 1

Con.	Description	Con.	Description
X106	Roof to Cab Harness - Roof	**X151**	Roof Earth
X154	not used	**X156**	Console Lamp Right Hand
X157	Radio 2	**X158**	Radio 1
X160	not used	**X163**	Grabrail Side lamp Right Hand
X164	Worklamp Grabrail Right Hand Front	**X165**	Worklamp Roof Front Left Hand 2
X166	Electric Mirror Left Hand	**X167**	Mirror Control
X168	Worklamps ECU	**X169**	Electric Mirror Right Hand
X170	Rotating Beacon Right Hand	**X171**	not used
X173	Worklamp Rear Right	**X174**	Licence Plate Diode
X175	Radio Speaker Right Hand Rear	**X176**	License Plate Right Hand
X177	Wiper Motor Rear	**X180**	Licence Plate Left Hand
X181	Radio Speaker Left Hand Rear	**X182**	Worklamp Left Rear
X184	not used	**X185**	Rotating Beacon Left Hand
X186	Door Switch Left Hand	**X187**	not used
X190	Interior Lamp A	**X191**	Interior Lamp B1
X192	Interior Lamp B2	**X193**	Puddle Lamp Left Hand
X195	Side Lamp Grabrail Left Hand	**X196**	Worklamp Grabrail Left Hand
X197	Worklamp Left Hand Front Upper	**X201**	Wiper Motor Front (Cab)
X207	Antenne Plus		

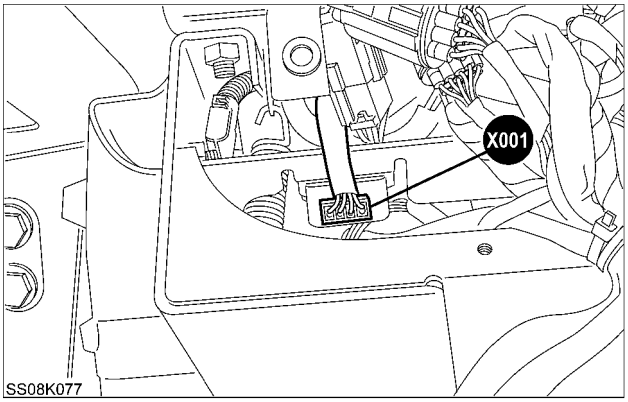
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Connector - Component Diagram 00

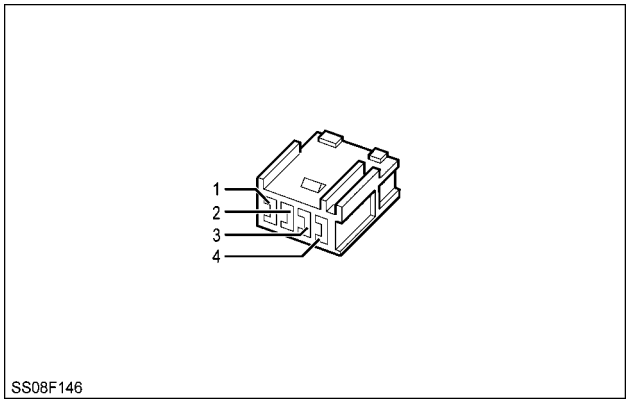
X001 CLUTCH SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1001AH (W)	STARTER SOLENOID FEED
2	7425 (Y)	DRIVE SIGNAL
3	7660 (R)	TRANS CLUTCH DISCONNECT
4	1000 (W)	SAFETY START SWITCH SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K077 1



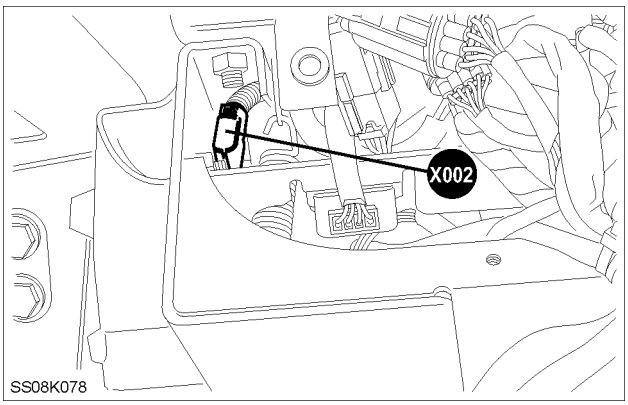
SS08F146 2

STEERING CONSOLE

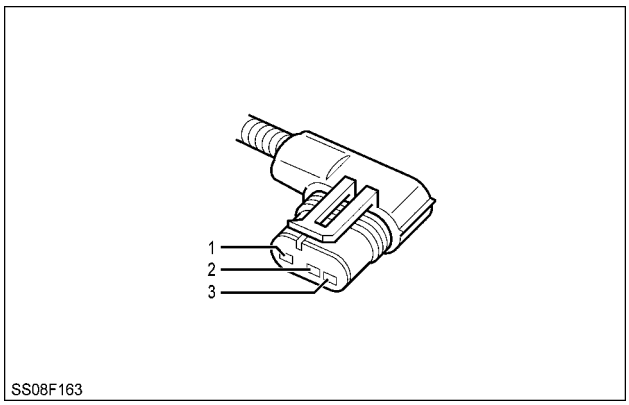
X002 CLUTCH POTENTIOMETER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7525A (G)	TRANS SENSOR SUPPLY 5v
2	7430 (Y)	CLUTCH POSITION SIGNAL
3	60B (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K078 3



SS08F163 4

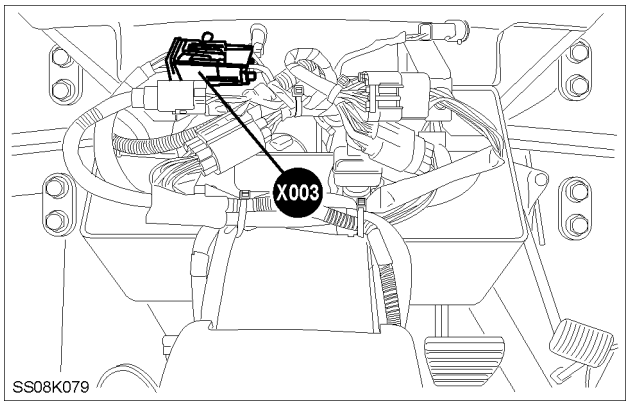
STEERING CONSOLE

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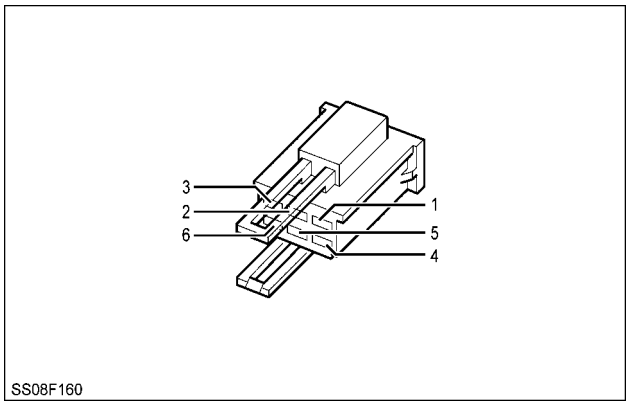
X003 STARTER SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150A (N)	BATTERY FEED (UNFUSED)(ALL)
2	137 (W)	RADIO FEED
3	71 (W)	IGNITION SWITCHED FEEDS (UNFUSED)
4	1010 (G)	IGNITION RELAY (COIL)
6	1000 (W)	SAFETY START SWITCH SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K079 5



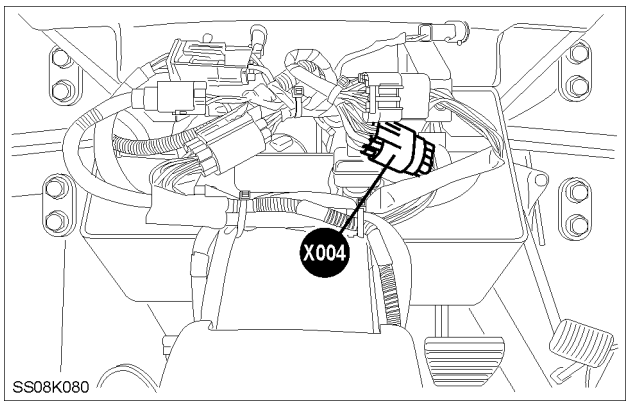
SS08F160 6

STEERING CONSOLE

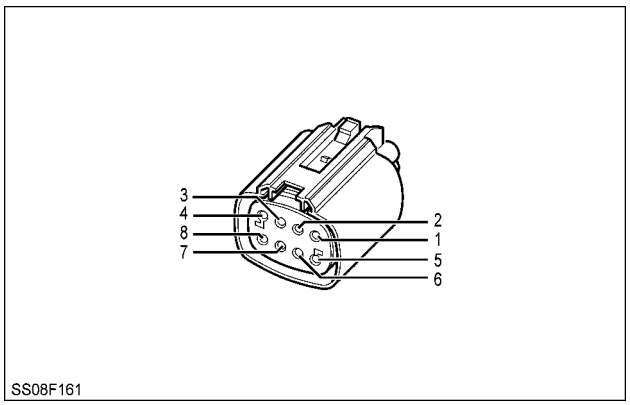
X004 MAIN LIGHT SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150AA (N)	BATTERY FEED (UNFUSED)(ALL)
2	1024 (R)	RIGHT & LEFT HAND SIDELAMP FEED
3	1027D (U)	HEADLAMP MAIN BEAM
4	1030C (U)	HEADLAMP DIP BEAM
5	3000 (G)	FLASHER UNIT SUPPLY (TERMINAL 49)
6	376 (L)	HORN FEED
7	3001 (G)	LEFT HAND FLASHER CIRCUIT
8	3002 (G)	RIGHT HAND FLASHER CIRCUIT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K080 7



SS08F161 8

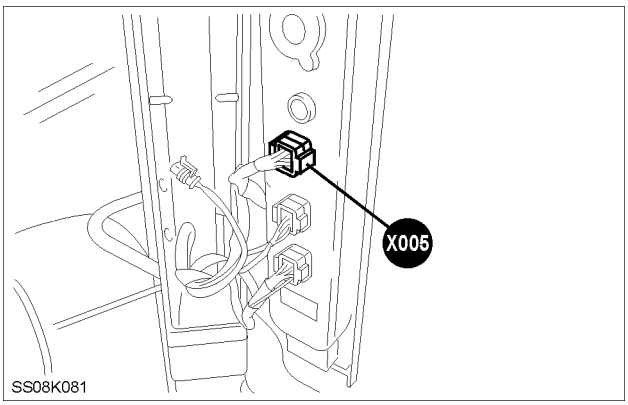
BEHIND STEERING CONSOLE

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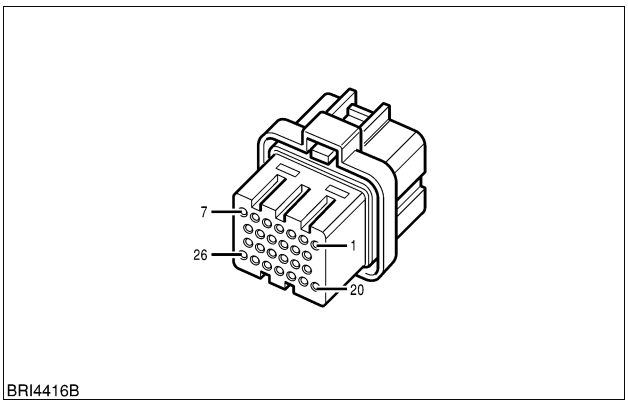
X005 INSTRUMENT CLUSTER UNIT CN1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3017 (G)	EPB SYSTEM FAILURE WARNING LIGHT
4	3016 (S)	BRAKE FLUID LEVEL SIGNAL
5	3005 (G)	LEFT HAND TURN SIGNAL WARNING LAMP
6	3004 (G)	RIGHT HAND TURN SIGNAL WARNING LAMP
8	7640Z (TN)	DIAGNOSTIC PLUG RS232 IN
9	7650Z (W)	DIAGNOSTIC PLUG RS232 OUT
11	1005 (S)	AIR CLEANER WARNING LAMP
12	7130 (N)	HYD FILTER WNG LP
14	1052 (Y)	GET U HOME LIGHTS RELAY
15	1012E (R)	ILLUMINATION
16	1001P (W)	STARTER SOLENOID FEED
19	2014A (G)	ENGINE OIL PRESSURE SENDER (+5 VOLT)
22	2095 (G)	INSTRUMENT SIGNAL GROUND
23	57BE (B)	EARTH (ALL)
24	160R (Y)	BATTERY SUPPLY ELECTRONICS
25	1006 (N)	ALTERNATOR WARNING LAMP
26	9031A (L)	ADIC MEMORY B+

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K081 9



BRI4416B-02 10

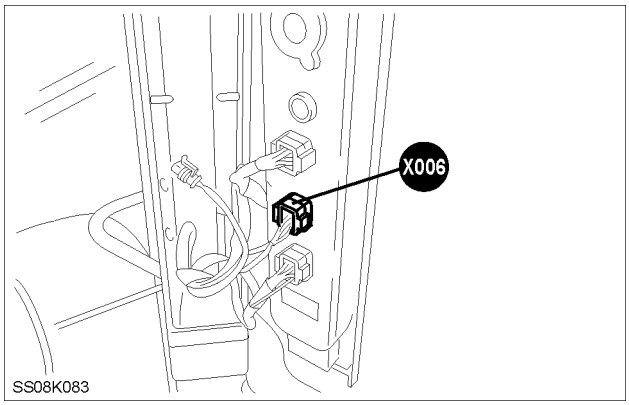
BEHIND INSTRUMENT CLUSTER

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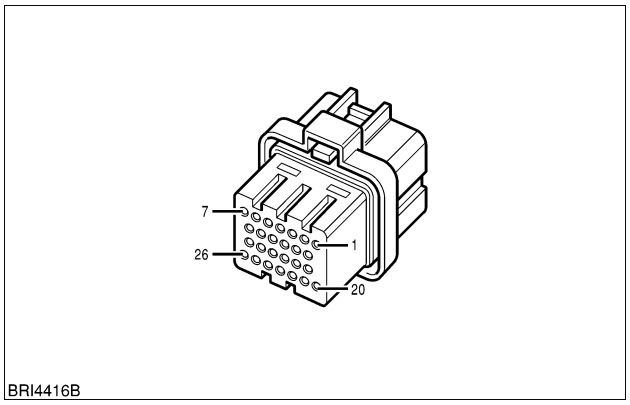
X006 INSTRUMENT CLUSTER UNIT CN2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
11	3062 (L)	IMPLEMENT SOCKET SWITCH
14	2330 (L)	PTO SPEED ISO11876 SKT.PIN#3
15	2320 (L)	TRUE GROUND SPEED ISO 11786 SKT.PIN#1
16	2300 (L)	THEORETICAL GROUND SPEED ISO 11786 SKT.PIN#2
17	2310 (L)	IN/OUT OF WORK-HPL MODE ISO11786 SKT.PIN#4

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K083 11



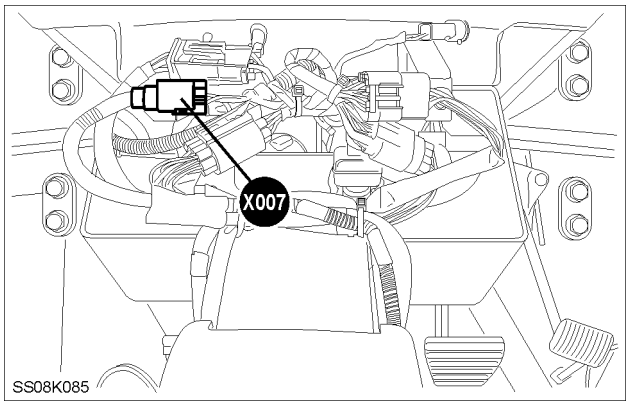
BRI4416B-03 12

BEHIND INSTRUMENT CLUSTER

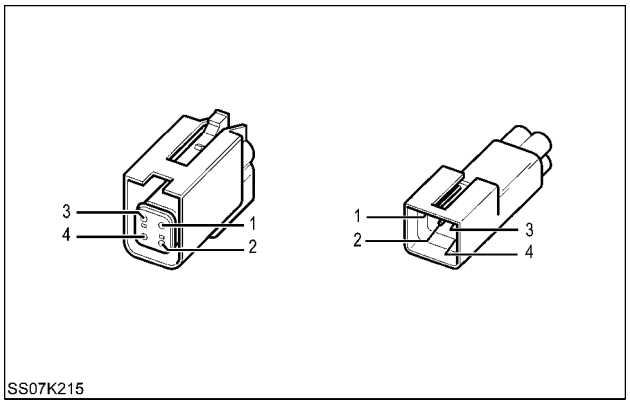
X007 HAZARD SWITCH HARNESS

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1021 (L) / 1021 (P)	HAZARD SWITCH SUPPLY (BATTERY)
2	1020A (G) / 1020A (G/W)	HAZARD SWITCH SUPPLY
3	57BF (B)	EARTH (ALL)
4	1020 (G) / 1020 (G/S)	HAZARD SWITCH SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K085 13



SS07K215 14

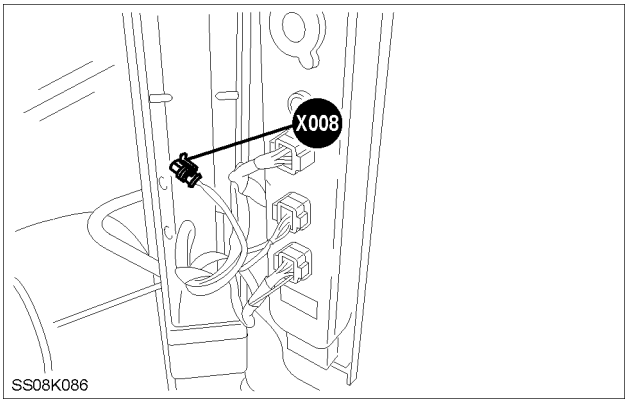
STEERING CONSOLE

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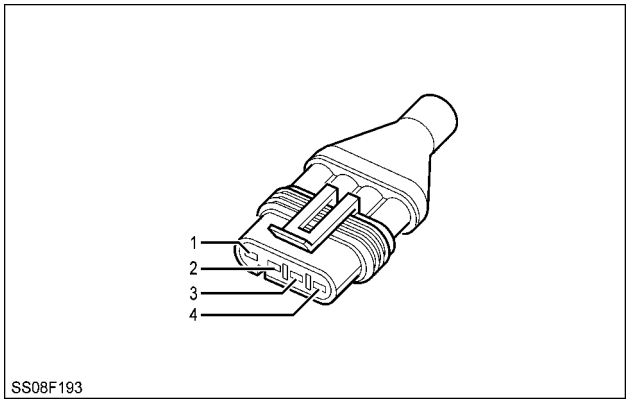
X008 KEY PAD

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1050F (G)	ACCESSORY FEED
2	5420H (G)	CAN L
3	5400A (Y)	CAN H
4	61H (B/O)	CASE GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K086 15



SS08F193 16

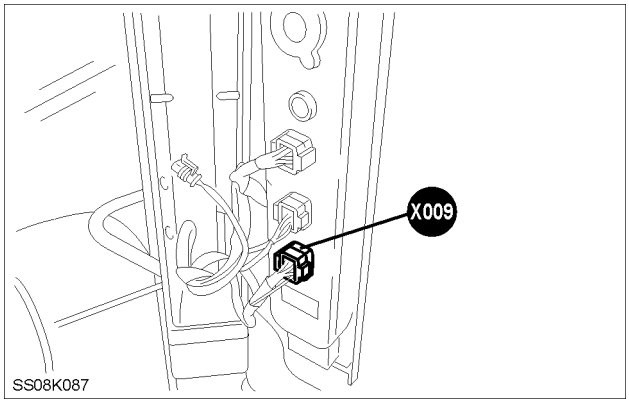
BEHIND INSTRUMENT CLUSTER

www.truck-freeworkshop.com

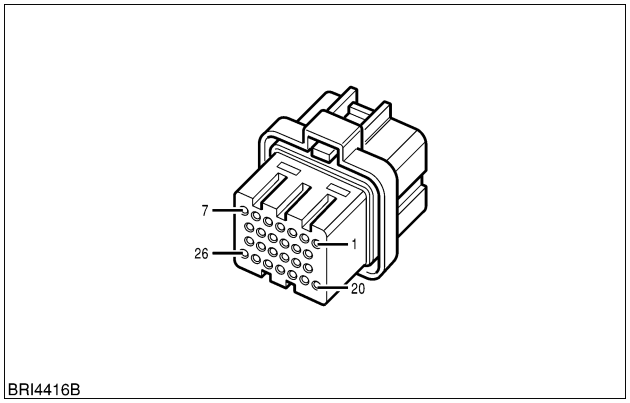
X009 INSTRUMENT CLUSTER UNIT CN3

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	7160 (R)	HYD LOW CHARGE WARNING
3	7135 (N)	HYD FILTER PRESSURE SWITCH
6	8020 (TN)	TRAILER BRAKE PRESSURE
7	3014A (R)	HANDBRAKE WARNING LAMP SIGNAL
9	2087 (O)	EXHAUST BRAKE SOLENOID
11	3052 (L)	DOME LAMP TO DOOR SWITCH
12	3500 (W)	POWER STEERING PRESSURE SIGNAL
13	1034 (LTG)	TURN SIGNAL WARNING LAMP (TERM C3)
14	29 (G)	MAIN FUEL SENDER SIGNAL
15	8010 (TN)	TRAILER BRAKE PRESSURE
16	1033 (LTG)	TURN SIGNAL WARNING LAMP (TERM C2)
17	7996 (R)	BRAKE PEDALS UNLATCHED SIGNAL
18	1026 (U)	HIGH BEAM INDICATOR LAMP
19	2200Z (G)	SERVICE MODE INITIATE
21	7155 (U)	VANE PUMP PRESSURE SENSOR SIGNAL
22	3120 (K)	STEERING SENSOR SIGNAL
25	5420G (G)	CAN L
26	5400G (Y)	CAN H

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K087 17



BRI4416B-02 18

BEHIND INSTRUMENT CLUSTER

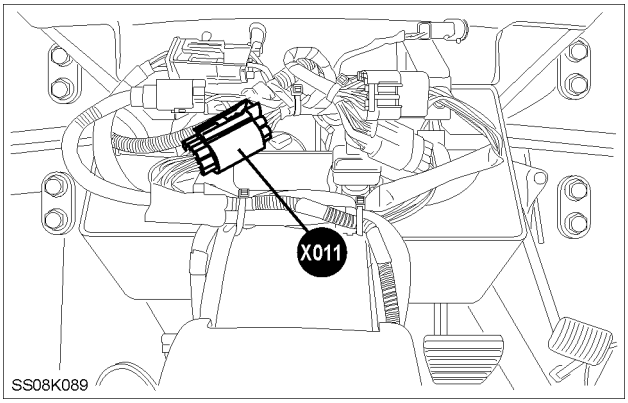
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Connector - Component diagram 01

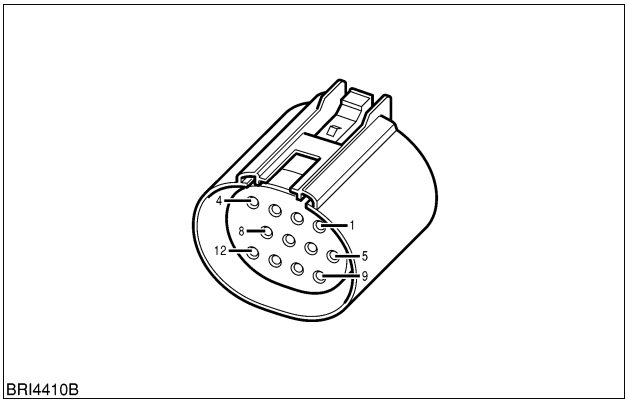
X011 FRONT AND REAR WIPER SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1038A (TN)	WINDSHIELD WIPER FEED-REAR
2	57E (B)	EARTH (ALL)
3	587 (LTG)	WINDSHIELD WIPER INTERMITTENT DELAY
5	58 (R)	WIPER MOTOR-LOW
6	56 (W)	WIPER MOTOR-HIGH
7	1121 (G)	RR WINDSHIELD WASH
8	1119 (G)	RR WINDSHIELD WIPER
9	97 (LTG)	WINDSHIELD WASHER FEED
10	63 (U)	WIPER MOTOR-PARK FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K089 1



BRI4410B 2

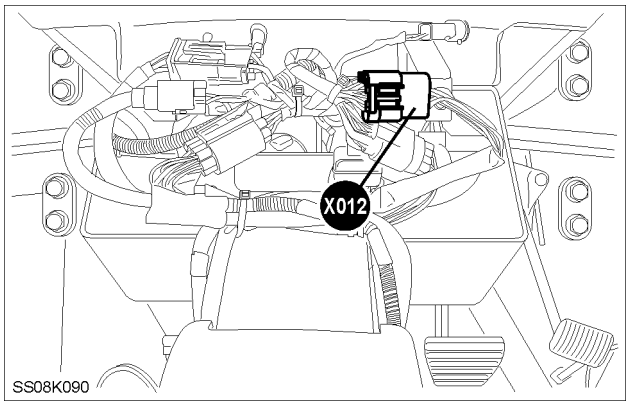
STEERING CONSOLE

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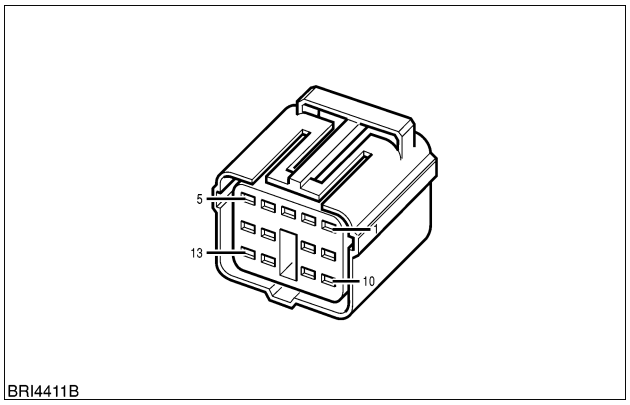
X012 SHUTTLE LEVER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7525C (G)	TRANS SENSOR SUPPLY 5v
2	7250 (S)	TRANSMISSION FORWARD SIGNAL
3	7260 (S)	TRANSMISSION REVERSE SIGNAL
4	7295 (W)	DRIVE DISABLE SIGNAL
5	7000B (U)	TRANS CONTROL SUPPLY
6	7420A (Y)	TCM TO CLUTCH POSITION SWITCH
7	7425 (Y)	DRIVE SIGNAL
8	57SS (B)	EARTH (ALL)
9	3036 (O)	EPB SHUTTLE PARK SWITCH INPUT
10	3039 (U)	EPB SHUTTLE PARK SWITCH OUTPUT
11	7730 (TN)	NOT IN PARKLOCK
12	1001X (W)	STARTER SOLENOID FEED
13	1001AH (W)	STARTER SOLENOID FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K090 3



BRI4411B 4

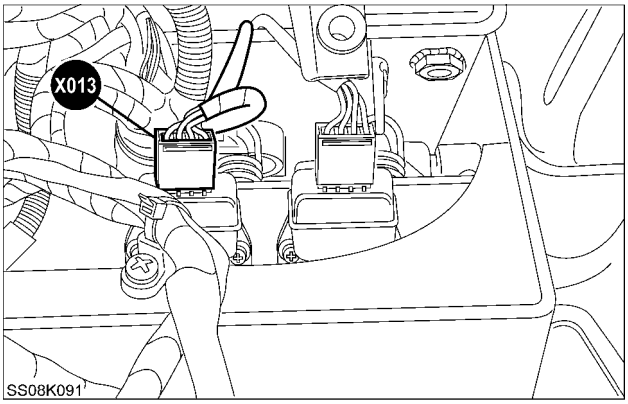
STEERING CONSOLE

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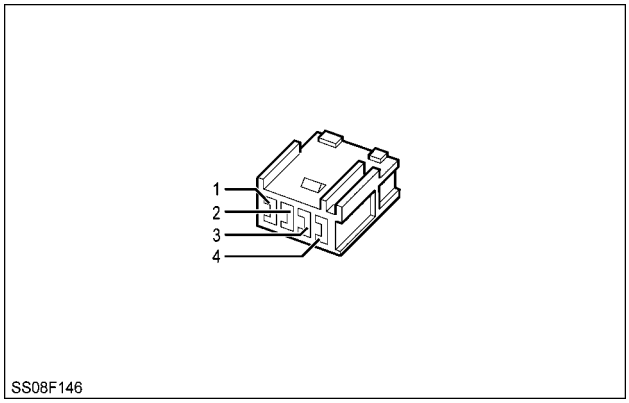
X013 STOP LAMP SWITCH LEFT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	10B (G)	IGNITION SUPPLY
2	10A (G)	IGNITION SUPPLY
3	840A (G)	R & L STOPLAMP SIGNAL
4	820 (R)	STOPLAMP SWITCH LH

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K091 5



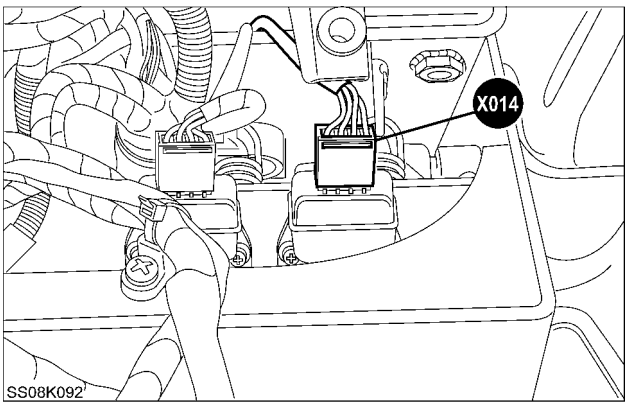
SS08F146 6

BEHIND STEERING CONSOLE

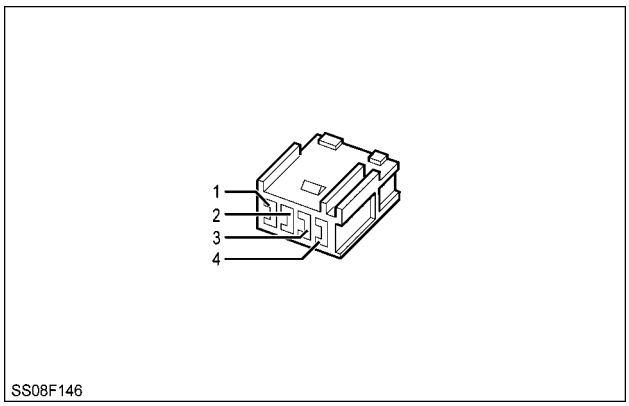
X014 STOP LAMP SWITCH RIGHT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	10C (G)	IGNITION SUPPLY
2	10DG)	IGNITION SUPPLY
3	840 (G)	R & L STOPLAMP SIGNAL
4	830 (R)	STOPLAMP SWITCH RH

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K092 7



SS08F146 8

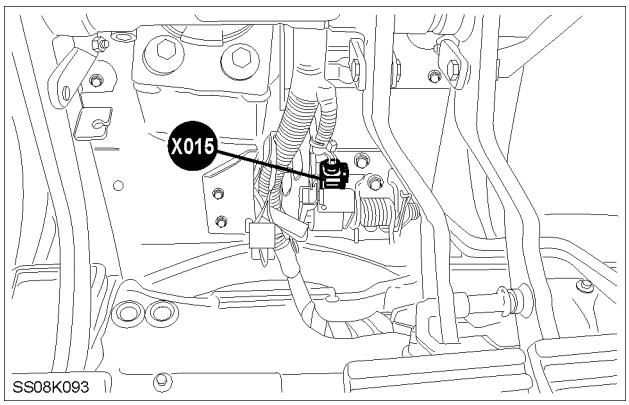
BEHIND STEERING CONSOLE

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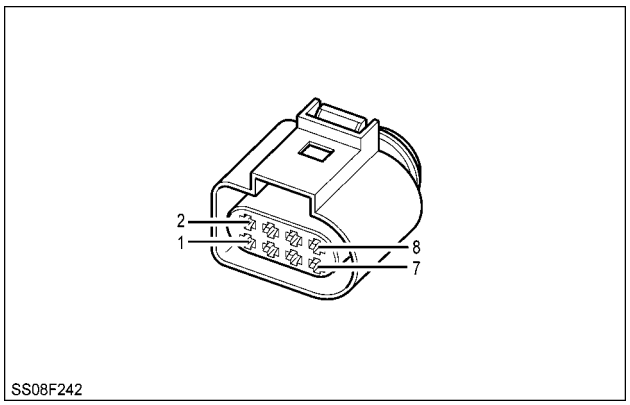
X015 FOOT THROTTLE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	6402 (G)	ECU TO THROTTLE POT. VAR
3	7000L (U)	TRANS CONTROL SUPPLY
4	6355B (R)	+5V LOW POWER REFERENCE
6	6404 (G)	THROTTLE POT. TO LOW IDLE SWITCH
7	60BL (B/W)	SENSOR GROUND
8	60BM (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K093 9



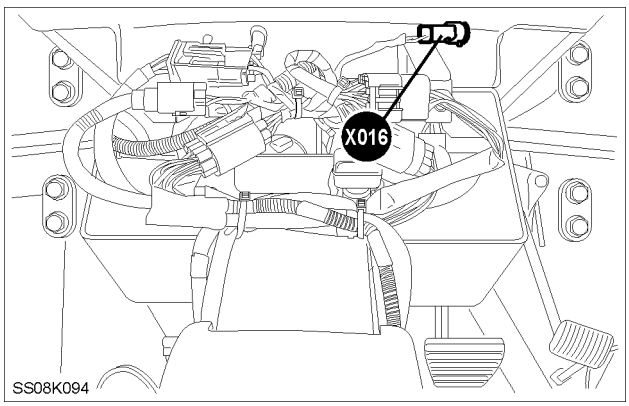
SS08F242 10

BASE STEERING CONSOLE

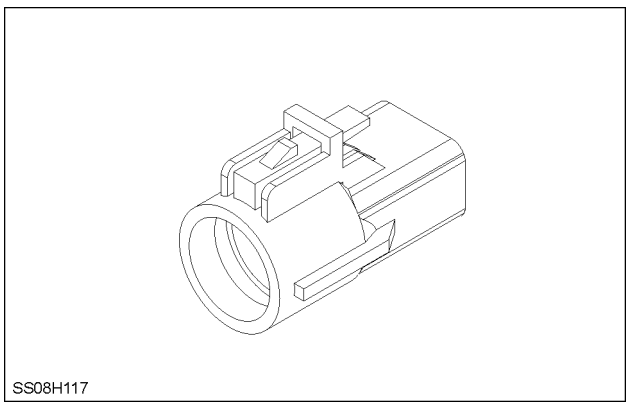
X016 BRAKE PEDALS LATCHED SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	10L (G)	IGNITION SUPPLY
2	7996 (R)	BRAKE PEDALS UNLATCHED SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K094 11



SS08H117 12

STEERING CONSOLE

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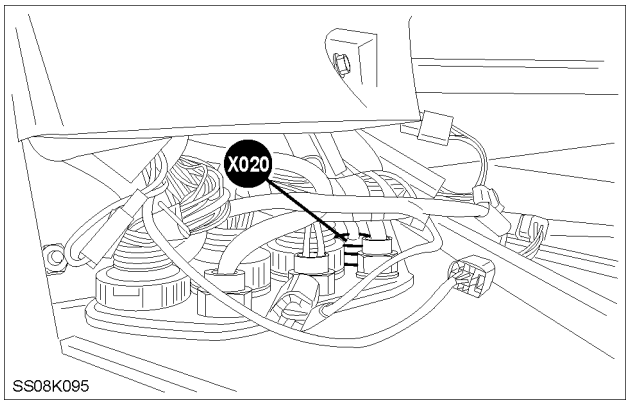
Connector - Component diagram 02

X020 EXTENSION HARNESS CONNECTOR 2 (CAB)

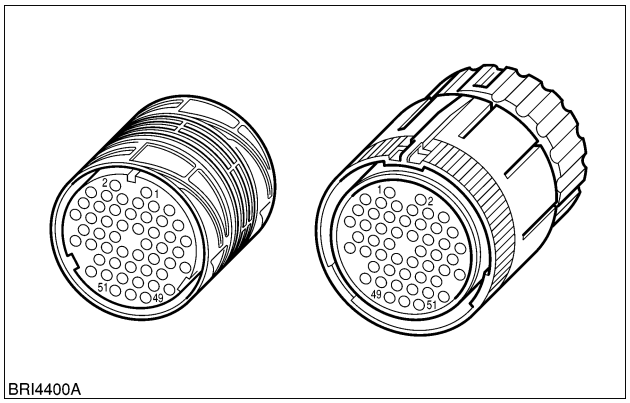
POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	29 (G)	MAIN FUEL SENDER SIGNAL
2	1013D (R) / 1013D (N)	RIGHT HAND LAMPS
3	1014E (R) / 1014E (B)	LEFT HAND LAMPS
4	810A (G) / 810A (R)	STOPLAMPS
5	349 (TN) / 349 (G)	TRAILER TURN LAMPS RH
6	350 (TN) / 350 (Y)	TRAILER TURN LAMPS LH
7	7925 (L)	TCM CLUTCH C RETURN
8	3286 (TN)	SUSPENSION LOCKOUT SOLENOID LOWER RETURN (-)
9	7160 (R)	HYD LOW CHARGE WARNING
10	3281 (TN)	SUSPENSION LOCKOUT SOLENOID UPPER RETURN (-)
11	2055A (W) / -	PTO SYNCHRO GROUND SPEED ENGAGED
12	2095B (G)	INSTRUMENT SIGNAL GROUND
13	3270 (O)	LOWER SOLENOID RET
14	3250 (O)	RAISE SOLENOID RET
15	7407 (K)	HYDROSTAT 1 SOLENOID +
16	3240 (O)	RAISE SOLENOID PWR
18	3260 (O)	LOWER SOLENOID PWR
19	7408 (L)	HYDROSTAT 1 SOLENOID GND
20	8010A (TN)	TRAILER BRAKE PRESSURE
21	8000A (N)	TRAILER BRAKE SOLENOID
22	8000X (N)	TRAILER BRAKE SOLENOID
23	3280 (O)	SUSPENSION LOCKOUT SOLENOID UPPER
24	8010 (TN)	TRAILER BRAKE PRESSURE
25	60A (B/W)	SENSOR GROUND
26	8020 (TN)	TRAILER BRAKE PRESSURE
27	8060D (U)	TRAILER BRAKE SUPPLY
28	3500 (W)	POWER STEERING PRESSURE SIGNAL
29	3285 (TN)	SUSPENSION LOCKOUT SOLENOID LOWER
30	5515 (S)	EHR +12V IGN.
31	5500V (R) / 5500L (R)	EHR CAN HIGH
32	5510V (U) / 5510L (U)	EHR CAN LOW
33	4055 (W)	LINK LEVEL TOP LINK EXTEND SOLENOID
34	4056 (W)	LINK LEVEL TOP LINK RETRACT SOLENOID
35	4057 (W)	LINK LEVEL RIGHT LINK RAISE SOLENOID
36	4058 (W)	LINK LEVEL RIGHT LINK LOWER SOLENOID
37	7135 (N) / -	HYD FILTER PRESSURE SWITCH
38	4054 (W)	LINK LEVEL DUMP SOLENOID
39	5830 (R) / 5830 (U)	HIGH FLOW PUMP LINK
40	5900F (Y) / 5900B (Y)	ISO BUS CAN SIGNAL LOW
41	5910F (G) / 5910B (G)	ISO BUS CAN SIGNAL HIGH
42	5915F (B) / 5915B (B)	ISO BUS CAN SUPPLY GROUND
43	5920F (R) / 5920B (R)	ISO BUS CAN SUPPLY POSITIVE
44	5970A (O)	ISO BUS ECU SIGNAL
45	5980 (U)	ISO BUS IMPLEMENT SIGNAL
46	7411 (Y)	TRANS HYDROSTAT INPUT SPEED SENSOR (CVT)
47	7970 (L)	TRANS MED/REV
48	7130 (N)	HYD FILTER WNG LP
49	8070 (L)	TRAILER PARK BRAKE SOLENOID
50	2250N (K) / -	PTO FRONT - SUPPLY
51	2012 (Y)	TRANS OIL PRESSURE WARNING LAMP

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NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K095 1



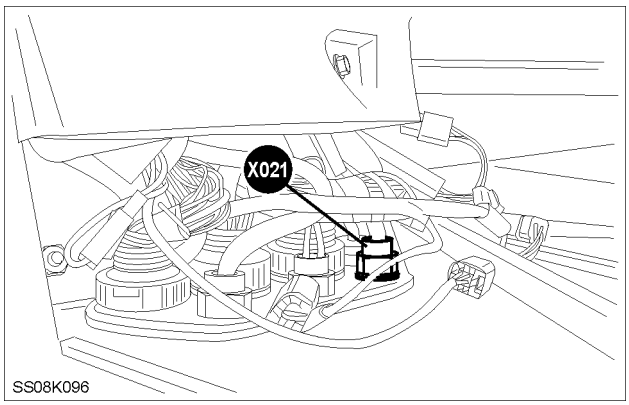
BRI4400B-03 2

FRONT RIGHT HAND CAB FLOOR

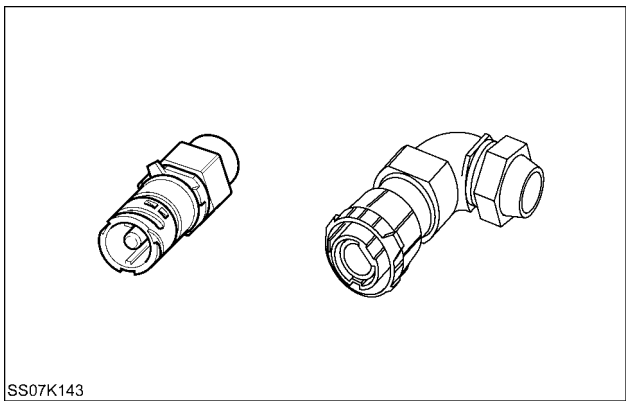
X021 MAIN POWER (FUSE) 1 POWER B+

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1 (R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K096 3



SS07K143 4

FRONT RIGHT HAND CAB FLOOR

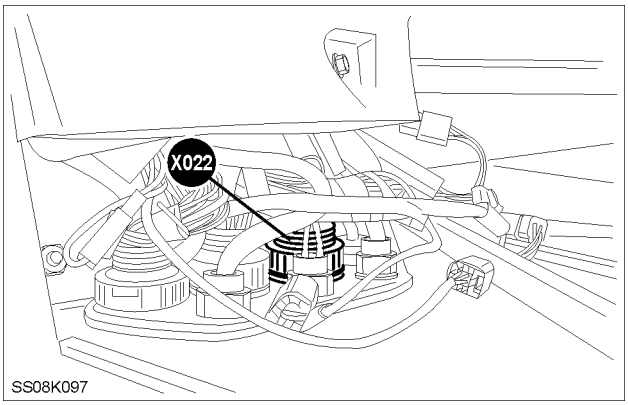
X022 EXTENSION HARNESS CONNECTOR 1 (ELECTRONIC)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3024 (Y)	2WD SOLENOID
2	7584 (U) / 7584 (R)	PARKLOCK SENSOR SWITCH SIGNAL
3	7080 (LTG)	DIFF-LOCK SOLENOID FEED
4	2130 (N)	PTO BRAKE SOLENOID
5	2051 (O)	PTO SOLENOID RETURN (-)
6	2042 (O)	PTO SOLENOID-REAR
7	2140 (O)	PTO SPEED SENSOR
8	2062 (W)	PTO TWIST SENSOR
9	7910 (TQ)	CLUTCH 'B' SIGNAL
10	7935 (L)	TCM CLUTCH D RETURN
11	7401 (L)	TRANS RPM SPEED SENSOR
12	7400 (Y)	TRANS RPM SPEED SENSOR TO TCM INPUT
13	7155 (U)	VANE PUMP PRESSURE SENSOR SIGNAL
14	7930 (TQ)	CLUTCH 'D' SIGNAL
15	7940 (TQ)	CLUTCH 'E' SIGNAL

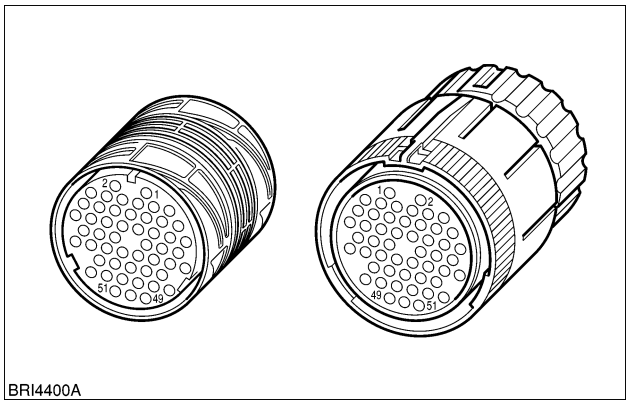
www.truck-freeworkshop.com

POS.	WIRE NUMBER	CIRCUIT REFERENCE
16	7960 (W)	TRANS SLOW/FAST
17	7431 (TQ)	SUPPLY
18	7915 (L)	TCM CLUTCH B RETURN
19	7000P (U)	TRANS CONTROL SUPPLY
20	7945 (L)	TCM CLUTCH E RETURN
21	9036 (TN)	50KPH DUMP SOLENOID RETURN
22	7225 (W)	TRANS HI RANGE SOL - RET
23	8045 (L) / -	TRANS REV SOL RET
24	7985 (G) / -	TRANS REVERSE RANGE
25	3295 (O)	FRONT SUSPENSION PRESSURE SWITCH SIGNAL
26	7235 (Y)	TRANS LOW RANGE SOL - RET
27	7785 (O) / 7785 (K)	A CLUTCH PRESSURE SIGNAL
28	7760 (W)	TORQUE SENSOR
29	9035 (TN)	50KPH DUMP SOLENOID
30	7586 (U)	PARKLOCK SOLENOID
31	7500 (G)	TRANS OIL TEMP. SENSOR
32	5097 (K)	EDC VALVE DOWN RETURN
33	5090 (K)	EDC VALVE DOWN
34	5087 (K)	EDC VALVE UP RETURN
35	5085 (K)	EDC VALVE UP
36	5070 (TN)	EDC LEFT PIN
37	5075 (K)	EDC VOLTAGE TO PINS
38	5065 (TN)	EDC RIGHT PIN
39	9033 (TN)	50KPH SOLENOID+
40	9034 (TN)	50KPH SOLENOID-
41	2014B (G)	ENGINE OIL PRESSURE SENDER (+5 VOLT)
42	7220 (S)	TRANSMISSION HIGH RANGE
43	7230 (S)	TRANSMISSION LOW RANGE
44	7900 (TQ)	CLUTCH 'A' SIGNAL
45	7775 (K) / 7775 (O)	B CLUTCH PRESSURE SIGNAL
46	5080 (K)	EDC ROCKSHAFT
47	5020A (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
48	7920 (TQ)	CLUTCH 'C' SIGNAL
49	2050L (G) / 2050AV (G)	PTO SUPPLY / DOG SUPPLY
51	7589 (U)	BRAKE PRESSURE SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K097 5



BRI4400B-03 6

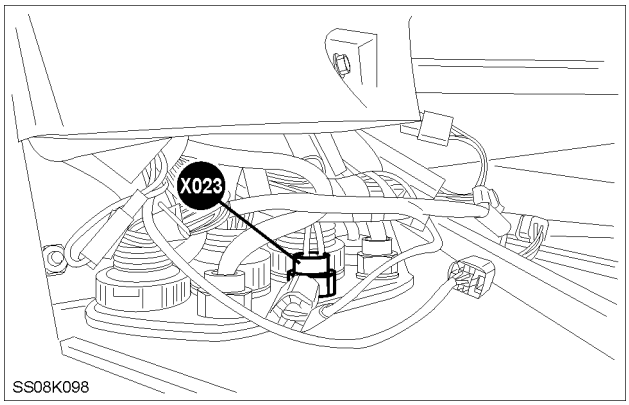
FRONT RIGHT HAND CAB FLOOR

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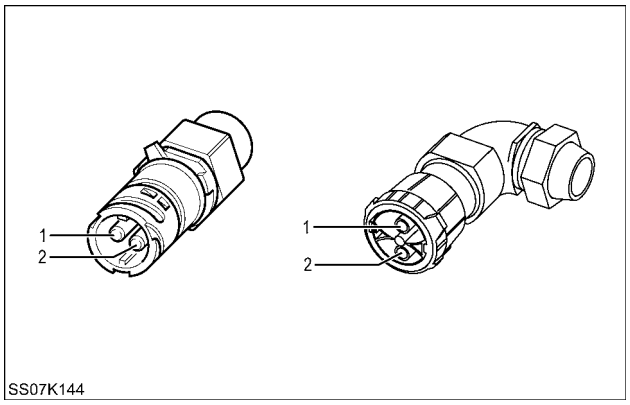
X023 MAIN POWER (FUSE) 2 POWER E

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	160 (U)	BATTERY SUPPLY ELECTRONICS
2	1C (R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K098 7



SS07K144 8

FRONT RIGHT HAND CAB FLOOR

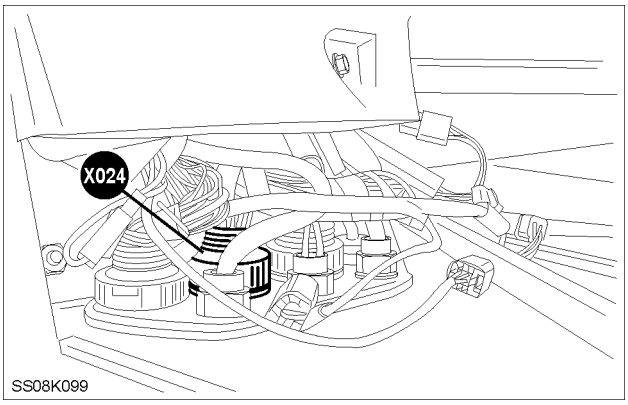
X024 CAB TO ENGINE MAIN CONNECTOR E2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3272 (O)	LOADER VALVE #1 OUT
2	3273 (O)	LOADER VALVE #1 RETURN
3	3235 (O) / 3235 (TN)	ACCELEROMETER SIGNAL
4	2590 (TN)	EXTERNAL SWITCH FHPL UP
5	2591 (TN)	EXTERNAL SWITCH FHPL DOWN
6	5920F (R) / 5920B (R)	ISO BUS CAN SUPPLY POSITIVE
7	5900F (G) / 5900B (Y)	ISO BUS CAN SIGNAL LOW
8	5915F (B) / 5915B (B)	ISO BUS CAN SUPPLY GROUND
9	5910F (Y) / 5910B (G)	ISO BUS CAN SIGNAL HIGH
10	5970A (O)	ISO BUS ECU SIGNAL
11	5980 (U)	ISO BUS IMPLEMENT SIGNAL
12	2027 (R)	RADAR ASSEMBLY (GUN) POWER
13	3120 (K)	STEERING SENSOR SIGNAL
14	2044 (O)	PTO SOLENOID-FRONT RETURN(-)
19	2570 (R)	FRONT HITCH RAISE SOLENOID
20	60AA (B/W) / 60AC (B/W)	SENSOR GROUND
21	2510 (N)	FRONT HITCH POSITION SIGNAL
22	2530 (N) / 2530B (N)	FRONT HITCH V REF
23	2031 (Y)	RADAR PRESENT
24	2028B (G)	RADAR ASSEMBLY (GUN) SIGNAL
25	3230 (U)	AXLE HEIGHT SENSOR POSITION
26	3220 (LTG) / 3220A (LTG)	AXLE HEIGHT SENSOR 5V REF
31	2043 (O)	PTO SOLENOID-FRONT
32	- / 2260 (O)	PTO FRONT - SPEED SIGNAL
34	1010C (G) / 1010 (G)	IGNITION RELAY (COIL)
35	3274 (R)	LOADER VALVE #2 OUT
36	3275 (R)	LOADER VALVE #2 RETURN
38	1018 (LTG)	AIR CONDITIONER CLUTCH
39	2006B (U)	DE-ICING SWITCH - AIR CONDITIONER
40	2006A (U)	DE-ICING SWITCH - AIR CONDITIONER

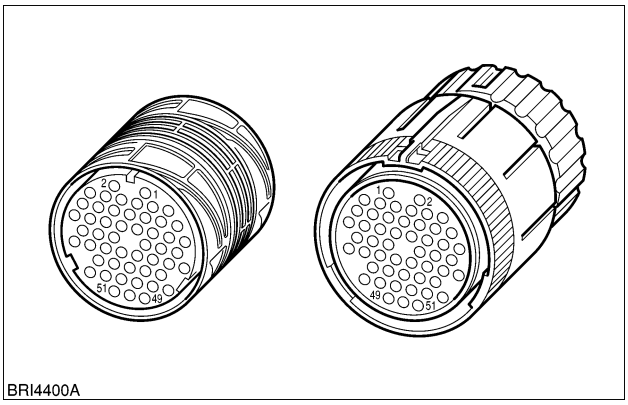
www.truck-freeworkshop.com

POS.	WIRE NUMBER	CIRCUIT REFERENCE
42	5200AA (N)	EDC VALVE SUPPLY
44	2007 (Y)	AIR CONDITIONER LOW PRESSURE
46	2250L (K) / 2250 (K)	PTO FRONT - SUPPLY
47	3070D (L) / -	'B' PILLAR SKT SUPPLY
48	9032B (Y) / -	IGN+ TO POWER SKT
49	172B (W) / 172A (W)	BATTERY ISOLATOR RELAY COIL (OFF)
50	171B (W)	BATTERY ISOLATOR RELAY COIL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K099 9



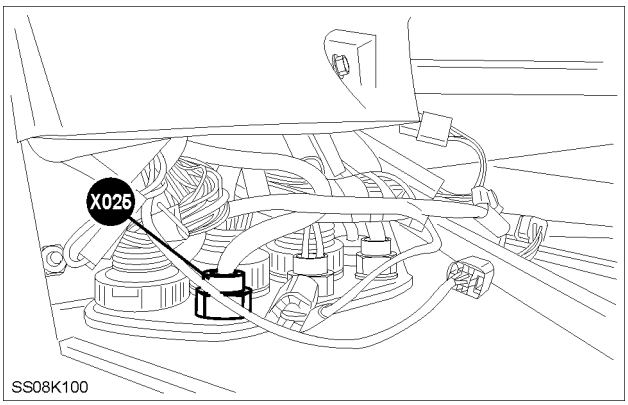
BRI4400B-03 10

FRONT RIGHT HAND CAB FLOOR

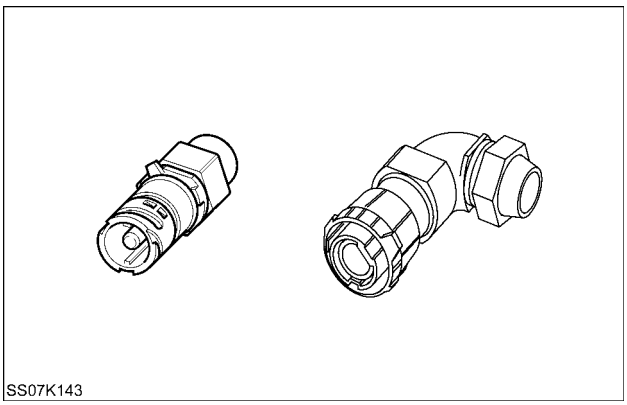
X025 MAIN POWER (FUSE) 3 POWER B

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57 (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K100 11



SS07K143 12

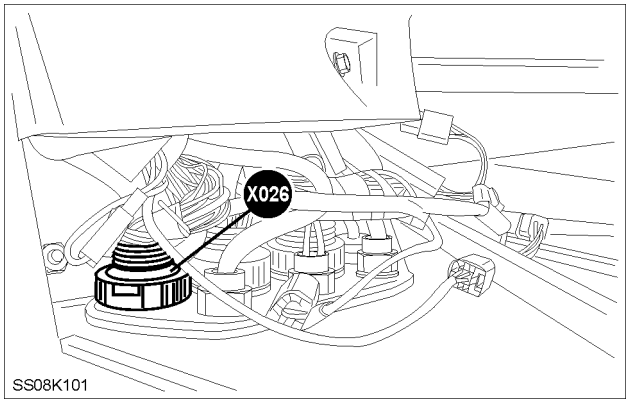
FRONT RIGHT HAND CAB FLOOR

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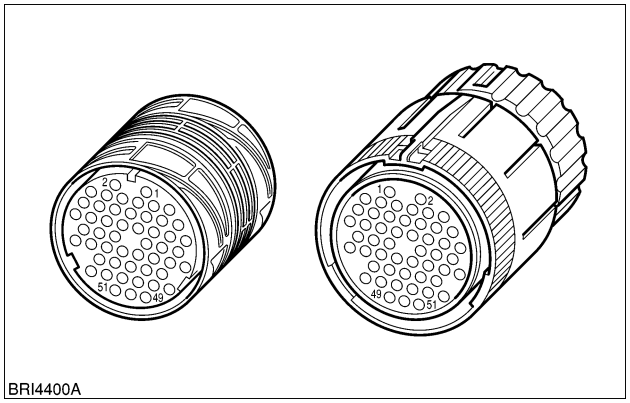
X026 MAIN HARNESS CONNECTOR - E1 - ENIGNE TO CAB

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5400BJ (Y) / 5400D (Y)	CAN H
2	5420BJ (G) / 5420D (G)	CAN L
10	2556 (N)	FRONT HITCH SWITCH COMMON RAIL
12	6315 (N)	REVERSIBLE FAN OPTION - RELAY CONTROL
13	6407 (O)	ENGINE SHUTDOWN SIGNAL (EDC16)
14	6408D (O) / 6408D (G)	FUSED B+ TO ECU (1)
15	6408N (G) / 6408A (G)	FUSED B+ TO ECU (1)
16	6408B (G)	FUSED B+ TO ECU (1)
17	6408C (G)	FUSED B+ TO ECU (1)
20	6418 (K)	ECU TO J1941(ISO) INTERFACE #2 CONNECTOR ISO K
24	3016 (S)	BRAKE FLUID LEVEL SIGNAL
25	10J (G) / 10H (G)	IGNITION SUPPLY
26	1030BB (U) / 1030B (U)	HEADLAMP DIP BEAM
27	1030A (U)	HEADLAMP DIP BEAM
28	6325 (N)	REVERSIBLE FAN OPTION - RELAY FEED
29	1073A (L)	WORKLAMP FRONT FEED
30	376 (L)	HORN FEED
36	1027BB (U) / 1027B (U)	HEADLAMP MAIN BEAM
37	1027A (U)	HEADLAMP MAIN BEAM
38	2095A (G) / 2095 (G)	INSTRUMENT SIGNAL GROUND
40	2014 (G)	ENGINE OIL PRESSURE SENDER (+5 VOLT)
41	1006A (N) / 1006 (N)	ALTERNATOR WARNING LAMP
43	71D (W) / 71C (W)	IGNITION SWITCHED FEEDS (UNFUSED)
44	1005 (S)	AIR CLEANER WARNING LAMP
45	1001S (W)	STARTER SOLENOID FEED
46	1001T (W)	STARTER SOLENOID FEED
47	2050AF (G) / -	PTO SUPPLY / DOG SUPPLY
48	6300 (N) / -	FAN SPEED
49	5020H (TN) / -	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
51	6408F (G) / 6408N (G)	FUSED B+ TO ECU (1)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K101 13



BRI4400B-03 14

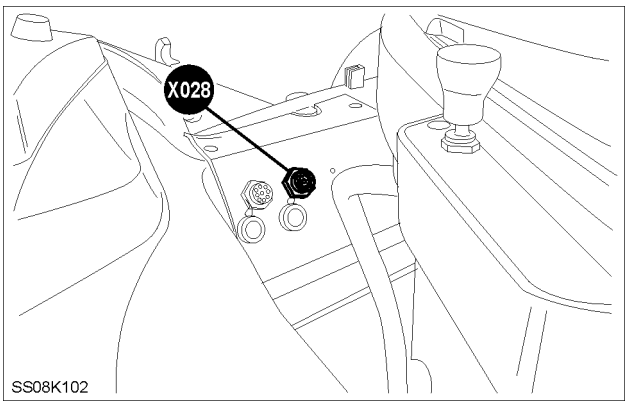
FRONT RIGHT HAND CAB FLOOR

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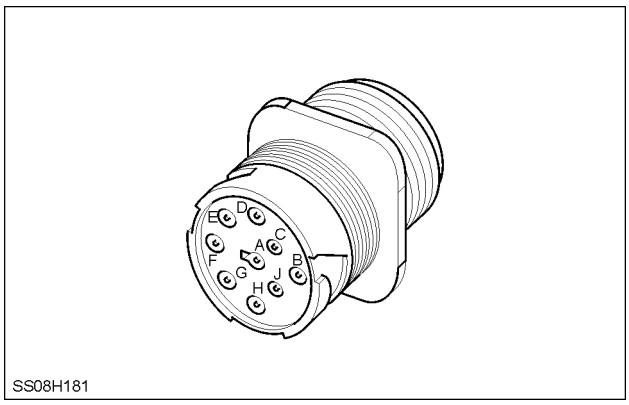
X028 DIAGNOSTIC CONNECTOR 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	57RG (B)	EARTH (ALL)
B	6408N (G)	FUSED B+ TO ECU (1)
C	5500E (R)	EHR CAN HIGH
D	5510E (U)	EHR CAN LOW
F	5960E (W)	RS232 OUTPUT TECU
G	5955C (G)	RS232 INPUT TECU

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K102 15



SS08H181 16

CAB RIGHT HAND BEHIND OPERATOR'S SEAT

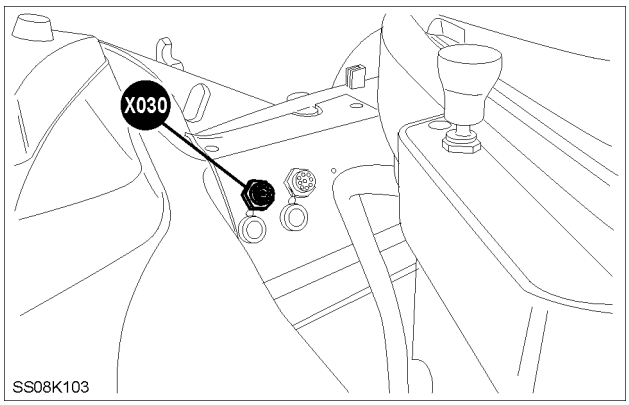
www.truck-freeworkshop.com

Connector - Component diagram 03

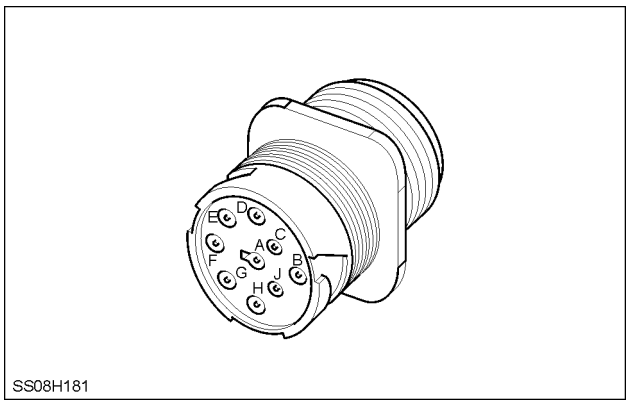
X030 DIAGNOSTIC CONNECTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	57AL (B)	EARTH (ALL)
B	6408E (G)	FUSED B+ TO ECU (1)
C	5400E (Y)	CAN H
D	5420E (G)	CAN L
E	6418 (K)	ECU TO J1941(ISO) INTERFACE #2 CONNECTOR ISO K
G	2200Z (G)	SERVICE MODE INITIATE
H	5900B (Y)	ISO BUS CAN SIGNAL LOW
J	5910B (G)	ISO BUS CAN SIGNAL HIGH

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K103 1



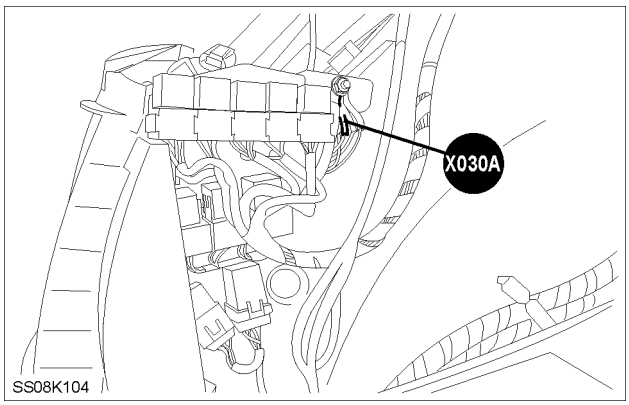
SS08H181 2

CAB RIGHT HAND BEHIND OPERATOR'S SEAT

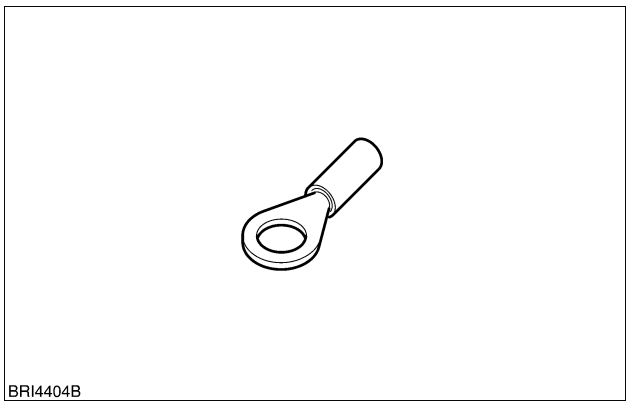
X030A EARTH HEADER 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
X	57BU (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K104 3



BRI4404B 4

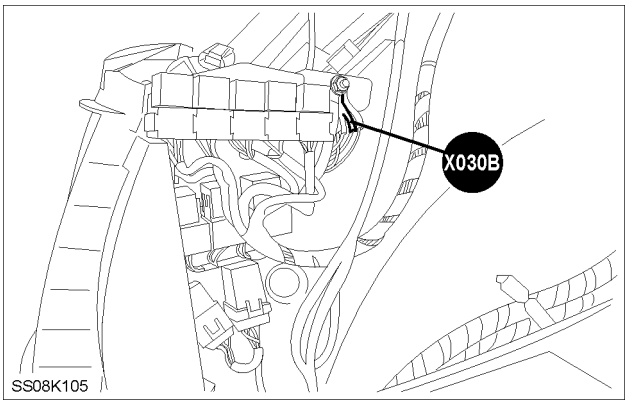
BEHIND RIGHT HAND TRIM

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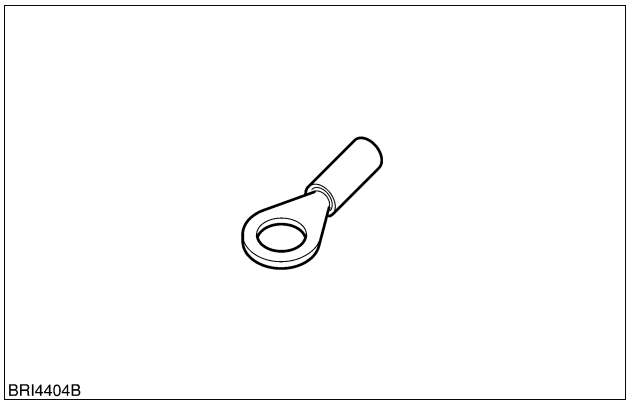
X030B EARTH HEADER 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
X	57XX (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K105 5



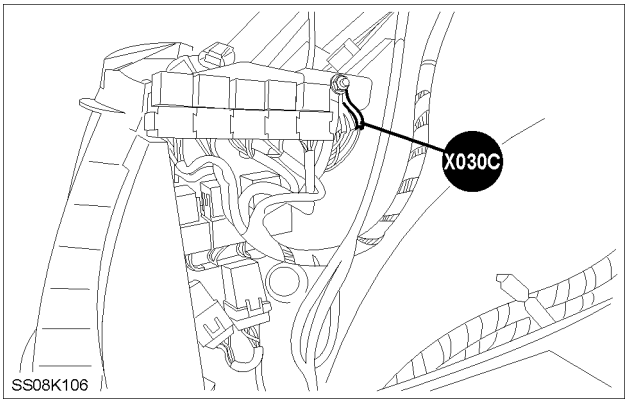
BRI4404B 6

BEHIND RIGHT HAND TRIM

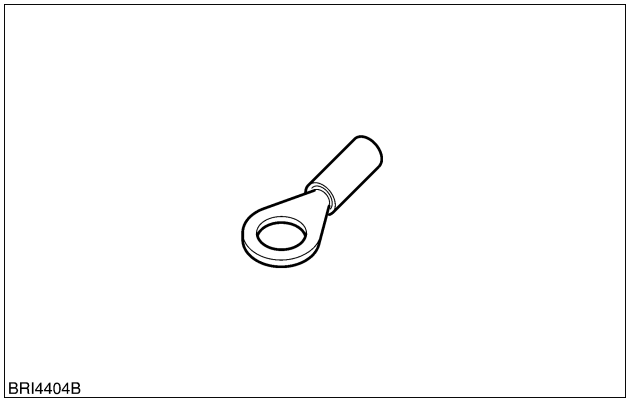
X030C EARTH HEADER 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
X	57BB (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K106 7



BRI4404B 8

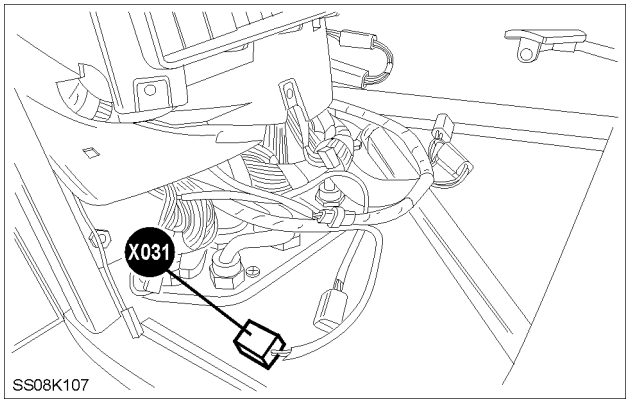
BEHIND RIGHT HAND TRIM

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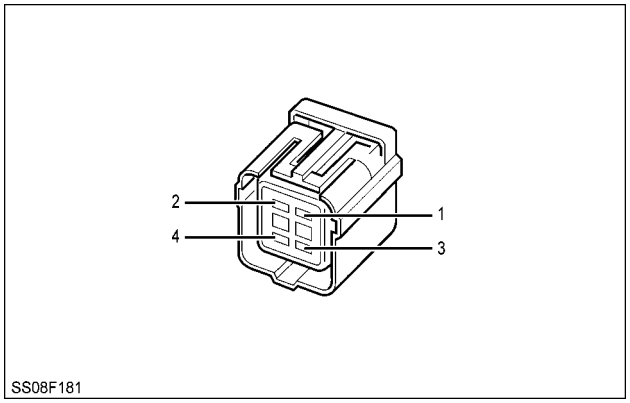
X031 ADIC DIAGNOSTIC CONNECTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7650Z (W)	DIAGNOSTIC PLUG RS232 OUT
2	7640Z (TN)	DIAGNOSTIC PLUG RS232 IN
3	57BT (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K107 9



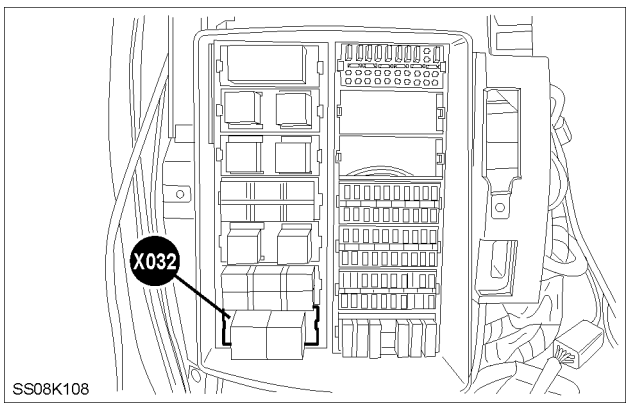
SS08F181 10

FRONT RIGHT HAND CAB FLOOR

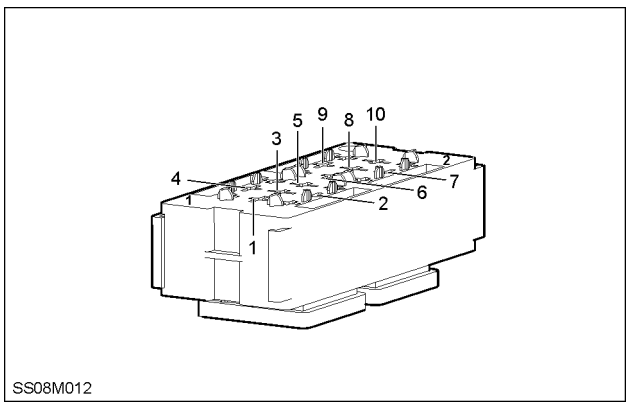
X032 TIMER RELAY FOR BATTERY ISOLATOR AND HEATED MIRROR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57HM (B)	EARTH (ALL)
2	1928 (R)	HEATED MIRROR RELAY COIL +12V FROM SW
3	1925B (R)	MIRROR CONTROL +12V
4	1927 (R)	MIRROR ILLUMINATION
5	666C (L)	DOMELAMP SWITCH FEED
6	172A (W)	BATTERY ISOLATOR RELAY COIL (OFF)
7	172 (W)	BATTERY ISOLATOR RELAY COIL (OFF)
9	57SL (B)	EARTH (ALL)
10	1L (R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K108 11



SS08M012 12

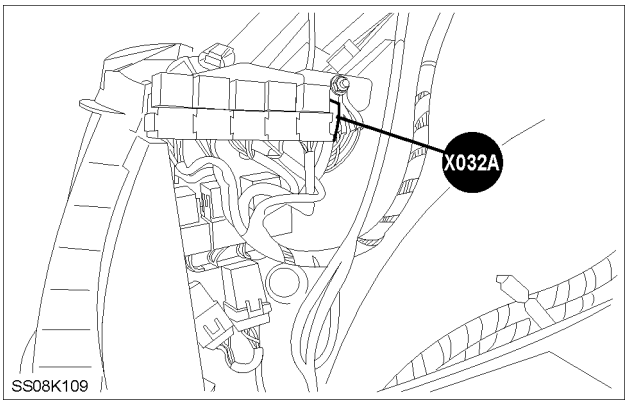
FRONT RIGHT HAND CAB

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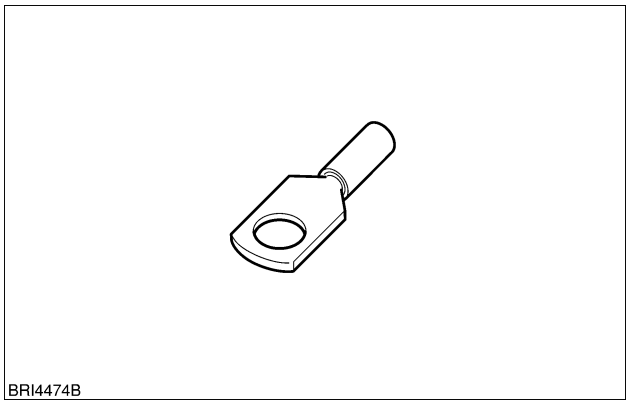
X032A EARTH HEADER 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
X	57 (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K109 13



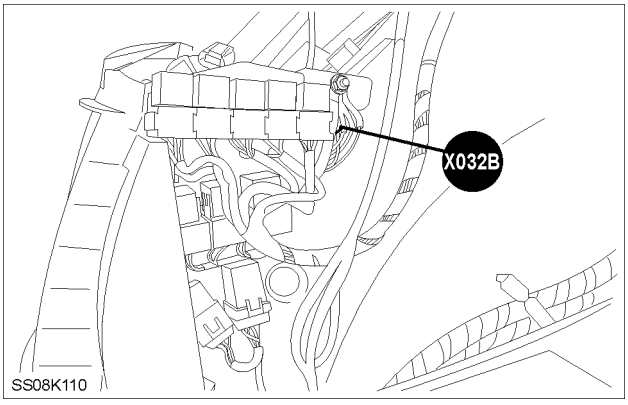
BRI4474B 14

BEHIND RIGHT HAND TRIM

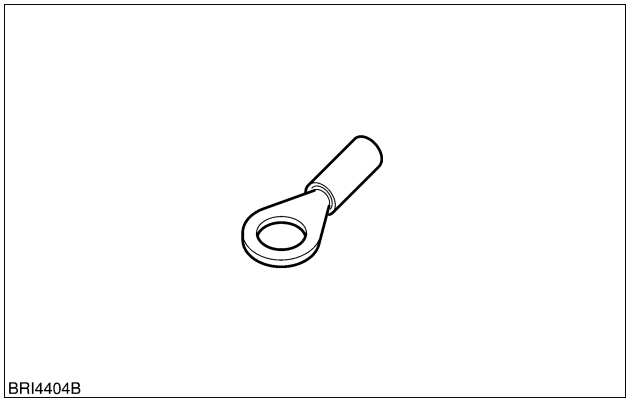
X032B EARTH HEADER 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
X	57CR (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K110 15



BRI4404B 16

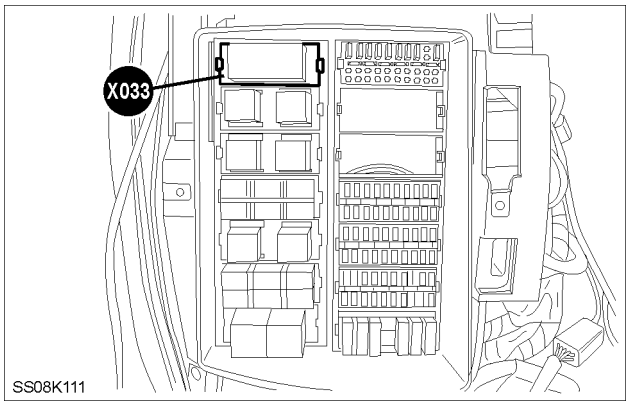
BEHIND RIGHT HAND TRIM

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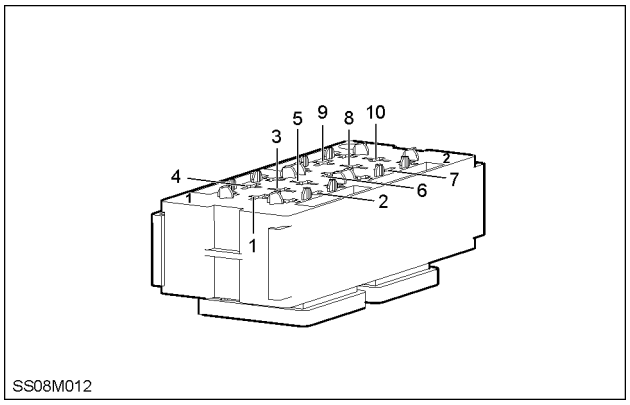
X033 WINDSCREEN WIPERS FRONT & REAR (K001 / K002)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1120 (G)	RR WINDSHIELD WIPER PARK RETURN
2	1121B (G)	RR WINDSHIELD WASH
4	57K (B)	EARTH (ALL)
5	1119 (G)	RR WINDSHIELD WIPER
6	28 (Y)	WIPER MOTOR (PARK RETURN)
7	587 (LTG)	WINDSHIELD WIPER INTERMITTENT DELAY
8	1019B (G)	WINDSHIELD WIPER FEED
9	57J (B)	EARTH (ALL)
10	63 (U)	WIPER MOTOR-PARK FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K111 17



SS08M012 18

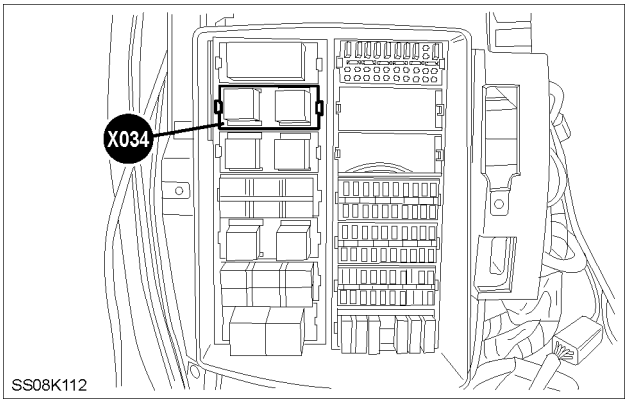
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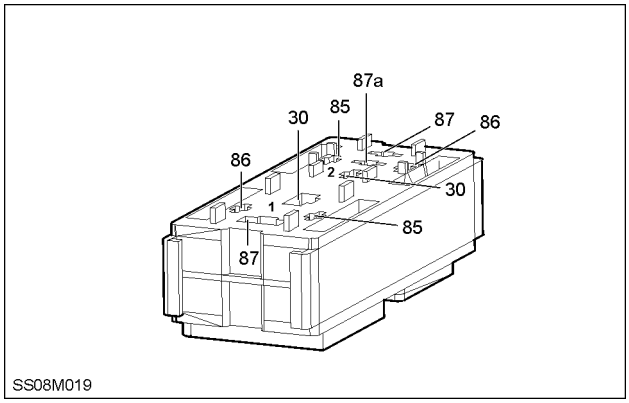
X034 IGNITION / LIGHTS RELAY (K003 / K004)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A30	150E (N)	BATTERY FEED (UNFUSED)(ALL)
A85	57AG (B)	EARTH (ALL)
A86	1010A (G)	IGNITION RELAY (COIL)
A87	1011 (Y)	SUPPLY TO FUSES
B30	1023 (N)	LIGHT SWITCH FEED
B85	57BC (B)	EARTH (ALL)
B86	1024 (R)	RIGHT & LEFT HAND SIDELAMP FEED
B87	1023A (N)	LIGHT SWITCH FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K112 19



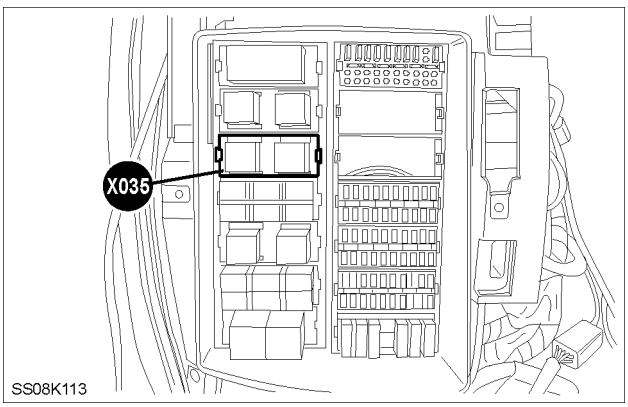
SS08M019 20

FRONT RIGHT HAND CAB

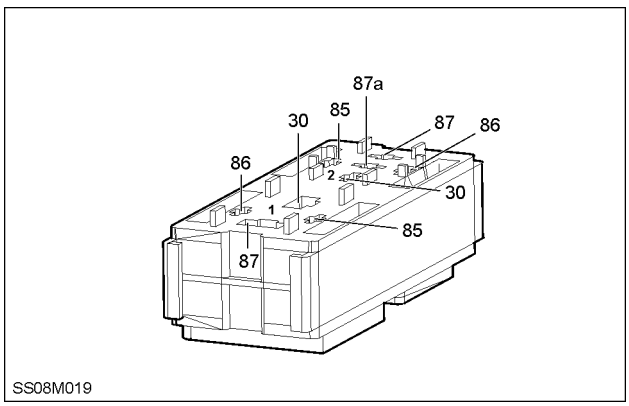
X035 STARTER MOTOR ON / BLOWER MOTOR RELAY (K005 / K006)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A30	150W (N)	BATTERY FEED (UNFUSED)(ALL)
A85	57AC (B)	EARTH (ALL)
A86	1001L (W)	STARTER SOLENOID FEED
A87	1001Y (W)	STARTER SOLENOID FEED
B30	982 (G)	BLOWER MOTOR FEED
B85	57CJ (B)	EARTH (ALL)
B86	181J (G)	BLOWER MOTOR FEED
B87	982A (G)	BLOWER MOTOR FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K113 21



SS08M019 22

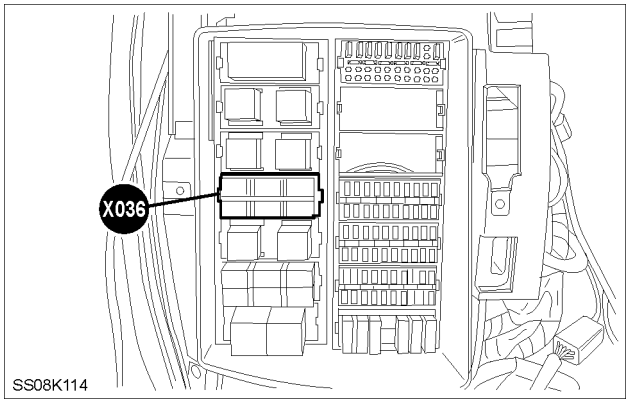
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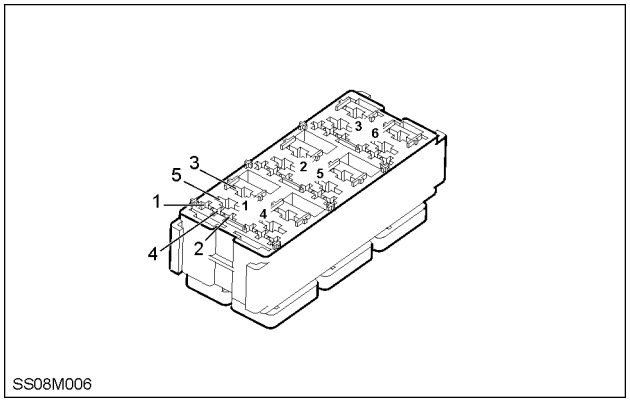
X036 CONTROL RELAYS (K007 / K012)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A1	825 (Y)	PNEUMATIC TRAILER SOLENOID +12V
A2	57CZ (B)	EARTH (ALL)
A3	10E (G)	IGNITION SUPPLY
A5	8000X (N)	TRAILER BRAKE SOLENOID
B1	57SZ (B)	EARTH (ALL)
B2	3150A (W)	HANDBRAKE SWITCH (N.C CONTACT) OFF SIG
B3	8060B (U)	TRAILER BRAKE SUPPLY
B4	8000B (N)	TRAILER BRAKE SOLENOID
B5	8070 (L)	TRAILER PARK BRAKE SOLENOID
C1	8010A (TN)	TRAILER BRAKE PRESSURE
C2	57BM (B)	EARTH (ALL)
C3	8060A (U)	TRAILER BRAKE SUPPLY
C5	8000C (N)	TRAILER BRAKE SOLENOID
D1	1027C (U)	HEADLAMP MAIN BEAM
D2	57BA (B)	EARTH (ALL)
D3	1027 (U)	HEADLAMP MAIN BEAM
D5	1027B (U)	HEADLAMP MAIN BEAM
E1	840B (G)	R & L STOPLAMP SIGNAL
E2	57BJ (B)	EARTH (ALL)
E3	810 (G)	STOPLAMPS
E5	810D (G)	STOPLAMPS
F1	1030AE (U)	HEADLAMP DIP BEAM
F2	57AZ (B)	EARTH (ALL)
F3	1030AA (U)	HEADLAMP DIP BEAM
F5	1030B (U)	HEADLAMP DIP BEAM

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K114 23



SS08M006 24

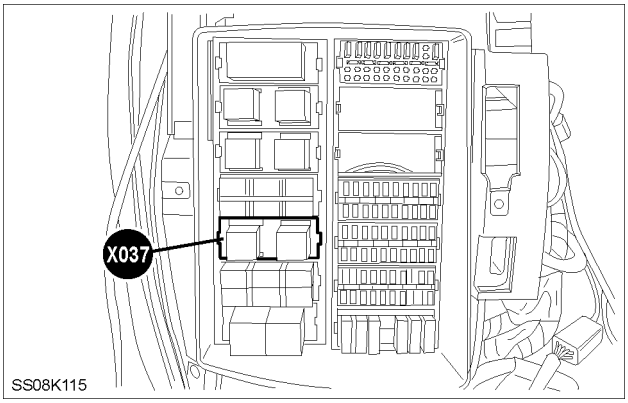
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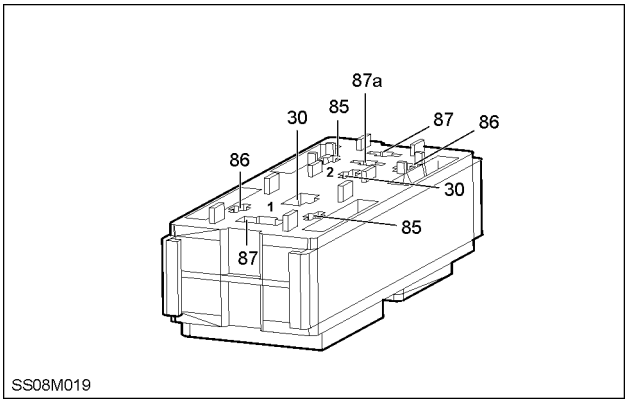
X037 ENGINE SHUTDOWN / GET U HOME RELAY (K013 / K014)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A30	6413B (O)	ENGINE SHUTDOWN RELAY SUPPLY
A85	6407 (O)	ENGINE SHUTDOWN SIGNAL (EDC16)
A86	150AP (N)	BATTERY FEED (UNFUSED)(ALL)
A87	150AN (N)	BATTERY FEED (UNFUSED)(ALL)
B30	1024 (R)	RIGHT & LEFT HAND SIDELAMP FEED
B85	1052 (Y)	GET U HOME LIGHTS RELAY
B86	1030AC (U)	HEADLAMP DIP BEAM
B87	1030AB (U)	HEADLAMP DIP BEAM

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K115 25



SS08M019 26

FRONT RIGHT HAND CAB

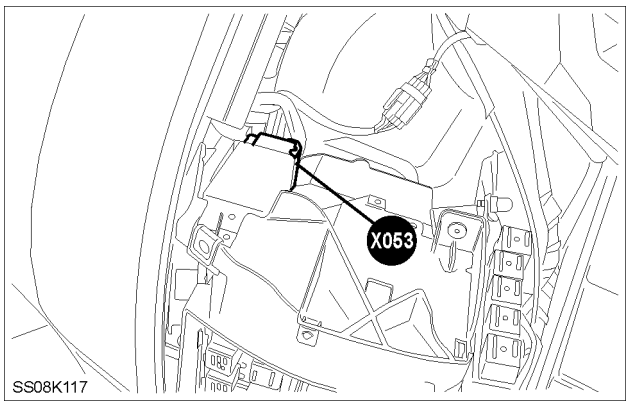
www.truck-freeworkshop.com

Connector - Component diagram 05

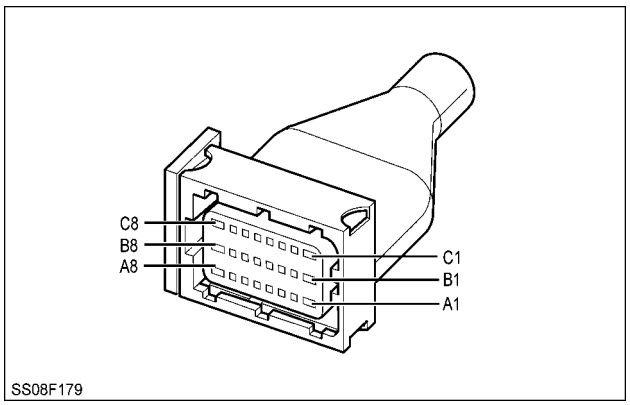
X053 FLASHER ECU

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A1	3009A (G)	FLASHER UNIT SUPPLY B+
A2	249 (LTG)	SMV LAMPS RH
A3	349 (TN)	TRAILER TURN LAMPS RH
A4	250 (LTG)	SMV LAMPS LH
A5	350 (TN)	TRAILER TURN LAMPS LH
A6	1020 (G)	HAZARD SWITCH SUPPLY
A7	1034 (LTG)	TURN SIGNAL WARNING LAMP (TERM C3
A8	3000B (G)	FLASHER UNIT SUPPLY (TERMINAL 49)
B1	3009B (G)	FLASHER UNIT SUPPLY B+
B2	3002 (G)	RIGHT HAND FLASHER CIRCUIT
B3	3001 (G)	LEFT HAND FLASHER CIRCUIT
B4	1020A (G)	HAZARD SWITCH SUPPLY
B5	1033 (LTG)	TURN SIGNAL WARNING LAMP (TERM C2)
B6	50 (G)	LEFT HAND TURN SIGNAL
B7	49 (G)	RIGHT HAND TURN SIGNAL
B8	57BG (B)	EARTH (ALL)
C1	49A (G)	RIGHT HAND TURN SIGNAL
C2	50A (G)	LEFT HAND TURN SIGNAL
C3	1039 (LTG)	NASO LIGHTS INPUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K117 1



SS08F179 2

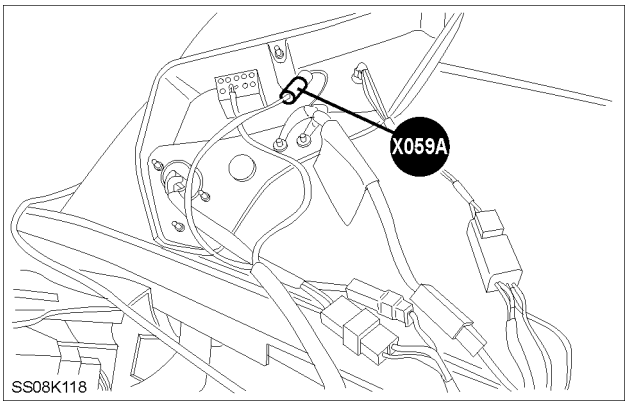
BEHIND RIGHT HAND TRIM TOP THE FUSEBOX

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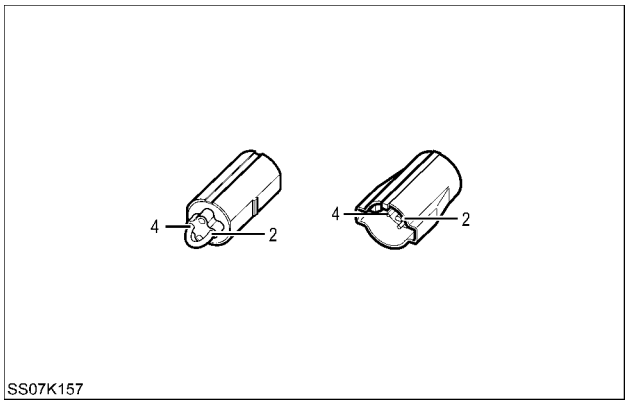
X059A LEVER MOUNTED PTO BRAKE SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	2120 (TN)	PTO BRAKE SIGNAL
4	2120A (TN)	PTO BRAKE SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K118 3



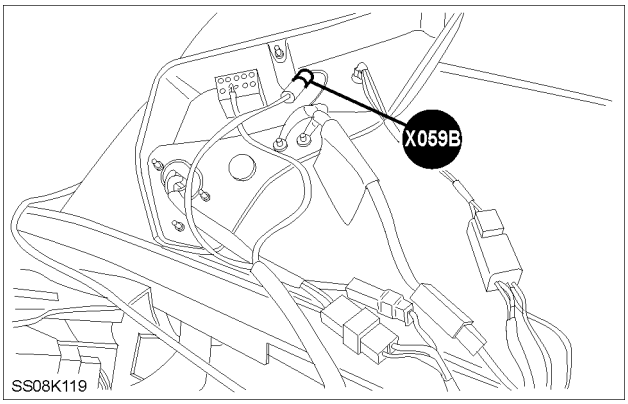
SS07K157 4

BEHIND RIGHT HAND SWITCH PANEL

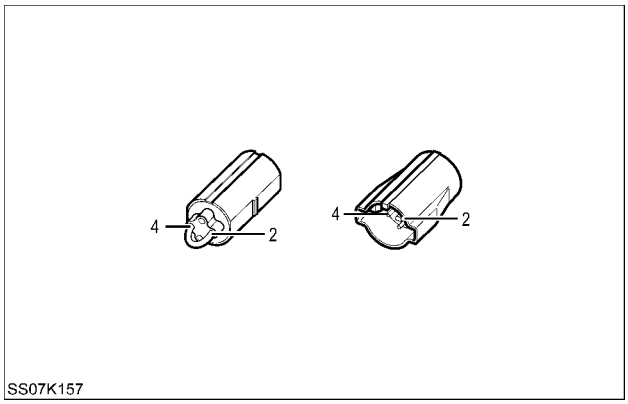
X059B LEVER MOUNTED PTO MATING HALF

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	2120B (TN)	PTO BRAKE SIGNAL
4	2120B (TN)	PTO BRAKE SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K119 5



SS07K157 6

BEHIND RIGHT HAND SWITCH PANEL

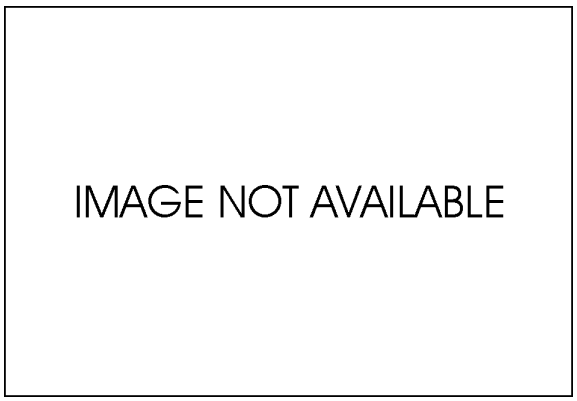
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Connector - Component diagram 06

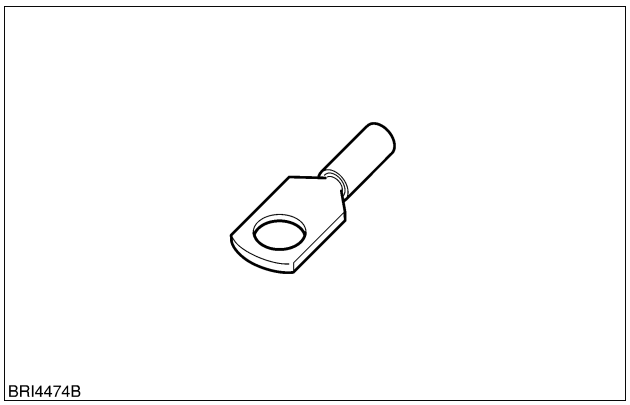
X060 FUSE BOX MAIN B+ FEED

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1 (R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 1



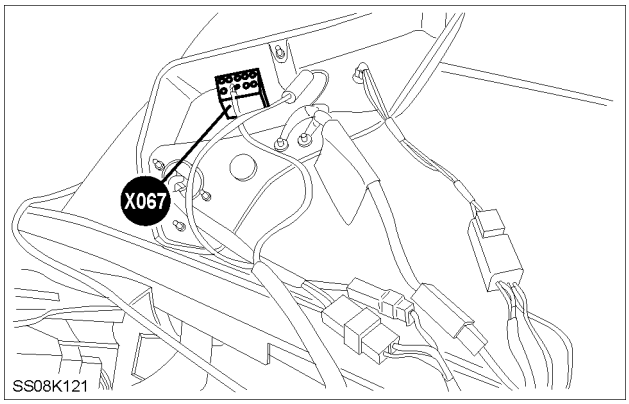
BRI4474B 2

BEHIND RIGHT HAND FUSEBOX

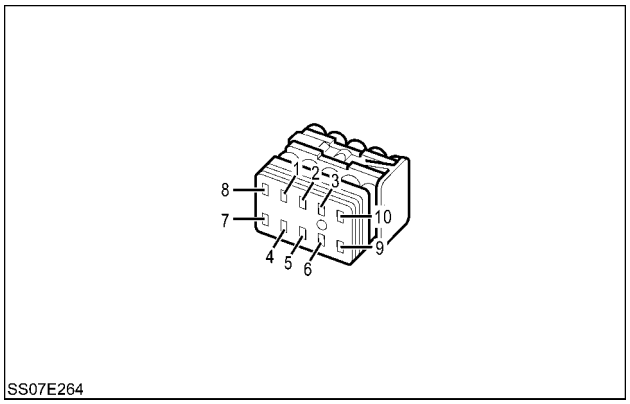
X067 REAR PTO BRAKE SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2120A (TN)	PTO BRAKE SIGNAL
2	2050J (G)	PTO SUPPLY / DOG SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K121 3



SS07E264 4

BEHIND RIGHT HAND SWITCH PANEL

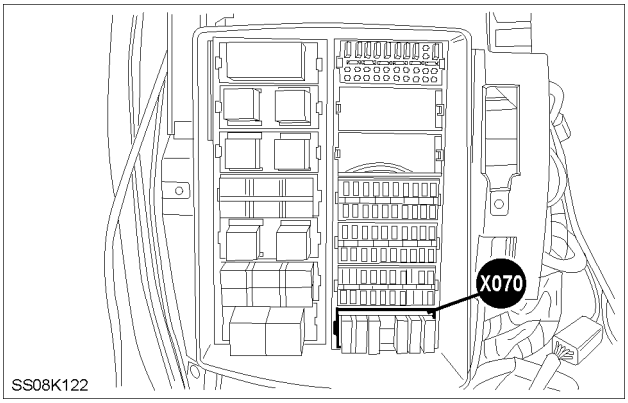
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Connector - Component diagram 07

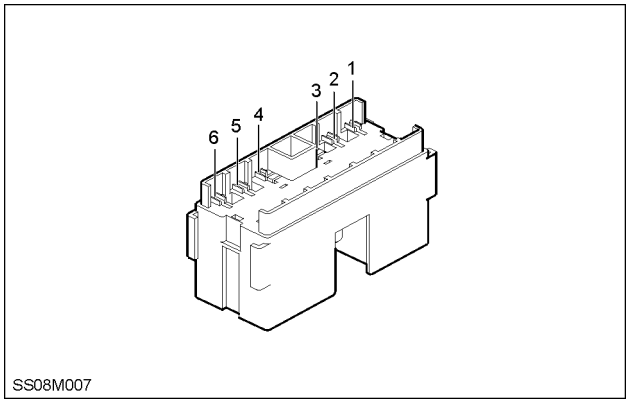
X070 MAXI - FUSE MODULE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
M1	150E (N)	BATTERY FEED (UNFUSED)(ALL)
M2	150V (N)	BATTERY FEED (UNFUSED)(ALL)
M3	150AF (N)	BATTERY FEED (UNFUSED)(ALL)
M4	150Y (N)	BATTERY FEED (UNFUSED)(ALL)
M5	150G (N)	BATTERY FEED (UNFUSED)(ALL)
M6	150F (N)	BATTERY FEED (UNFUSED)(ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K122 1



SS08M007 2

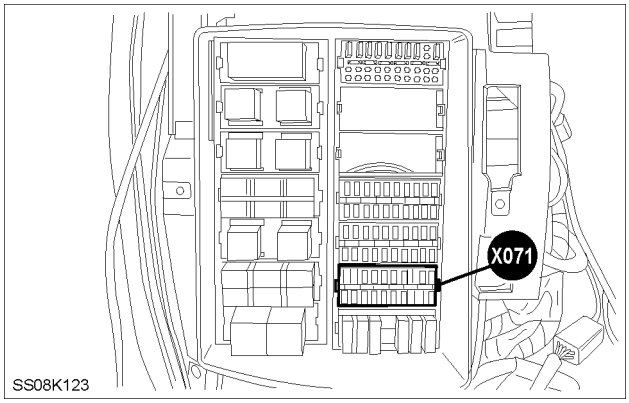
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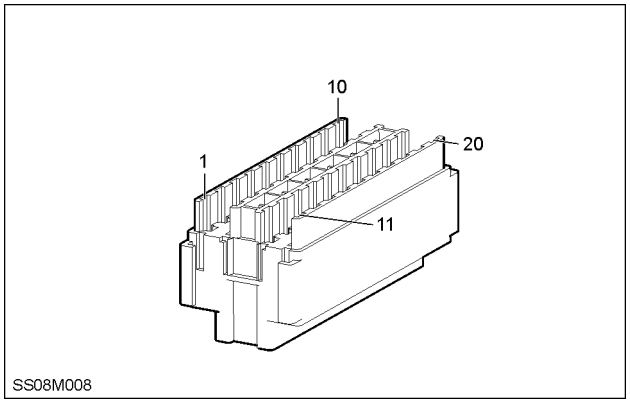
X071 MINI FUSE MODULE F041 TO F060

POS.	WIRE NUMBER	CIRCUIT REFERENCE
3A	71 (W)	IGNITION SWITCHED FEEDS (UNFUSED)
3B	71D (W)	IGNITION SWITCHED FEEDS (UNFUSED)
4A	3070D (L)	'B' PILLAR SKT SUPPLY
4B	150AJ (N)	BATTERY FEED (UNFUSED)(ALL)
5A	9032C (Y)	IGN+ TO POWER SKT.
5B	1011E (Y)	SUPPLY TO FUSES
6A	6408K (G)	FUSED B+ TO ECU (1)
7A	6413B (O)	ENGINE SHUTDOWN RELAY SUPPLY
9A	6408D (O)	FUSED B+ TO ECU (1)
10A	6325 (N)	REVERSIBLE FAN OPTION - RELAY FEED
10B	1011K (Y)	SUPPLY TO FUSES
11A	3031 (N)	EPB +12 HOT
11B	150BC (N)	BATTERY FEED (UNFUSED)(ALL)
12A	160R (Y)	BATTERY SUPPLY ELECTRONICS
13A	7000 (U)	TRANS CONTROL SUPPLY
14A	2050 (G)	PTO SUPPLY / DOG SUPPLY
14B	160C (U)	BATTERY SUPPLY ELECTRONICS
15A	5200 (N)	EDC VALVE SUPPLY
16A	2250 (K)	PTO FRONT - SUPPLY
17A	2540 (N)	FRONT HITCH +12v IGN
20A	1H (R)	BATTERY SUPPLY
20B	1E (R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K123 3



SS08M008 4

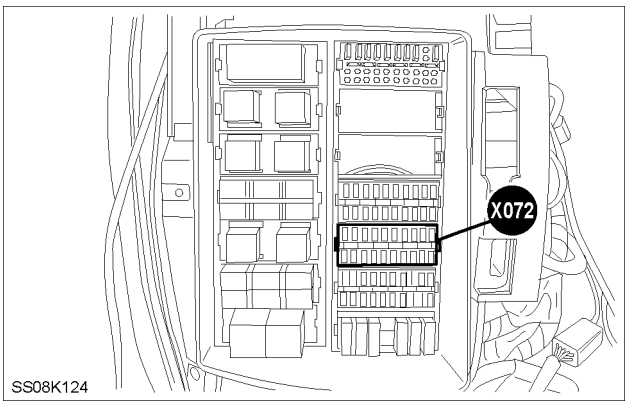
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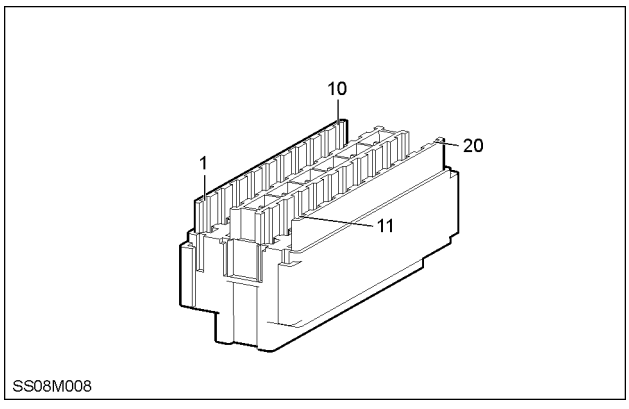
X072 MINI FUSE MODULE F021 TO F040

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1A	10J (G)	IGNITION SUPPLY
1B	1011D (Y)	SUPPLY TO FUSES
2A	1013 (R)	RIGHT HAND LAMPS
3A	1014 (R)	LEFT HAND LAMPS
3B	1023A (N)	LIGHT SWITCH FEED
4A	1012 (R)	ILLUMINATION
5A	1030 (U)	HEADLAMP DIP BEAM
5B	1023 (N)	LIGHT SWITCH FEED
6A	1027 (U)	HEADLAMP MAIN BEAM
6B	150T (N)	BATTERY FEED (UNFUSED)(ALL)
7A	1073 (L)	WORKLAMP FRONT FEED
7B	150P (N)	BATTERY FEED (UNFUSED)(ALL)
8A	998D (G)	WORK LAMP-REAR FEED (INNER)
9A	1071 (L)	WORKLAMP FRONT FEED
10A	998C (G)	WORK LAMP-REAR FEED (INNER)
10B	150AB (N)	BATTERY FEED (UNFUSED)(ALL)
11A	4011 (L)	ROTATING BEACON SWITCH SUPPLY
11B	150BA (N)	BATTERY FEED (UNFUSED)(ALL)
12A	3009 (G)	FLASHER UNIT SUPPLY B+
13A	6408 (G)	FUSED B+ TO ECU (1)
14A	9031 (L)	ADIC MEMORY B+
14B	150AG (N)	BATTERY FEED (UNFUSED)(ALL)
15A	5000 (L)	EDC MEMORY POWER
16A	1072A (L)	WORKLAMP FRONT RELAY SUPPLY
17A	1072B (L)	WORKLAMP FRONT RELAY SUPPLY
17B	150JA (N)	BATTERY FEED (UNFUSED)(ALL)
18A	1099 (R)	FEED FRONT WORKLAMP INNER
20A	3079 (R)	RADIO +12V IGNITION
20B	137 (W)	RADIO FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K124 5



SS08M008 6

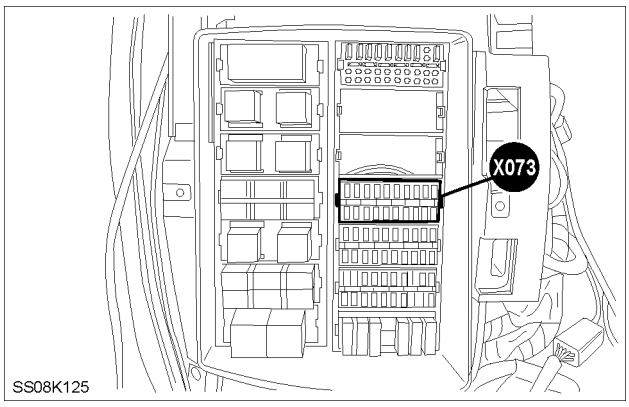
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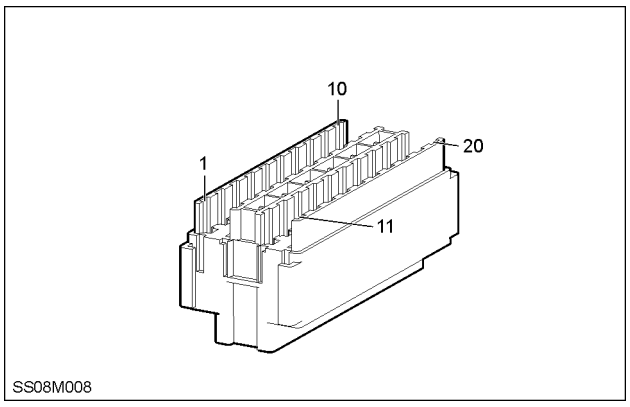
X073 MINI FUSE MODULE F001 TO F020

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1A	666 (L)	DOMELAMP SWITCH FEED
1B	150AC (N)	BATTERY FEED (UNFUSED)(ALL)
2A	3070 (L)	'B' PILLAR SKT SUPPLY
3A	981 (G)	A/C CLUTCH RELAY FEED
4A	3070A (L)	'B' PILLAR SKT SUPPLY
5A	982 (G)	BLOWER MOTOR FEED
5B	150AD (N)	BATTERY FEED (UNFUSED)(ALL)
6A	138A (L)	RADIO KAM
7A	150B (N)	BATTERY FEED (UNFUSED)(ALL)
7B	150J (N)	BATTERY FEED (UNFUSED)(ALL)
8A	150A (N)	BATTERY FEED (UNFUSED)(ALL)
9A	3271A (O)	LOADER RELAY FEED
9B	1011A (Y)	SUPPLY TO FUSES
10A	3070E (L)	'B' PILLAR SKT SUPPLY
11A	1019 (G)	WINDSHIELD WIPER FEED
12A	1038 (TN)	WINDSHIELD WIPER FEED-REAR
13A	810 (G)	STOPLAMPS
13B	1011B (Y)	SUPPLY TO FUSES
14A	3000A (G)	FLASHER UNIT SUPPLY (TERMINAL 49)
15A	10 (G)	IGNITION SUPPLY
16A	8060 (U)	TRAILER BRAKE SUPPLY
17A	9032 (Y)	IGN+ TO POWER SKT.
18A	181A (G)	BLOWER MOTOR FEED
18B	1011C (Y)	SUPPLY TO FUSES
19A	1925 (R)	MIRROR CONTROL +12V
20A	1050 (G)	BLOWER MOTOR FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K125 7



SS08M008 8

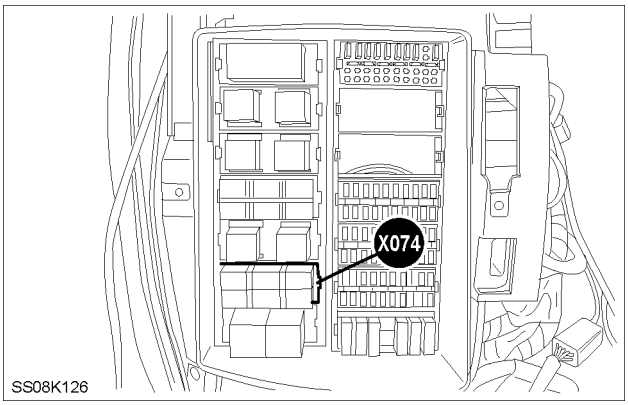
FRONT RIGHT HAND CAB

www.truck-freeworkshop.com

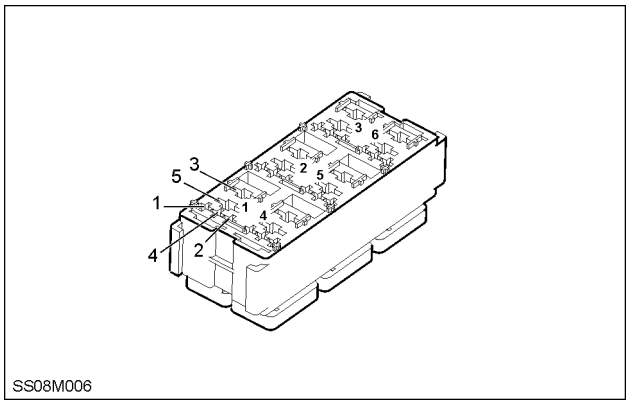
X074 RELAY MODULE (K015 - K020)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A1	5597A (S)	EHR MASTER ENABLE
A2	57GH (B)	EARTH (ALL)
A3	2250F (K)	PTO FRONT - SUPPLY
A5	5515 (S)	EHR +12V IGN.
B1	2005 (O)	AIR CON CLUTCH RELAY
B2	57CK (B)	EARTH (ALL)
B3	981 (G)	A/C CLUTCH RELAY FEED
B5	1018 (LTG)	AIR CONDITIONER CLUTCH
C1	173A (W)	BATTERY ISOLATOR RELAY COIL +12V
C2	57CC (B)	EARTH (ALL)
C3	172A (W)	BATTERY ISOLATOR RELAY COIL (OFF)
C4	172B (W)	BATTERY ISOLATOR RELAY COIL (OFF)
D1	1010B (G)	IGNITION RELAY (COIL)
D2	57AF (B)	EARTH (ALL)
D3	160 (U)	BATTERY SUPPLY ELECTRONICS
D5	160C (U)	BATTERY SUPPLY ELECTRONICS
E1	1090 (R)	REAR WORKLAMP RELAY SIGNAL
E2	57AS (B)	EARTH (ALL)
E3	998C (G)	WORK LAMP-REAR FEED (INNER)
E5	998 (G)	WORK LAMP-REAR FEED (INNER)
F1	1092 (R)	FRONT WORKLAMP RELAY SIGNAL
F2	57AR (B)	EARTH (ALL)
F3	1073 (L)	WORKLAMP FRONT FEED
F5	1073A (L)	WORKLAMP FRONT FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K126 9



SS08M006 10

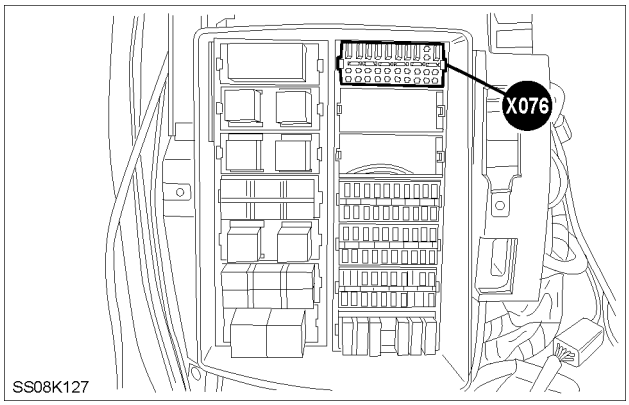
FRONT RIGHT HAND CAB

www.truck-freeworkshop.com

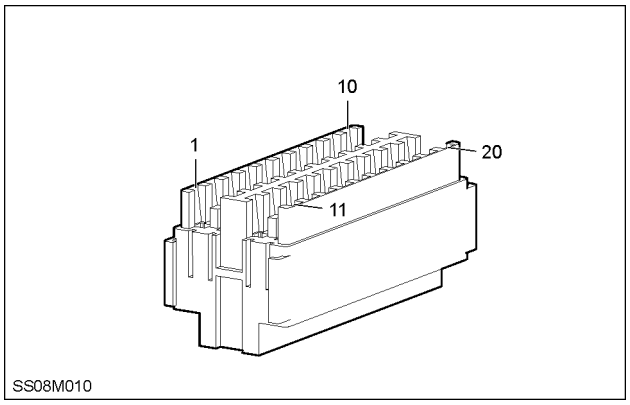
X076 DIODE BLOCK

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1A	1013AG (R)	RIGHT HAND LAMPS
1B	1024A (R)	RIGHT & LEFT HAND SIDELAMP FEED
2A	1013AF (R)	RIGHT HAND LAMPS
2B	1013AE (R)	RIGHT HAND LAMPS
3A	1030AE (U)	HEADLAMP DIP BEAM
3B	1024B (R)	RIGHT & LEFT HAND SIDELAMP FEED
4A	1030AF (U)	HEADLAMP DIP BEAM
4B	1030C (U)	HEADLAMP DIP BEAM
5A	825B (Y)	PNEUMATIC TRAILER SOLENOID +12V
5B	830A (R)	STOPLAMP SWITCH RH
6A	820A (R)	STOPLAMP SWITCH LH
6B	825A (Y)	PNEUMATIC TRAILER SOLENOID +12V
7A	171A (W)	BATTERY ISOLATOR RELAY COIL
7B	1001AD (W)	STARTER SOLENOID FEED
10A	1030AJ (U)	HEADLAMP DIP BEAM
10B	1027AA (U)	HEADLAMP MAIN BEAM
19A	150AH (N)	BATTERY FEED (UNFUSED)(ALL)
19B	150AM (N)	BATTERY FEED (UNFUSED)(ALL)
20A	150AI (N)	BATTERY FEED (UNFUSED)(ALL)
20B	1D (R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K127 11



SS08M010 12

FRONT RIGHT HAND CAB

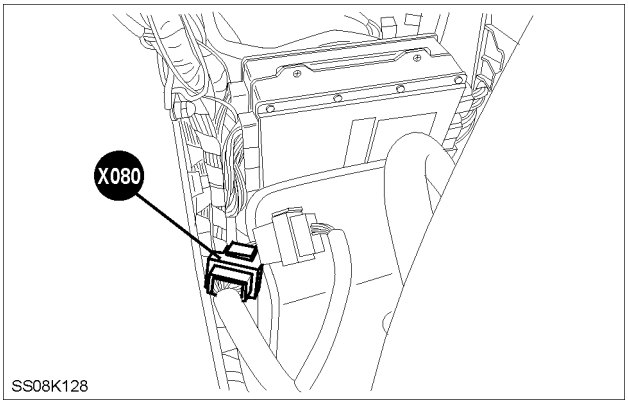
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Connector - Component diagram 08

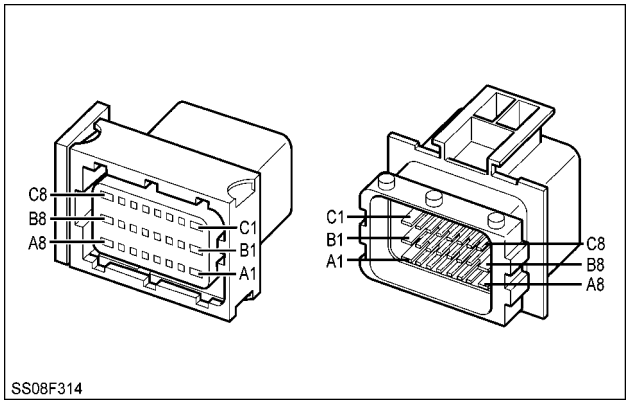
X080 ARMREST 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A1	5200AT (N)	EDC VALVE SUPPLY
A2	5400D (Y)	CAN H
A3	5420D (G)	CAN L
A4	5500W (R) / 5500B (R)	EHR CAN HIGH
A5	5510W (U) / 5510B (U)	EHR CAN LOW
A6	5955C (G) / 5955C (S)	RS232 INPUT TECU
A7	5960E (W) / 5960C (W)	RS232 OUTPUT TECU
A8	2250S (K)	PTO FRONT - SUPPLY
B1	7000BM (U)	TRANS CONTROL SUPPLY
B2	2045 (O)	PTO SWITCH TO MODULE
B3	2046 (O)	PTO SWITCH (VCC)
B4	2248 (K)	PTO FRONT - SWITCH (VCCS)
B5	2245 (K)	PTO FRONT - SWITCH TO MODULE
B6	2065 (N)	PTO ENGAGED
B7	2270 (O)	PTO FRONT - WARNING LAMP
B8	57RE (B)	EARTH (ALL)
C2	5915 (B)	EDC VALVE SUPPLY
C3	5900 (G)	ISO BUS CAN SIGNAL LOW
C4	5910 (Y)	ISO BUS CAN SIGNAL HIGH
C5	5920 (R)	ISO BUS CAN SUPPLY POSITIVE
C8	57RF (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K128 1



SS08F314 2

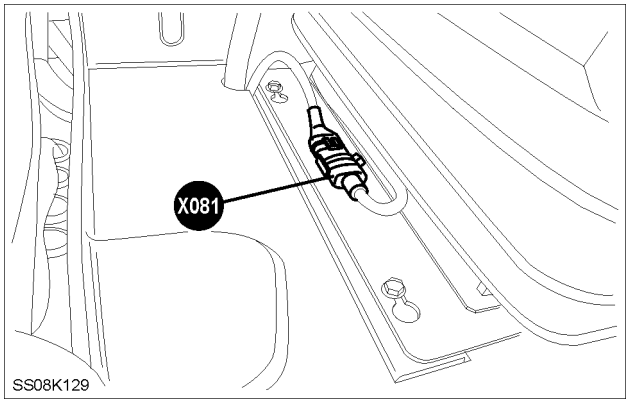
BEHIND RIGHT HAND TRIM

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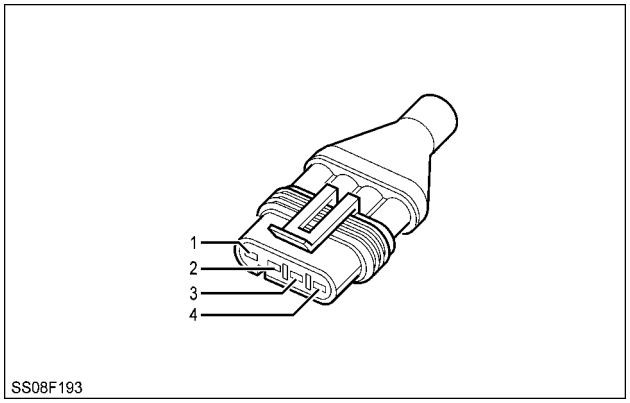
X081 SEAT CONNECTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	6355A (R)	+5V LOW POWER REFERENCE
2	2069 (O)	PTO MANAGEMENT ON
3	181K (G)	BLOWER MOTOR FEED
4	57CN (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K129 3



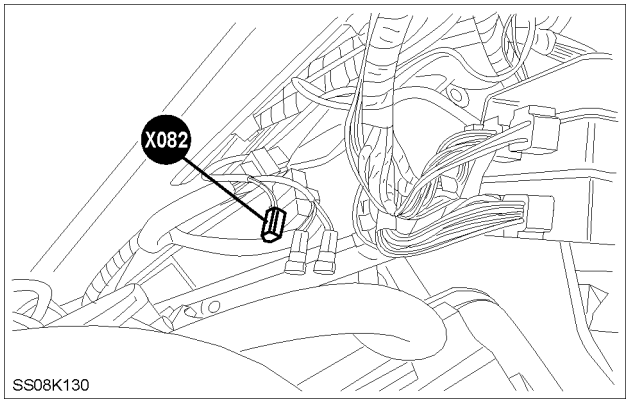
SS08F193 4

IN CAB RIGHT OF OPERATOR'S SEAT

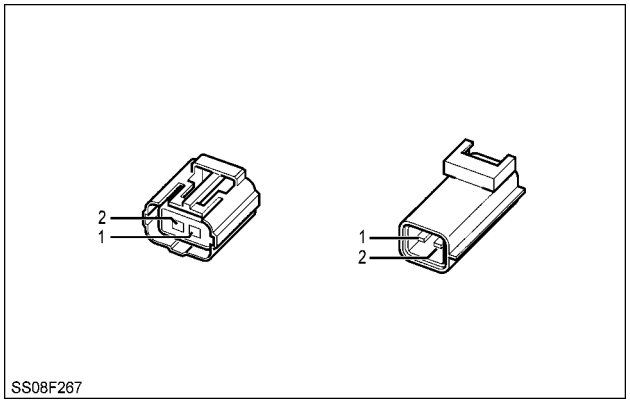
X082 LOADER POWER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3271A (O)	LOADER RELAY FEED
2	57FP (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K130 5



SS08F267 6

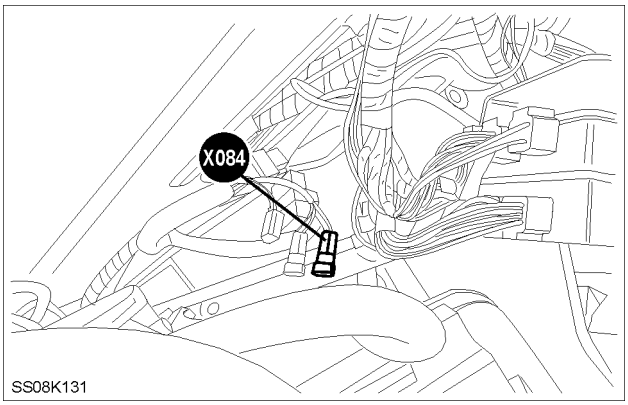
BEHIND RIGHT HAND TRIM

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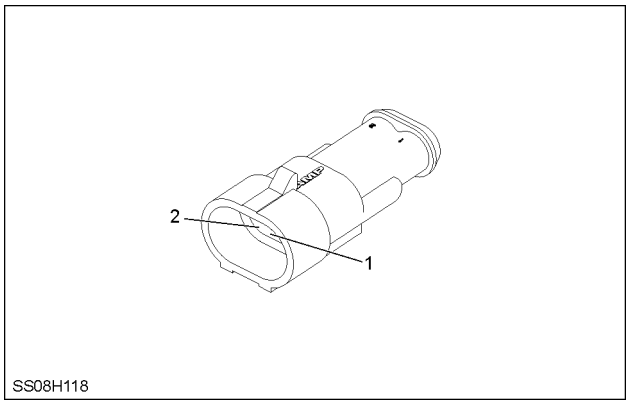
X084 LOADER VALVE 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3274 (R)	LOADER VALVE #2 OUT
2	3275 (R)	LOADER VALVE #2 RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K131 7



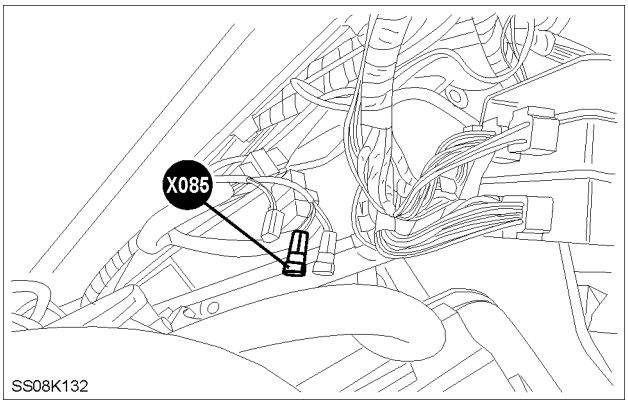
SS08H118 8

BEHIND RIGHT HAND TRIM

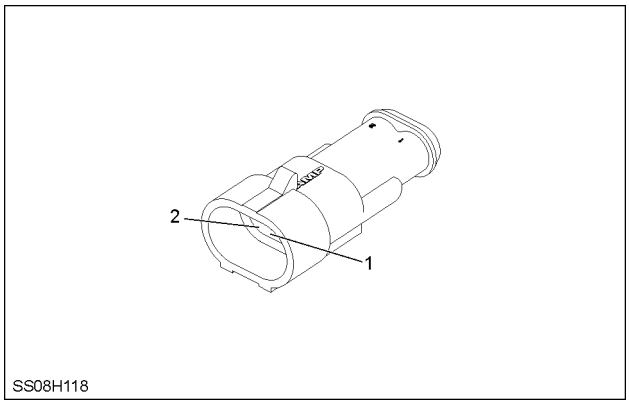
X085 LOADER VALVE 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3272 (O)	LOADER VALVE #1 OUT
2	3273 (O)	LOADER VALVE #1 RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K132 9



SS08H118 10

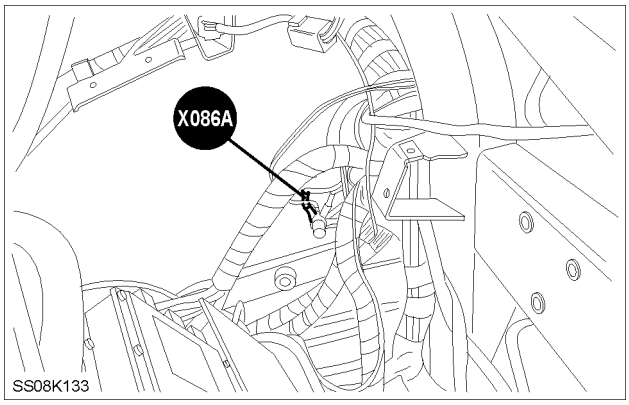
BEHIND RIGHT HAND TRIM

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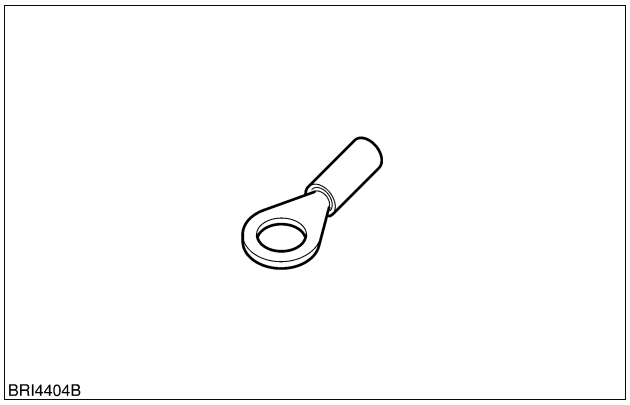
X086A EARTH HEADER 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57CG (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K133 11



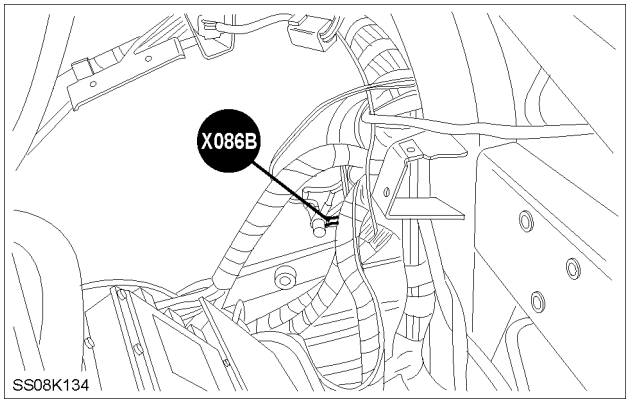
BRI4404B 12

BEHIND RIGHT HAND TRIM

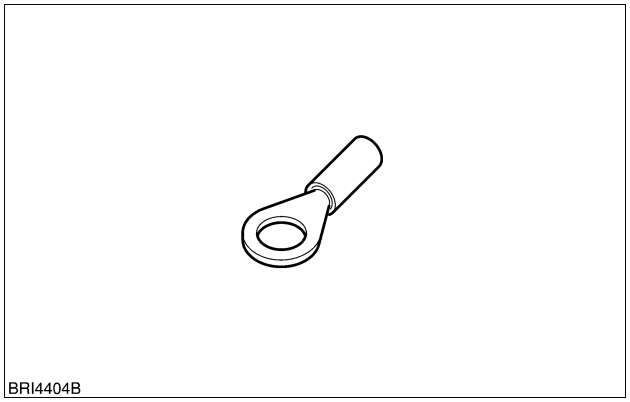
X086B EARTH HEADER 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57CH (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K134 13



BRI4404B 14

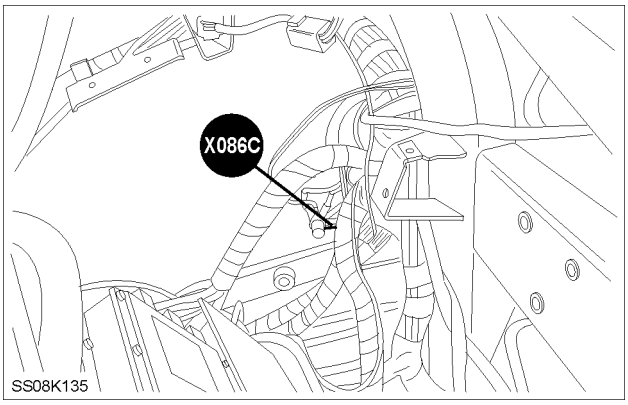
BEHIND RIGHT HAND TRIM

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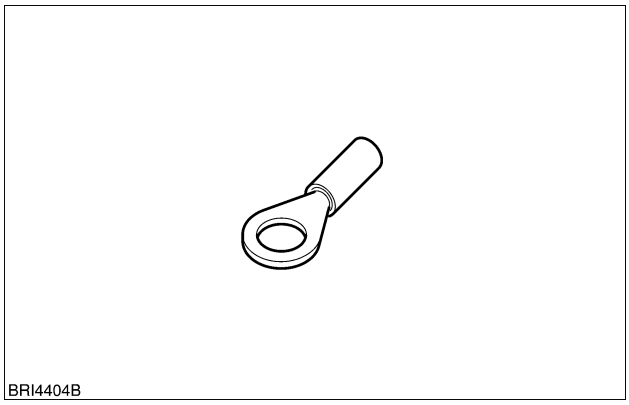
X086C EARTH HEADER 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57BH (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K135 15



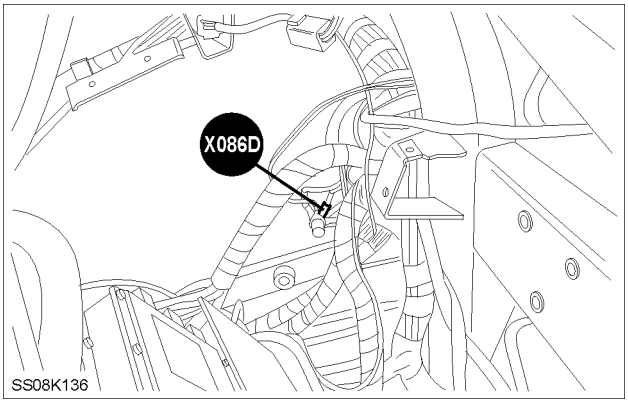
BRI4404B 16

BEHIND RIGHT HAND TRIM

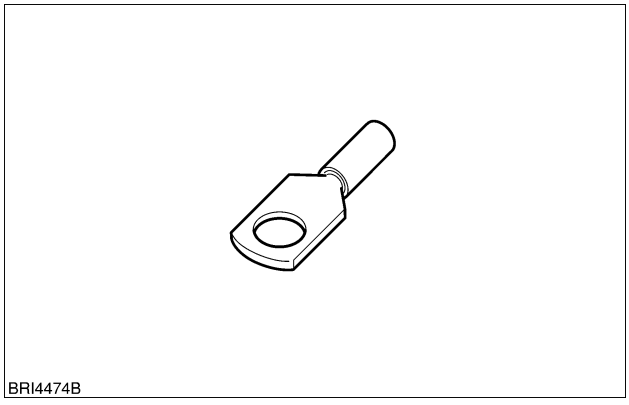
X086D EARTH HEADER 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57CF (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K136 17



BRI4474B 18

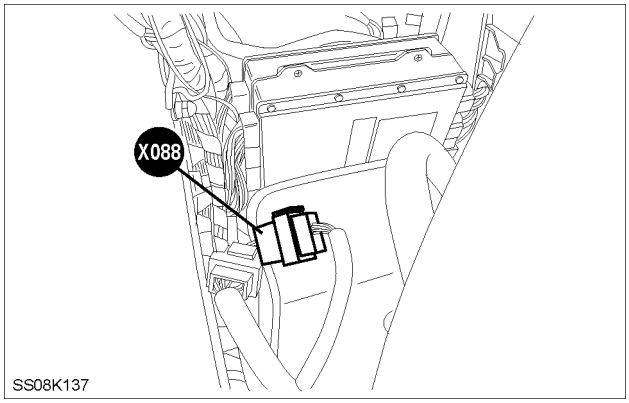
BEHIND RIGHT HAND TRIM

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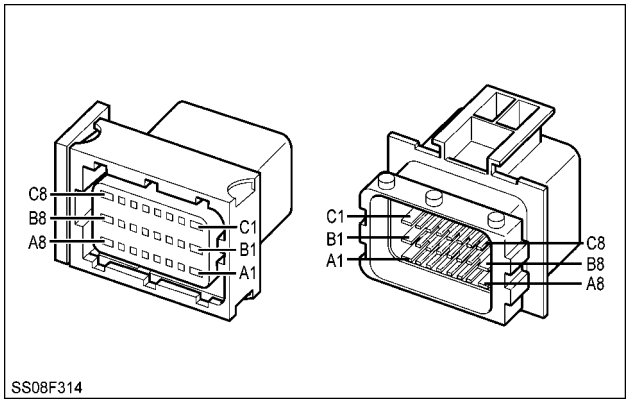
X088 ARMREST 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A1	181L (G) / 181P (W)	BLOWER MOTOR FEED
A2	5400BJ (Y) / 5400H (Y)	CAN H
A3	5420BJ (G) / 5420H (G)	CAN L
A4	5500V (R) / 5500D (R)	EHR CAN HIGH
A5	5510V (U) / 5510D (U)	EHR CAN LOW
B1	57AD (B) / 57 (B)	EARTH (ALL)
C2	5915F (B)	EDC VALVE SUPPLY
C3	5900F (Y) / 5900F (G)	ISO BUS CAN SIGNAL LOW
C4	5910F (G) / 5910F (Y)	ISO BUS CAN SIGNAL HIGH
C5	5920F (R)	ISO BUS CAN SUPPLY POSITIVE

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K137 19



SS08F314 20

BEHIND RIGHT HAND TRIM

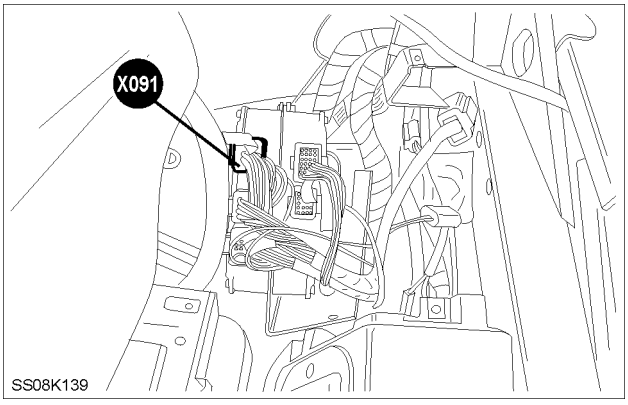
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Connector - Component diagram 09

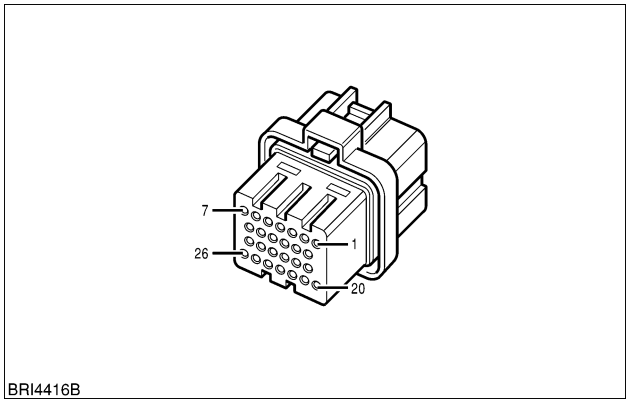
X091 CCM CENTRAL CONTROL UNIT (CN2)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7915 (L)	TCM CLUTCH B RETURN
2	7225 (W)	TRANS HI RANGE SOL - RET
3	7935 (L)	TCM CLUTCH D RETURN
4	5087 (K)	EDC VALVE UP RETURN
5	5097 (K)	EDC VALVE DOWN RETURN
6	7925 (L)	TCM CLUTCH C RETURN
7	7982 (W)	TCM CLUTCH C RETURN
8	7900 (TQ)	CLUTCH 'A' SIGNAL
14	2062 (W)	PTO TWIST SENSOR
15	2151 (K)	EPTO DRIVE RELAY UPPER SPEED
16	3168 (O)	AUTO GUIDANCE DUMP SOLENOID FEED (HSD)
17	2152 (K)	ESPTO DRIVE RELAY LOWER SPEED
20	2140 (O)	PTO SPEED SENSOR
21	57W (B)	EARTH (ALL)
23	6355 (R)	+5V LOW POWER REFERENCE
24	6315 (N)	REVERSIBLE FAN OPTION - RELAY CONTROL
26	57X (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K139 1



BRI4416B-02 2

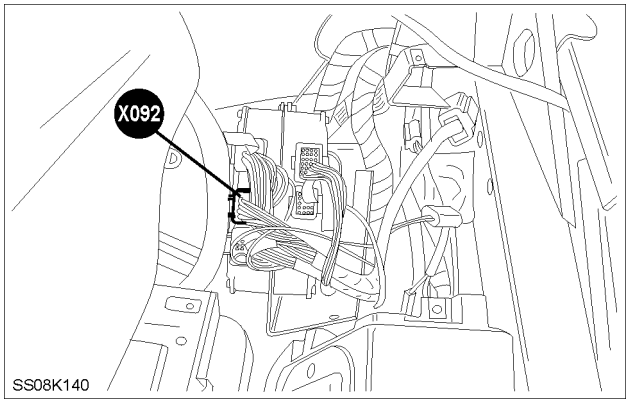
BEHIND OPERATOR'S SEAT

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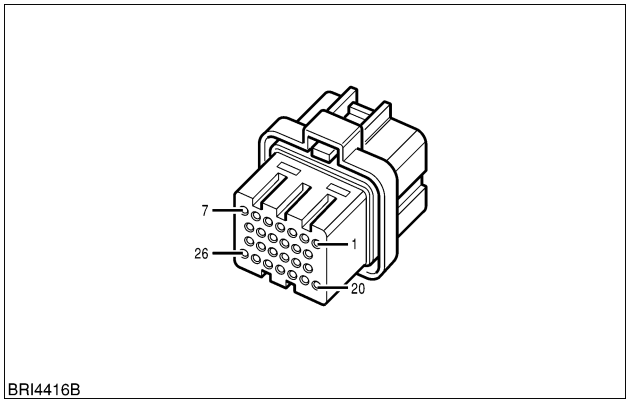
X092 CCM CENTRAL CONTROL UNIT (CN1a)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7000C (U)	TRANS CONTROL SUPPLY
2	7000D (U)	TRANS CONTROL SUPPLY
3	7000E (U)	TRANS CONTROL SUPPLY
4	7431 (TQ)	SUPPLY
5	5085 (K)	EDC VALVE UP
6	7920 (TQ)	CLUTCH 'C' SIGNAL
7	7930 (TQ)	CLUTCH 'D' SIGNAL
8	7660 (R)	TRANS CLUTCH DISCONNECT
9	7220 (S)	TRANSMISSION HIGH RANGE
11	7910 (TQ)	CLUTCH 'B' SIGNAL
12	5090 (K)	EDC VALVE DOWN
13	7980 (K)	TRANS MED. RANGE
14	5000A (L)	EDC MEMORY POWER
15	5400T (Y)	CAN H
16	5420T (G)	CAN L
19	61 (O)	CASE GROUND
20	5200A (N)	EDC VALVE SUPPLY
21	5500H (R)	EHR CAN HIGH
22	5510H (U)	EHR CAN LOW
23	60 (B/W)	SENSOR GROUND
25	57Y (B)	EARTH (ALL)
26	57Z (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K140 3



BRI4416B-02 4

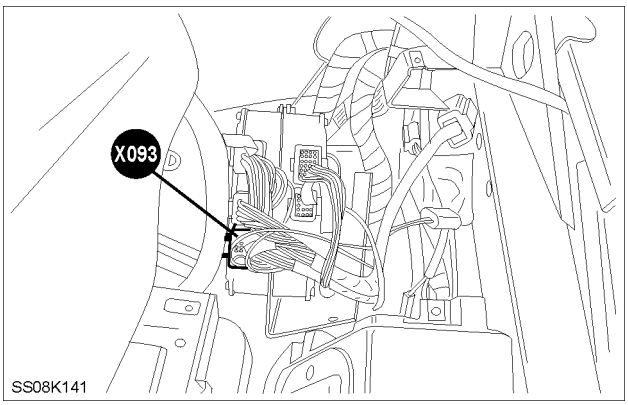
BEHIND OPERATOR'S SEAT

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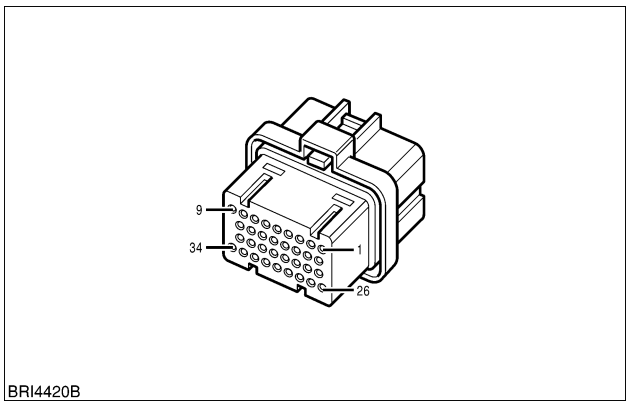
X093 CCM CENTRAL CONTROL UNIT (CN1b)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	6402 (G)	ECU TO THROTTLE POT. VAR
2	5080 (K)	EDC ROCKSHAFT
7	2012 (Y)	TRANS OIL PRESSURE WARNING LAMP
9	5065 (TN)	EDC RIGHT PIN
10	5070 (TN)	EDC LEFT PIN
11	2050K (G)	PTO SUPPLY / DOG SUPPLY
12	7250 (S)	TRANSMISSION FORWARD SIGNAL
13	7260 (S)	TRANSMISSION REVERSE SIGNAL
14	7500 (G)	TRANS OIL TEMP. SENSOR
16	5020 (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
17	7525 (G)	TRANS SENSOR SUPPLY 5v
19	2031 (Y)	RADAR PRESENT
21	1001 (W)	STARTER SOLENOID FEED
22	820B (R)	STOPLAMP SWITCH LH
23	830B (R)	STOPLAMP SWITCH RH
25	5075 (K)	EDC VOLTAGE TO PINS
27	7420A (Y)	TCM TO CLUTCH POSITION SWITCH
29	5100 (K)	EDC EXTERNAL SWITCH UP
30	5095 (K)	EDC EXTERNAL SWITCH DOWN
33	2028B (G)	RADAR ASSEMBLY (GUN) SIGNAL
34	7401 (L	TRANS RPM SPEED SENSOR

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K141 5



BRI4420B 6

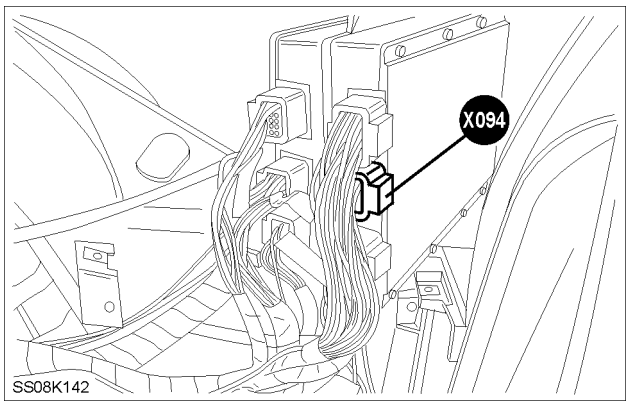
BEHIND OPERATOR'S SEAT

www.truck-freeworkshop.com

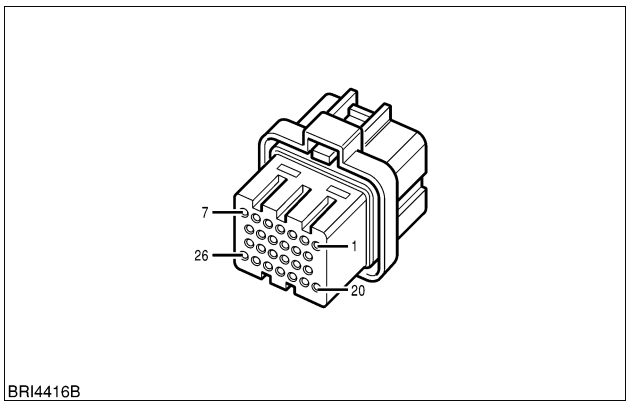
X094 CCM CENTRAL CONTROL UNIT (CN3a)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7589 (U)	BRAKE PRESSURE SIGNAL
2	7970 (L)	TRANS MED/REV
3	2059 (W)	FENDER PTO SWITCH INPUT
8	7775 (K)	B CLUTCH PRESSURE SIGNAL
9	7785 (O)	A CLUTCH PRESSURE SIGNAL
10	7584 (U)	PARKLOCK SENSOR SWITCH SIGNAL
12	2045 (O)	PTO SWITCH TO MODULE
13	2046 (O)	PTO SWITCH (VCC)
14	2007 (Y)	AIR CONDITIONER LOW PRESSURE
15	1039 (LTG)	NASO LIGHTS INPUT
16	5595 (S)	EHR MASTER STOP SWITCH
17	5210 (O)	EDC VALVE ENABLE
18	2056 (W)	PTO FENDER PTO SWITCH ON
20	2159 (U)	PTO UPPER SPEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K142 7



BRI4416B-02 8

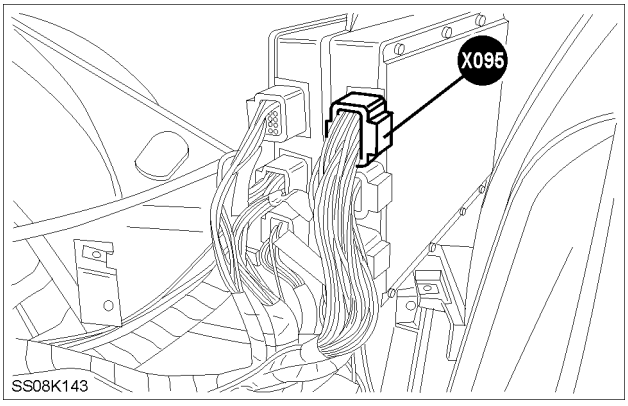
BEHIND OPERATOR'S SEAT

www.truck-freeworkshop.com

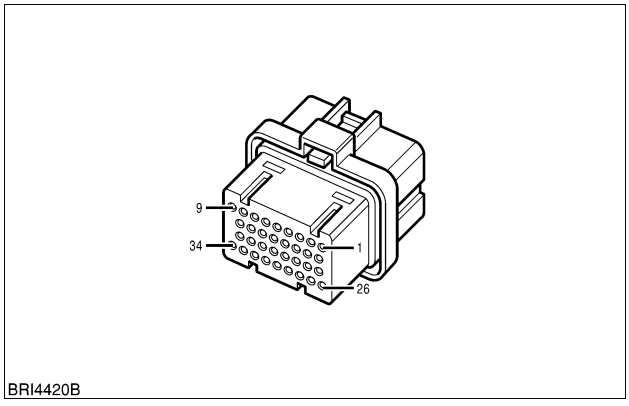
X095 CCM CENTRAL CONTROL UNIT (CN3b)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7945 (L)	TCM CLUTCH E RETURN
2	9036 (TN)	50KPH DUMP SOLENOID RETURN
3	7235 (Y)	TRANS LOW RANGE SOL - RET
4	8045 (L)	TRANS REV SOL RET
5	9035 (TN)	50KPH DUMP SOLENOID
6	9033 (TN)	50KPH SOLENOID+
7	7985 (G)	TRANS REVERSE RANGE
8	2130 (N)	PTO BRAKE SOLENOID
9	7080 (LTG)	DIFF-LOCK SOLENOID FEED
10	9034 (TN)	50KPH SOLENOID-
12	7586 (U)	PARKLOCK SOLENOID
13	7940 (TQ)	CLUTCH 'E' SIGNAL
14	2042 (O)	PTO SOLENOID-REAR
15	7230 (S)	TRANSMISSION LOW RANGE
17	3024 (Y)	2WD SOLENOID
18	2051 (O)	PTO SOLENOID RETURN (-)
19	7411 (Y)	TRANS HYDROSTAT INPUT SPEED SENSOR (CVT)
20	7400 (Y)	TRANS RPM SPEED SENSOR TO TCM INPUT
21	6300 (N)	FAN SPEED
22	7760 (W)	TORQUE SENSOR
24	2120 (TN)	PTO BRAKE SIGNAL
25	7000J (U)	TRANS CONTROL SUPPLY
26	7295 (W)	DRIVE DISABLE SIGNAL
27	2065 (N)	PTO ENGAGED
32	6404 (G)	THROTTLE POT. TO LOW IDLE SWITCH
33	2055A (W)	PTO SYNCHRO GROUND SPEED ENGAGED
34	7000K (U)	TRANS CONTROL SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K143 9



BRI4420B 10

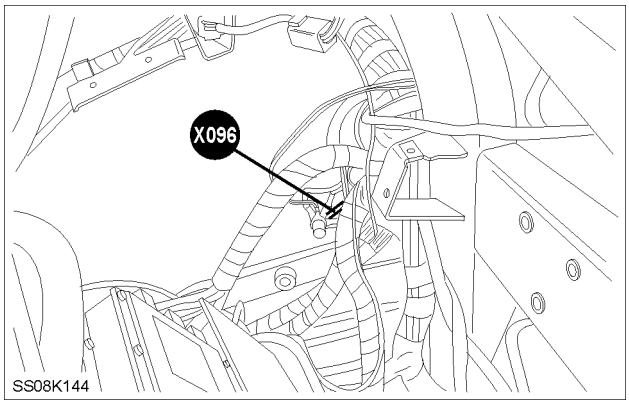
BEHIND OPERATOR'S SEAT

www.truck-freeworkshop.com

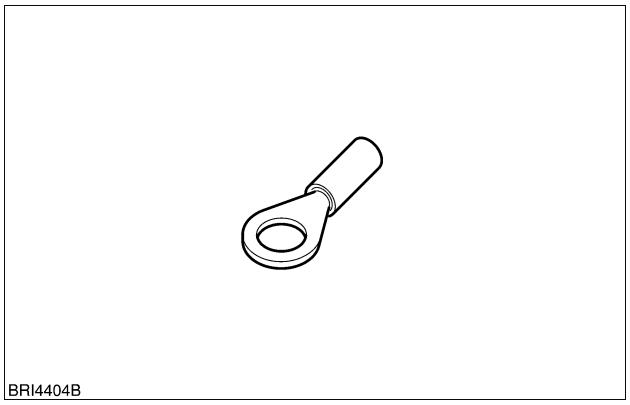
X096 CASE EARTH CCM & ACU

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	61,61A,61G (O,B/O,B)	CASE GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K144 11



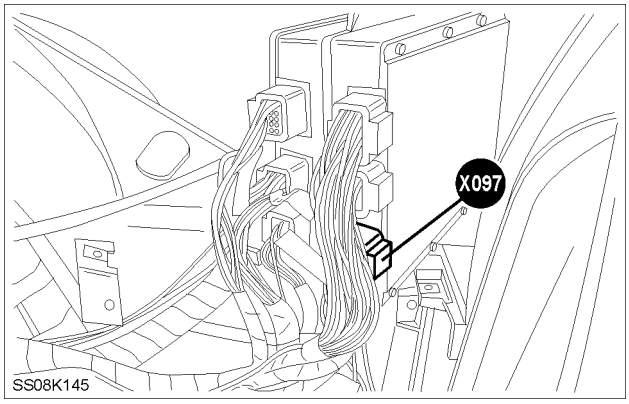
BRI4404B 12

BEHIND RIGHT HAND TRIM

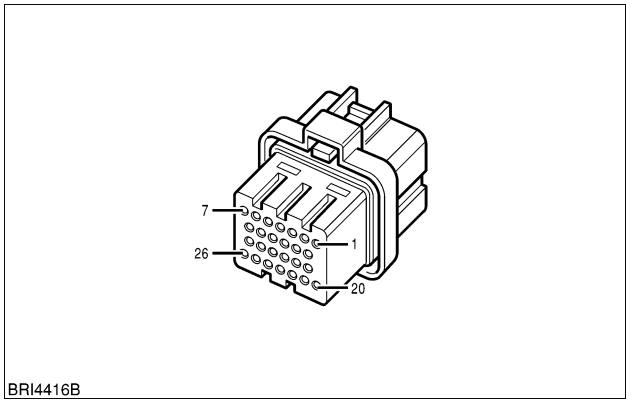
X097 CCM CENTRAL CONTROL UNIT (CN4)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
4	2157 (U)	ESPTO NEUTRAL
6	3169 (O)	AUTO GUIDANCE DUMP SOLENOID RETURN (CURSEN)
7	2155 (N)	ESPTO ACTUATOR POWER +12V
8	2156 (N)	ESPTO ACTUATOR POS SIGNAL
9	2069 (O)	PTO MANAGEMENT ON
10	3014C (R)	HANDBRAKE WARNING LAMP SIGNAL
14	7960 (W)	TRANS SLOW/FAST
16	7730 (TN)	NOT IN PARKLOCK
18	2158 (U)	ESPTO LOWER SPEED
20	7430 (Y)	CLUTCH POSITION SIGNAL
21	5830 (R)	HIGH FLOW PUMP LINK
24	5835 (S)	HYDRAULIC MASTER SWITCH HIGH FLOW PUMP LINK
25	5840 (W)	FRONT HITCH DETECT INPUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K145 13



BRI4416B-02 14

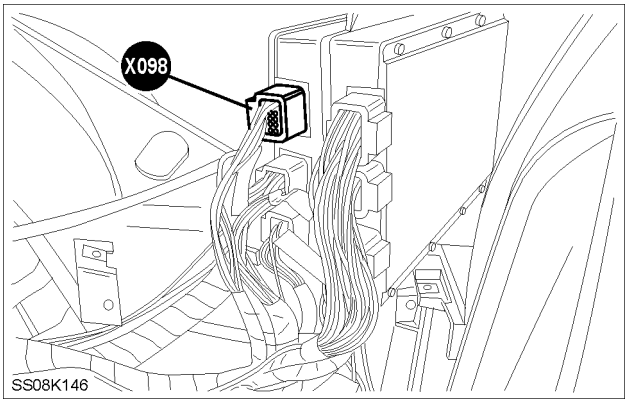
BEHIND OPERATOR'S SEAT

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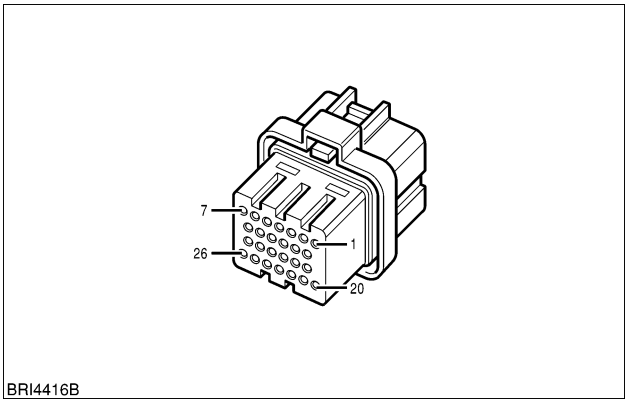
X098 ACU AUXILIARY CONTROL UNIT (CN2)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3250 (O)	RAISE SOLENOID RET
3	3286 (TN)	SUSPENSION LOCKOUT SOLENOID LOWER RETURN (-)
6	3281 (TN)	SUSPENSION LOCKOUT SOLENOID UPPER RETURN (-)
7	2044 (O)	PTO SOLENOID-FRONT RETURN(-)
13	3270 (O)	LOWER SOLENOID RET
19	2270 (O)	PTO FRONT - WARNING LAMP
21	57BN (B)	EARTH (ALL)
26	57BP (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K146 15



BRI4416B-02 16

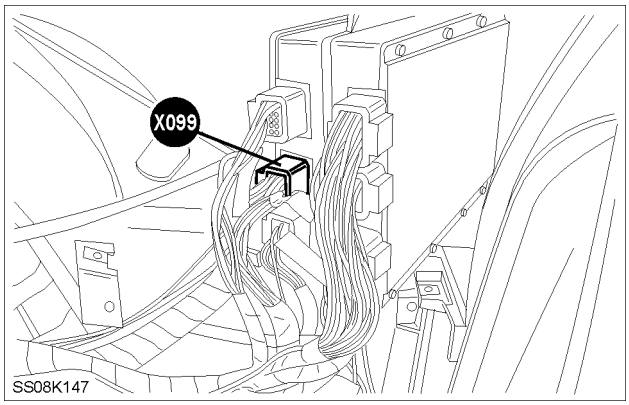
BEHIND OPERATOR'S SEAT

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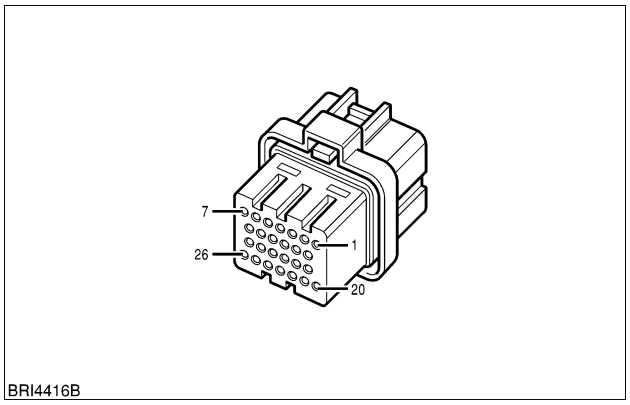
X099 ACU AUXILIARY CONTROL UNIT (CN1a)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2540S (N)	FRONT HITCH +12v IGN
2	2540T (N)	FRONT HITCH +12v IGN
3	2540W (N)	FRONT HITCH +12v IGN
6	3280 (O)	SUSPENSION LOCKOUT SOLENOID UPPER
7	3285 (TN)	SUSPENSION LOCKOUT SOLENOID LOWER
8	2250K (K)	PTO FRONT - SUPPLY
10	3260 (O)	LOWER SOLENOID PWR
11	3240 (O)	RAISE SOLENOID PWR
12	2570 (R)	FRONT HITCH RAISE SOLENOID
13	2043 (O)	PTO SOLENOID-FRONT
14	5000B (L)	EDC MEMORY POWER
15	5400S (Y)	CAN H
16	5420S (G)	CAN L
19	61G (B)	CASE GROUND
20	5200N (N)	EDC VALVE SUPPLY
21	5500G (R)	EHR CAN HIGH
22	5510G (U)	EHR CAN LOW
23	60AA (B/W)	SENSOR GROUND
25	57BR (B)	EARTH (ALL)
26	57BS (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K147 17



BRI4416B-02 18

BEHIND OPERATOR'S SEAT

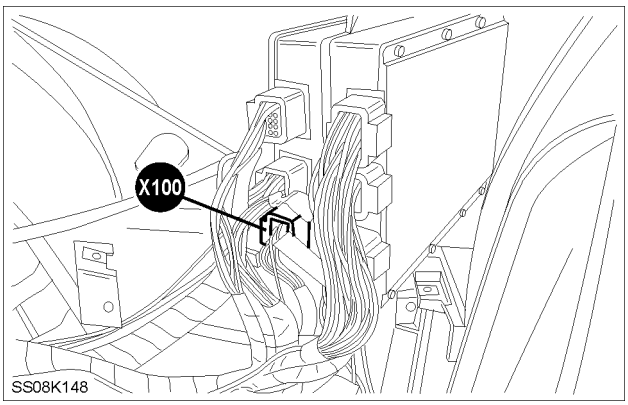
www.truck-freeworkshop.com

Connector - Component diagram 10

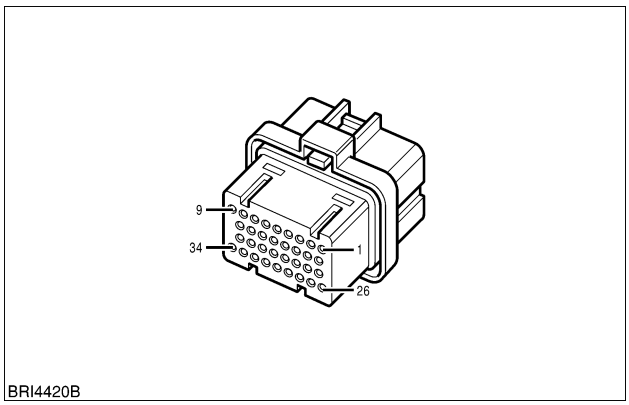
X100 ACU AUXILIARY CONTROL UNIT (CN1b)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	2510 (N)	FRONT HITCH POSITION SIGNAL
5	3235 (O)	ACCELEROMETER SIGNAL
6	3230 (U)	AXLE HEIGHT SENSOR POSITION
11	2248 (K)	PTO FRONT - SWITCH (VCCS)
12	2245 (K)	PTO FRONT - SWITCH TO MODULE (MOM)
16	2530 (N)	FRONT HITCH V REF
17	5520A (LTG)	EHR 5V Ref.
19	2591 (TN)	EXTERNAL SWITCH FHPL DOWN
21	1001Z (W)	STARTER SOLENOID FEED
22	2556 (N)	FRONT HITCH SWITCH COMMON RAIL
23	3295 (O)	FRONT SUSPENSION PRESSURE SWITCH SIGNAL
26	2590 (TN)	EXTERNAL SWITCH FHPL UP

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K148 1



BRI4420B 2

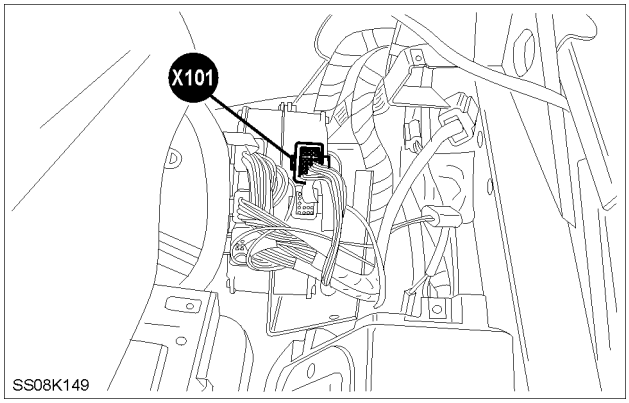
IN CAB RIGHT HAND BEHIND OPERATOR'S SEAT

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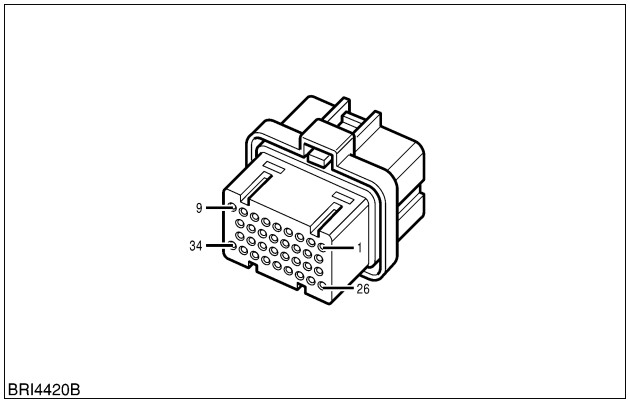
X101 ACU AUXILIARY CONTROL UNIT (CN3b)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
5	4054 (W)	LINK LEVEL DUMP SOLENOID
6	4056 (W)	LINK LEVEL TOP LINK RETRACT SOLENOID
7	4058 (W)	LINK LEVEL RIGHT LINK LOWER SOLENOID
14	4055 (W)	LINK LEVEL TOP LINK EXTEND SOLENOID
15	4057 (W)	LINK LEVEL RIGHT LINK RAISE SOLENOID
25	2250C (K)	PTO FRONT - SUPPLY
34	2250B (K)	PTO FRONT - SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K149 3



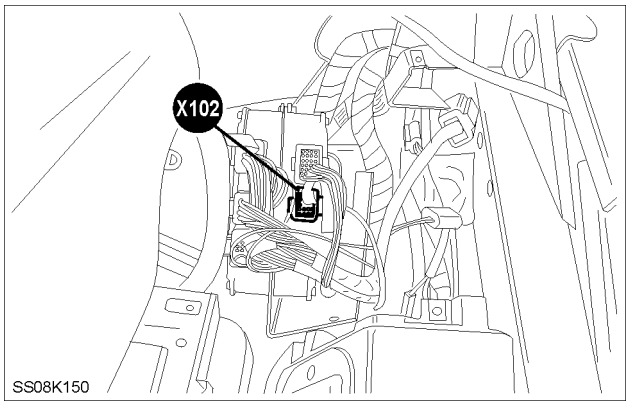
BRI4420B 4

IN CAB RIGHT HAND BEHIND OPERATOR'S SEAT

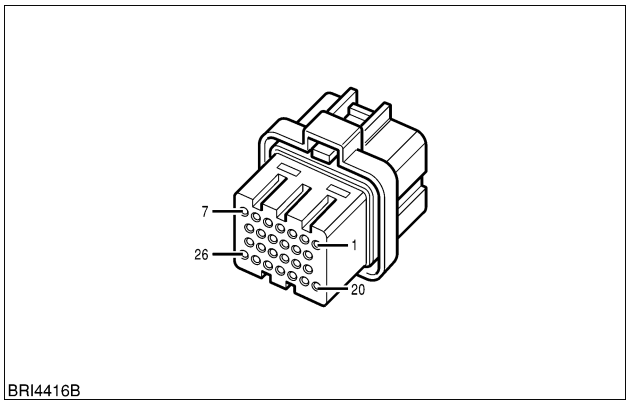
X102 ACU AUXILIARY CONTROL UNIT (CN3a)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
16	5574 (L)	FENDER 3RD EHR SWITCH – UP
17	5576 (L)	FENDER 3RD EHR SWITCH – DOWN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K150 5



BRI4416B-01 6

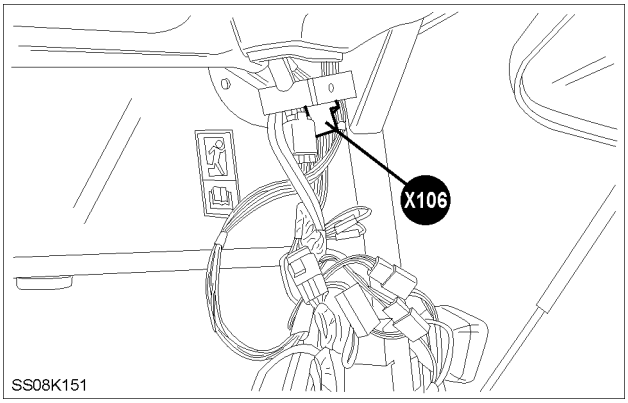
IN CAB RIGHT HAND BEHIND OPERATOR'S SEAT

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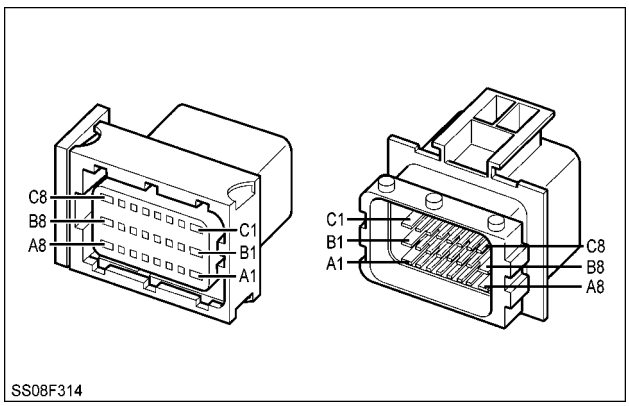
X106 ROOF TO CAB HARNESS - ROOF

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A1	998D (G) / 998 (G)	WORK LAMP-REAR FEED (INNER)
A2	28 (Y)	WIPER MOTOR (PARK RETURN)
A3	56 (W)	WIPER MOTOR-HIGH
A4	58 (R)	WIPER MOTOR-LOW
A5	1019A (G) / 1019 (G)	WINDSHIELD WIPER FEED
A6	1038B (TN) / 1038 (TN)	WINDSHIELD WIPER FEED-REAR
A7	1120 (G)	RR WINDSHIELD WIPER PARK RETURN
A8	4011 (L)	ROTATING BEACON SWITCH SUPPLY
B1	1013B (R) / 1013 (R)	RIGHT HAND LAMPS
B2	249 (LTG)	SMV LAMPS RH
B3	666A (L) / 666 (L)	DOMELAMP SWITCH FEED
B4	1090 (R)	REAR WORKLAMP RELAY SIGNAL
B5	1092 (R)	FRONT WORKLAMP RELAY SIGNAL
B6	1925C (R) / 1925 (R)	MIRROR CONTROL +12V
B7	1071B (L)	WORKLAMP FRONT FEED
B8	1071A (L)	WORKLAMP FRONT FEED
C1	1014D (R) / 1014 (R)	LEFT HAND LAMPS
C2	250 (LTG)	SMV LAMPS LH
C3	138A (L) / 138 (L)	RADIO KAM
C4	3079 (R)	RADIO +12V IGNITION
C5	1927A (R) / 1927 (R)	MIRROR ILLUMINATION
C6	3052 (L) / -	DOME LAMP TO DOOR SWITCH
C7	1013AH (R)	RIGHT HAND LAMPS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K151 7



SS08F314 8

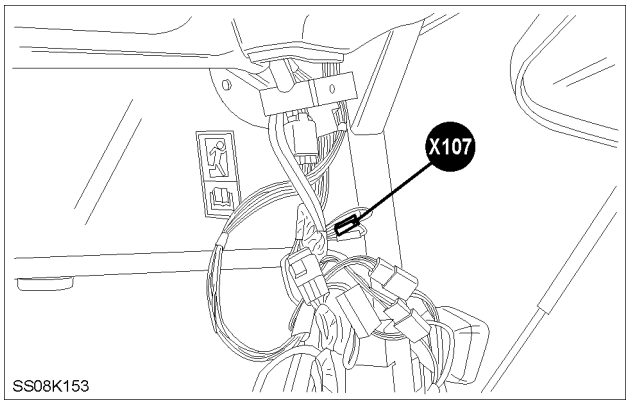
REAR RIGHT HAND C-PILLAR

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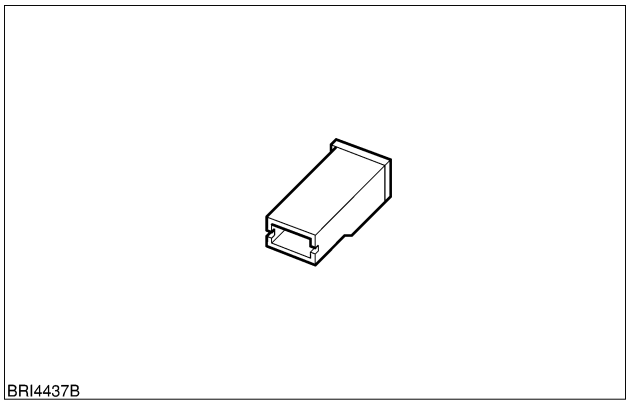
X107 AUX HEADLAMP SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1030A (U)	HEADLAMP DIP BEAM

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K153 9



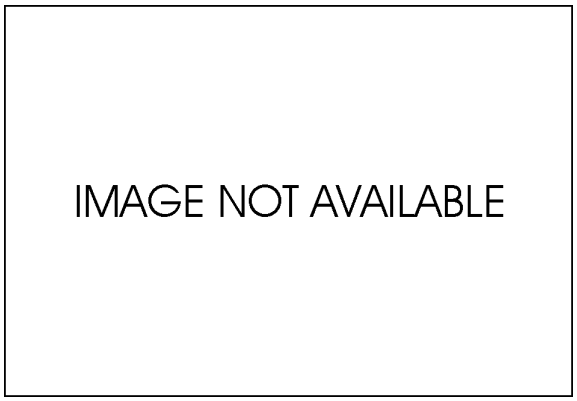
BRI4437B 10

REAR RIGHT HAND C-PILLAR

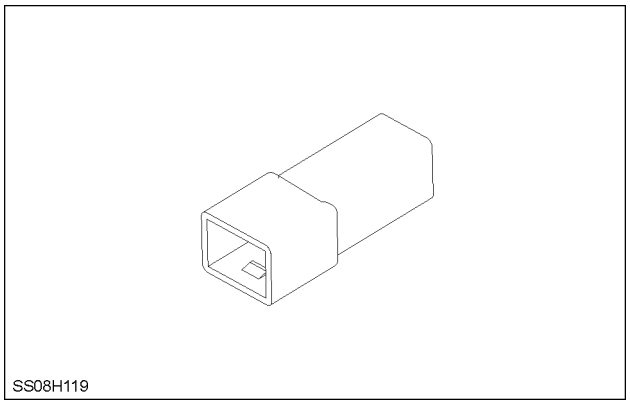
X107_A AUX HEADLAMP SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1030A (U)	HEADLAMP DIP BEAM

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



INA 11



SS08H119 12

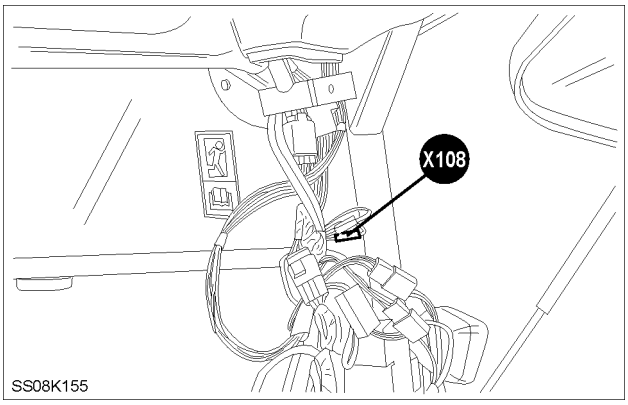
REAR RIGHT HAND C-PILLAR

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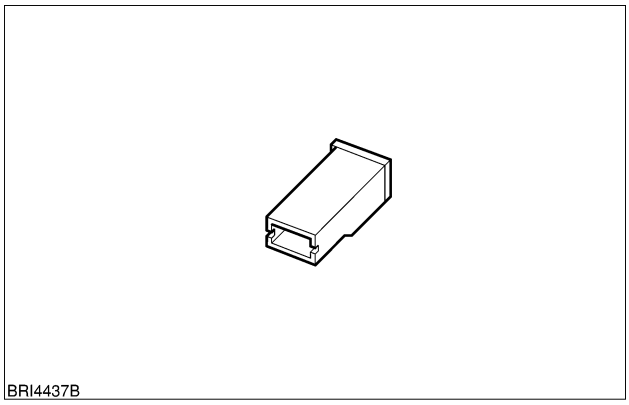
X108 AUX HEADLAMP SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1027A (U)	HEADLAMP MAIN BEAM

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K155 13



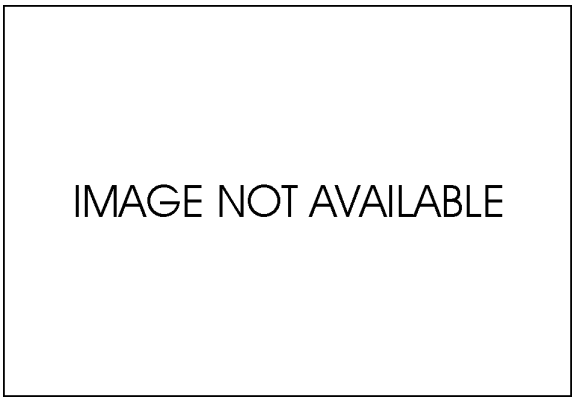
BRI4437B 14

REAR RIGHT HAND C-PILLAR

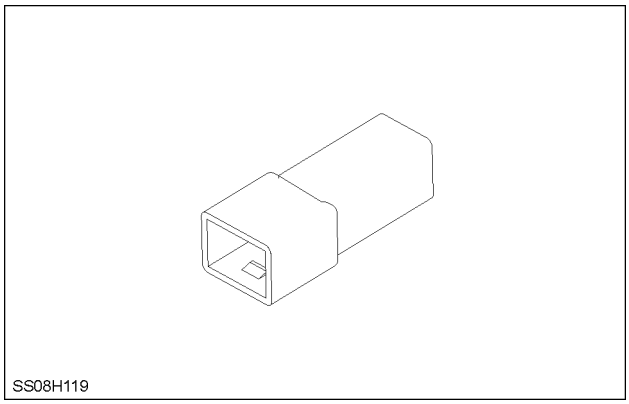
X108_A AUX HEADLAMP SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1027A (U)	HEADLAMP MAIN BEAM

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



INA 15



SS08H119 16

REAR RIGHT HAND C-PILLAR

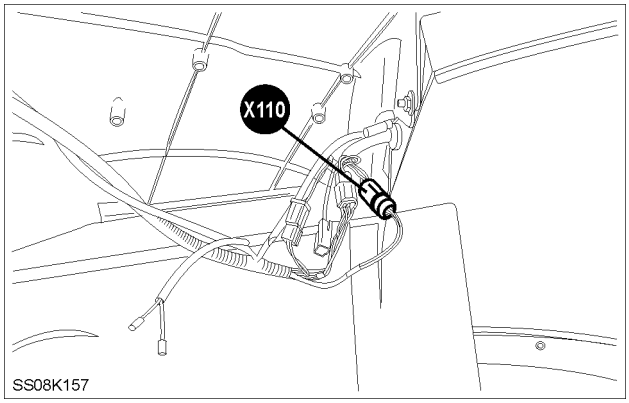
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Connector - Component diagram 11

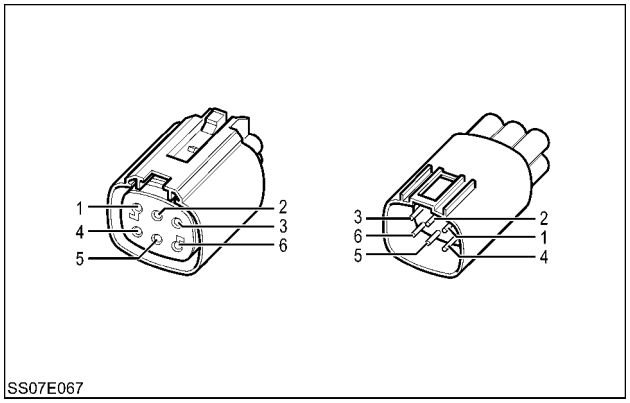
X110 RIGHT HAND FENDER CONNECTOR 2 HPL RAISE/LOWER SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5100B (K) / 5100 (K)	EDC EXTERNAL SWITCH UP
2	5200B (N) / 5200 (N)	EDC VALVE SUPPLY
3	5095A (K) / 5095 (K)	EDC VALVE DOWN EDC EXTERNAL SWITCH DOWN
4	2059 (W)	FENDER PTO SWITCH INPUT
5	2050E (G) / 2050 (G)	PTO SUPPLY / DOG SUPPLY
6	2056A (W) / 2056 (W)	PTO FENDER PTO SWITCH ON

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K157 1



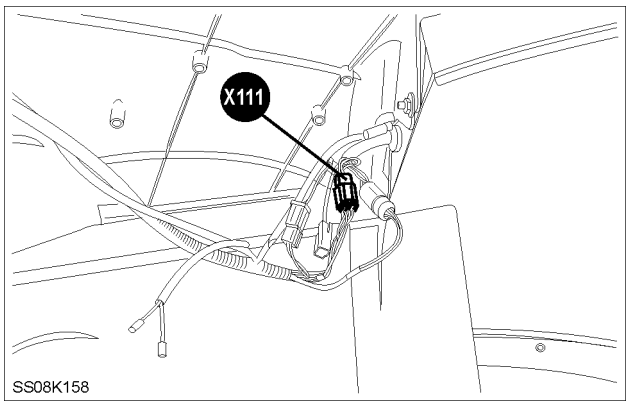
SS07E067 2

RIGHT HAND REAR FENDER

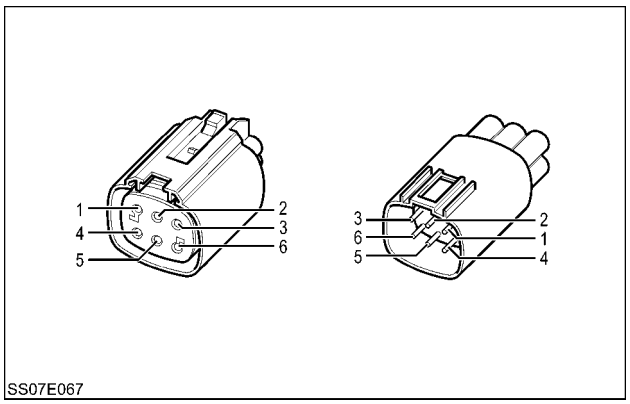
X111 RIGHT HAND FENDER CONNECTOR 1 TAIL LAMP

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1013C (R) / 1013 (R)	RIGHT HAND LAMPS
2	810C (G) / 810 (G)	STOPLAMPS
3	3004B (G) / 3004 (G)	RIGHT HAND TURN SIGNAL WARNING LAMP
4	57AV (B)	EARTH (ALL)
5	998B (G) / 998 (G)	WORK LAMP-REAR FEED (INNER)
6	57AP (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K158 3



SS07E067 4

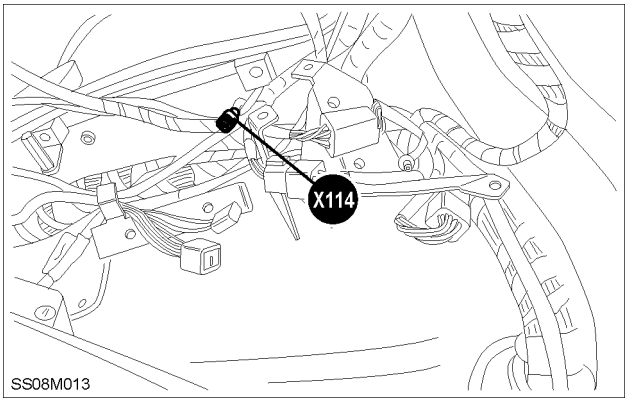
RIGHT HAND REAR FENDER

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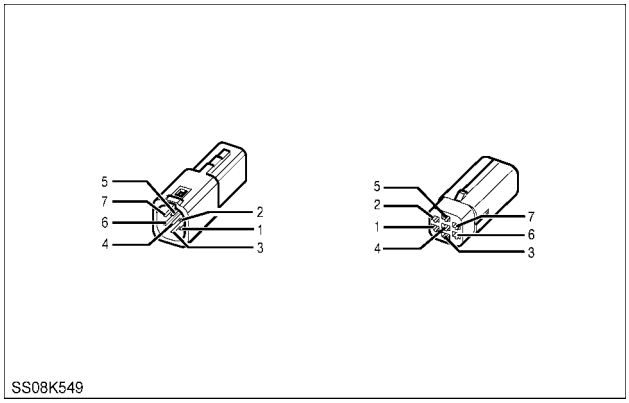
X114 ISO 11786 SIGNAL SOCKET

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2320 (L) / 2320 (P/K/Y)	TRUE GROUND SPEED ISO 11786 SKT.PIN#1
2	2300 (L) / 2300 (P/B/Y)	THEORETICAL GROUND SPEED ISO 11786 SKT.PIN#2
3	2330 (L) / 2330 (P/LG/Y)	PTO SPEED ISO11876 SKT.PIN#3
4	2310 (L) / 2310 (P/G/Y)	IN/OUT OF WORK-HPL MODE ISO11786 SKT.PIN#4
5	3062 (L)	IMPLEMENT SOCKET SWITCH
6	1050A (G) / 1050 (G/W)	ACCESSORY FEED
7	61B (B/O) / 61 (B)	CASE GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08M013 5



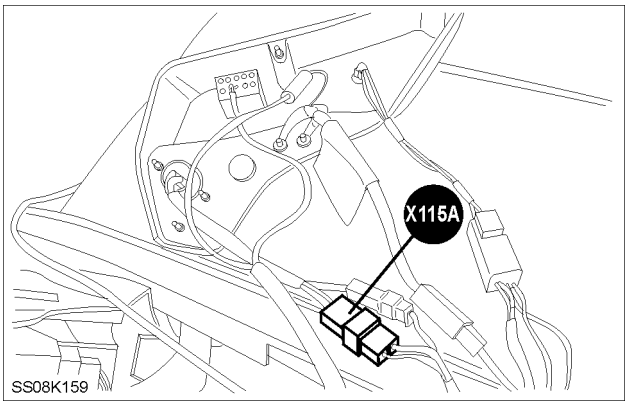
SS08K549 6

BEHIND RIGHT HAND SWITCH PANEL

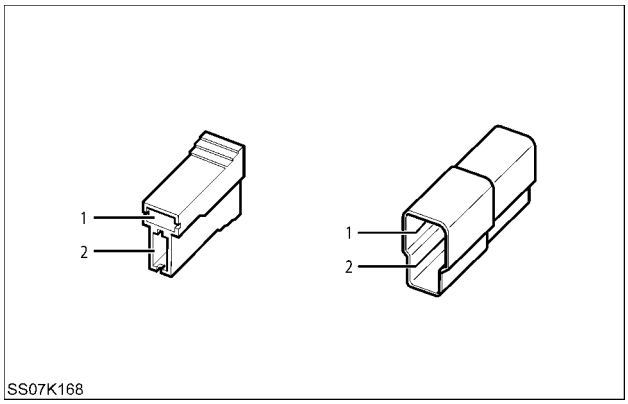
X115A 30 AMPERE POWER SOCKET POSITIV

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150BF (N)	BATTERY FEED (ALL)
2	9032A (Y) / 9032B (Y)	IGN+ TO POWER SKT.

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K159 7



SS07K168 8

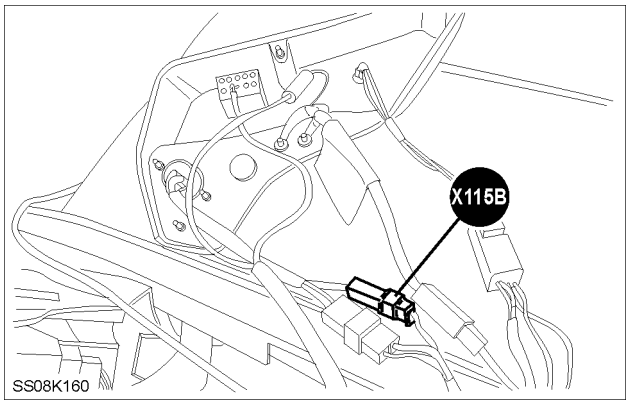
BEHIND RIGHT HAND SWITCH PANEL

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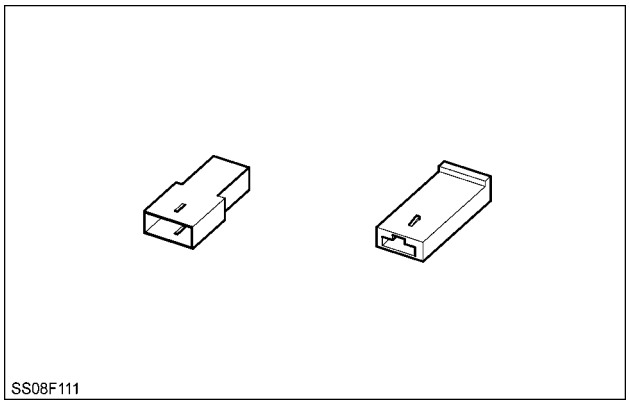
X115B 30 AMPERE POWER SOCKET NEGATIV

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57CW (B) / 57CR (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K160 9



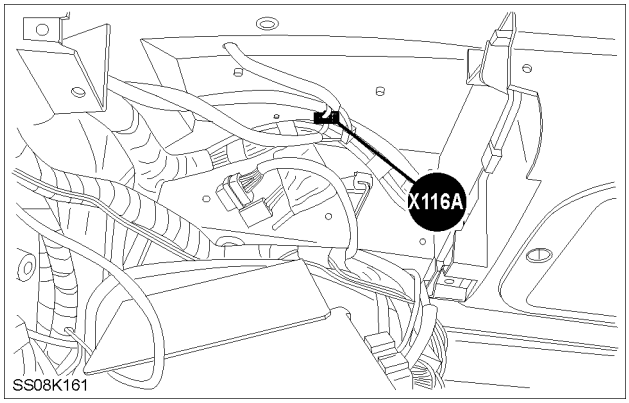
SS08F111 10

BEHIND RIGHT HAND SWITCH PANEL

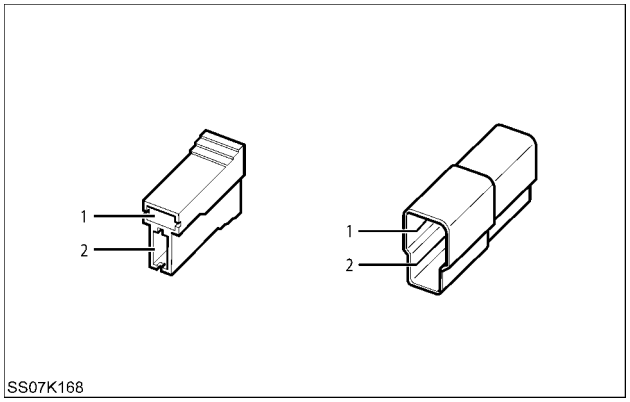
X116A REAR POWER SOCKET IMPLEMENT POSITIVE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150BF (N)	BATTERY FEED (ALL)
2	9032B (Y)	IGN.+ TO POWER SKT.

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K161 11



SS07K168 12

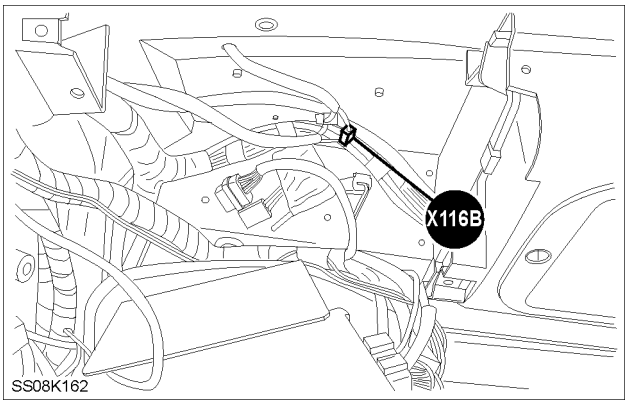
CAB RIGHT HAND BEHIND OPERATOR'S SEAT

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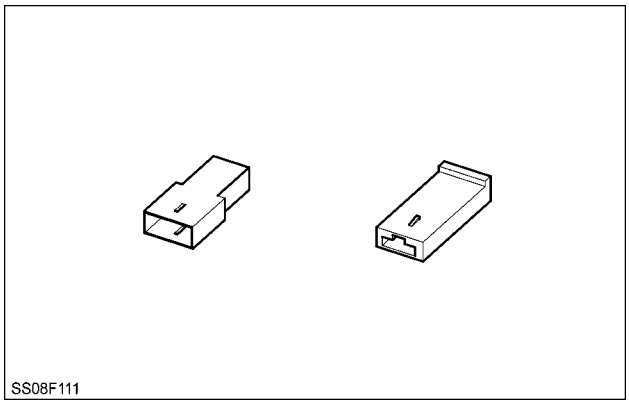
X116B REAR POWER SOCKET IMPLEMENT NEGATIVE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57CR (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K162 13



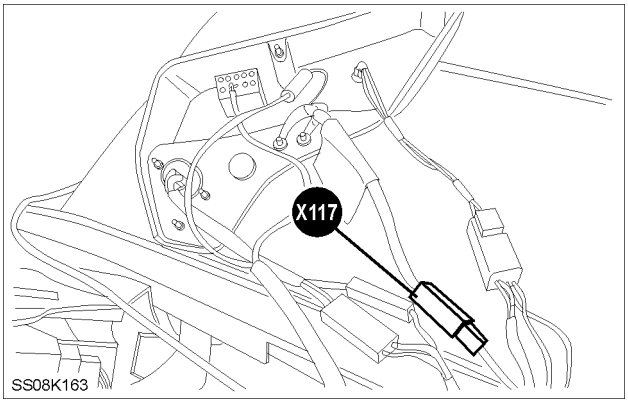
SS08F111 14

CAB RIGHT HAND BEHIND OPERATOR'S SEAT

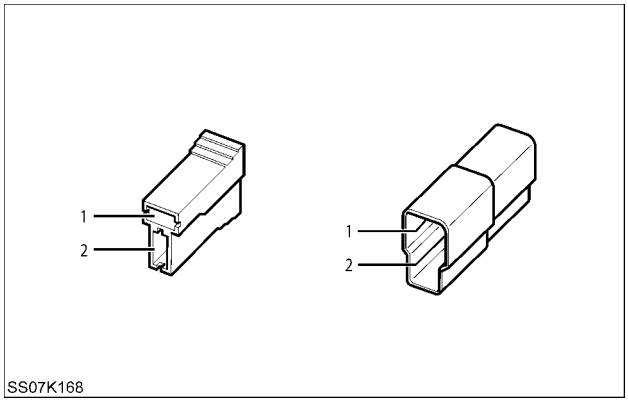
X117 POWER STUDS

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3070A (L) / 3070 (P/W)	'B' PILLAR SKT SUPPLY
2	57PT (B) / 57 (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K163 15



SS07K168 16

BEHIND RIGHT HAND SWITCH PANEL

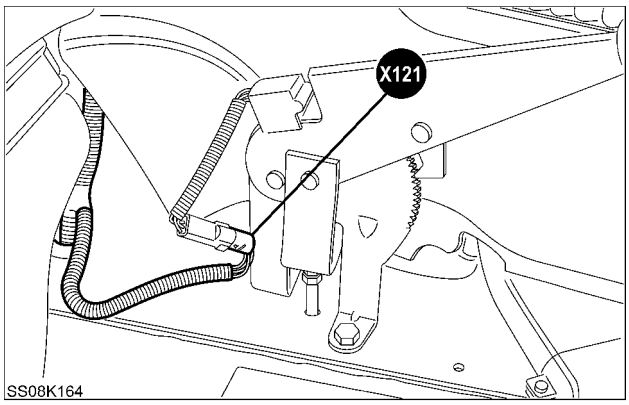
www.truck-freeworkshop.com

Connector - Component diagram 12

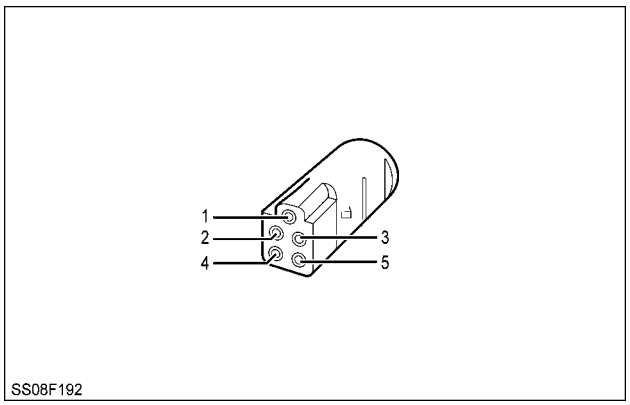
X121 HAND BRAKE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57BL (B)	EARTH (ALL)
2	3014B (R)	HANDBRAKE WARNING LAMP SIGNAL
3	9031B (L)	ADIC MEMORY B+
4	3150 (W)	HANDBRAKE SWITCH (N.C CONTACT) OFF SIG

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K164 1



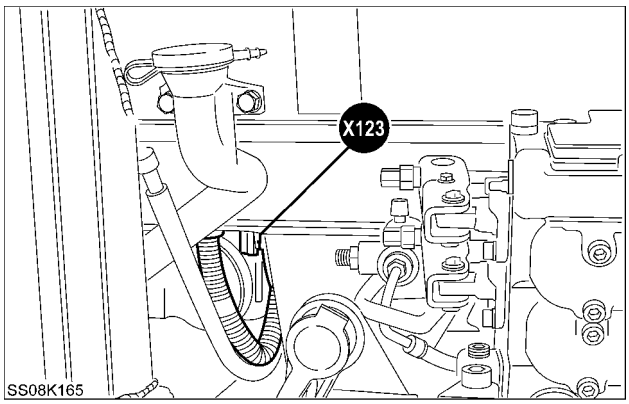
SS08F192 2

LEFT HAND SIDE OPERATOR'S SEAT

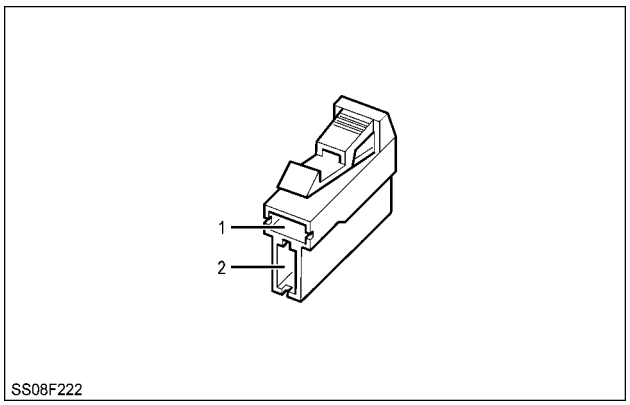
X123 WASHER MOTOR REAR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1121A (G)	HANDBRAKE SWITCH (N.C CONTACT) OFF SIG
2	57G (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K165 3



SS08F222 4

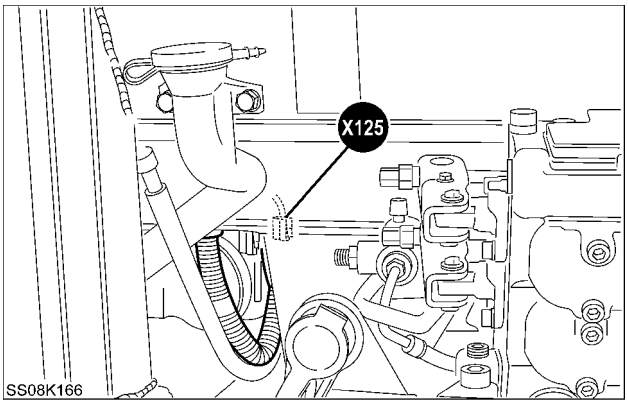
REAR OF TRACTOR UNDERNEATH CAB

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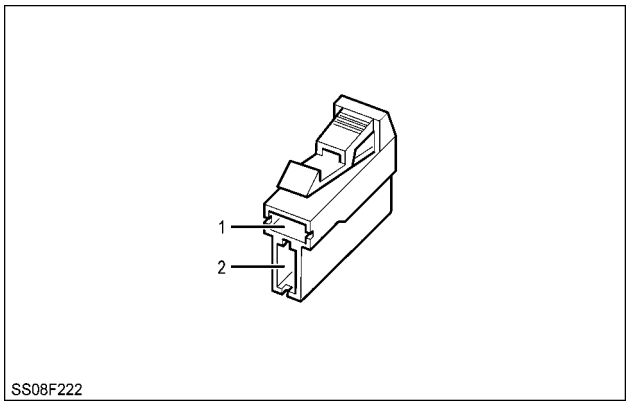
X125 WASHER MOTOR FRONT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	97 (LTG)	WINDSHIELD WASHER FEED
2	57F (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K166 5



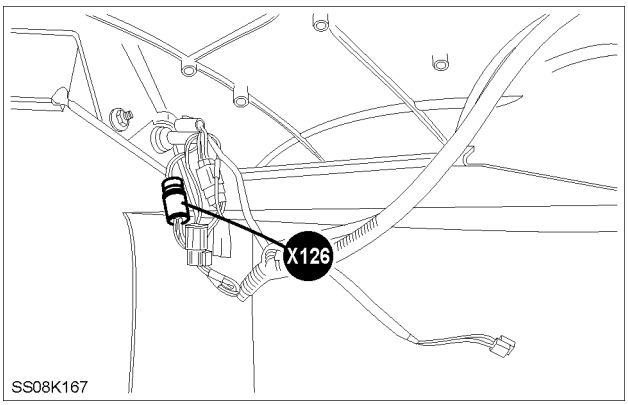
SS08F222 6

REAR OF TRACTOR UNDERNEATH CAB

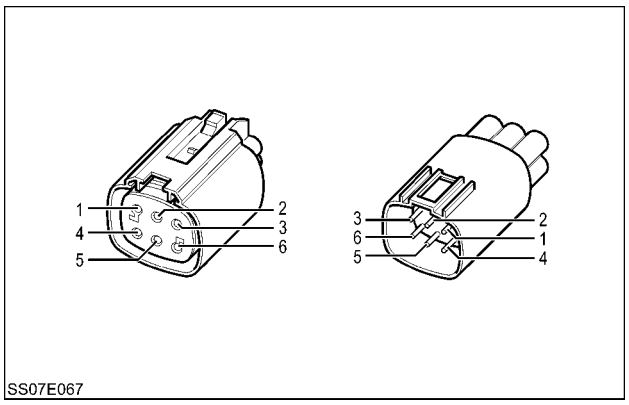
X126 LEFT HAND FENDER CONNECTOR 1 TAIL LAMP

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1014C (R) / 1013 (R)	LEFT HAND LAMPS
2	810B (G) / 810 (G)	STOPLAMPS
3	3005B (G) / 3004 (G)	LEFT HAND TURN SIGNAL WARNING LAMP
4	57AW (B) / 57AY (B)	EARTH (ALL)
5	998A (G) / 998 (G)	WORK LAMP-REAR FEED (INNER)
6	57AN (B) / 57AP (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K167 7



SS07E067 8

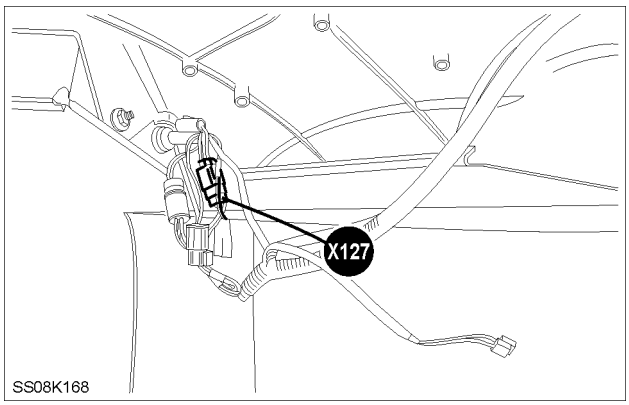
LEFT HAND REAR FENDER

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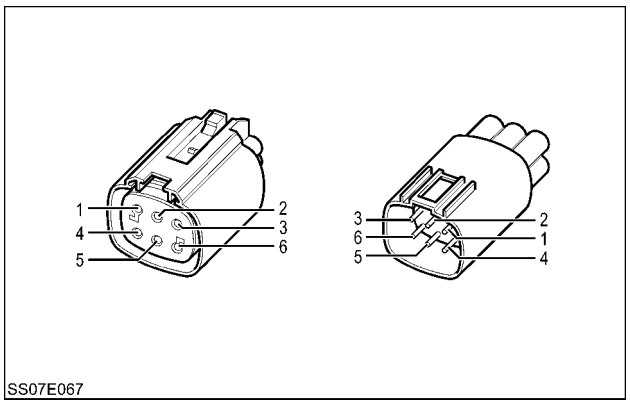
X127 LEFT HAND FENDER CONNECTOR 2 HPL RAISE /LOWER SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5100A (K) / 5100 (K)	EDC EXTERNAL SWITCH UP
2	5200C (N) / 5200 (N)	EDC VALVE SUPPLY
3	5095B (K) / 5095 (K)	EDC EXTERNAL SWITCH DOWN
4	2059 (W)	FENDER PTO SWITCH INPUT
5	2057 (W)	PTO FENDER SWITCH LH - RH LINK
6	2056B (W) / 2056 (W)	PTO FENDER PTO SWITCH ON

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K168 9



SS07E067 10

LEFT HAND REAR FENDER

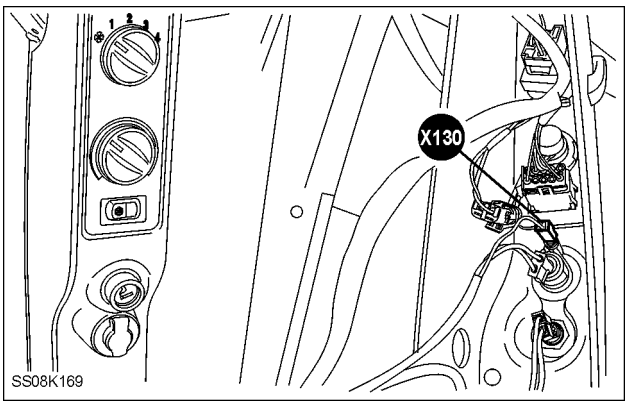
www.truck-freeworkshop.com

Connector - Component diagram 13

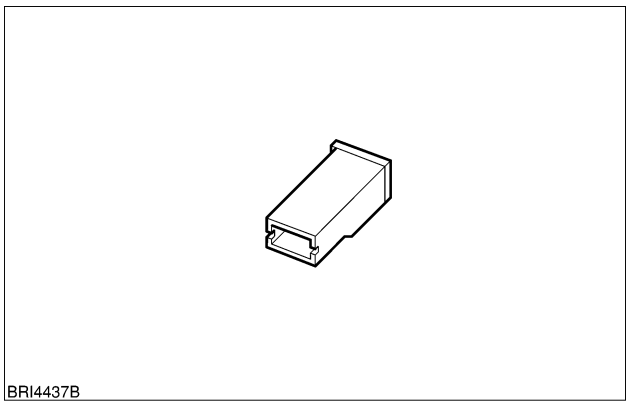
X130 CIGAR LIGHTER (ILLUMINATION)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1012G (R)	ILLUMINATION

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K169 1



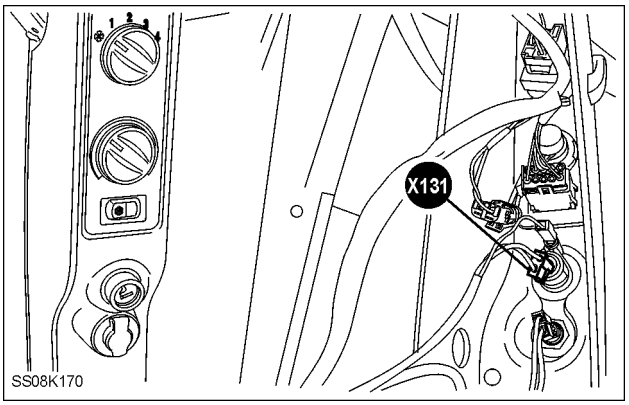
BRI4437B 2

REAR LEFT HAND C-PILLAR

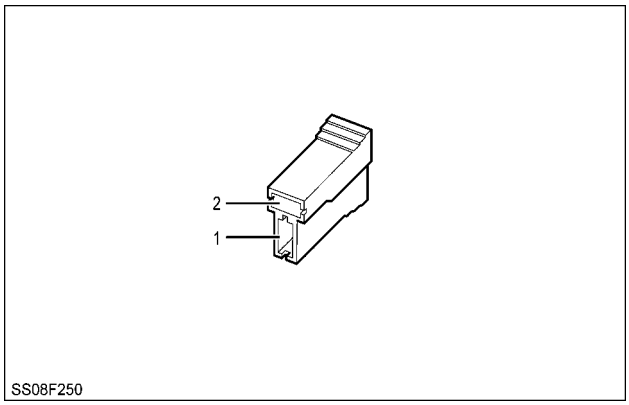
X131 CIGAR LIGHTER (POWER)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3070B (L)	'B' PILLAR SKT SUPPLY
2	57CV (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K170 3



SS08F250 4

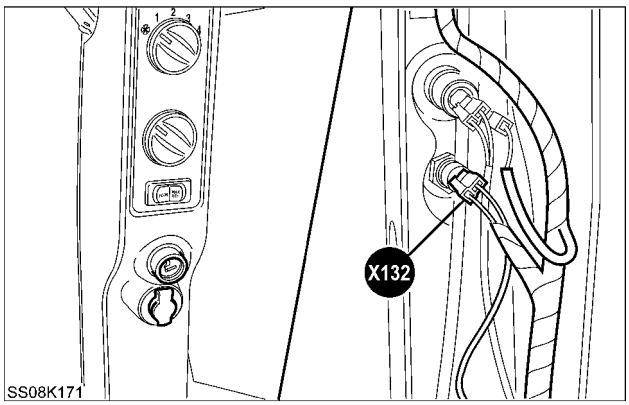
REAR LEFT HAND C-PILLAR

www.truck-freeworkshop.com

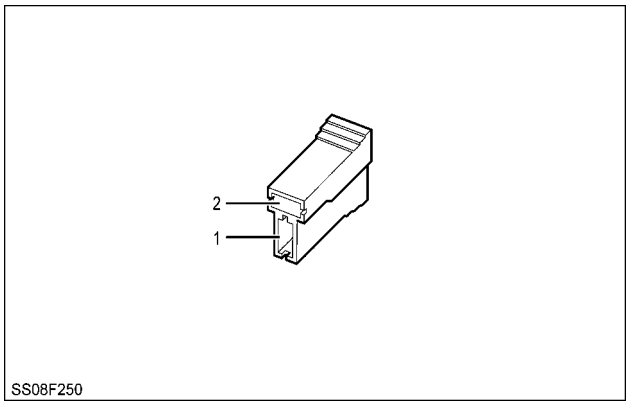
X132 8 AMPERE SOCKET

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	9032C (Y)	IGN+ TO POWER SKT.
2	57CT (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K171 5



SS08F250 6

REAR LEFT HAND C-PILLAR

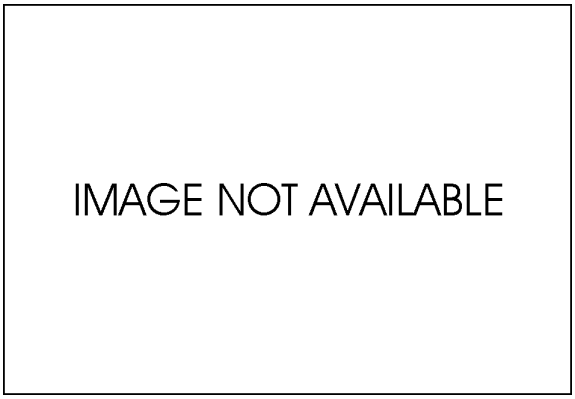
www.truck-freeworkshop.com

Connector - Component diagram 15

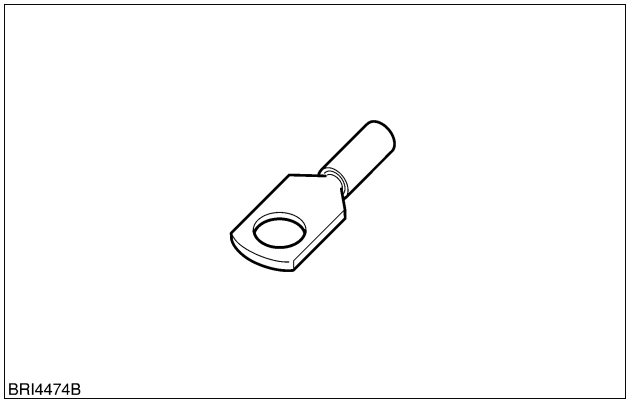
X151 ROOF EARTH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57,57A,57B (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 1



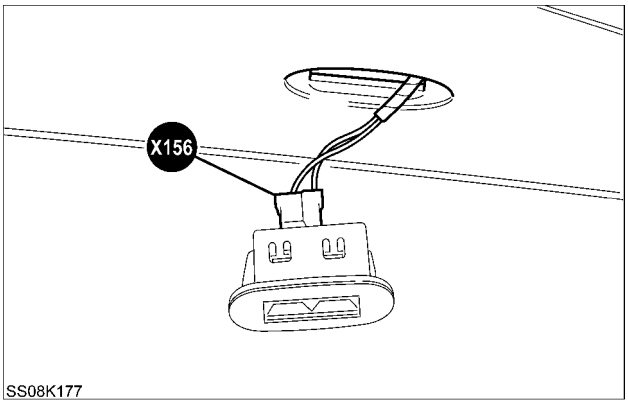
BRI4474B 2

BEHIND RIGHT HAND C-PILLAR COVER TOP

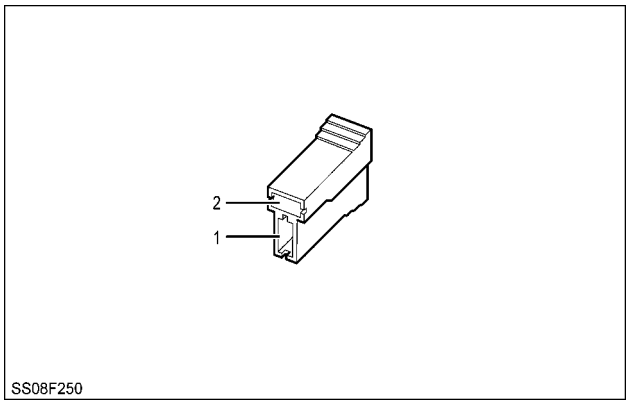
X156 CONSOLE LAMP RIGHT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57H (B)	EARTH (ALL)
2	1013B (R)	RIGHT HAND LAMPS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K177 3



SS08F250 4

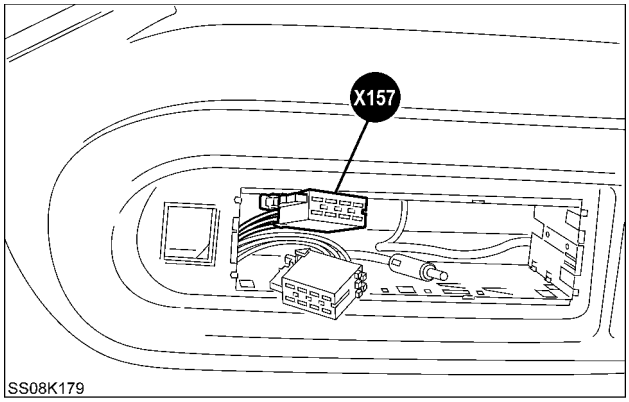
RIGHT HAND INSIDE CAB ROOF

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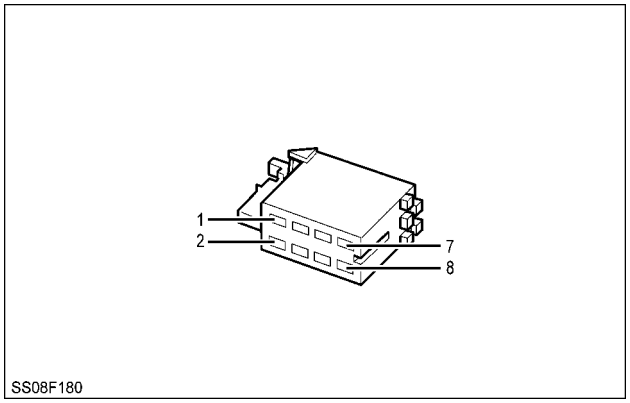
X157 RADIO 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
3	3091 (L)	SPEAKER RR-RHS +
4	3092 (L)	SPEAKER RR-RHS -
5	3097 (G)	SPEAKER RR-LHS +
6	3098 (G)	SPEAKER RR-LHS -

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K179 5



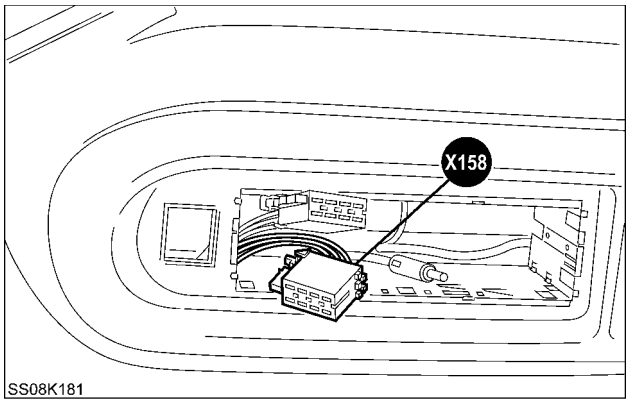
SS08F180 6

RIGHT HAND CAB ROOF

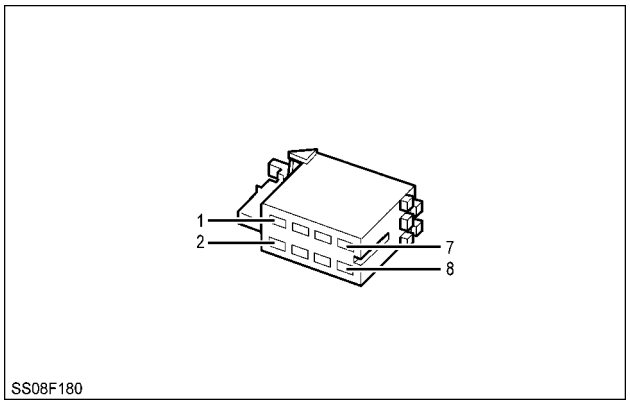
X158 RADIO 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
4	3077 (Y)	RADIO +12VB
6	3078 (O)	RADIO +12V ILLUMINATION
7	3079A (R)	RADIO +12V IGNITION
8	57 (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K181 7



SS08F180 8

RIGHT HAND CAB ROOF

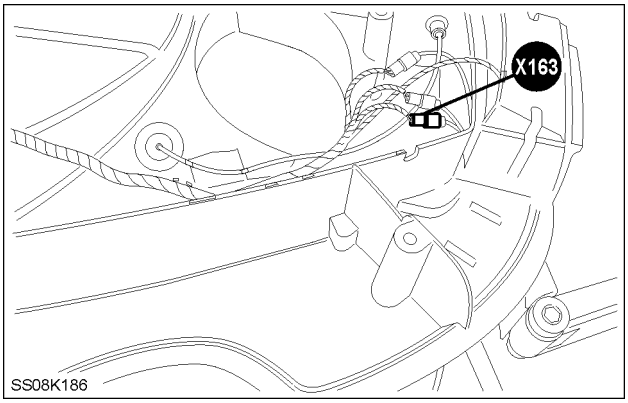
www.truck-freeworkshop.com

Connector - Component diagram 16

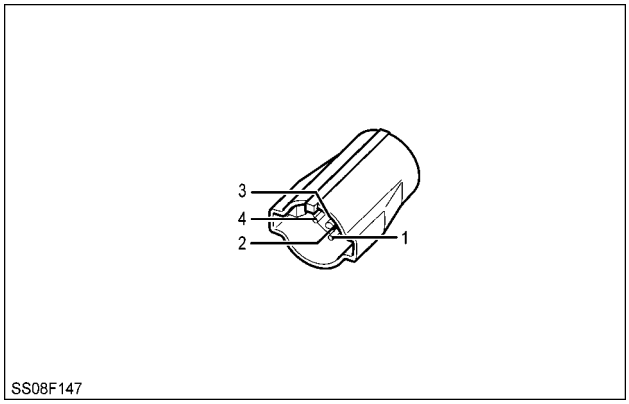
X163 GRABRAIL SIDE LAMP RIGHT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	249 (LTG)	SMV LAMPS RH
2	1013C (R)	RIGHT HAND LAMPS
4	57C (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K186 1



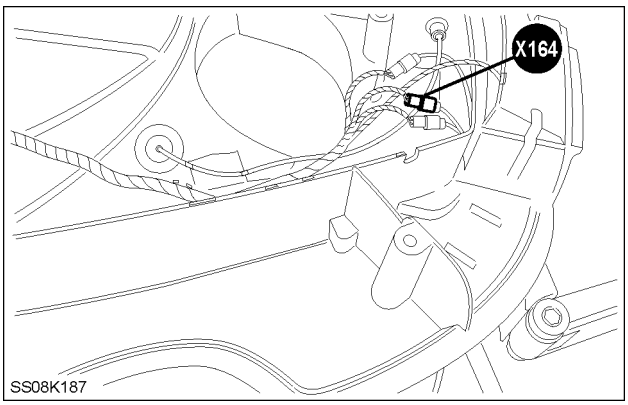
SS08F147 2

RIGHT HAND CAB ROOF

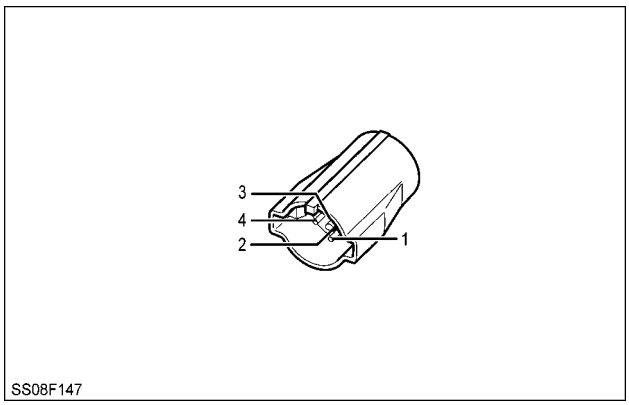
X164 WORKLAMP GRABRAIL RIGHT HAND FRONT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	1097B (R)	FEED FRONT WORKLAMP OUTER
4	57L (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K187 3



SS08F147 4

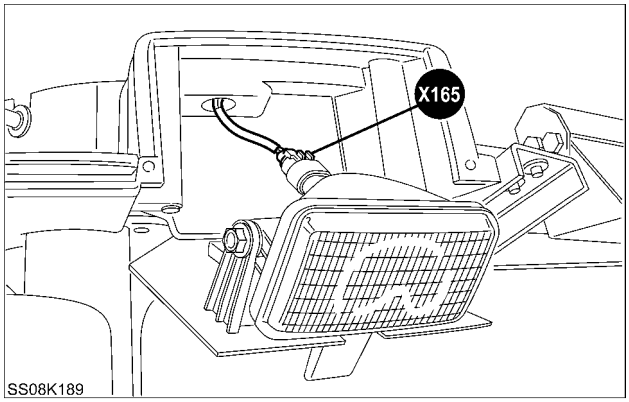
RIGHT HAND CAB ROOF

www.truck-freeworkshop.com

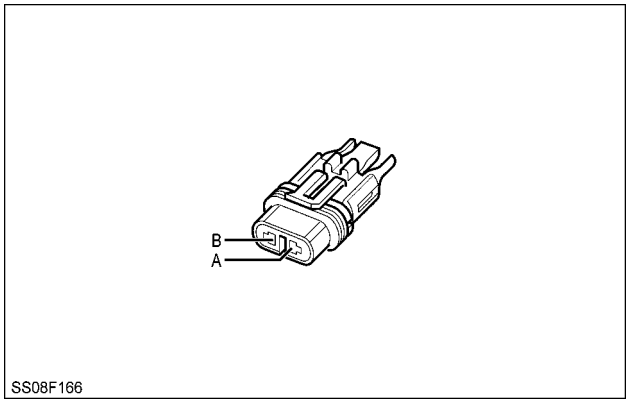
X165 WORKLAMP ROOF FRONT LEFT HAND 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	1098B (W)	FRONT WORKLAMP RELAY GROUND
B	57AA (B)	EARTH (ALL)

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



SS08K189 5



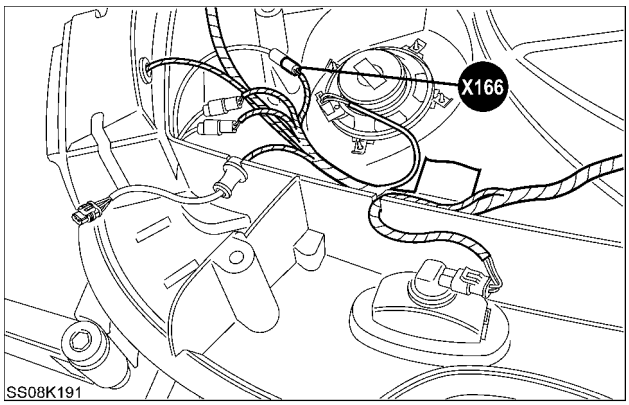
SS08F166 6

FRONT RIGHT HAND CAB ROOF

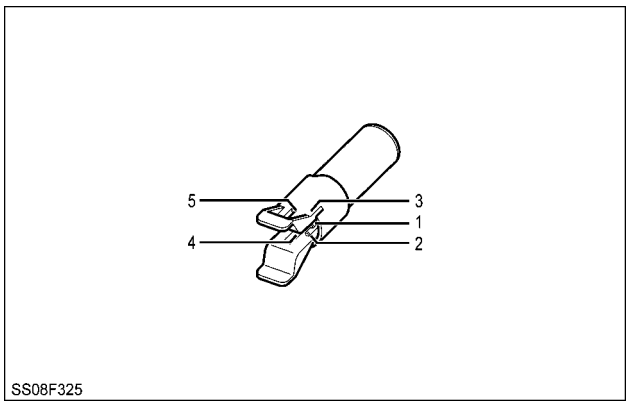
X166 ELECTRIC MIRROR LEFT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1922A (G)	MIRROR CONTROL COMMON
2	1920 (O)	LH MIRROR CONTROL SIDE-SIDE
3	1921 (Y)	LH MIRROR CONTROL UP-DOWN
4	1927A (R)	MIRROR ILLUMINATION
5	57AC (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K191 7



SS08F325 8

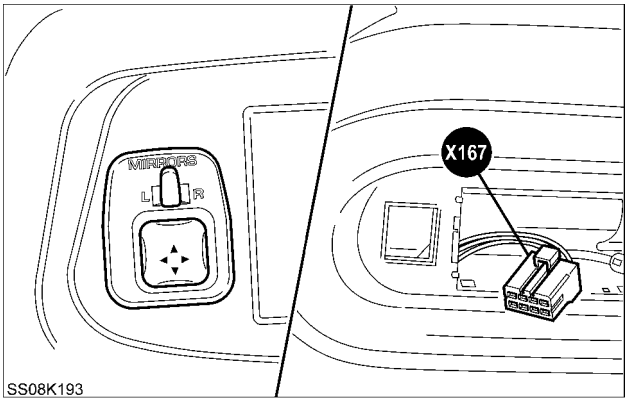
LEFT HAND FRONT CAB ROOF

www.truck-freeworkshop.com

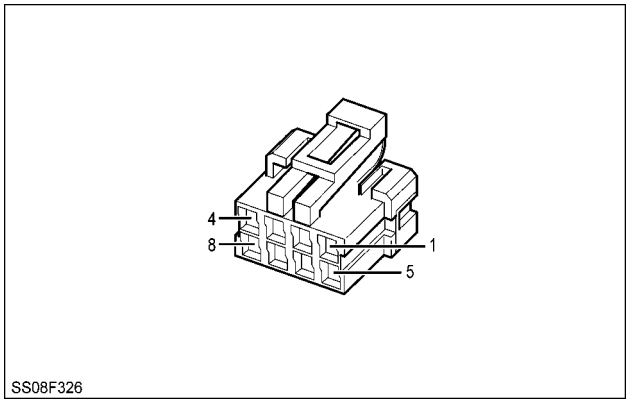
X167 MIRROR CONTROL

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1920 (O)	LH MIRROR CONTROL SIDE-SIDE
2	1923 (O)	RH MIRROR CONTROL SIDE-SIDE
4	57AE (B)	EARTH (ALL)
5	1924 (Y)	RH MIRROR CONTROL UP-DOWN
6	1921 (Y)	LH MIRROR CONTROL UP-DOWN
7	1922 (G)	MIRROR CONTROL COMMON
8	1925 (R)	MIRROR CONTROL +12V

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K193 9



SS08F326 10

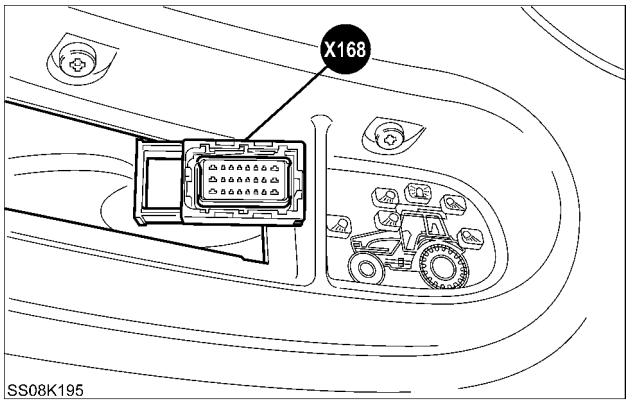
CAB ROOF

www.truck-freeworkshop.com

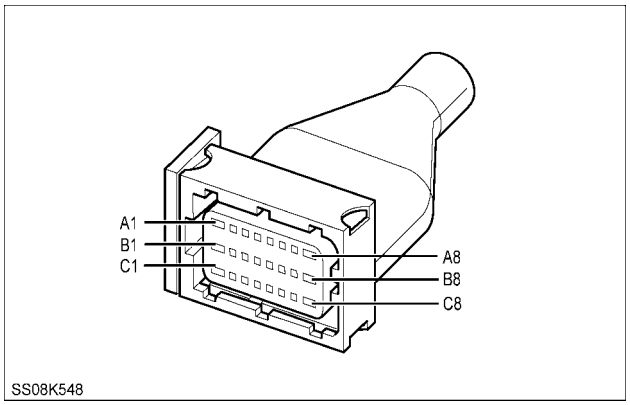
X168 WORKLAMPS ECU

POS.	WIRE NUMBER	CIRCUIT REFERENCE
B1	4011 (L)	ROTATING BEACON SWITCH SUPPLY
B2	138B (L)	RADIO KAM
B3	57X (B)	EARTH (ALL)
B4	1098A (W)	FRONT WORKLAMP RELAY GROUND
B5	1098B (W)	FRONT WORKLAMP RELAY GROUND
B6	1090 (R)	REAR WORKLAMP RELAY SIGNAL
B7	1097A (R)	FEED FRONT WORKLAMP OUTER
B8	1097B (R)	FEED FRONT WORKLAMP OUTER
C1	997 (G)	WORK LAMP-REAR FEED (OUTER)
C2	4012 (L)	ROTATING BEACON FEED
C3	998A (G)	WORK LAMP-REAR FEED (INNER)
C4	998B (G)	WORK LAMP-REAR FEED (INNER)
C5	1013AH (R)	RIGHT HAND LAMPS
C6	1092 (R)	FRONT WORKLAMP RELAY SIGNAL
C7	1071A (L)	WORKLAMP FRONT FEED
C8	1071B (L)	WORKLAMP FRONT FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K195 11



SS08K548 12

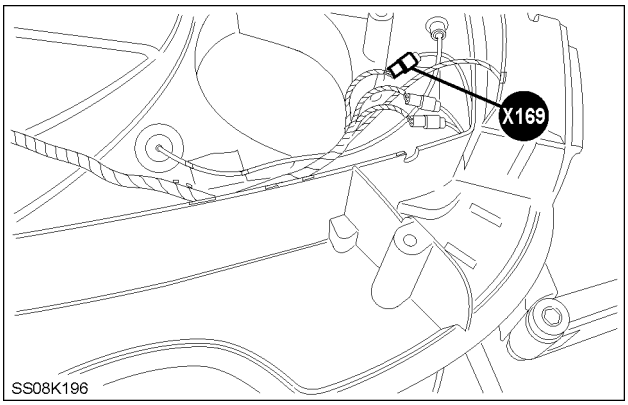
CAB ROOF

www.truck-freeworkshop.com

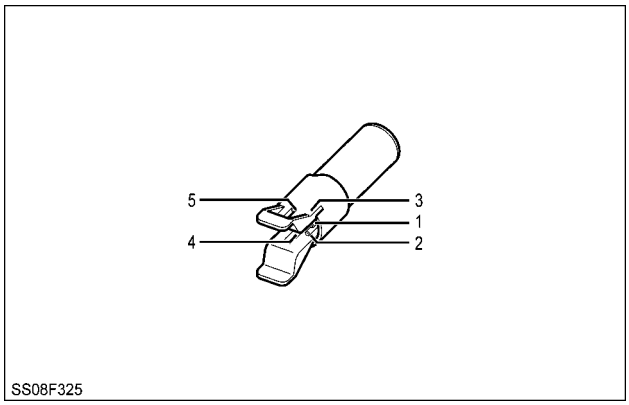
X169 ELECTRIC MIRROR RIGHT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1922B (G)	MIRROR CONTROL COMMON
2	1923 (O)	RH MIRROR CONTROL SIDE-SIDE
3	1924 (Y)	RH MIRROR CONTROL UP-DOWN
4	1927B (R)	MIRROR ILLUMINATION
5	57AD (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K196 13



SS08F325 14

FRONT RIGHT HAND CAB ROOF

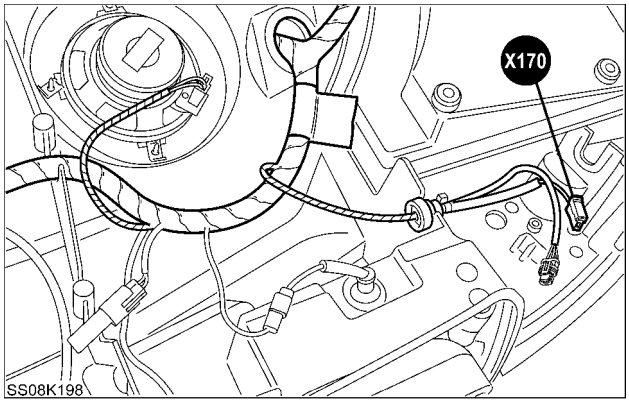
www.truck-freeworkshop.com

Connector - Component diagram 17

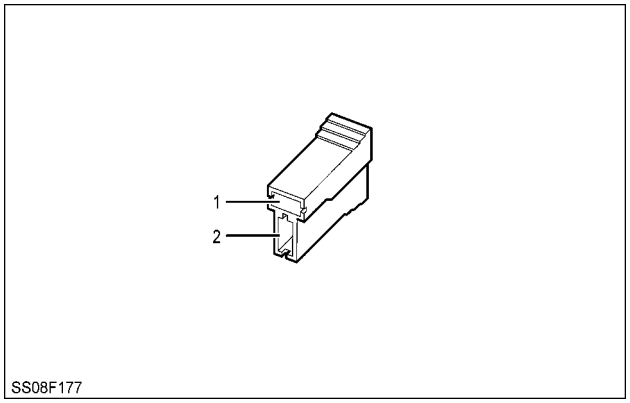
X170 ROTATING BEACON RIGHT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	4012B (L)	ROTATING BEACON FEED
2	57Y (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K198 1



SS08F177 2

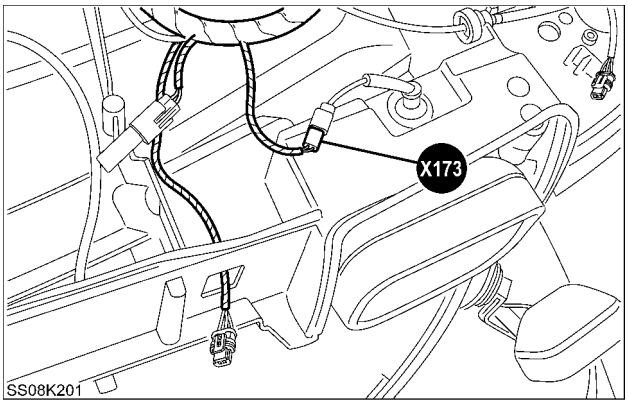
RIGHT HAND CAB ROOF

www.truck-freeworkshop.com

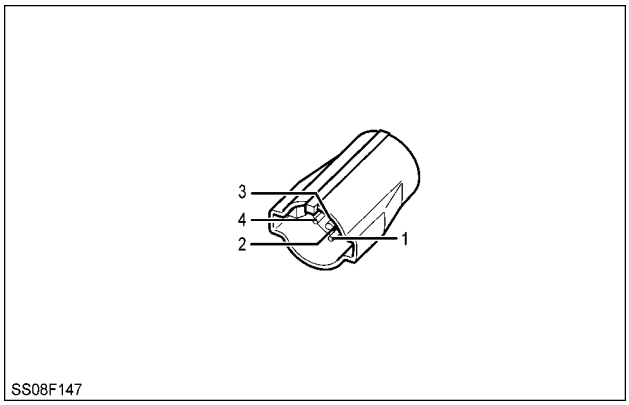
X173 WORKLAMP REAR RIGHT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	997B (G)	WORK LAMP-REAR FEED (OUTER)
4	57F (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K201 3



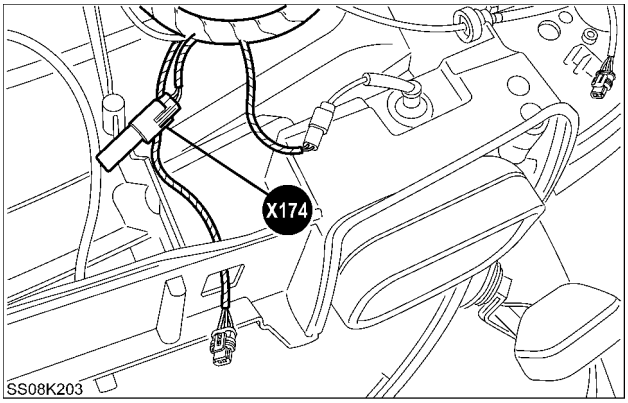
SS08F147 4

REAR RIGHT HAND CAB ROOF

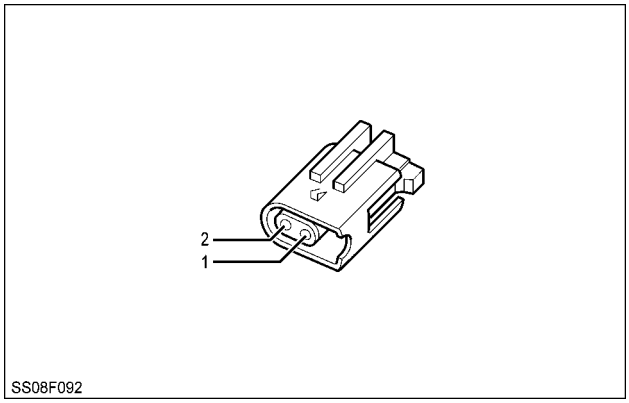
X174 LICENCE PLATE DIODE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	978 (W)	LICENCE PLATE LAMP
2	997C (G)	WORK LAMP-REAR FEED (OUTER)

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



SS08K203 5



SS08F092 6

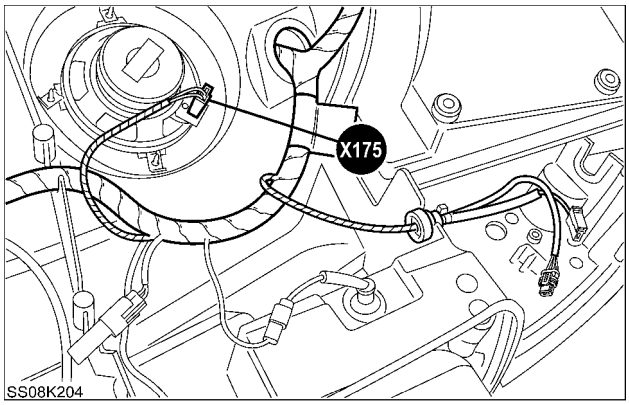
REAR RIGHT HAND CAB ROOF

www.truck-freeworkshop.com

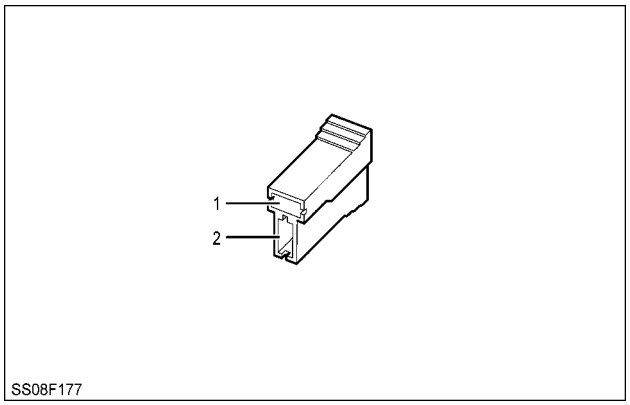
X175 RADIO SPEAKER RIGHT HAND REAR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3091 (L)	SPEAKER RR-RHS +
2	3092 (L)	SPEAKER RR-RHS -

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K204 7



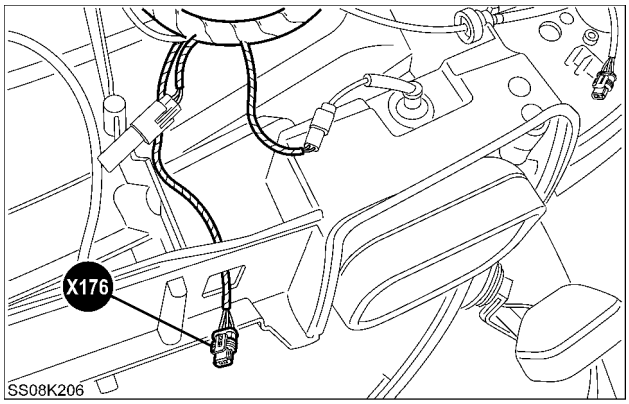
SS08F177 8

REAR RIGHT HAND CAB ROOF

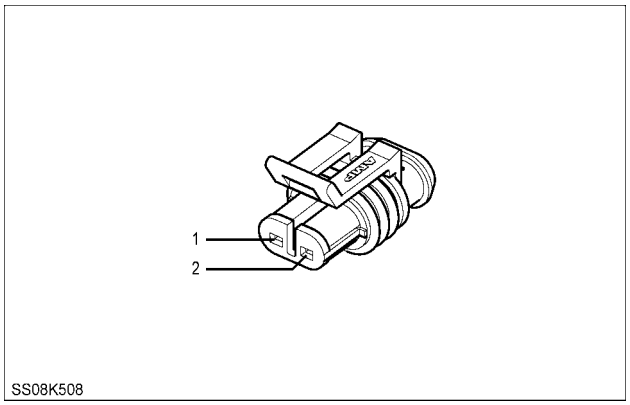
X176 LICENCE PLATE RIGHT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1014A (R)	LEFT HAND LAMPS
2	998A (W)	WORK LAMP-REAR FEED (INNER)

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



SS08K206 9



SS08K508 10

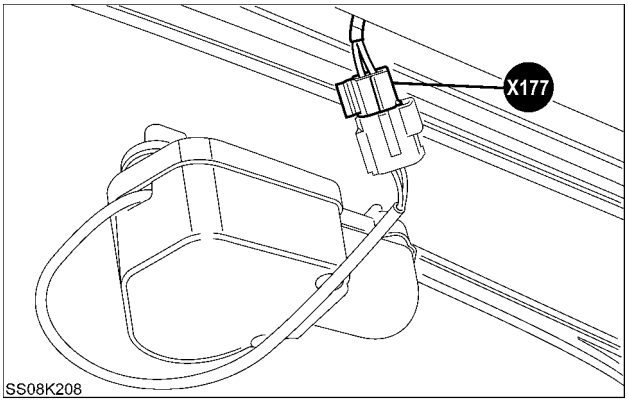
REAR RIGHT HAND CAB ROOF

www.truck-freeworkshop.com

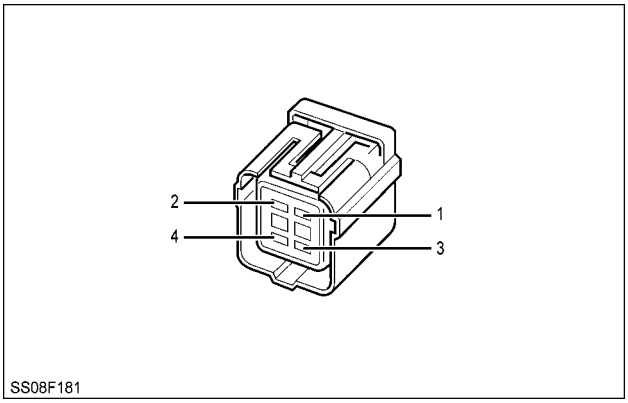
X177 WIPER MOTOR REAR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1120 (G)	RR WINDSHIELD WIPER PARK RETURN
2	57D (B)	EARTH (ALL)
3	1038 (TN)	WINDSHIELD WIPER FEED-REAR

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K208 11



SS08F181 12

REAR CAB ROOF

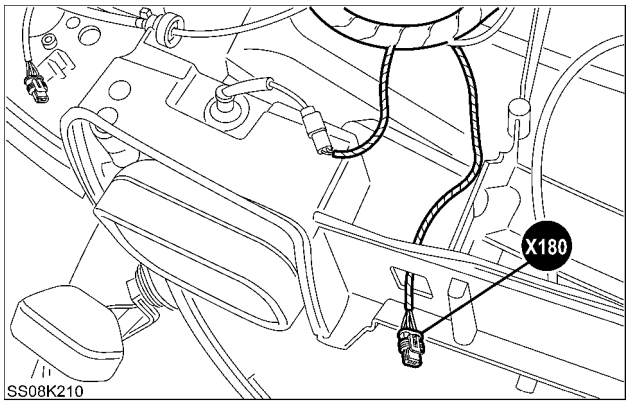
www.truck-freeworkshop.com

Connector - Component diagram 18

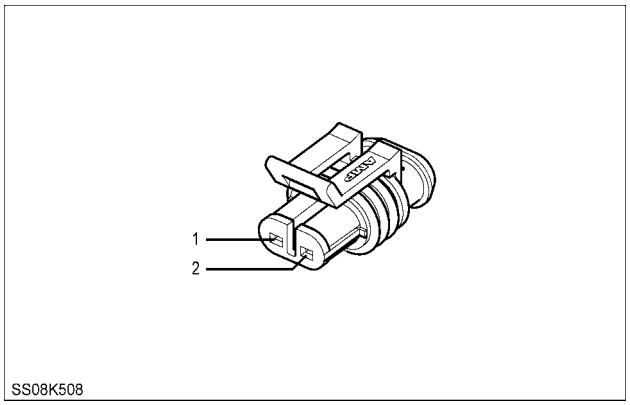
X180 LICENCE PLATE LEFT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1014B (R)	LEFT HAND LAMPS
2	978B (W)	LICENCE PLATE LAMP

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



SS08K210 1



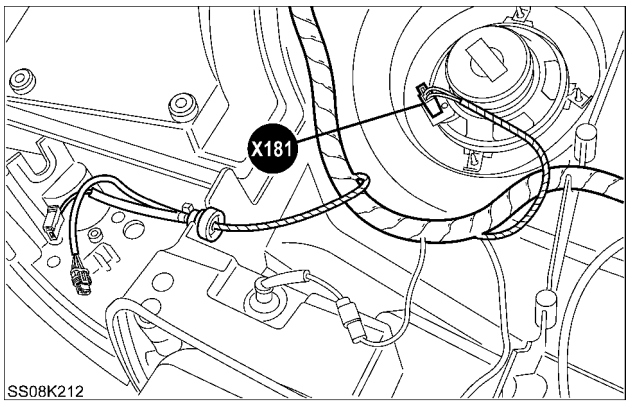
SS08K508 2

REAR LEFT HAND CAB ROOF

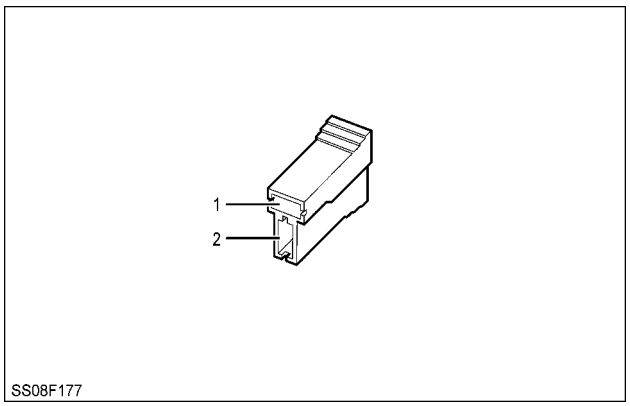
X181 RADIO SPEAKER LEFT HAND REAR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3097 (G)	SPEAKER RR-LHS +
2	3098 (G)	SPEAKER RR-LHS -

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K212 3



SS08F177 4

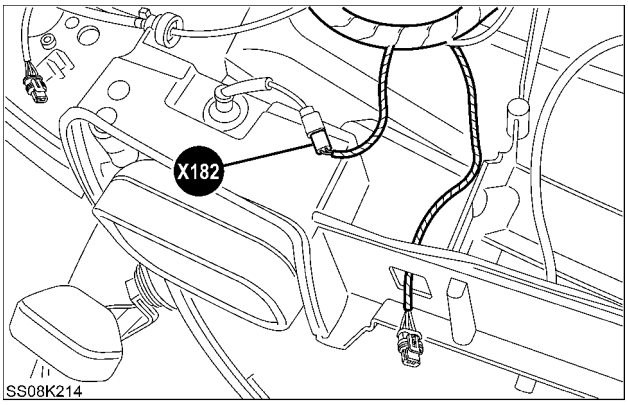
REAR LEFT HAND CAB ROOF

www.truck-freeworkshop.com

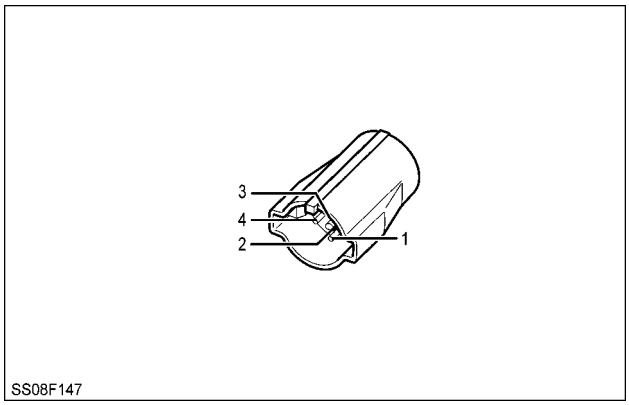
X182 WORKLAMP LEFT HAND REAR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	997A (G)	WORK LAMP-REAR FEED (OUTER)
4	57P (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K214 5



SS08F147 6

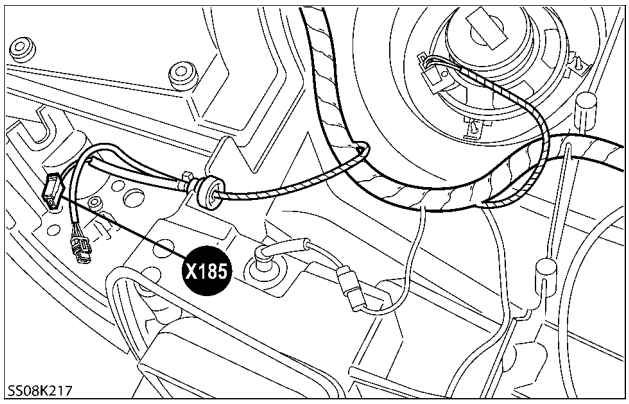
REAR LEFT HAND CAB ROOF

www.truck-freeworkshop.com

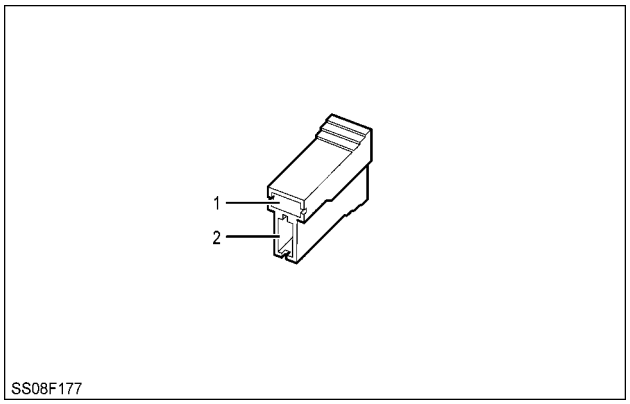
X185 ROTATING BEACON LEFT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	4012A (L)	ROTATING BEACON FEED
2	57Z (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K217 7



SS08F177 8

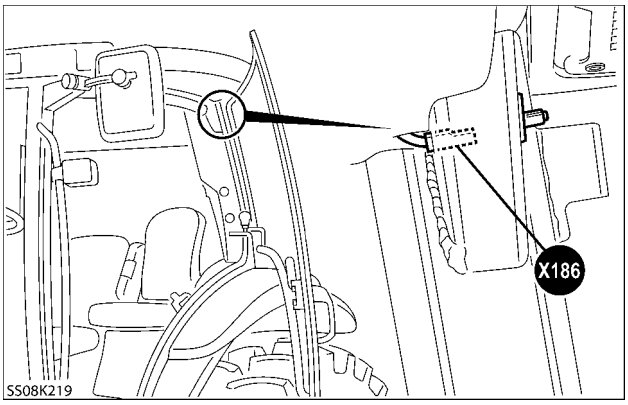
REAR LEFT HAND CAB ROOF

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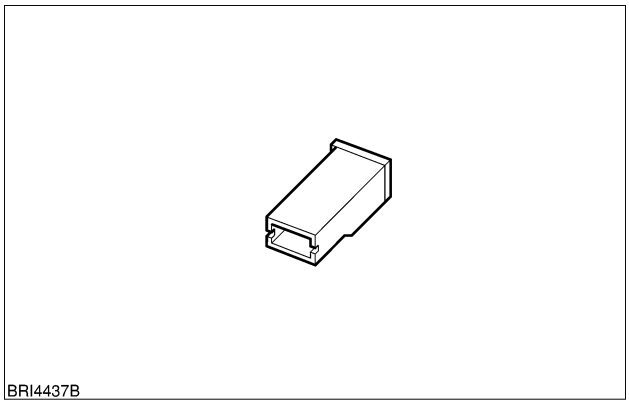
X186 DOOR SWITCH LEFT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3052B (L)	DOME LAMP TO DOOR SWITCH

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K219 9



BRI4437B 10

TOP REAR LEFT HAND CAB DOOR

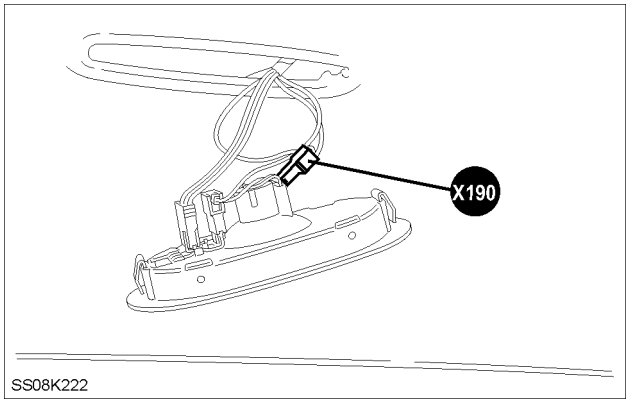
www.truck-freeworkshop.com

Connector - Component diagram 19

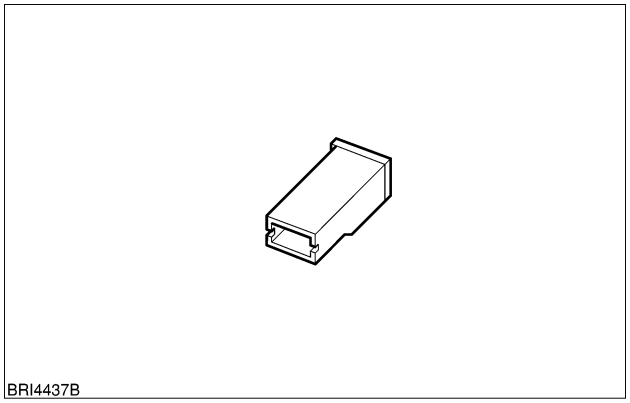
X190 INTERIOR LAMP A

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3057,3057A (P)	PUDDLE LAMP RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K222 1



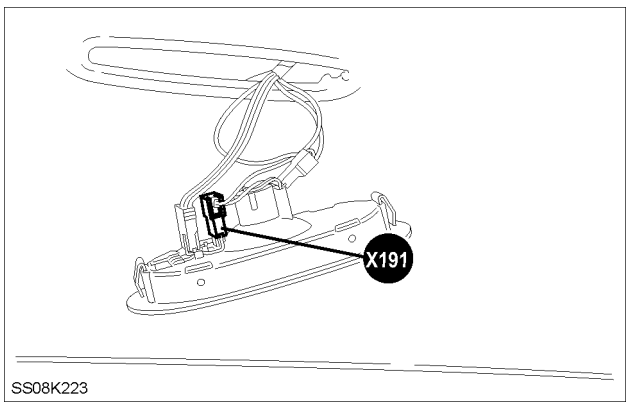
BRI4437B 2

CAB ROOF

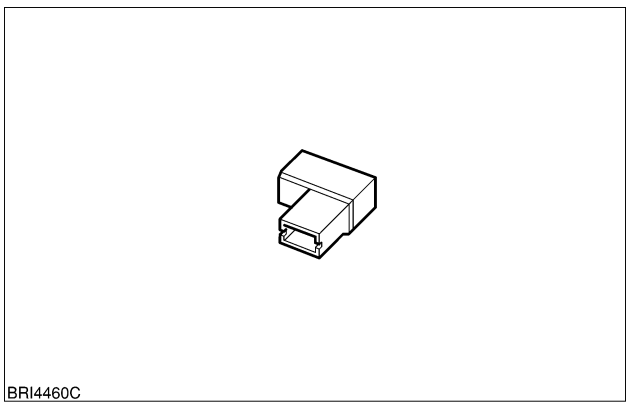
X191 INTERIOR LAMP B1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	666A (L)	DOMELAMP SWITCH FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K223 3



BRI4460C 4

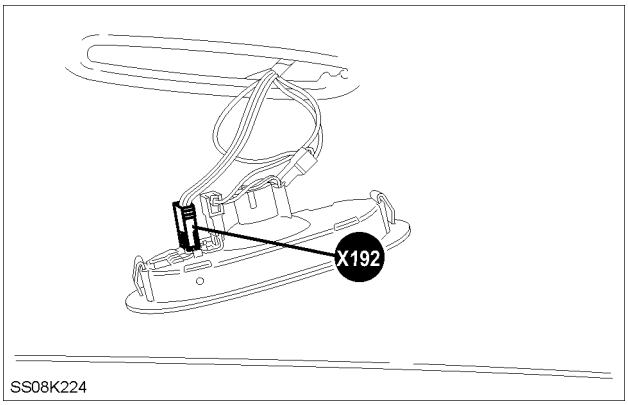
CAB ROOF

www.truck-freeworkshop.com

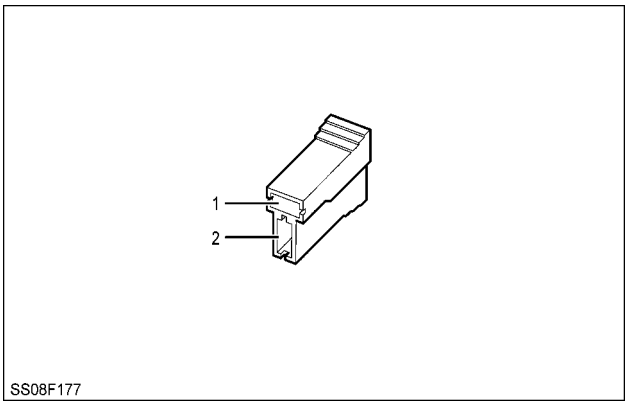
X192 INTERIOR LAMP B2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3052A,3052B (L)	DOME LAMP TO DOOR SWITCH
2	57R (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K224 5



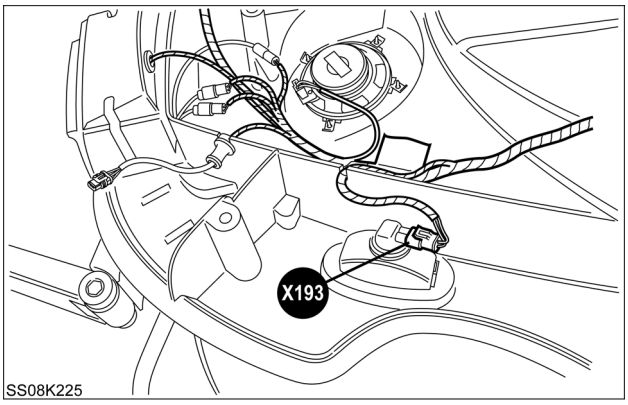
SS08F177 6

CAB ROOF

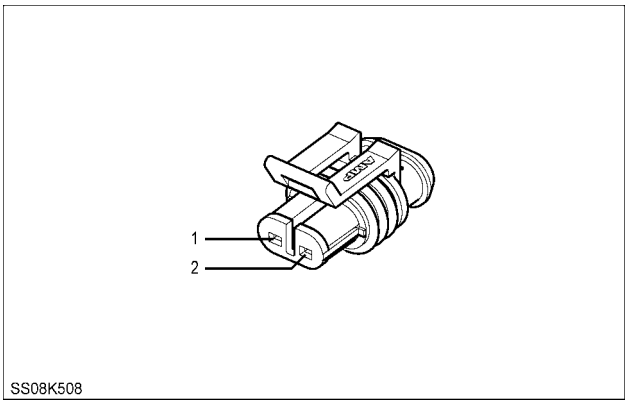
X193 PUDDLE LAMP LEFT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3057A (L)	PUDDLE LAMP RETURN
2	666C (L)	DOMELAMP SWITCH FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K225 7



SS08K508 8

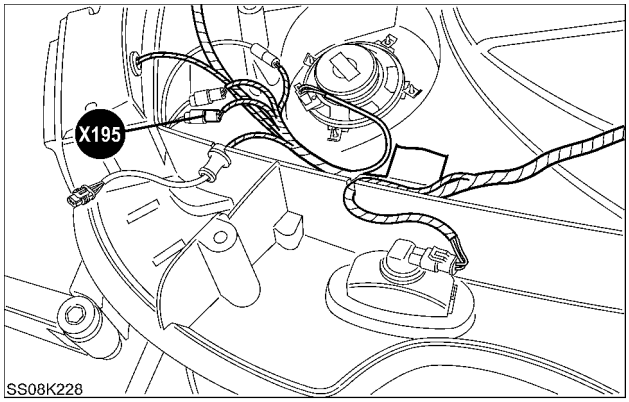
FRONT LEFT HAND CAB ROOF

www.truck-freeworkshop.com

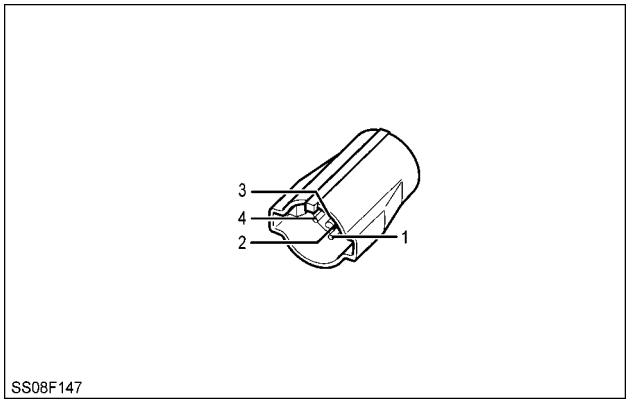
X195 SIDE LAMP GRABRAIL LEFT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	250 (LTG)	SMV LAMPS LH
2	1014C (R)	LEFT HAND LAMPS
4	57E (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K228 9



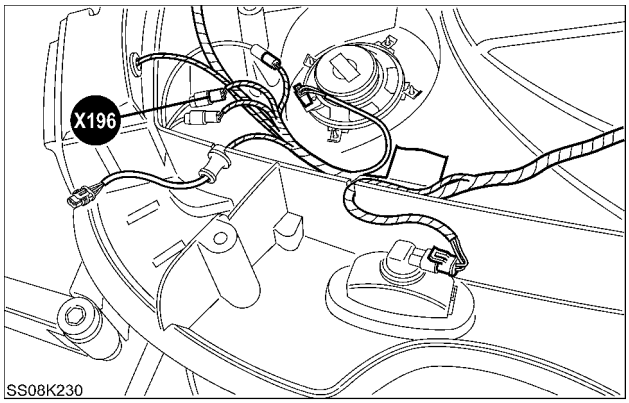
SS08F147 10

FRONT LEFT HAND CAB ROOF

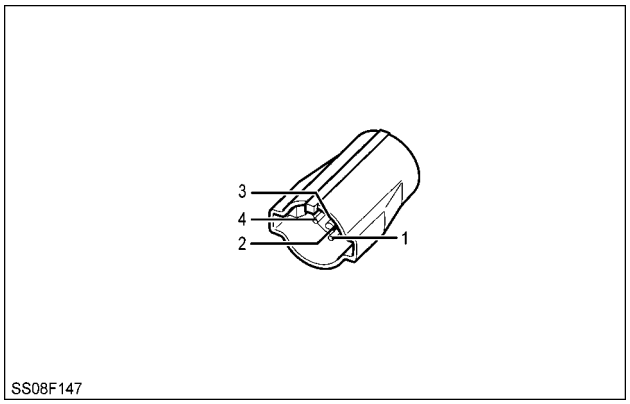
X196 WORKLAMP GRABRAIL LEFT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	1097A (R)	FEED FRONT WORKLAMP OUTER
4	57V (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K230 11



SS08F147 12

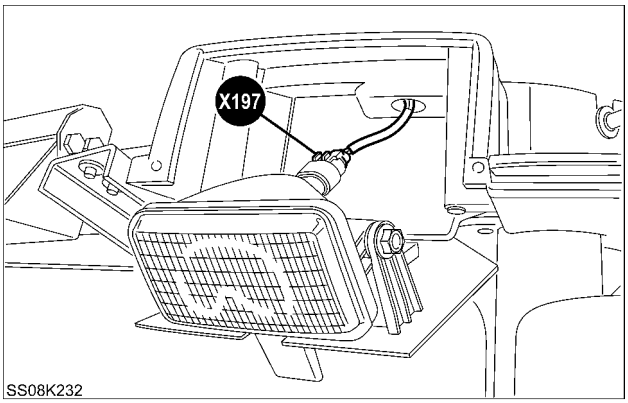
FRONT LEFT HAND CAB ROOF

www.truck-freeworkshop.com

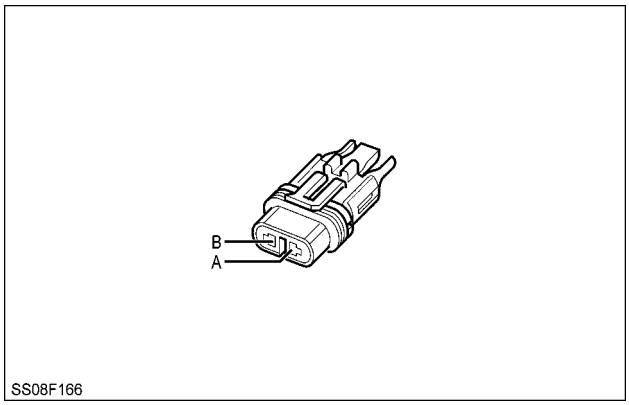
X197 WORKLAMP LEFT HAND FRONT UPPER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	1098A (W)	FRONT WORKLAMP RELAY GROUND
B	57AB (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K232 13



SS08F166 14

FRONT LEFT HAND CAB ROOF

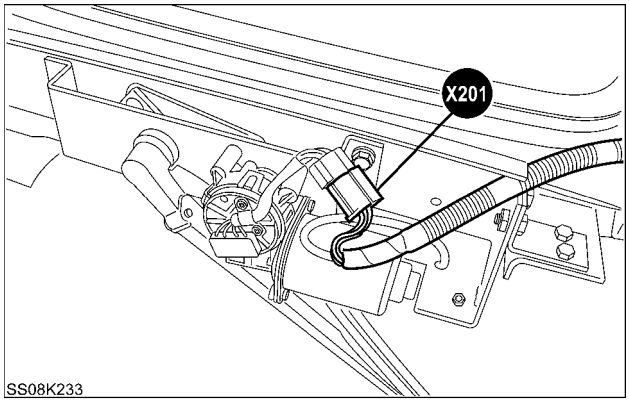
www.truck-freeworkshop.com

Connector - Component diagram 20

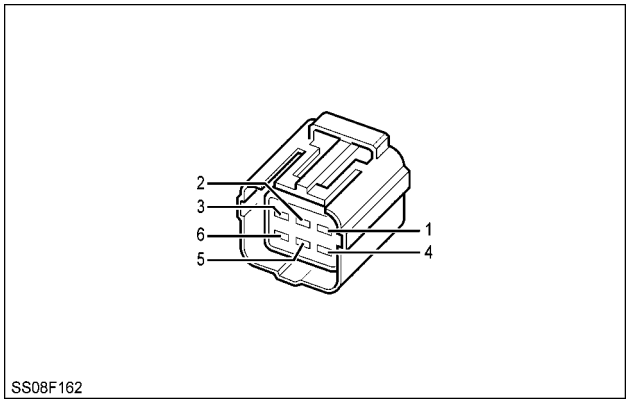
X201 WIPER MOTOR FRONT (CABINE)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	28 (Y)	WIPER MOTOR (PARK RETURN)
2	57M (B)	EARTH (ALL)
3	58 (R)	WIPER MOTOR-LOW
4	1019 (G)	WINDSHIELD WIPER FEED
6	56 (W)	WIPER MOTOR-HIGH

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K233 1



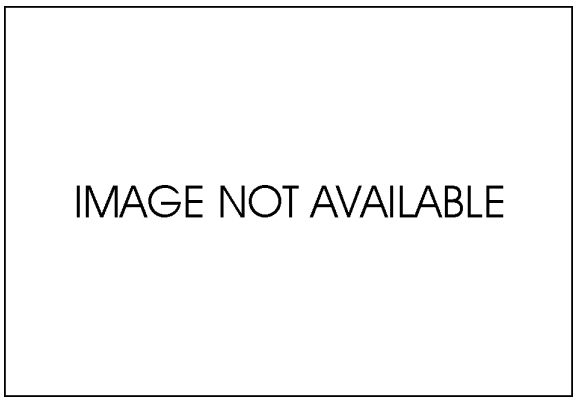
SS08F162 2

FRONT CAB ROOF

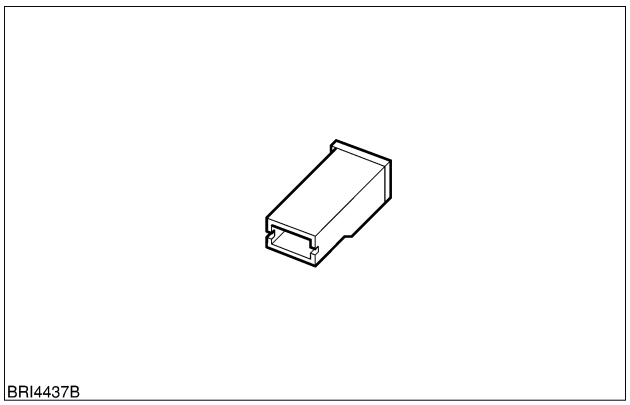
X207 ANTENNE PLUS

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3079B (R)	RADIO +12V IGNITION

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 3



BRI4437B 4

CAB ROOF

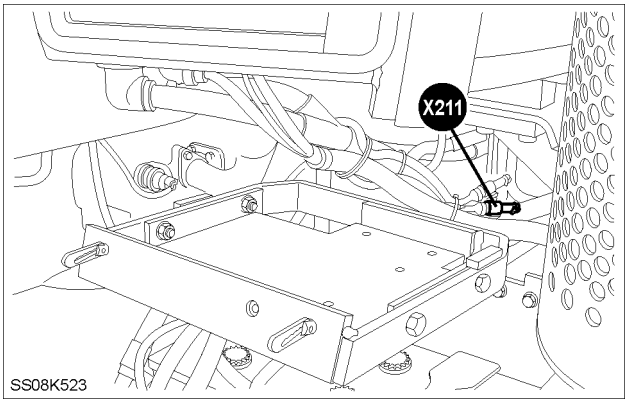
www.truck-freeworkshop.com

Connector - Component diagram 21

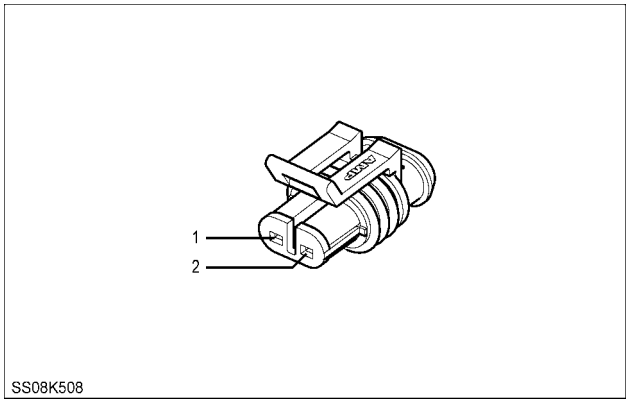
X211 LOADER VALVE OPTION A

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3272 (O)	LOADER VALVE #1 OUT
2	3273 (O)	LOADER VALVE #1 RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K523 1



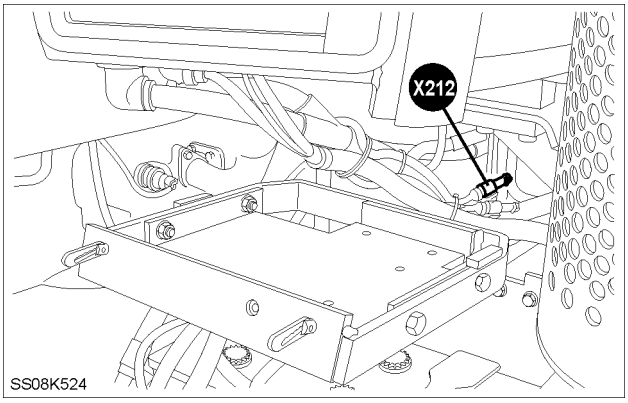
SS08K508 2

RIGHT HAND BEHIND STEPS

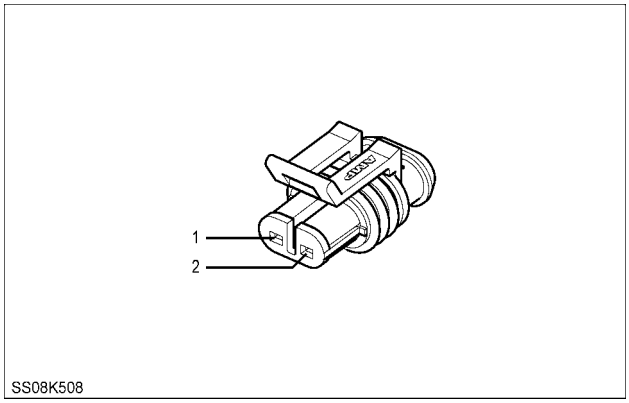
X212 LOADER VALVE OPTION B

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3274 (R)	LOADER VALVE #2 OUT
2	3275 (R)	LOADER VALVE #2 RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K524 3



SS08K508 4

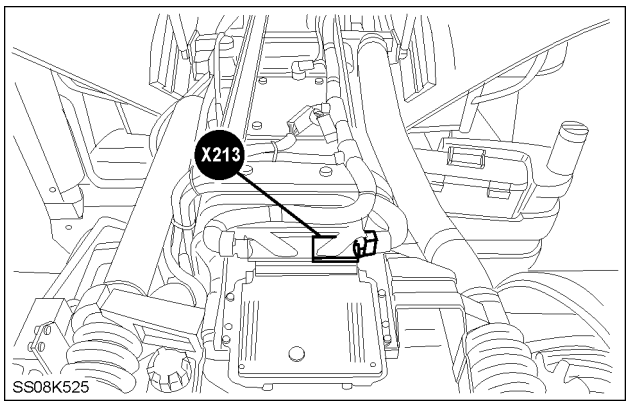
RIGHT HAND BEHIND STEPS

www.truck-freeworkshop.com

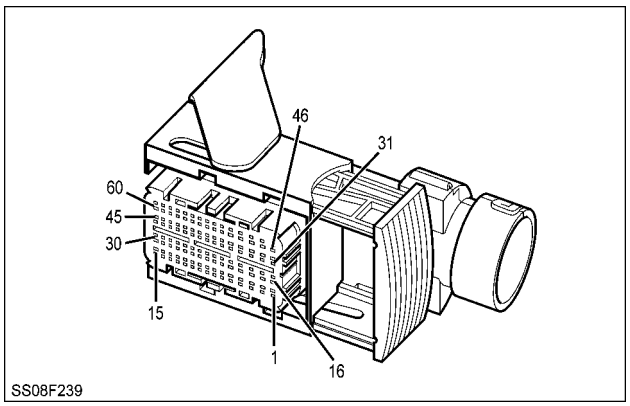
X213 ENGINE CONTROL UNIT - A

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	Y/B	
2	U/B	
3	W/G	
8	W/B	
9	N/B	
11	G	
12	W	
13	O/U	
16	S/Y	
17	S/B	
18	N/B	
19	G	
20	W	
21	B	
22	Y/G	
23	Y/B	
27	R	
28	S/B	
31	O/W	
32	O/U	
33	B/P	
36	K/N	
40	U/B	
41	W/Y	
43	R/G	
46	U/R	
47	N/W	
48	S/R	
49	O	
50	R	
51	O/B	
52	W/U	
53	W/R	
54	Y/R	
58	O/G	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K525 5



SS08F239 6

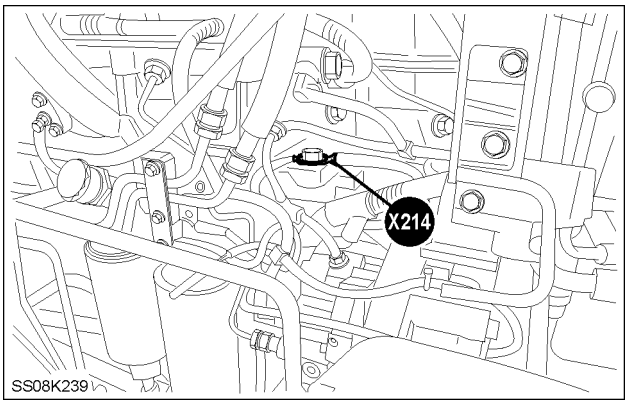
TOP ENGINE

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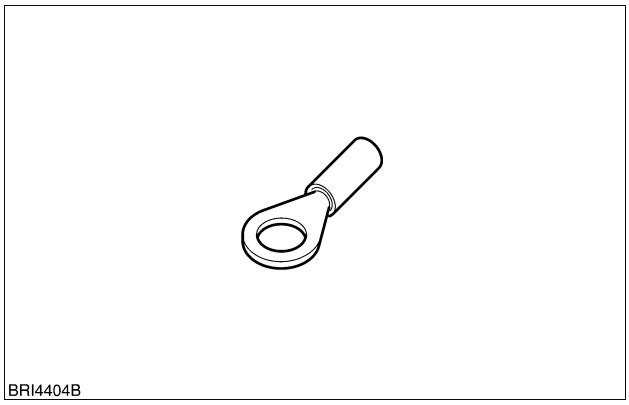
X214 EARTH POINT - ELECTRONIC MODULE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57FG (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K239 7



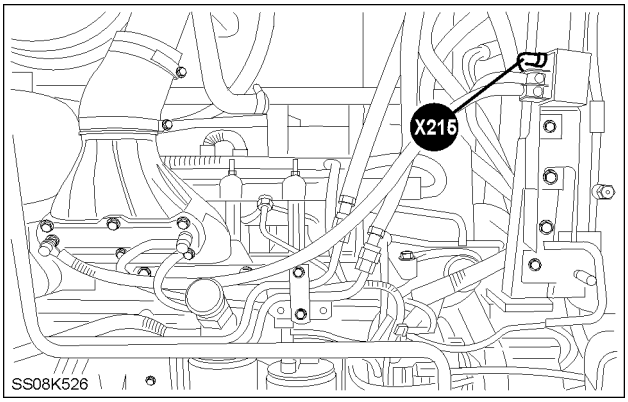
BRI4404B 8

LEFT HAND ENGINE

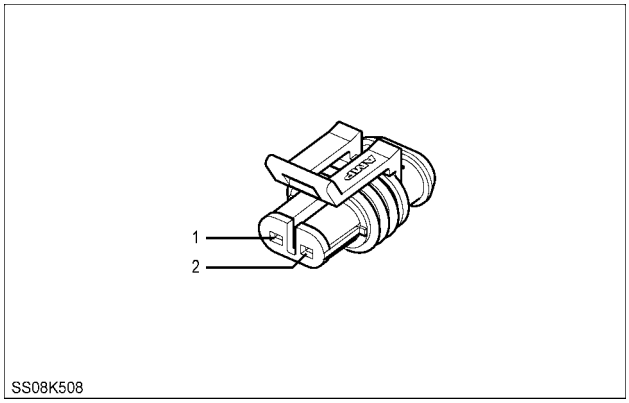
X215 GRID HEATER RELAY

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	6586 (L)	ECU TO GRID HEATER RELAY RETURN
2	6408H (G)	FUSED B+ TO ECU (1)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K526 9



SS08K508 10

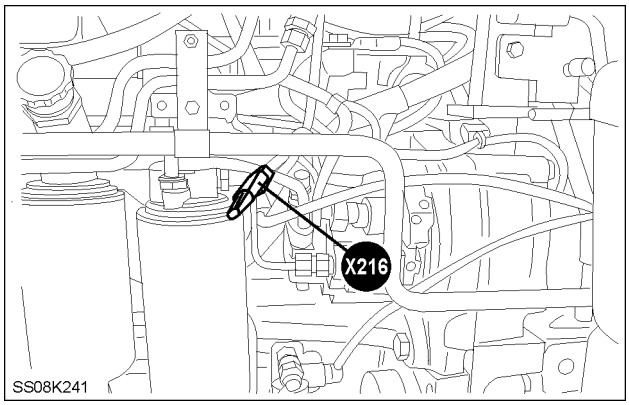
LEFT HAND ENGINE

www.truck-freeworkshop.com

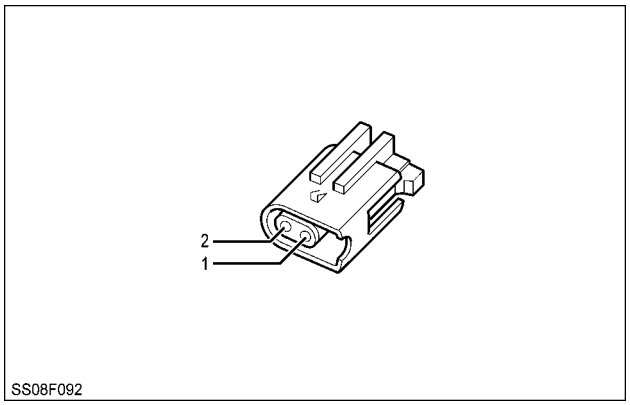
X216 FUEL HEATER RELAY

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	6570 (G)	ECU TO FUEL FILTER HEATER RETURN
2	6408J (G)	FUSED B+ TO ECU (1)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K241 11



SS08F092 12

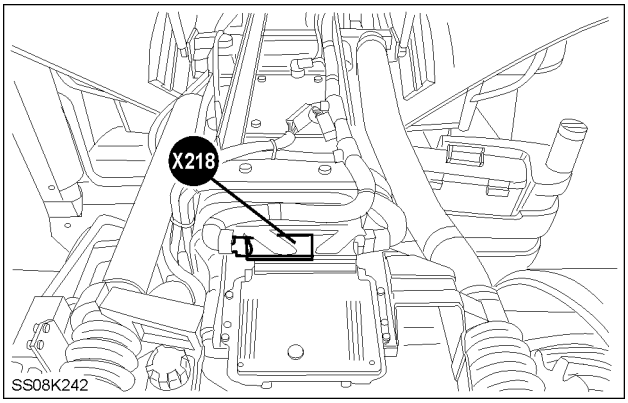
LEFT HAND ENGINE

www.truck-freeworkshop.com

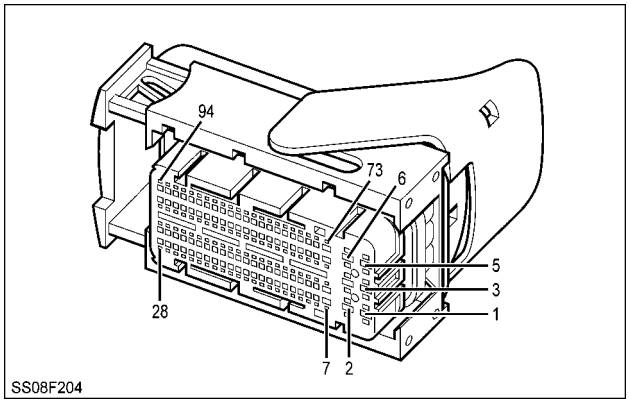
X218 ENGINE MODULE BOSCH EDC 16

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	6408P (G)	FUSED B+ TO ECU (1)
2	57FC (B)	EARTH (ALL)
4	57FE (B)	EARTH (ALL)
5	6408F (G)	FUSED B+ TO ECU (1)
6	57FD (B)	EARTH (ALL)
24	6320 (N)	FAN 5V REF.
25	6418 (K)	ECU TO J1941(ISO) INTERFACE #2 CONNECTOR ISO K
28	71C (W)	IGNITION SWITCHED FEEDS (UNFUSED)
29	2087 (O)	EXHAUST BRAKE SOLENOID
53	6305 (O)	REVERSIBLE FAN OPTION - MOTOR FEED
61	5420D (G)	CAN L
62	5400D (Y)	CAN H
68	6570 (G)	ECU TO FUEL FILTER HEATER RETURN
72	6407 (O)	ENGINE SHUTDOWN
75	6300 (N)	FAN SPEED
79	2040 (LTG)	WATER IN FUEL SENSOR
90	6310 (N)	FAN SOLENOID
93	6586 (L)	ECU TO GRID HEATER RELAY RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K242 13



SS08F204 14

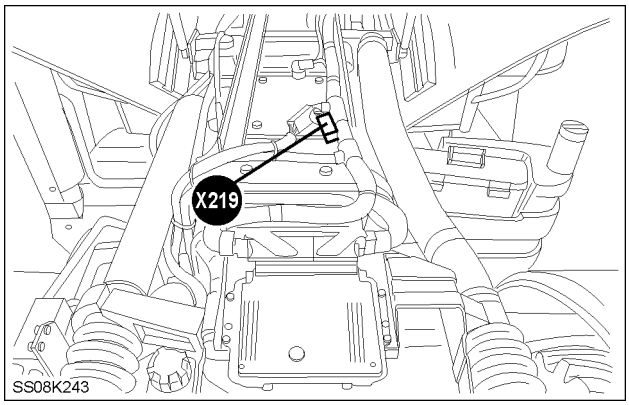
TOP ENGINE

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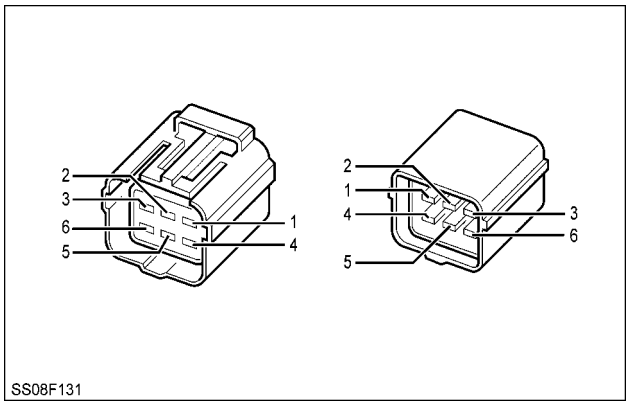
X219 VISCTRONIC FAN

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	6300 (N)	FAN SPEED
2	6305 (O)	REVERSIBLE FAN OPTION - MOTOR FEED
3	6408G (G)	FUSED B+ TO ECU (1)
4	6310 (N)	FAN SOLENOID
5	6320 (N)	FAN 5V REF.

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K243 15



SS08F131 16

TOP ENGINE

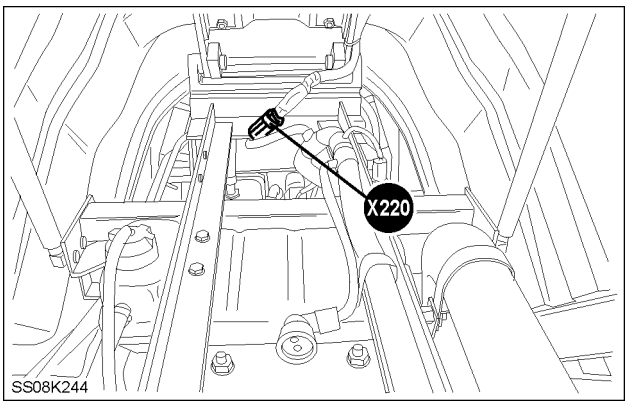
www.truck-freeworkshop.com

Connector - Component diagram 22

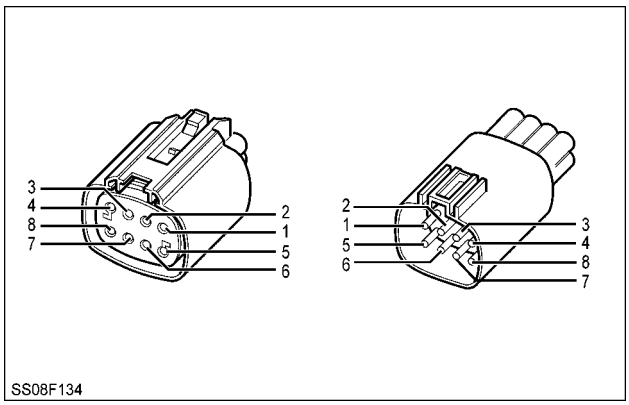
X220 FRONT LAMPS

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57JF (B) / 57AB (B)	EARTH (ALL)
2	376 (L)	HORN FEED
3	1030B (U)	HEADLAMP DIP BEAM
4	1027B (U)	HEADLAMP MAIN BEAM
5	1073A (L) / 1073 (L)	WORKLAMP FRONT FEED
6	57JG (B) / 57B (B)	EARTH (ALL)
7	1030A (U) / 1030 (U)	HEADLAMP DIP BEAM
8	1027A (U) / 1027 (U)	HEADLAMP MAIN BEAM

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K244 1



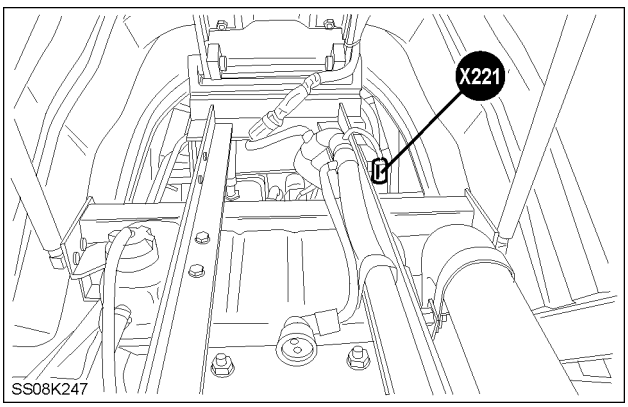
SS08F134 2

TOP LEFT HAND ENGINE

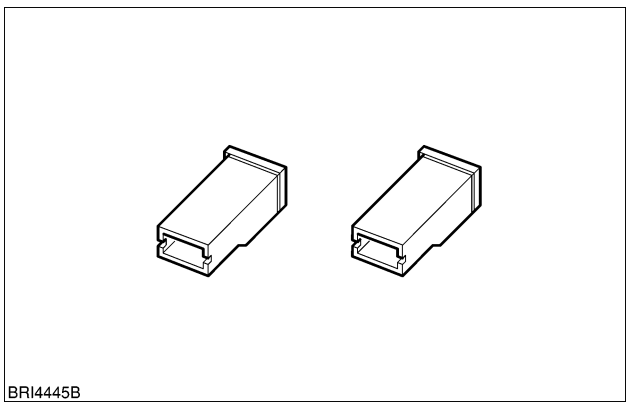
X221 BRAKE FLUID LEVEL

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3016 (S)	BRAKE FLUID LEVEL SIGNAL
1	10M (G)	IGNITION SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K247 3



BRI4445B 4

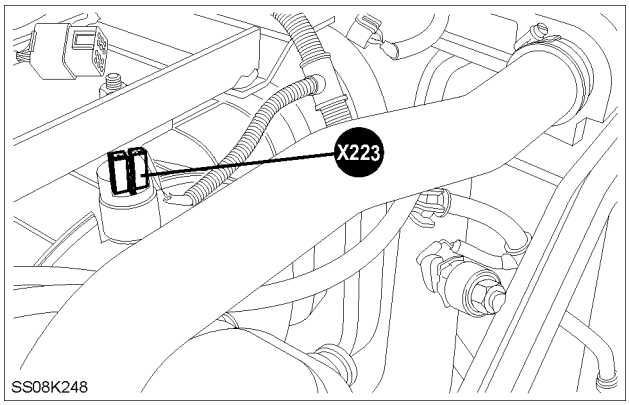
TOP LEFT HAND ENGINE

www.truck-freeworkshop.com

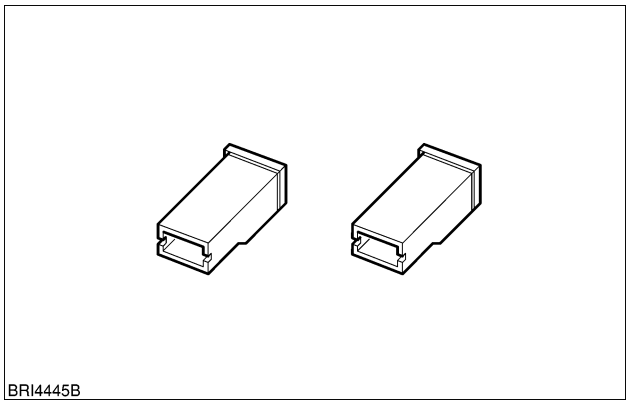
X223 AIR CLEANER SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57JB (B)	EARTH (ALL)
1	1005 (S)	AIR CLEANER WARNING LAMP

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K248 5



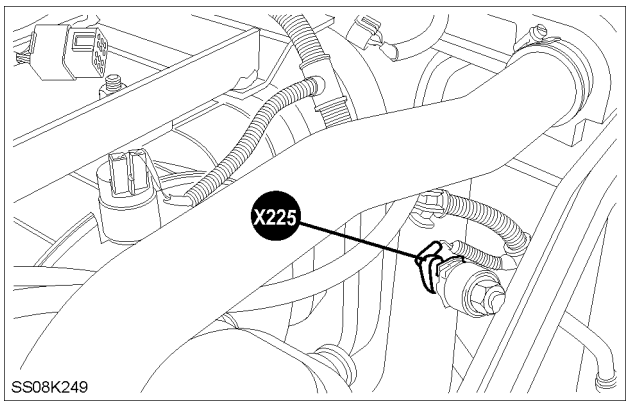
BRI4445B 6

TOP RIGHT HAND ENGINE

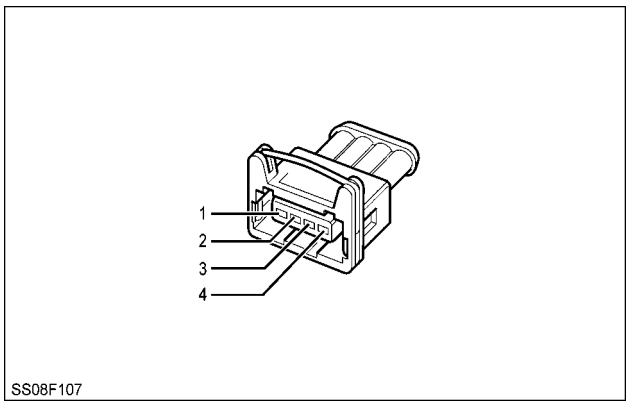
X225 A/C PRESSURE SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2006A (U)	DE-ICING SWITCH - AIR CONDITIONER
2	2006B (U)	DE-ICING SWITCH - AIR CONDITIONER
3	2007 (Y)	AIR CONDITIONER LOW PRESSURE
4	5200AA (N)	EDC VALVE SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K249 7



SS08F107 8

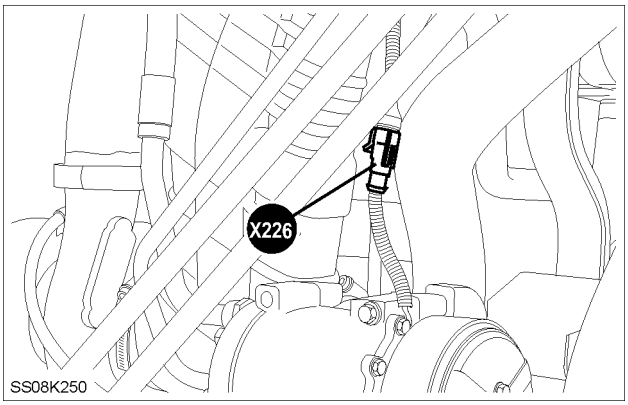
TOP RIGHT HAND ENGINE

www.truck-freeworkshop.com

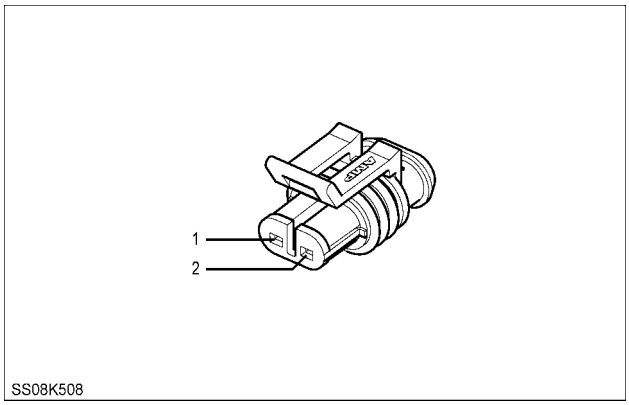
X226 A/C CLUTCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1018 (LTG)	AIR CONDITIONER CLUTCH
2	57JC (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K250 9



SS08K508 10

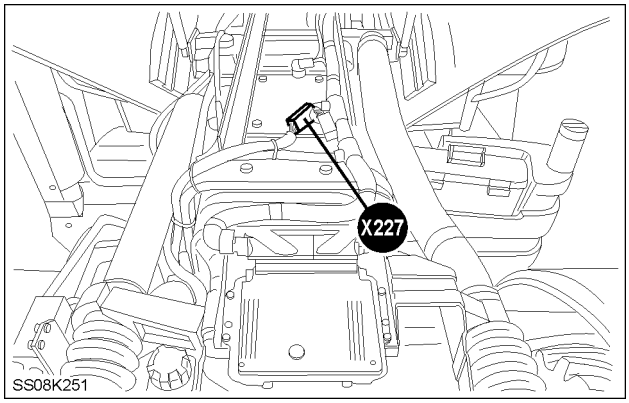
TOP RIGHT HAND ENGINE

www.truck-freeworkshop.com

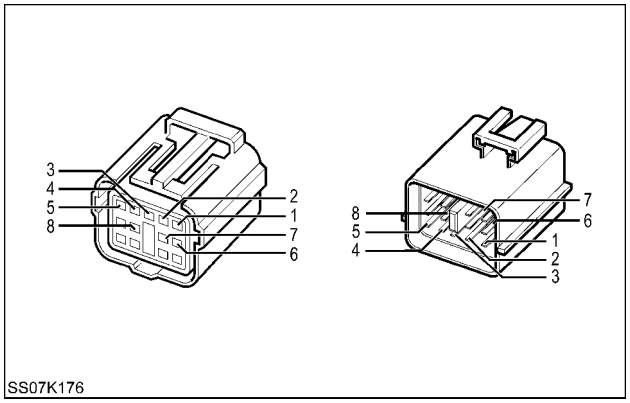
X227 FRONT HITCH AND FRONT PTO

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2044 (O)	PTO SOLENOID-FRONT RETURN(-)
2	2043 (O)	PTO SOLENOID-FRONT
3	2260 (O)	PTO FRONT - SPEED SIGNAL
4	60AB (B/W) / 60AE (B/W)	SENSOR GROUND
5	2570 (R)	FRONT HITCH RAISE SOLENOID
6	2530B (N)	FRONT HITCH V REF
7	2510 (N)	FRONT HITCH POSITION SIGNAL
8	57JT (B)	EARTH (ALL)
9	2250 (K)	PTO FRONT - SUPPLY
10	2556 (N) / 2556 (O)	FRONT HITCH SWITCH COMMON RAIL
11	2590 (TN)	EXTERNAL SWITCH FHPL UP
12	2591 (TN)	EXTERNAL SWITCH FHPL DOWN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K251 11



SS07K176 12

TOP OF ENGINE

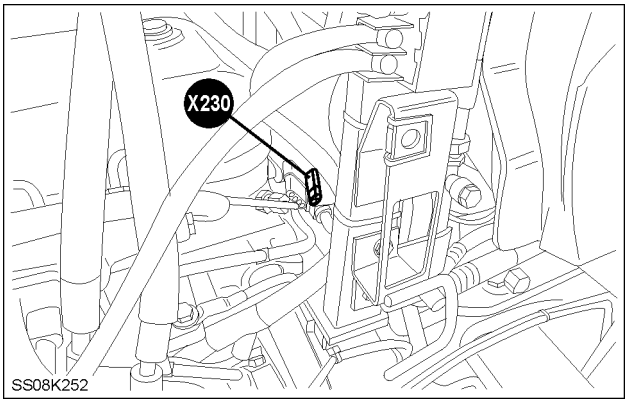
www.truck-freeworkshop.com

Connector - Component diagram 23

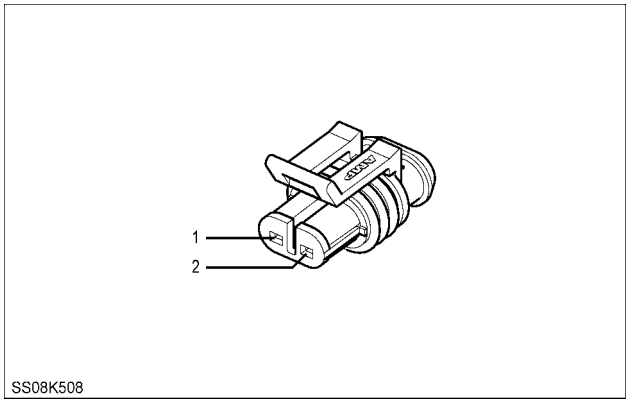
X230 D.I.A. ENGINE INLINE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57HB (B)	EARTH (ALL)
2	1010 (G)	IGNITION RELAY (COIL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K252 1



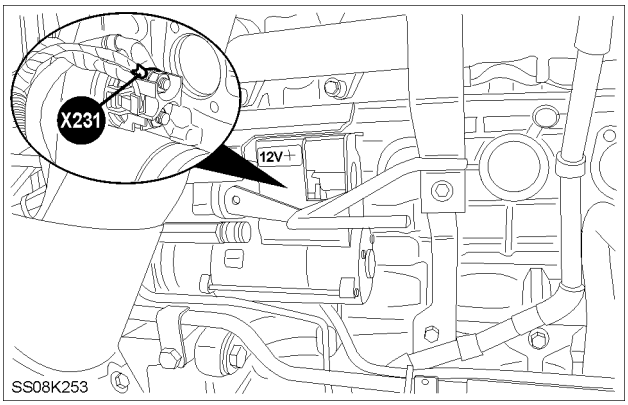
SS08K508 2

REAR LEFT HAND OF ENGINE

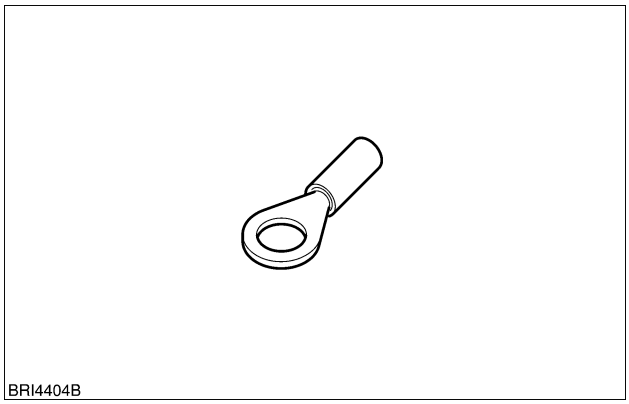
X231 STARTER SOLENOID B+

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150 (R)	BATTERY FEED (UNFUSED)(ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K253 3



BRI4404B 4

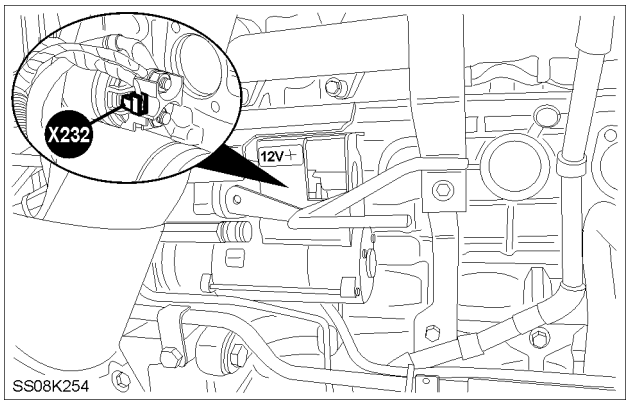
REAR RIGHT HAND OF ENGINE

www.truck-freeworkshop.com

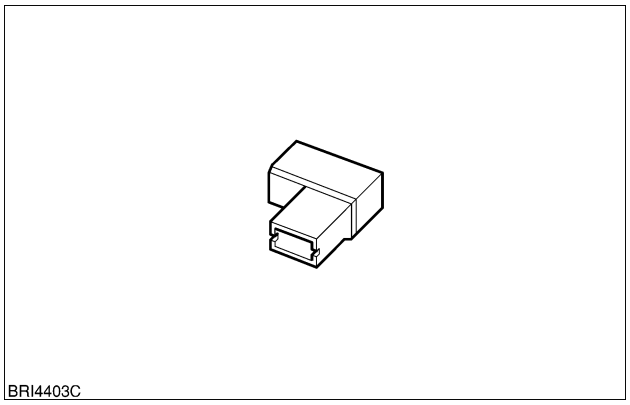
X232 STARTER SOLENOID 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1001 (W)	STARTER SOLENOID FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K254 5



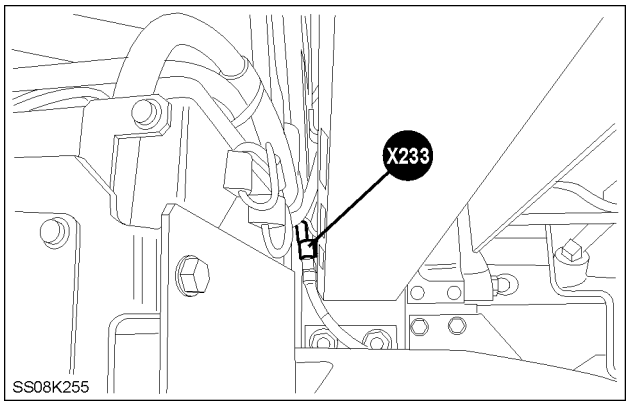
BRI4403C 6

REAR RIGHT HAND OF ENGINE

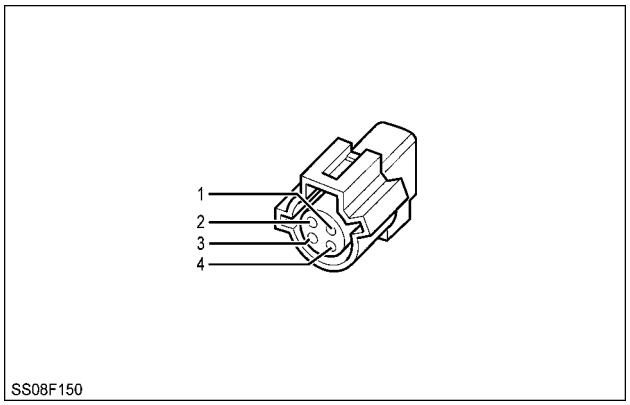
X233 RADAR GUN

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2028B (G)	RADAR ASSEMBLY (GUN) SIGNAL
2	57JB (B)	EARTH (ALL)
3	2027 (R)	RADAR ASSEMBLY (GUN) POWER
4	2031 (Y)	RADAR PRESENT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K255 7



SS08F150 8

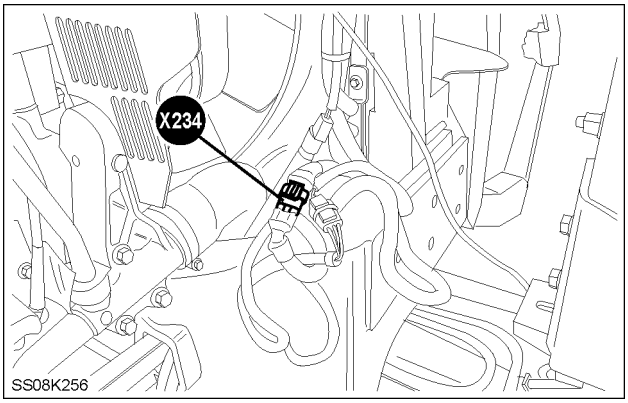
REAR RIGHT HAND ENGINE

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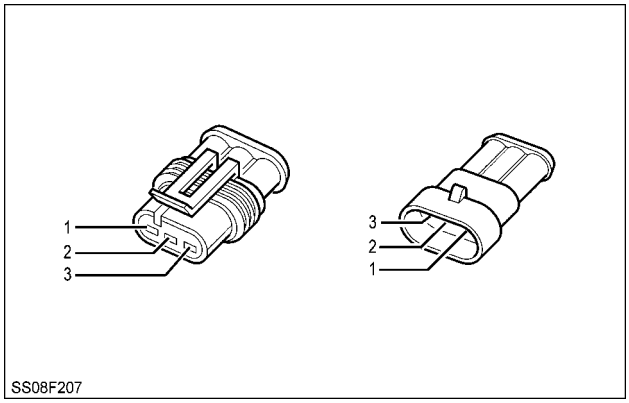
X234 FRONT AXLE (SELF LEVEL)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3220B (LTG)	AXLE HEIGHT SENSOR 5V REF
2	3230 (U) / 3230 (O)	AXLE HEIGHT SENSOR POSITION
3	60AF (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K256 9

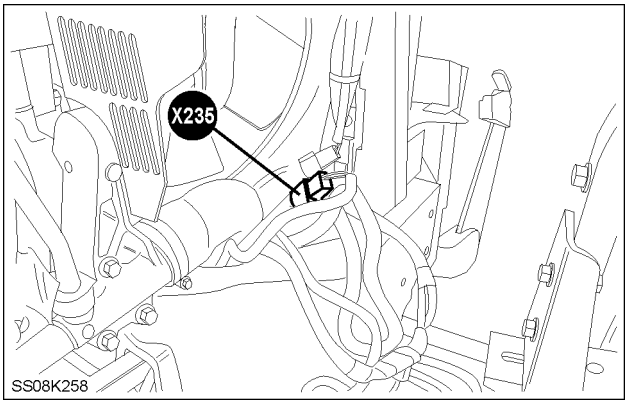


SS08F207 10

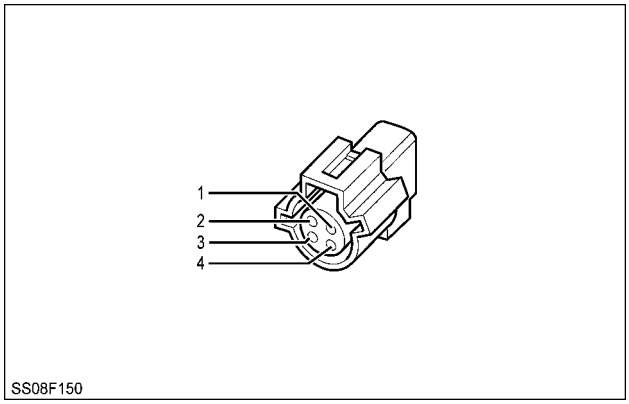
FRONT RIGHT HAND ENGINE

X235 STEERING ANGLE SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3120 (K)	STEERING SENSOR SIGNAL
2	2014 (G)	ENGINE OIL PRESSURE SENDER (+5 VOLT)
4	2095 (G)	INSTRUMENT SIGNAL GROUND



SS08K258 11



SS08F150 12

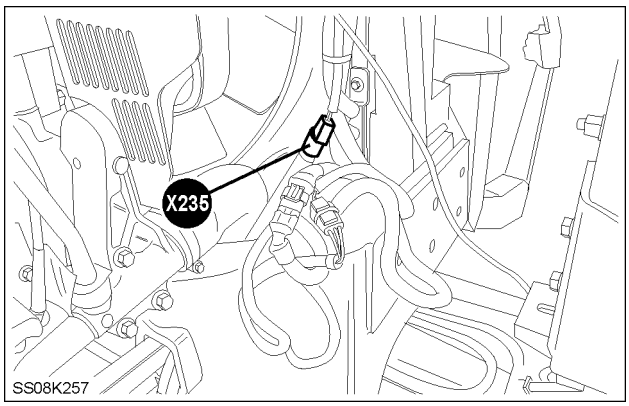
FRONT RIGHT HAND ENGINE

www.truck-freeworkshop.com

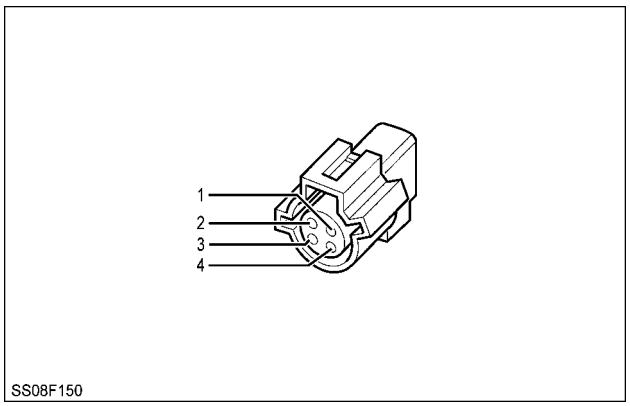
X235 STEERING ANGLE SENSOR (AUTO GUIDANCE)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3100 (G)	STEERING SENSOR +5v
2	3120 (K)	STEERING SENSOR SIGNAL
3	3140 (LTG)	STEERING SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K257 13



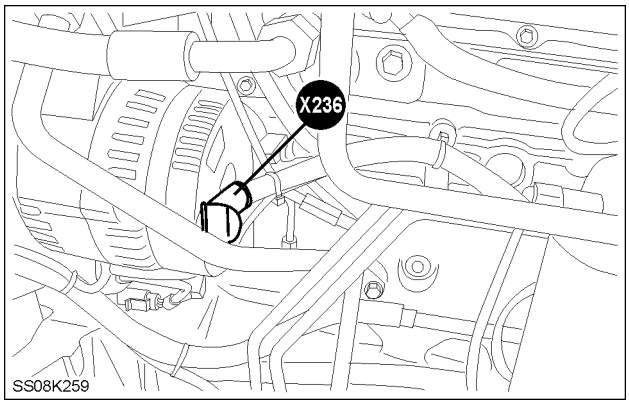
SS08F150 14

FRONT RIGHT HAND ENGINE

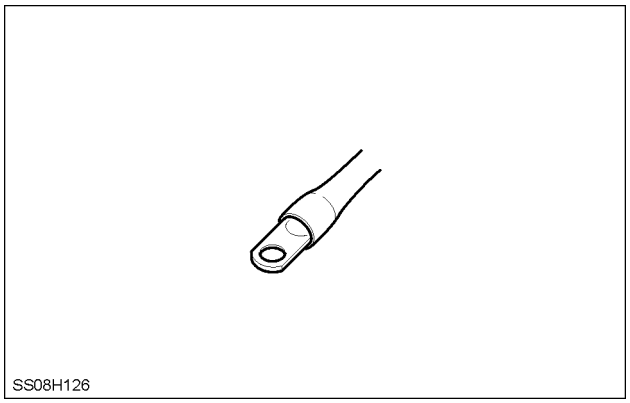
X236 ALTERNATOR B+

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150 (R)	BATTERY FEED (UNFUSED)(ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K259 15



SS08H126 16

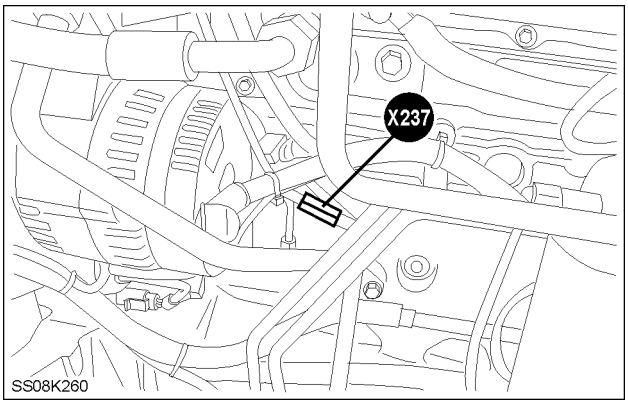
FRONT TOP LEFT HAND ENGINE

www.truck-freeworkshop.com

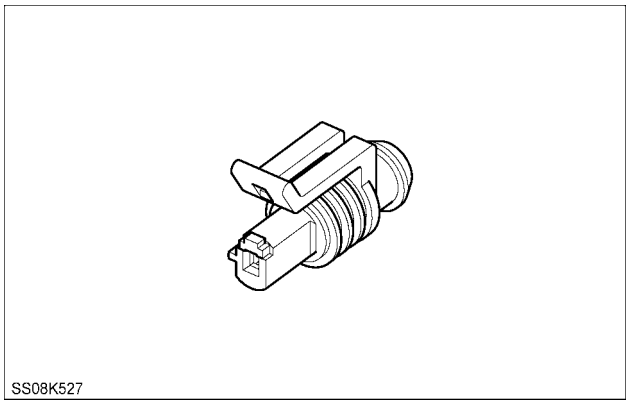
X237 ALTERNATOR D+

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1006 (N)	ALTERNATOR WARNING LAMP

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K260 17



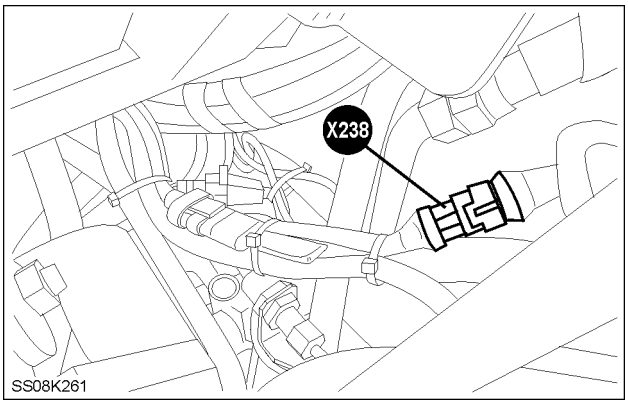
SS08K527 18

FRONT TOP LEFT HAND ENGINE

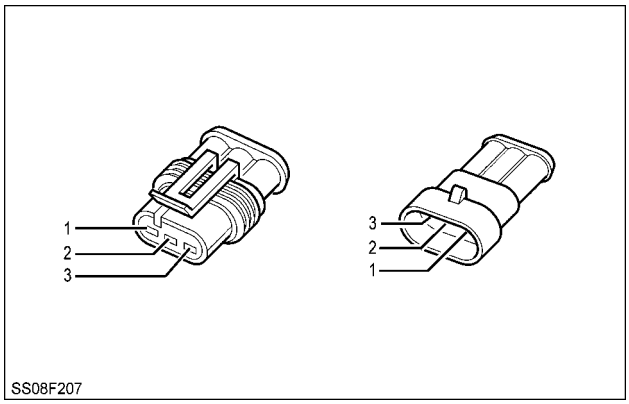
X238 BATTERY ISOLATOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	171B (W) / 171B (W/TQ/B)	BATTERY ISOLATOR RELAY COIL
2	57HA (B)	EARTH (ALL)
3	172A (W) / 172A (W/TQ/Y)	BATTERY ISOLATOR RELAY COIL (OFF)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K261 19



SS08F207 20

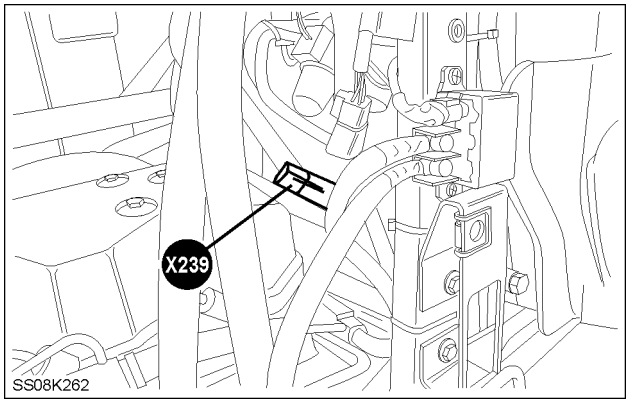
RIGHT HAND BEHIND STEPS

www.truck-freeworkshop.com

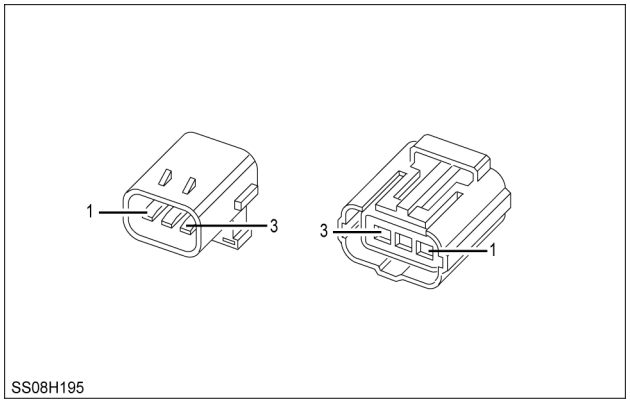
X239 REVERSIBLE FAN

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	6325 (N)	REVERSIBLE FAN OPTION - RELAY FEED
2	6315 (N) / 6315 (G)	REVERSIBLE FAN OPTION - RELAY CONTROL
3	57RJ (B) / 57RH (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K262 21



SS08H195 22

REAR LEFT HAND OF ENGINE

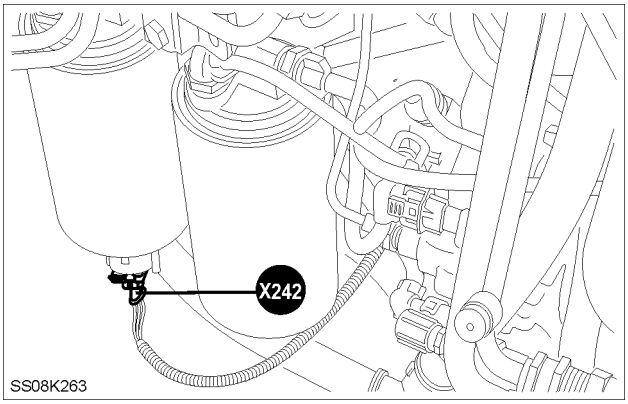
www.truck-freeworkshop.com

Connector - Component diagram 24

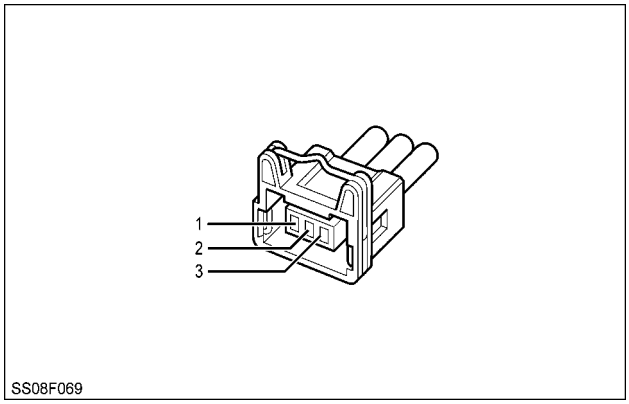
X242 WATER IN FUEL SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2040 (LTG)	WATER IN FUEL SENSOR
2	57JE (B)	EARTH (ALL)
3	10N (G)	IGNITION SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K263 1



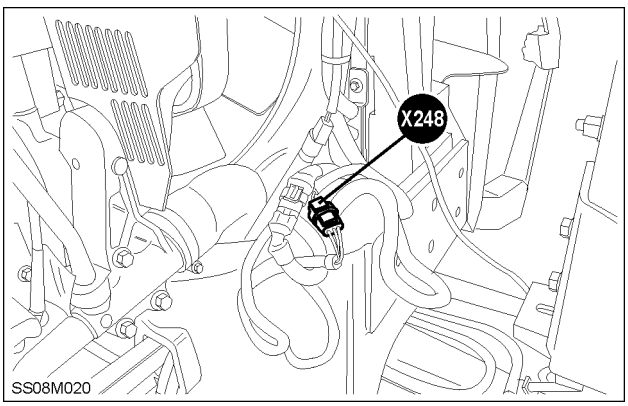
SS08F069 2

REAR LEFT HAND ENGINE

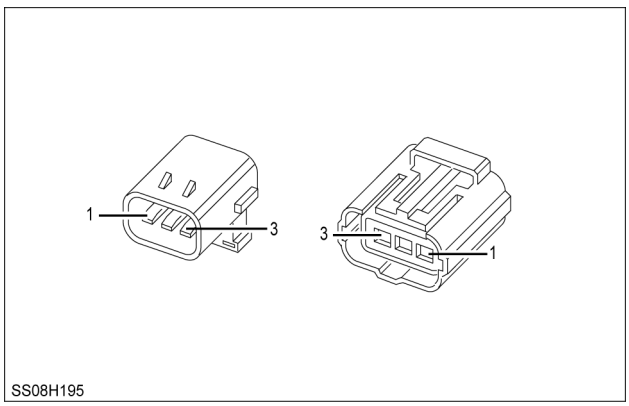
X248 SUSPENSION ACCELEROMETER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3235 (TN)	ACCELEROMETER SIGNAL
2	60AG (B/W)	SENSOR GROUND
3	3220C (LTG)	AXLE HEIGHT SENSOR 5V REF

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08M020 3



SS08H195 4

FRONT RIGHT HAND ENGINE

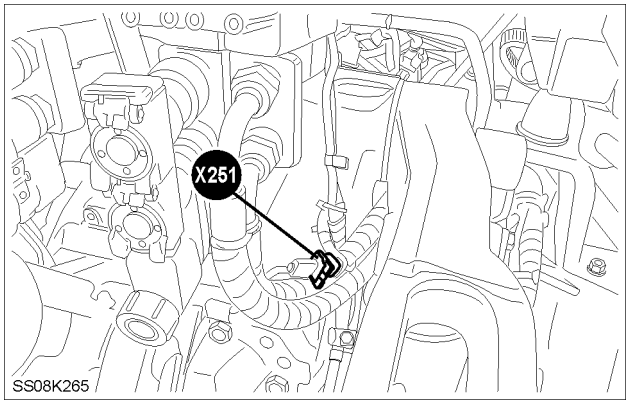
www.truck-freeworkshop.com

Connector - Component diagram 25

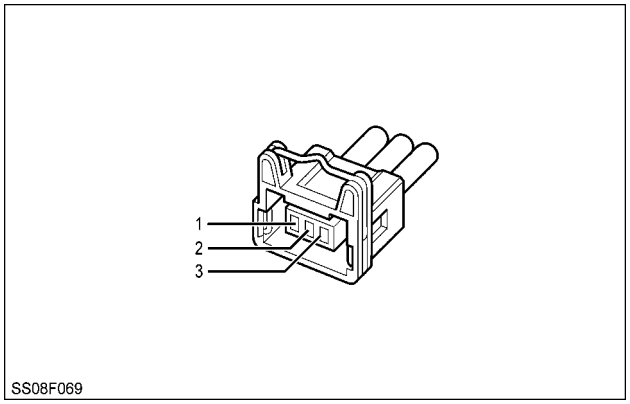
X251 PTO SPEED SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2050AV (G)	PTO SUPPLY / DOG SUPPLY
2	2140 (O)	PTO SPEED SENSOR
3	60AS (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K265 1



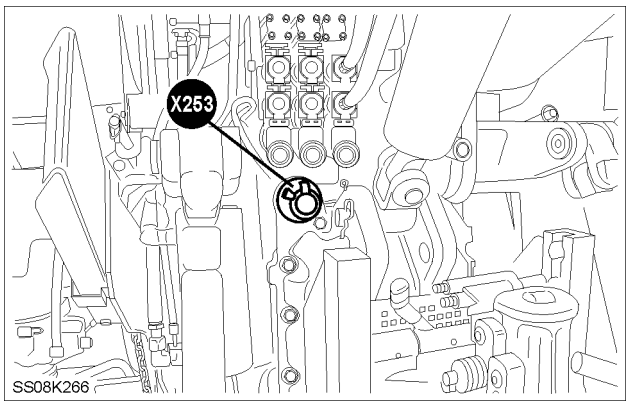
SS08F069 2

REAR RIGHT HAND TRANSMISSION

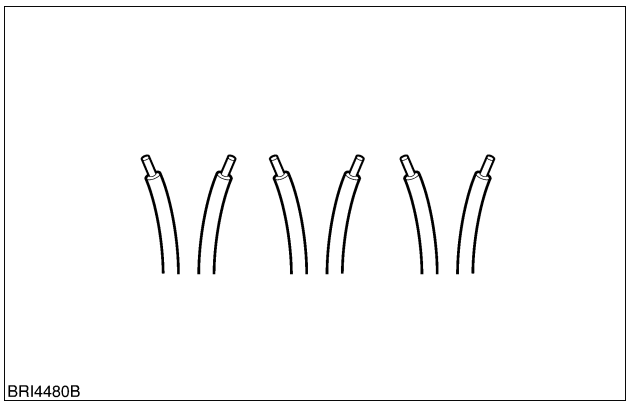
X253 TRAILER SOCKET

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1013D (N)	RIGHT HAND LAMPS
1	810A (R)	STOPLAMPS
1	1014E (B)	LEFT HAND LAMPS
1	349 (G)	TRAILER TURN LAMPS RH
1	57EG (W)	EARTH (ALL)
1	350 (Y)	TRAILER TURN LAMPS LH

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K266 3



BRI4480B 4

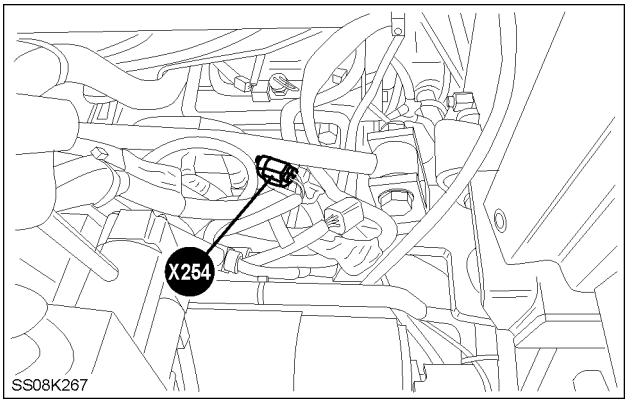
REAR LEFT HAND TRANSMISSION

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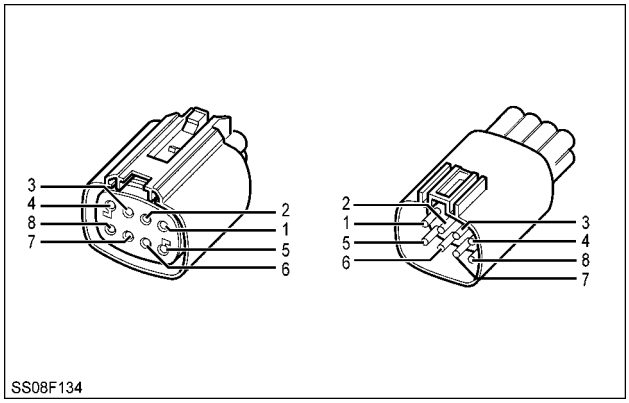
X254 TRAILER BRAKES - AIR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2095C (G) / 2095D (G)	INSTRUMENT SIGNAL GROUND
2	8000X (N)	TRAILER BRAKE SOLENOID
3	8010 (TN)	TRAILER BRAKE PRESSURE
4	8020B (TN)	TRAILER BRAKE PRESSURE
5	57EH (B)	EARTH (ALL)
6	8070 (L)	TRAILER PARK BRAKE SOLENOID
8	8060F (U)	TRAILER BRAKE SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K267 5



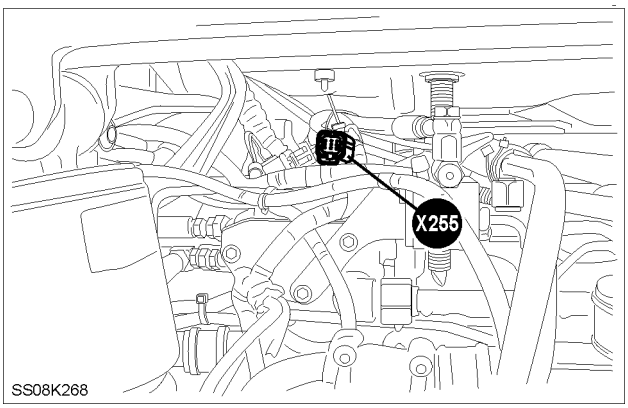
SS08F134 6

REAR RIGHT HAND TRNSMISSION

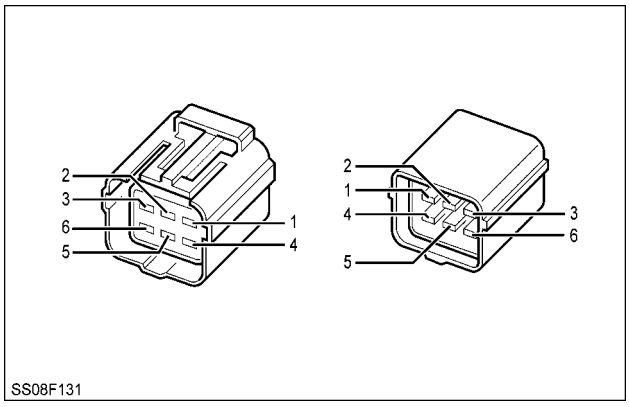
X255 TRAILER BRAKES HYDRAULIC

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	8000A (N)	TRAILER BRAKE SOLENOID
2	8010A (TN)	TRAILER BRAKE PRESSURE
3	8020A (TN)	TRAILER BRAKE PRESSURE
4	57FA (B)	EARTH (ALL)
5	8060E (U)	TRAILER BRAKE SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K268 7



SS08F131 8

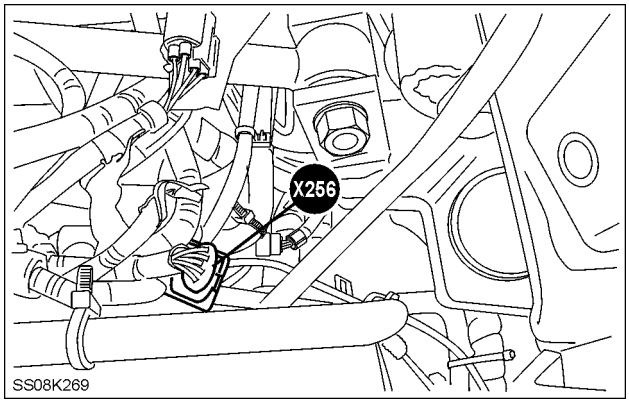
RIGHT HAND TRANSMISSION

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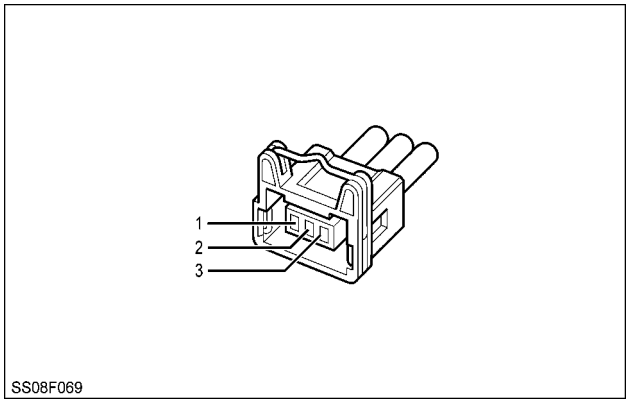
X256 DRAFT PIN RIGHT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	60H (B/W)	SENSOR GROUND
2	5065 (TN)	EDC RIGHT PIN
3	5075A (K)	EDC VOLTAGE TO PINS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K269 9



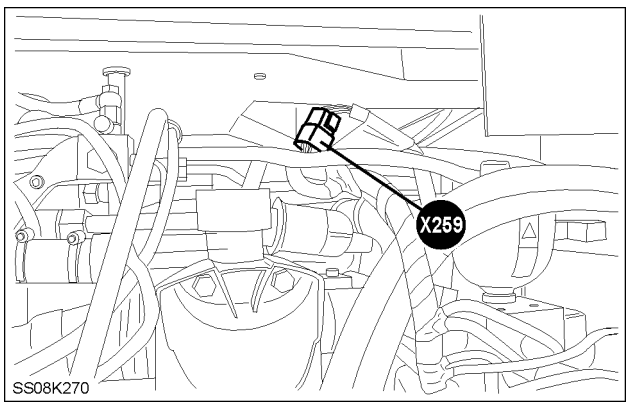
SS08F069 10

REAR RIGHT HAND TRANSMISSION

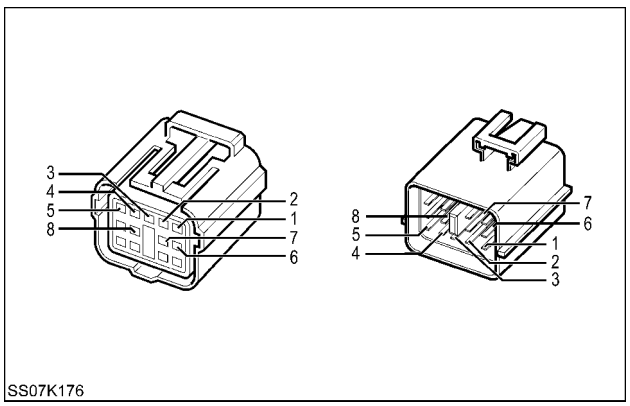
X259 FRONT SUSPENSION CONNECTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3240 (O)	RAISE SOLENOID PWR
2	3250 (O)	RAISE SOLENOID RET
3	3260 (O)	LOWER SOLENOID PWR
4	3270 (O)	LOWER SOLENOID RET
5	3280 (O)	SUSPENSION LOCKOUT SOLENOID UPPER
6	3281 (TN)	SUSPENSION LOCKOUT SOLENOID UPPER RETURN (-)
7	3285 (TN)	SUSPENSION LOCKOUT SOLENOID LOWER
8	3286 (TN)	SUSPENSION LOCKOUT SOLENOID LOWER RETURN (-)
9	- / 3295 (O)	FRONT SUSPENSION PRESSURE SWITCH SIGNAL
10	- / 57FK (B)	EARTH (ALL)
12	3295 (O) / -	FRONT SUSPENSION PRESSURE SWITCH SIGNAL
13	57ED (B) / -	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K270 11



SS07K176 12

RIGHT HAND TRANSMISSION

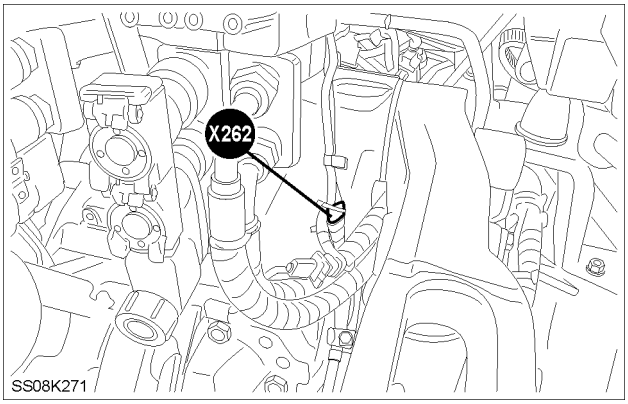
www.truck-freeworkshop.com

Connector - Component diagram 26

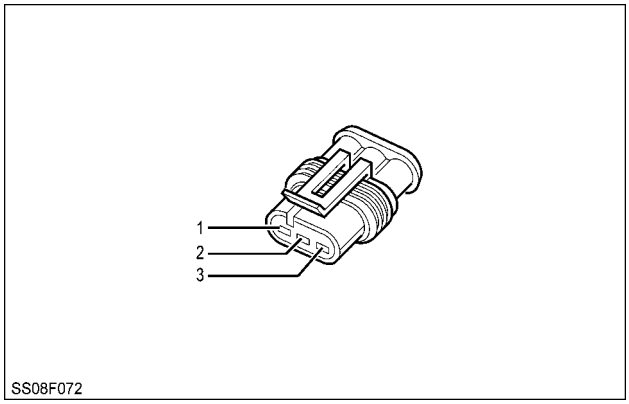
X262 PTO TWIST SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7000BH (U)	TRANS CONTROL SUPPLY
2	2062 (W)	PTO TWIST SENSOR
3	60N (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K271 1



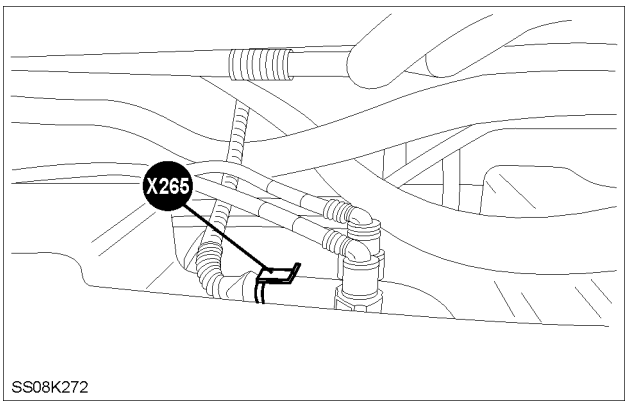
SS08F072 2

REAR RIGHT HAND TRANSMISSION

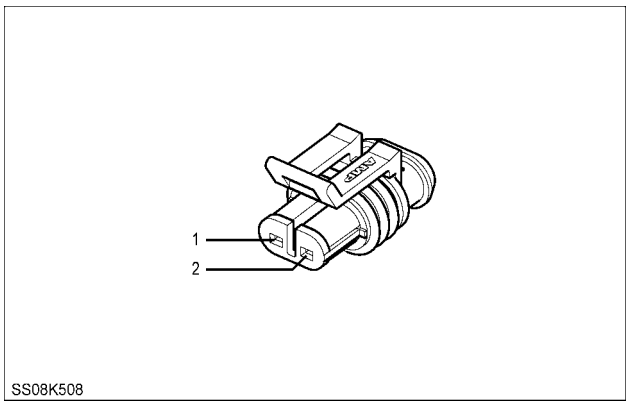
X265 FUEL TANK SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7000P (G)	TRANS CONTROL SUPPLY
2	2095D (G)	INSTRUMENT SIGNAL GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K272 3



SS08K508 4

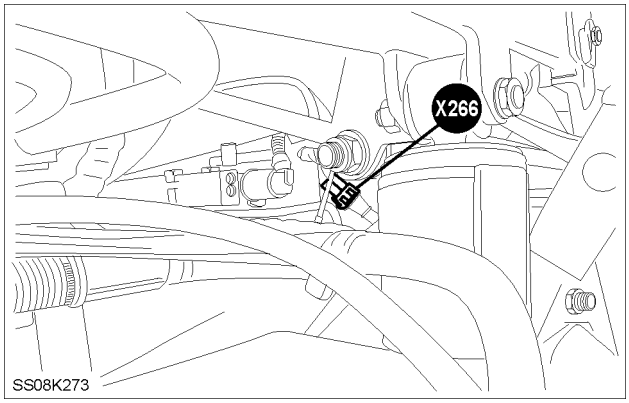
FUEL TANK

www.truck-freeworkshop.com

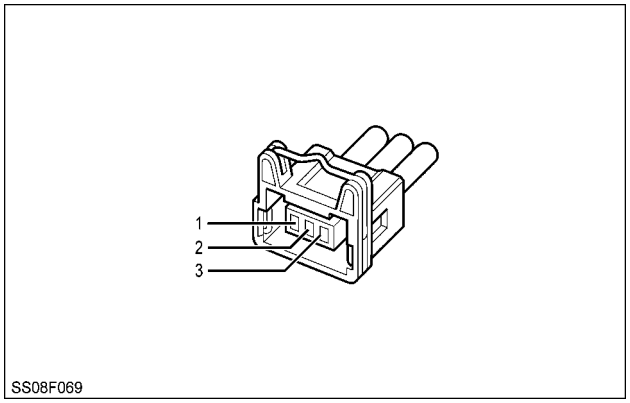
X266 DRAFT PIN LEFT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	60BA (B/W)	SENSOR GROUND
2	5070 (TN)	EDC LEFT PIN
3	5075B (K)	EDC VOLTAGE TO PINS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K273 5



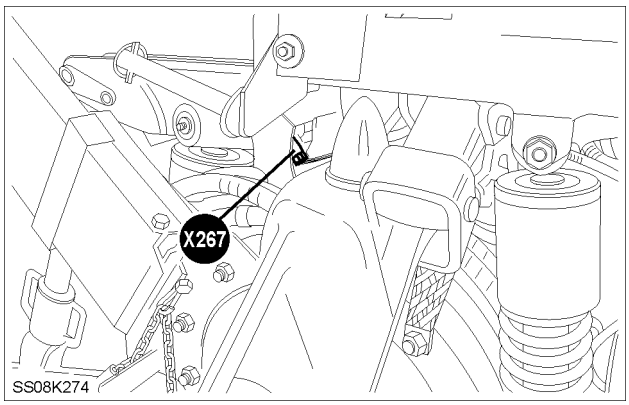
SS08F069 6

REAR LEFT HAND TRANSMISSION

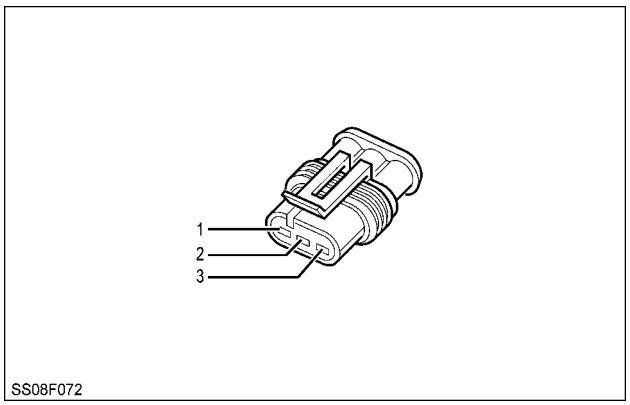
X267 ROCK SHAFT POTENTIOMETER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5080 (K)	EDC ROCKSHAFT
2	5020M (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
3	60L (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K274 7



SS08F072 8

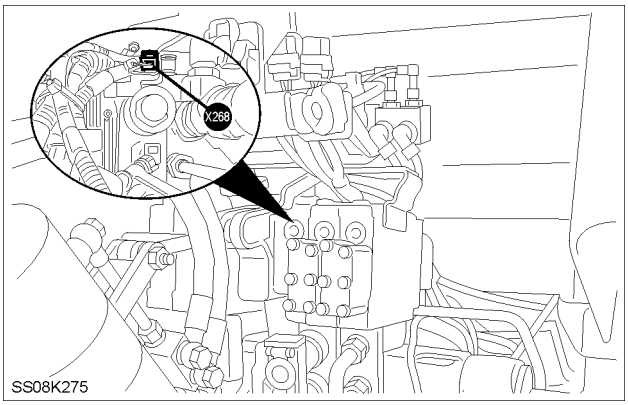
REAR RIGHT HAND TRANSMISSION

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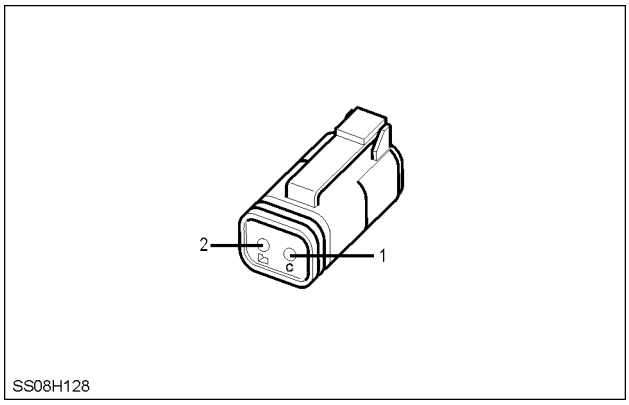
X268 EDC VALVE RAISE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5085 (K)	EDC VALVE UP
2	5087 (K)	EDC VALVE UP RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K275 9



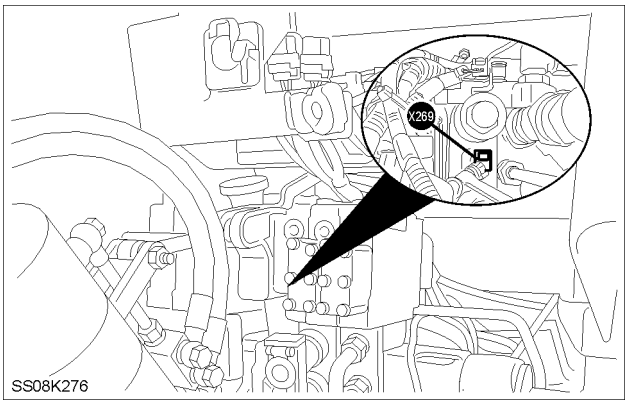
SS08H128 10

REAR RIGHT HAND TRANSMISSION

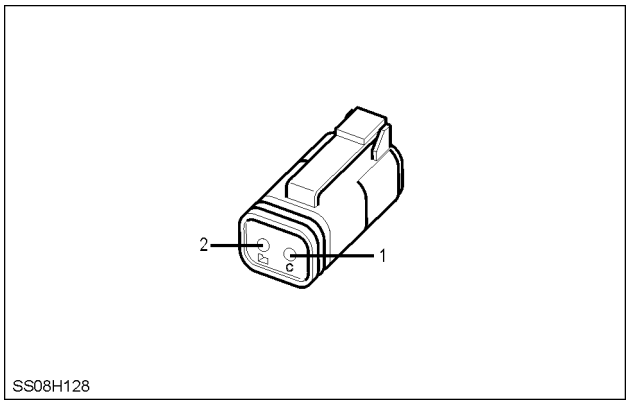
X269 EDC VALVE LOWER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5090 (K)	EDC VALVE DOWN
2	5097 (K)	EDC VALVE DOWN RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K276 11



SS08H128 12

REAR RIGHT HAND TRANSMISSION

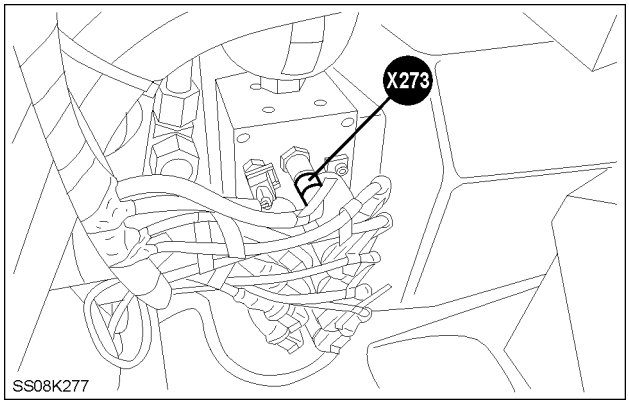
www.truck-freeworkshop.com

Connector - Component diagram 27

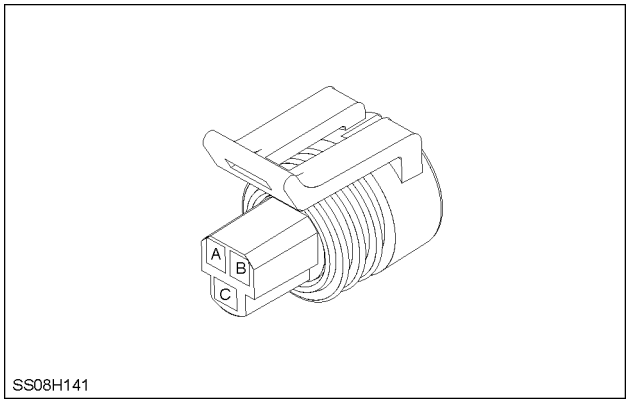
X273 TRANSMISSION OIL PRESSURE SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	60BX (B/W)	SENSOR GROUND
B	5020 (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
C	2012 (Y)	TRANS OIL PRESSURE WARNING LAMP

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K277 1



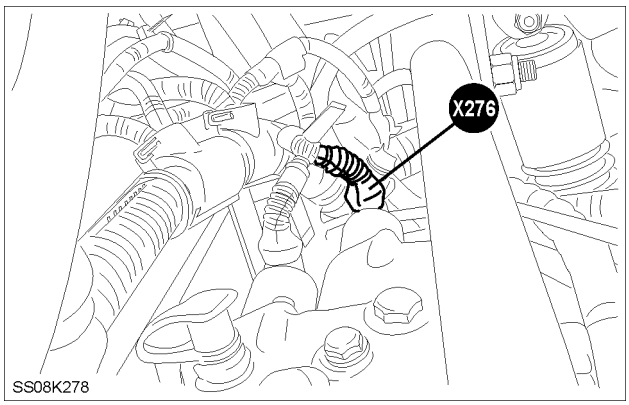
SS08H141 2

RIGHT HAND TRANSMISSION

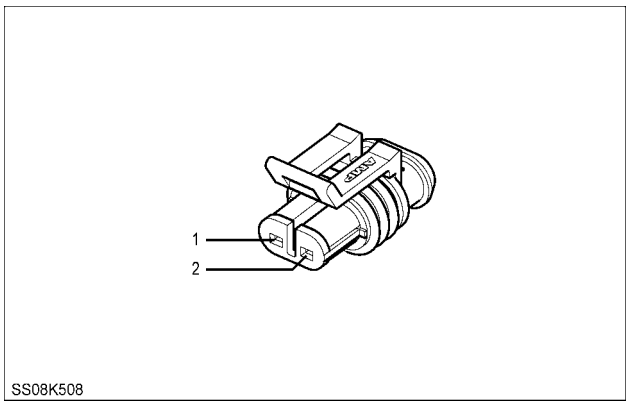
X276 DIFF. LOCK SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7080 (LTG)	DIFF-LOCK SOLENOID FEED
2	57ES (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K278 3



SS08K508 4

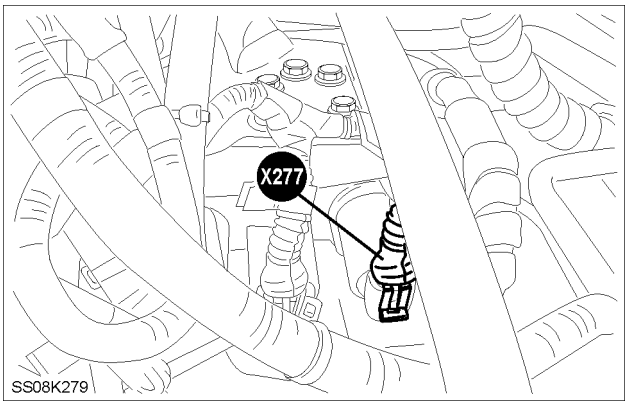
REAR RIGHT HAND TRANSMISSION

www.truck-freeworkshop.com

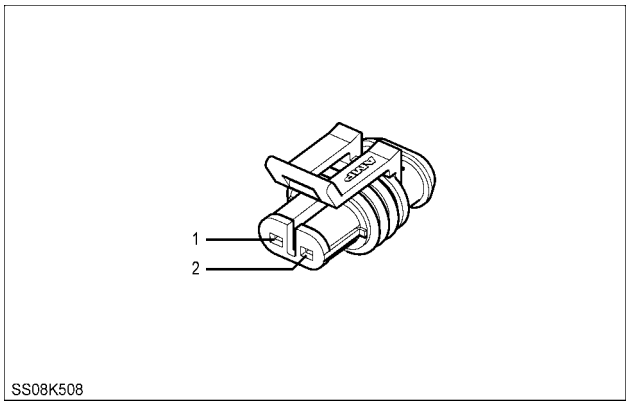
X277 REAR P.T.O BRAKE SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2130 (N)	PTO BRAKE SOLENOID
2	57ET (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K279 5



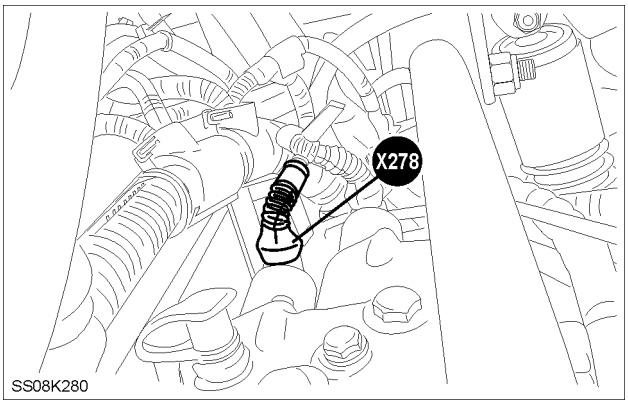
SS08K508 6

REAR LEFT HAND TRANSMISSION

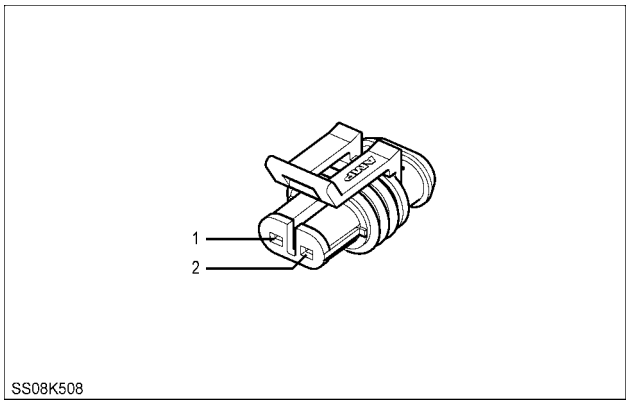
X278 REAR P.T.O SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2042 (O)	PTO SOLENOID-REAR
2	2051 (O)	PTO SOLENOID RETURN (-)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K280 7



SS08K508 8

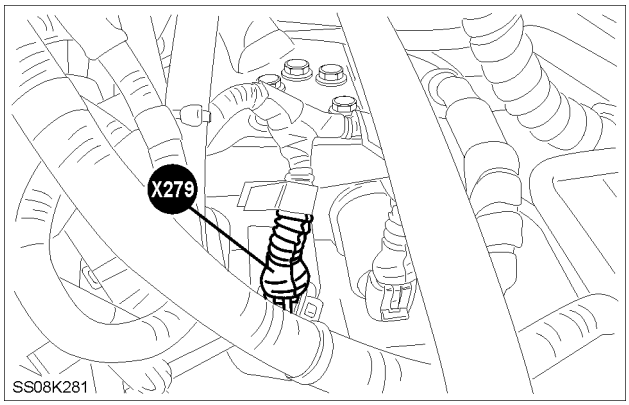
REAR RIGHT HAND TRANSMISSION

www.truck-freeworkshop.com

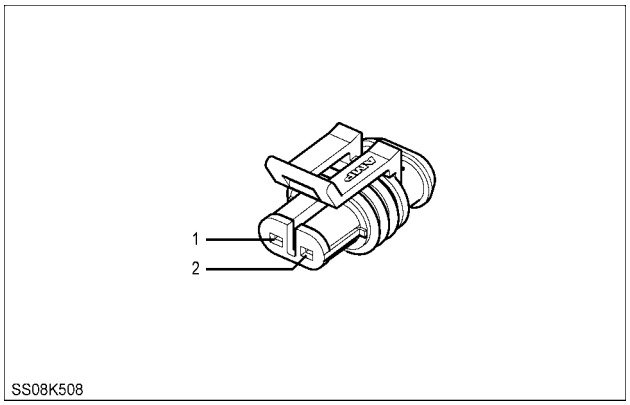
X279 4WD SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3024 (Y)	2WD SOLENOID
2	57EX (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K281 9



SS08K508 10

REAR LEFT HAND TRANSMISSION

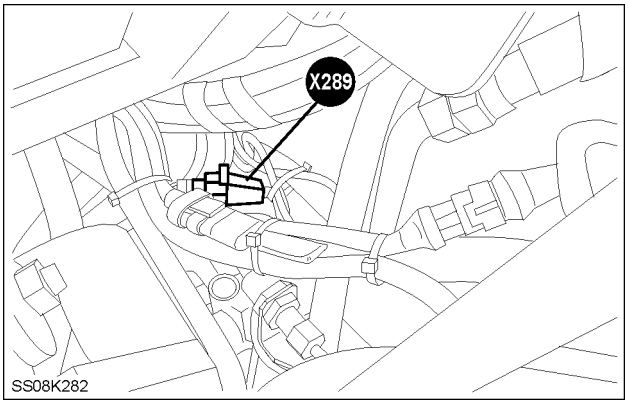
www.truck-freeworkshop.com

Connector - Component diagram 28

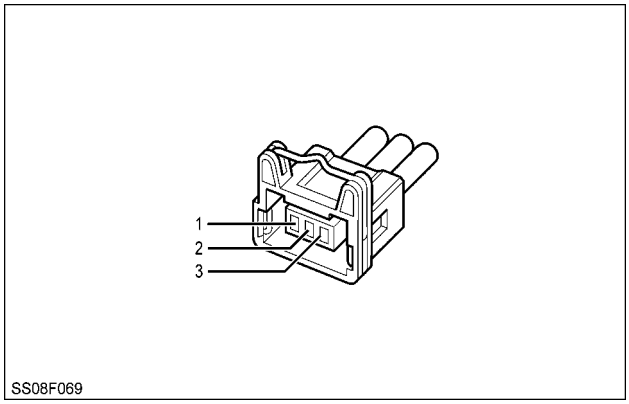
X289 FLY WHEEL SPEED SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7000BG (U)	TRANS CONTROL SUPPLY
2	7760 (W)	TORQUE SENSOR
3	60AV (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K282 1



SS08F069 2

TOP OF TRANSMISSION

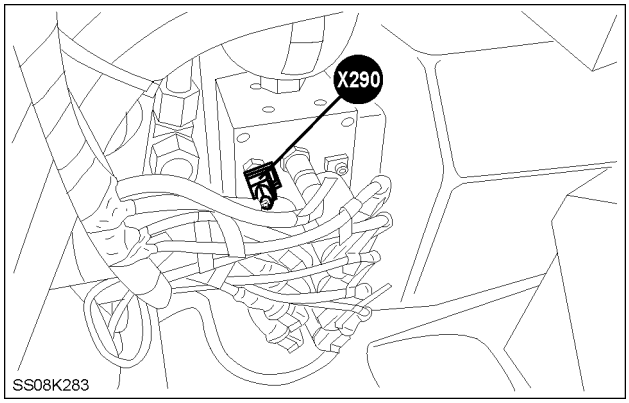
www.truck-freeworkshop.com

Connector - Component diagram 29

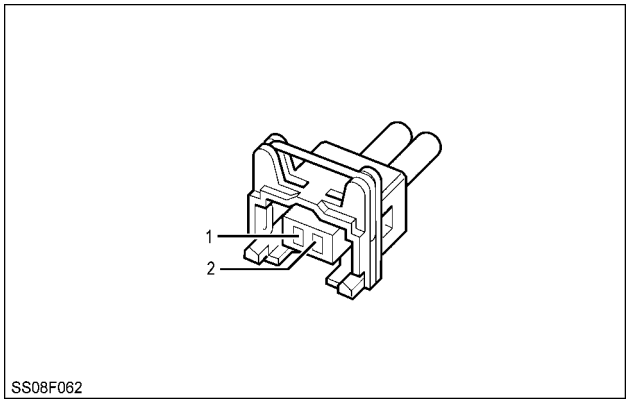
X290 TRANS OIL TEMPERATURE SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7500 (G)	TRANS OIL TEMP. SENSOR
2	60AT (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K283 1



SS08F062 2

RIGHT HAND TRANSMISSION

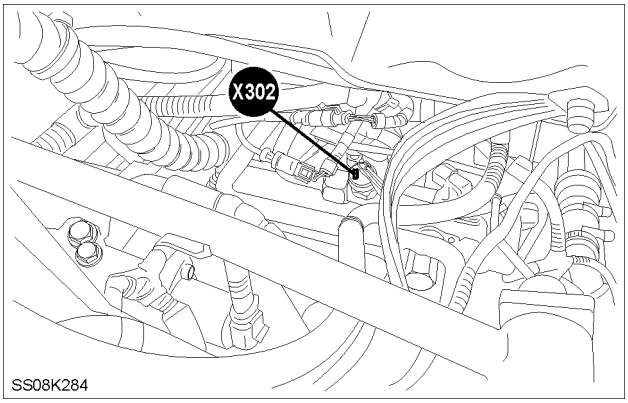
www.truck-freeworkshop.com

Connector - Component diagram 30

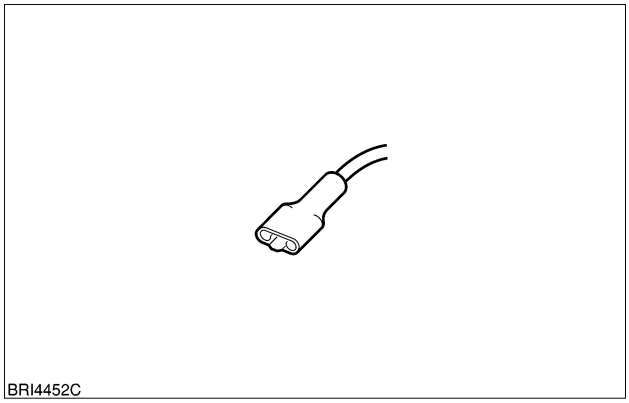
X302 POWER STEERING PRESSURE SWITCH PIN 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57FC (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K284 1



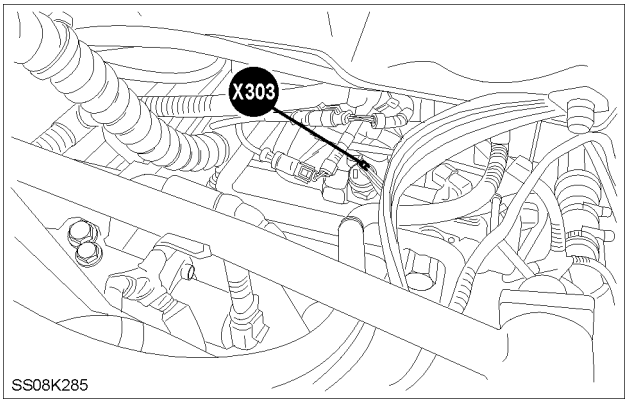
BRI4452C 2

TOP OF TRANSMISSION

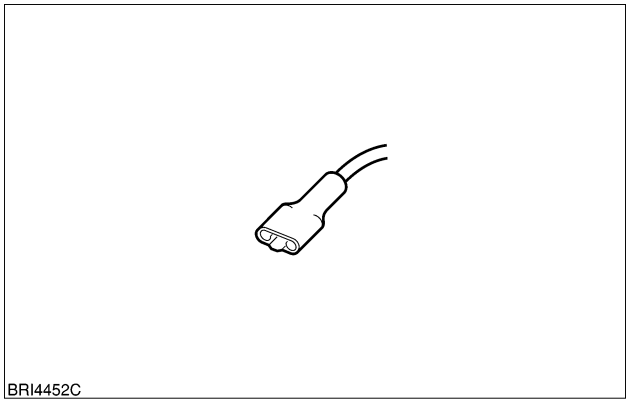
X303 POWER STEERING PRESSURE SWITCH PIN 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3500 (W)	POWER STEERING PRESSURE SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K285 3



BRI4452C 4

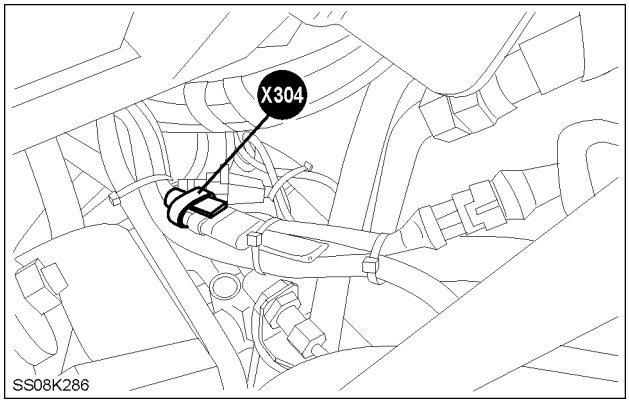
TOP OF TRANSMISSION

www.truck-freeworkshop.com

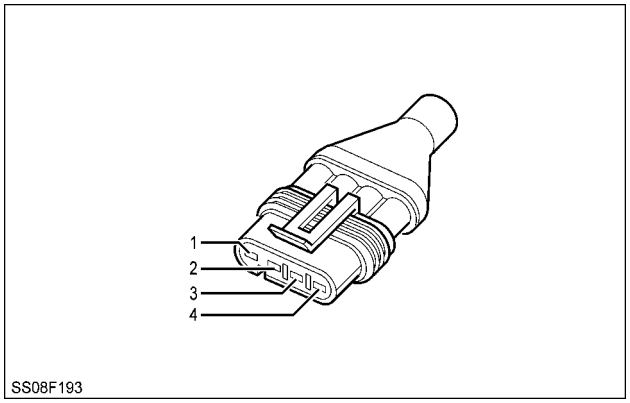
X304 CAN TERMINATOR RESISTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5515F (S)	EHR +12V IGN.
2	5510A (U)	EHR CAN LOW
3	5500A (R)	EHR CAN HIGH
4	57FM (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K286 5



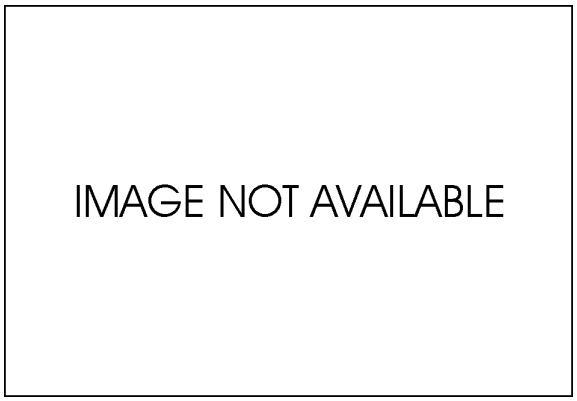
SS08F193 6

TOP OF TRANSMISSION

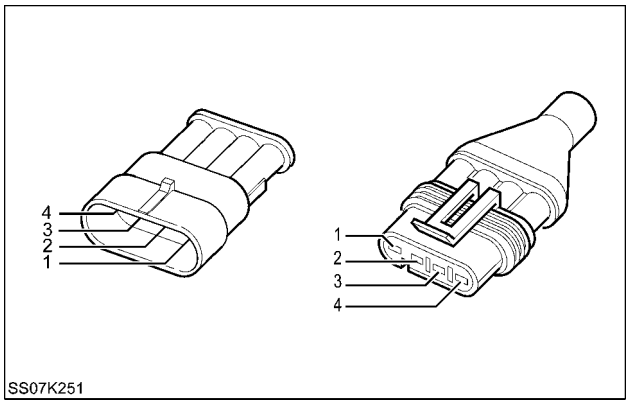
X304 MAIN EXTENSION

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5515C (S)	EHR +12V IGN.
2	5510M (U)	EHR CAN LOW
3	5500M (R)	EHR CAN HIGH
4	57MA (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 7



SS07K251 8

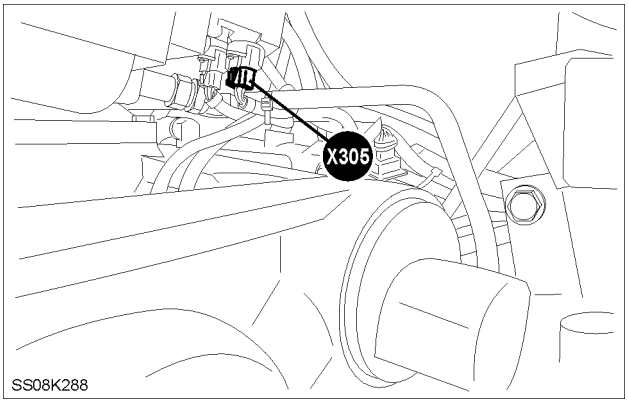
TOP OF TRANSMISSION

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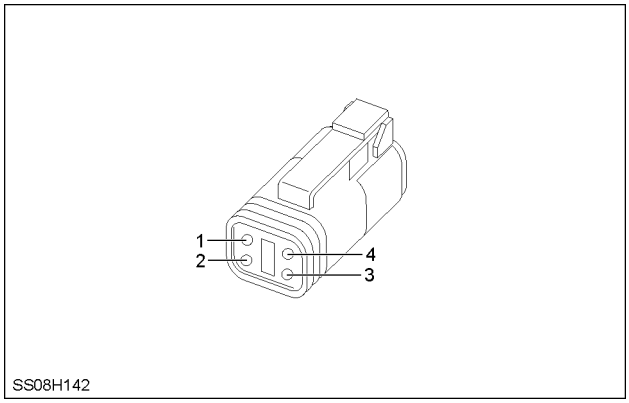
X305 EHR VALVE CONNECTOR 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5515A (S)	EHR +12V IGN.
2	5510K (U)	EHR CAN LOW
3	5500K (R)	EHR CAN HIGH
4	57FE (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K288 9



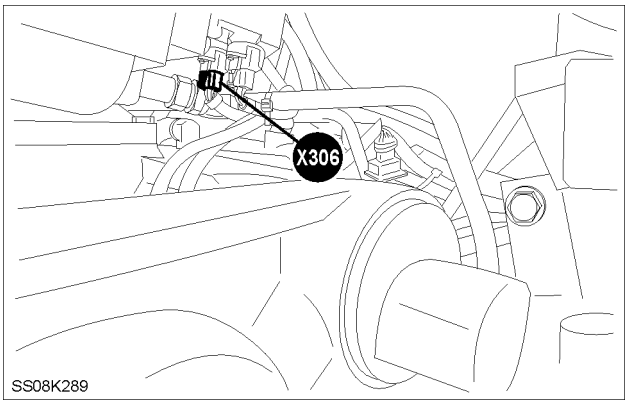
SS08H142 10

REAR RIGHT HAND TRANSMISSION

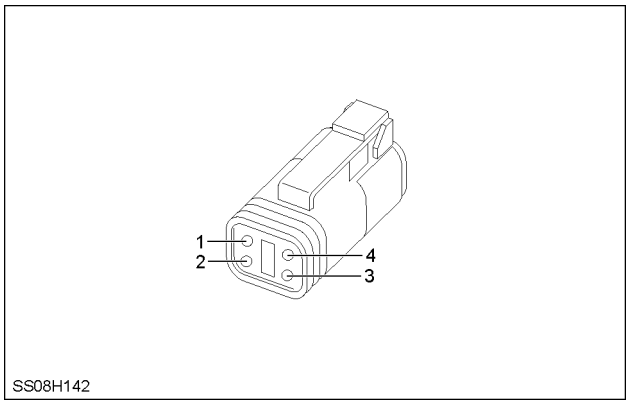
X306 EHR VALVE CONNECTOR 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5515B (S)	EHR +12V IGN.
2	5510H (U)	EHR CAN LOW
3	5500H (R)	EHR CAN HIGH
4	57FE (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K289 11



SS08H142 12

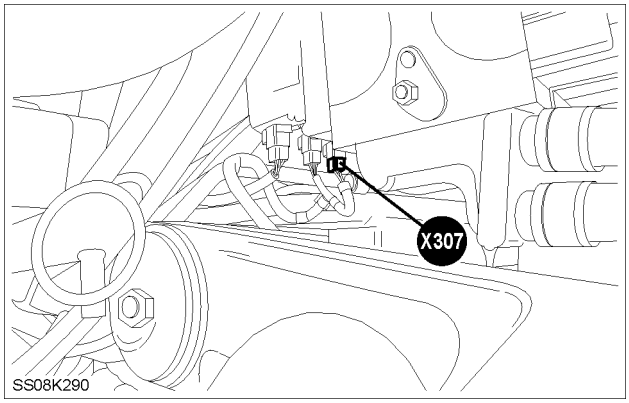
REAR RIGHT HAND TRANSMISSION

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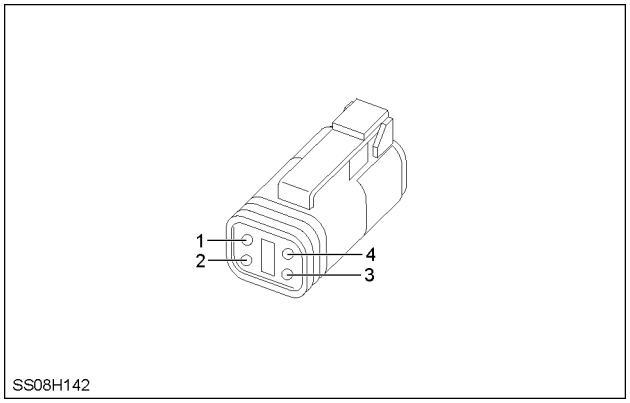
X307 EHR VALVE CONNECTOR 3

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5515C (S)	EHR +12V IGN.
2	5510F (U)	EHR CAN LOW
3	5500F (R)	EHR CAN HIGH
4	57FF (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K290 13



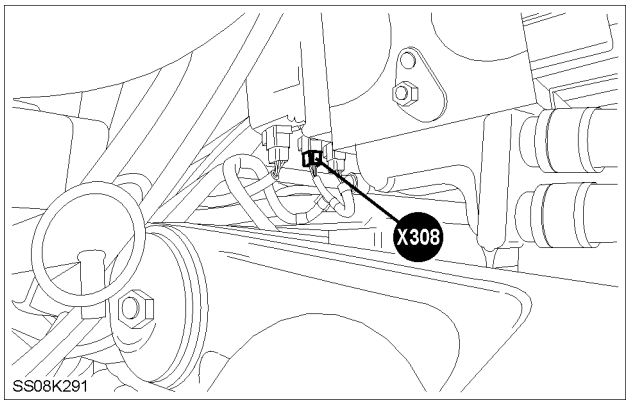
SS08H142 14

REAR LEFT HAND TRANSMISSION

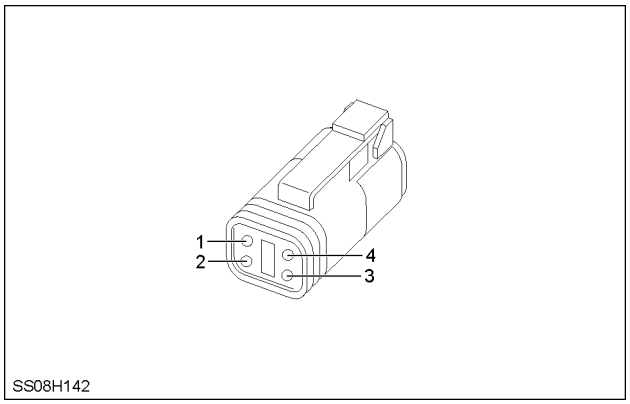
X308 EHR VALVE CONNECTOR 4

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5515D (S)	EHR +12V IGN.
2	5510D (U)	EHR CAN LOW
3	5500D (R)	EHR CAN HIGH
4	57FG (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K291 15



SS08H142 16

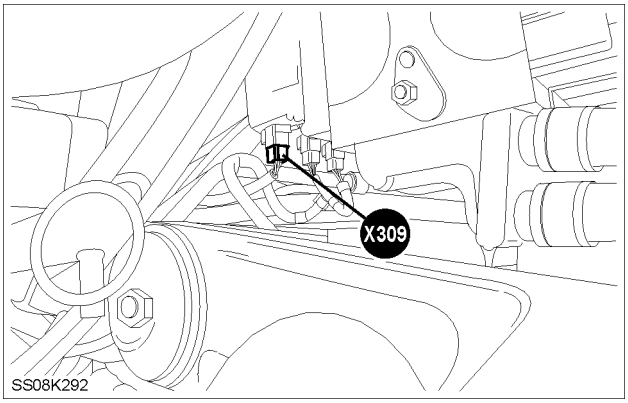
REAR LEFT HAND TRANSMISSION

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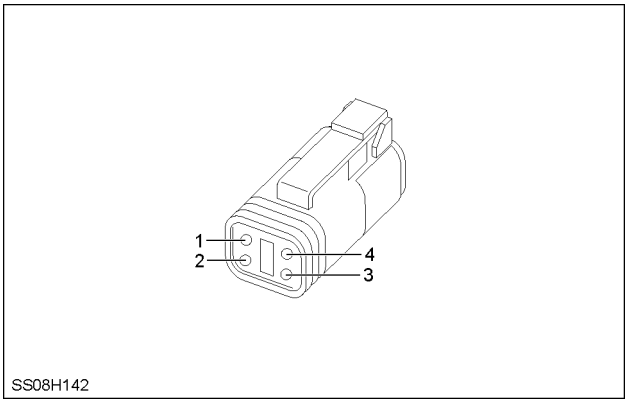
X309 EHR VALVE CONNECTOR 5

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5515E (S)	EHR +12V IGN.
2	5510B (U)	EHR CAN LOW
3	5500B (R)	EHR CAN HIGH
4	57FK (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K292 17



SS08H142 18

REAR LEFT HAND TRANSMISSION

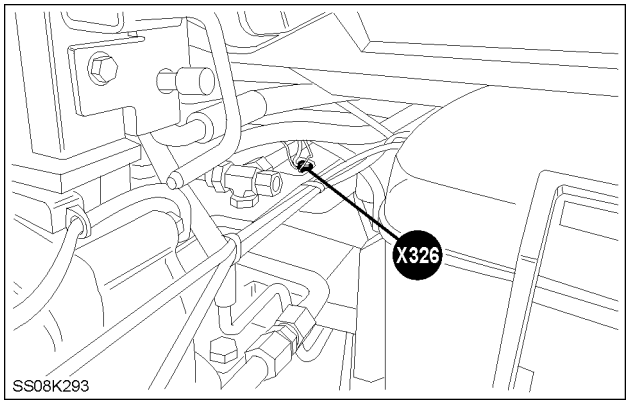
www.truck-freeworkshop.com

Connector - Component diagram 32

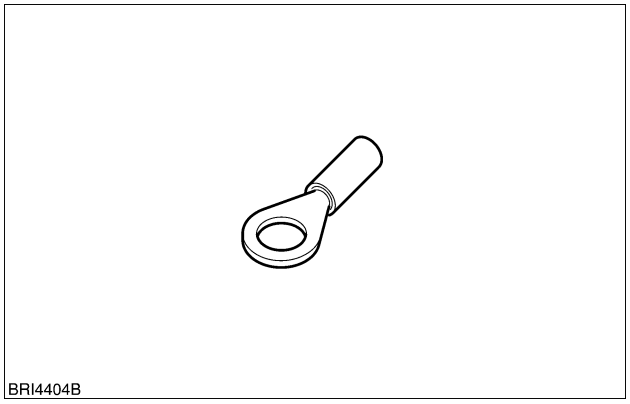
X326 EARTH TRANSMISSION

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57M (B)	EARTH (ALL)
1	57EG (W)	EARTH (ALL)
1	57HZ (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K293 1



BRI4404B 2

LEFT HAND TOP OF TRANSMISSION

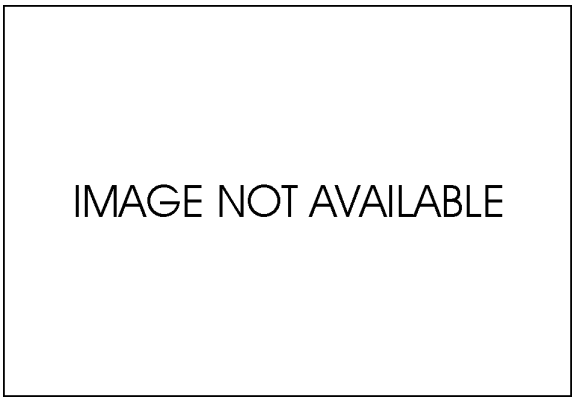
www.truck-freeworkshop.com

Connector - Component diagram 33

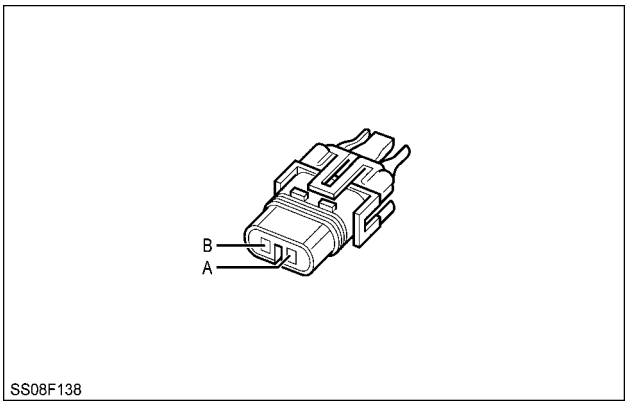
X331 WORKLAMP RIGHT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	1073C (L)	WORKLAMP FRONT FEED
B	57H (B)	EARTH (ALL)

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



INA 1



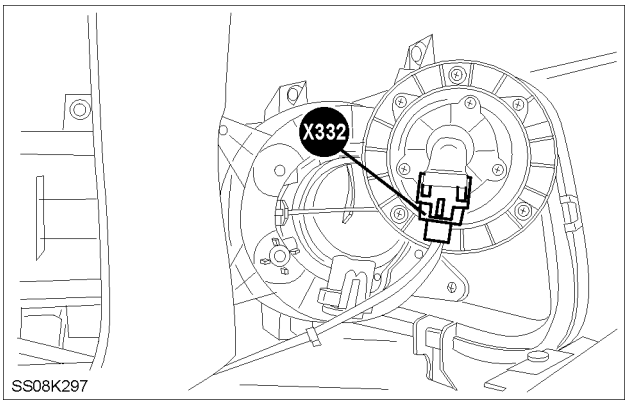
SS08F138 2

FRONT HOOD

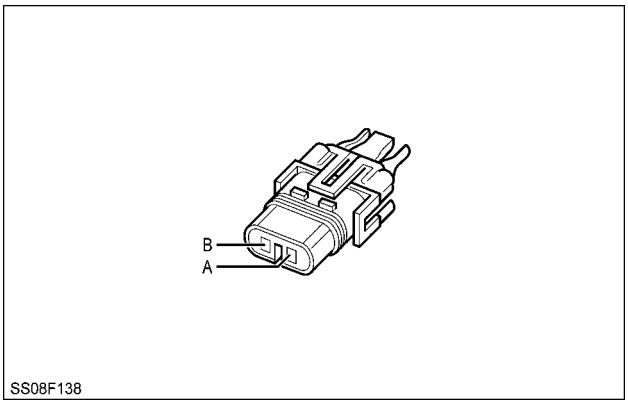
X332 CORNER LAMP RIGHT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	1073B (L)	WORKLAMP FRONT FEED
B	57H (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K297 3



SS08F138 4

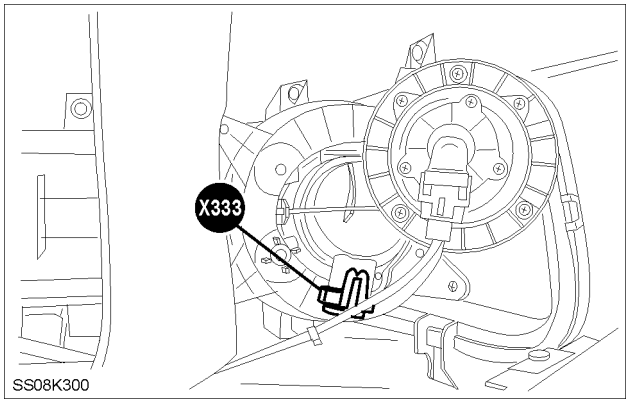
FRONT RIGHT HAND HOOD

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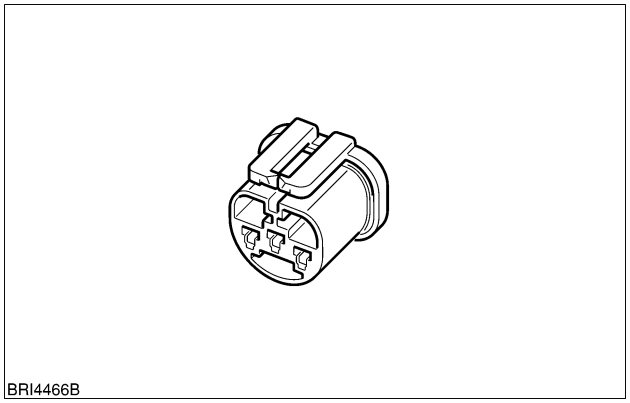
X333 HEADLAMP RIGHT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	1030C (U)	HEADLAMP DIP BEAM
B	57D (B)	EARTH (ALL)
C	1027C (U)	HEADLAMP MAIN BEAM

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K300 5



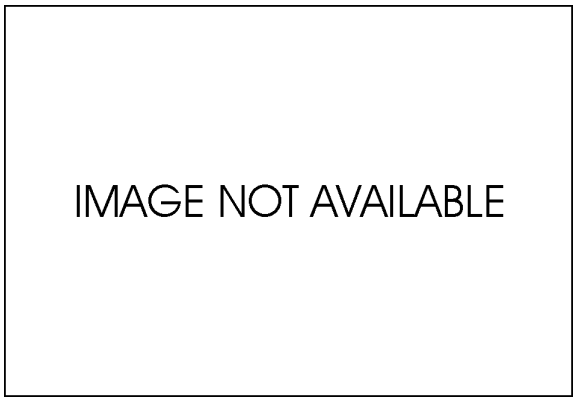
BRI4466B 6

FRONT RIGHT HAND HOOD

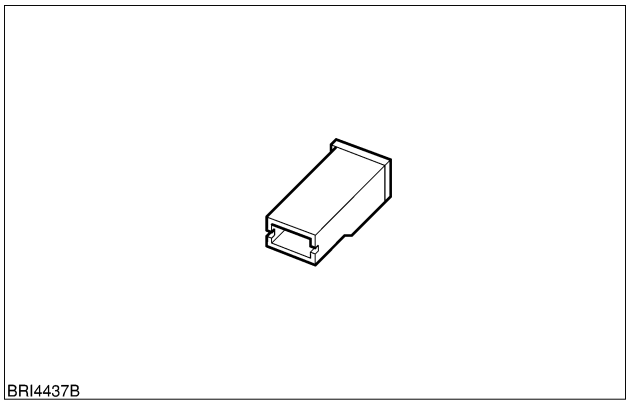
X334 HORN

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57E (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 7



BRI4437B 8

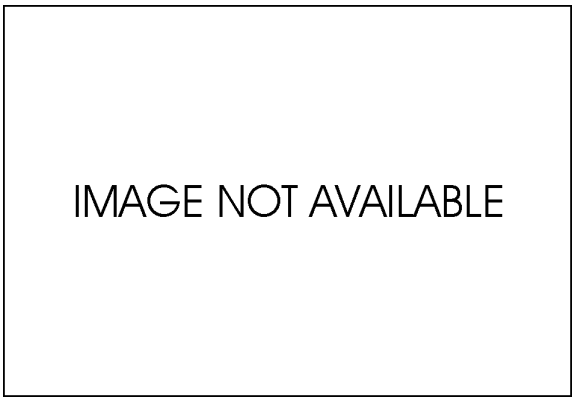
FRONT HOOD

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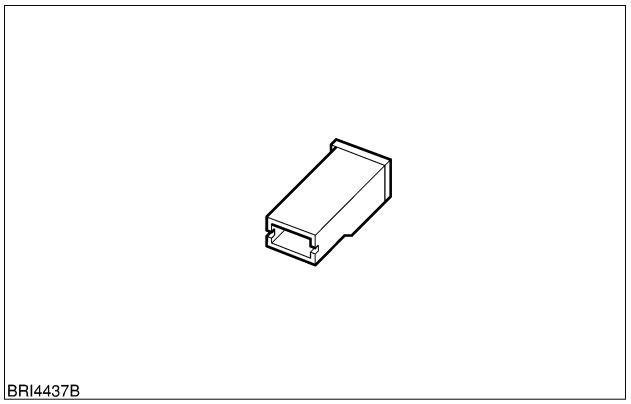
X335 HORN

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	376 (L)	HORN FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 9



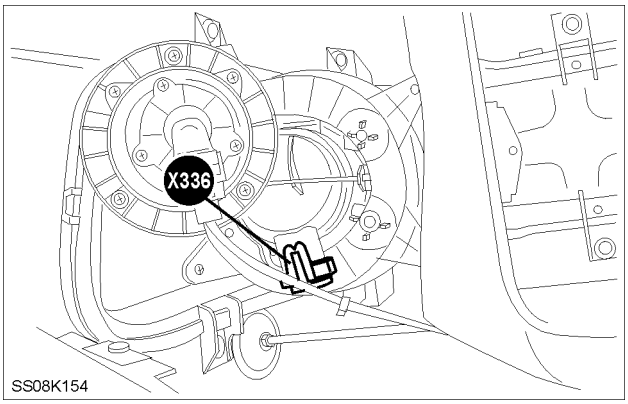
BRI4437B 10

FRONT HOOD

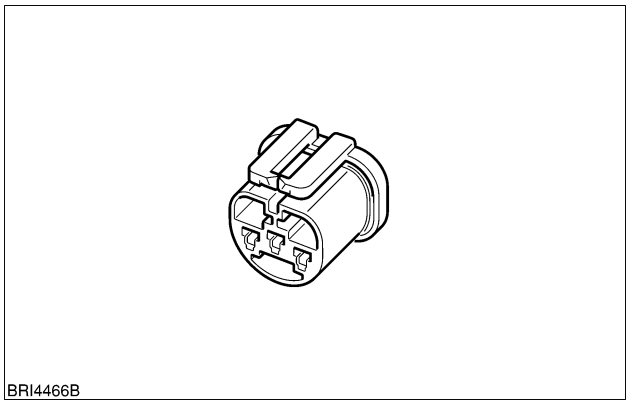
X336 HEADLAMP LEFT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	1030D (U)	HEADLAMP DIP BEAM
B	57C (B)	EARTH (ALL)
C	1027D (U)	HEADLAMP MAIN BEAM

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K154 11



BRI4466B 12

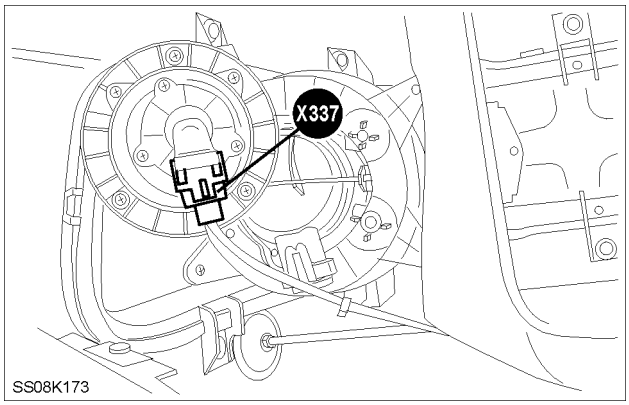
FRONT LEFT HAND HOOD

www.truck-freeworkshop.com

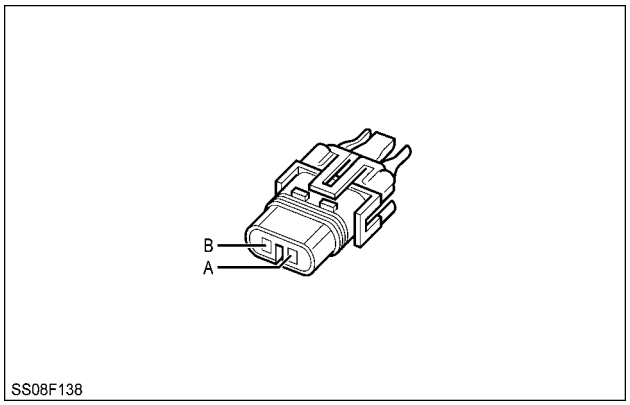
X337 CORNER LAMP LEFT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	1073A (L)	WORKLAMP FRONT FEED
B	57F (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K173 13



SS08F138 14

FRONT LEFT HAND HOOD

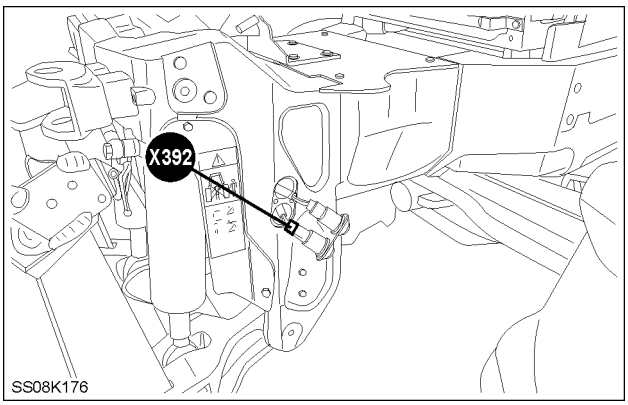
www.truck-freeworkshop.com

Connector - Component diagram 39

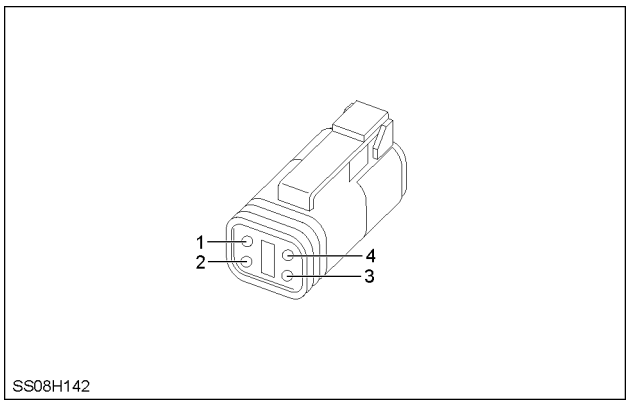
X392 FRONT HITCH LOWER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	(R)	
2	(R)	
3	(Y)	
4	(U)	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K176 1



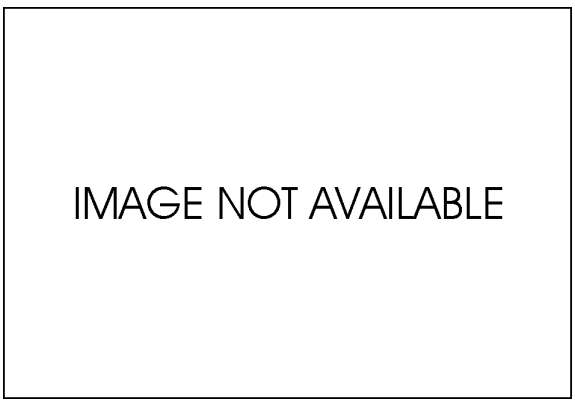
SS08H142 2

LEFT HAND FRONT HITCH

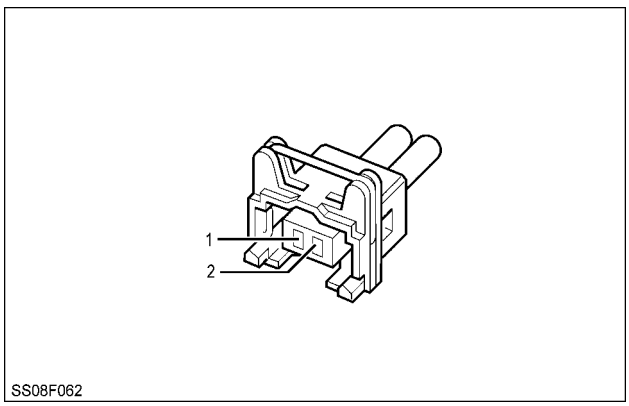
X393 FRONT PTO SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	(N)	
2	(P)	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 3



SS08F062 4

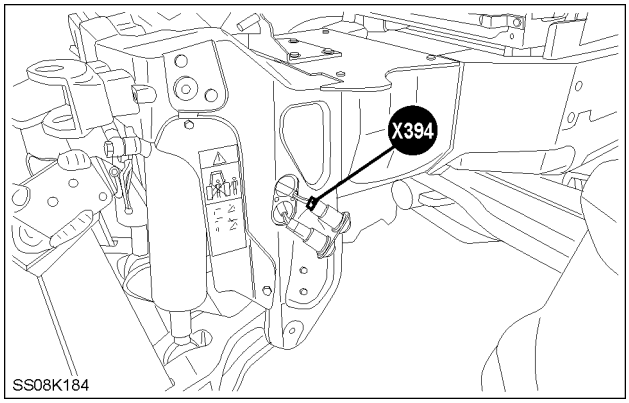
FRONT HITCH

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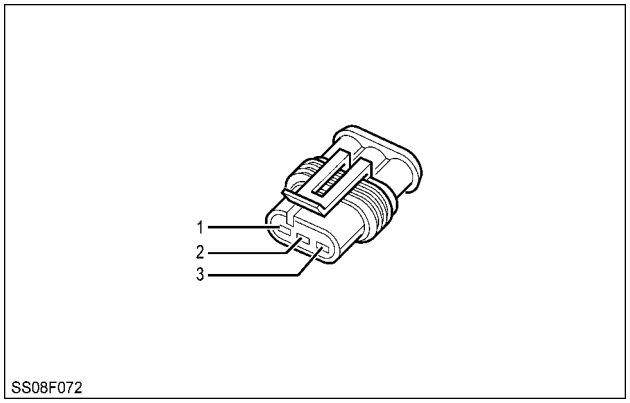
X394 FRONT HITCH RAISE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	(R)	
2	(U)	
3	(G)	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K184 5



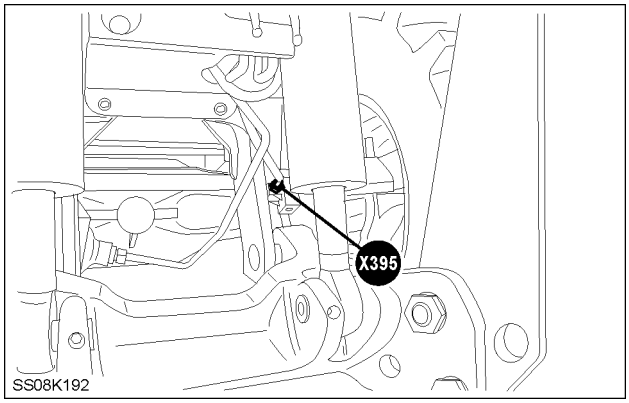
SS08F072 6

LEFT HAND FRONT HITCH

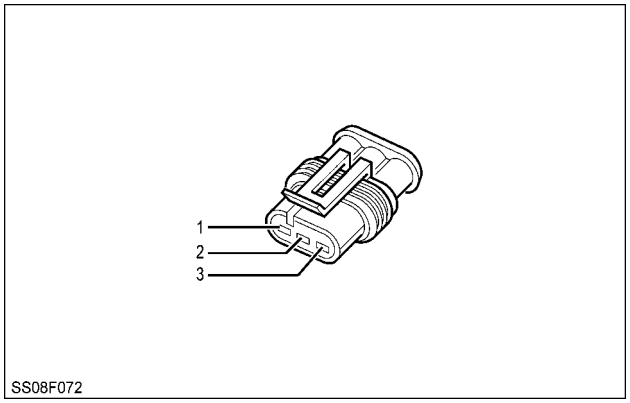
X395 FRONT HITCH POSITION SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	(B)	
2	(R)	
3	(W)	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K192 7



SS08F072 8

FRONT HITCH

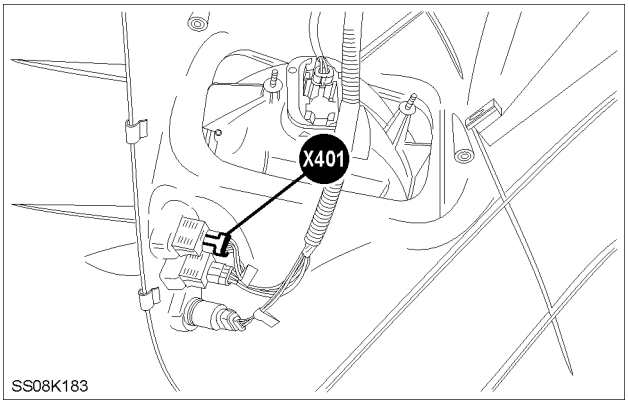
www.truck-freeworkshop.com

Connector - Component diagram 40

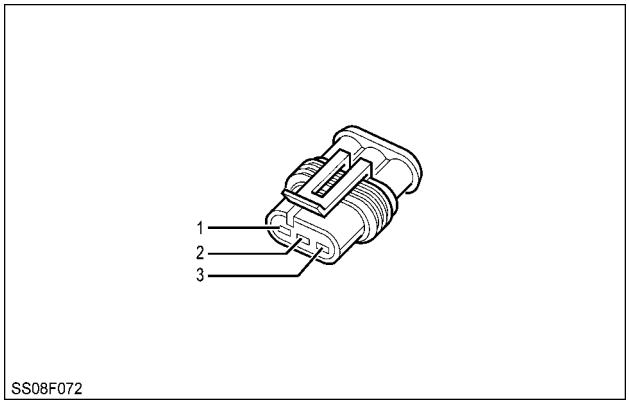
X401 EHR 3 SWITCH FENDER RIGHT AND LEFT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5574 (L)	FENDER 3RD EHR SWITCH – UP
2	5200W (N)	EDC VALVE SUPPLY
3	5576 (L)	FENDER 3RD EHR SWITCH – DOWN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

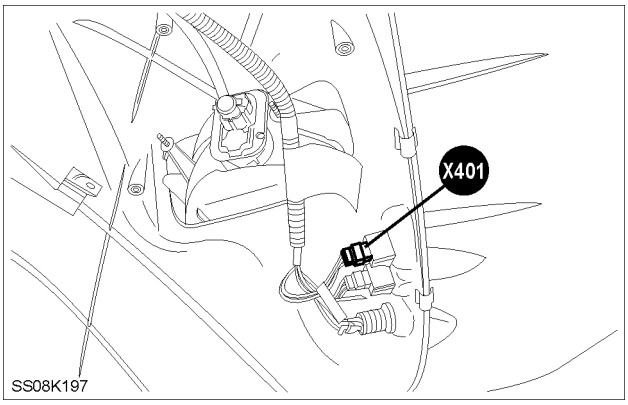


SS08K183 1

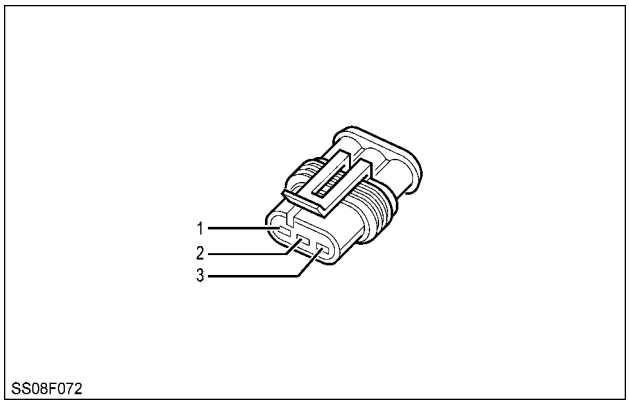


SS08F072 2

RIGHT HAND REAR FENDER



SS08K197 3



SS08F072 4

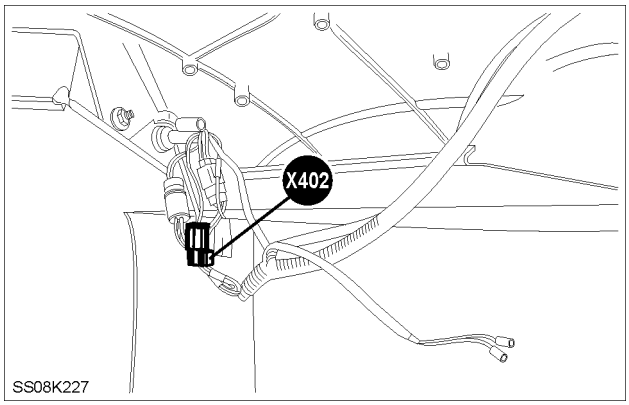
LEFT HAND REAR FENDER

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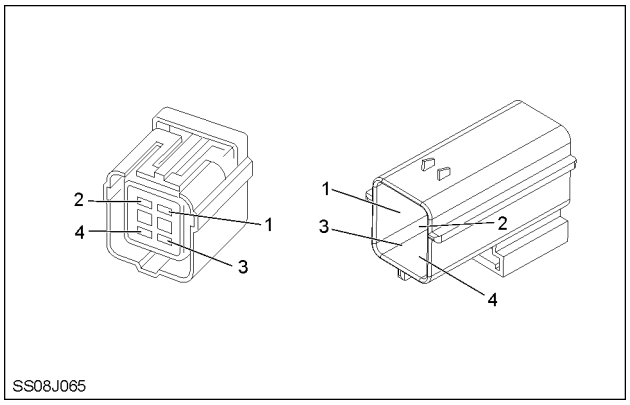
X402 REAR FENDER 3RD REMOTE LEFT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
3	5574B (L) / 5574 (L)	FENDER 3RD EHR SWITCH – UP
4	5576B (L) / 5576 (L)	FENDER 3RD EHR SWITCH – DOWN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K227 5



SS08J065 6

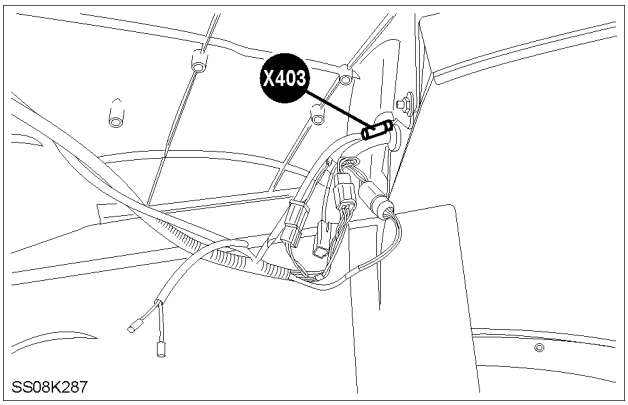
LEFT HAND REAR FENDER

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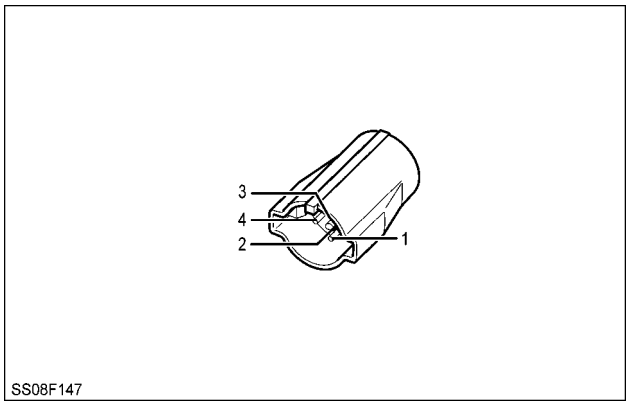
X403 WORKLAMP C - PILLAR RIGHT AND LEFT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	998 (G)	WORK LAMP-REAR FEED (INNER)
4	57AP (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

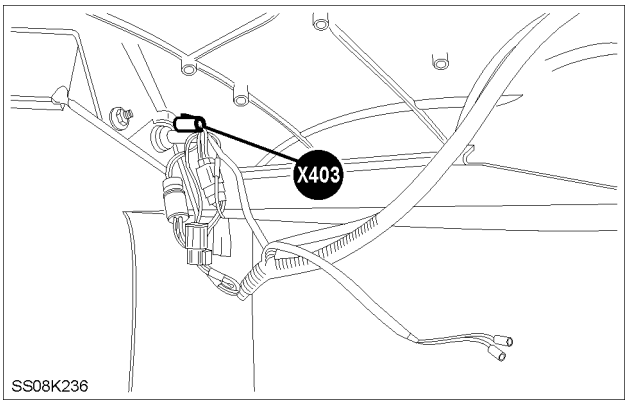


SS08K287 7

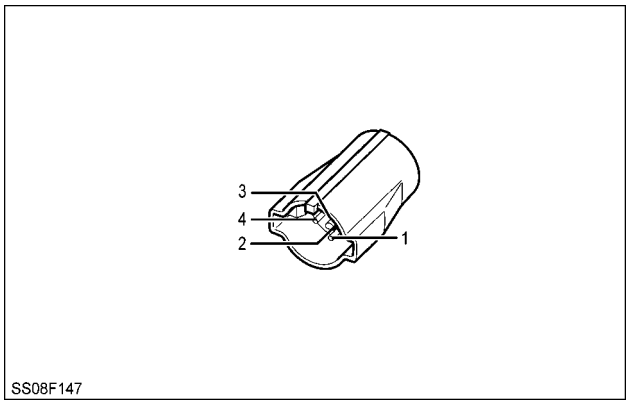


SS08F147 8

RIGHT HAND REAR FENDER



SS08K236 9



SS08F147 10

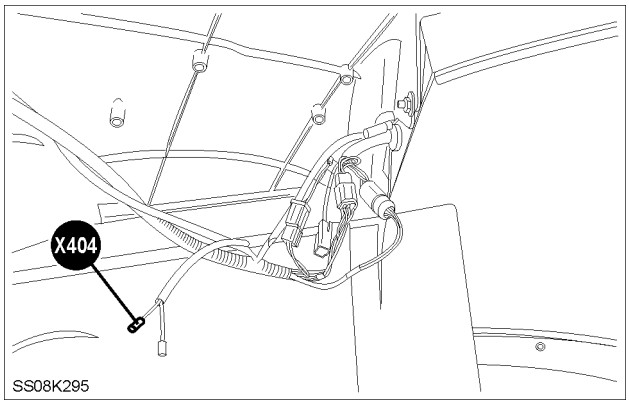
LEFT HAND REAR FENDER

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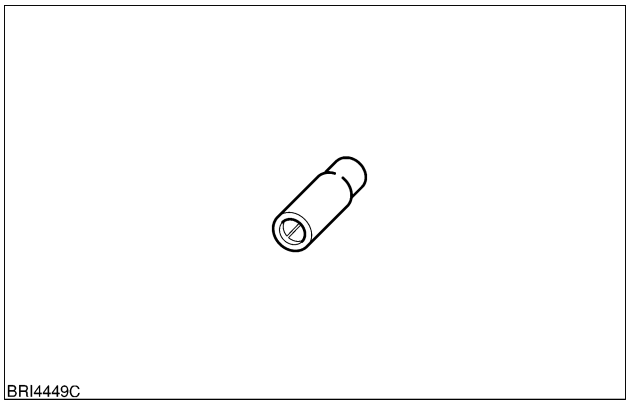
X404 LICENSE LAMP RIGHT AND LEFT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1013B (R) / 1013 (R)	RIGHT HAND LAMPS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

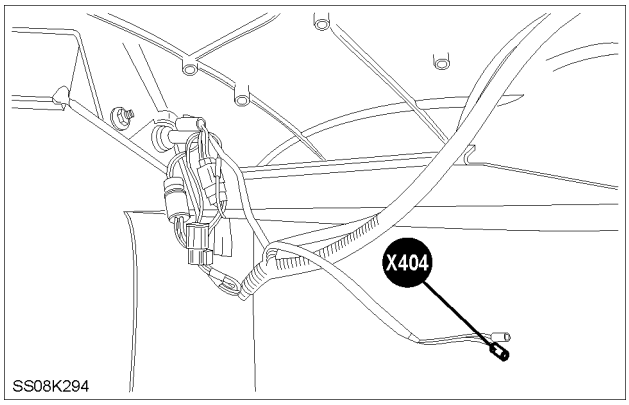


SS08K295 11

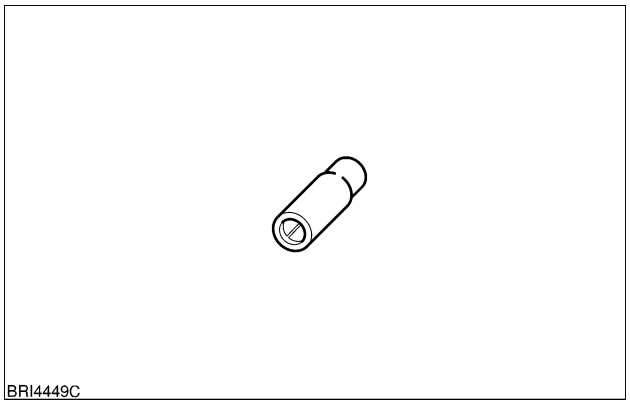


BRI4449C 12

RIGHT HAND REAR FENDER



SS08K294 13



BRI4449C 14

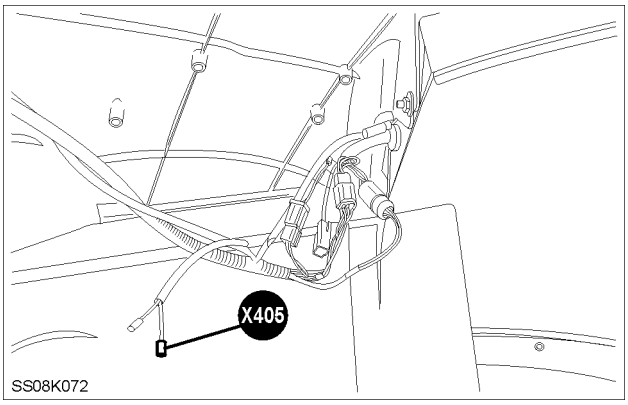
LEFT HAND REAR FENDER

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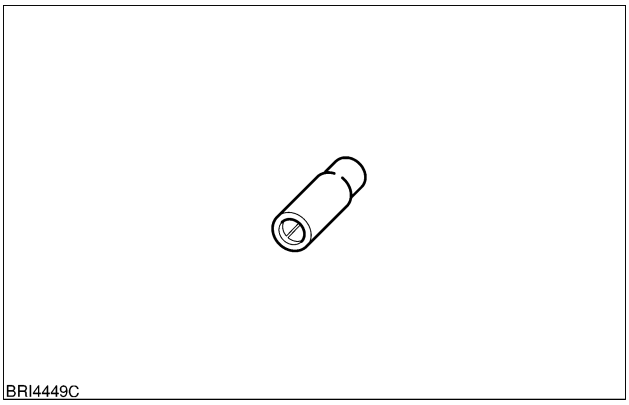
X405 LICENSE LAMP RIGHT AND LEFT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57AW (B) / 57 (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

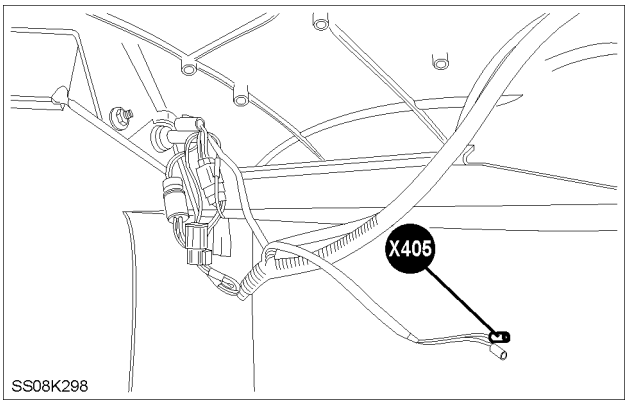


SS08K072 15

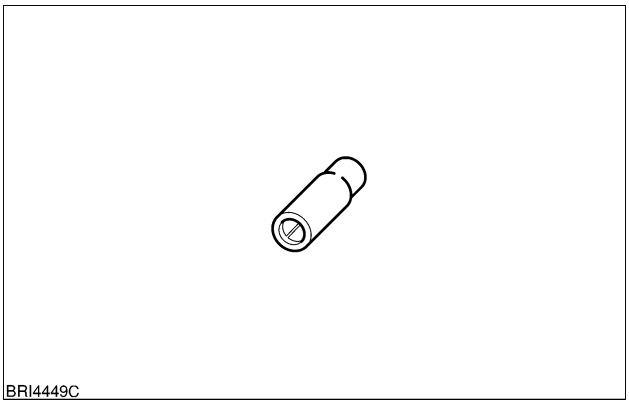


BRI4449C 16

RIGHT HAND REAR FENDER



SS08K298 17



BRI4449C 18

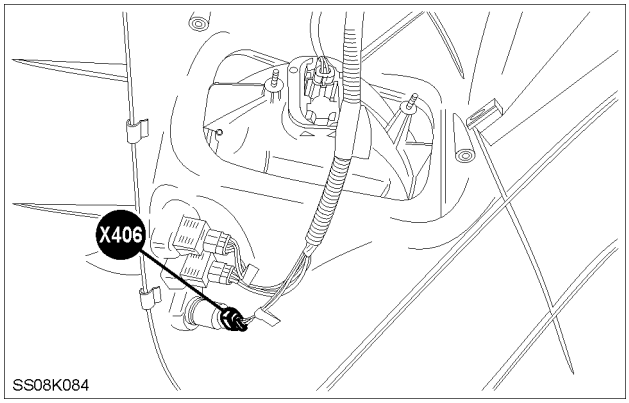
LEFT HAND REAR FENDER

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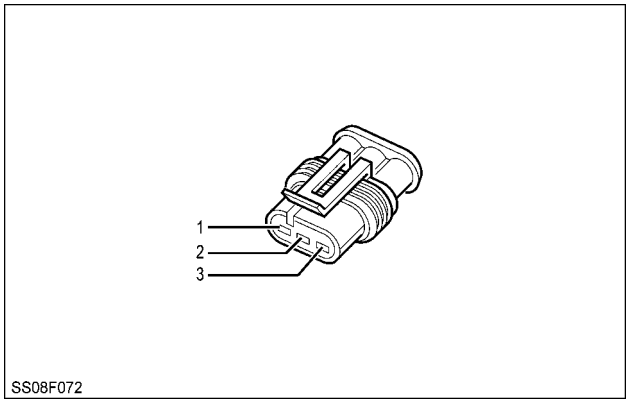
X406 REAR PTO SWITCH RIGHT AND LEFT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2050 (G)	PTO SUPPLY / DOG SUPPLY
2	2059 (W)	FENDER PTO SWITCH INPUT
3	2056 (W)	PTO FENDER PTO SWITCH ON

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

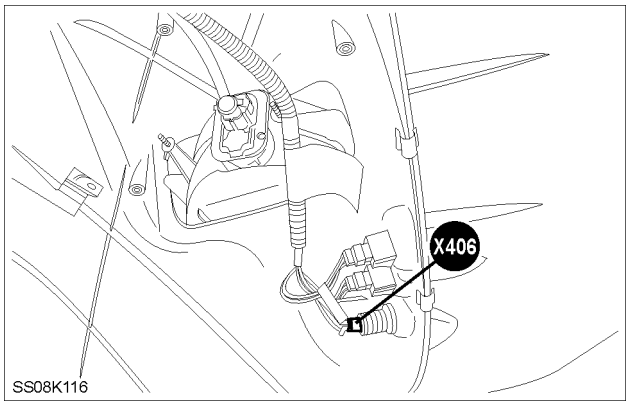


SS08K084 19

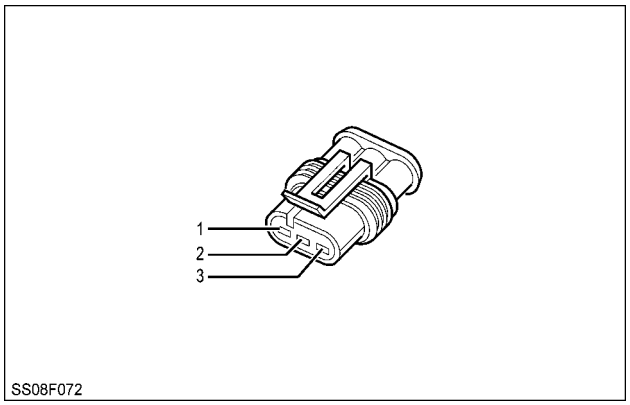


SS08F072 20

RIGHT HAND REAR FENDER



SS08K116 21



SS08F072 22

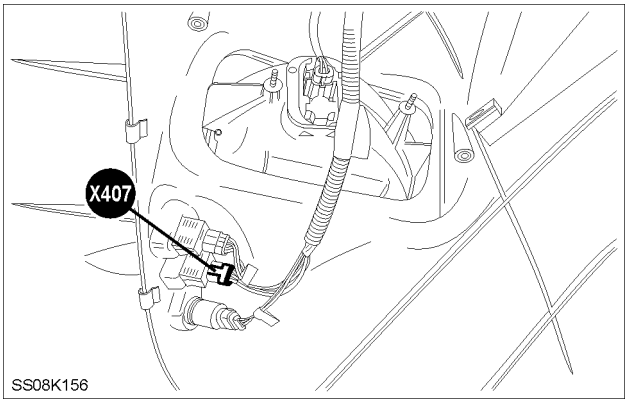
LEFT HAND REAR FENDER

www.truck-freeworkshop.com

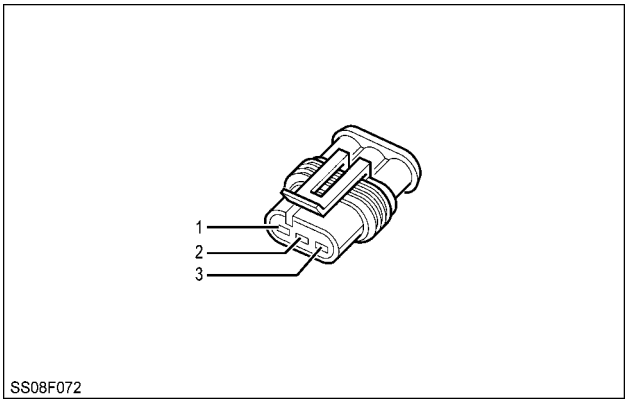
X407 HPL SWITCH RIGHT AND LEFT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5100 (K)	EDC EXTERNAL SWITCH UP
2	5200AP (N)	EDC VALVE SUPPLY
3	5095 (K)	EDC EXTERNAL SWITCH DOWN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

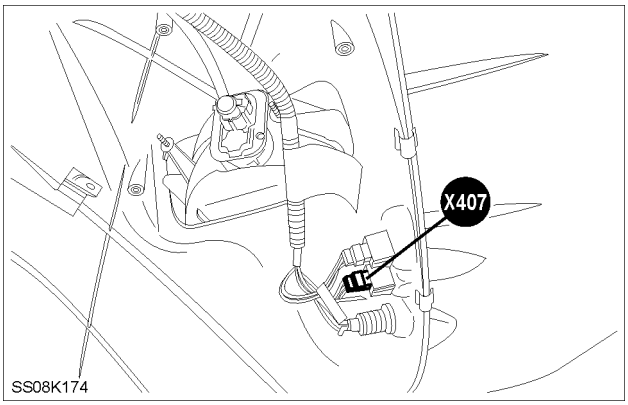


SS08K156 23

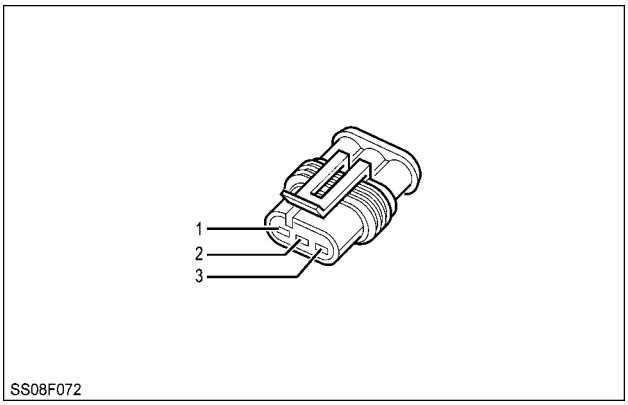


SS08F072 24

RIGHT HAND REAR FENDER



SS08K174 25



SS08F072 26

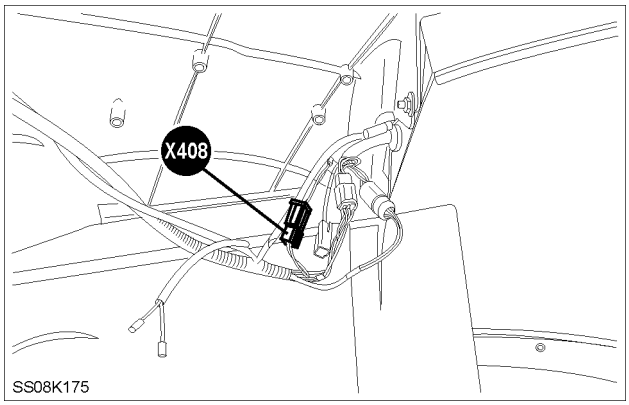
LEFT HAND REAR FENDER

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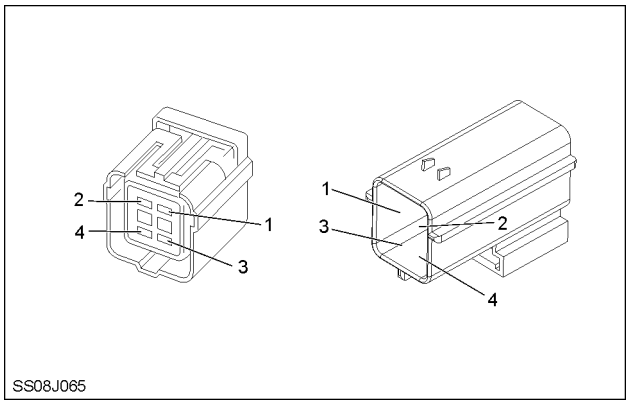
X408 REAR FENDER 3RD REMOTE RIGHT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
3	5574A (L) / 5574 (L)	FENDER 3RD EHR SWITCH – UP
4	5576A (L) / 5576 (L)	FENDER 3RD EHR SWITCH – DOWN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K175 27



SS08J065 28

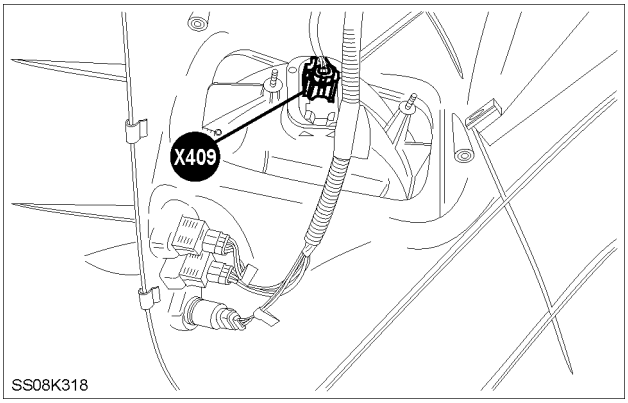
RIGHT HAND REAR FENDER

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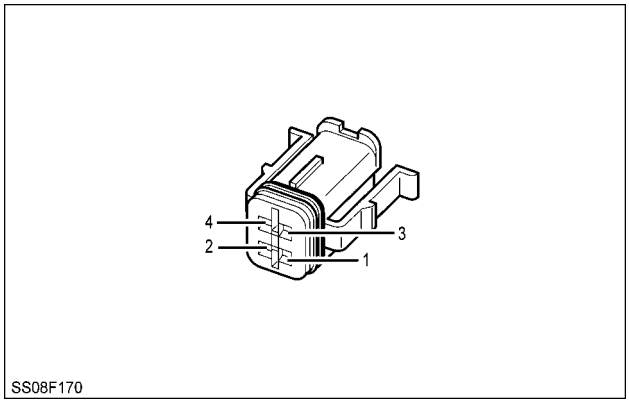
X409 STOP TAIL LIGHT RIGHT AND LEFT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57AX (B)	EARTH (ALL)
2	3004 (G)	RIGHT HAND TURN SIGNAL WARNING LAMP
3	1013A (R)	RIGHT HAND LAMPS
4	810 (G)	STOPLAMPS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

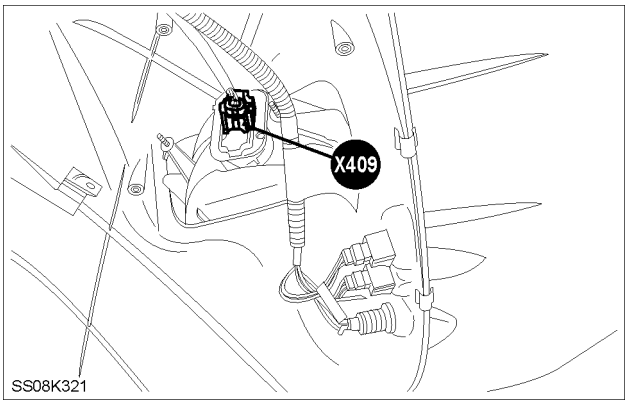


SS08K318 29

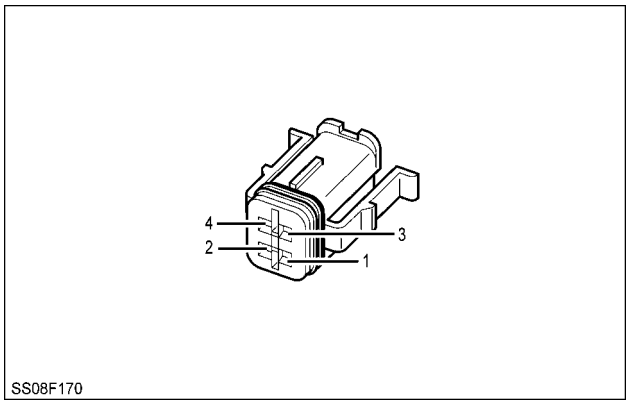


SS08F170 30

RIGHT HAND REAR FENDER



SS08K321 31



SS08F170 32

LEFT HAND REAR FENDER

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Connector - Component diagram 42

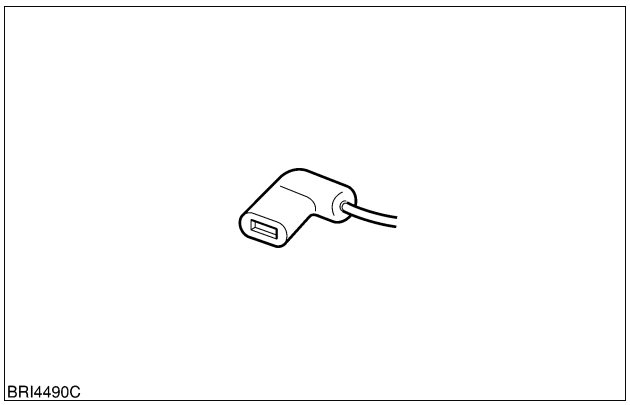
X422 LOW BRAKE PRESSURE LINE SWITCH 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	8020A (TN)	TRAILER BRAKE PRESSURE

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

IMAGE NOT AVAILABLE

INA 1



BRI4490C 2

REAR RIGHT HAND AXLE

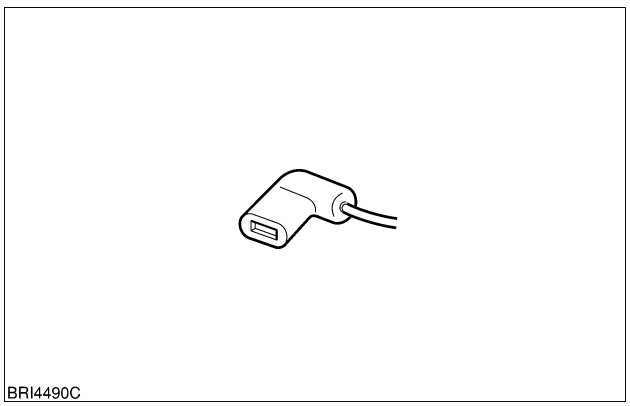
X423 LOW BRAKE PRESSURE LINE SWITCH 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57FA (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

IMAGE NOT AVAILABLE

INA 3



BRI4490C 4

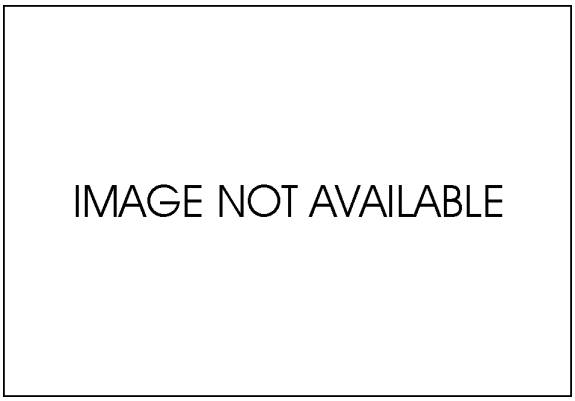
REAR RIGHT HAND AXLE

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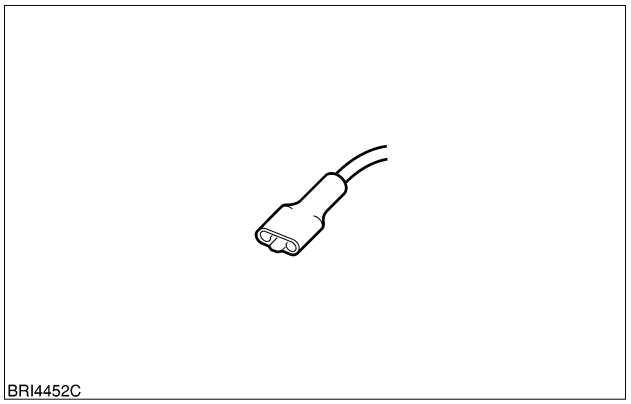
X424 HYDRAULIC TRAILER BRAKE SOLENOID 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	8000B (N)	TRAILER BRAKE SOLENOID

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 5



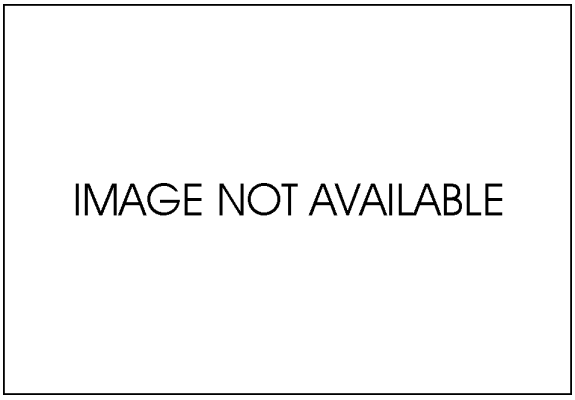
BRI4452C 6

REAR RIGHT HAND AXLE

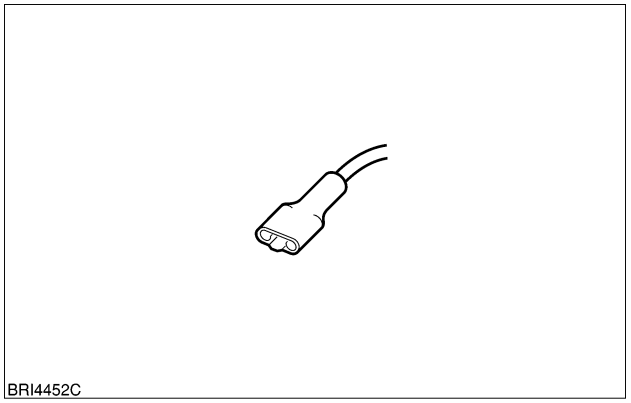
X425 HYDRAULIC TRAILER BRAKE SOLENOID 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	8000C (N)	TRAILER BRAKE SOLENOID

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 7



BRI4452C 8

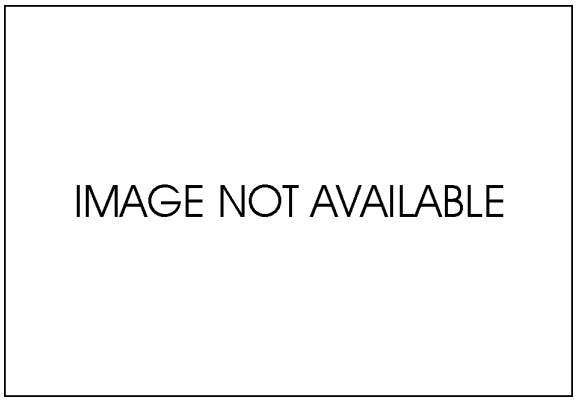
REAR RIGHT HAND AXLE

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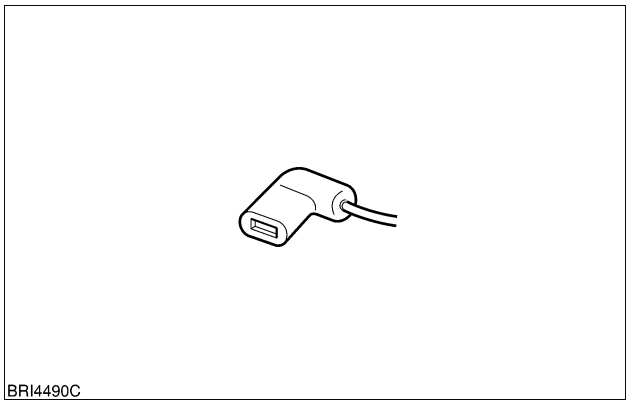
X426 LOW PUMP OUTPUT PRESS SWITCH 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	8010A (TN)	TRAILER BRAKE PRESSURE

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 9



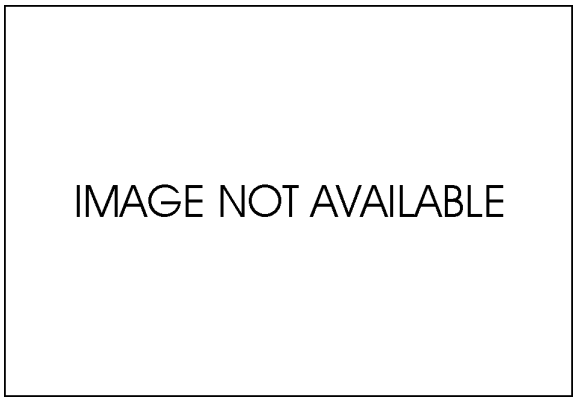
BRI4490C 10

REAR RIGHT HAND AXLE

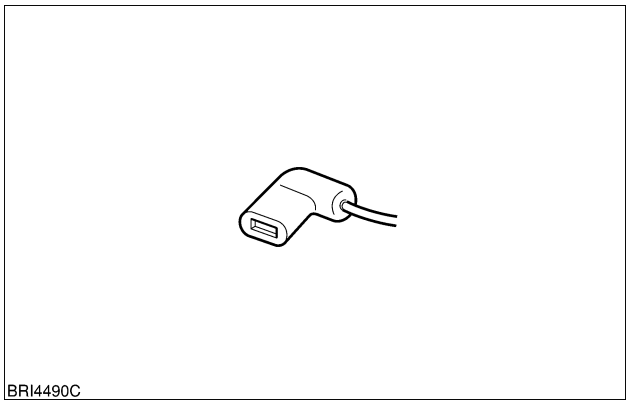
X427 LOW PUMP OUTPUT PRESS SWITCH 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	8060E (U)	TRAILER BRAKE SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 11



BRI4490C 12

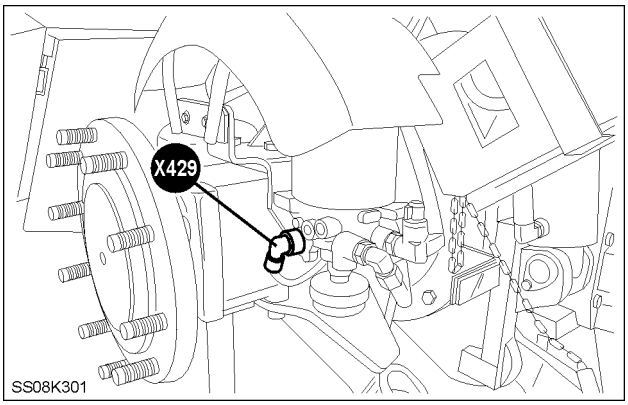
REAR RIGHT HAND AXLE

www.truck-freeworkshop.com

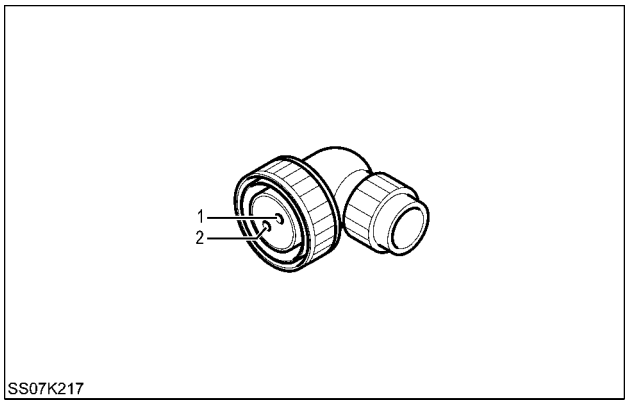
X429 BRAKE DE-ICER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	8060F (U)	TRAILER BRAKE SUPPLY
2	57FN (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K301 13



SS07K217 14

REAR LEFT HAND TRANSMISSION

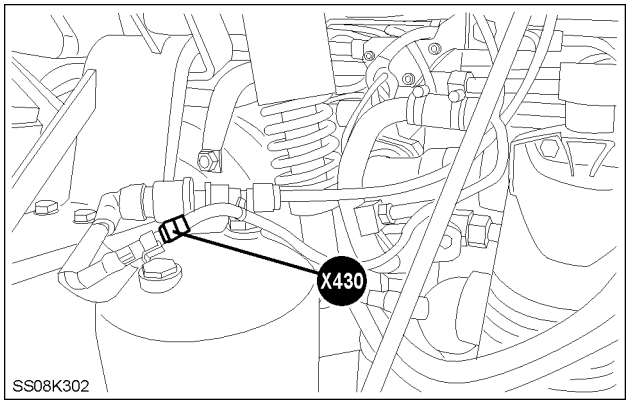
www.truck-freeworkshop.com

Connector - Component diagram 43

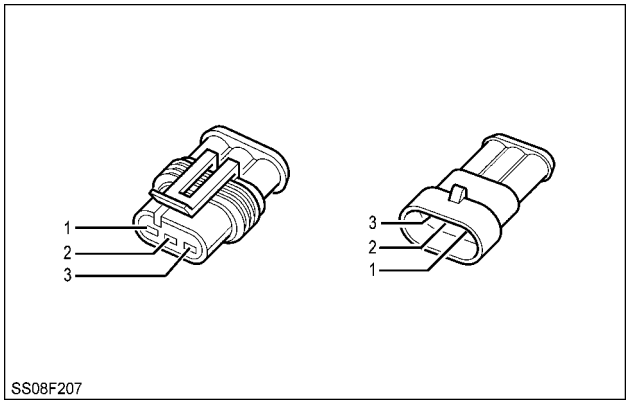
X430 AIR BRAKE PRESSURE SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	8010 (TN)	TRAILER BRAKE PRESSURE
2	8020B (TN)	TRAILER BRAKE PRESSURE
3	2095D (G)	INSTRUMENT SIGNAL GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K302 1



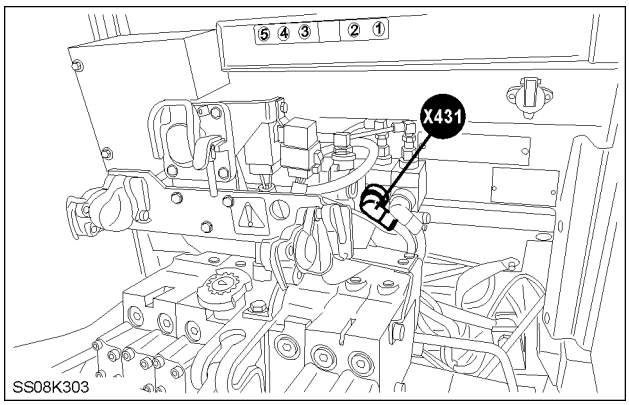
SS08F207 2

REAR RIGHT HAND TRANSMISSION

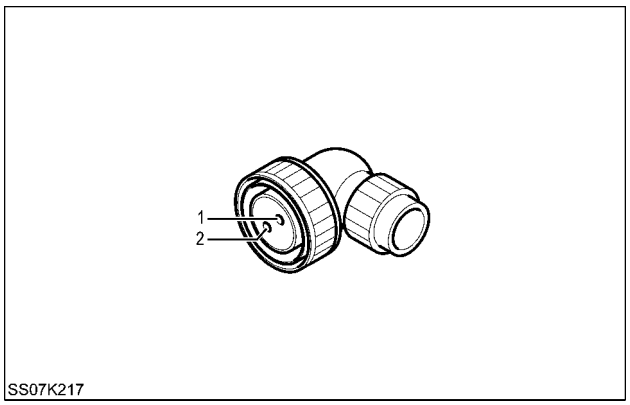
X431 PNEUMATIC TRAILER BRAKE SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	8000X (N)	TRAILER BRAKE SOLENOID
2	57EK (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K303 3



SS07K217 4

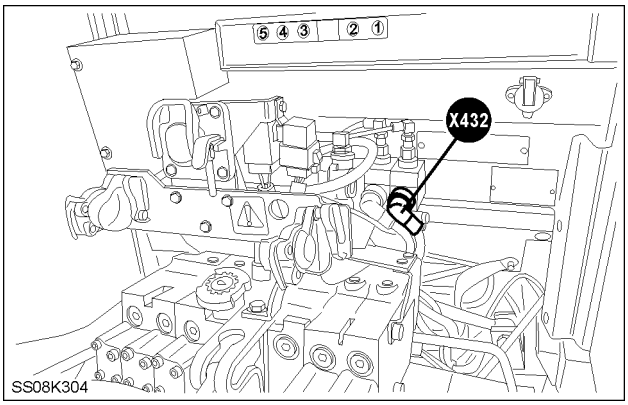
REAR OF TRACTOR

www.truck-freeworkshop.com

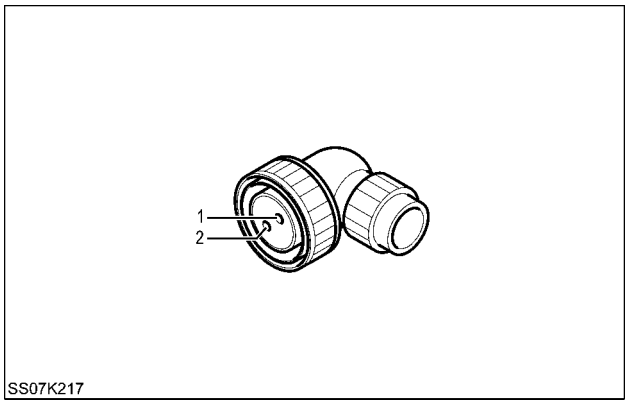
X432 PARK BRAKE SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	8070 (L)	TRAILER PARK BRAKE SOLENOID
2	57EL (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K304 5



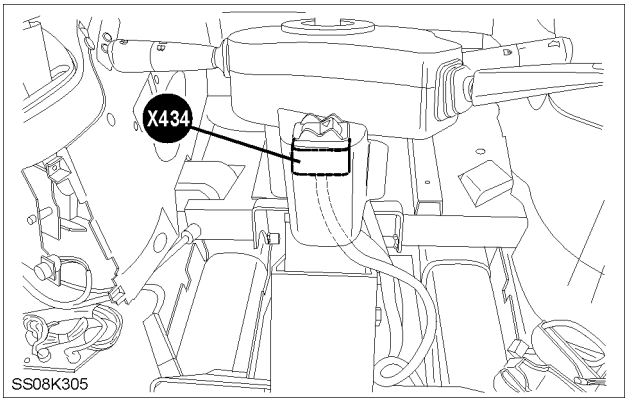
SS07K217 6

REAR OF TRACTOR

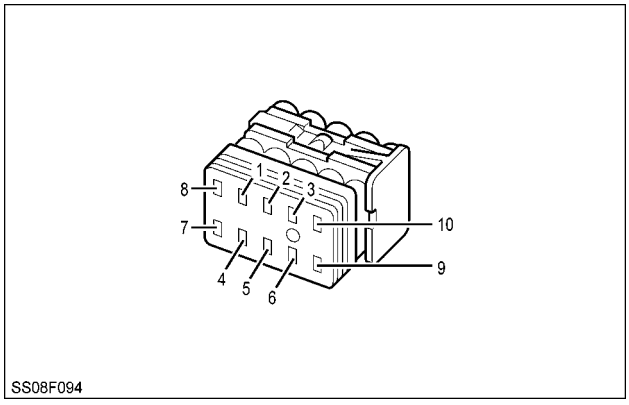
X434 HAZARD SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	1021 (P)	HAZARD SWITCH SUPPLY (BATTERY)
3	1020A (G/W)	HAZARD SWITCH SUPPLY
7	57BF (B)	EARTH (ALL)
8	1020 (G/S)	HAZARD SWITCH SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K305 7



SS08F094 8

FRONT INSIDE CAB

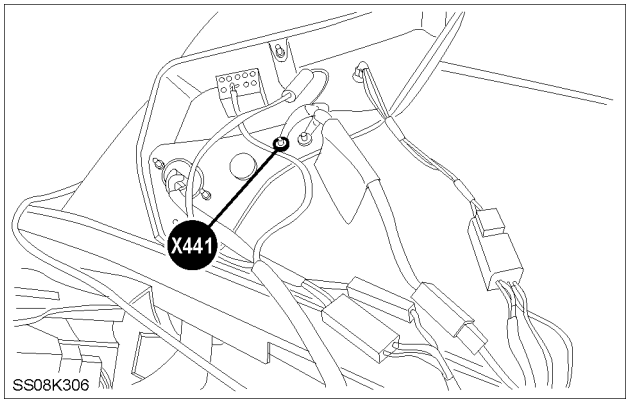
www.truck-freeworkshop.com

Connector - Component diagram 44

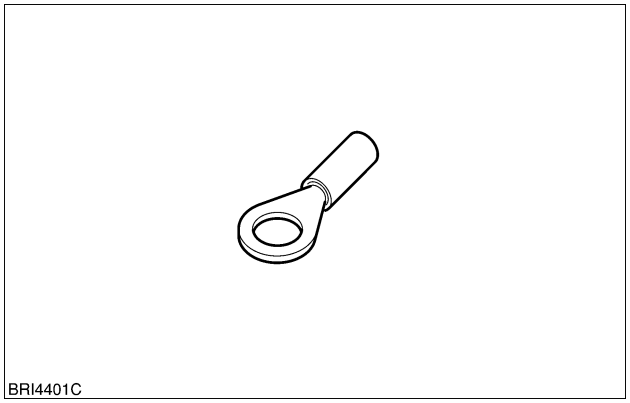
X441 STUD 8 AMPERE PLUS

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3070 (P/W)	'B' PILLAR SKT SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K306 1



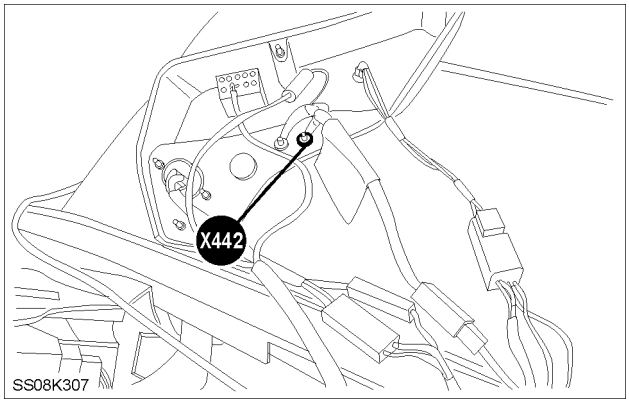
BRI4401C 2

BEHIND RIGHT HAND SWITCH PANEL

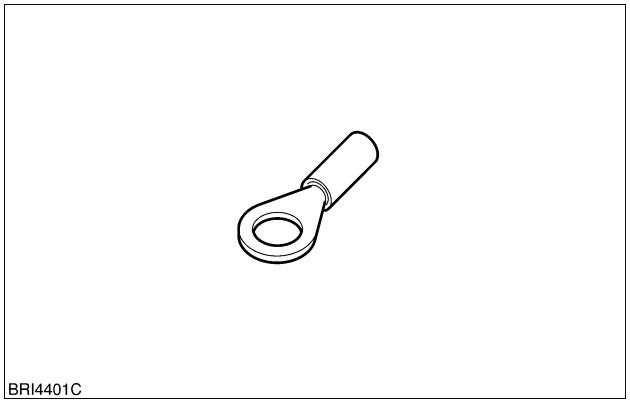
X442 STUD 8 AMPERE MINUS

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57 (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K307 3



BRI4401C 4

BEHIND RIGHT HAND SWITCH PANEL

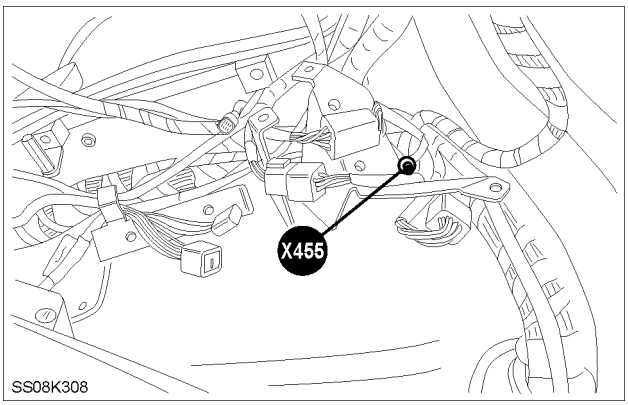
www.truck-freeworkshop.com

Connector - Component diagram 45

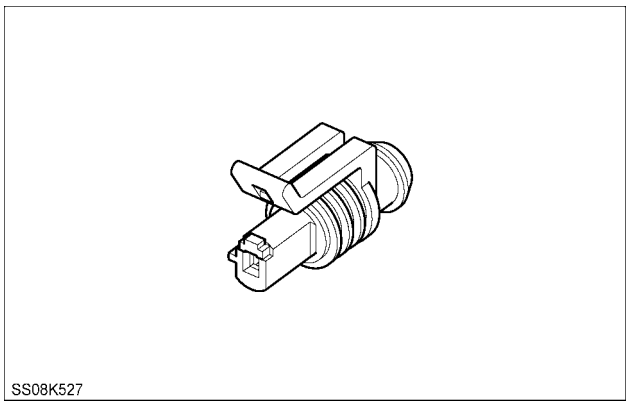
X455 REV. ALARM H58

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1P (R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K308 1



SS08K527 2

BEHIND RIGHT HAND TRIM

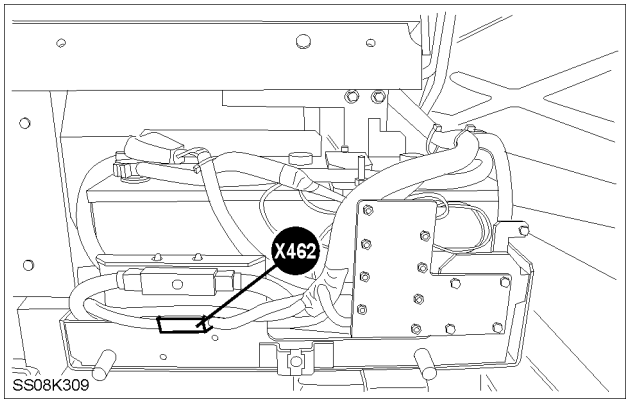
www.truck-freeworkshop.com

Connector - Component diagram 46

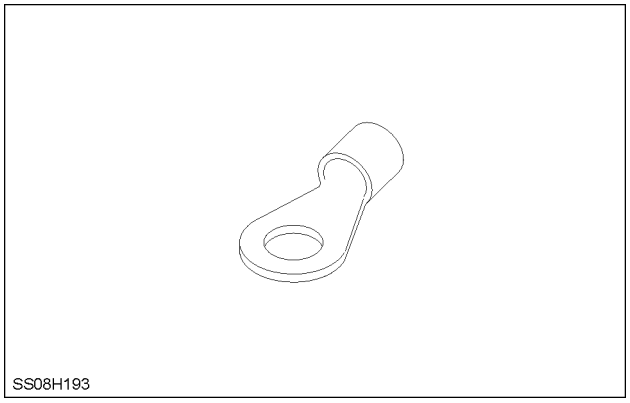
X462 FUSE PF2 / C

POS.	WIRE NUMBER	CIRCUIT REFERENCE
C	160 (U)	BATTERY SUPPLY ELECTRONICS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K309 1



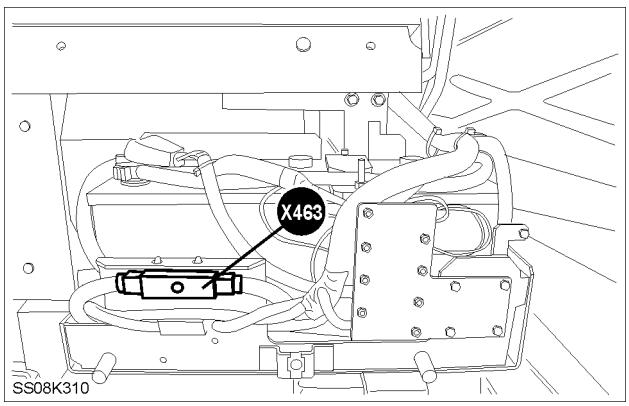
SS08H193 2

RIGHT HAND BEHIND STEPS

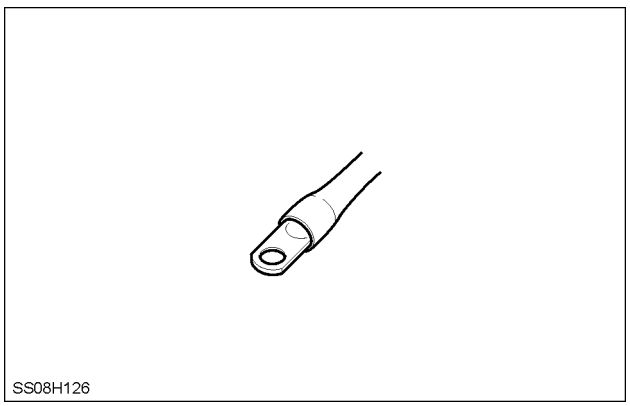
X463 FUSE PF1 / A

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	1 (R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K310 3



SS08H126 4

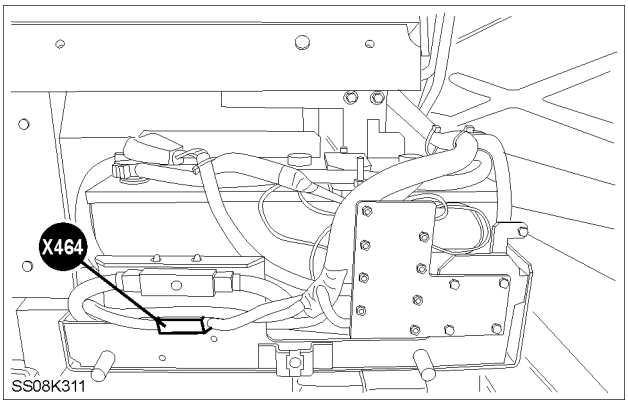
RIGHT HAND BEHIND STEPS

www.truck-freeworkshop.com

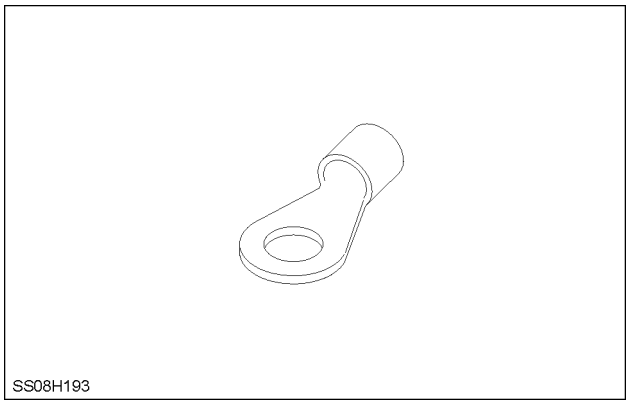
X464 FUSE PF2 / D

POS.	WIRE NUMBER	CIRCUIT REFERENCE
D	160A (U)	BATTERY SUPPLY ELECTRONICS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K311 5



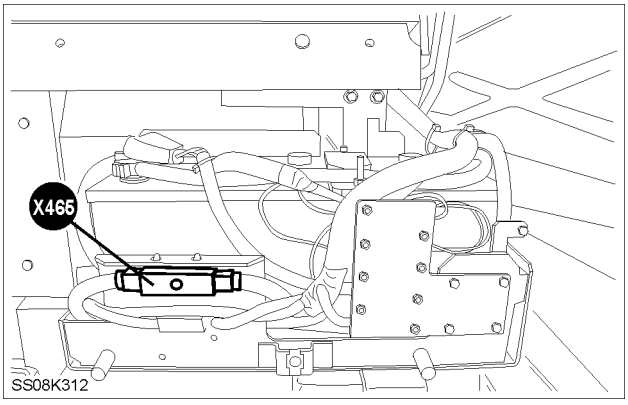
SS08H193 6

RIGHT HAND BEHIND STEPS

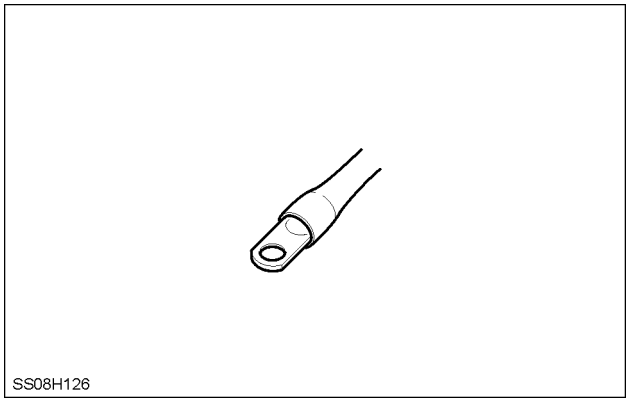
X465 FUSE PF1 / B

POS.	WIRE NUMBER	CIRCUIT REFERENCE
B	1A (R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K312 7



SS08H126 8

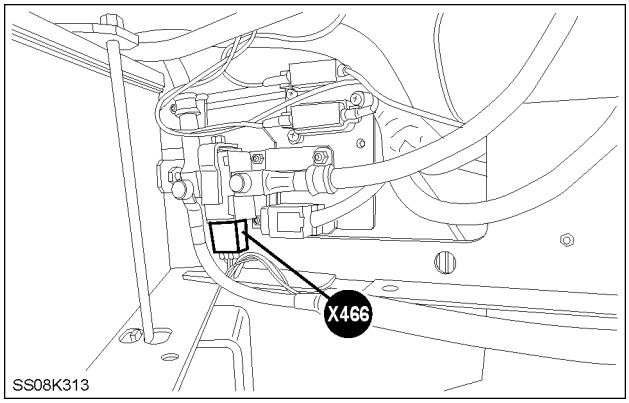
RIGHT HAND BEHIND STEPS

www.truck-freeworkshop.com

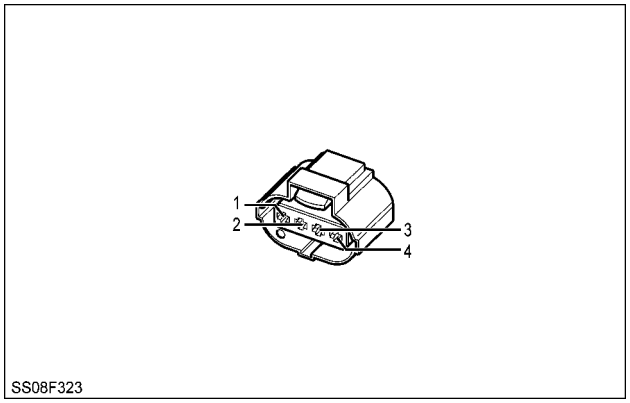
X466 BATTERY ISOLATOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	172A (W/TQ/Y)	BATTERY ISOLATOR RELAY COIL (OFF)
2	57NN (B)	EARTH (ALL)
3	57NP (B)	EARTH (ALL)
4	171B (W/TQ/B)	BATTERY ISOLATOR RELAY COIL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K313 9



SS08F323 10

RIGHT HAND BEHIND STEPS

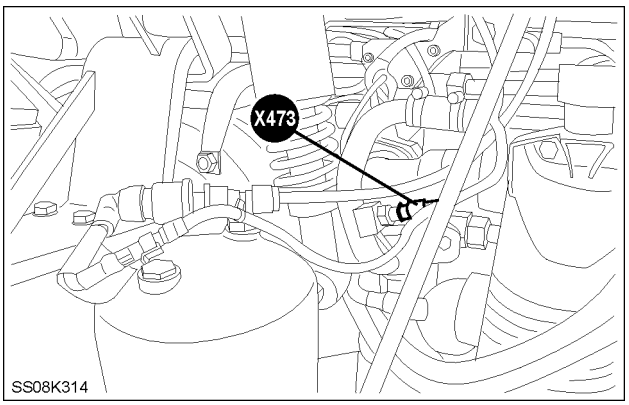
www.truck-freeworkshop.com

Connector - Component diagram 47

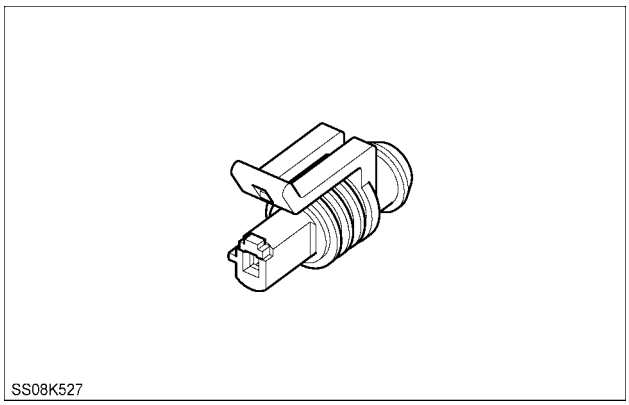
X473 LOW HYDRO CHARGE SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	7160 (R)	HYD LOW CHARGE WARNING

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K314 1



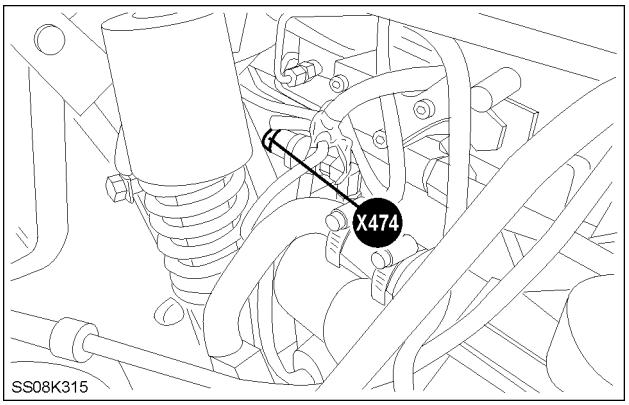
SS08K527 2

REAR RIGHT HAND TRANSMISSION

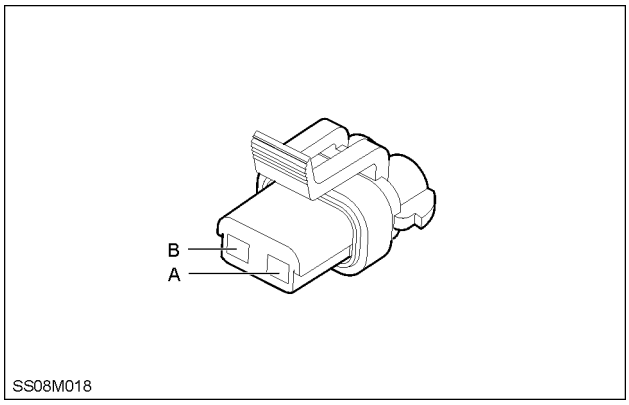
X474 HYDRAULIC FILTER BLOCKED (VACUUM SWITCH)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	7130 (N)	HYD FILTER WNG LP
B	57EV (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K315 3



SS08M018 4

REAR RIGHT HAND TRANSMISSION

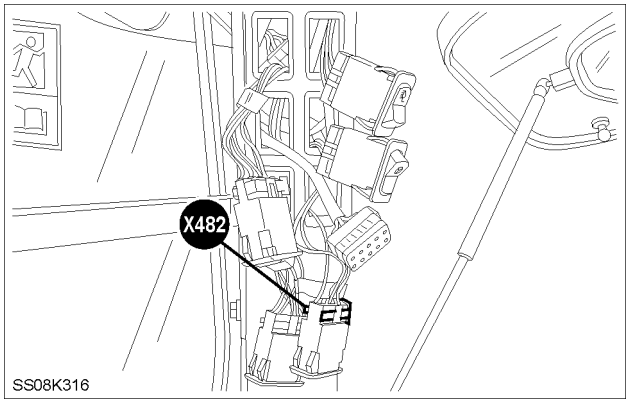
www.truck-freeworkshop.com

Connector - Component diagram 48

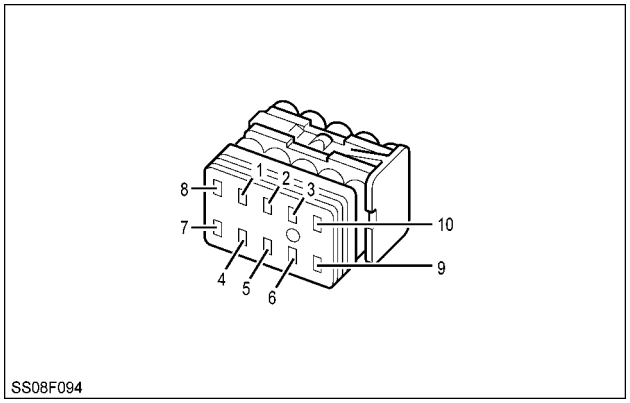
X482 BATTERY ISOLATOR CONTROL SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	171 (W)	BATTERY ISOLATOR RELAY COIL
2	1J (R)	BATTERY SUPPLY
3	172 (W)	BATTERY ISOLATOR RELAY COIL (OFF)
7	10V (G)	IGNITION SUPPLY
8	666E (L)	DOMELAMP SWITCH FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K316 1



SS08F094 2

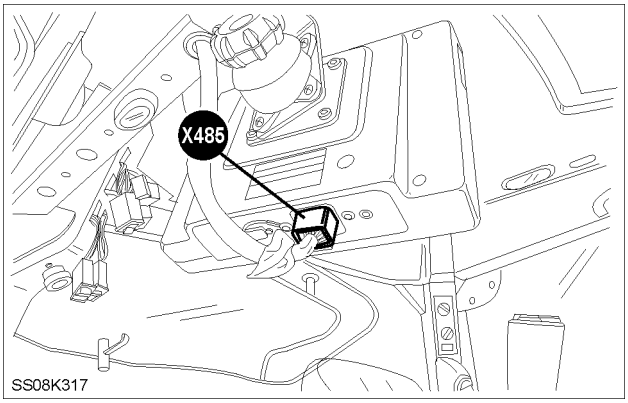
RIGHT HAND C-PILLAR

www.truck-freeworkshop.com

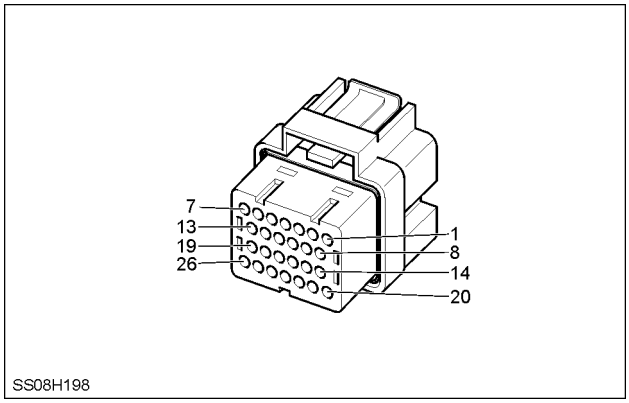
X485 COLOUR DISPLAY

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5500J (R)	EHR CAN HIGH
2	5510J (U)	EHR CAN LOW
3	5945 (Y)	ROTARY ENCODER SIGNAL - "P1"
4	5950 (Y)	ROTARY ENCODER SIGNAL - "P2"
5	5900F (Y)	ISO BUS CAN SIGNAL LOW
6	5910F (G)	ISO BUS CAN SIGNAL HIGH
9	5960 (Y)	RS232 OUTPUT TECU
10	5955A (Y)	RS232 INPUT TECU
13	5000 (L)	EDC MEMORY POWER
14	57 (B)	EARTH (ALL)
15	7000AT (U)	TRANS CONTROL SUPPLY
17	5935 (Y)	ROTARY ENCODER SIGNAL - "HOME"
18	5940 (Y)	ROTARY ENCODER SIGNAL - "ESC"
19	5990 (Y)	ROTARY ENCODER SIGNAL - "ENTER"
20	5520 (LTG)	EHR 5V Ref
21	5962 (R)	USB + 5V Ref.
22	5966 (G)	USB Data +
23	5964 (W)	USB Data -
24	5968 (B)	USB Ground

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K317 3



SS08H198 4

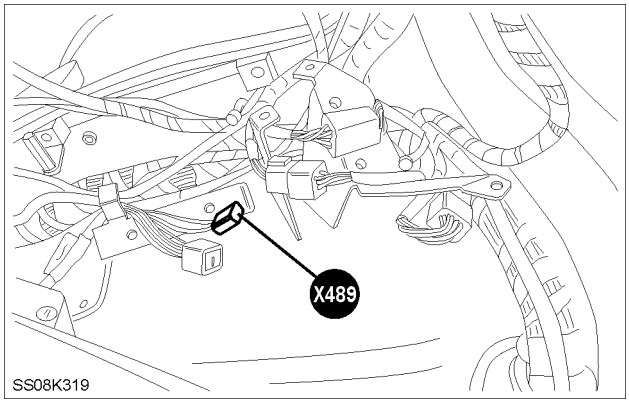
IN CAB RIGHT HAND

www.truck-freeworkshop.com

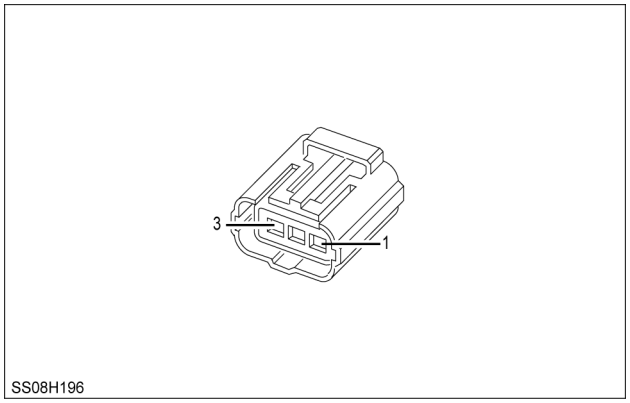
X489 REAR VIEW CAMERA

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5520B (LTG)	EHR 5V Ref
2	57B (B)	EARTH (ALL)
3	5960A (Y)	RS232 OUTPUT TECU

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K319 5



SS08H196 6

BEHIND RIGHT HAND TRIM

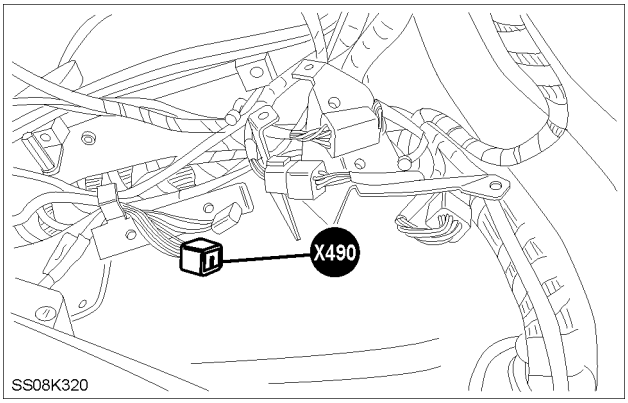
www.truck-freeworkshop.com

Connector - Component diagram 49

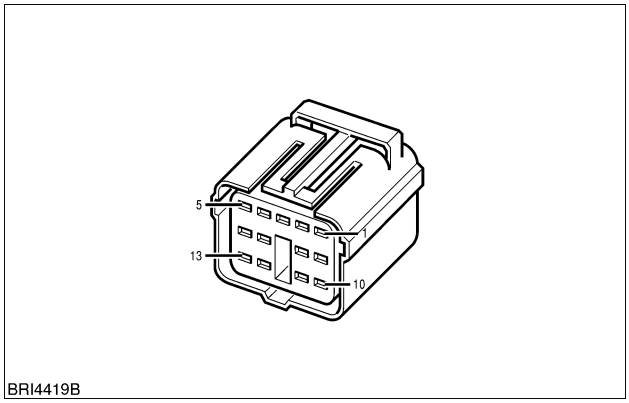
X490 ENCODER AND SWITCHES

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5520 (LTG)	EHR 5V Ref
2	5935 (Y)	ROTARY ENCODER SIGNAL - "HOME"
3	5940 (Y)	ROTARY ENCODER SIGNAL - "ESC"
4	5945 (Y)	ROTARY ENCODER SIGNAL - "P1"
5	5950 (Y)	ROTARY ENCODER SIGNAL - "P2"
6	5990 (Y)	ROTARY ENCODER SIGNAL - "ENTER"
7	57 (B)	EARTH (ALL)
8	57D (B)	EARTH (ALL)
9	57E (B)	EARTH (ALL)
10	57F (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K320 1



BRI4419B 2

BEHIND RIGHT HAND TRIM

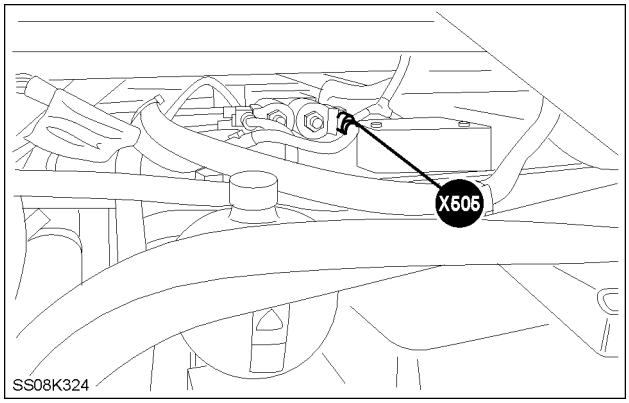
www.truck-freeworkshop.com

Connector - Component diagram 50

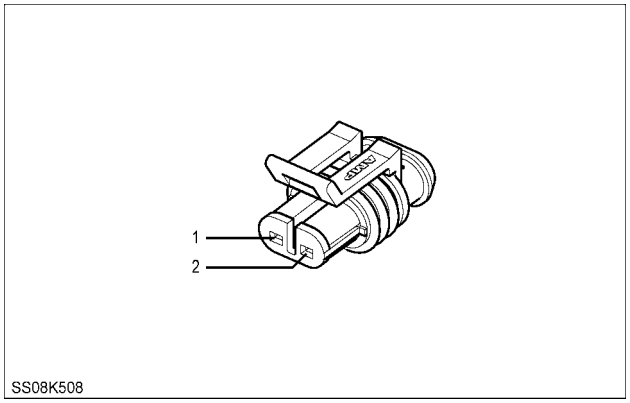
X505 SUSPENSION RAISE SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3260 (O)	LOWER SOLENOID PWR
2	3270 (O)	LOWER SOLENOID RET

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K324 1



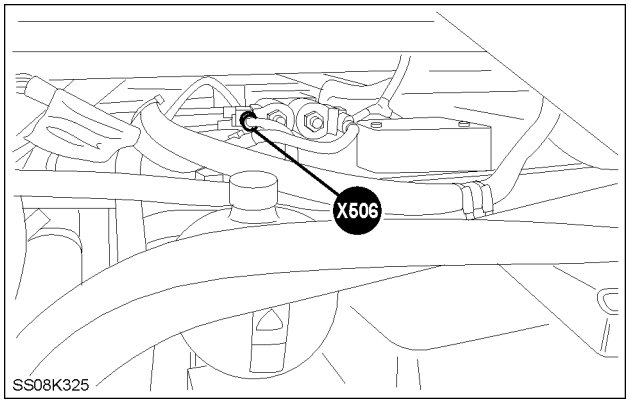
SS08K508 2

RIGHT HAND TOP OF TRANSMISSION

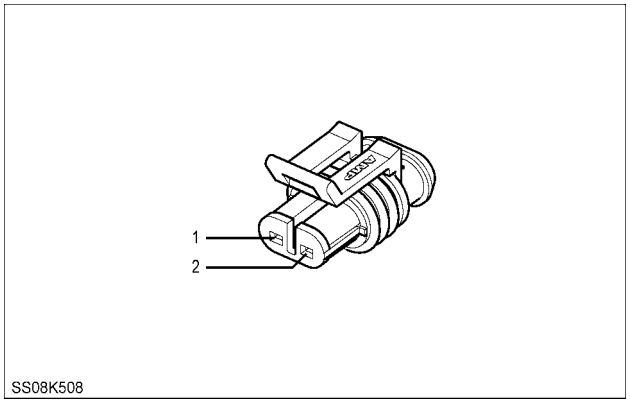
X506 SUSPENSION LOWER SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3240 (O)	RAISE SOLENOID PWR
2	3250 (O)	RAISE SOLENOID RET

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K325 3



SS08K508 4

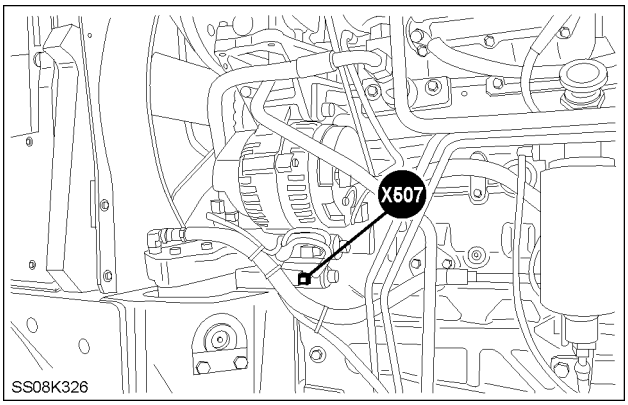
RIGHT HAND TOP OF TRANSMISSION

www.truck-freeworkshop.com

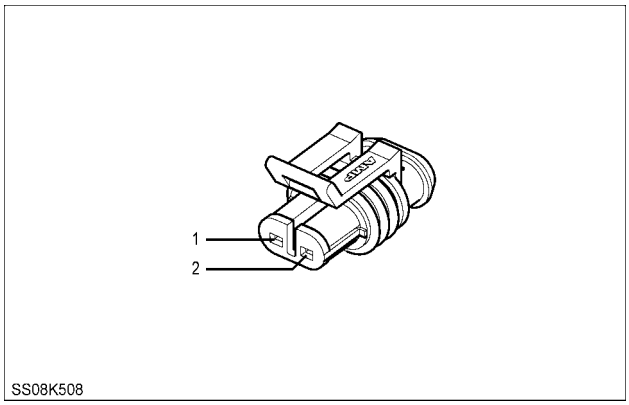
X507 UPPER LOCKOUT SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3280 (O)	SUSPENSION LOCKOUT SOLENOID UPPER
2	3281 (TN)	SUSPENSION LOCKOUT SOLENOID UPPER RETURN (-)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K326 5



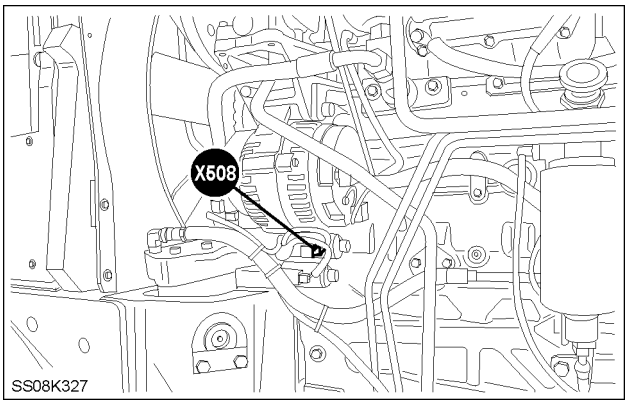
SS08K508 6

FRONT LEFT HAND ENGINE

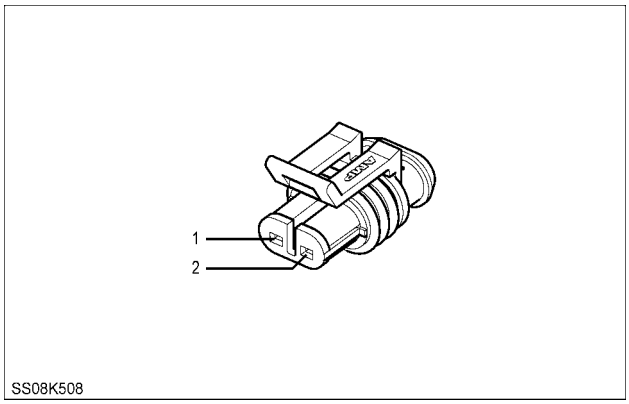
X508 LOWER LOCKOUT SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3285 (TN)	SUSPENSION LOCKOUT SOLENOID LOWER
2	3286 (TN)	SUSPENSION LOCKOUT SOLENOID LOWER RETURN (-)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K327 7



SS08K508 8

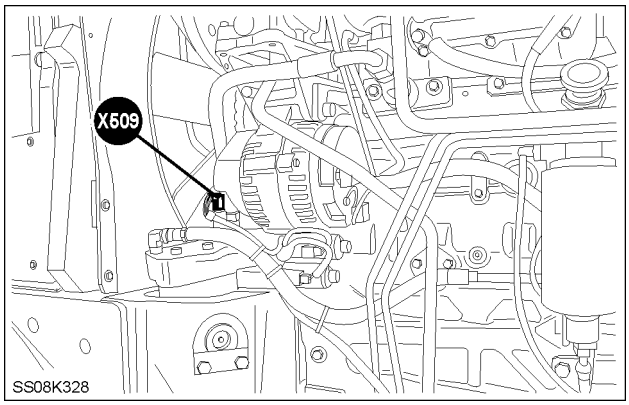
FRONT LEFT HAND ENGINE

www.truck-freeworkshop.com

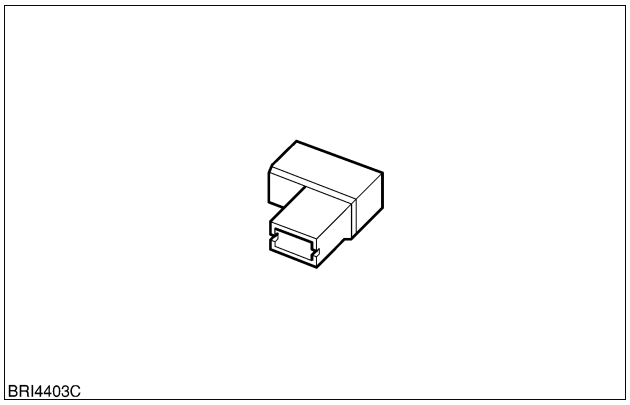
X509 FRONT SUSPENSION NOT PRESSURE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3290 (O)	SUSPENSION LOCKOUT LAMP (OR SOLENOID RET)
1	57FK (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K328 9



BRI4403C 10

FRONT LEFT HAND ENGINE

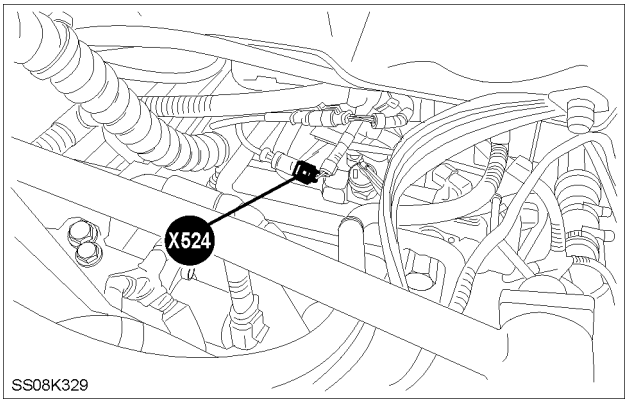
www.truck-freeworkshop.com

Connector - Component diagram 52

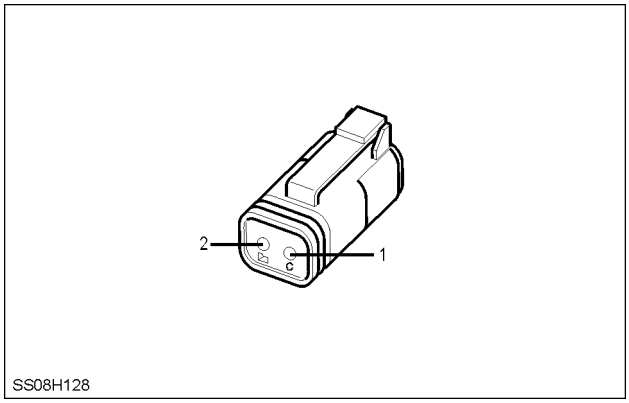
X524 OUTPUT WHEEL SPEED SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7411 (Y)	TRANS HYDROSTAT INPUT SPEED SENSOR (CVT)
2	7000BK (U)	TRANS CONTROL SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K329 1



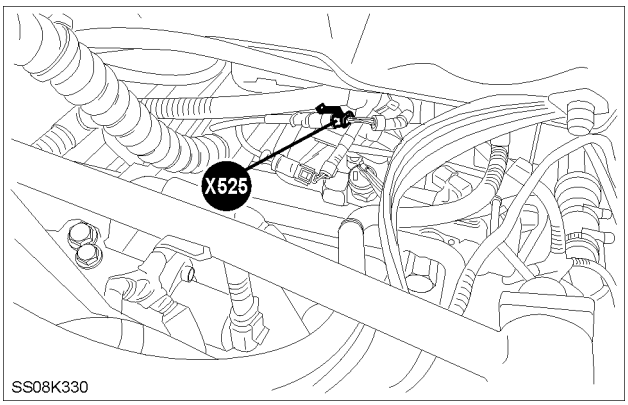
SS08H128 2

REAR OF TRACTOR UNDERNEATH CAB

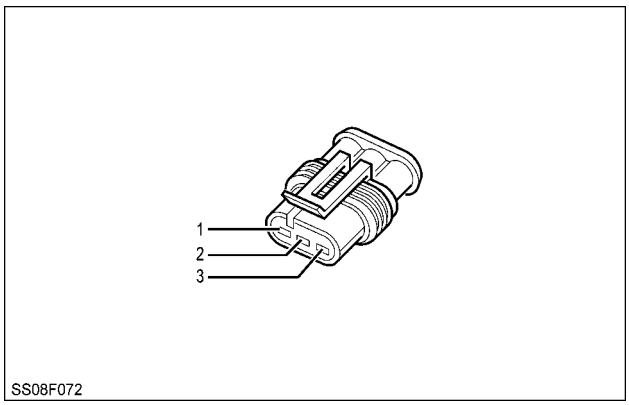
X525 HYDROSTAT INPUT SPEED SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7000BP (U)	TRANS CONTROL SUPPLY
2	7401 (L)	TRANS RPM SPEED SENSOR
3	60BJ (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K330 3



SS08F072 4

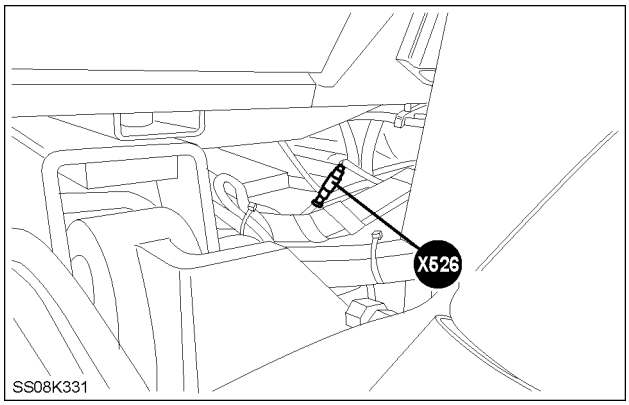
REAR OF TRACTOR UNDERNEATH CAB

www.truck-freeworkshop.com

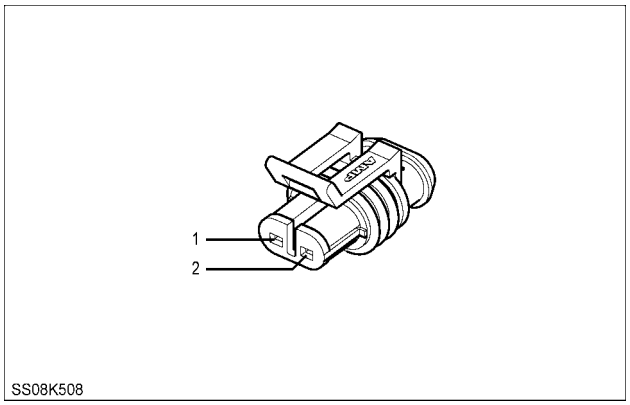
X526 RING SPEED SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7400 (Y)	TRANS RPM SPEED SENSOR TO TCM INPUT
2	7000BL (U)	TRANS CONTROL SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K331 5



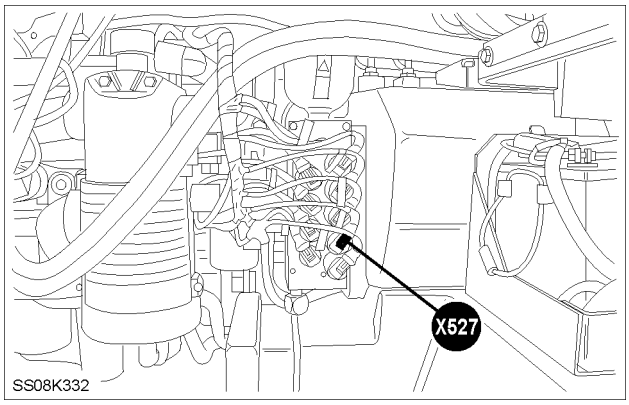
SS08K508 6

RIGHT HAND TOP OF TRANSMISSION

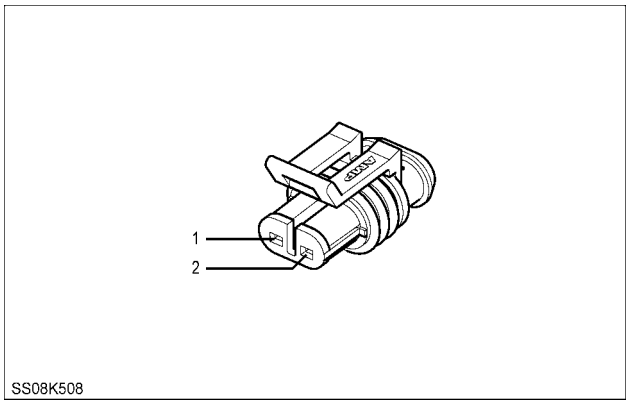
X527 CLUTCH SOLENOID A

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7910 (TQ)	CLUTCH 'B' SIGNAL
2	7915 (L)	TCM CLUTCH B RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K332 7



SS08K508 8

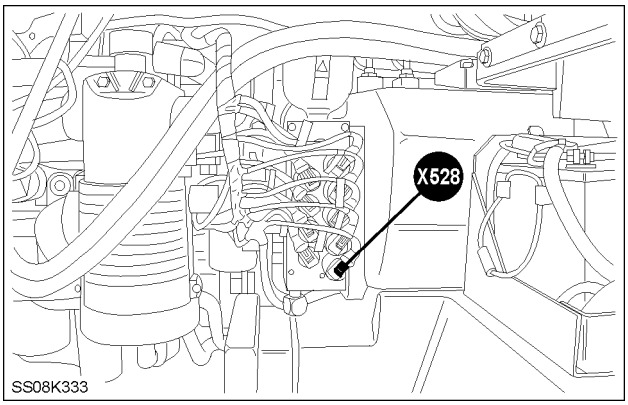
RIGHT HAND TRANSMISSION

www.truck-freeworkshop.com

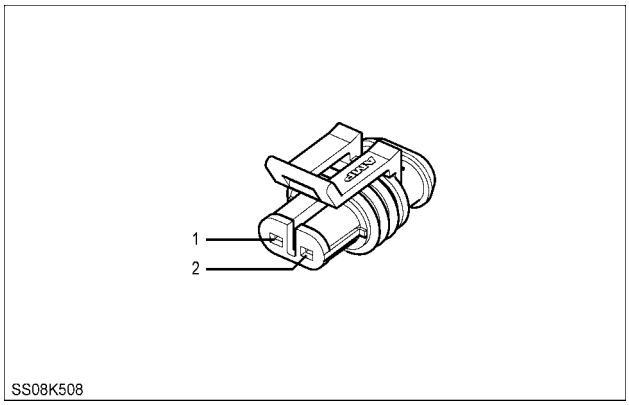
X528 CLUTCH SOLENOID B

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7431 (TQ)	SUPPLY
2	7900 (TQ)	CLUTCH 'A' SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K333 9



SS08K508 10

RIGHT HAND TRANSMISSION

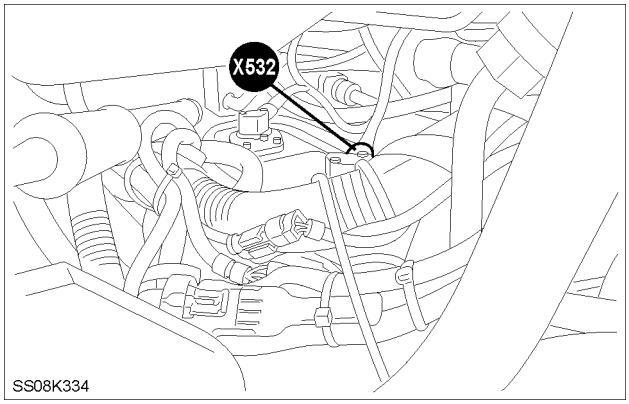
www.truck-freeworkshop.com

Connector - Component diagram 53

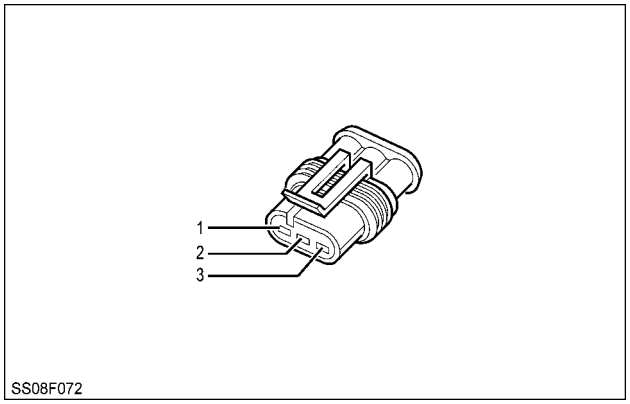
X532 POTENTIOMETER SYNCHRONISER F1 - F3

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7960 (W)	TRANS SLOW/FAST
2	5020R (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
3	60BN (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K334 1



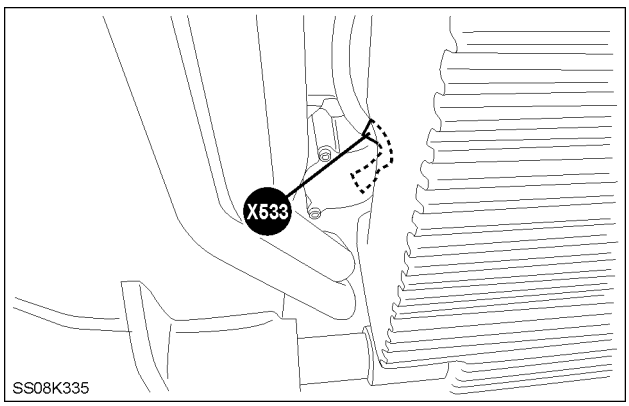
SS08F072 2

RIGHT HAND TOP OF TRANSMISSION

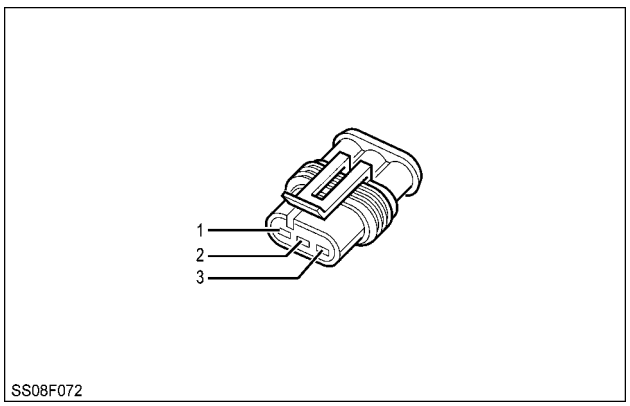
X533 POTENTIOMETER SYNCHRONISER F2 - R1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7584 (R)	PARKLOCK SENSOR SWITCH SIGNAL
2	5020N (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
3	60BP (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K335 3



SS08F072 4

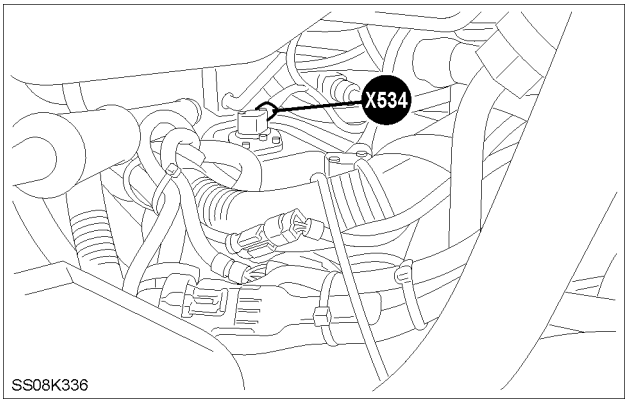
RIGHT HAND UNDER SIDE OF TRANSMISSION

www.truck-freeworkshop.com

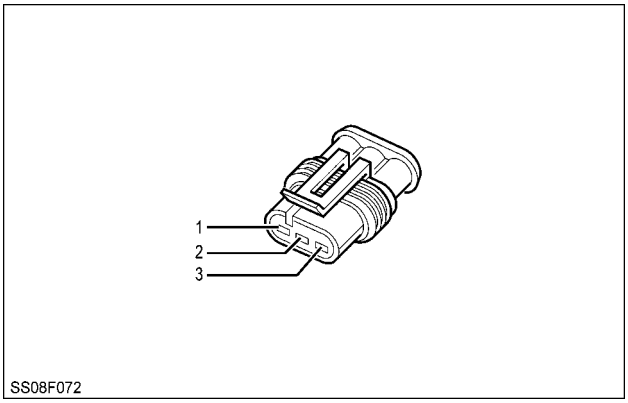
X534 POTENTIOMETER SYNCHRONISER F4 - R2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7970 (L)	TRANS MED/REV
2	5020P (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
3	60BR (B/W)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K336 5



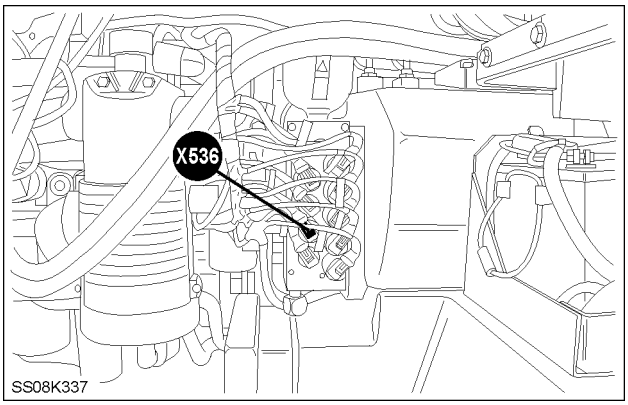
SS08F072 6

RIGHT HAND TOP OF TRANSMISSION

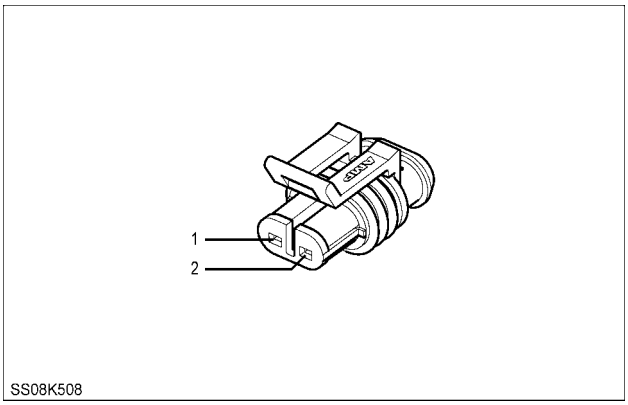
X536 SOLENOID VALVE R1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7220 (S)	TRANSMISSION HIGH RANGE
2	7225 (W)	TRANS HI RANGE SOL - RET

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K337 7



SS08K508 8

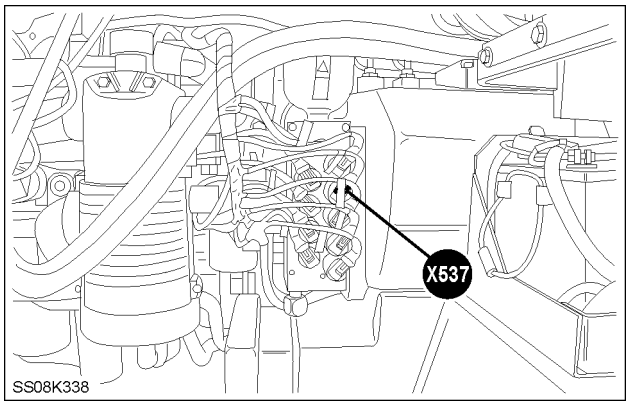
RIGHT HAND TRANSMISSION

www.truck-freeworkshop.com

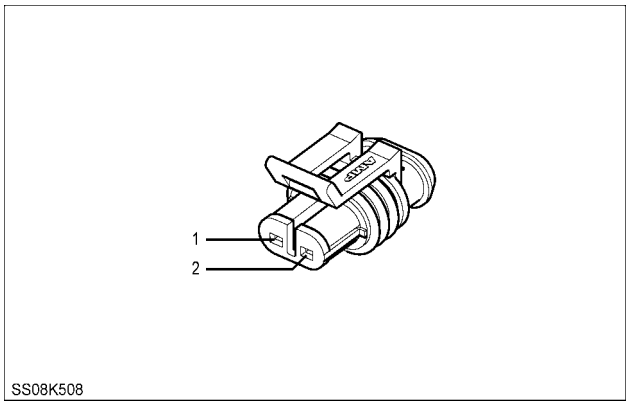
X537 SOLENOID VALVE F1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7920 (TQ)	CLUTCH 'C' SIGNAL
2	7925 (L)	TCM CLUTCH C RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K338 9



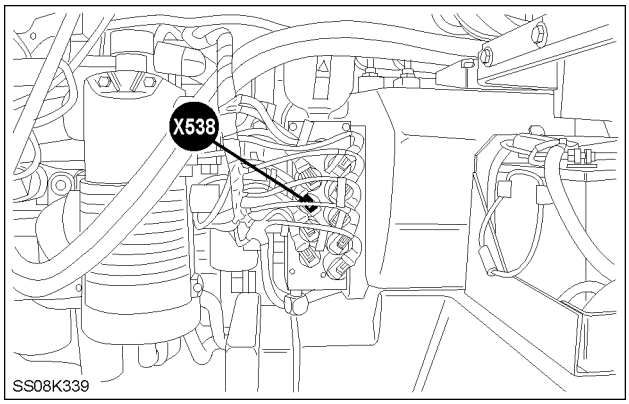
SS08K508 10

RIGHT HAND TRANSMISSION

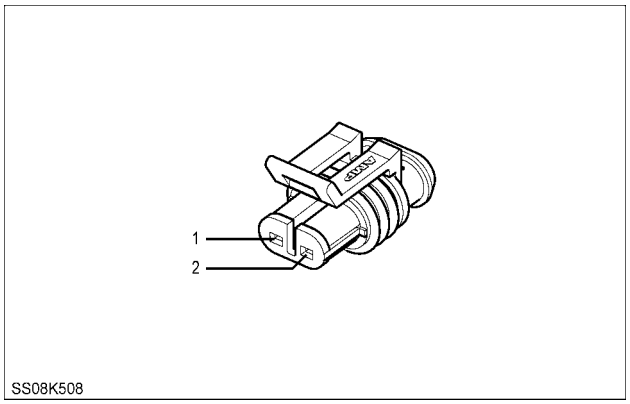
X538 SOLENOID VALVE F3

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7930 (TQ)	CLUTCH 'D' SIGNAL
2	7935 (L)	TCM CLUTCH D RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K339 11



SS08K508 12

RIGHT HAND TRANSMISSION

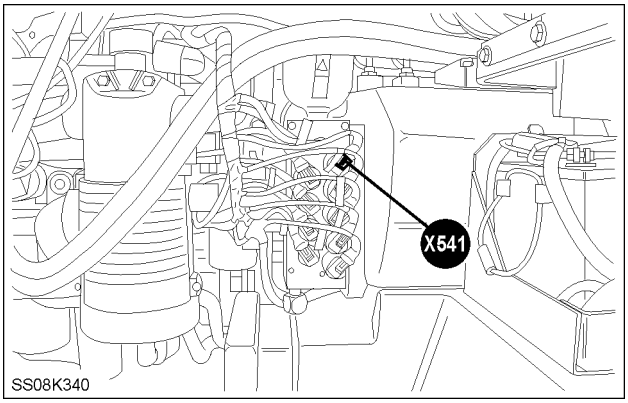
www.truck-freeworkshop.com

Connector - Component diagram 54

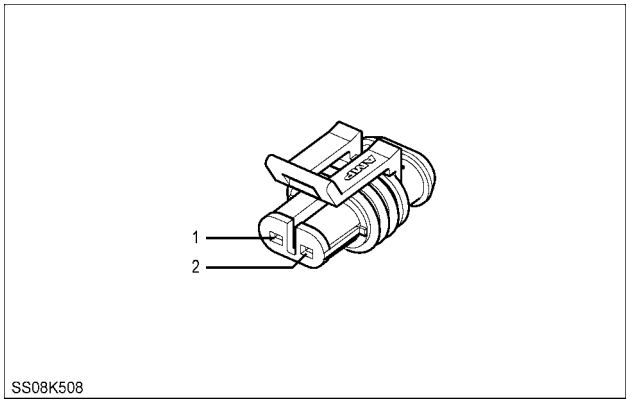
X541 SOLENOID VALVE R2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	9033 (TN)	50KPH SOLENOID+
2	9034 (TN)	50KPH SOLENOID-

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K340 1



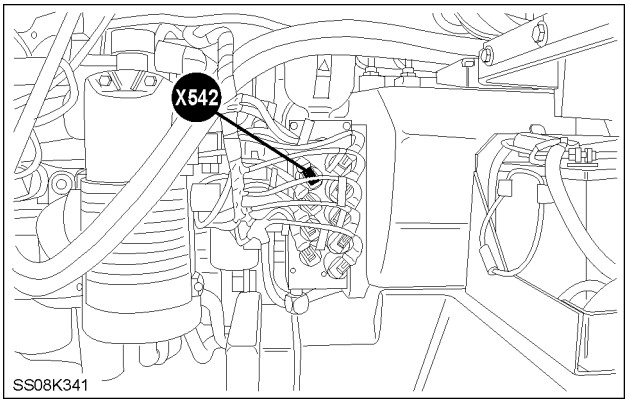
SS08K508 2

RIGHT HAND TRANSMISSION

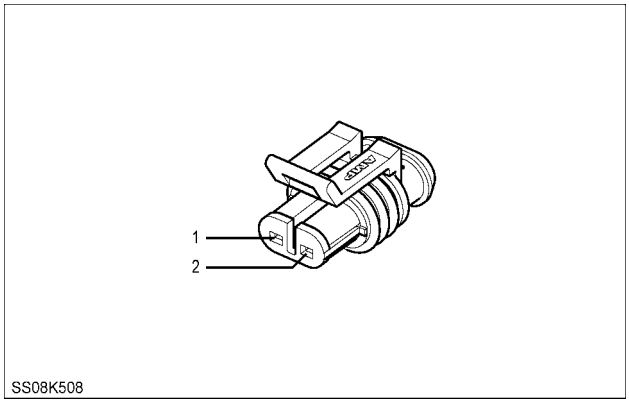
X542 SOLENOID VALVE F4

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7230 (S)	TRANSMISSION LOW RANGE
2	7235 (Y)	TRANS LOW RANGE SOL - RET

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K341 3



SS08K508 4

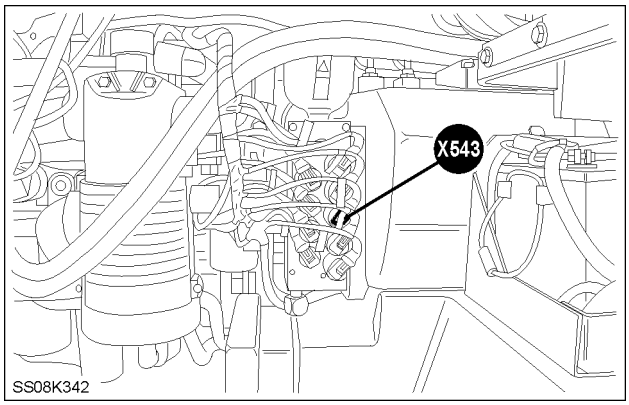
RIGHT HAND TRANSMISSION

www.truck-freeworkshop.com

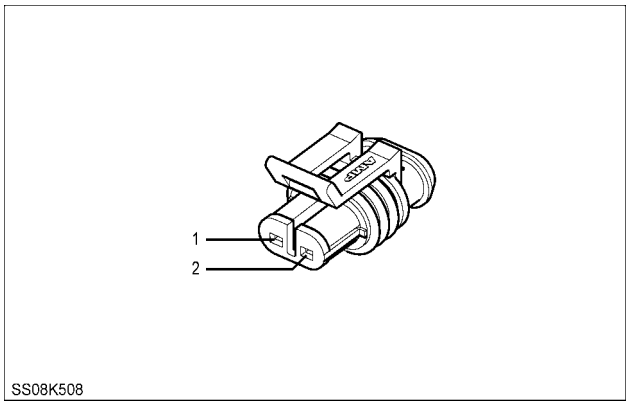
X543 SOLENOID VALVE F2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7940 (TQ)	CLUTCH 'E' SIGNAL
2	7945 (L)	TCM CLUTCH E RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K342 5



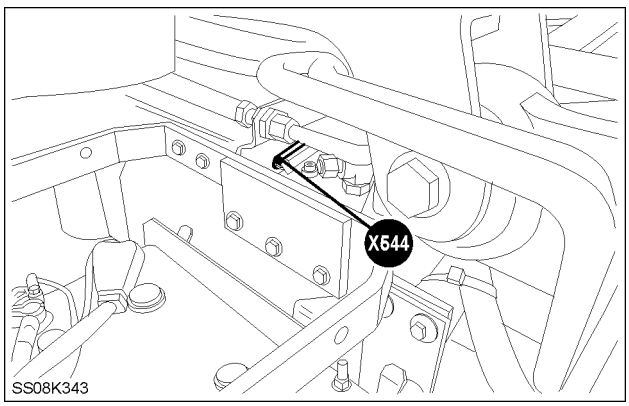
SS08K508 6

RIGHT HAND TRANSMISSION

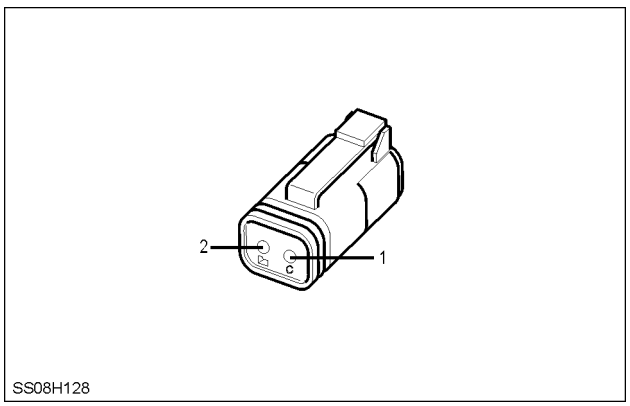
X544 SOLENOID VALVE HYDROSTAT 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7985 (G)	TRANS REVERSE RANGE
2	8045 (L)	TRANS REV SOL RET

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K343 7



SS08H128 8

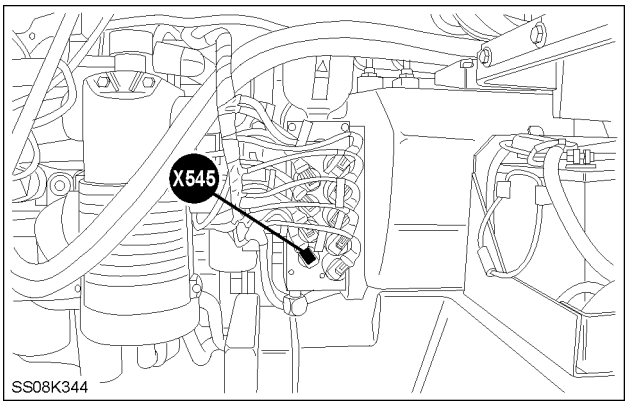
RIGHT HAND BEHIND STEPS

www.truck-freeworkshop.com

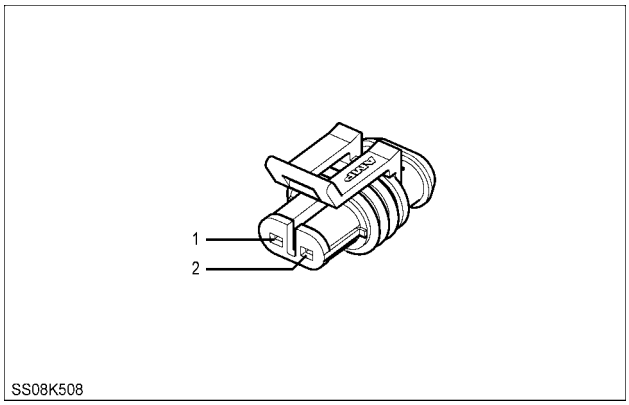
X545 SOLENOID VALVE DUMP

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	9035 (TN)	50KPH DUMP SOLENOID
2	9036 (TN)	50KPH DUMP SOLENOID RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K344 9



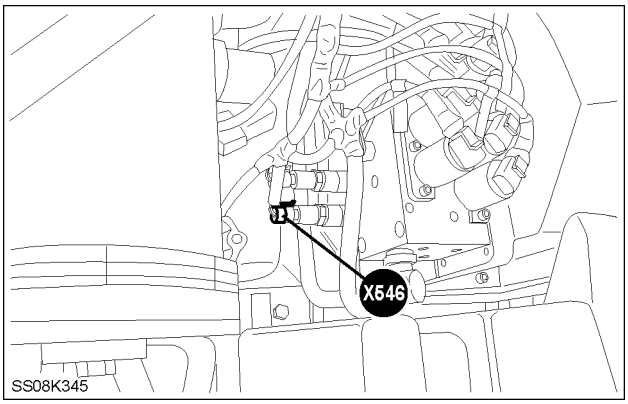
SS08K508 10

RIGHT HAND TRANSMISSION

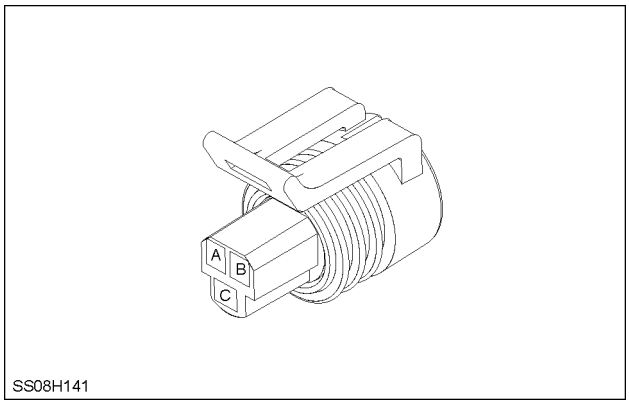
X546 A CLUTCH PRESSURE SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	60BS (B/W)	SENSOR GROUND
B	5020S (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
C	7775 (O)	B CLUTCH PRESSURE SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K345 11



SS08H141 12

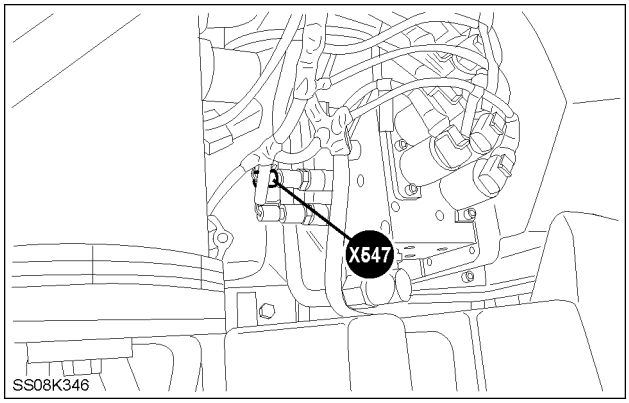
RIGHT HAND TRANSMISSION

www.truck-freeworkshop.com

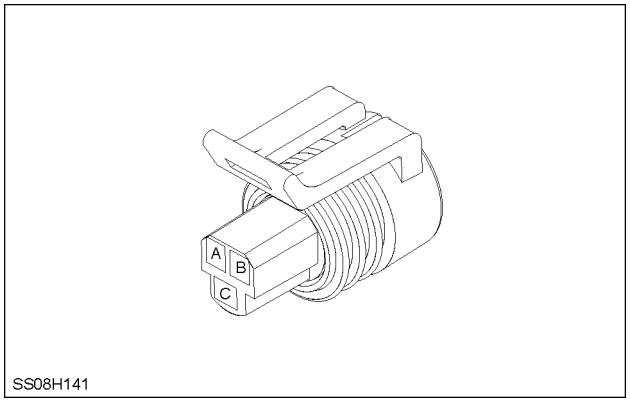
X547 B CLUTCH PRESSURE SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	60BT (B/W)	SENSOR GROUND
B	5020T (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
C	7785 (K)	A CLUTCH PRESSURE SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K346 13



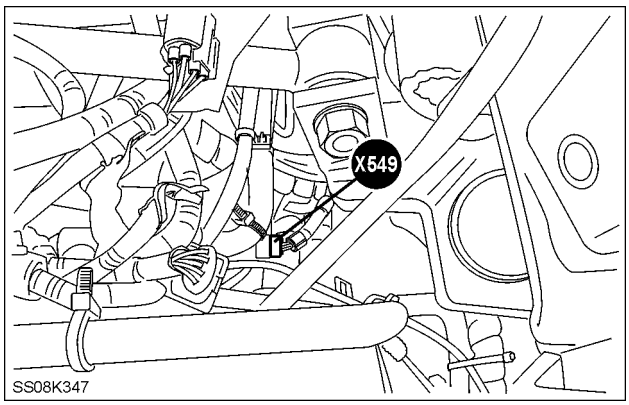
SS08H141 14

RIGHT HAND TRANSMISSION

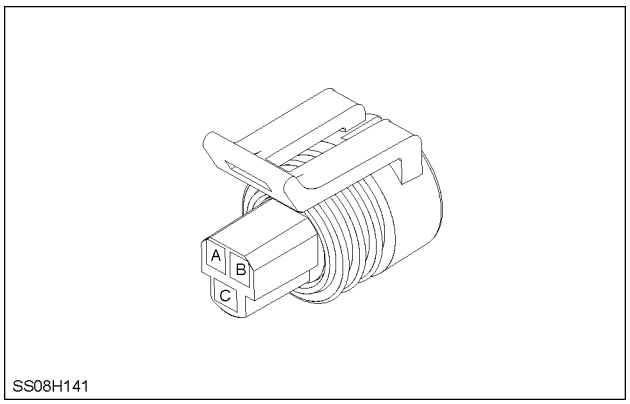
X549 BRAKE PRESSURE SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	60EX (B/W)	SENSOR GROUND
B	5020W (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
C	7589 (U)	BRAKE PRESSURE SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K347 15



SS08H141 16

REAR RIGHT HAND TRANSMISSION

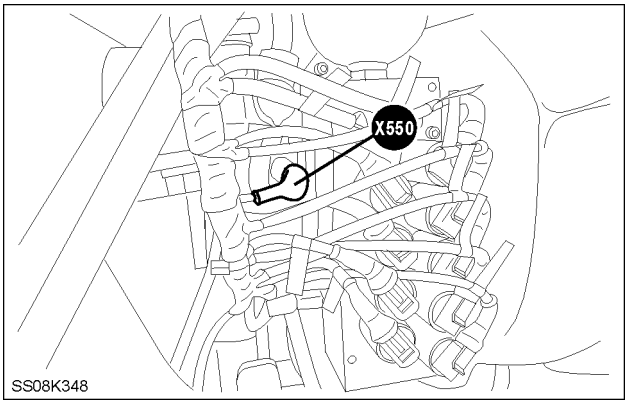
www.truck-freeworkshop.com

Connector - Component diagram 55

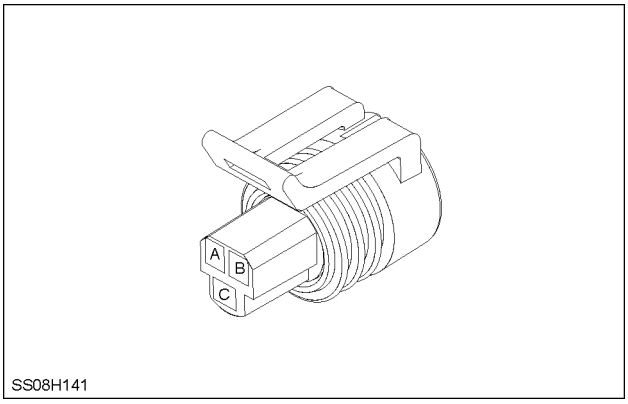
X550 VANE PUMP PRESSURE SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	7155 (U)	VANE PUMP PRESSURE SENSOR SIGNAL
B	2095J (G)	INSTRUMENT SIGNAL GROUND
C	2014B (G)	ENGINE OIL PRESSURE SENDER (+5 VOLT)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K348 1



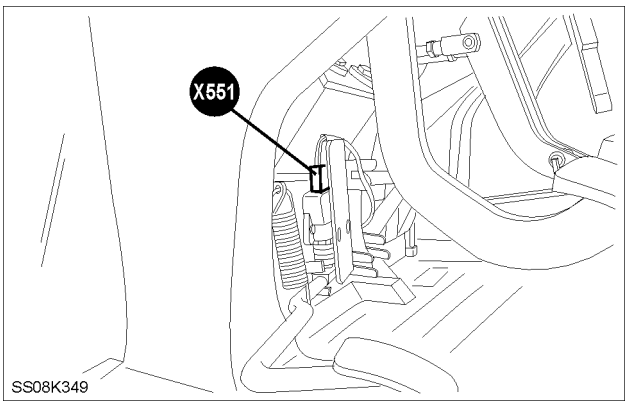
SS08H141 2

RIGHT HAND TRANSMISSION

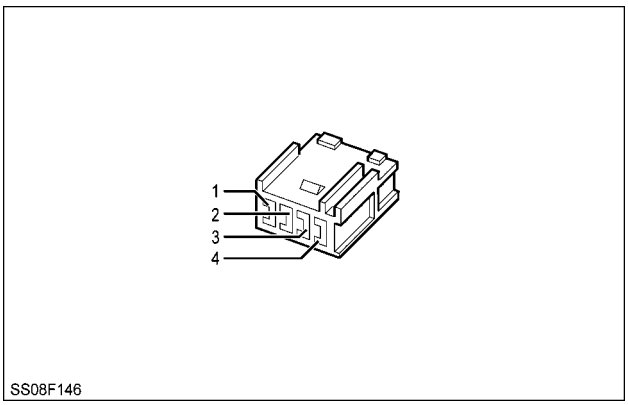
X551 EXHAUST BRAKE SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	10AA (G)	IGNITION SUPPLY
4	2087 (O)	EXHAUST BRAKE SOLENOID

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K349 3



SS08F146 4

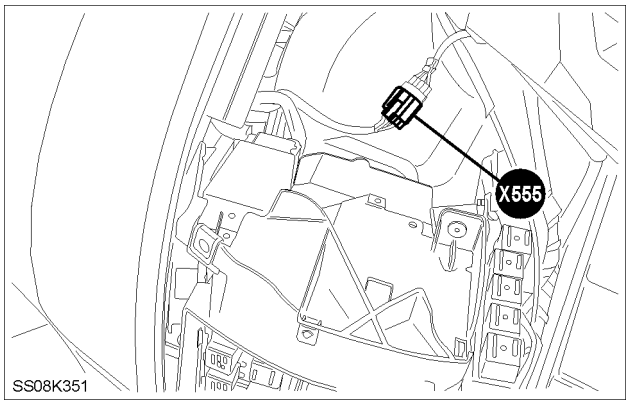
FRONT LEFT HAND CAB FLOOR

www.truck-freeworkshop.com

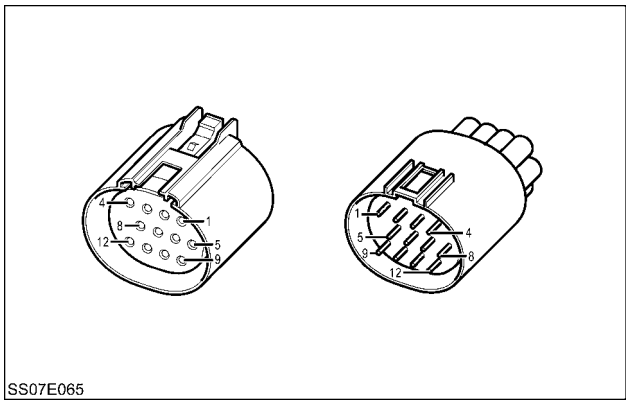
X555 ADDITIONAL ROOF HEADLAMPS

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1013AK (R)	RIGHT HAND LAMPS
2	3000C (G)	FLASHER UNIT SUPPLY (TERMINAL 49)
3	57 GE (B)	EARTH (ALL)
4	1072A (L)	WORKLAMP FRONT RELAY SUPPLY
5	1072B (L)	WORKLAMP FRONT RELAY SUPPLY
6	1099 (R)	FEED FRONT WORKLAMP INNER
7	1027AA (U)	HEADLAMP MAIN BEAM
9	1027B (U)	HEADLAMP MAIN BEAM
10	1030B (U)	HEADLAMP DIP BEAM
11	1027BB (U)	HEADLAMP MAIN BEAM
12	1030BB (U)	HEADLAMP DIP BEAM

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K351 5



SS07E065 6

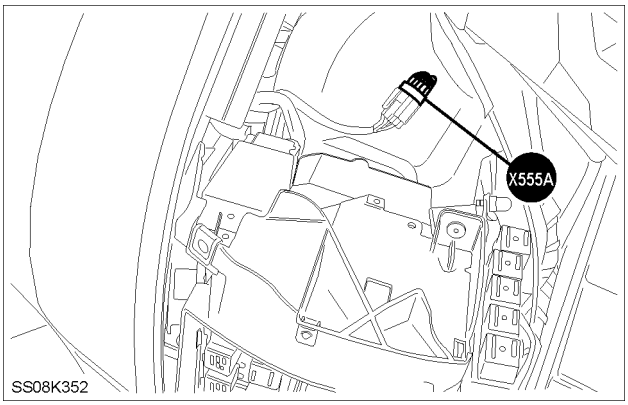
BEHIND RIGHT HAND TRIM TOP THE FUSEBOX

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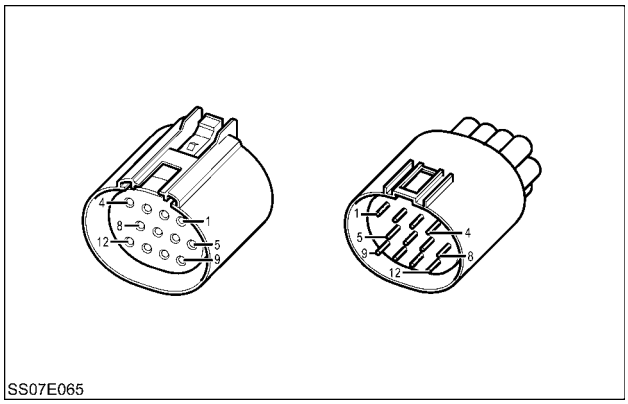
X555A CONNECTOR BRIDGE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
9	1027AB (U)	HEADLAMP MAIN BEAM
10	1027BB (U)	HEADLAMP MAIN BEAM
11	1027AB (U)	HEADLAMP MAIN BEAM
12	1027BB (U)	HEADLAMP MAIN BEAM

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



SS08K352 7



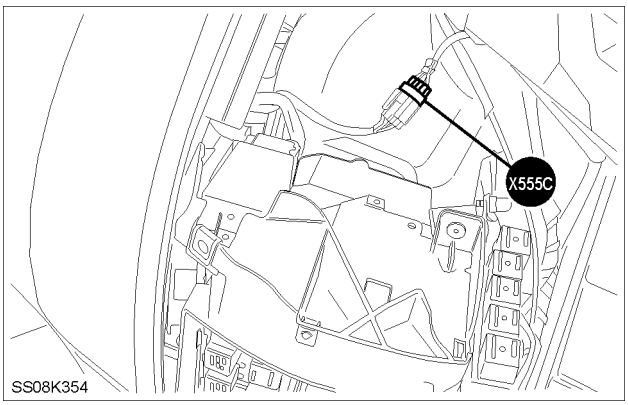
SS07E065 8

BEHIND RIGHT HAND TRIM TOP THE FUSEBOX

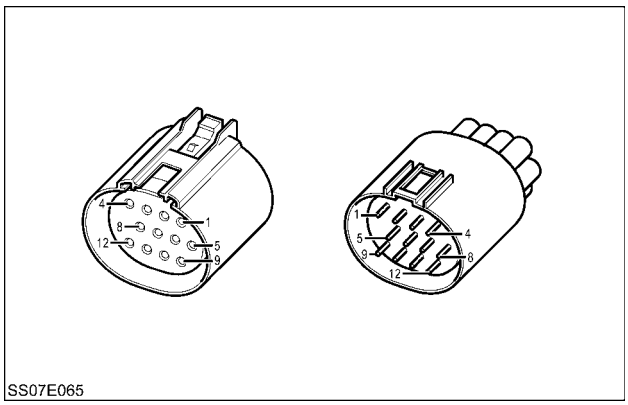
X555C MAIN REAR INTERFACE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
9	1027B (U)	HEADLAMP MAIN BEAM
10	1030B (U)	HEADLAMP DIP BEAM
11	1027BB (U)	HEADLAMP MAIN BEAM
12	1030BB (U)	HEADLAMP DIP BEAM

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



SS08K354 9



SS07E065 10

BEHIND RIGHT HAND TRIM TOP THE FUSEBOX

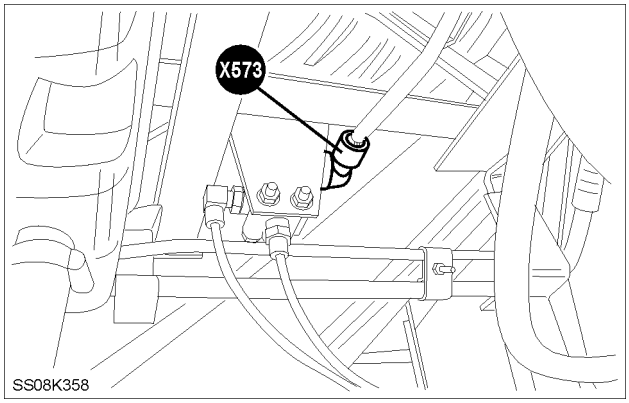
www.truck-freeworkshop.com

Connector - Component diagram 57

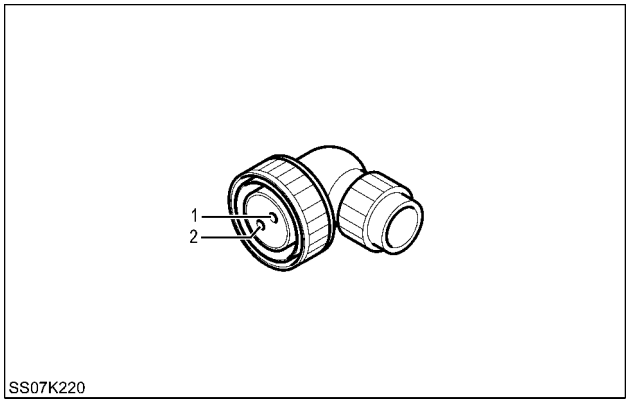
X573 EXHAUST BRAKE SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2087 (O)	EXHAUST BRAKE SOLENOID
2	6408P (G)	FUSED B+ TO ECU (1)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K358 1



SS07K220 2

TOP OF ENGINE

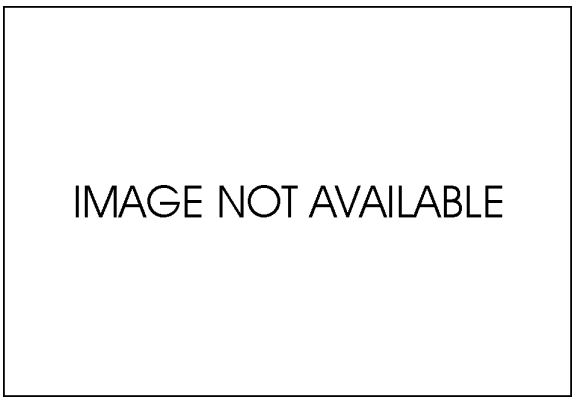
www.truck-freeworkshop.com

Connector - Component diagram 60

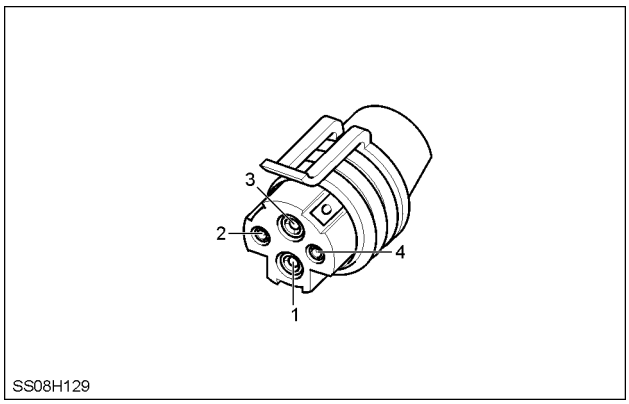
X600 ISO IMPLEMENT SOCKET (FRONT)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57MT (B)	EARTH (ALL)
2	57MV (B)	EARTH (ALL)
3	5975 (O)	ISO RELAY 2 POWER OUT
4	5985 (U)	ISO RELAY 1 POWER OUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 1

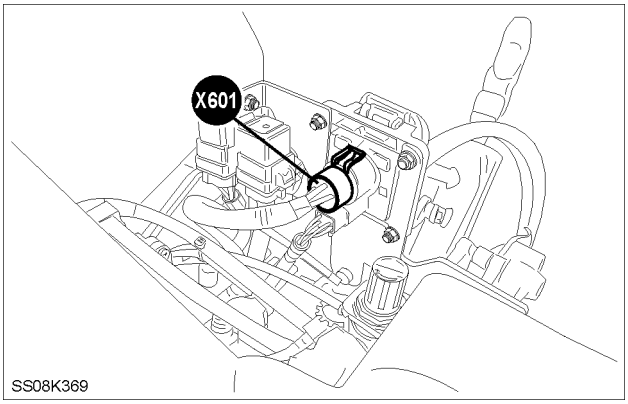


SS08H129 2

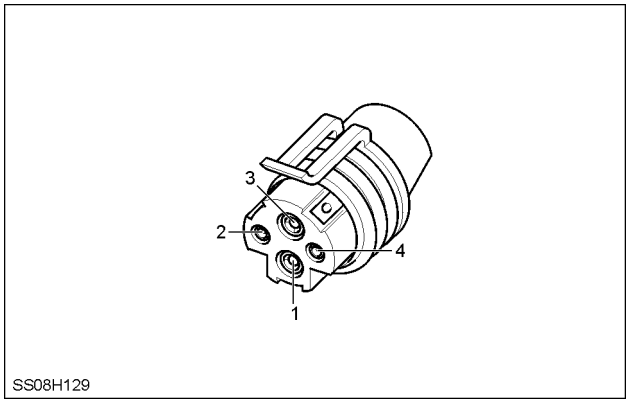
X601 ISO IMPLEMENT SOCKET (REAR)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57MT (B)	EARTH (ALL)
2	57MV (B)	EARTH (ALL)
3	5975 (O)	ISO RELAY 2 POWER OUT
4	5985 (U)	ISO RELAY 1 POWER OUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K369 3



SS08H129 4

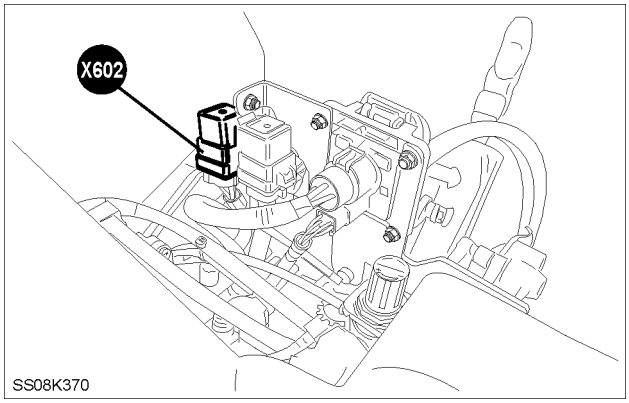
REAR OF TRACTOR

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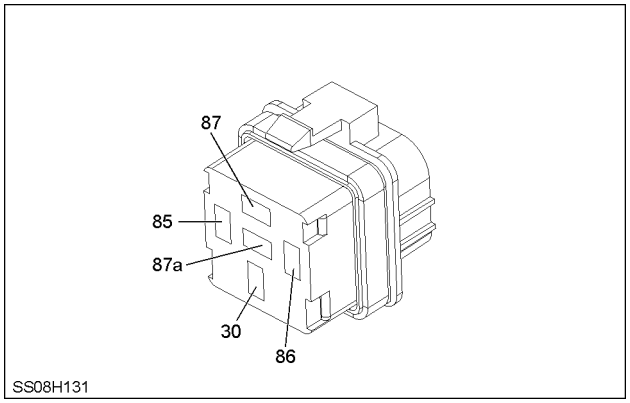
X602 ISO RELAY 1 REAR (K040)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
30	150AW (N)	BATTERY FEED (UNFUSED)(ALL)
85	5980 (U)	ISO BUS IMPLEMENT SIGNAL
86	57MX (B)	EARTH (ALL)
87	5985 (U)	ISO RELAY 1 POWER OUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K370 5



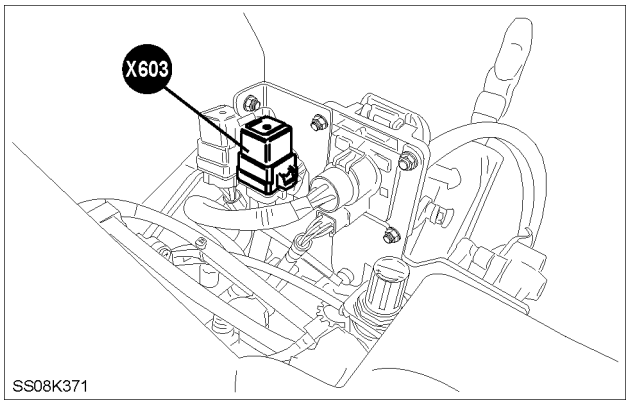
SS08H131 6

REAR OF TRACTOR

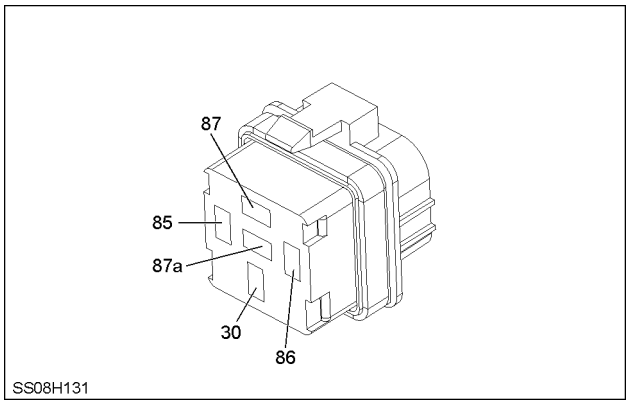
X603 ISO RELAY 2 REAR (K041)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
30	150AX (N)	BATTERY FEED (UNFUSED)(ALL)
85	5970A (O)	ISO BUS ECU SIGNAL
86	57MY (B)	EARTH (ALL)
87	5975 (O)	ISO RELAY 2 POWER OUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K371 7



SS08H131 8

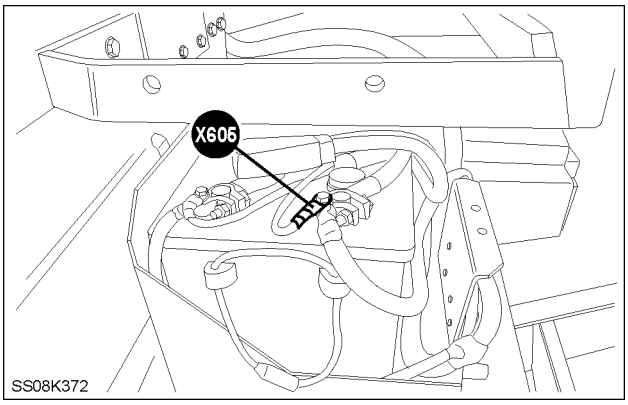
REAR OF TRACTOR

www.truck-freeworkshop.com

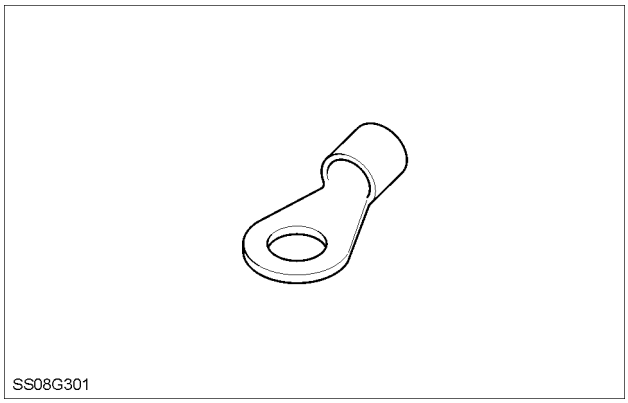
X605 EARTH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57MZ (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K372 9



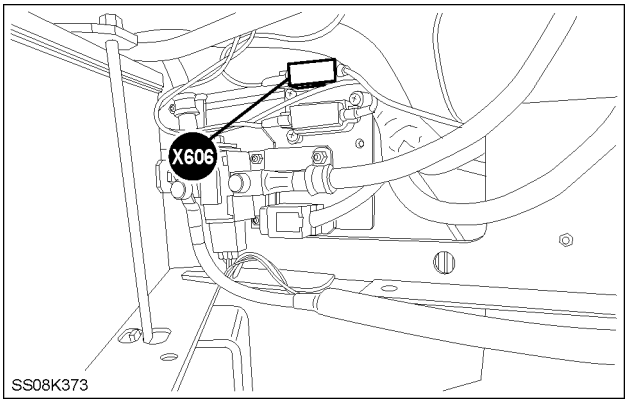
SS08G301 10

RIGHT HAND BEHIND STEPS

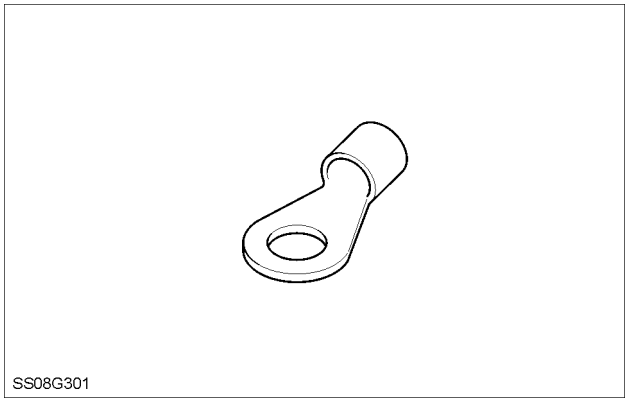
X606 FUSE PF4

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150AT (N)	BATTERY FEED (UNFUSED)(ALL)
1	150AW (N)	BATTERY FEED (UNFUSED)(ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K373 11



SS08G301 12

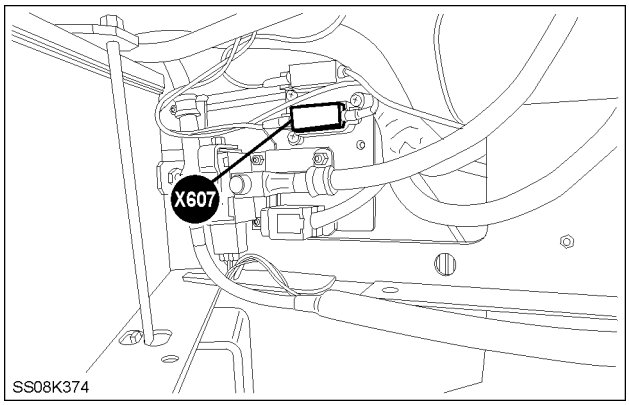
RIGHT HAND BEHIND STEPS

www.truck-freeworkshop.com

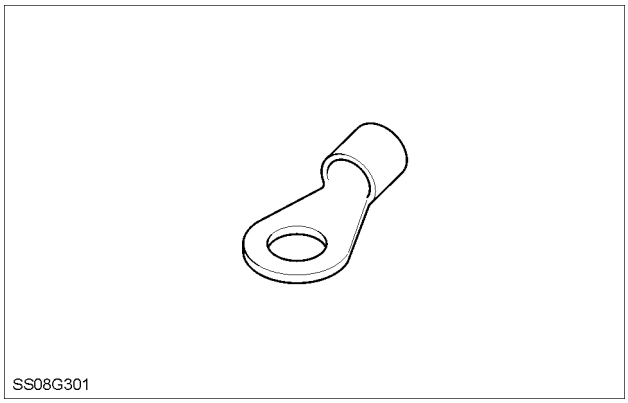
X607 FUSE PF5

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150AX (N)	BATTERY FEED (UNFUSED)(ALL)
1	150AV (N)	BATTERY FEED (UNFUSED)(ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K374 13



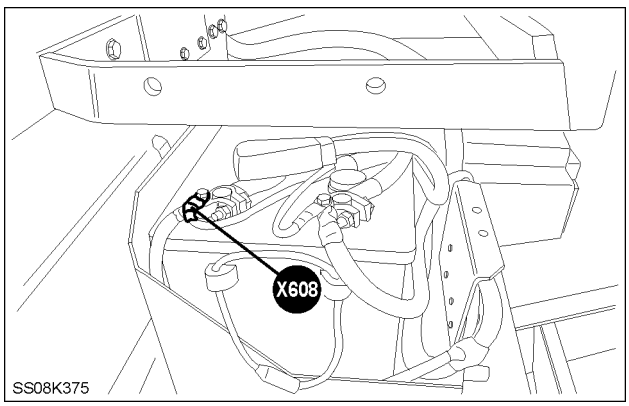
SS08G301 14

RIGHT HAND BEHIND STEPS

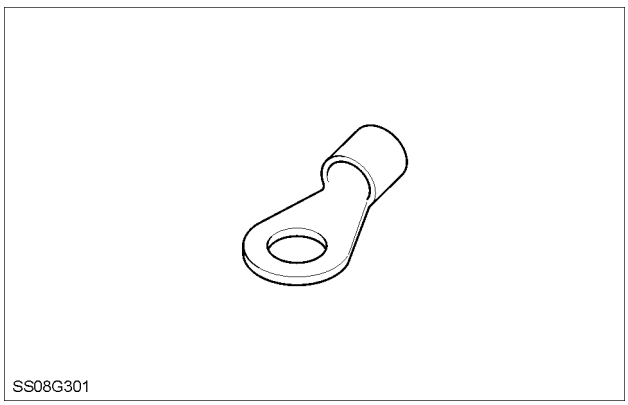
X608 ISO BUS POWER SUPPLY

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150AS (N)	BATTERY FEED (UNFUSED)(ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K375 15



SS08G301 16

RIGHT HAND BEHIND STEPS

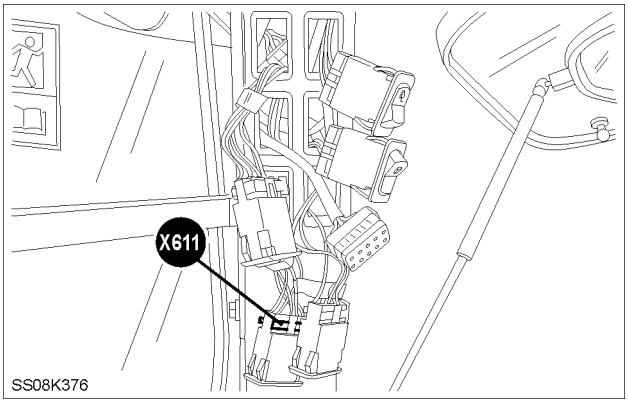
www.truck-freeworkshop.com

Connector - Component diagram 61

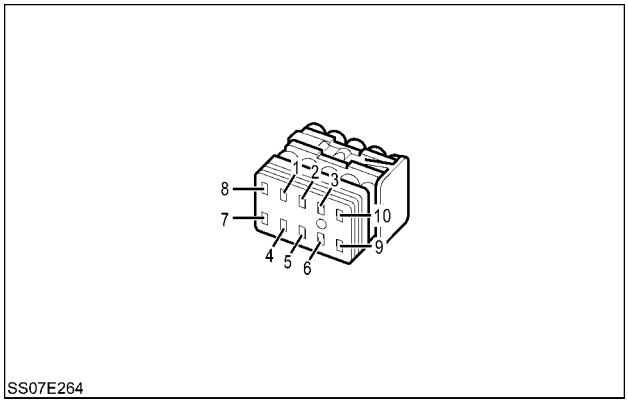
X611 HEATED MIRROR SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	1925A (R)	MIRROR CONTROL +12V
3	1928 (R)	HEATED MIRROR RELAY COIL +12V FROM SW
7	57CY (B)	EARTH (ALL)
8	1927B (R)	MIRROR ILLUMINATION
9	57PW (B)	EARTH (ALL)
10	1012N (R)	ILLUMINATION

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K376 1



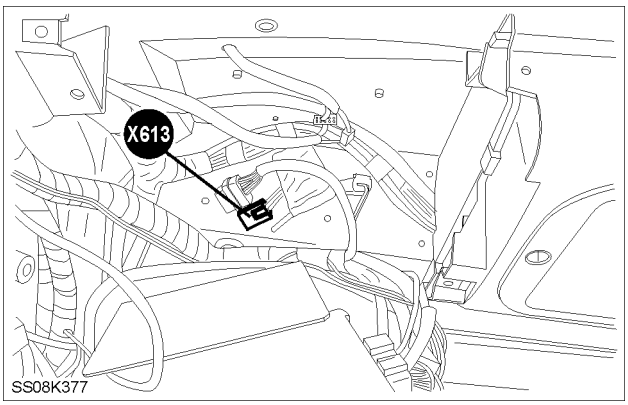
SS07E264 2

REAR RIGHT HAND C-PILLAR

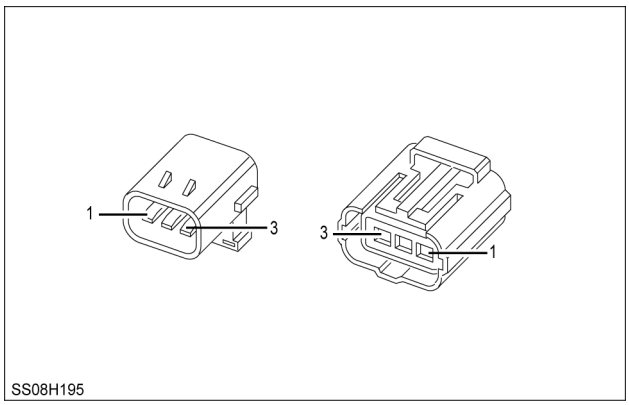
X613 TECU POWER IN / OUT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5980D (U)	ISO BUS IMPLEMENT SIGNAL
2	5970 (O)	ISO BUS ECU SIGNAL
3	7000AR (U)	TRANS CONTROL SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K377 3



SS08H195 4

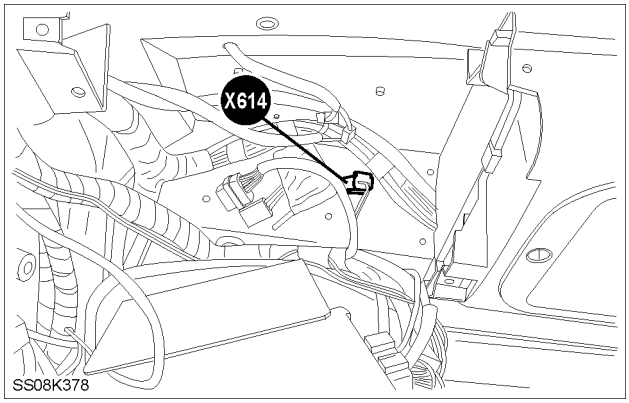
IN CAB RIGHT HAND BEHIND OPERATOR'S SEAT

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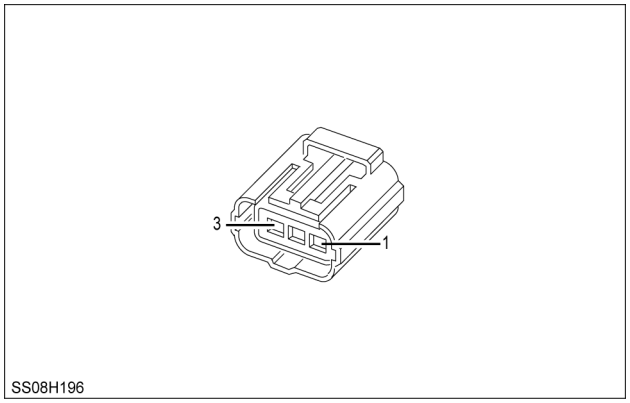
X614 TECU BY - PASS

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5980C (U)	ISO BUS IMPLEMENT SIGNAL
2	5970B (O)	ISO BUS ECU SIGNAL
3	7000AR (U)	TRANS CONTROL SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K378 5



SS08H196 6

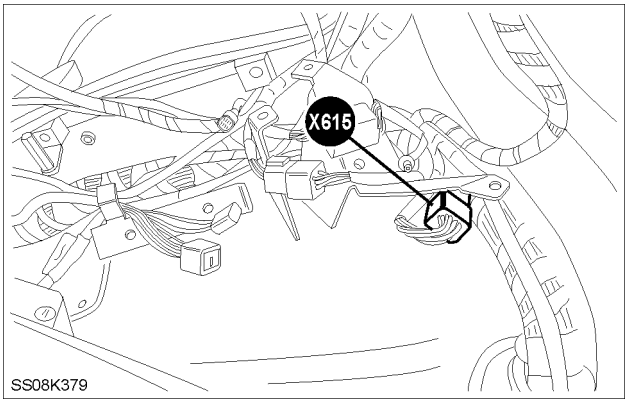
IN CAB RIGHT HAND BEHIND OPERATOR'S SEAT

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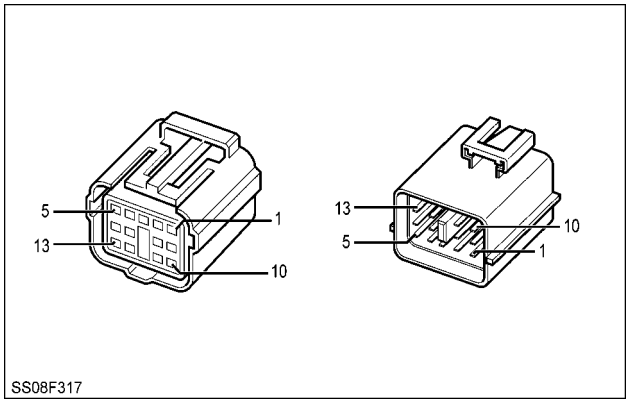
X615 TECU VT / SWCD INPUT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5900A (Y) / 5900G (Y) / 5900C (Y)	ISO BUS CAN SIGNAL LOW
2	5910A (G) / 5910G (G) / 5910C (G)	ISO BUS CAN SIGNAL HIGH
3	5915A (B) / 5915G (R) / 5915C (B)	ISO BUS CAN SUPPLY GROUND
4	5920A (R) / 5920G (B) / 5920C (R)	ISO BUS CAN SUPPLY POSITIVE
5	- / 5960B (O) / 5960B (Y)	RS232 OUTPUT TECU
6	5500B (R) / 5500AB (R) / 5500A (R)	EHR CAN HIGH
7	5510B (U) / 5510AB (U) / 5510A (U)	EHR CAN LOW
8	- / 5000 (L)	EDC MEMORY POWER
9	- / 5955 (O) / 5955 (Y)	RS232 INPUT TECU
11	- / 7000AS (U) / 7000AT (U)	TRANS CONTROL SUPPLY
12	- / 1012J (R)	ILLUMINATION
13	- / 57SW (B) / 57A (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K379 7



SS08F317 8

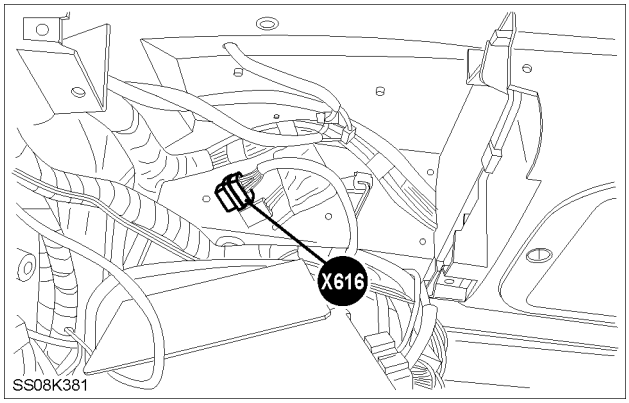
BEHIND RIGHT HAND TRIM

www.truck-freeworkshop.com

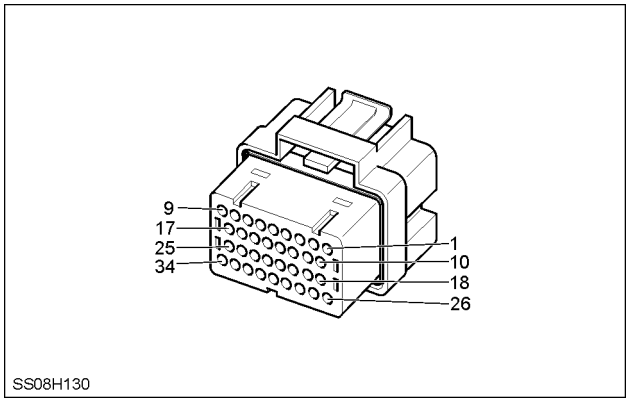
X616 TECU UNIT CN1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5900D (Y)	ISO BUS CAN SIGNAL LOW
2	5910D (G)	ISO BUS CAN SIGNAL HIGH
4	5400P (Y)	CAN H
5	5420P (G)	CAN L
10	5000C (L)	EDC MEMORY POWER
11	57TA (B)	EARTH (ALL)
14	5980D (U)	ISO BUS IMPLEMENT SIGNAL
15	5970 (O)	ISO BUS ECU SIGNAL
16	7000AR (U)	TRANS CONTROL SUPPLY
21	61T (B/O)	CASE GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K381 9

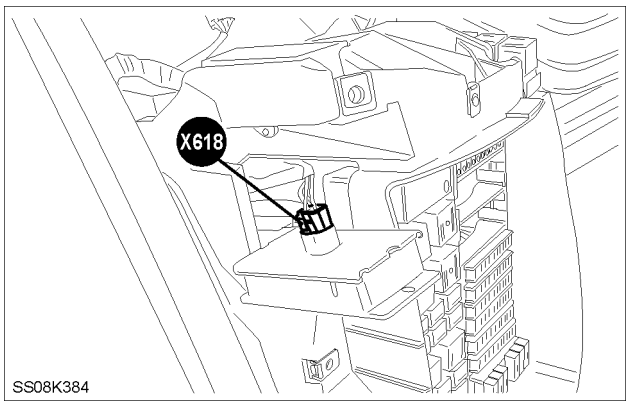


SS08H130 10

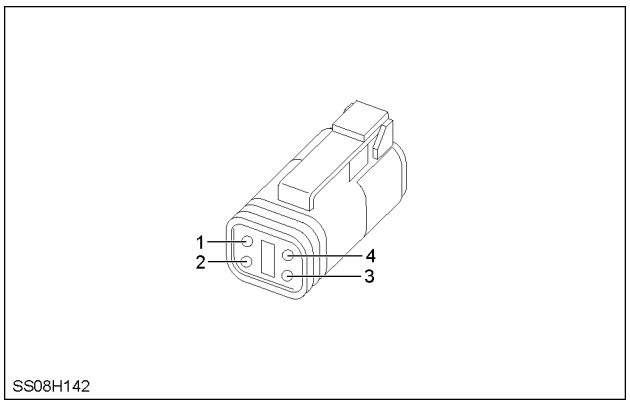
IN CAB RIGHT HAND BEHIND OPERATOR'S SEAT

X618 ISO BUS CAN TERMINATOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5920E (R	ISO BUS CAN SUPPLY POSITIVE
2	5900E (Y)	ISO BUS CAN SIGNAL LOW
3	5915E (B)	ISO BUS CAN SUPPLY GROUND
4	5910E (G)	ISO BUS CAN SIGNAL HIGH



SS08K384 11



SS08H142 12

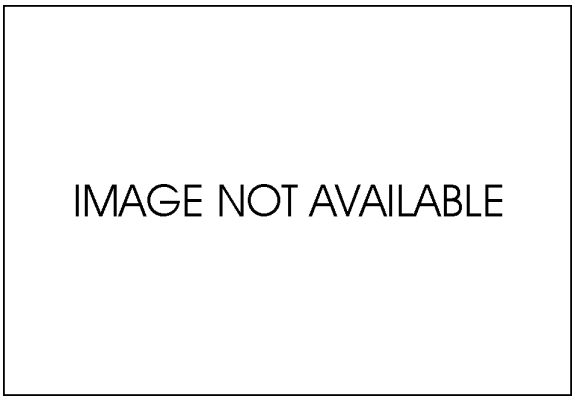
BEHIND RIGHT HAND TRIM TOP THE FUSEBOX

www.truck-freeworkshop.com

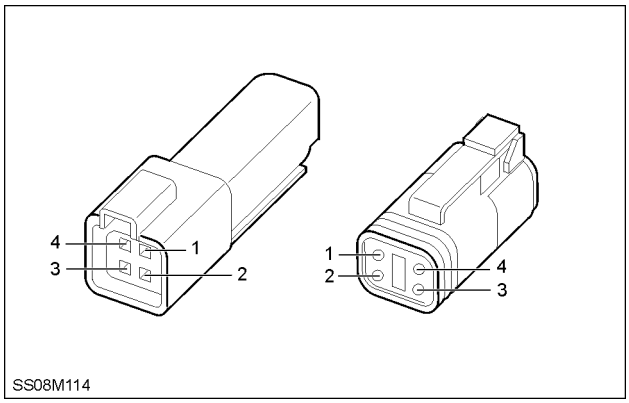
X618 ISO BUS CAN EXTENSION

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5920E (R)	ISO BUS CAN SUPPLY POSITIVE
2	5900E (Y)	ISO BUS CAN SIGNAL LOW
3	5915E (B)	ISO BUS CAN SUPPLY GROUND
4	5910E (G)	ISO BUS CAN SIGNAL HIGH

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 13



SS08M114 14

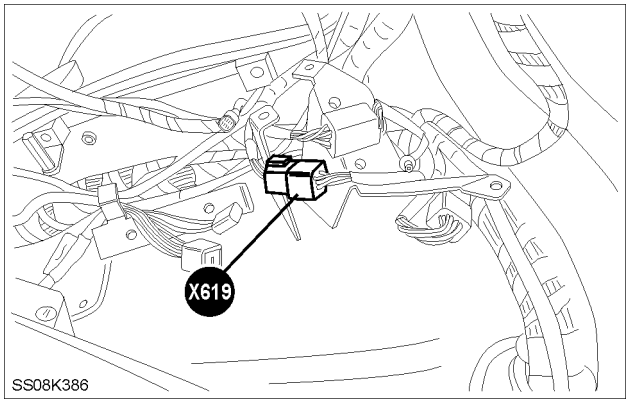
BEHIND RIGHT HAND TRIM TOP THE FUSEBOX

www.truck-freeworkshop.com

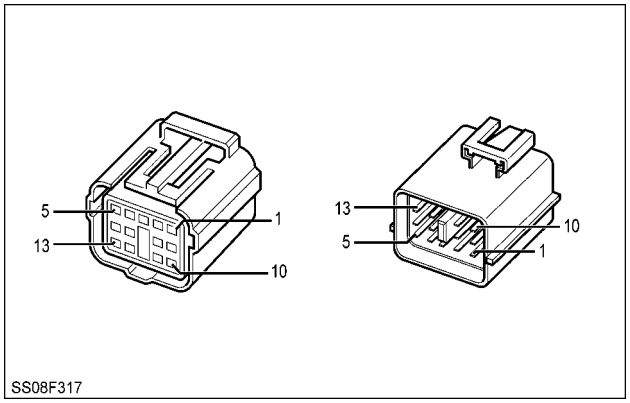
X619 TECU VT / SWCD OUTPUT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5900 (Y) / 5900G (Y)	ISO BUS CAN SIGNAL LOW
2	5910 (G) /5910G (G)	ISO BUS CAN SIGNAL HIGH
3	5920 (R) / 5915G (R) / 5915G (B)	ISO BUS CAN SUPPLY GROUND
4	5915 (B) / 5920G (B) / 5920G (R)	ISO BUS CAN SUPPLY POSITIVE
5	- / 5960B (O) / 5960C (Y)	RS232 OUTPUT TECU
6	5500W (R) / 5500M (R) / 5500K (R)	EHR CAN HIGH
7	5510W (U) / 5510M (U) / 5510K (U)	EHR CAN LOW
8	5000DE (L) / 5000 (L)	EDC MEMORY POWER
9	5955 (O) / -	RS232 INPUT TECU
11	7000R (U) / 7000AS (U) / 7000AT (U)	TRANS CONTROL SUPPLY
12	1012J (R)	ILLUMINATION
13	57SW (B) / 57G (B)	EARTH /(ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K386 15



SS08F317 16

BEHIND RIGHT HAND TRIM

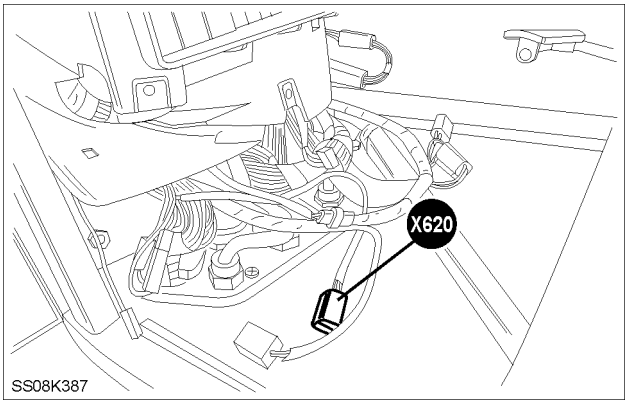
www.truck-freeworkshop.com

Connector - Component diagram 62

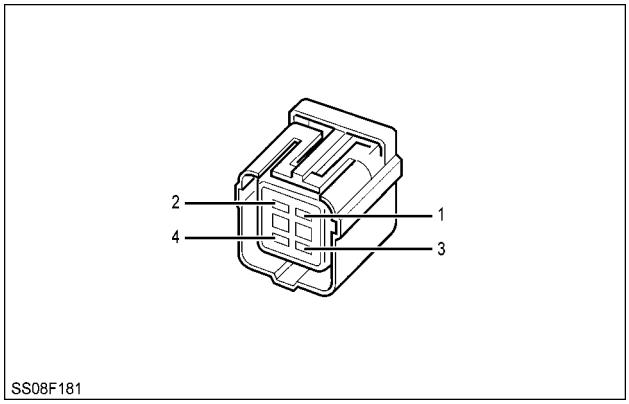
X620 FRONT BREAK AWAY (OPTION)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5980B (U) / 5980 (U)	ISO BUS IMPLEMENT SIGNAL
2	5970C (O) / 5970A (O)	ISO BUS ECU SIGNAL
3	2250P (K) / -	PTO FRONT - SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K387 1



SS08F181 2

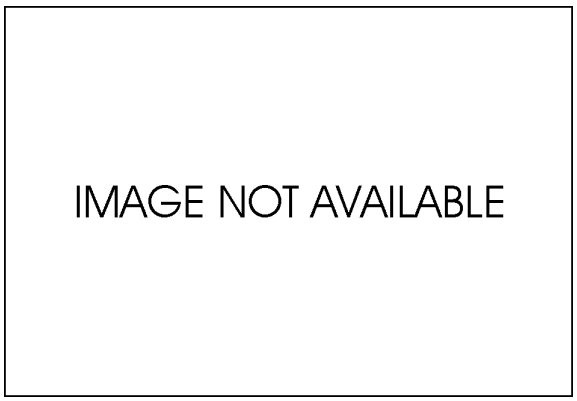
FRONT RIGHT HAND CAB FLOOR

www.truck-freeworkshop.com

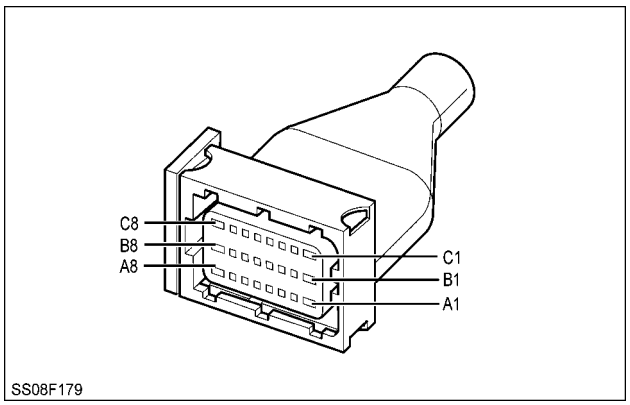
X621 CONTROL UNIT FAST STEER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A1	3170 (O)	FSS – ENABLE
A2	3173 (R)	FSS – HYDRAULIC VALVE HIGH SIDE DRIVER
A4	5400 (Y)	CAN H
A5	5420 (G)	CAN L
A6	3174 (G)	FSS – HYDRAULIC VALVE LOW SIDE DRIVER
A7	57C (B)	EARTH (ALL)
A8	57B (B)	EARTH (ALL)
B1	3171 (O)	FSS – LAMP
B4	3172 (L)	FSS – STEERING PROXIMITY SENSOR POSITION
B5	3178 (G/Y)	FSS – POSITION SENSOR SECONDARY POSITIVE
B6	3179 (N)	FSS – POSITION SENSOR SECONDARY NEGATIVE
B8	160 (U)	BATTERY SUPPLY ELECTRONICS
C1	3175 (W)	FSS – POSITION SENSOR PRIMARY POSITIVE
C2	3176 (B)	FSS – POSITION SENSOR PRIMARY NEGATIVE
C3	3177 (U)	FSS – POSITION SENSOR SECONDARY COMMON
C4	3180 (B)	FSS – SAFETY SWITCH
C8	10D (G)	IGNITION SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 3



SS08F179 4

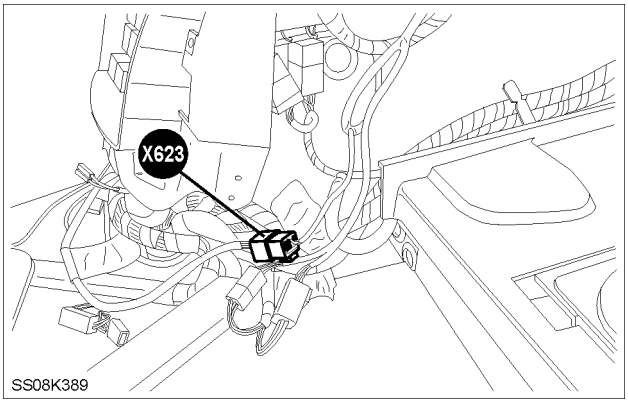
BEHIND RIGHT HAND TRIM TOP THE FUSEBOX

www.truck-freeworkshop.com

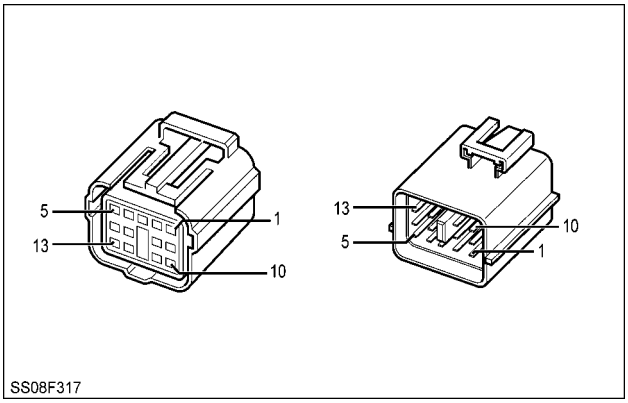
X623 FAST STEER CONNECTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5000D (L)	EDC MEMORY POWER
2	5200AB (N) / 5200AB (N)	EDC VALVE SUPPLY
3	57HV (B) / 57A (B)	EARTH (ALL)
4	5400V (Y) / 5400 (Y)	CAN H
5	5420 (G)	CAN L
6	1001AC (W)	STARTER SOLENOID FEED
12	- / 3169 (O)	AUTO GUIDANCE DUMP SOLENOID RETURN (CURSEN)
13	- / 3168 (O)	AUTO GUIDANCE DUMP SOLENOID FEED (HSD)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K389 5



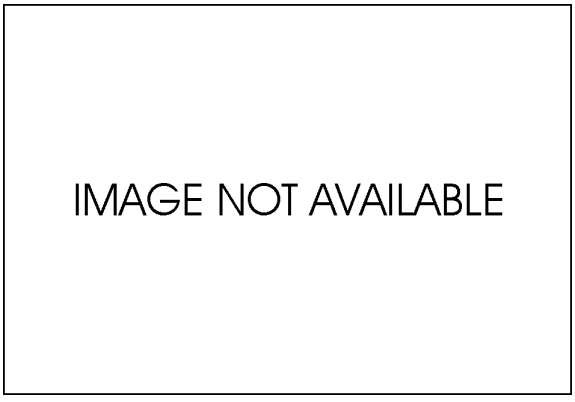
SS08F317 6

FRONT RIGHT HAND CAB FLOOR

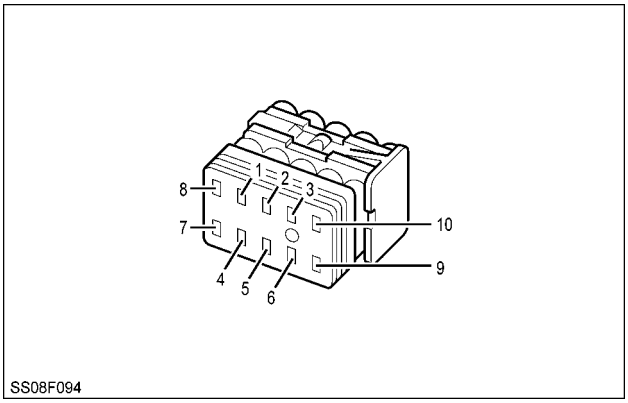
X624 FAST STEER CONTROL SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	10B (G)	IGNITION SUPPLY
3	3170 (O)	FSS – ENABLE
4	3180 (B)	FSS – SAFETY SWITCH
5	57 (B)	EARTH (ALL)
7	3171 (O)	FSS – LAMP
8	10E (G)	IGNITION SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 7



SS08F094 8

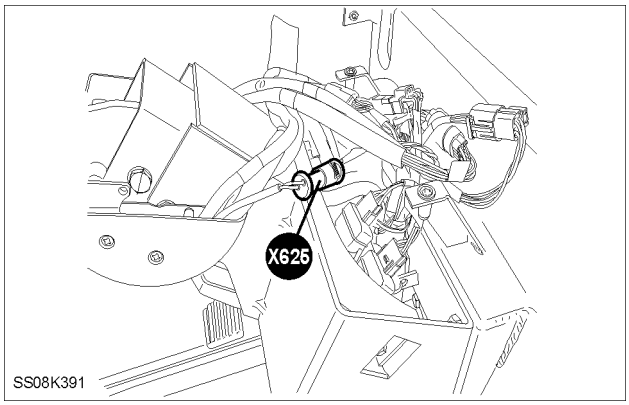
REAR RIGHT HAND C-PILLAR

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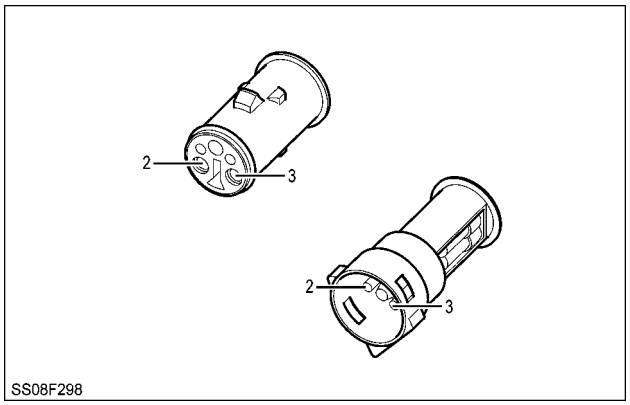
X625 PROXIMITY SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	3172 (L)	FSS – STEERING PROXIMITY SENSOR POSITION
3	10C (G)	IGNITION SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K391 9



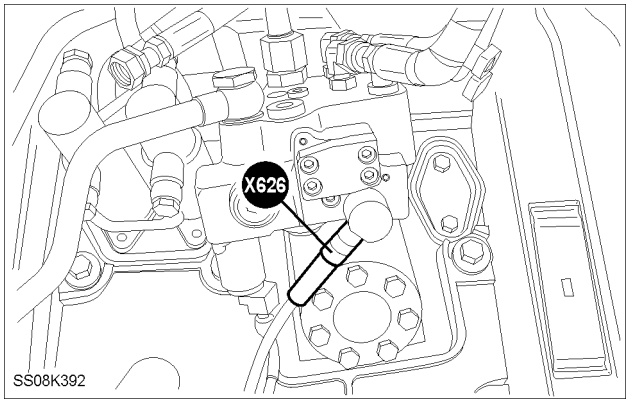
SS08F298 10

STEERING CONSOLE

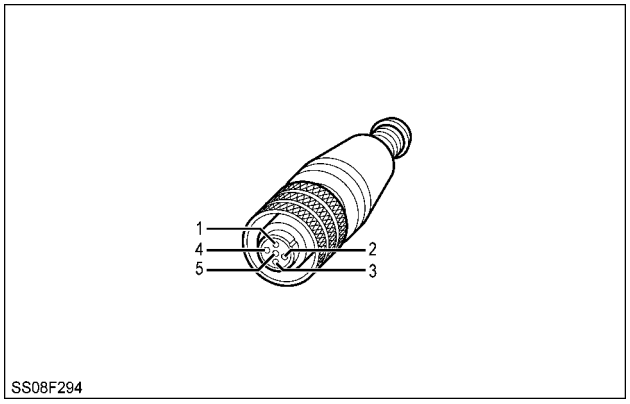
X626 POSITION TRANSDUCER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3179 (N)	FSS – POSITION SENSOR SECONDARY NEGATIVE
2	3175 (W)	FSS – POSITION SENSOR PRIMARY POSITIVE
3	3177 (U)	FSS – POSITION SENSOR SECONDARY COMMON
4	3176 (B)	FSS – POSITION SENSOR PRIMARY NEGATIVE
5	3178 (G/Y)	FSS – POSITION SENSOR SECONDARY POSITIVE

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K392 11



SS08F294 12

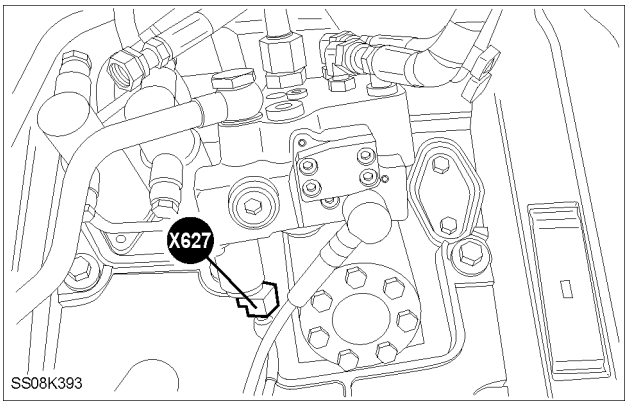
REAR OF ENGINE

www.truck-freeworkshop.com

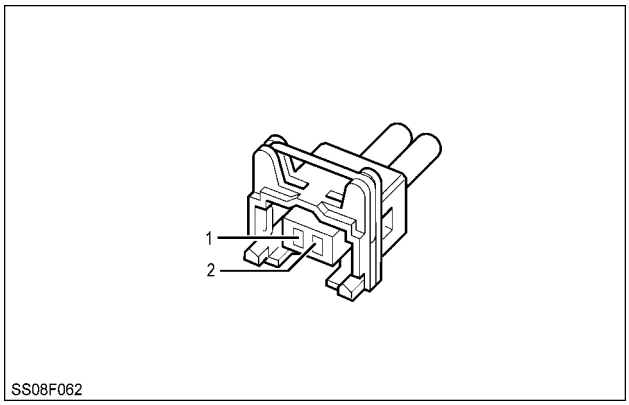
X627 FAST STEER SOLENOID VALVE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3173 (R)	FSS – HYDRAULIC VALVE HIGH SIDE DRIVER
2	3174 (G)	FSS – HYDRAULIC VALVE LOW SIDE DRIVER

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K393 13



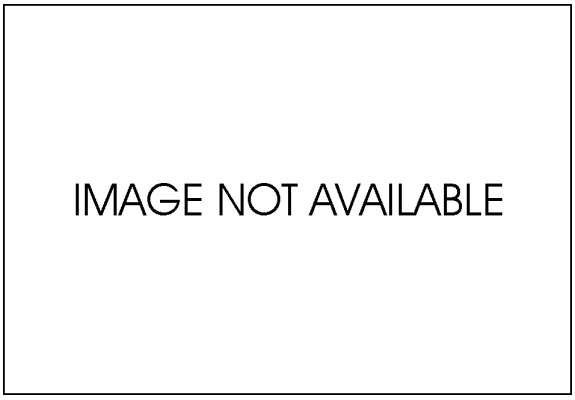
SS08F062 14

REAR OF ENGINE

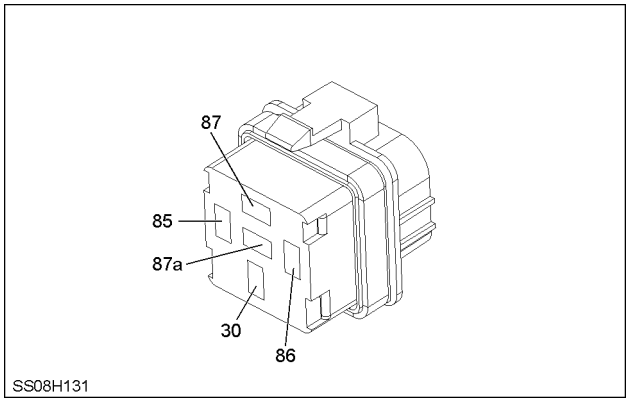
X628 ISO RELAY 2 FRONT (K043)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
30	150AX (N)	BATTERY FEED (UNFUSED)(ALL)
85	5970A (O)	ISO BUS ECU SIGNAL
86	57MY (B)	EARTH (ALL)
87	5975 (O)	ISO RELAY 2 POWER OUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 15



SS08H131 16

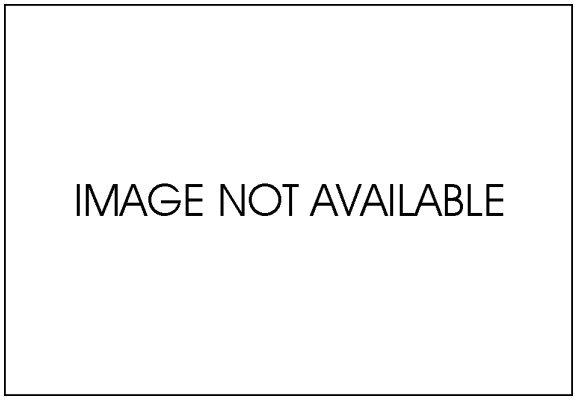
LEFT HAND ENGINE

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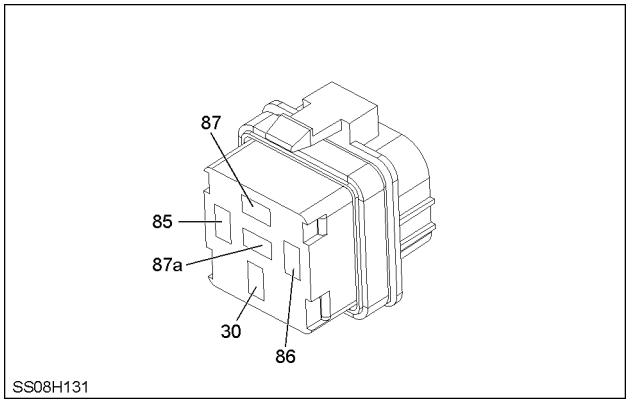
X629 ISO RELAY 1 FRONT (K042)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
30	150AW (N)	BATTERY FEED (UNFUSED)(ALL)
85	5980 (U)	ISO BUS IMPLEMENT SIGNAL
86	57MX (B)	EARTH (ALL)
87	5985 (U)	ISO RELAY 1 POWER OUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 17



SS08H131 18

LEFT HAND ENGINE

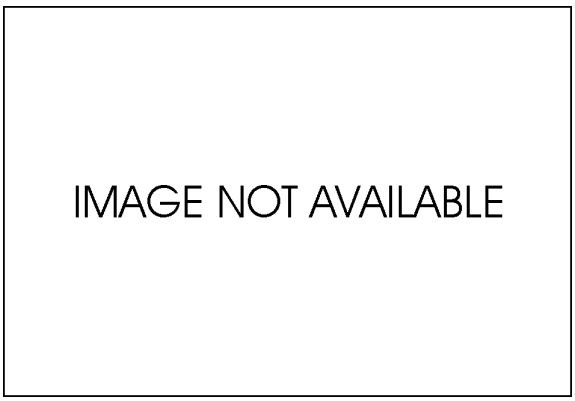
www.truck-freeworkshop.com

Connector - Component diagram 63

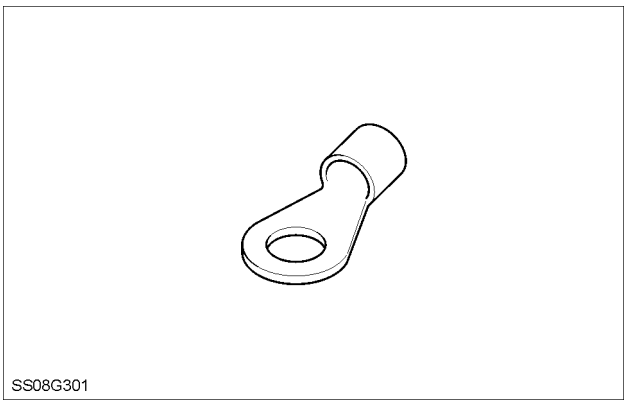
X630 EARTH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57MZ (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 1



SS08G301 2

RIGHT HAND BEHIND STEPS

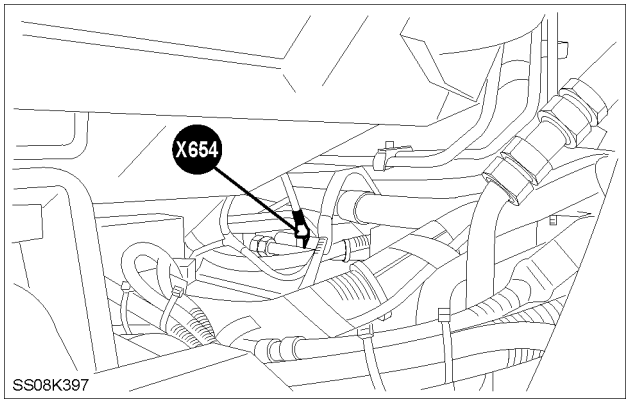
www.truck-freeworkshop.com

Connector - Component diagram 65

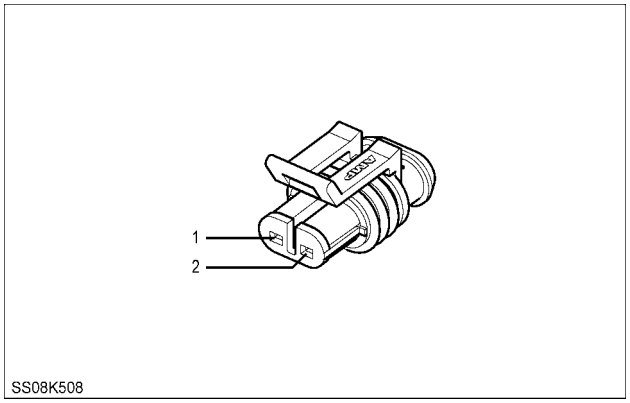
X654 BRAKE LUBRICATION CONTROL SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7586 (U)	PARKLOCK SOLENOID
2	57EE (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K397 1



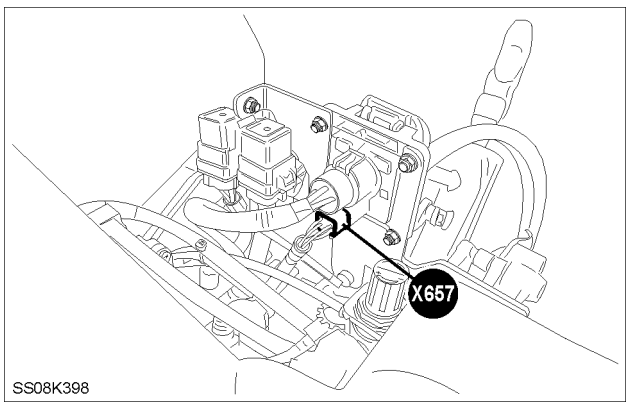
SS08K508 2

REAR LEFT HAND AXLE

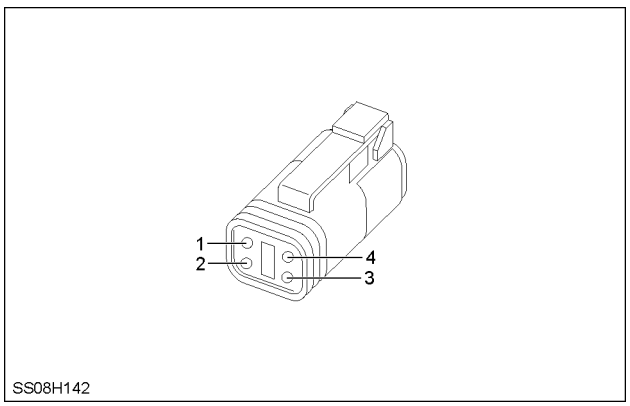
X657 ISO BUS IMPLEMENT SOCKET (REAR)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5920B (R)	ISO BUS CAN SUPPLY POSITIVE
2	5900B (Y)	ISO BUS CAN SIGNAL LOW
3	5915B (B)	ISO BUS CAN SUPPLY GROUND
4	5910B (G)	ISO BUS CAN SIGNAL HIGH

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K398 3



SS08H142 4

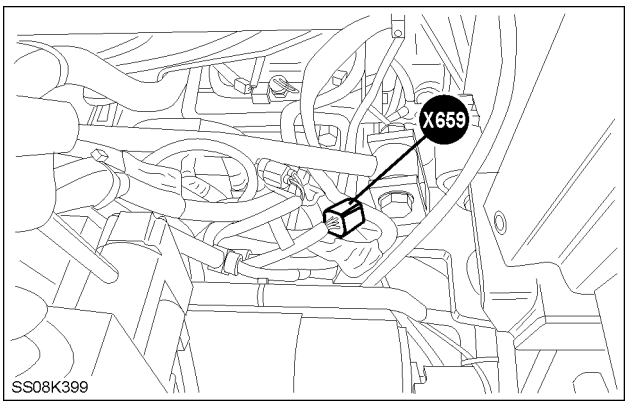
REAR OF TRACTOR TOP OF TRANSMISSION

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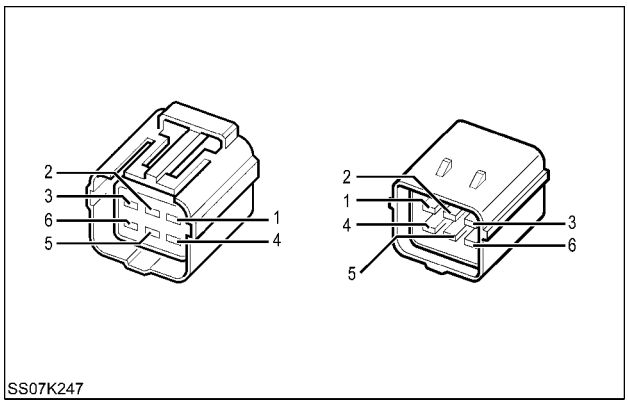
X659 LINK LEVEL (EXTERNAL CONNECTION)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57EY (B)	EARTH (ALL)
2	4055 (W)	LINK LEVEL TOP LINK EXTEND SOLENOID
3	4056 (W)	LINK LEVEL TOP LINK RETRACT SOLENOID
4	4057 (W)	LINK LEVEL RIGHT LINK RAISE SOLENOID
5	4058 (W)	LINK LEVEL RIGHT LINK LOWER SOLENOID
6	4054 (W)	LINK LEVEL DUMP SOLENOID

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K399 5



SS07K247 6

REAR OF TRACTOR UNDERNEATH CAB

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Connector - Component diagram 66

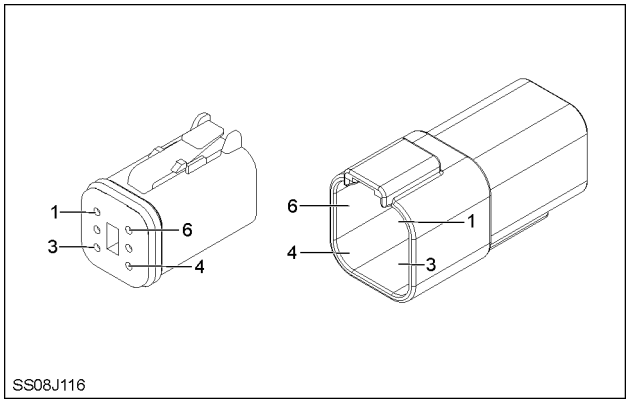
X660 ISO IMPLEMENT CONNECTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5920B (R)	ISO BUS CAN SUPPLY POSITIVE
2	5900B (Y)	ISO BUS CAN SIGNAL LOW
3	5915B (B)	ISO BUS CAN SUPPLY GROUND
4	5910B (G)	ISO BUS CAN SIGNAL HIGH
5	5970A (O)	ISO BUS ECU SIGNAL
6	5980 (U)	ISO BUS IMPLEMENT SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

IMAGE NOT AVAILABLE

INA 1



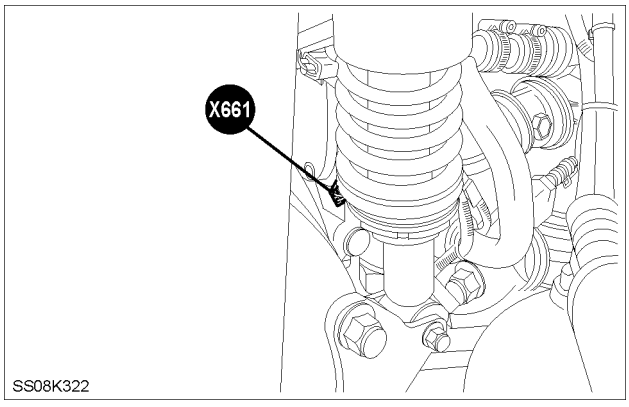
SS08J116 2

RIGHT HAND TOP OF TRANSMISSION

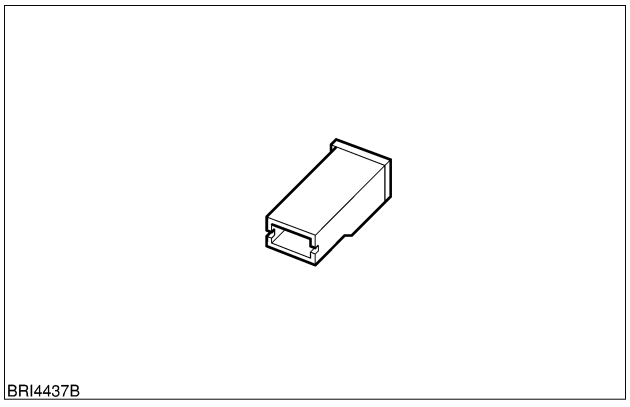
X661 HIGH FLOW PUMP (DETECTION)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5830 (U)	HIGH FLOW PUMP LINK

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K322 3



BRI4437B 4

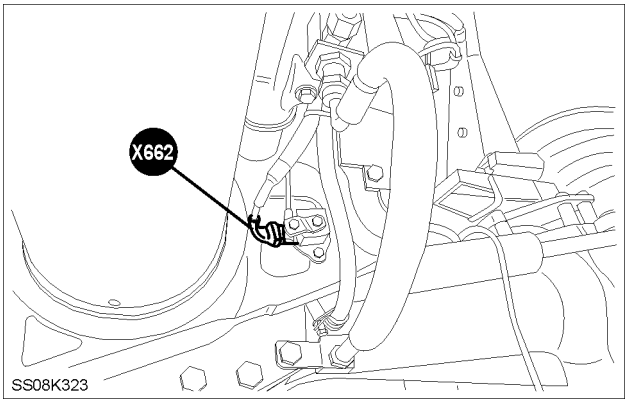
REAR RIGHT HAND TRANSMISSION

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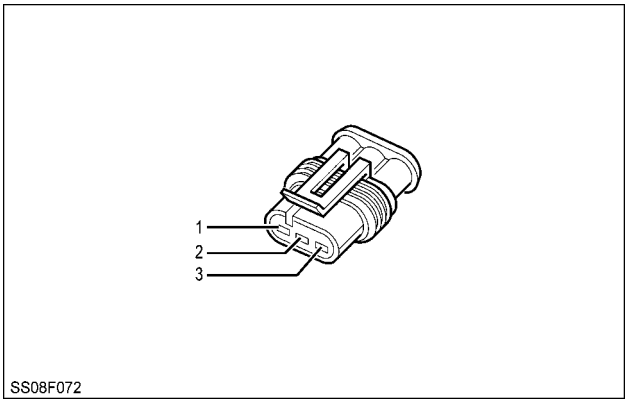
X662 FRONT AXLE POSITION SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3220 (O)	AXLE HEIGHT SENSOR 5V REF
2	3230 (O)	AXLE HEIGHT SENSOR POSITION
3	60 (B)	SENSOR GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K323 5



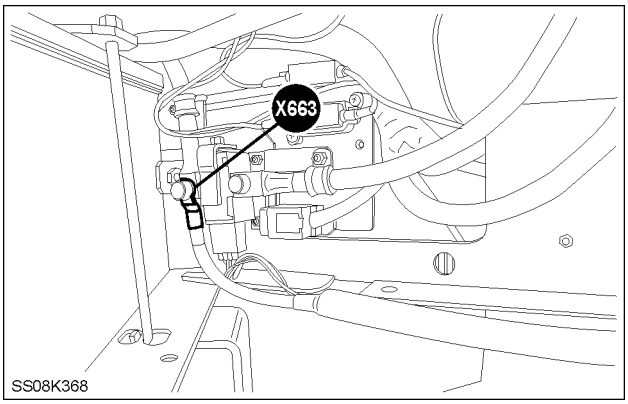
SS08F072 6

RIGHT HAND FRONT AXLE

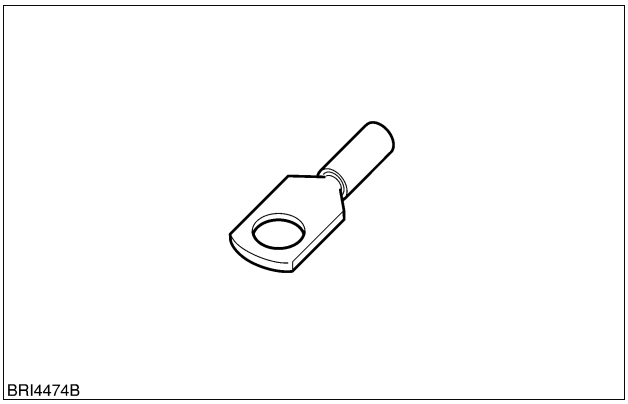
X663 ELECTRICAL BATTERY ISOLATOR PLUS 30

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1AA (R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K368 7



BRI4474B 8

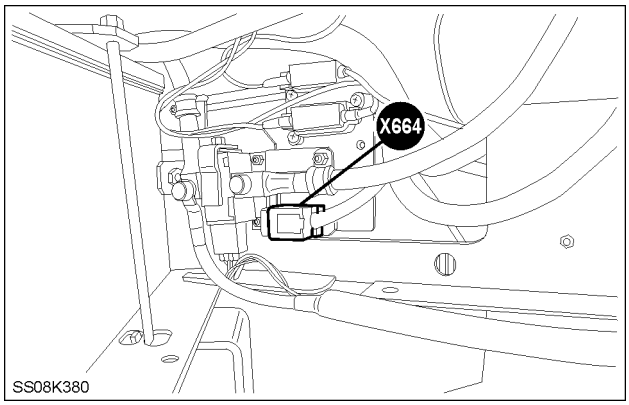
RIGHT HAND BEHIND STEPS

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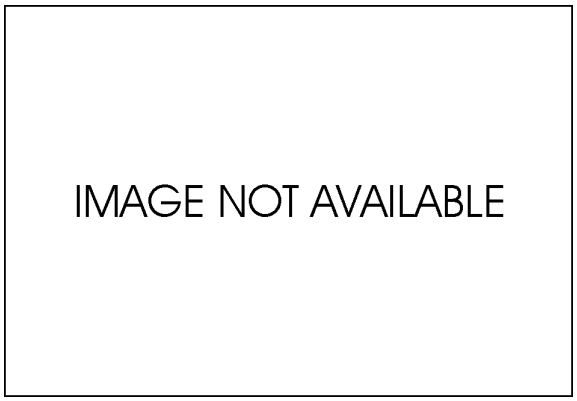
X664 ELECTRICAL BATTERY ISOLATOR FUSE PF3

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1B (R)	BATTERY SUPPLY
2	1C R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K380 9



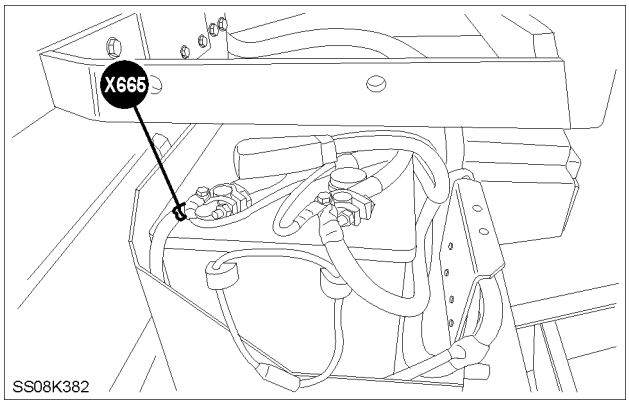
INA 10

RIGHT HAND BEHIND STEPS

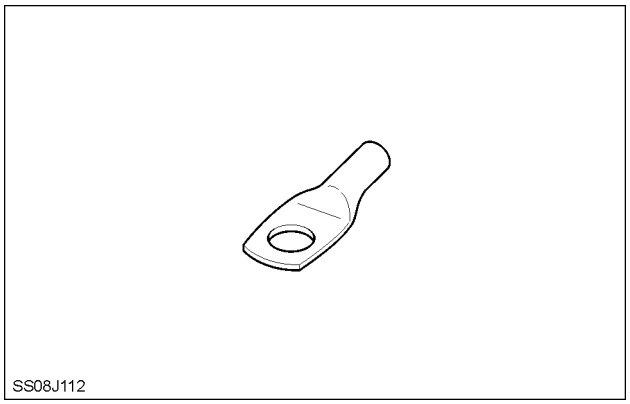
X665 BATTERY TO CAB. PLUS SUPPLY

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1A (R) / 1B (R)	BATTERY SUPPLY
2	160A (U) / -	BATTERY SUPPLY ELECTRONICS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K382 11



SS08J112 12

RIGHT HAND BEHIND STEPS

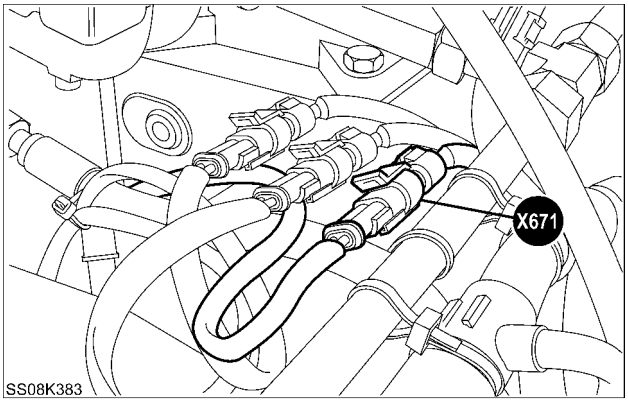
www.truck-freeworkshop.com

Connector - Component diagram 67

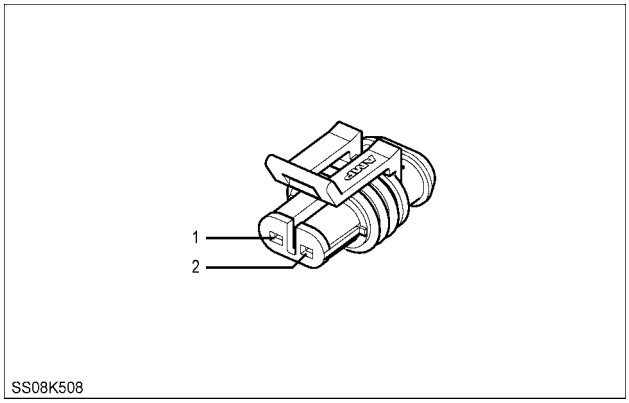
X671 LINK LEVELLING VALVE 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	4054 (W)	LINK LEVEL DUMP SOLENOID
2	57MJ (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K383 1



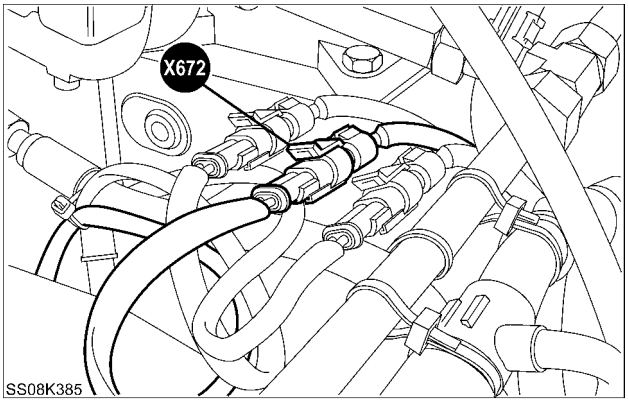
SS08K508 2

REAR AXLE

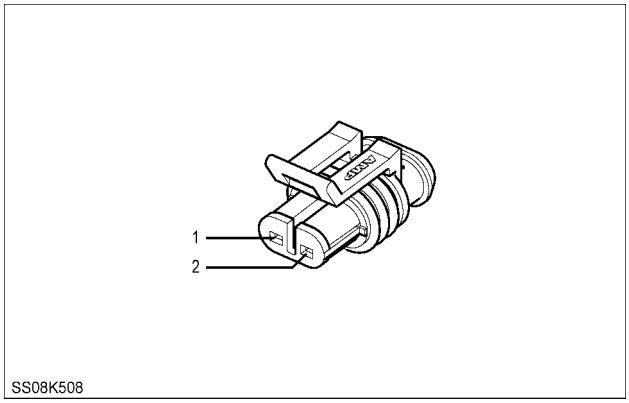
X672 LINK LEVELLING VALVE 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	4055 (W)	LINK LEVEL TOP LINK EXTEND SOLENOID
2	57MK (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K385 3



SS08K508 4

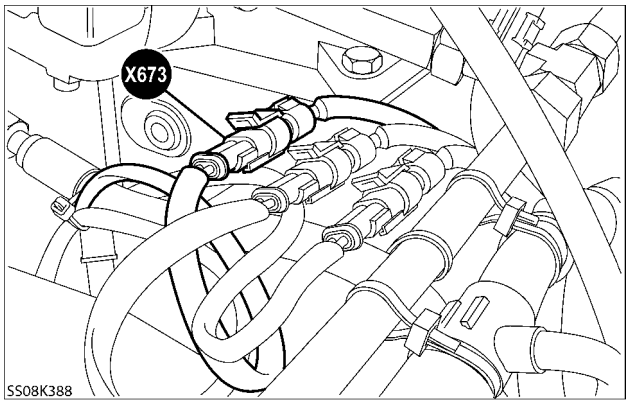
REAR AXLE

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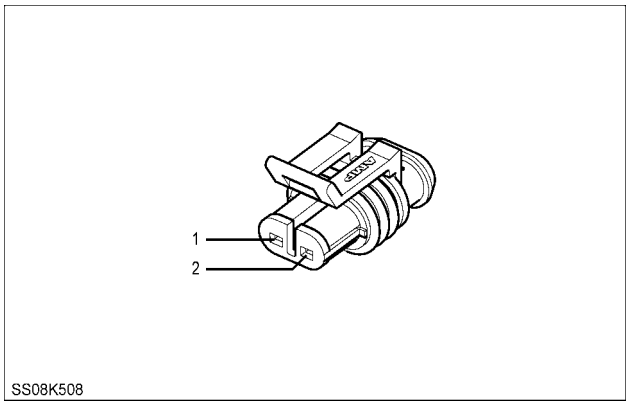
X673 LINK LEVELLING VALVE 3

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	4054 (W)	LINK LEVEL DUMP SOLENOID
2	57ML (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K388 5



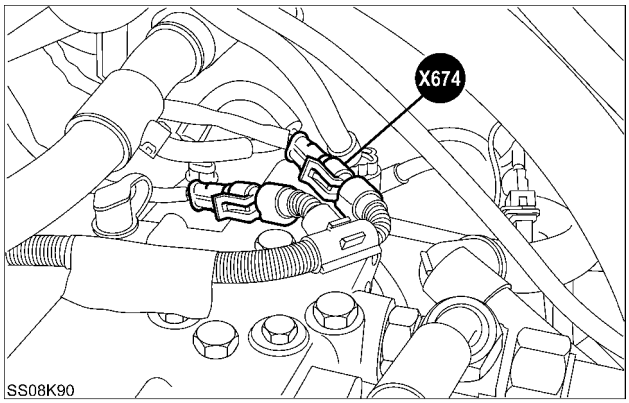
SS08K508 6

REAR AXLE

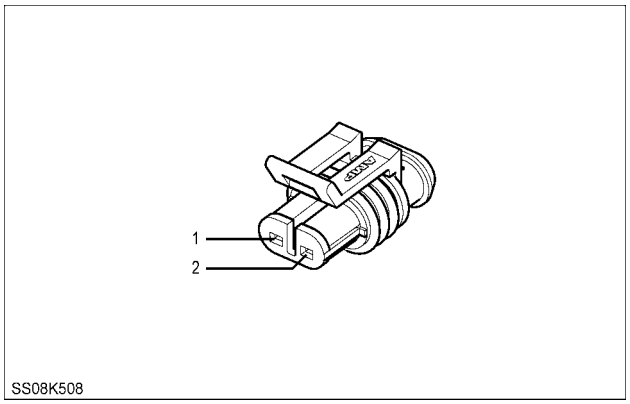
X674 LINK LEVELLING VALVE 4

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	4057 (W)	LINK LEVEL RIGHT LINK RAISE SOLENOID
2	57MM (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K390 7



SS08K508 8

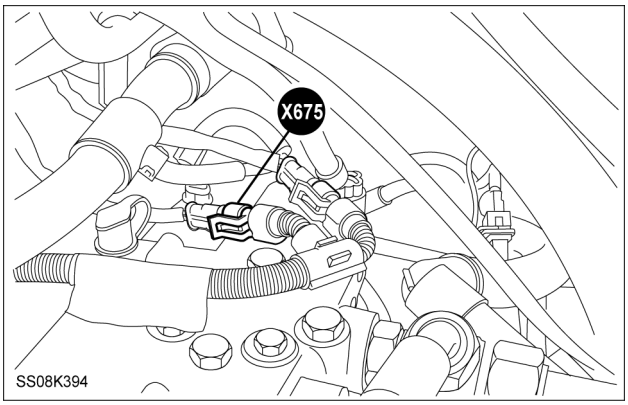
REAR AXLE

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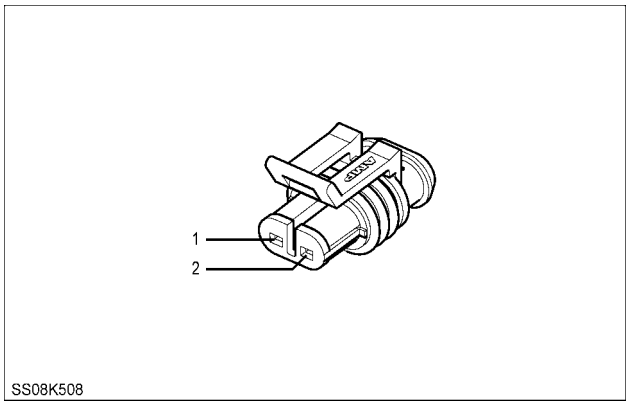
X675 LINK LEVELLING VALVE 5

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	4058 (W)	LINK LEVEL RIGHT LINK LOWER SOLENOID
2	57MN (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K394 9



SS08K508 10

REAR AXLE

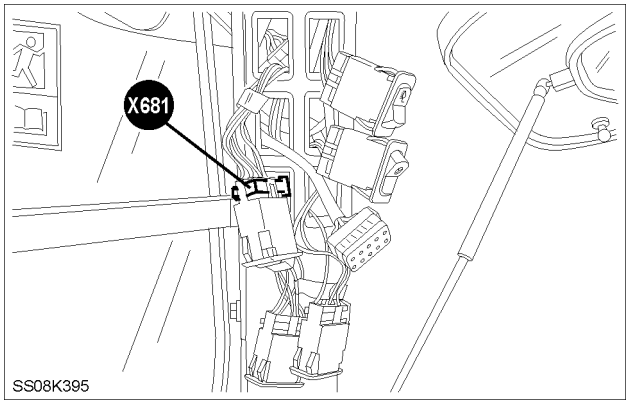
www.truck-freeworkshop.com

Connector - Component diagram 68

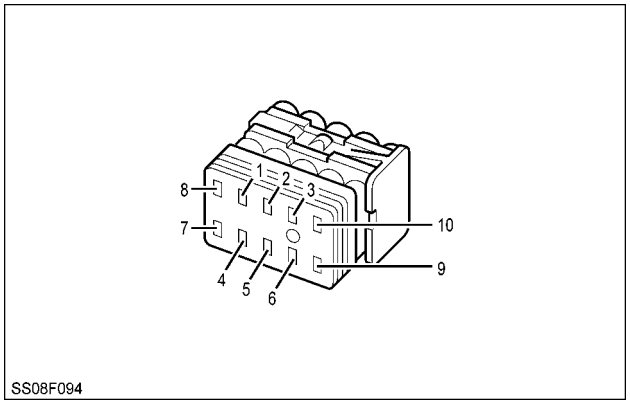
X681 HYDRAULICS MASTER SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5210 (O)	EDC VALVE ENABLE
2	7000M (U)	TRANS CONTROL SUPPLY
3	5597 (S)	EHR MASTER ENABLE
5	5835(S)	HYDRAULIC MASTER SWITCH HIGH FLOW PUMP LINK
7	57PV (B)	EARTH (ALL)
8	1012L (R)	ILLUMINATION
9	57RP (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K395 1



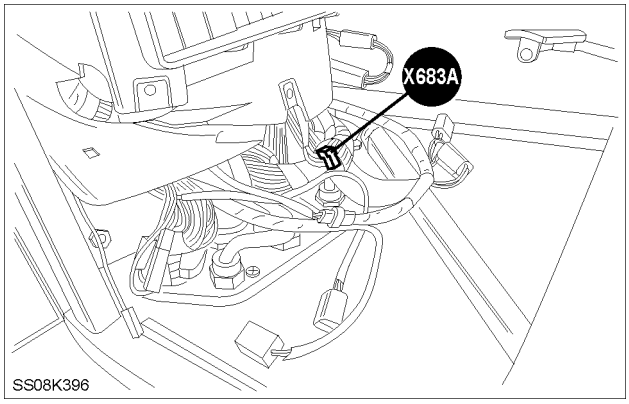
SS08F094 2

RIGHT HAND C PILLAR

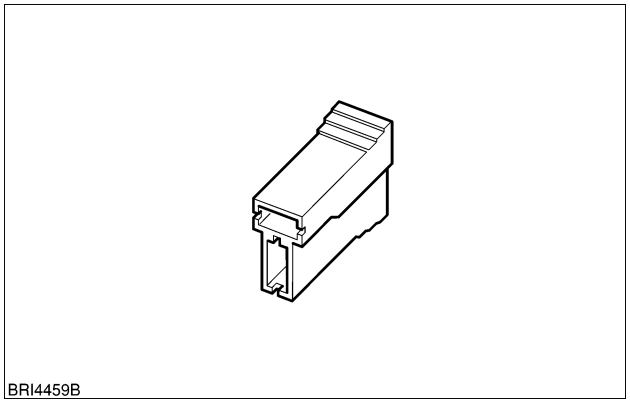
X683A HEATED SCREEN B+

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1P (R)	BATTERY SUPPLY
2	1N (R)	BATTERY SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K396 3



BRI4459B 4

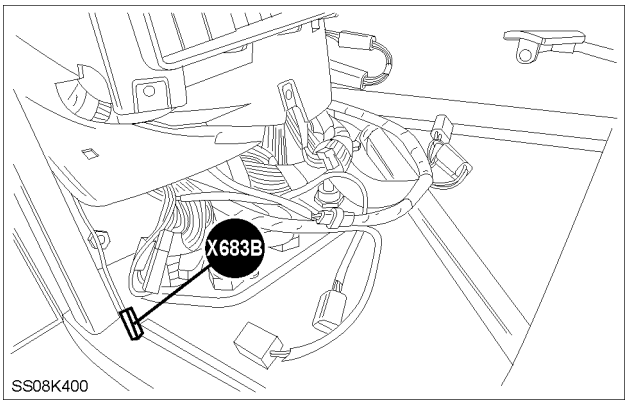
BEHIND RIGHT HAND TRIM

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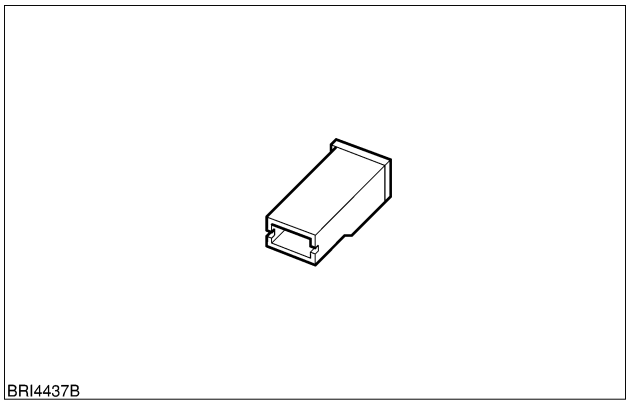
X683B HEATED SCREEN D+

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1006B (N) / 1006D (N)	ALTERNATOR WARNING LAMP

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K400 5



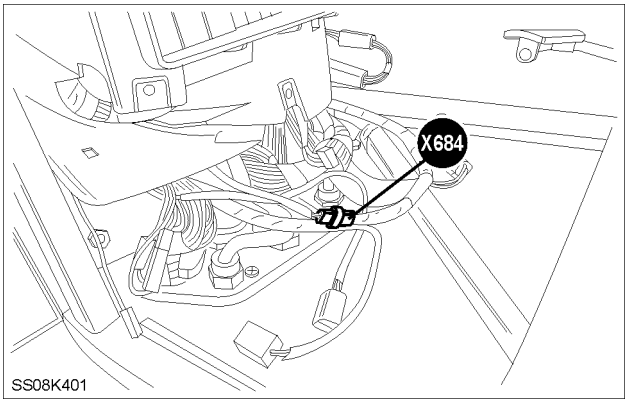
BRI4437B 6

BEHIND RIGHT HAND TRIM

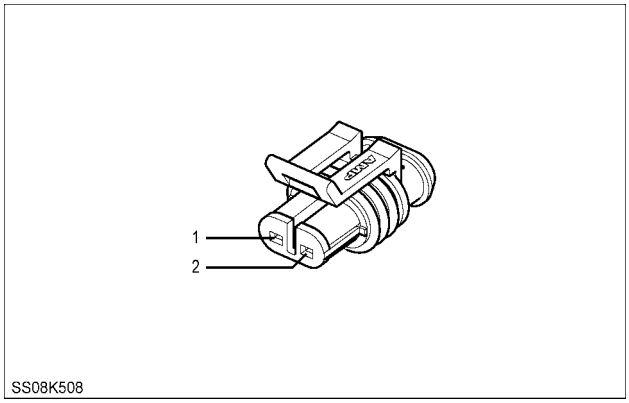
X684 FRONT HITCH DETECT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5200L (N)	EDC VALVE SUPPLY
2	5840 (W)	FRONT HITCH DETECT INPUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K401 7



SS08K508 8

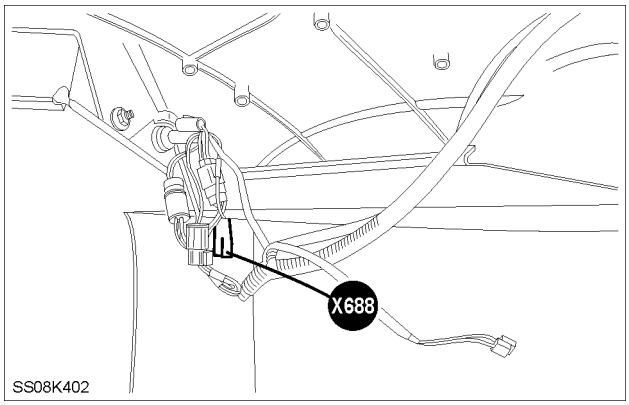
BEHIND RIGHT HAND TRIM

www.truck-freeworkshop.com

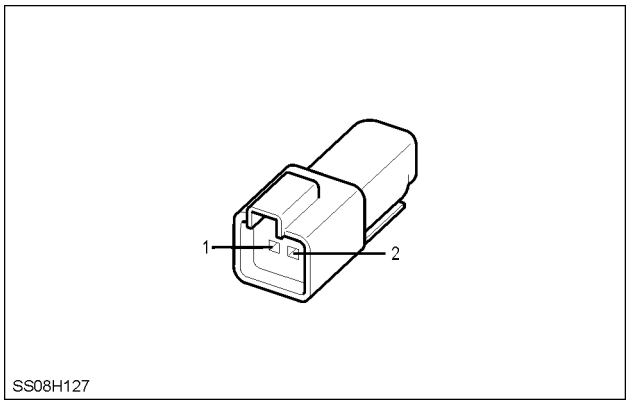
X688 EXTREMITY LAMP LEFT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	50A (G)	LEFT HAND TURN SIGNAL
2	57MS (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K402 9



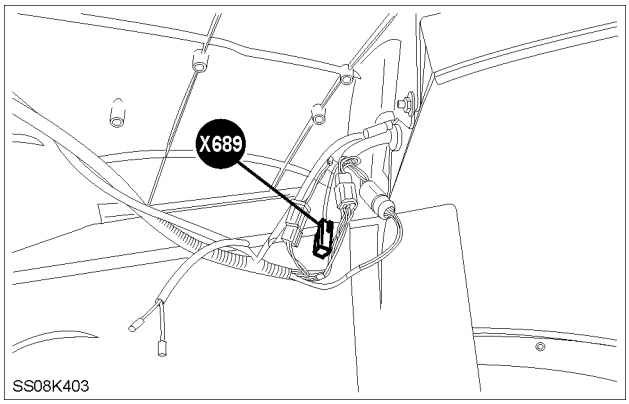
SS08H127 10

LEFT HAND REAR FENDER

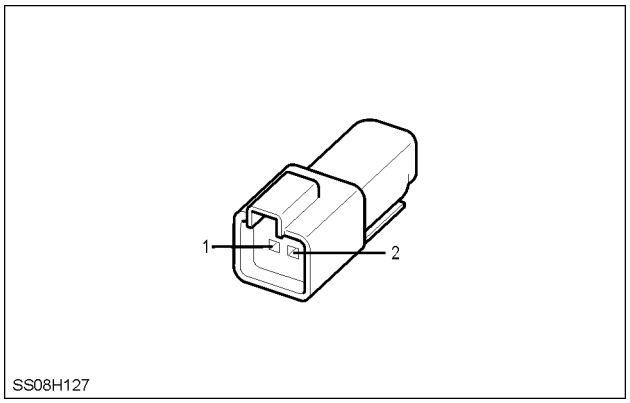
X689 EXTREMITY LAMP RIGHT HAND

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	49A (G)	RIGHT HAND TURN SIGNAL
2	57MR (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K403 11



SS08H127 12

RIGHT HAND REAR FENDER

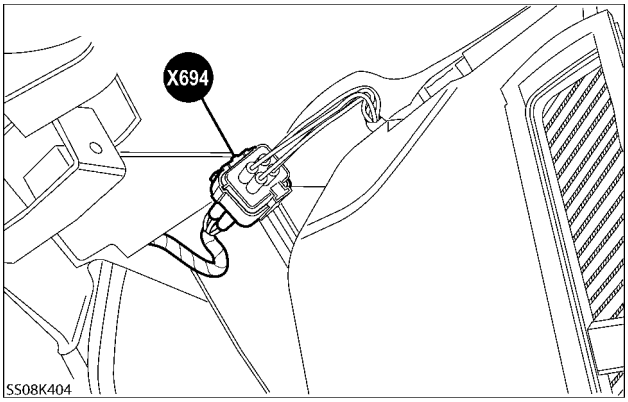
www.truck-freeworkshop.com

Connector - Component diagram 69

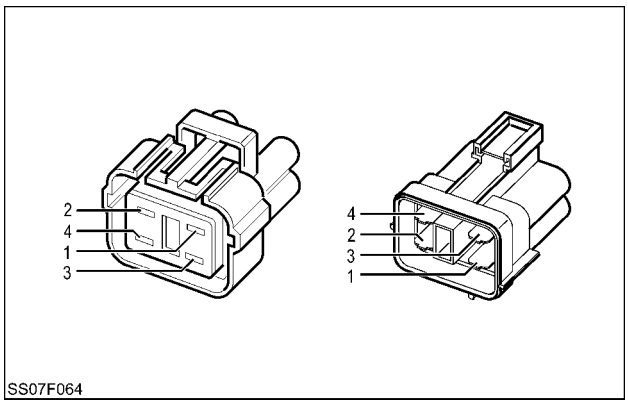
X694 AIR CON POWER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	982B (G) / (R)	BLOWER MOTOR FEED
2	982C (G) / (R)	BLOWER MOTOR FEED
3	57NZ (B)	EARTH (ALL)
4	57PA (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K404 1



SS07F064 2

LEFT HAND REAR TRACTOR BEHIND OPERATOR'S SEAT

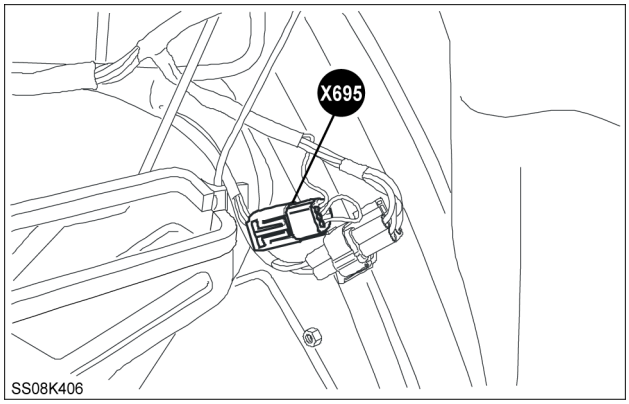
www.truck-freeworkshop.com

X695 AIR CON CONTROL

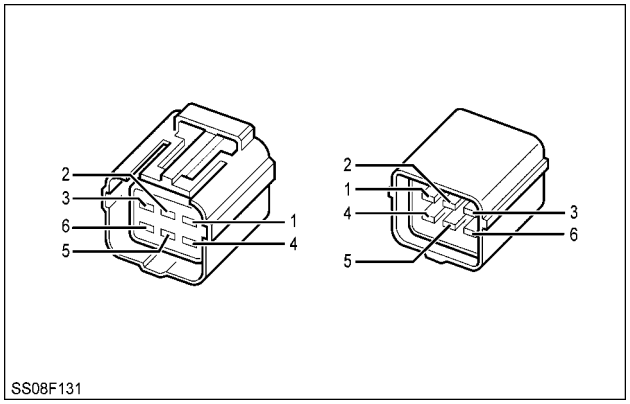
MANUAL

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5420M (G)	CAN L
2	5400M (Y)	CAN H
3	- / (O/R)	DEFOG OUTPUT
4	2006A (U) / (W)	DE-ICING SWITCH - AIR CONDITIONER
5	2006B (U) / (W/U)	DE-ICING SWITCH - AIR CONDITIONER
6	2005 (O) / (P/R)	AIR CON CLUTCH RELAY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K406 3



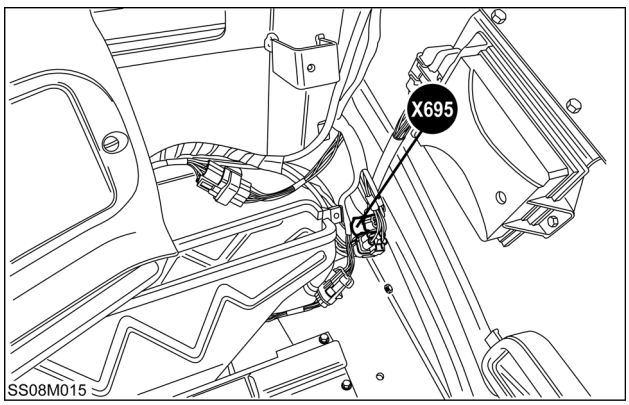
SS08F131 4

LEFT HAND REAR TRACTOR BEHIND OPERATOR'S SEAT

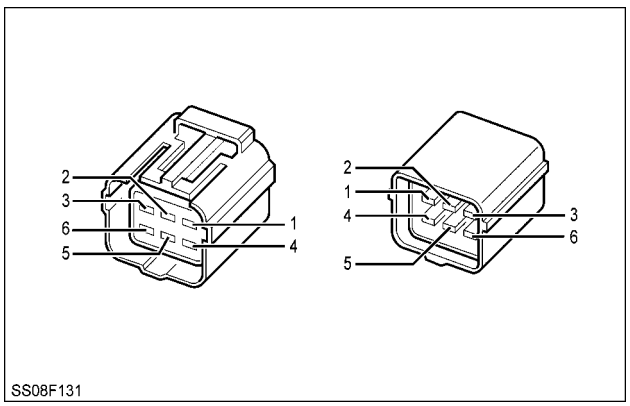
ATC

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5420M (G)	CAN L
2	5400M (Y)	CAN H
3	9229 (O/R)	DEFOG OUTPUT
4	2006A (U) / (L)	DE-ICING SWITCH - AIR CONDITIONER
5	2006B (U) / (W)	DE-ICING SWITCH - AIR CONDITIONER
6	2005 (O) / (W)	AIR CON CLUTCH RELAY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08M015 5



SS08F131 6

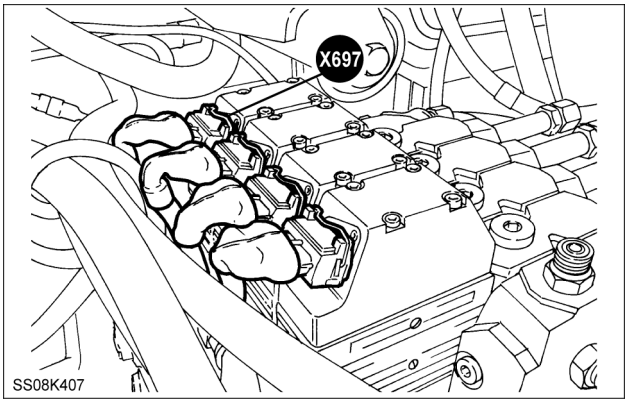
LEFT HAND REAR TRACTOR BEHIND OPERATOR'S SEAT

www.truck-freeworkshop.com

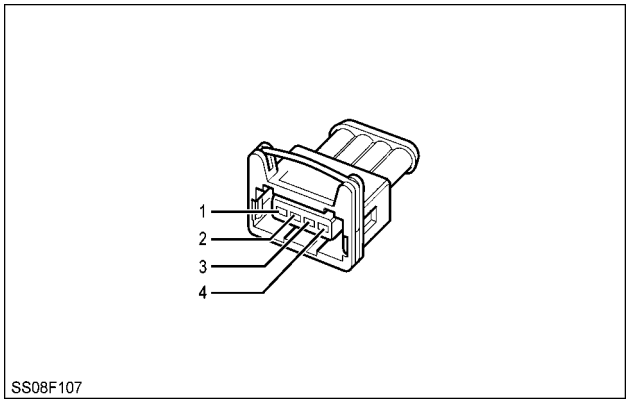
X697 MEHR 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5515J (S)	EHR +12V IGN.
2	5610H (U)	HTS PROGRAM
3	5500H (R)	EHR CAN HIGH
4	57WC (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K407 7



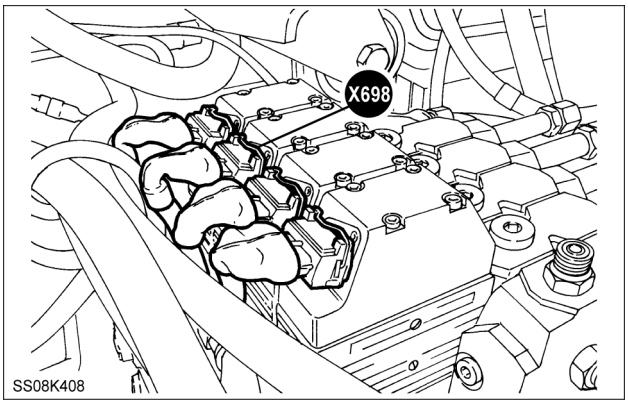
SS08F107 8

RIGHT HAND BEHIND STEPS

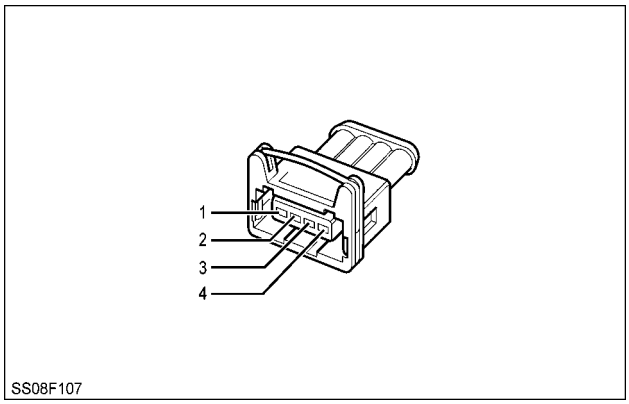
X698 MEHR 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5515K (S)	EHR +12V IGN.
2	5510Q (U)	EHR CAN LOW
3	5500Q (R)	EHR CAN HIGH
4	57MD (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K408 9



SS08F107 10

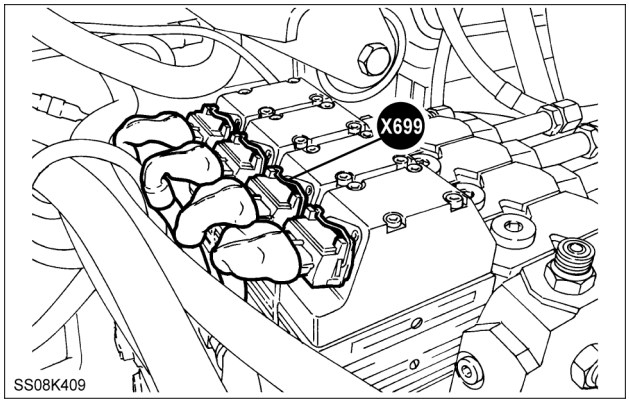
RIGHT HAND BEHIND STEPS

www.truck-freeworkshop.com

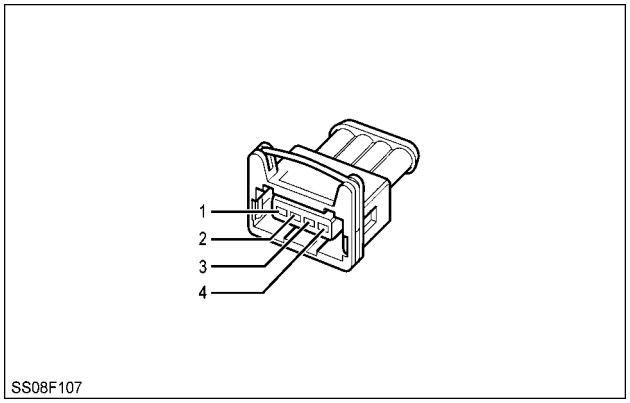
X699 MEHR 3

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5515L (S)	EHR +12V IGN
2	5510S (U)	EHR CAN LOW
3	5500S (R)	EHR CAN HIGH
4	57WE (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K409 11



SS08F107 12

RIGHT HAND BEHIND STEPS

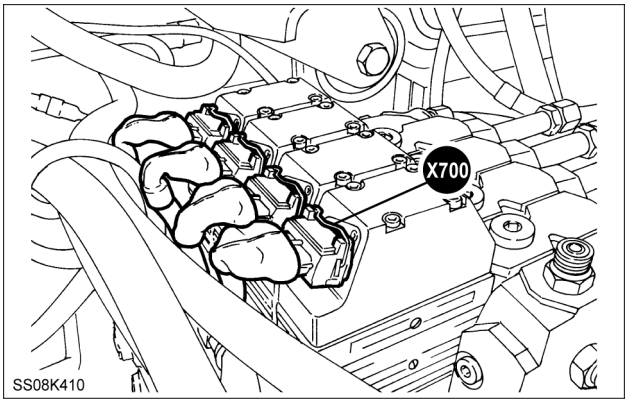
www.truck-freeworkshop.com

Connector - Component diagram 70

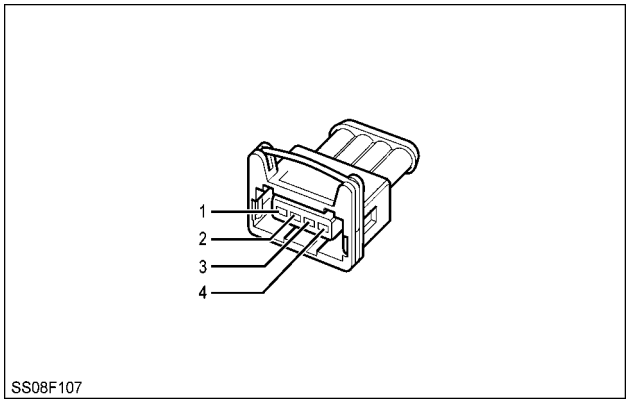
X700 MEHR 4

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5515M (S)	EHR +12V IGN.
2	5510U (U)	EHR CAN LOW
3	5500U (R)	EHR CAN HIGH
4	57MF (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K410 1



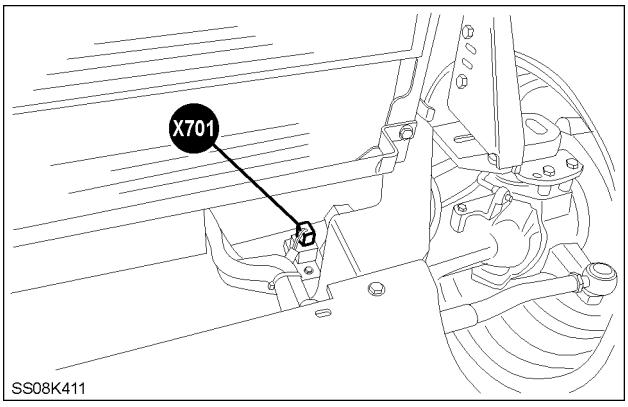
SS08F107 2

RIGHT HAND BEHIND STEPS

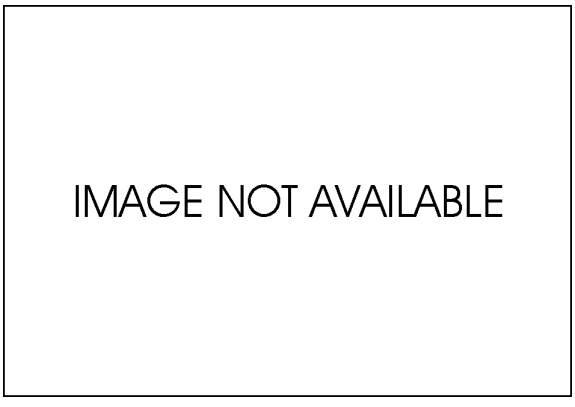
X701 SUSPENSION ACCELEROMETER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3235 (TN)	ACCELEROMETER SIGNAL
2	60AG (B/W)	SENSOR GROUND
3	5520D (G)	EHR 5V REF.

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K411 3



INA 4

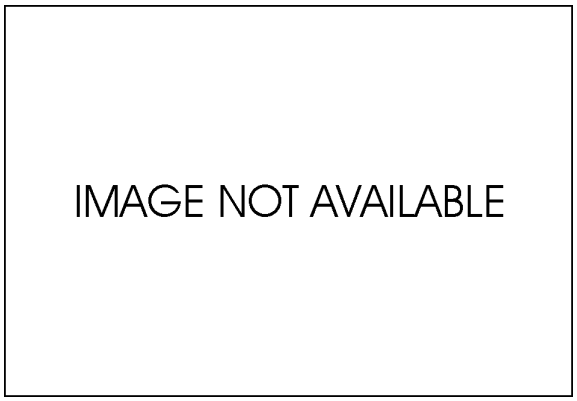
FRONT LEFT HAND ENGINE

www.truck-freeworkshop.com

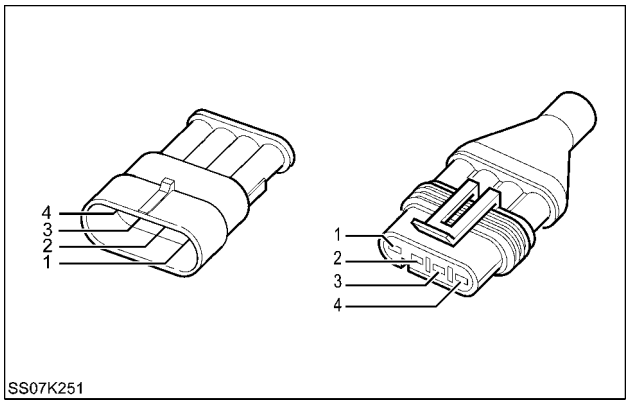
X702 TERMINATING RESISTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	5510V (U)	EHR CAN LOW
3	5500V (R)	EHR CAN HIGH

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 5



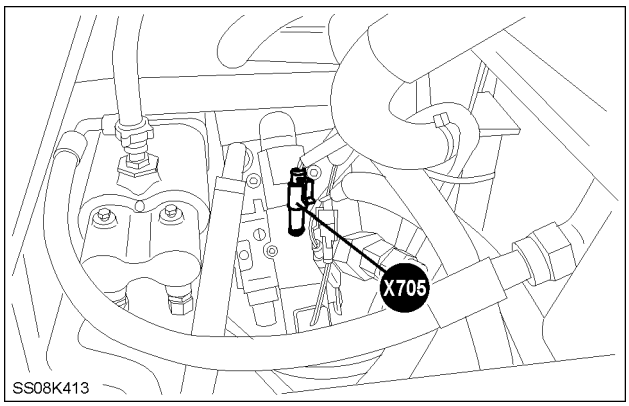
SS07K251 6

RIGHT HAND BEHIND STEPS

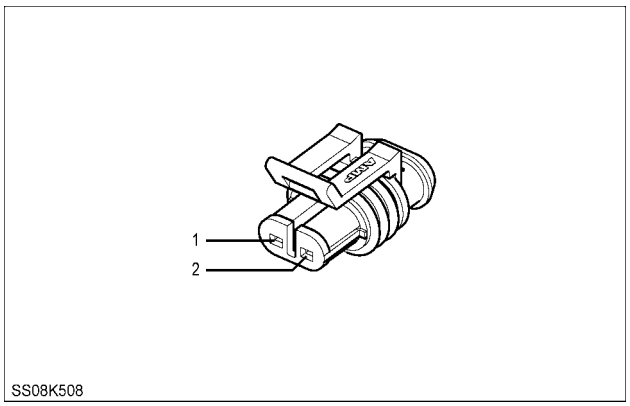
X705 TURN RIGHT (TOP)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3163 (O)	AUTO GUIDANCE STEERING SOLENOID VLV R FEED
2	3164 (O)	AUTO GUIDANCE STEERING SOLENOID VLV R RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K413 7



SS08K508 8

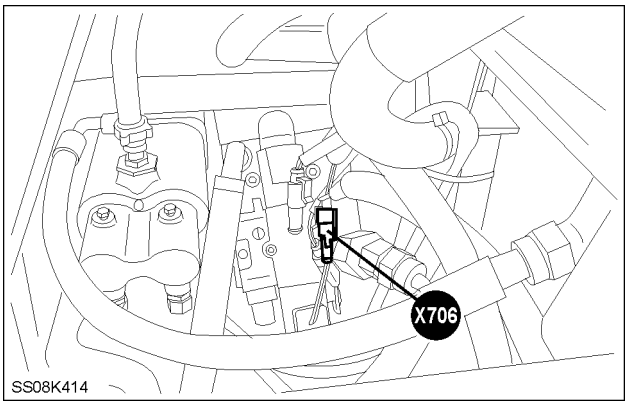
REAR TOP OF ENGINE

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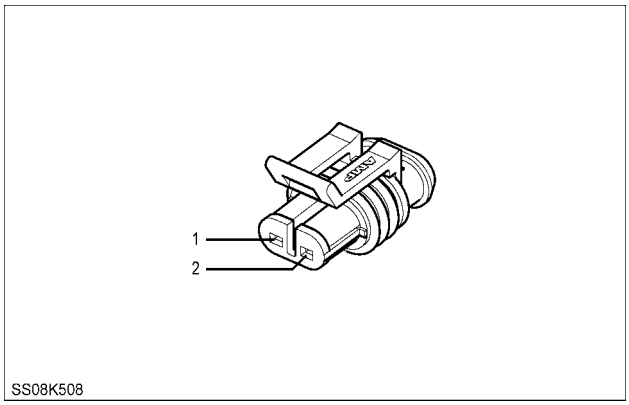
X706 TURN LEFT (BOTTON)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3165 (O)	AUTO GUIDANCE STEERING SOLENOID VLV L FEED
2	3166 (O)	AUTO GUIDANCE STEERING SOLENOID VLV L RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K414 9



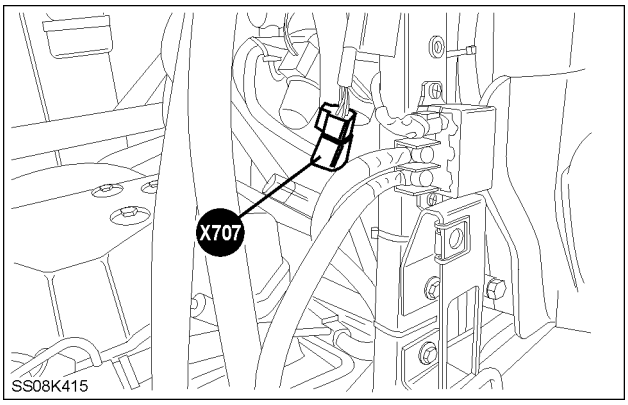
SS08K508 10

REAR TOP OF ENGINE

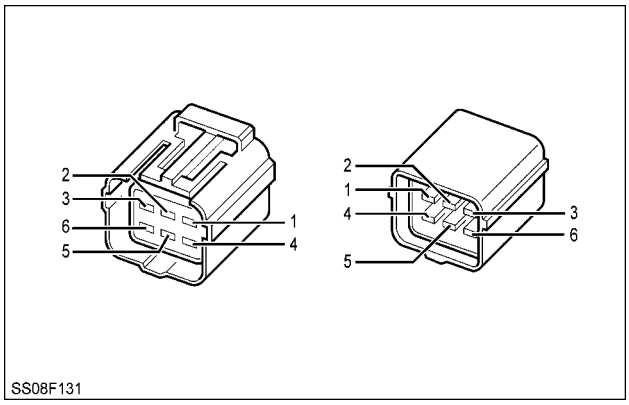
X707 SOLENOIDS CONNECTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3163 (O)	AUTO GUIDANCE STEERING SOLENOID VLV R FEED
2	3164 (O)	AUTO GUIDANCE STEERING SOLENOID VLV R RETURN
3	3165 (O)	AUTO GUIDANCE STEERING SOLENOID VLV L FEED
4	3166 (O)	AUTO GUIDANCE STEERING SOLENOID VLV L RETURN
5	3168 (O)	AUTO GUIDANCE DUMP SOLENOID FEED (HSD)
6	3169 (O)	AUTO GUIDANCE DUMP SOLENOID RETURN (CURSEN)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K415 11



SS08F131 12

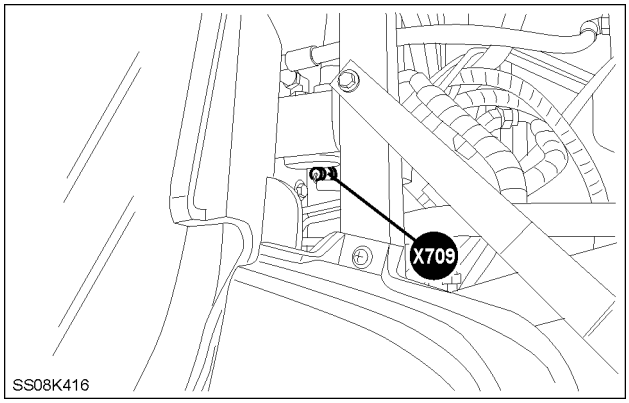
LEFT HAND ENGINE

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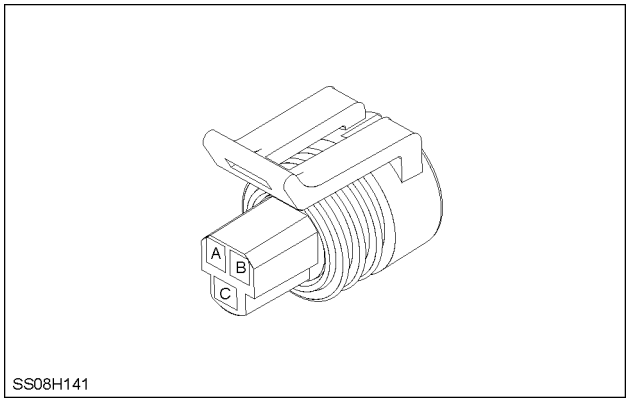
X709 STEERING PRESSURE SENDER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	3161 (O)	AUTO GUIDANCE STEERING PRESS SENSOR RETURN
B	3167 (O)	AUTO GUIDANCE STEERING PRESS SNSR +5V REF
C	3160 (O)	AUTO GUIDANCE STEERING PRESS SENSOR SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K416 13



SS08H141 14

REAR TOP OF ENGINE

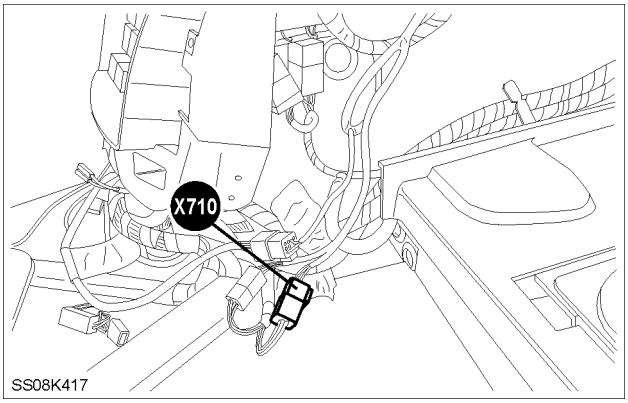
www.truck-freeworkshop.com

Connector - Component diagram 71

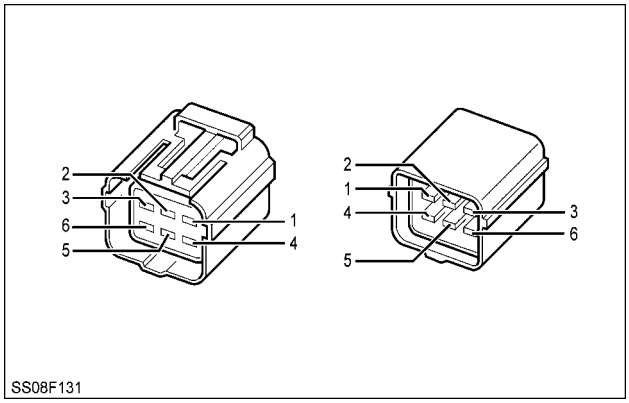
X710 AUTO GUIDANCE SOLENOIDS

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3169 (O)	AUTO GUIDANCE DUMP SOLENOID RETURN (CURSEN)
2	3168 (O)	AUTO GUIDANCE DUMP SOLENOID FEED (HSD)
3	3163A (O) / 3163 (O)	AUTO GUIDANCE STEERING SOLENOID VLV R FEED
4	3164 (O)	AUTO GUIDANCE STEERING SOLENOID VLV R RETURN
5	3165A (O) / 3165 (O)	AUTO GUIDANCE STEERING SOLENOID VLV L FEED
6	3166 (O)	AUTO GUIDANCE STEERING SOLENOID VLV L RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K417 1



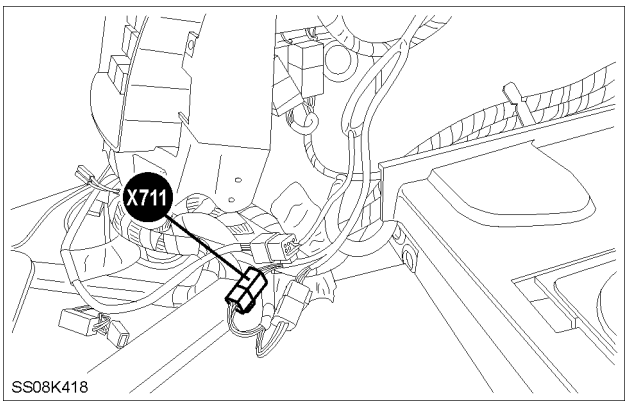
SS08F131 2

BEHIND RIGHT HAND TRIM

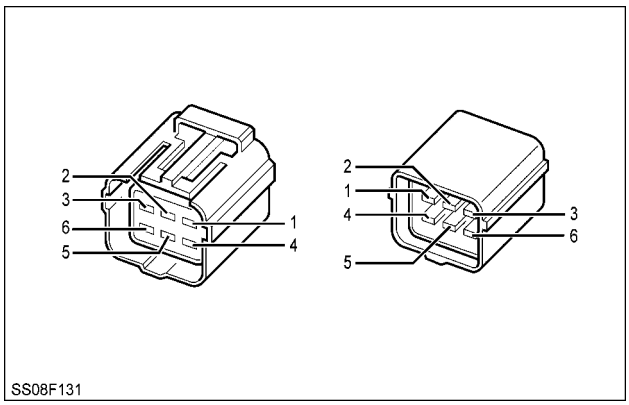
X711 AUTO GUIDANCE SENSORS

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3100 (G)	STEERING SENSOR +5V
2	3120 (K)	STEERING SENSOR SIGNAL
3	3140 (LTG)	STEERING SENSOR GROUND
4	3160 (O)	AUTO GUIDANCE STEERING PRESS SENSOR SIGNAL
5	3161 (O)	AUTO GUIDANCE STEERING PRESS SENSOR RETURN
6	3167 (O)	AUTO GUIDANCE STEERING PRESS SNSR +5V REF

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K418 3



SS08F131 4

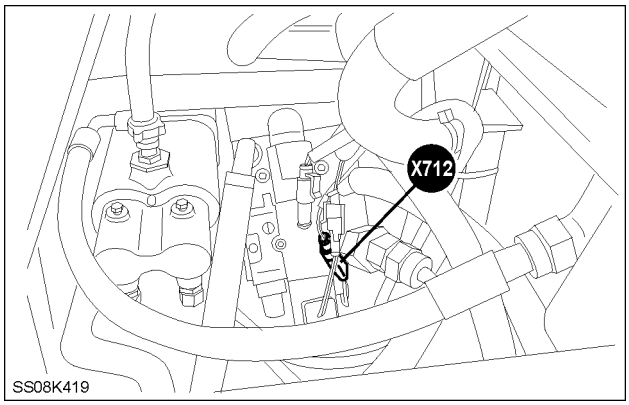
BEHIND RIGHT HAND TRIM

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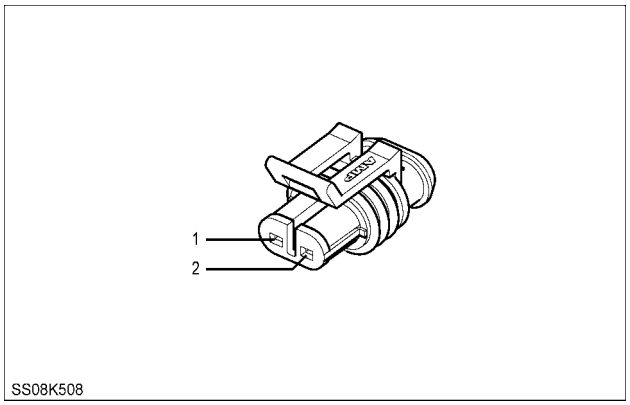
X712 AG DUMP SOLENOID

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	3168 (O)	AUTO GUIDANCE DUMP SOLENOID FEED (HSD)
2	3169 (O)	AUTO GUIDANCE DUMP SOLENOID RETURN (CURSEN)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K419 5



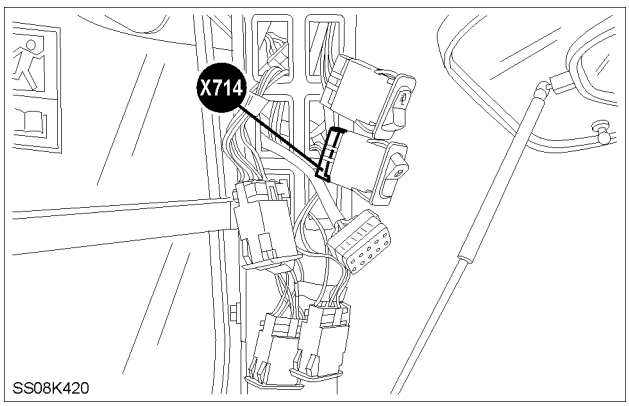
SS08K508 6

REAR TOP LEFT HAND ENGINE

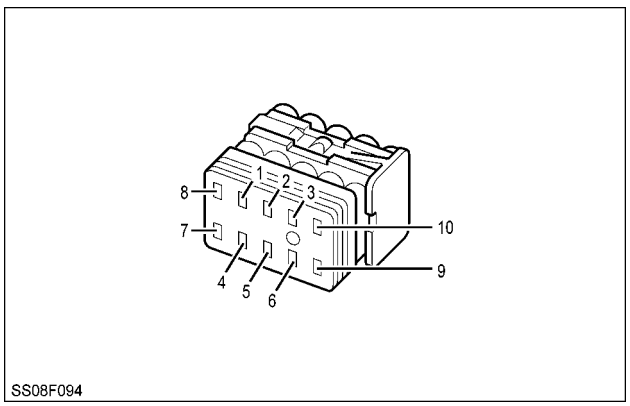
X714 AUTO GUIDANCE CONTROL SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	5200AK (N)	EDC VALVE SUPPLY
3	3185 (N)	AUTO GUIDANCE REMOTE ENGAGE
5	5200AL (N)	EDC VALVE SUPPLY
6	3187A (N)	AUTO GUIDANCE ROADING SELECT
7	57NB (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K420 7



SS08F094 8

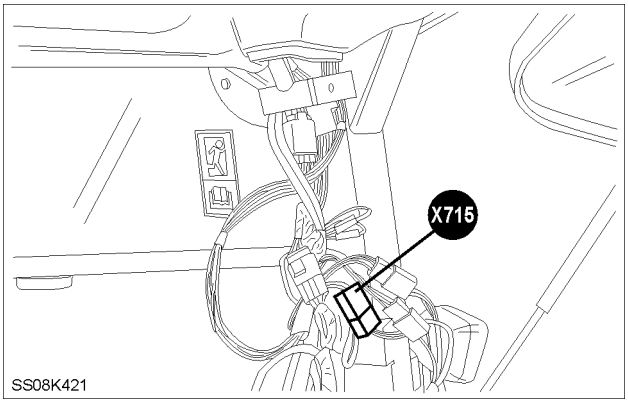
RIGHT HAND C-PILLAR

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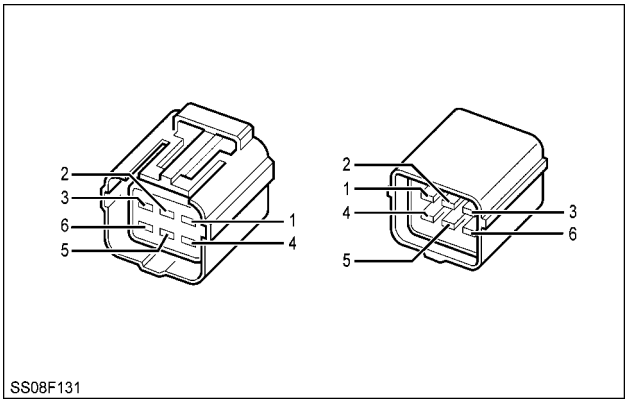
X715 ROOF CONNECTOR DATA 1

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5500T (R) / 5500R (R)	EHR CAN HIGH
2	5510T (U) / 5510R (U)	EHR CAN LOW
5	7655G (Y)	RS232 GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K421 9



SS08F131 10

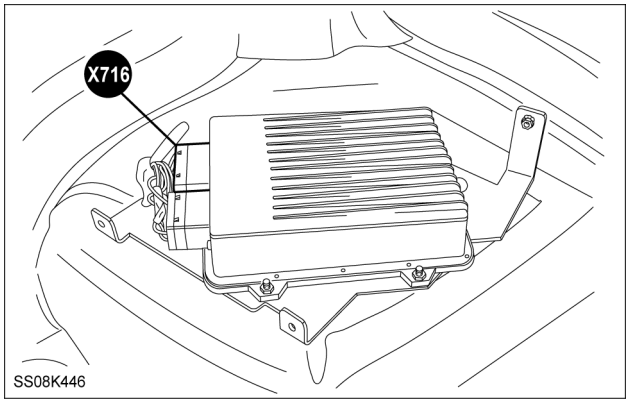
BEHIND RIGHT HAND C-PILLAR COVER TOP

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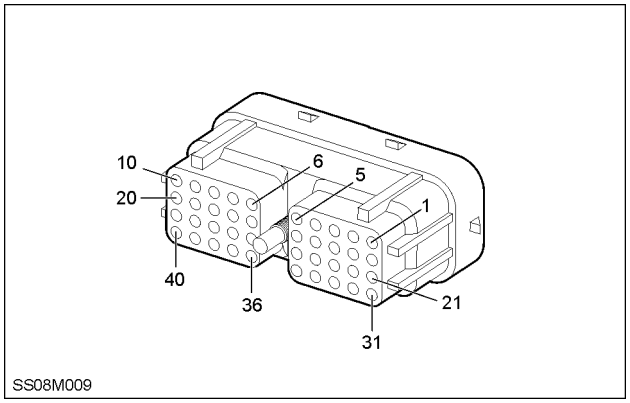
X716 CERES CONTROLLER A

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57NC (B)	EARTH (ALL)
2	7640G (TN)	DIAGNOSTIC PLUG RS232 IN
3	5500P (R)	EHR CAN HIGH
6	3185 (N)	AUTO GUIDANCE REMOTE ENGAGE
9	3140 (LTG)	STEERING SENSOR GROUND
10	3163 (O)	AUTO GUIDANCE STEERING SOLENOID VLV R FEED
11	5200AJ (N)	EDC VALVE SUPPLY
12	7655G (Y)	RS232 GROUND
13	5510P (U)	EHR CAN LOW
18	3120 (K)	STEERING SENSOR SIGNAL
19	3160 (O)	AUTO GUIDANCE STEERING PRESS SENSOR SIGNAL
20	3165 (O)	AUTO GUIDANCE STEERING SOLENOID VLV L FEED
21	3186 (S)	CERES PPS IN
29	3167 (O)	AUTO GUIDANCE STEERING PRESS SNSR +5V REF
30	3164 (O)	AUTO GUIDANCE STEERING SOLENOID VLV R RETURN
31	7650G (W)	DIAGNOSTIC PLUG RS232 OUT
38	3100 (G)	STEERING SENSOR +5V
39	3161 (O)	AUTO GUIDANCE STEERING PRESS SENSOR RETURN
40	3166 (O)	AUTO GUIDANCE STEERING SOLENOID VLV L RETURN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K446 11



SS08M009 12

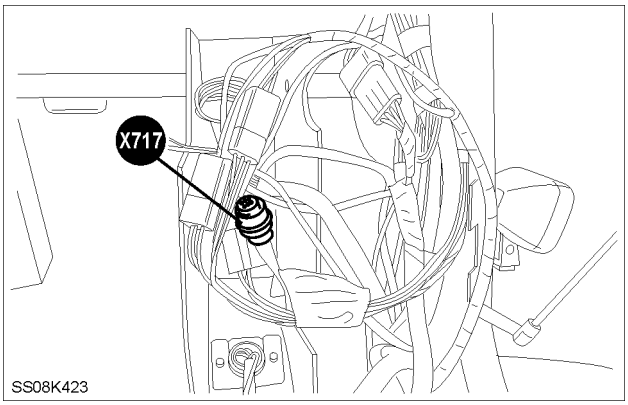
REAR LEFT HAND CAB BENEATH STORAGE TRAY

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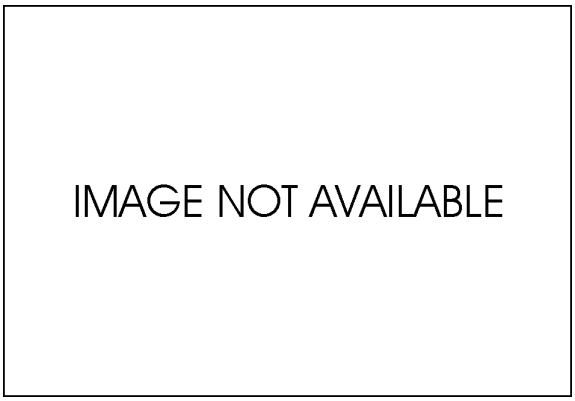
X717 DATA LOGGER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	7640D (N)	DIAGNOSTIC PLUG RS232 IN
3	7650 (W)	DIAGNOSTIC PLUG RS232 OUT
5	7655D (Y)	RS232 GROUND
10	3181 (S)	AUTO GUIDANCE PPS SIGNAL INPUT TO GPS
11	57NE (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K423 13



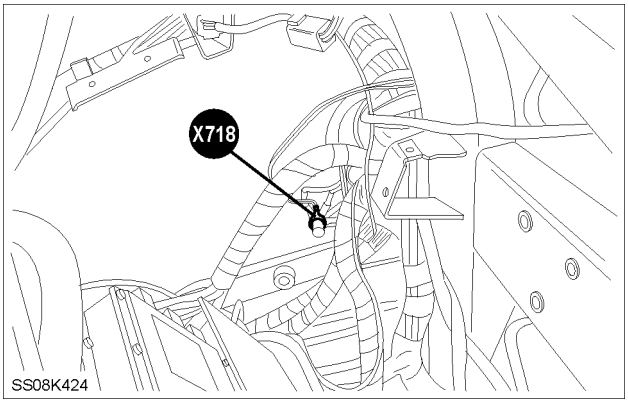
INA 14

BEHIND RIGHT HAND C-PILLAR COVER

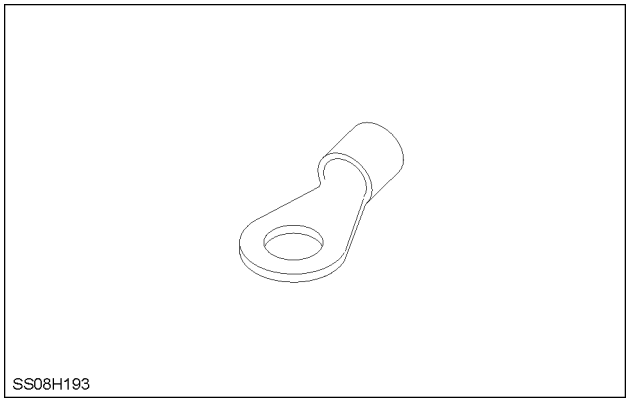
X718 EARTH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57NC; 57NL (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K424 15



SS08H193 16

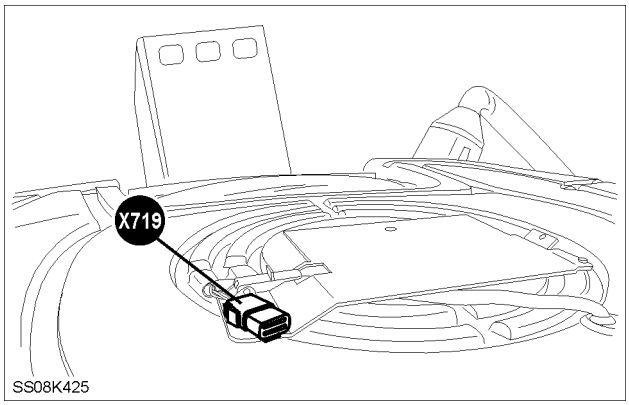
BEHIND REAR RIGHT HAND TRIM

www.truck-freeworkshop.com

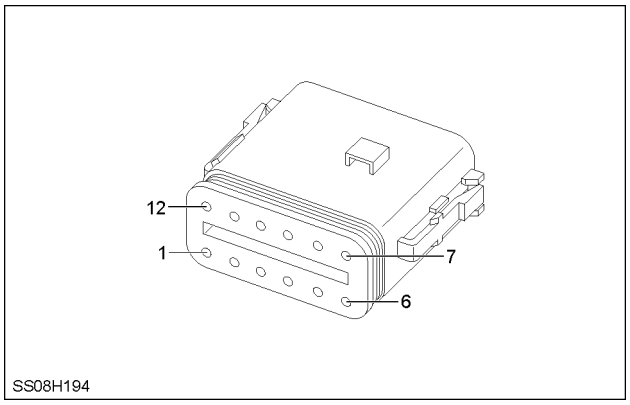
X719 GPS RECEIVER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5500AC (R)	EHR CAN HIGH
2	7640G (TN)	DIAGNOSTIC PLUG RS232 IN
3	7650G (W)	DIAGNOSTIC PLUG RS232 OUT
4	3186 (S)	CERES PPS IN
5	7655G (Y)	RS232 GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K425 17



SS08H194 18

TOP CAB ROOF

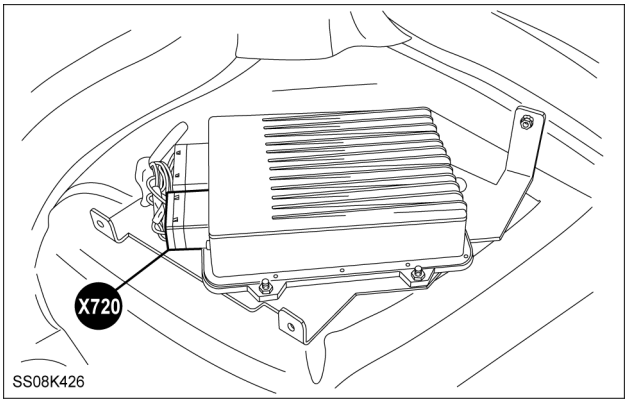
www.truck-freeworkshop.com

Connector - Component diagram 72

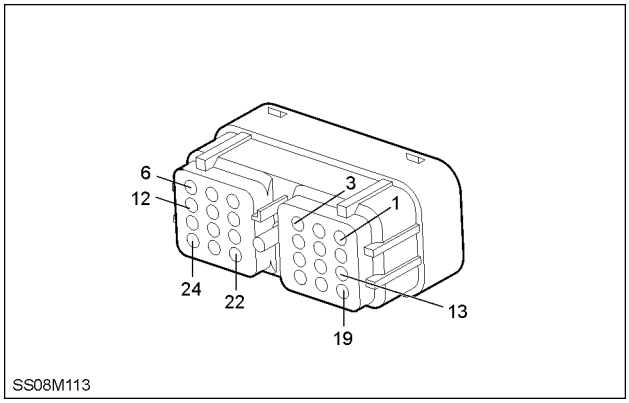
X720 CERES CONTROLLER B

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57NE (B)	EARTH (ALL)
2	7650D (W)	DIAGNOSTIC PLUG RS232 OUT
3	3187 (N)	AUTO GUIDANCE ROADING SELECT
7	3181 (S)	AUTO GUIDANCE PPS SIGNAL INPUT TO GPS
8	7640D (TN)	DIAGNOSTIC PLUG RS232 IN
14	7655D (Y)	RS232 GROUND

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K426 1



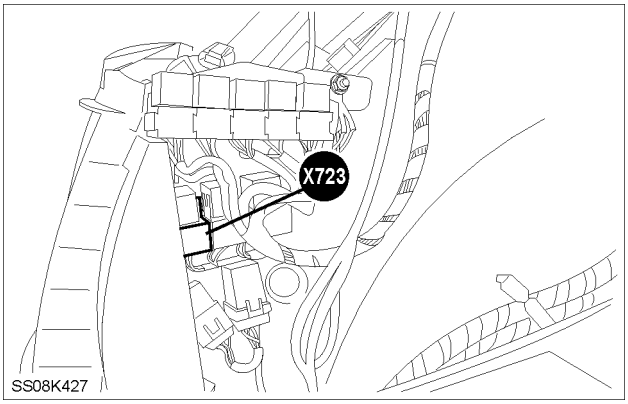
SS08M113 2

REAR LEFT HAND CAB BENEATH STORAGE TRAY

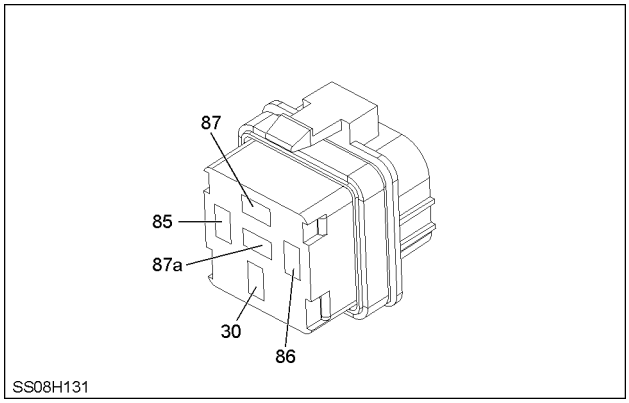
X723 RELAY BASE CRANK ISOLATE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
30	5200AB (N)	EDC VALVE SUPPLY
85	57NH (B)	EARTH (ALL)
86	1001AC (W)	STARTER SOLENOID FEED
87A	5200AG (N)	EDC VALVE SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K427 3



SS08H131 4

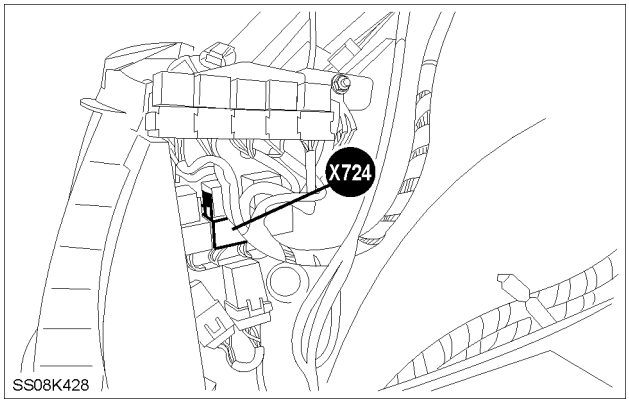
BEHIND RIGHT HAND TRIM

www.truck-freeworkshop.com

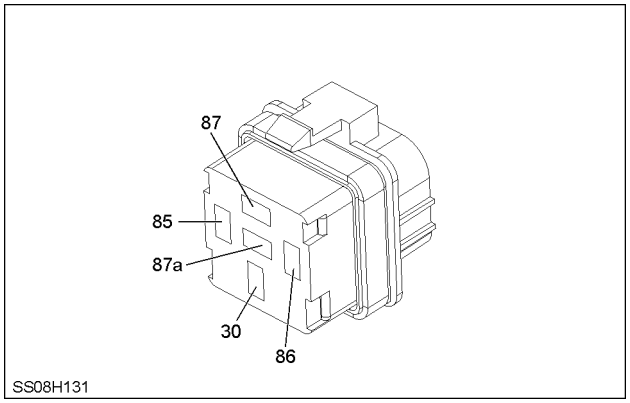
X724 RELAY BASE SOL VALVE B

POS.	WIRE NUMBER	CIRCUIT REFERENCE
30	3163A (O)	AUTO GUIDANCE STEERING SOLENOID VLV R FEED
85	57NJ (B)	EARTH (ALL)
86	3187B (N)	AUTO GUIDANCE ROADING SELECT
87	3163 (O)	AUTO GUIDANCE STEERING SOLENOID VLV R FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K428 5



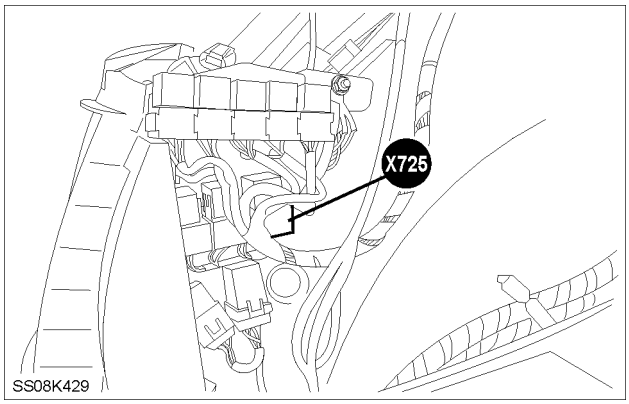
SS08H131 6

BEHIND RIGHT HAND TRIM

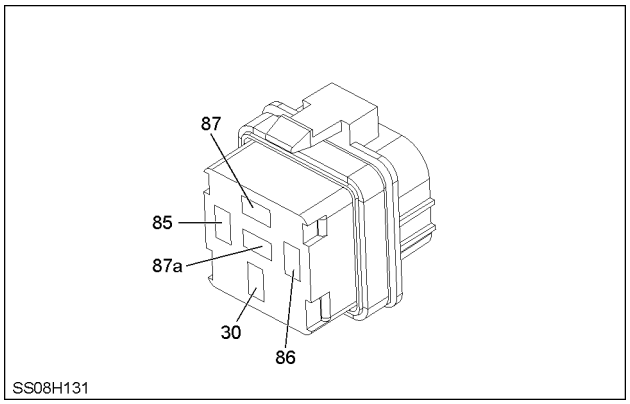
X725 RELAY BASE SOL VALVE A

POS.	WIRE NUMBER	CIRCUIT REFERENCE
30	3165A (O)	AUTO GUIDANCE STEERING SOLENOID VLV L FEED
85	57NK (B)	EARTH (ALL)
86	3187C (N)	AUTO GUIDANCE ROADING SELECT
87	3165 (O)	AUTO GUIDANCE STEERING SOLENOID VLV L FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K429 7



SS08H131 8

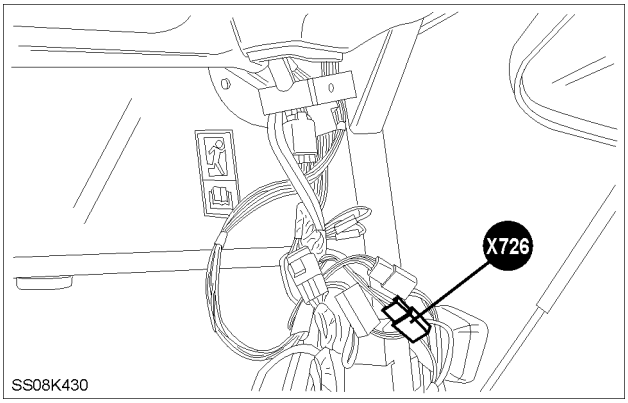
BEHIND RIGHT HAND TRIM

www.truck-freeworkshop.com

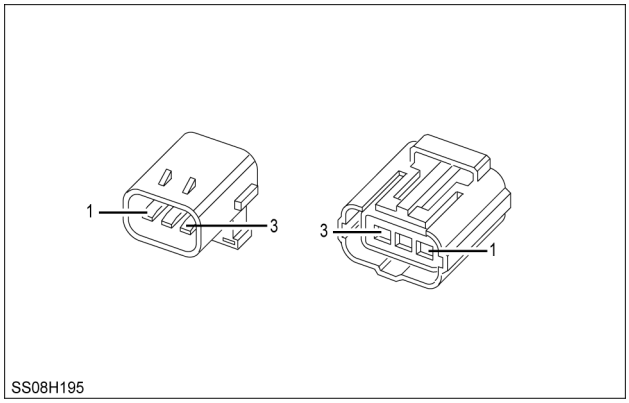
X726 ROOF CONNECTOR POWER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5200AH (N)	EDC VALVE SUPPLY
2	3186 (S)	CERES PPS IN
3	57NA (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K430 9



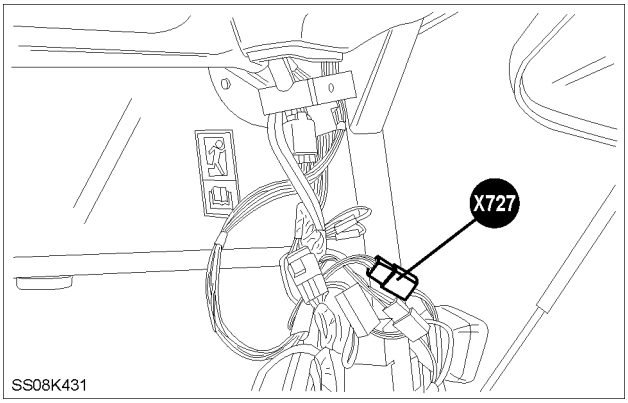
SS08H195 10

BEHIND RIGHT HAND C-PILLAR COVER

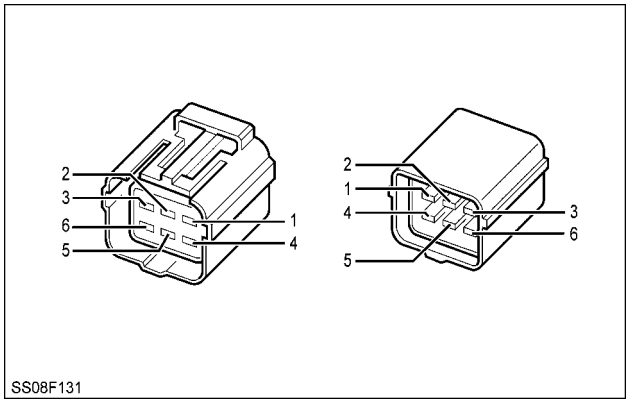
X727 ROOF CONNECTOR DATA 2

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5500AB (R)	EHR CAN HIGH
2	5510AB (U)	EHR CAN LOW
5	7640G (TN)	DIAGNOSTIC PLUG RS232 IN
6	7650G (W)	DIAGNOSTIC PLUG RS232 OUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K431 11



SS08F131 12

BEHIND RIGHT HAND C-PILLAR COVER

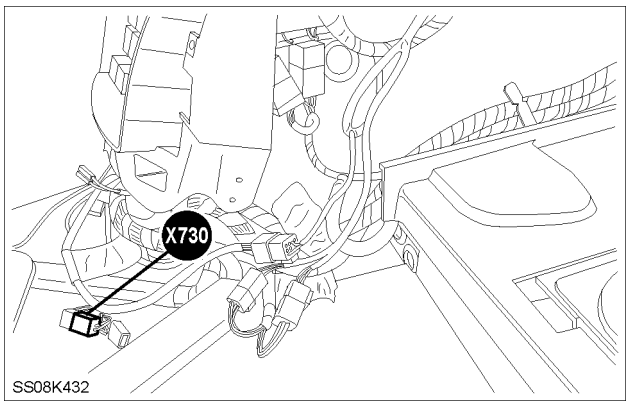
www.truck-freeworkshop.com

Connector - Component diagram 73

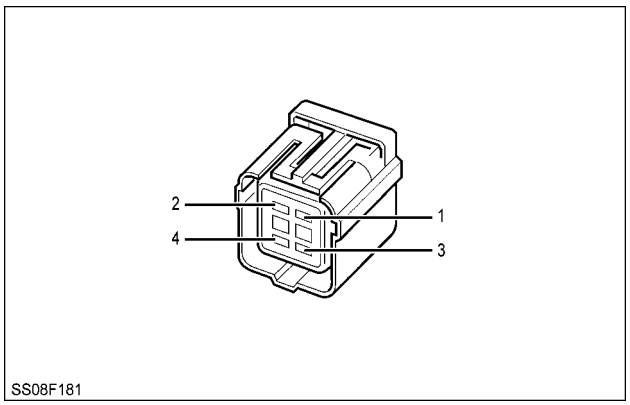
X730 MULTI CONTROL OPTION

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5400K (Y)	CAN H
2	5420K (G)	CAN L
3	5400J (Y)	CAN H
4	5420J (G)	CAN L

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K432 1



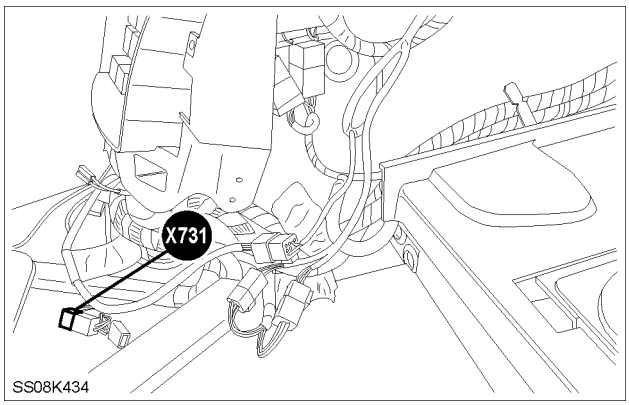
SS08F181 2

FRONT RIGHT HAND CAB FLOOR

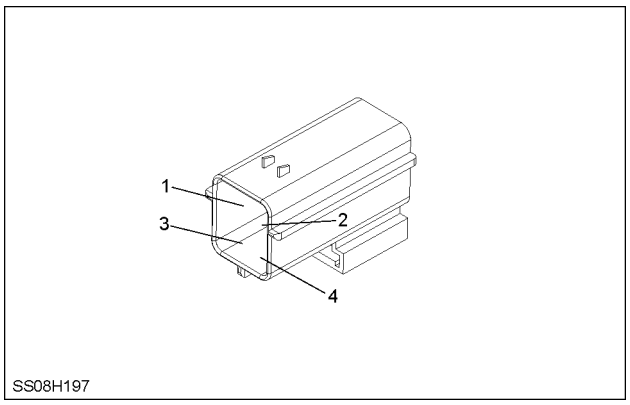
X731 MULTI CONTROL OPTION

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5400KX (Y)	CAN H
2	5420KX (G)	CAN L
3	5400WX (Y)	CAN H
4	5420WX (G)	CAN L

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K434 3



SS08H197 4

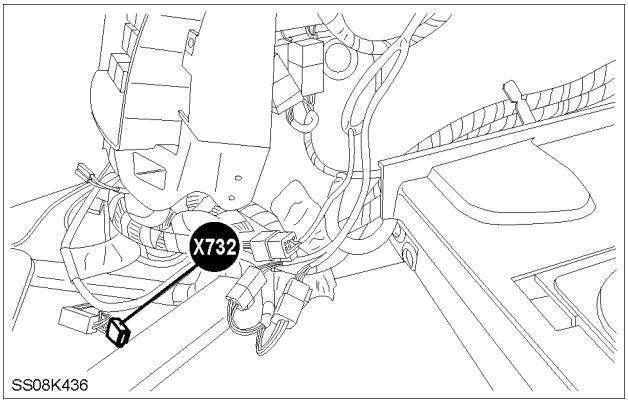
FRONT RIGHT HAND CAB FLOOR

www.truck-freeworkshop.com

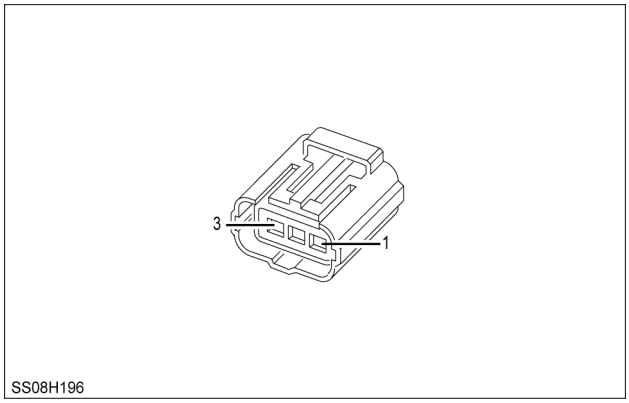
X732 CAN DOG POWER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	7000BX (U)	TRANS CONTROL SUPPLY
2	1001AE (W)	STARTER SOLENOID FEED
3	57AB (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K436 5



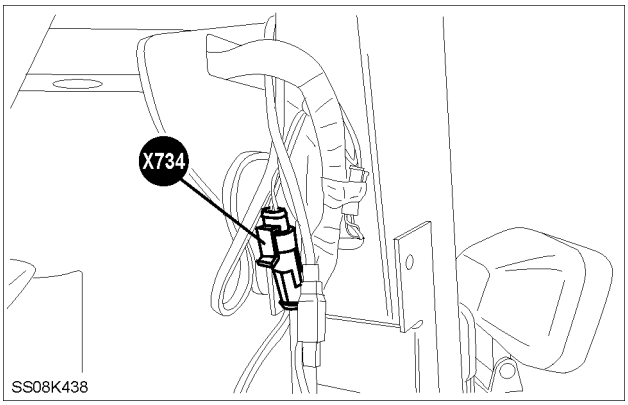
SS08H196 6

FRONT RIGHT HAND CAB FLOOR

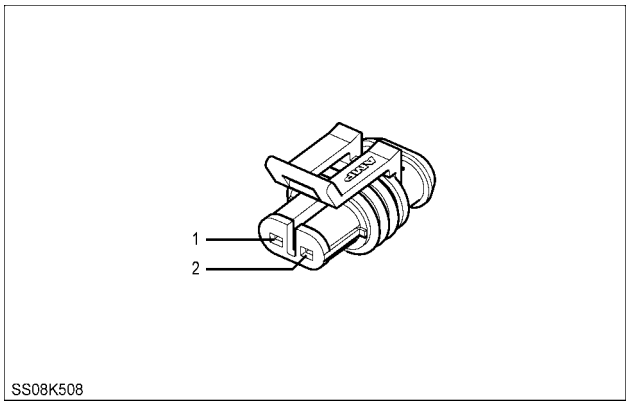
X734 LAMP FEED

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1012L (R)	ILLUMINATION
2	57PW (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K438 7



SS08K508 8

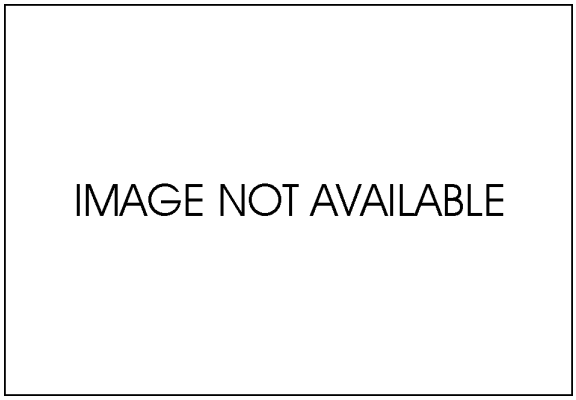
BEHIND RIGHT HAND C-PILLAR COVER

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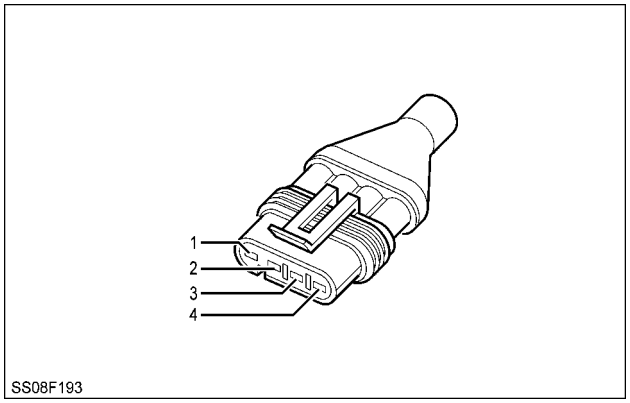
X739 REVERSIBLE FAN COMPRESSOR / VALVE

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	6327A (N)	REVERSIBLE FAN RELAY POWER OUT
2	57SD (B)	EARTH (ALL)
3	6327B (N)	REVERSIBLE FAN RELAY POWER OUT
4	57SC (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 9



SS08F193 10

LEFT HAND ENGINE

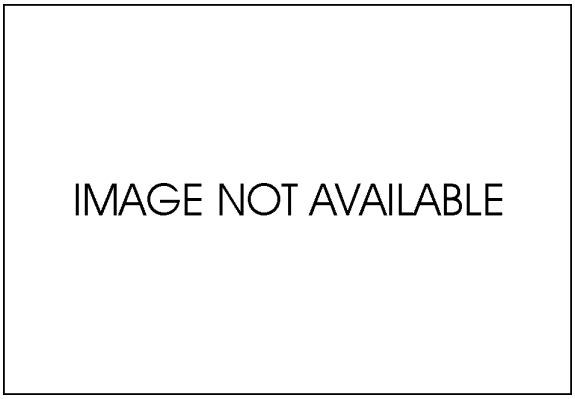
www.truck-freeworkshop.com

Connector - Component diagram 74

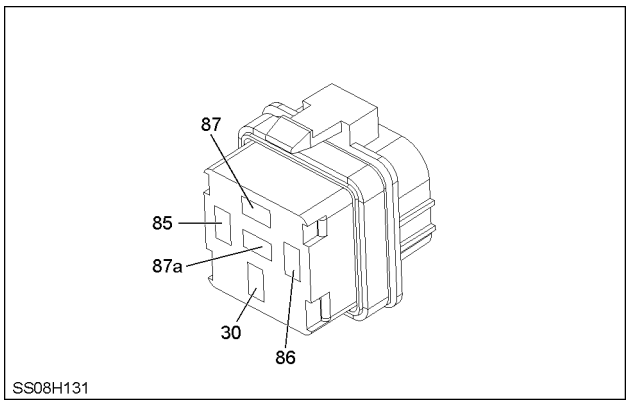
X740 REVERSIBLE FAN RELAY

POS.	WIRE NUMBER	CIRCUIT REFERENCE
30	6325A (R)	REVERSIBLE FAN OPTION - RELAY FEED
85	6325B (N)	REVERSIBLE FAN OPTION - RELAY FEED
86	6315 (G)	REVERSIBLE FAN OPTION - RELAY CONTROL
87	6327 (R)	REVERSIBLE FAN RELAY POWER OUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 1



SS08H131 2

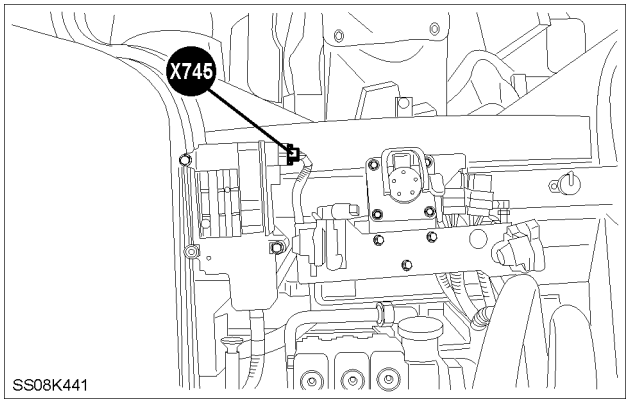
LEFT HAND ENGINE

www.truck-freeworkshop.com

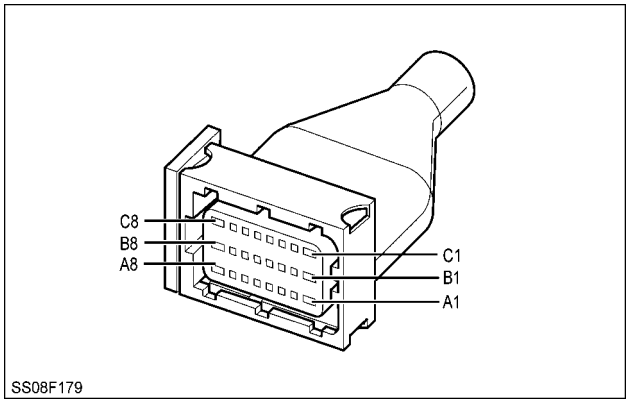
X745 ELECTRONIC PARK BRAKE INTERFACE CONN

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A1	3031 (N)	EPB +12 HOT
A2	3150A (W)	HANDBRAKE SWITCH (N.C CONTACT) OFF SIG
A4	3036 (O)	EPB SHUTTLE PARK SWITCH INPUT
A7	3017 (G)	EPB SYSTEM FAILURE WARNING LIGHT
A8	57RK (B)	EARTH (ALL)
B3	3150 (W)	HANDBRAKE SWITCH (N.C CONTACT) OFF SIG
B4	1001AG (W)	STARTER SOLENOID FEED
C1	10X (G)	IGNITION SUPPLY
C2	5400MC (Y)	CAN H
C3	5420MC (G)	CAN L
C7	3039 (U)	EPB SHUTTLE PARK SWITCH OUTPUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K441 3



SS08F179 4

REAR LEFT HAND CAB

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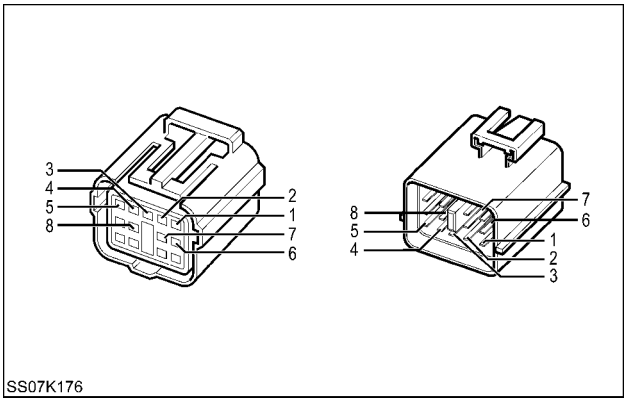
X748 ELECTRIC SHIFT PTO

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2050MY (G) / 2050AW (B)	PTO SUPPLY / DOG SUPPLY
2	5020Z (TN) / 5020AB (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
3	2151 (K)	EPTO DRIVE RELAY UPPER SPEED
4	2152 (K)	ESPTO DRIVE RELAY LOWER SPEED
5	2155 (N)	ESPTO ACTUATOR POWER +12V
6	60BY (B/W)	SENSOR GROUND
7	2156 (N)	ESPTO ACTUATOR POS SIGNAL
8	2157 (U) / 2157 (N)	ESPTO NEUTRAL
9	2158 (U)	ESPTO LOWER SPEED
10	2159 (U)	PTO UPPER SPEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

IMAGE NOT AVAILABLE

INA 5



SS07K176 6

BEHIND RIGHT HAND TRIM TOP THE FUSEBOX

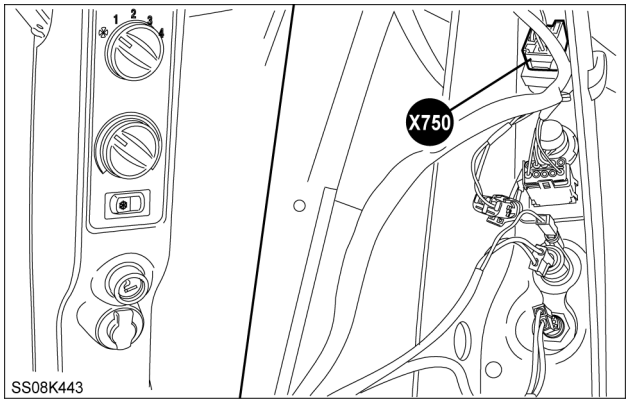
www.truck-freeworkshop.com

Connector - Component diagram 75

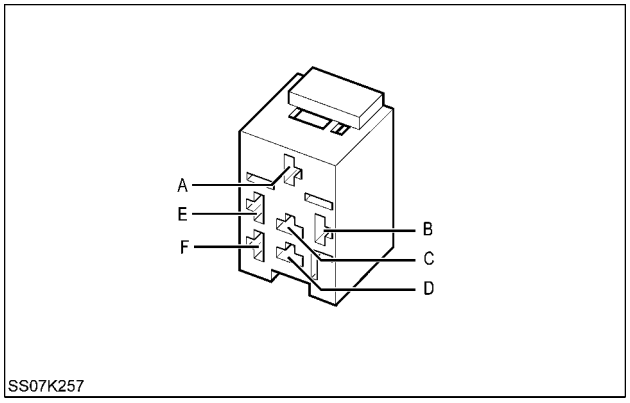
X750 HEATER BLOWER SEED SWITCH H.V.A.C. ATC

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	9228 (G/S)	AC-AUTOMATIC BLOWER SPEED
B	9211 (G/Y)	AC-BLOWER SPEED LOW (1)
C	9212 (K/G)	AC-BLOWER SPEED MED.1 (2)
D	9213 (K/O)	AC-BLOWER SPEED MED.2 (3)
E	9227 (B/W)	AC-BLOWER SWITCH SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K443 1



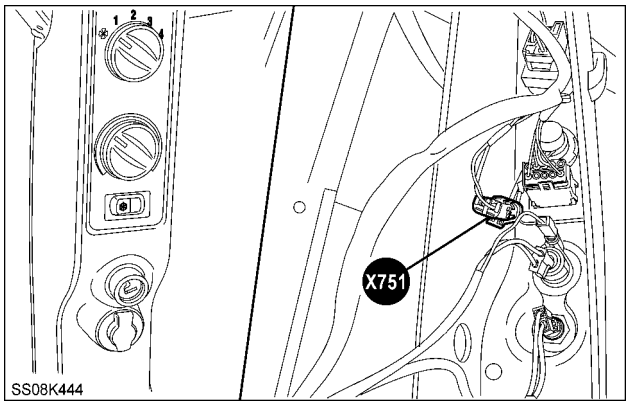
SS07K257 2

CAB LEFT HAND C-PILLAR

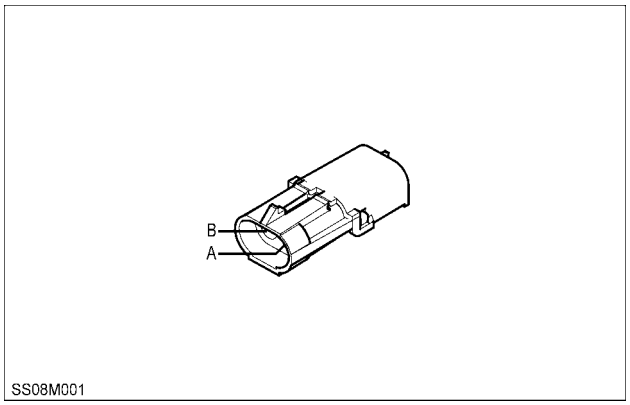
X751 POTENTIOMETER TEMPERATURE ADJUSTMENT H.V.A.C ATC

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	9216 (LG/R)	AC-TEMPERATURE POTI CAB
B	57ZN (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K444 3



SS08M001 4

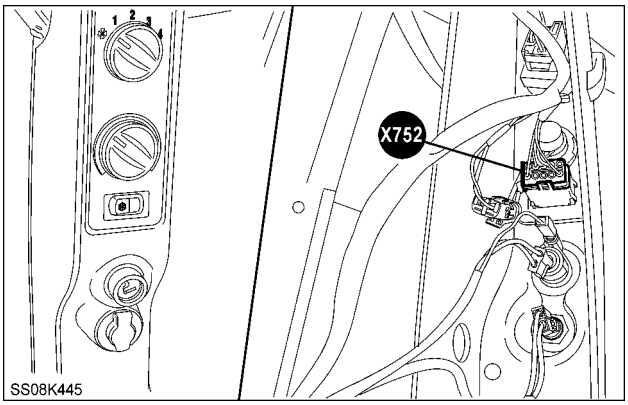
CAB LEFT HAND C-PILLAR

www.truck-freeworkshop.com

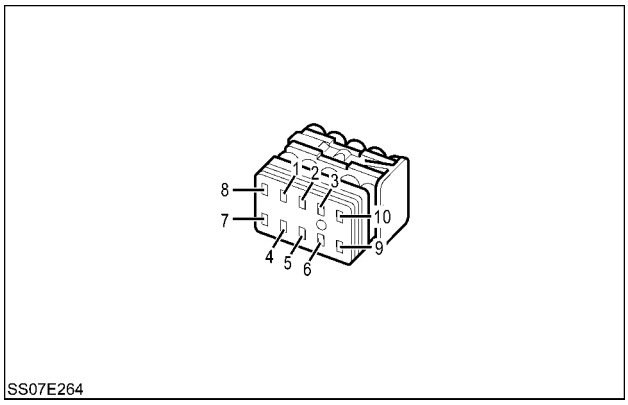
X752 AIR CONDITION MODE SWITCH H.V.A.C ATC

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	9217 (N/R)	AC-SWITCH MAX DEFROST
2	982E (R)	BLOWER MOTOR FEED
3	9218 (S/R)	AC-SWITCH ECONOMY
7	57 ZM (B)	EARTH (ALL)
9	57ZL (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K445 5



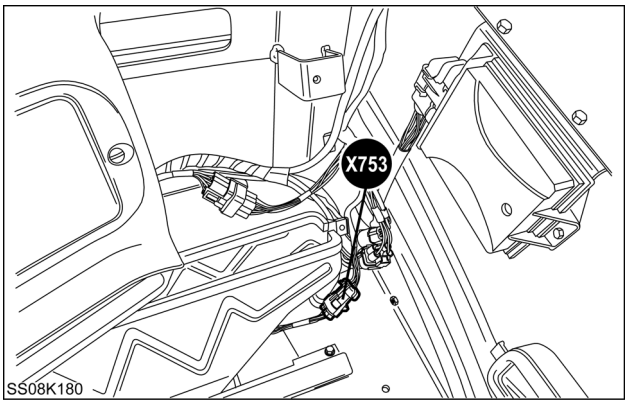
SS07E264 6

CAB LEFT HAND C-PILLAR

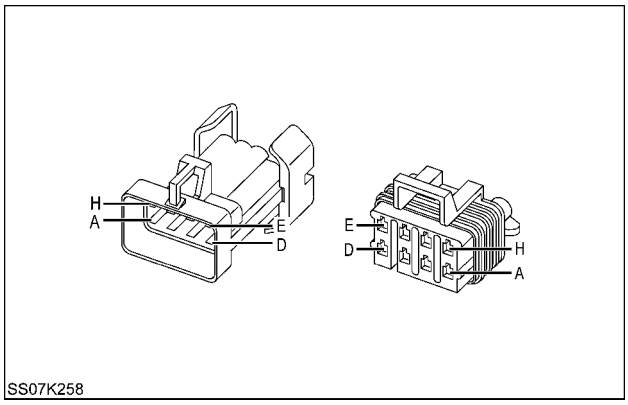
X753 ASSEMBLY H.V.A.C ATC

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	9222 (Y/B)	AC-SIGNAL OUTLET TEMPERATURE SENSOR
B	9221 (L/B)	AC-EVAPORATOR TEMPERATURE SENSOR
C	9220 (U)	AC-LOW PRESSURE SWITCH INPUT
D	57ZH (B)	EARTH (ALL)
E	982D (R)	BLOWER MOTOR FEED
F	9226 (Y/R)	AC-SIGNAL WATER VALVE
G	9219 (U/W)	AC-LOW PRESSURE SWITCH OUTPUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K180 7



SS07K258 8

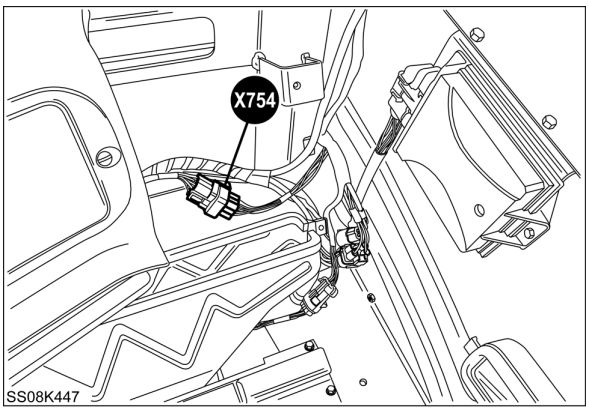
CAB REAR LEFT HAND

www.truck-freeworkshop.com

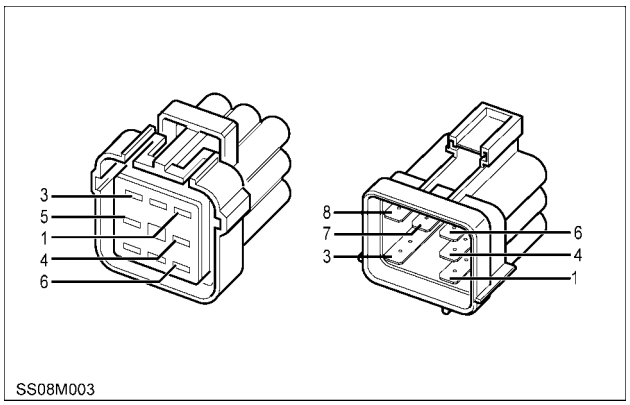
X754 BLOWER MOTOR ASSEMBLY H.V.A.C ATC

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	982 (R)	BLOWER MOTOR FEED
3	57ZD (B)	EARTH (ALL)
4	9225 (U/R)	AC-BLOWER SPEED
6	9224 (O/B)	AC-SIGNAL AMBIENT TEMPERATURE SENSOR
7	9223 (R/B)	AC-SIGNAL CAB TEMPERATURE SENSOR
8	57ZC (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K447 9



SS08M003 10

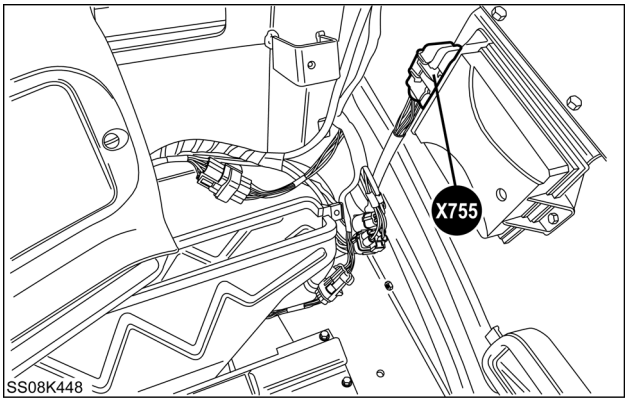
CAB REAR LEFT HAND

www.truck-freeworkshop.com

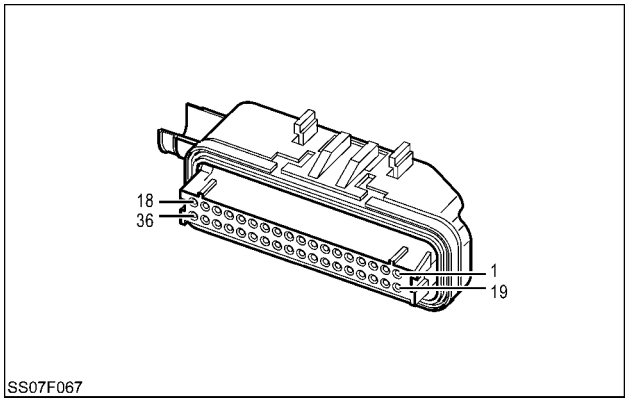
X755 AUTOMATIC TEMPERATURE CONTROL H.V.A.C

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	(G)	CAN L
2	(Y)	CAN H
3	9226 (Y/R)	AC-SIGNAL WATER VALVE
4	982G (W/R)	BLOWER MOTOR FEED
5	9225 (U/R)	AC-BLOWER SPEED
6	982 (U/R)	BLOWER MOTOR FEED
15	2005 (L/R)	AIR CON CLUCH RELAY
16	9229 (O/R)	AC-DE-FOG
17	982J (R)	BLOWER MOTOR FEED
18	57ZE (B)	EARTH (ALL)
21	9223 (R/B)	AC-SIGNAL CAB TEMPERATURE SENSOR
22	9222 (Y/B)	AC-SIGNAL OUTLET TEMPERATURE SENSOR
23	9221 (L/B)	AC-EVAPORATOR TEMPERATURE SENSOR
24	9224 (O/B)	AC-SIGNAL AMBIENT TEMPERATURE SENSOR
25	9217 (N/R)	AC-SWITCH MAX DEFROST
26	9218 (S/R)	AC-SWITCH ECONOMY
27	9228 (G/S)	AC-AUTOMATIC BLOWER SPEED
28	9211 (G/Y)	AC-BLOWER SPEED LOW (1)
29	9216 (LG/R)	AC-TEMPERATURE POTI CAB
30	9212 (K/G)	AC-BLOWER SPEED MED.1 (2)
31	9213 (K/O)	AC-BLOWER SPEED MED.2 (3)
33	2006A (W)	DE-ICING SWITCH - AIR CONDITIONER
34	2006B (W/U)	DE-ICING SWITCH - AIR CONDITIONER
35	9220 (U)	AC-LOW PRESSURE SWITCH INPUT
36	9219 (U/W)	AC-LOW PRESSURE SWITCH OUTPUT

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K448 11



SS07F067 12

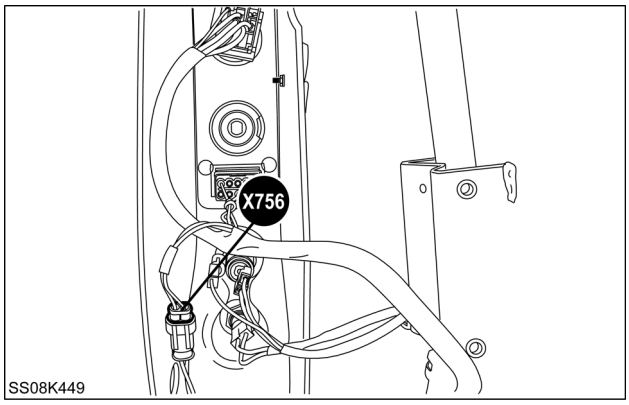
CAB REAR LEFT HAND

www.truck-freeworkshop.com

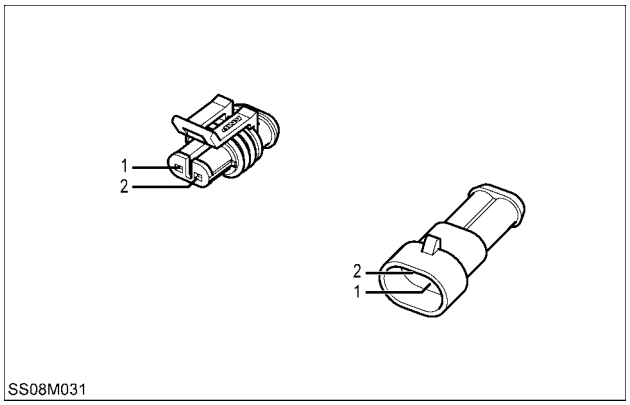
X756 LOW PRESSURE SWITCH H.V.A.C SYSTEM MANUAL

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	9215 (U) / (U/K)	AC-SWITCH ON
2	2006A (L) / (U/R)	DE-ICING SWITCH - AIR CONDITIONER

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K449 13



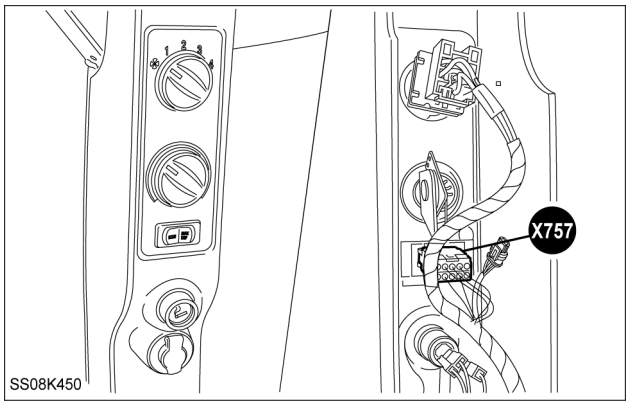
SS08M031 14

CAB LEFT HAND C-PILLAR

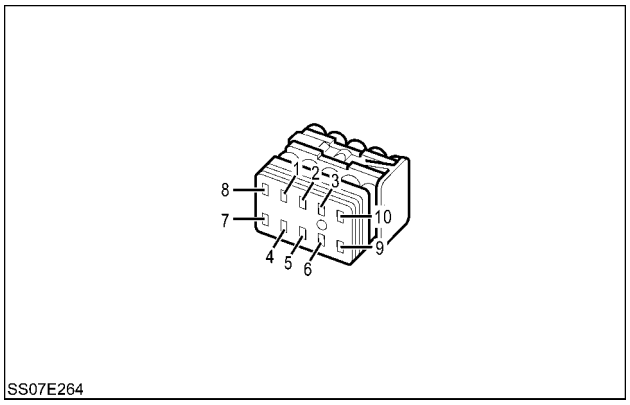
X757 OPERATING MODE SWITCH H.V.A.C SYSTEM MANUAL

POS.	WIRE NUMBER	CIRCUIT REFERENCE
2	9210 (G)	AC-SWITCH POWER
3	9215 (U)	AC-SWITCH ON
7	57A (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K450 15



SS07E264 16

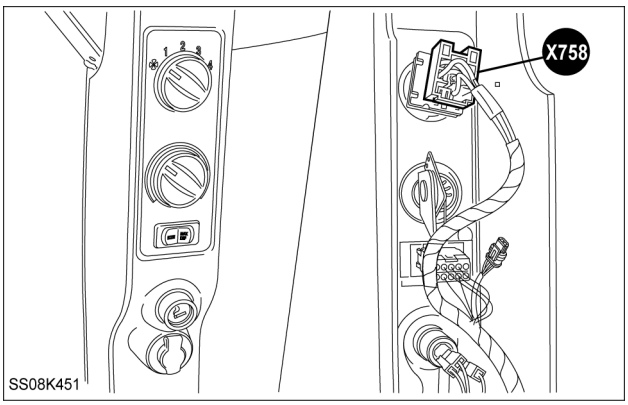
CAB LEFT HAND C-PILLAR

www.truck-freeworkshop.com

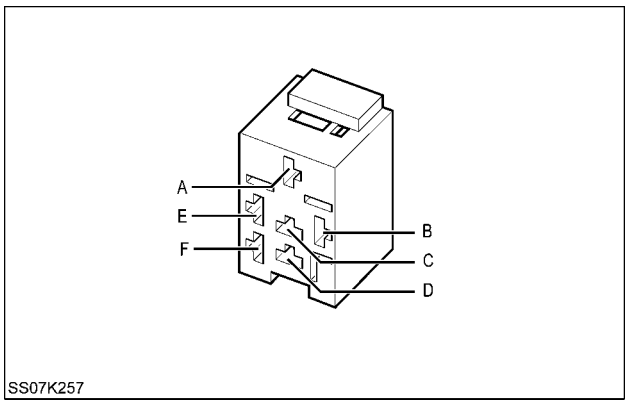
X758 BLOWER SPEED SWITCH H.V.A.C SYSTEM MANUAL

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A	9211 (G/Y)	AC-BLOWER SPEED LOW (1)
B	9212 (K)	AC-BLOWER SPEED MED.1 (2)
C	9213 (K/O)	AC-BLOWER SPEED MED.2 (3)
D	9214 (G/S)	AC-BLOWER SPEED HIGH.2 (2)
E	982A (R)	BLOWER MOTOR FEED
F	9210 (G)	AC-SWITCH POWER

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K451 17



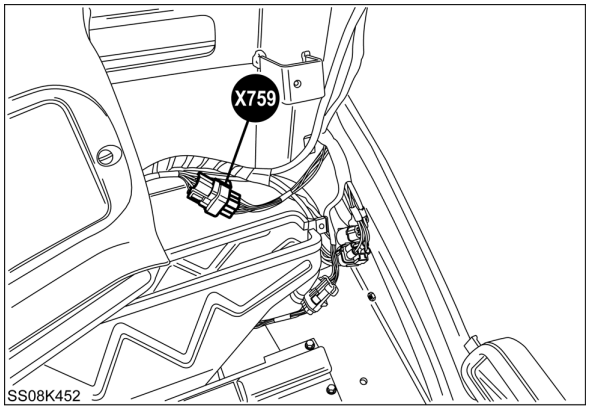
SS07K257 18

CAB LEFT HAND C-PILLAR

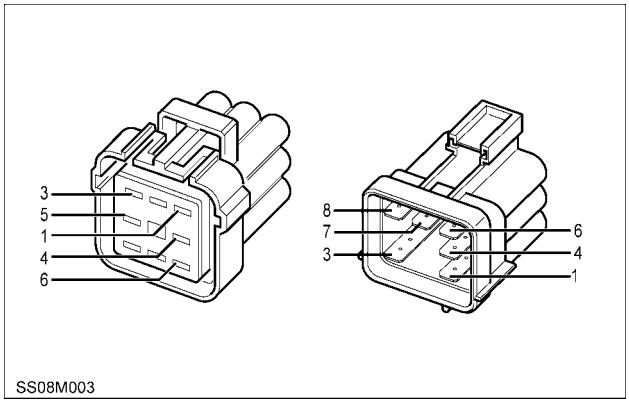
X759 BLOWER MOTOR H.V.A.C MANUAL SYSTEM

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57B (B)	EARTH (ALL)
3	9211 (G/Y)	AC-BLOWER SPEED LOW (1)
4	9212 (K)	AC-BLOWER SPEED MED.1 (2)
5	9213 (K/O)	AC-BLOWER SPEED MED.2 (3)
8	9214 (G/S)	AC-BLOWER SPEED HIGH.2 (2)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K452 19



SS08M003 20

CAB REAR LEFT HAND

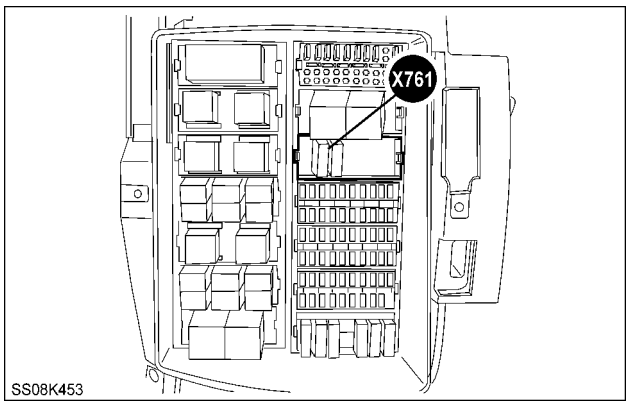
www.truck-freeworkshop.com

Connector - Component diagram 76

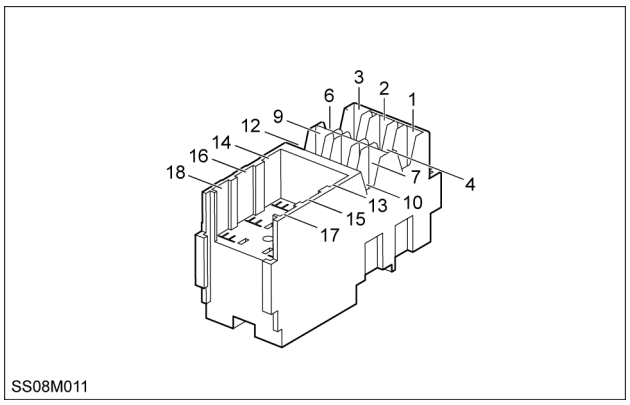
X761 MAXI FUSEHOLDER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
13	150BG (N)	BATTERY FEED (UNFUSED)(ALL)
14	150BJ (N)	BATTERY FEED (UNFUSED)(ALL)
15	150BH (N)	BATTERY FEED (UNFUSED)(ALL)
16	150BK (N)	BATTERY FEED (UNFUSED)(ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K453 1



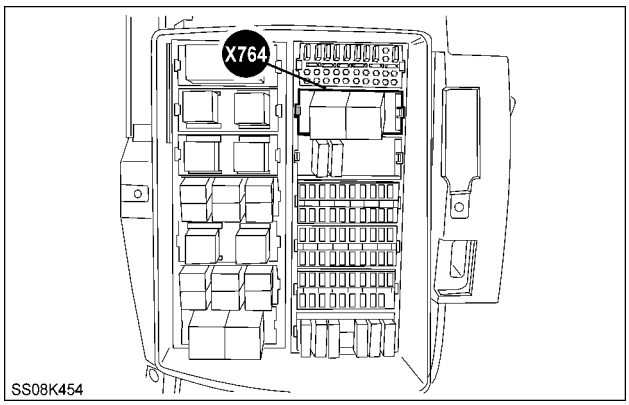
SS08M011 2

FRONT RIGHT HAND CAB

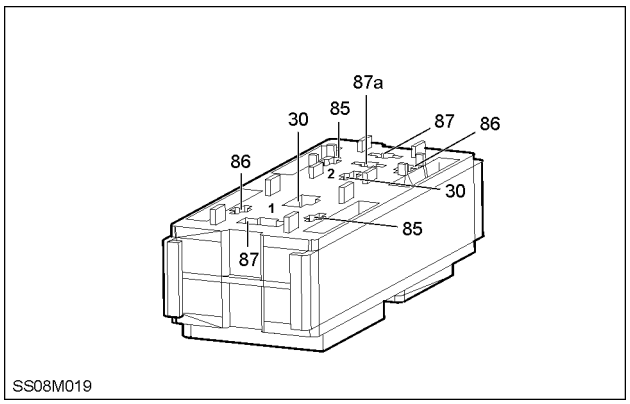
X764 FRONT SCREEN HEATER RELAY

POS.	WIRE NUMBER	CIRCUIT REFERENCE
A30	150BK (N)	BATTERY FEED (UNFUSED)(ALL)
A85	57RZ (B)	EARTH (ALL)
A86	1085 (N)	FRONT SCREEN HEATER RELAY CONTROL
A87	1082 (Y)	REAR SCREEN HEATER
B30	150BJ (N)	BATTERY FEED (UNFUSED)(ALL)
B85	57RY (B)	EARTH)ALL)
B86	1086 (N)	REAR SCREEN HEATER RELAY CONTROL
B87	1080 (R)	FRONT SCREEN HEATER

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K454 3



SS08M019 4

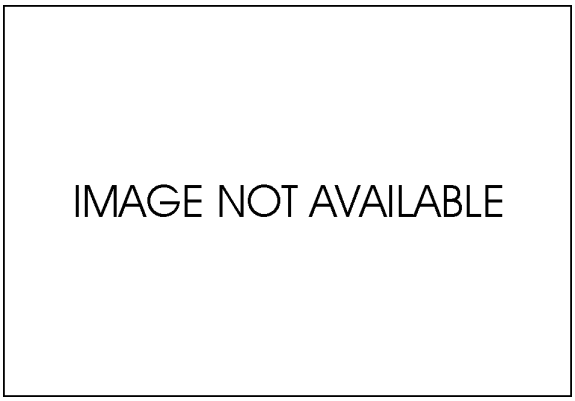
FRONT RIGHT HAND CAB

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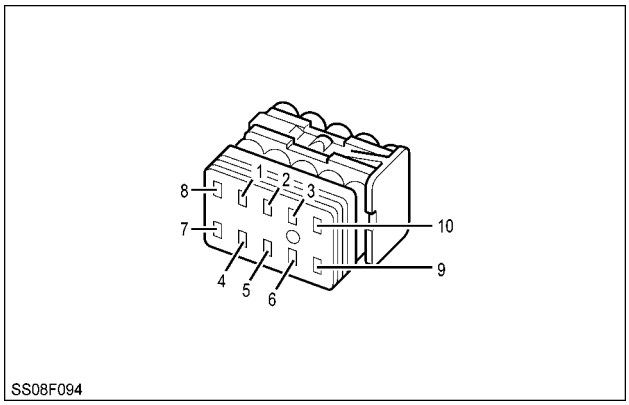
X766 SCREEN HEATER SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1085 (N)	FRONT SCREEN HEATER RELAY CONTROL
2	1006D (N)	ALTERNATOR WARNING LAMP
3	1086 (N)	REAR SCREEN HEATER RELAY CONTROL
7	57SA (B)	EARTH (ALL)
9	57SB (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 5



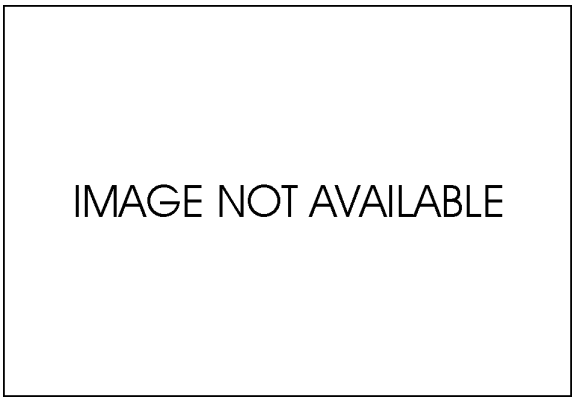
SS08F094 6

RIGHT HAND C-PILLAR

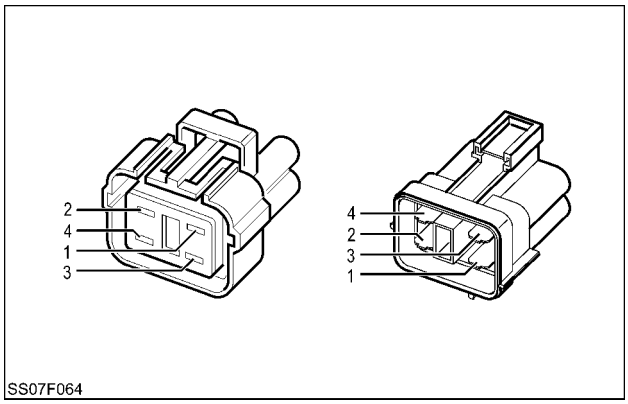
X767 SCREEN HEATER ROOF CONNECTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1080A (R)	FRONT SCREEN HEATER
2	1080B (R)	FRONT SCREEN HEATER
3	1082A (Y)	REAR SCREEN HEATER
4	1082B (Y)	REAR SCREEN HEATER

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 7



SS07F064 8

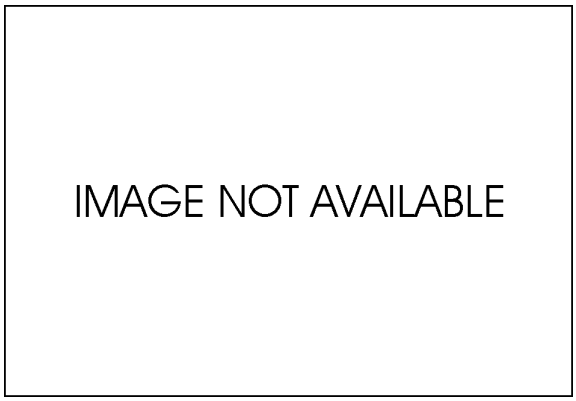
LEFT HAND C-PILLAR

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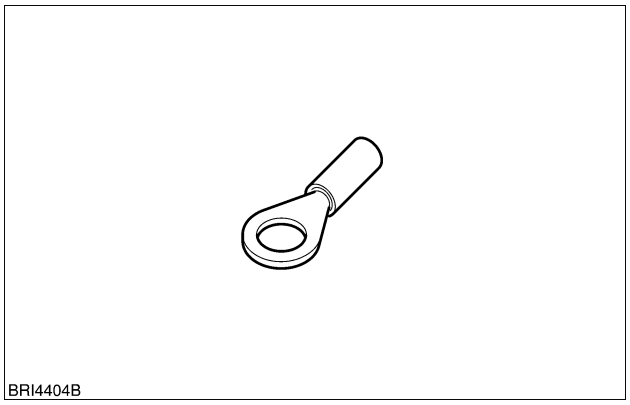
X768 MAIN EARTH POINT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57RX (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 9



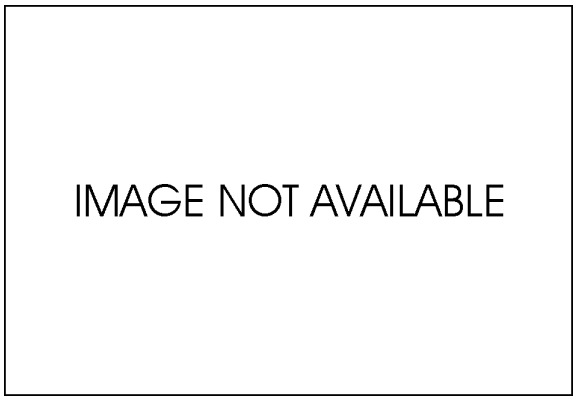
BRI4404B 10

TOP LEFT HAND C-PILLAR

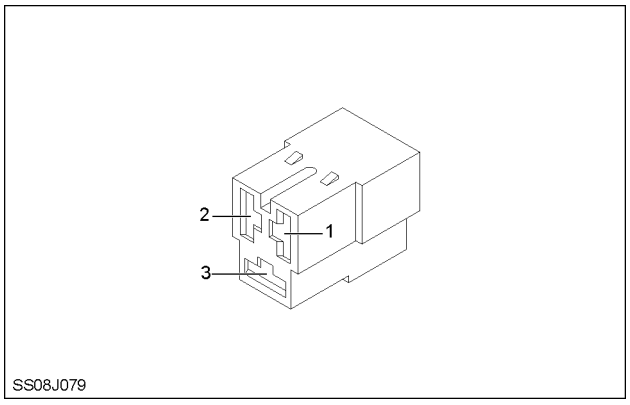
X769 REAR SCREEN HEATER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1082A (Y)	REAR SCREEN HEATER
2	1082B (Y)	REAR SCREEN HEATER
3	57TY (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 11



SS08J079 12

REAR CAB ROOF

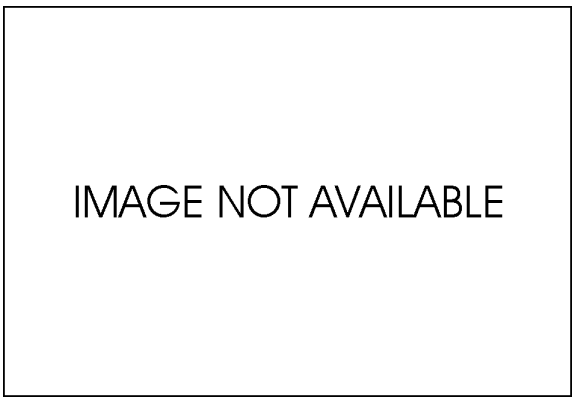
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Connector - Component diagram 77

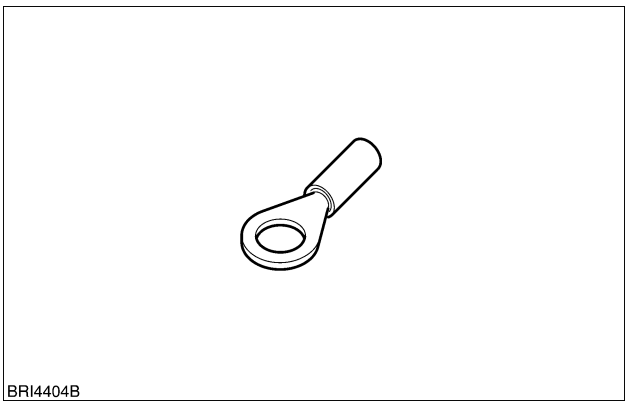
X770 EARTH CONNECTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57TX (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 1



BRI4404B 2

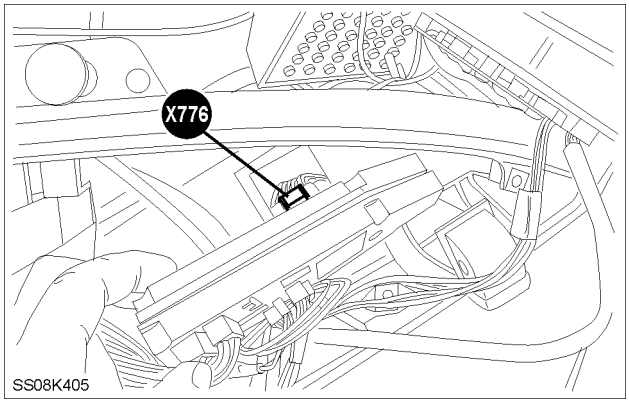
LEFT HAND C PILLAR

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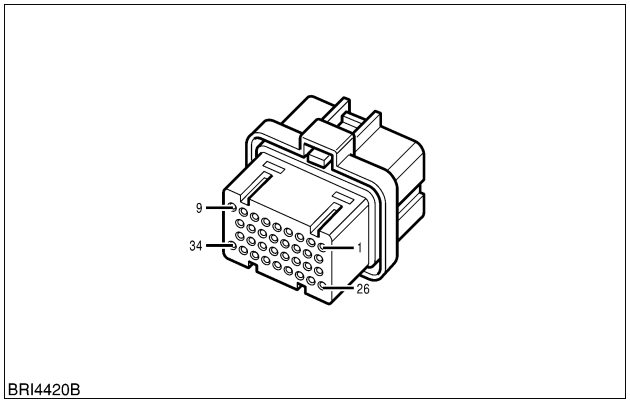
X776 ARMREST (GARU)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5200AT (N)	EDC VALVE SUPPLY
2	7000BM (U)	TRANS CONTROL SUPPLY
4	2250S (K)	PTO FRONT - SUPPLY
5	2045 (O)	PTO SWITCH TO MODULE
6	2046 (O)	PTO SWITCH (VCC)
7	2248 (K)	PTO FRONT - SWITCH (VCCS)
8	2245 (K)	PTO FRONT - SWITCH TO MODULE (MOM)
9	2065 (N)	PTO ENGAGED
10	2270 (O)	PTO FRONT - WARNING LAMP
11	5910 (Y)	ISO BUS CAN SIGNAL HIGH
12	5900 (G)	ISO BUS CAN SIGNAL LOW
13	5910F (Y)	ISO BUS CAN SIGNAL HIGH
14	5900F (G)	ISO BUS CAN SIGNAL LOW
18	5400E (Y)	CAN H
19	5420E (G)	CAN L
21	5400G (Y)	CAN H
22	5420G (G)	CAN L
23	5500B (R)	EHR CAN HIGH
24	5510B (U)	EHR CAN LOW
26	5500D (R)	EHR CAN HIGH
27	5510D (U)	EHR CAN LOW
30	5955C (S)	RS232 INPUT TECU
31	5960C (W)	RS232 OUTPUT TECU
32	57RE (B)	EARTH (ALL)
33	57RF (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K405 3



BRI4420B 4

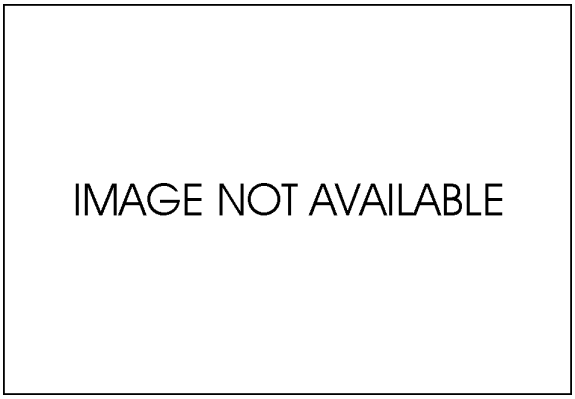
LEFT HAND C PILLAR

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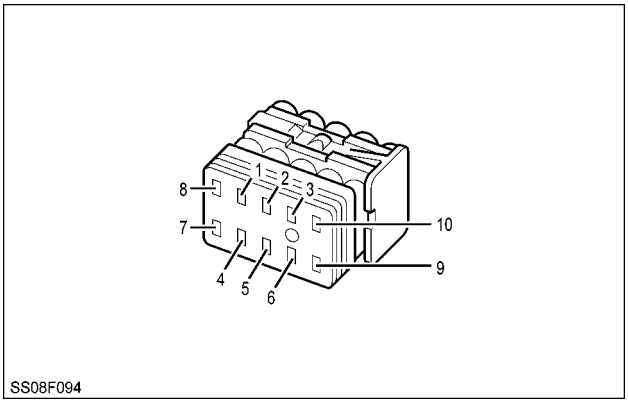
X777 SWITCH ADJUST MOTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	181R (W)	BLOWER MOTOR FEED
2	57D (G)	EARTH (ALL)
3	57B (B)	EARTH (ALL)
4	57C (B)	EARTH (ALL)
5	181T (L)	BLOWER MOTOR FEED
6	181N (W)	BLOWER MOTOR FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 5



SS08F094 6

LEFT HAND ON GARU

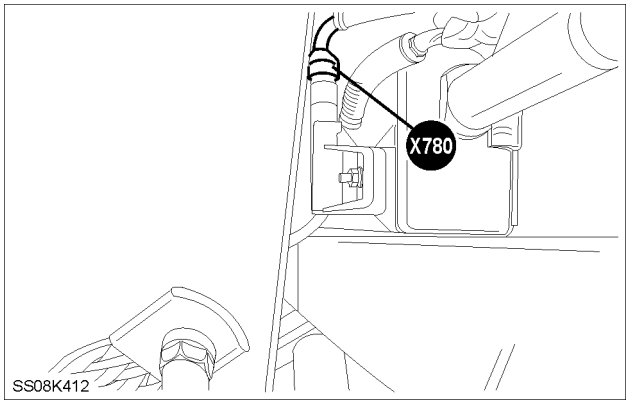
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Connector - Component diagram 78

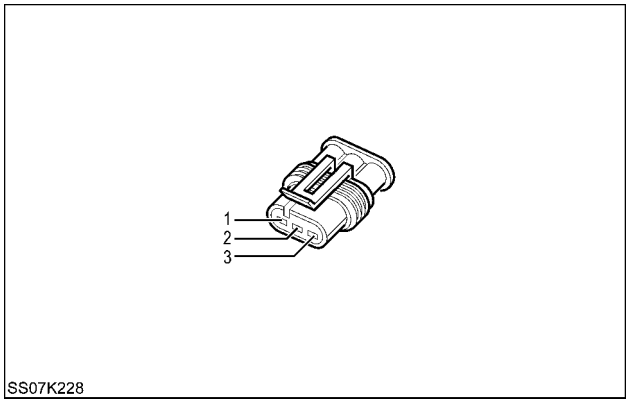
X780 REAR PTO SHIFT POSITION SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	60BY (B/W)	SENSOR GROUND
2	5020AB (TN)	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
3	2156 (N)	ESPTO ACTUATOR POS SIGNAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K412 1



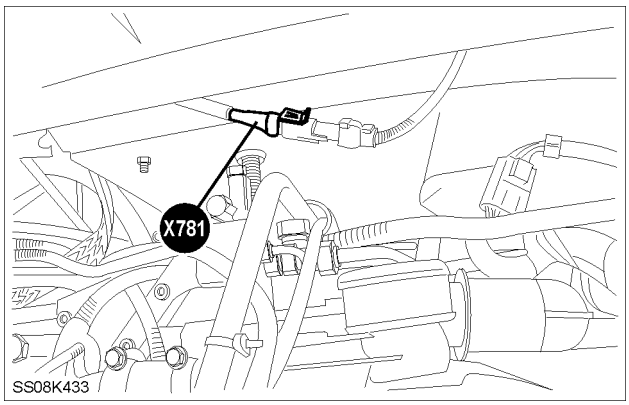
SS07K228 2

REAR RIGHT HAND UNDERSIDE OF CAB

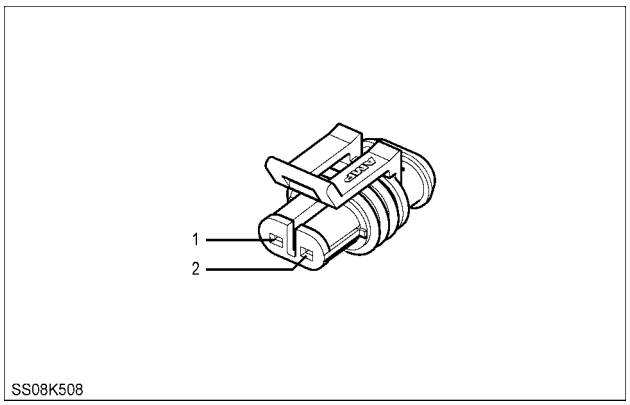
X781 ACTUATOR PTO SHIFT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2154 (N)	ESPTO ACTUATOR LOWER SPEED
2	2153 (R)	ESPTO ACTUATOR UPPER SPEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K433 3



SS08K508 4

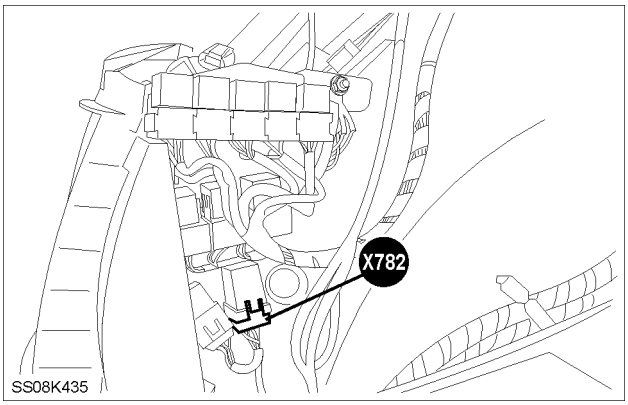
REAR RIGHT HAND UNDERSIDE OF CAB

www.truck-freeworkshop.com

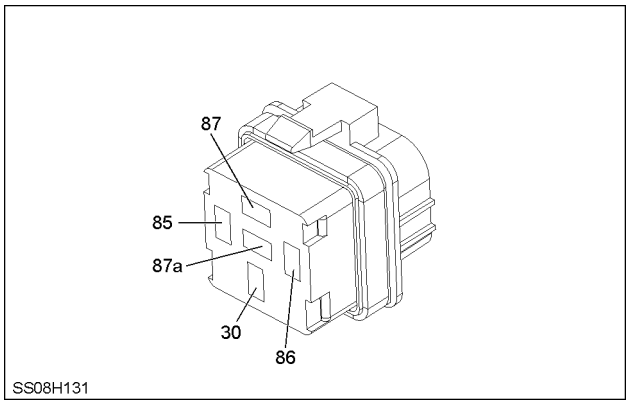
X782 ESPTO DRIVE UPPER SPEED RELAY

POS.	WIRE NUMBER	CIRCUIT REFERENCE
30	2153 (R)	ESPTO ACTUATOR UPPER SPEED
85	2050BA (G)	PTO SUPPLY / DOG SUPPLY
86	2151 (K)	EPTO DRIVE RELAY UPPER SPEED
87A	2155A (N)	ESPTO ACTUATOR POWER +12V
87	2050AY (G)	PTO SUPPLY / DOG SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K435 5



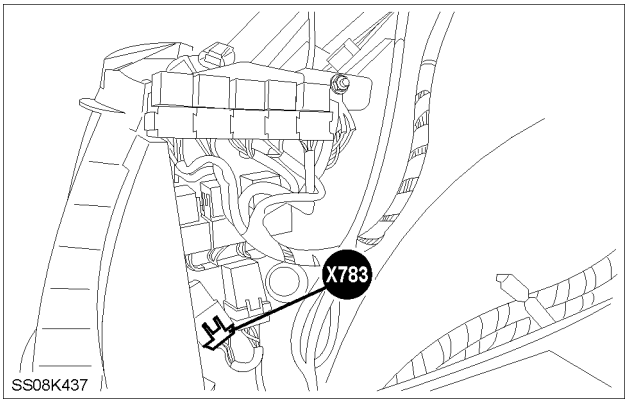
SS08H131 6

BEHIND RIGHT HAND TRIM

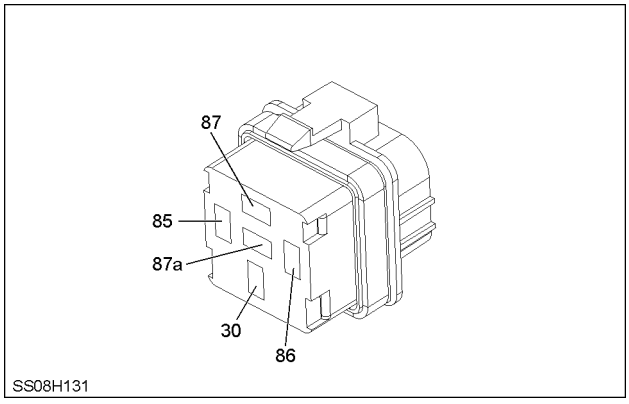
X783 ESPTO DRIVE LOWER SPEED RELAY

POS.	WIRE NUMBER	CIRCUIT REFERENCE
30	2154 (N)	ESPTO ACTUATOR LOWER SPEED
85	2050BB (G)	PTO SUPPLY / DOG SUPPLY
86	2152 (K)	ESPTO DRIVE RELAY LOWER SPEED
87A	2155B (N)	ESPTO ACTUATOR POWER +12V
87	2050AZ (G)	PTO SUPPLY / DOG SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K437 7



SS08H131 8

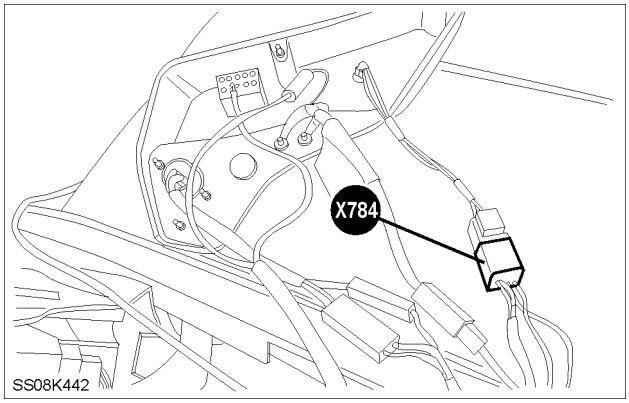
BEHIND RIGHT HAND TRIM

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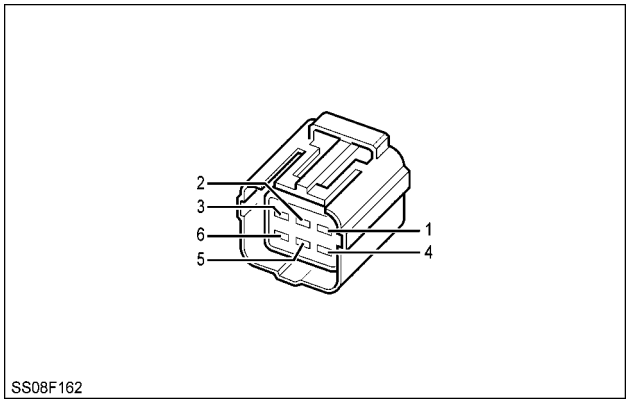
X784 PTO SPEED SELECT SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2050BC (G)	PTO SUPPLY / DOG SUPPLY
2	2159 (U)	ESPTO UPPER SPEED
3	2158 (U)	ESPTO LOWER SPEED
6	2157 (N)	ESPTO NEUTRAL

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K442 9



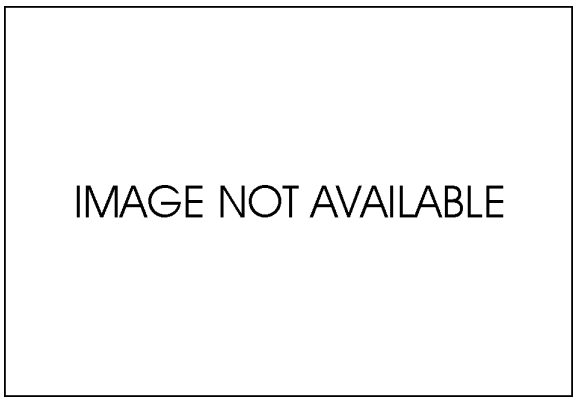
SS08F162 10

BEHIND RIGHT HAND SWITCH PANEL

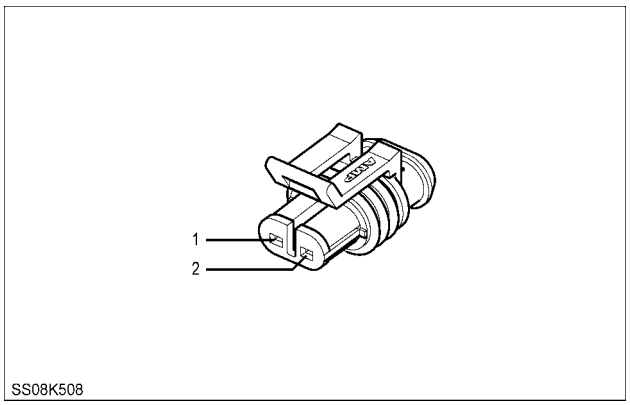
X787 CONNECTOR ADJUST MOTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	181S (L)	BLOWER MOTOR FEED
2	57E (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 11



SS08K508 12

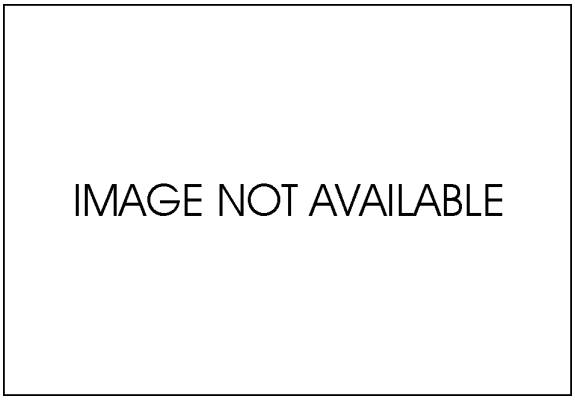
IN GARU

www.truck-freeworkshop.com

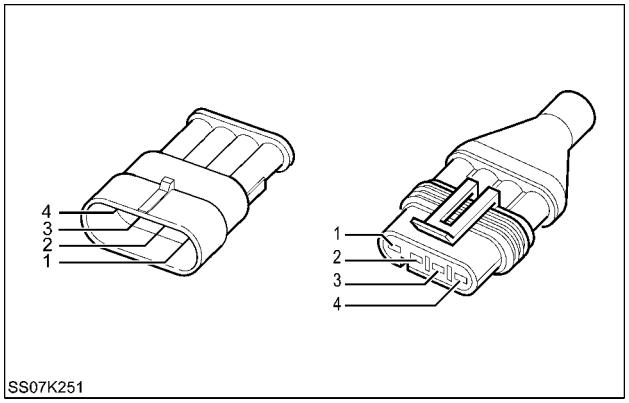
X788 ELECTRIC ADJUST MOTOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	181P (W) / 181M (W)	BLOWER MOTOR FEED
2	57 (B) / 57A (B)	EARTH (ALL)
3	57E (G) / 57D (G)	EARTH (ALL)
4	181T (L) / 181D (L)	BLOWER MOTOR FEED

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 13



SS07K251 14

IN GARU

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Connector - Component diagram 80

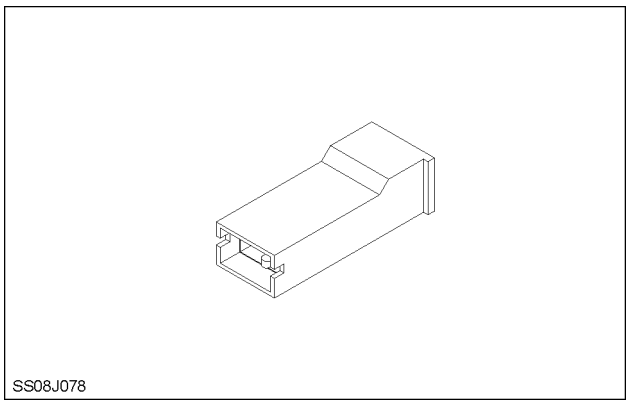
X800 FRONT SCREEN HEATER A+

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1080A (R)	FRONT SCREEN HEATER

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

IMAGE NOT AVAILABLE

INA 1



SS08J078 2

FRONT CAB

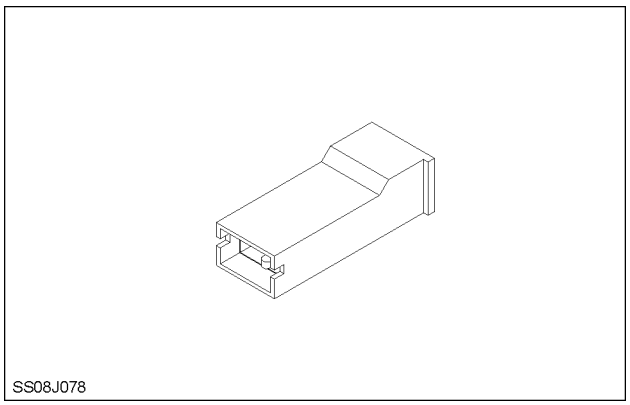
X801 FRONT SCREEN HEATER A-

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57VA (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

IMAGE NOT AVAILABLE

INA 3



SS08J078 4

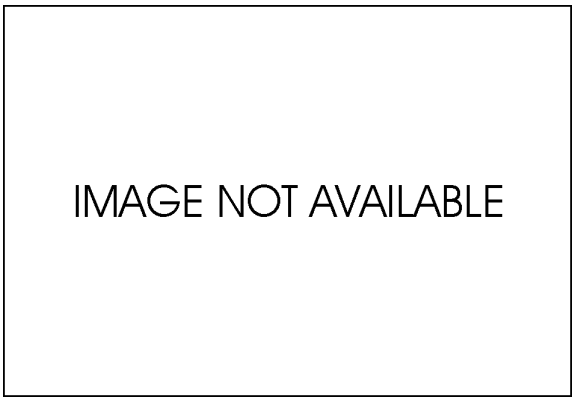
FRONT CAB

www.truck-freeworkshop.com

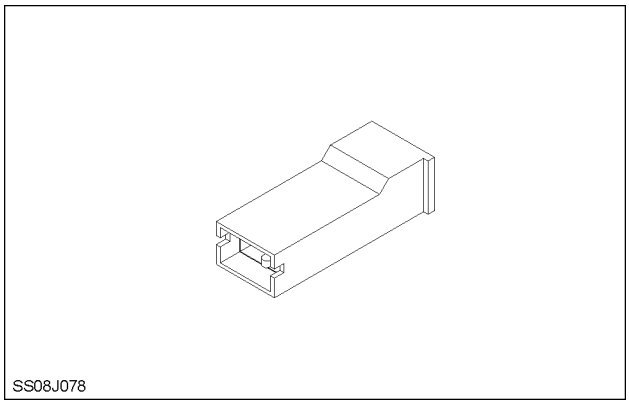
X802 FRONT SCREEN HEATER B+

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1080B (R)	FRONT SCREEN HEATER

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 5



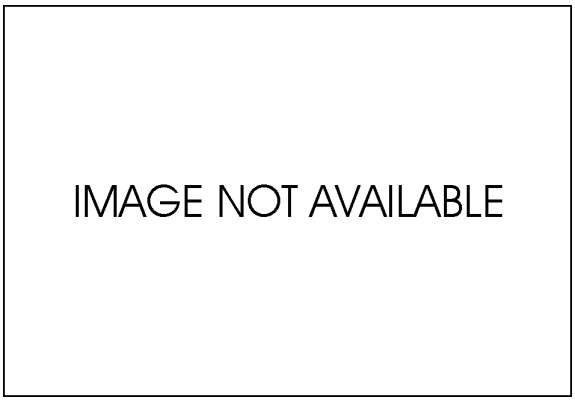
SS08J078 6

FRONT CAB

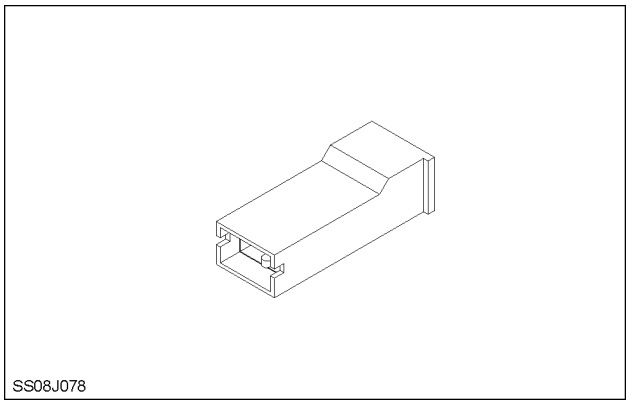
X803 FRONT SCREEN HEATER B-

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57TZ (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 7



SS08J078 8

FRONT CAB

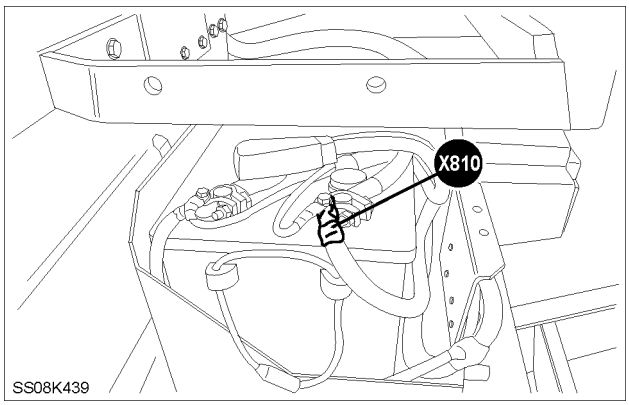
www.truck-freeworkshop.com

Connector - Component diagram 81

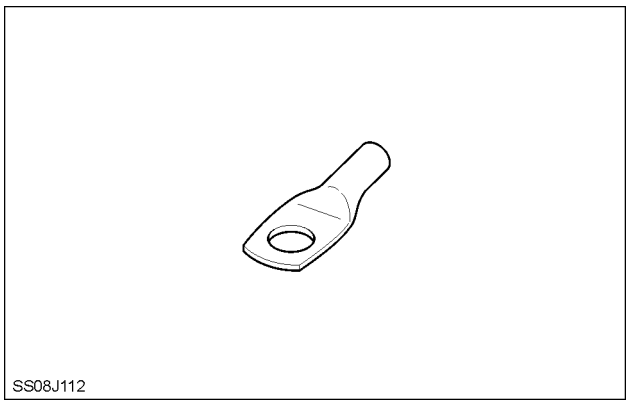
X810 BATTERIE TO CAB. MINUS SUPPLY

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	57 (B)	EARTH (ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K439 1



SS08J112 2

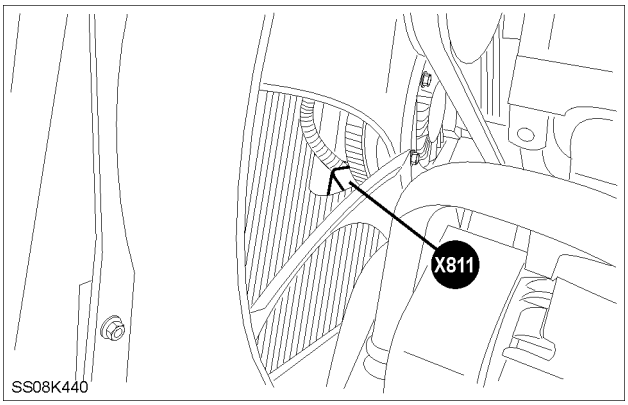
RIGHT HAND BEHIND STEPS

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X811 VISTRONIC FAN

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	6300 (N)	FAN SPEED
2	57U (B)	EARTH (ALL)
3	57V (B)	EARTH (ALL)
4	6330 (N)	VISTRONIC FAN INPUT
5	6320 (N)	FAN 5V REF.

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K440 3

IMAGE NOT AVAILABLE

INA 4

FRONT LEFT HAND ENGINE

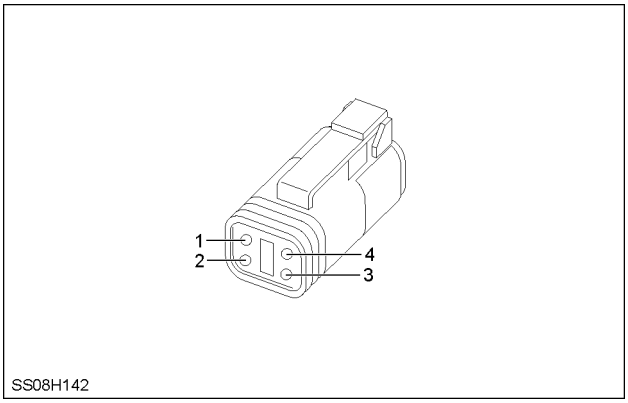
X812 ISO BUS BREAK AWAY FRONT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5920E (R)	ISO BUS CAN SUPPLY POSITIVE
2	5900E (Y)	ISO BUS CAN SIGNAL LOW
3	5915E (B)	ISO BUS CAN SUPPLY GROUND
4	5910E (G)	ISO BUS CAN SIGNAL HIGH

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

IMAGE NOT AVAILABLE

INA 5



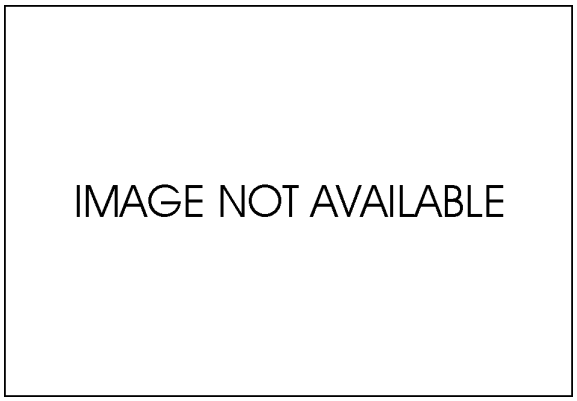
SS08H142 6

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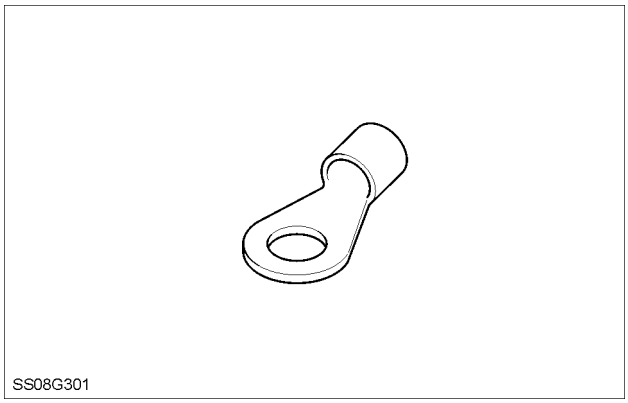
X813 POWER FUSE PF 6 ISO BUS FRONT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150AT (N)	BATTERY FEED (UNFUSED)(ALL)
1	150AW (N)	BATTERY FEED (UNFUSED)(ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 7



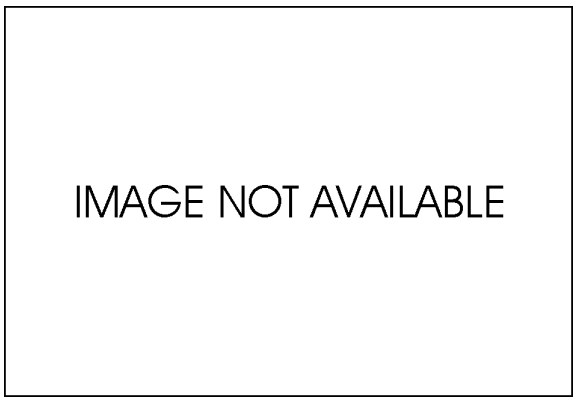
SS08G301 8

RIGHT HAND BEHIND STEPS

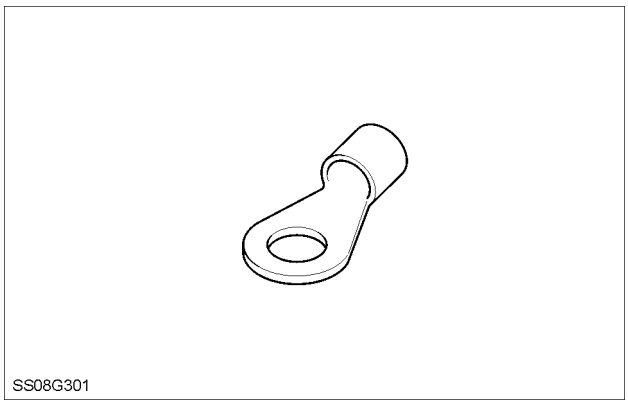
X814 POWER FUSE PF 7 ISO BUS FRONT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150AV (N)	BATTERY FEED (UNFUSED)(ALL)
1	150AX (N)	BATTERY FEED (UNFUSED)(ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 9



SS08G301 10

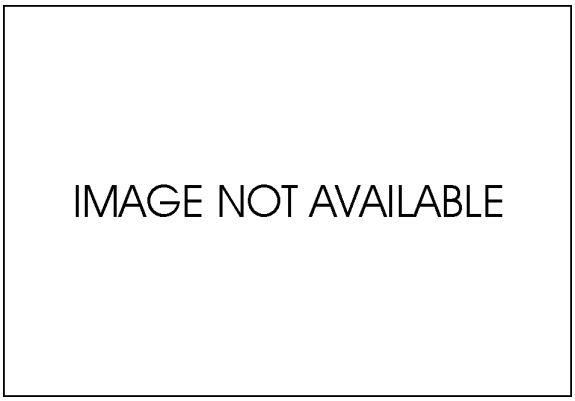
RIGHT HAND BEHIND STEPS

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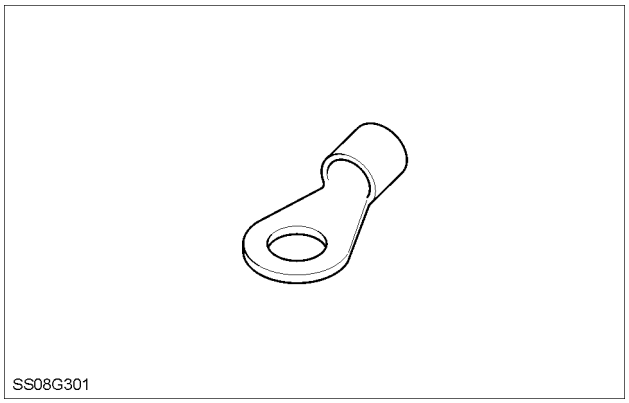
X815 ISO BUS POWER SUPPLY FRONT

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	150AS (N)	BATTERY FEED (UNFUSED)(ALL)

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 11



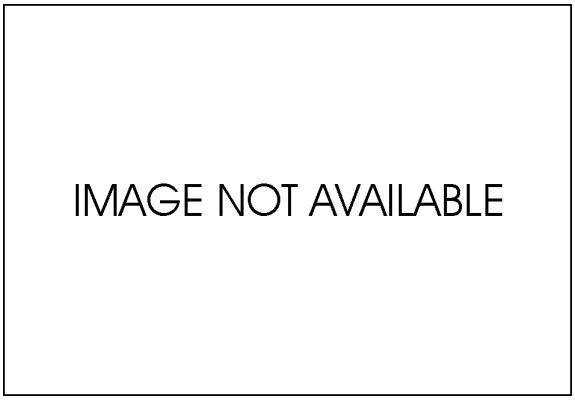
SS08G301 12

RIGHT HAND BEHIND STEPS

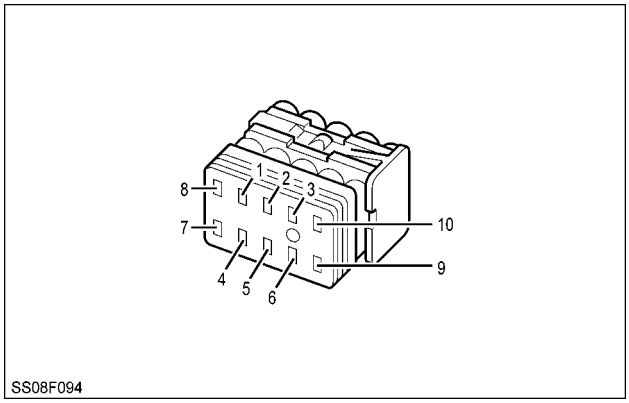
X816 HIGH MOUNT HEADLAMP SWITCH

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1027BB (U)	HEADLAMP MAIN BEAM
2	1027B (U)	HEADLAMP MAIN BEAM
3	1027A (U)	HEADLAMP MAIN BEAM
4	1030BB (U)	HEADLAMP DIP BEAM
5	1030B (U)	HEADLAMP DIP BEAM
6	1030A (U)	HEADLAMP DIP BEAM

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



INA 13



SS08F094 14

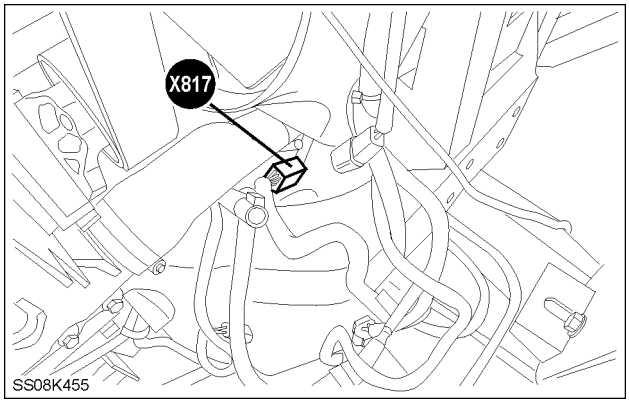
REAR RIGHT HAND C-PILLAR

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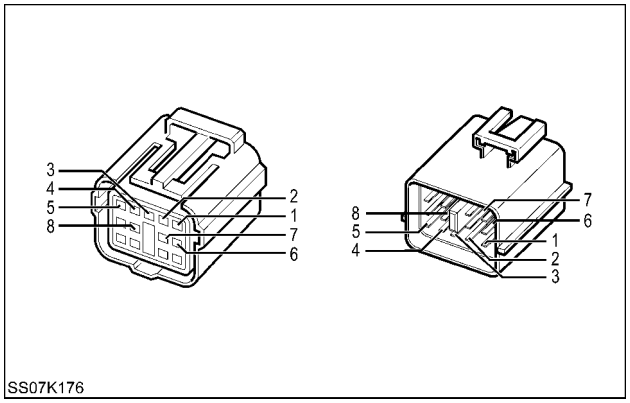
X817 FRONT HITCH AND FRONT PTO

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	2044 (O) / (N)	PTO SOLENOID-FRONT RETURN(-)
2	2043 (O) / (P)	PTO SOLENOID-FRONT
3	2260 (O)	PTO FRONT - SPEED SIGNAL
4	60AE (B/W) / (S)	SENSOR GROUND
5	2570 (R) / -	FRONT HITCH RAISE SOLENOID
6	2530B (N) / -	FRONT HITCH V REF
7	2510 (N) / (W)	FRONT HITCH POSITION SIGNAL
8	57JT (B)	EARTH (ALL)
9	1010B (G) / (R)	IGNITION RELAY (COIL)
10	2556 (O) / (U)	FRONT HITCH SWITCH COMMON RAIL
11	2590 (TN) / (G)	EXTERNAL SWITCH FHPL UP
12	2591 (TN) / (Y)	EXTERNAL SWITCH FHPL DOWN

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K455 15



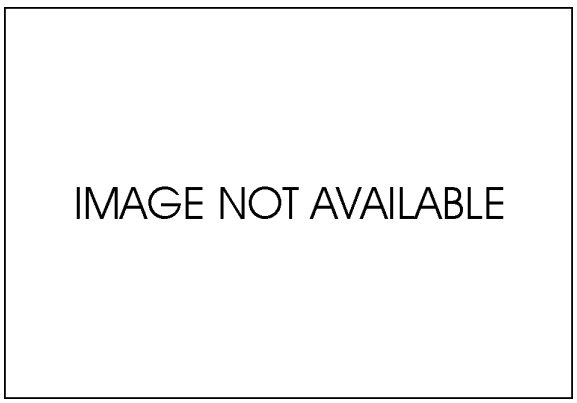
SS07K176 16

FRONT RIGHT HAND ENGINE

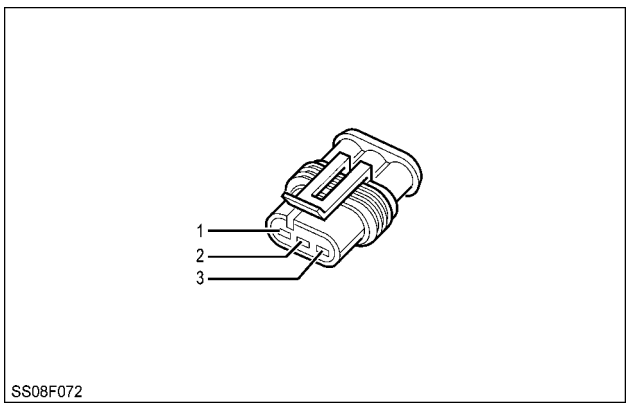
X818 HEADLAMP 2 LH GRAB RAIL

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1027B (UW)	HEADLAMP MAIN BEAM
2	1030B (UR)	HEADLAMP DIP BEAM
3	57B (B)	EARTH (ALL)

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



INA 17



SS08F072 18

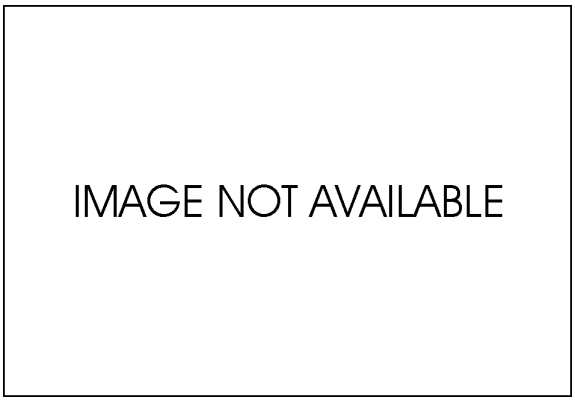
LEFT HAND ON GRABRAIL

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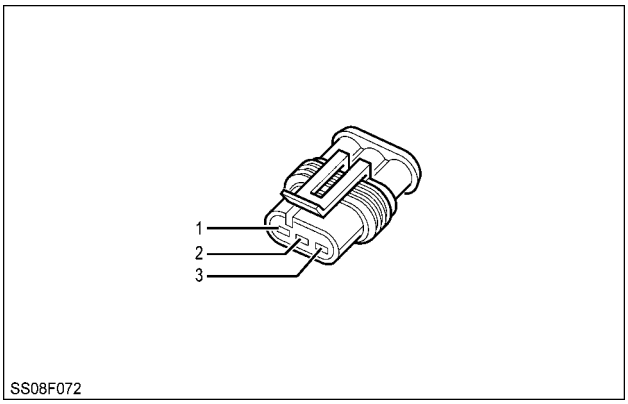
X819 HEADLAMP 1 RH GRAB RAIL

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	1027A (UW)	HEADLAMP MAIN BEAM
2	1030A (UR)	HEADLAMP DIP BEAM
3	57A (B)	EARTH (ALL)

NOTE: For the wiring color code refer to, **Wiring harness - Overview (A.30.A)**.



INA 19



SS08F072 20

RIGHT HAND ON GRABRAIL

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Connector - Component diagram 82

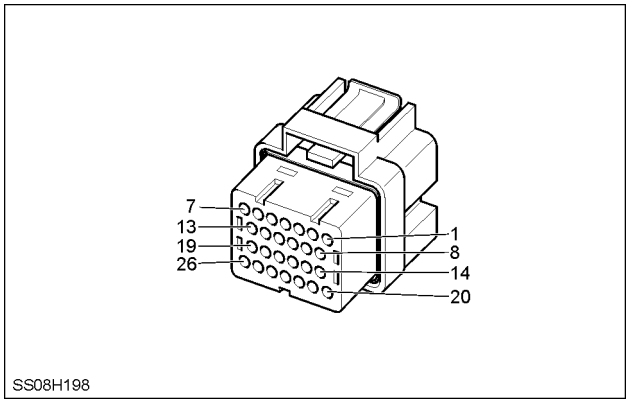
X820 GARU SWCD

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	5500J (R)	EHR CAN HIGH
2	5510J (U)	EHR CAN LOW
3	5000 (L)	EDC MEMORY POWER
5	5910F (G)	ISO BUS CAN SIGNAL HIGH
6	5900F (Y)	ISO BUS CAN SIGNAL LOW
9	5960 (Y)	RS232 OUTPUT TECU
10	5955 (Y)	RS232 INPUT TECU
13	5000 (L)	EDC MEMORY POWER
14	57 (B)	EARTH (ALL)
15	7000AT (U)	TRANS CONTROL SUPPLY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

IMAGE NOT AVAILABLE

INA 1



SS08H198 2

RIGHT HAND SIDE CAB

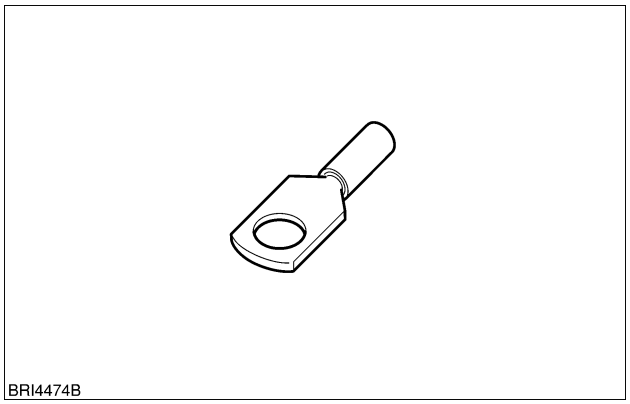
X823 MEGA FUSE (125A) GRIDHEATER / FUELHEATER

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	(R)	SUPPLY B+
2	(R)	HIGH CURRENT RELAY

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*

IMAGE NOT AVAILABLE

INA 3



BRI4474B 4

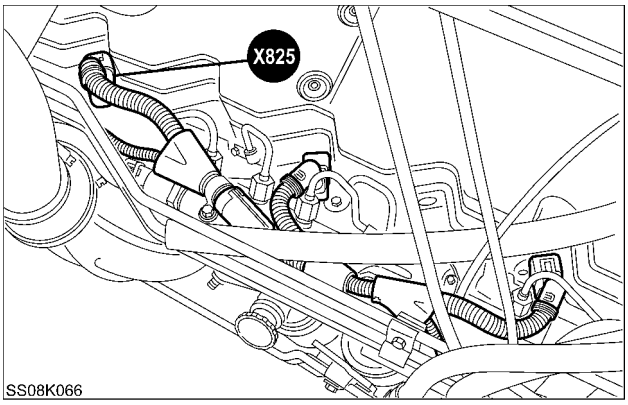
BOTTOM REAR ENGINE

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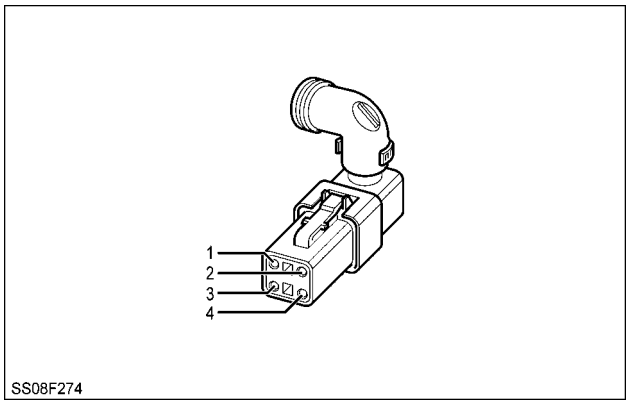
X825 INJECTOR CYLINDER 1 & 2 (EDC16)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	N/B	PLUS
2	S/R	MINUS
3	S/Y	PLUS
4	N/W	MINUS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K066 5



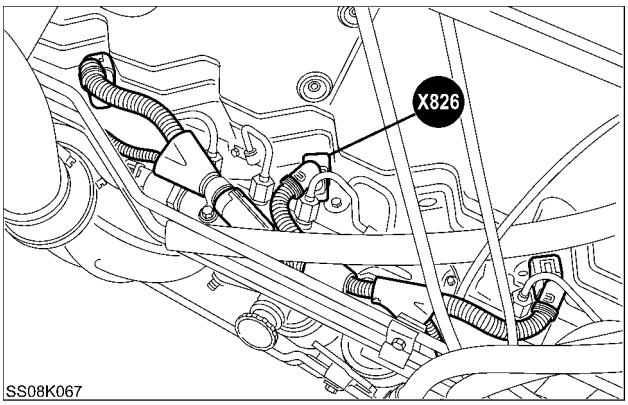
SS08F274 6

LEFT HAND TOP ENGINE

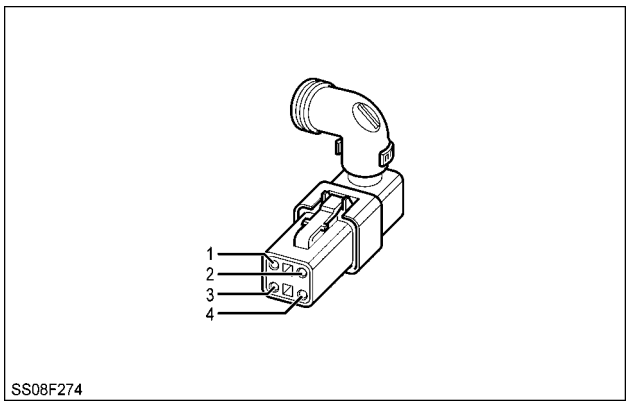
X826 INJECTOR CYLINDER 3 & 4 (EDC16)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	W/G	PLUS
2	U/O	MINUS
3	S/B	PLUS
4	B/P	MINUS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K067 7



SS08F274 8

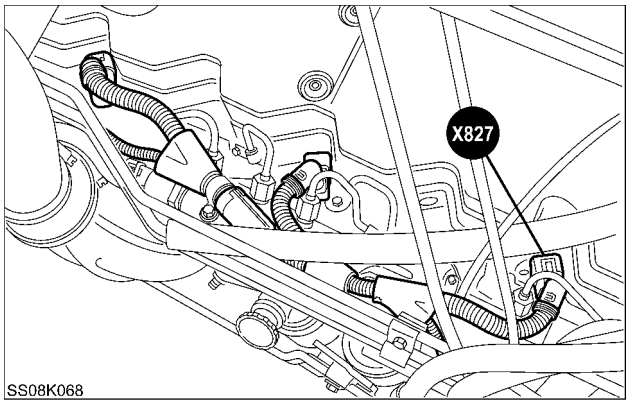
LEFT HAND TOP ENGINE

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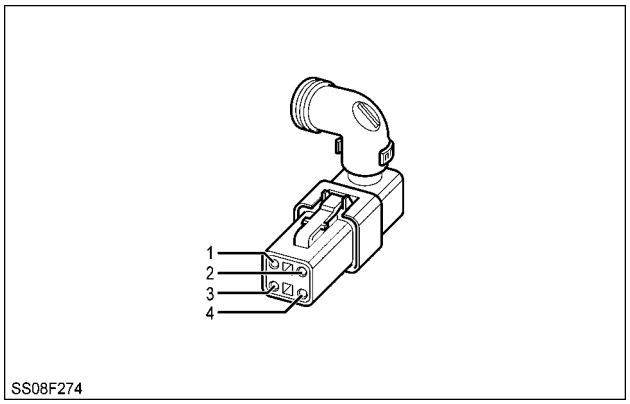
X827 INJECTOR CYLINDER 5 & 6 (EDC16)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	U/B	PLUS
2	O/W	MINUS
3	U/R	PLUS
4	Y/B	MINUS

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K068 9



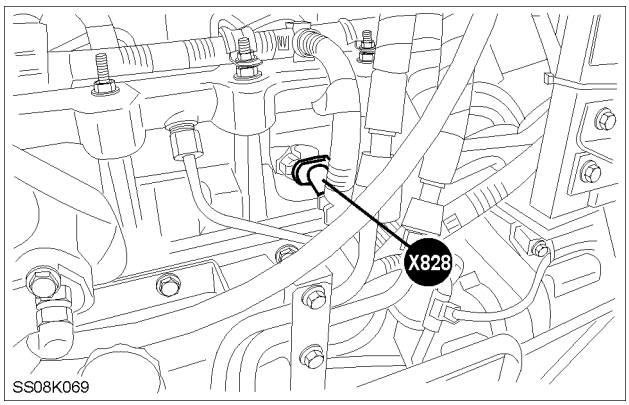
SS08F274 10

LEFT HAND TOP ENGINE

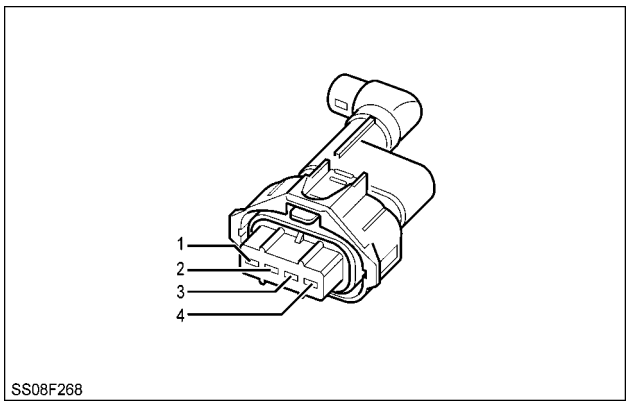
X828 BOOST PRESSURE / TEMPERATURE SENSOR (EDC16)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	Y/B	
2	W/R	
3	O/U	
4	U/B	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K069 11



SS08F268 12

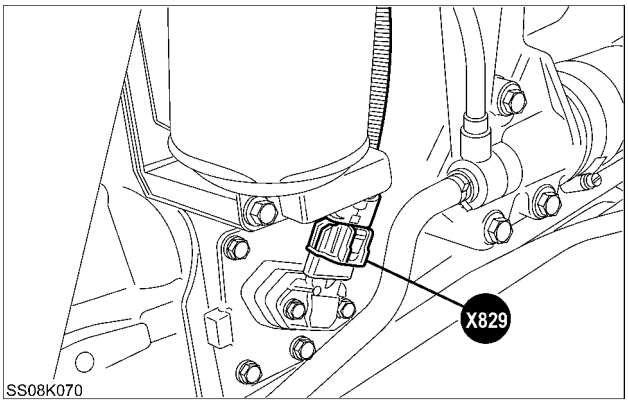
LEFT HAND ENGINE

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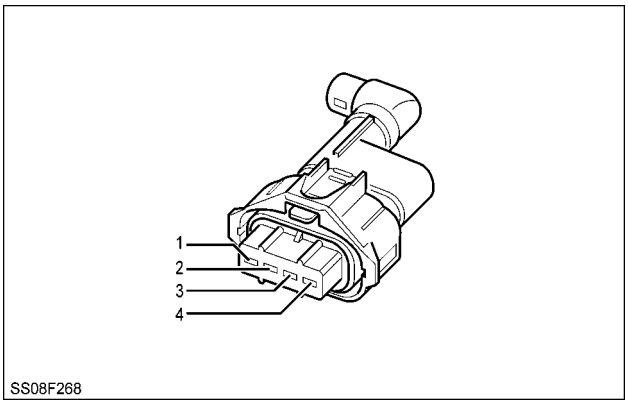
X829 OIL PRESSURE / TEMPERATURE SENSOR (EDC16)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	Y/G	
2	K/B	
3	N/B	
4	Y/R	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K070 13



SS08F268 14

FRONT LOWER RIGHT HAND ENGINE

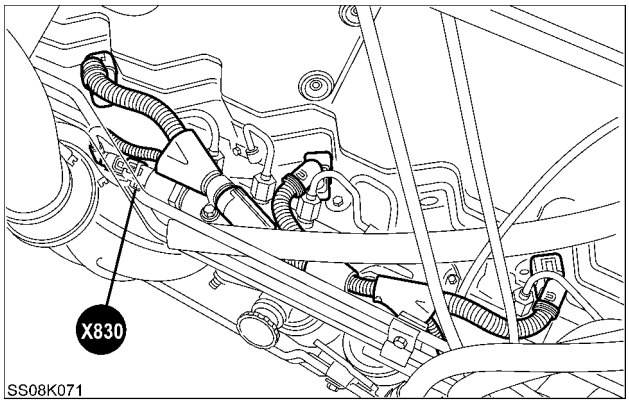
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Connector - Component diagram 83

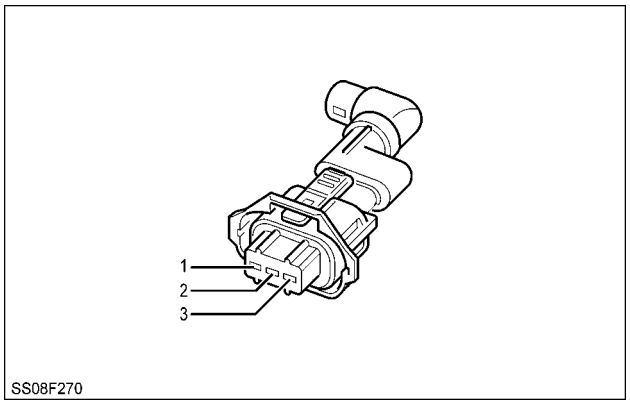
X830 RAIL PRESSURE SENSOR (EDC16)

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	W/B	
2	R/G	
3	S/B	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K071 1



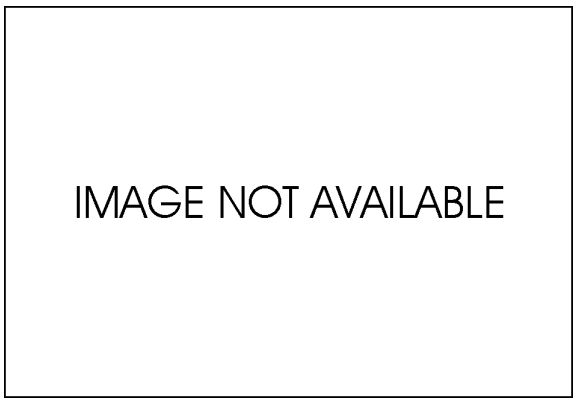
SS08F270 2

LEFT HAND TOP ENGINE

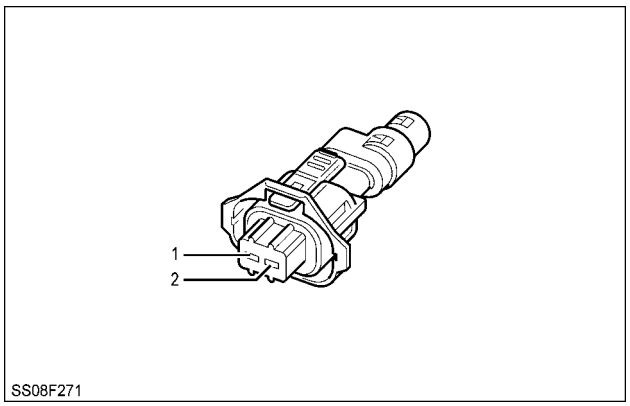
X831 COOLANT TEMPERATURE SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	O/G	
2	W/Y	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



INA 3



SS08F271 4

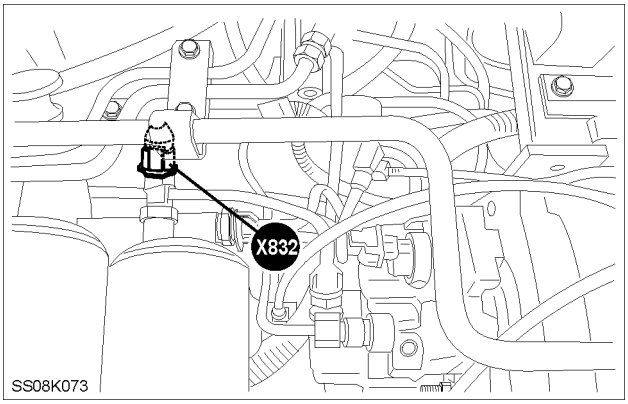
FRONT RIGHT HAND ENGINE

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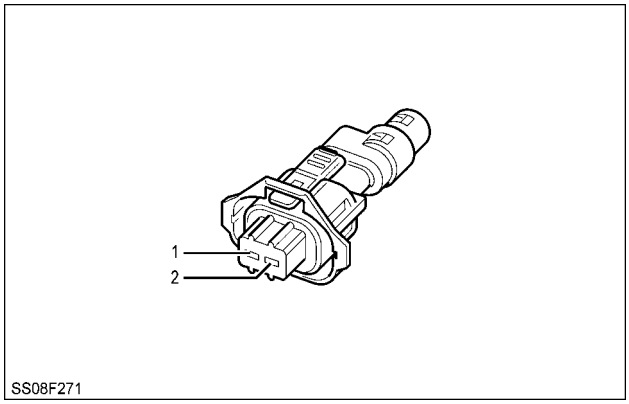
X832 FUEL TEMPERATURE SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	W/U	
2	O/B	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K073 5



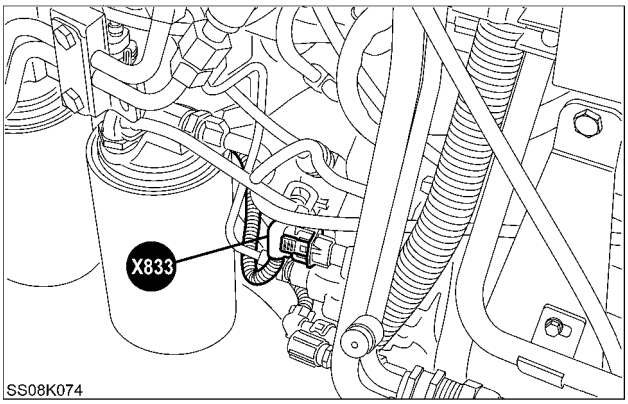
SS08F271 6

LEFT HAND ENGINE

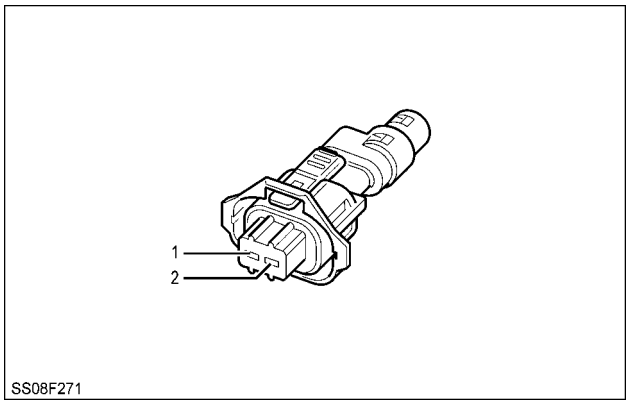
X833 HIGH PRESSURE PUMP

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	G	
2	O	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K074 7



SS08F271 8

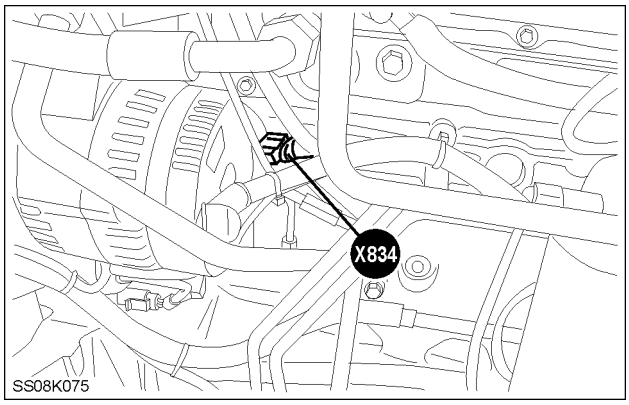
REAR LEFT HAND ENGINE

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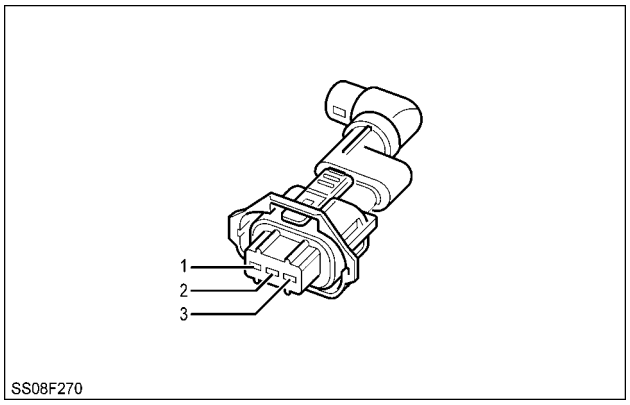
X834 INCREMENT SPEED SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	W	
2	R	
3	B	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K075 9



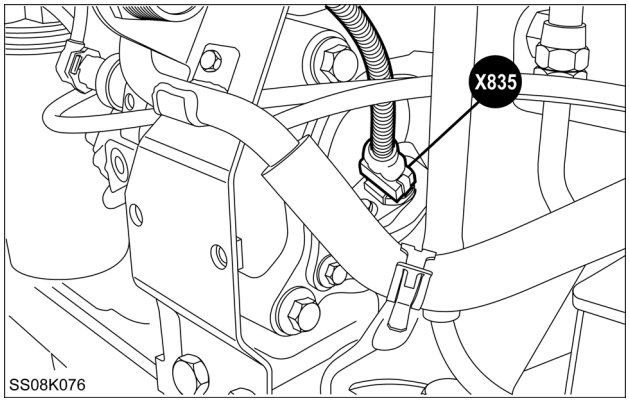
SS08F270 10

FRONT LEFT HAND ENGINE

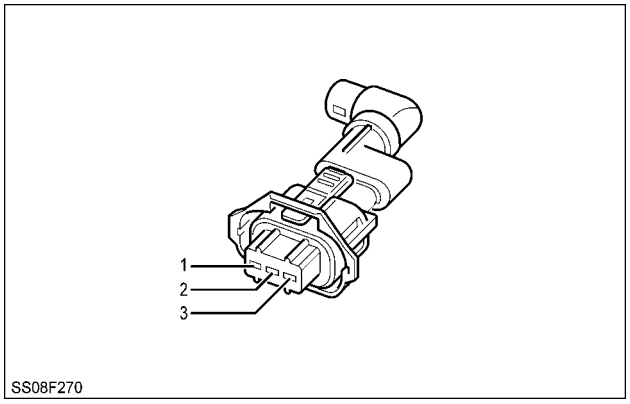
X835 CAMSHAFT SPEED SENSOR

POS.	WIRE NUMBER	CIRCUIT REFERENCE
1	W	
2	R	
3	G	

NOTE: *For the wiring color code refer to,* ***Wiring harness - Overview (A.30.A)****.*



SS08K076 11



SS08F270 12

REAR LEFT HAND ENGINE

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Wiring harness - Overview

Wire Colour Codes							
B	Black	S	Slate (Grey)	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

Wire Code References

CIRC	COLOUR	DESCRIPTION
1	R	BATTERY SUPPLY
10	G	IGNITION SUPPLY
11	G	IGNITION SUPPLY (2ND)
12	U	MAIN BEAM HEADLAMP FUSE SUPPLY
13	U	DIP BEAM HEADLAMP FUSE SUPPLY
15	U	LIGHTING SWITCH SUPPLY
28	Y	WIPER MOTOR (PARK RETURN)
29	G	MAIN FUEL SENDER SIGNAL
31	Y	ENGINE OIL PRESSURE SENDER SIGNAL
39	G	TEMPERATURE GAUGE SIGNAL
44	L	FLASHER UNIT (49A)
49	G	RIGHT HAND TURN SIGNAL
50	G	LEFT HAND TURN SIGNAL
56	W	WIPER MOTOR-HIGH
57	B	EARTH (ALL)
58	R	WIPER MOTOR-LOW
60	B/W	SENSOR GROUND
61	B	CASE GROUND
63	U	WIPER MOTOR-PARK FEED
65	W	DUAL POWER/4 WHEEL DRIVE SWITCH FEED
71	W	IGNITION SWITCHED FEEDS (UNFUSED)
84	G	WINDSHIELD WASHER SWITCH FEED
90	G	DUAL POWER / FOUR WHEEL DRIVE SWITCH
97	LG	WINDSHIELD WASHER FEED
137	W	RADIO FEED
138	P	RADIO KAM
150	N	BATTERY FEED (ALL)
155	G	BATTERY FEED (FUSED)
160	U	BATTERY SUPPLY ELECTRONICS
170	K/N/B	BATTERY ISOLATOR CONTROL SWITCH
171	W/TQ/B	BATTERY ISOLATOR RELAY COIL
172	W/TQ/Y	BATTERY ISOLATOR RELAY COIL (OFF)
173	W	BATTERY ISOLATOR RELAY COIL +12V
181	G	BLOWER MOTOR FEED
182	P	THERMOSTATIC SWITCH FEED
249	LG	SMV LAMPS RH
250	LG	SMV LAMPS LH
252	N	ALTERNATOR FIELD
349	LN	TRAILER TURN LAMPS RH
350	LN	TRAILER TURN LAMPS LH
365	G	LOW FUEL WARNING LAMP (DELAY ON)
366	O	LOW FUEL WARNING LAMP (DELAY SWITCH)
376	P	HORN FEED
587	LG	WINDSHIELD WIPER INTERMITTENT DELAY

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CIRC	COLOUR	DESCRIPTION
649	O	COOLANT TEMPERATURE SWITCH
650	TQ	COOLANT LEVEL SWITCH
666	P	DOMELAMP SWITCH FEED
787	G	AUXILIARY FUEL PUMP SUPPLY
810	G	STOPLAMPS
820	R	STOPLAMP SWITCH LH
825	Y	PNEUMATIC TRAILER SOLENOID +12V
830	U	STOPLAMP SWITCH RH
840	G	R & L STOPLAMP SIGNAL
976	W/N/B	LICENCE PLATE LAMP / WORKLAMP DIODE
978	W	LICENCE PLATE LAMP
979	S	BLOWER MOTOR HIGH SPEED (4th)
980	N	THERMOSTAT SWITCH SUPPLY
981	G	A/C CLUTCH RELAY FEED
982	G	BLOWER MOTOR FEED
984	P	TEMPERATURE CONTROL POT. INPUT
986	P	TEMPERATURE CONTROL POT. OUTPUT
989	P	BLOWER MOTOR MEDIUM SPEED (2nd)
996	P	BLOWER MOTOR HIGH SPEED (3RD)
997	G	WORK LAMP-REAR FEED (OUTER)
998	G	WORK LAMP-REAR FEED (INNER)
999	G	BLOWER MOTOR LOW SPEED (1st)
1000	W	SAFETY START SWITCH SUPPLY
1001	W	STARTER SOLENOID FEED
1002	P	IMPLEMENT LAMP SWITCH SUPPLY
1003	G	SUPPLY TO GAUGES
1004	G	SUPPLY TO HORN AND HEADLAMP FLASH
1005	S	AIR CLEANER WARNING LAMP
1006	N	ALTERNATOR WARNING LAMP
1007	W	ETHER START BUTTON SUPPLY
1008	N	ETHER START SOLENOID SUPPLY
1009	N	ALTERNATOR FIELD
1010	G	IGNITION RELAY (COIL)
1011	Y	SUPPLY TO FUSES
1012	R	ILLUMINATION
1013	R	RIGHT HAND LAMPS
1014	R	LEFT HAND LAMPS
1015	P	DOME LAMP SWITCH FEED
1016	P	HORN FEED
1017	LG	AIR CON. THERMOSTATIC SWITCH FEED
1018	LG	AIR CONDITIONER CLUTCH
1019	G	WINDSHIELD WIPER FEED
1020	G	HAZARD SWITCH SUPPLY
1021	P	HAZARD SWITCH SUPPLY (BATTERY)
1022	N	THERMOSTART
1023	N	LIGHT SWITCH FEED
1024	R	RIGHT & LEFT HAND SIDELAMP FEED
1025	G	HZD SWITCH IGN FEED
1026	U	HIGH BEAM INDICATOR LAMP
1027	U	HEADLAMP MAIN BEAM
1028	U	HEADLAMP MAIN BEAM FUSE
1029	U	HEADLAMP DIP BEAM FUSE
1030	U	HEADLAMP DIP BEAM
1031	R	INSTRUMENT ILLUMINATION
1032	LG	TURN SIGNAL WARNING LAMP (TERM C)
1033	LG	TURN SIGNAL WARNING LAMP (TERM C2)

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CIRC	COLOUR	DESCRIPTION
1034	LG	TURN SIGNAL WARNING LAMP (TERM C3)
1035	W	ENGINE OIL PRESSURE WARNING LAMP
1036	N	IGNITION SWITCH (BATTERY)
1037	LG	FLASHER UNIT (TERM 49A)
1038	LN	WINDSHIELD WIPER FEED-REAR
1039	LTG	NASO LIGHTS INPUT
1040	LG	FLASHER SWITCH TO RELAY-RHS CUT OUT
1041	LG	FLASHER SWITCH TO RELAY-LHS CUT OUT
1042	U	RELAY FEED ELECTRONICS
1043	U	RELAY FEED TO FUSES
1044	W/U/S	GRID HEATER FEEDBACK
1050	G	ACCESSORY FEED
1051	Y	SIDE LIGHTS RELAY COIL FEED
1052	Y	GET YOU HOME LIGHTS RELAY
1070	R	FRONT WORKLAMP SWITCH FEED
1071	P	WORKLAMP FRONT FEED
1072	P	WORKLAMP FRONT RELAY SUPPLY
1073	P	WORKLAMP FRONT FEED
1080	R	FRONT SCREEN HEATER
1082	Y	REAR SCREEN HEATER
1085	N	FRONT SCREEN HEATER RELAY CONTROL
1086	N	REAR SCREEN HEATER RELAY CONTROL
1090	R	REAR WORKLAMP RELAY SIGNAL
1091	R	FRONT WORKLAMP LOWER RELAY SIGNAL
1092	R	FRONT WORKLAMP RELAY SIGNAL
1093	R	FENDER WORKLAMP RELAY SIGNAL
1096	R	WORKLAMP FENDER MOUNTED
1097	R	FEED FRONT WORKLAMP OUTER
1098	W	FRONT WORKLAMP RELAY GROUND
1099	R	FEED FRONT WORKLAMP INNER
1119	G	RR WINDSHIELD WIPER
1120	G	RR WINDSHIELD WIPER PARK RETURN
1121	G	RR WINDSHIELD WASH
1130	N	ENGINE HEATER CONTROL TO IGN SWITCH
1135	G	THERMOSTART WARNING LAMP
1140	K	THERMOSTART INITIATE SIGNAL TO RELAY
1141	N	GRID HEATER +
1142	N	GRID HEATER FUSE TO PWR. RELAY
1143	N	POWER RELAY TO GRID HEATER
1150	N	CAL/SEL SWITCH
1160	R	REVERSE ALARM
1900	LG/B/S	HEATED FRONT WINDSCREEN SW SIGNAL
1901	LN/LG/S	HEATED FRONT WINDSCREEN POWER
1902	O/LN/S	HEATED FRONT WINDSCREEN WARNING LAMP
1903	P/B/S	HEATED REAR SCREEN SW SIGNAL
1904	Y/B/S	HEATED REAR SCREEN POWER
1905	U/W/S	HEATED REAR SCREEN WARNING LAMP
1920	O	LH MIRROR CONTROL SIDE-SIDE
1921	Y	LH MIRROR CONTROL UP-DOWN
1922	G	MIRROR CONTROL COMMON
1923	O	RH MIRROR CONTROL SIDE-SIDE
1924	Y	RH MIRROR CONTROL UP-DOWN
1925	R	MIRROR CONTROL +12V
1927	R	MIRROR ILLUMINATION
1928	R	HEATED MIRROR RELAY COIL +12V FROM SW
2001	N	BATTERY TEMPERATURE SENSOR
2002	N	BATTERY TEMP SENSOR (ALT OUTPUT)

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CIRC	COLOUR	DESCRIPTION
2003	W	STARTER SOLENOID FEED
2005	O/U	AIR CON CLUTCH RELAY
2006	U	DE-ICING SWITCH - AIR CONDITIONER
2007	Y/U	AIR CONDITIONER LOW PRESSURE
2008	N/TQ	LIFT PUMP SUPPLY
2009	G	FUEL PUMP SUPPLY
2010	LG	AIRCON PLUG TO DE-ICING SWITCH
2011	P	HORN RETURN
2012	Y	TRANS OIL PRESSURE WARNING LAMP
2013	Y	PTO OVERSPEED WARNING LAMP
2014	G	ENGINE OIL PRESSURE SENDER (+5 VOLT)
2015	W	TACHOMETER SENSOR-SIGNAL
2016	Y	REAR AXLE SPEED SENSOR-SIGNAL
2017	B	BULB TEST (EIC)
2018	B	RADAR PRESENT
2019	B	ENGINE RPM (TACHO MODULE TO TPM)
2020	Y	ENGINE SHUT DOWN (TACHO MODULE TO TPM)
2021	Y	AXLE GROUND SPEED (TACHO MODULE TO TPM)
2022	B	PTO 540/1000 RPM (TACHO MODULE TO TPM)
2023	S	TPM TO EIC (AXLE SPEED DRIVE)
2024	S	RADAR SIGNAL DRIVE
2025	S	AUDIO ALARM CONTROL
2026	S	IMPLEMENT SWITCH SIGNAL
2027	R	RADAR ASSEMBLY (GUN) POWER
2028	G	RADAR ASSEMBLY (GUN) SIGNAL
2029	P	INSTRUMENT MEMORY SUPPLY
2030	N	ELECTRONIC DRAFT CONTROL
2031	Y	RADAR PRESENT
2040	LG	WATER IN FUEL SENSOR
2041	P	FUEL SHUT OFF
2042	O	PTO SOLENOID-REAR
2043	O	PTO SOLENOID-FRONT
2044	O	PTO SOLENOID-FRONT RETURN(-)
2045	O	PTO SWITCH TO MODULE
2046	O	PTO SWITCH (VCC)
2047	O	PTO SWITCH (VCCO)
2048	O	PTO SWITCH (VCCS)
2049	O	PTO SWITCH 1000RPM WARNING LAMP
2050	G	PTO SUPPLY / DOG SUPPLY
2051	O	PTO SOLENOID RETURN (-)
2052	W	PTO LUBE SOL
2053	P	PTO LUBE SOL RETURN
2055	W	PTO SYNCHRO GROUND SPEED ENGAGED
2056	W	PTO FENDER PTO SWITCH ON
2057	W	PTO FENDER SWITCH LH - RH LINK
2059	W	FENDER PTO SWITCH INPUT
2060	O	PTO 540/1000 SWITCH
2062	W	PTO TWIST SENSOR
2065	N	PTO ENGAGED
2068	N	PTO SOFT START
2069	U	PTO MANAGEMENT ON
2070	O	ENGINE SHUT OFF RELAY +12V
2080	O	ENGINE SHUT OFF RELAY
2087	O	EXHAUST BRAKE SOLENOID
2090	W/U	STARTER RELAY TO START INHIBIT SWITCH
2095	G	INSTRUMENT SIGNAL GROUND

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CIRC	COLOUR	DESCRIPTION
2100	G	A/C CONDENSER MOTOR FEED
2120	LN	PTO BRAKE SIGNAL
2130	N	PTO BRAKE SOLENOID
2140	O	PTO SPEED SENSOR
2150	P	PTO EXT. SWITCH OFF
2151	K	EPTO DRIVE RELAY UPPER SPEED
2152	K	ESPTO DRIVE RELAY LOWER SPEED
2153	R	ESPTO ACTUATOR UPPER SPEED
2154	N	ESPTO ACTUATOR LOWER SPEED
2155	N	ESPTO ACTUATOR POWER +12V
2156	N	ESPTO ACTUATOR POS SIGNAL
2157	U	ESPTO NEUTRAL
2158	N	ESPTO LOWER SPEED
2159	U	ESPTO UPPER SPEED
2200	G	SERVICE MODE INITIATE
2245	K	PTO FRONT - SWITCH TO MODULE (MOM)
2248	K	PTO FRONT - SWITCH (VCCS)
2250	K	PTO FRONT - SUPPLY
2260	O	PTO FRONT - SPEED SIGNAL
2270	O	PTO FRONT - WARNING LAMP
2300	P	THEORETICAL GROUND SPEED ISO 11786 SKT.PIN#2
2310	P	IN/OUT OF WORK-HPL MODE ISO11786 SKT.PIN#4
2320	P	TRUE GROUND SPEED ISO 11786 SKT.PIN#1
2330	P	PTO SPEED ISO11876 SKT.PIN#3
2500	N	FRONT HITCH SOLENOID
2510	N	FRONT HITCH POSITION SIGNAL
2520	N	FRONT HITCH SET POSITION SIGNAL
2530	N	FRONT HITCH V REF
2540	N	FRONT HITCH +12v IGN
2550	N	FRONT HITCH OVERIDE SWITCH
2556	N/Y/S	FRONT HITCH SWITCH COMMON RAIL
2560	N	FRONT HITCH 0v REF
2570	R	FRONT HITCH RAISE SOLENOID
2571	S	FRONT HITCH RAISE SOLENOID RETURN(-)
2575	W	STEYR EFH TRANSPORT SIGNAL – BOSCH EFH MODULE
2576	W	STEYR EFH WORK SIGNAL – BOSCH EFH MODULE
2577	P	STEYR EFH DIAGNOSTIC LAMP – BOSCH EFH MODULE
2578	G	STEYR EFH TRANSPORT SWITCH – EOLBAU ARMREST
2579	N	STEYR EFH WORK SWITCH – EOLBAU ARMREST
2580	R	FRONT HITCH LOWER SOLENOID
2581	S	FRONT HITCH LOWER SOLENOID RETURN (-)
2582	LG	STEYR - EXT SWITCHES
2583	LN	STEYR - EXT SWITCHES
2584	W	OILMOTOR MODE
2585	LN	EFH RAISE SWITCH
2586	LN	EFH WORK SWITCH
2587	N	EFH EXTERNAL SWITCH +
2588	P	EFH EXTERNAL SWITCH UP
2589	R	EFH EXTERNAL SWITCH DOWN
2590	LN	EXTERNAL SWITCH FHPL UP
2591	LN	EXTERNAL SWITCH FHPL DOWN
2592	N	EFH VALVE DOWN +
2593	N	EFH VALVE DOWN -
2594	O	EFH POSITION SENSOR +
2595	P	EFH POSITION SENSOR SIGNAL
2596	R	EFH POSITION SENSOR -
2597	LN	EFH PRESSURE SENSOR SIGNAL

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CIRC	COLOUR	DESCRIPTION
2598	S	EFH ACCUMULATOR 14 BAR
2599	N	EFH ACCUMULATOR 40 BAR
2600	Y	REAR AXLE SPEED MONITOR
3000	G	FLASHER UNIT SUPPLY (TERMINAL 49)
3001	G	LEFT HAND FLASHER CIRCUIT
3002	G	RIGHT HAND FLASHER CIRCUIT
3003	W	RADIO FEED
3004	G	RIGHT HAND TURN SIGNAL WARNING LAMP
3005	G	LEFT HAND TURN SIGNAL WARNING LAMP
3006	G	AUXILIARY FUEL TANK SENDER
3007	G	FUEL GAUGE FEED
3008	U	WORKLAMP WARNING LIGHT
3009	G	FLASHER UNIT SUPPLY B+
3010	R	FOGLAMP FEED
3011	R	FOGLAMP FEED
3012	G	HANDBRAKE WARNING FEED
3013	LG	AUXILIARY FUEL TANK SIGNAL
3014	R	HANDBRAKE WARNING LAMP SIGNAL
3015	P	ACCESSORY SOCKET (POWER)
3016	S	BRAKE FLUID LEVEL SIGNAL
3017	G	EPB SYSTEM FAILURE WARNING LIGHT
3018	G	FLASHER UNIT BUZZER FEED
3019	G	EPB SYSTEM OPERATION STATUS LIGHT
3020	Y	DUAL POWER SOLENOID SUPPLY
3022	Y	DUAL POWER (HIGH) WARNING LAMP
3023	P	EPB SYSTEM BATTERY ISOLATOR INTERLOCK
3024	Y	2WD SOLENOID
3025	Y	FOUR WHEEL DRIVE SOLENOID (MANUAL)
3026	Y	BRAKE PEDAL SWITCH - RIGHT
3027	Y	FOUR WHEEL DRIVE SOLENOID (AUTO)
3028	Y/G	BRAKE PEDAL SWITCH - LEFT
3029	LN	EPB +5V REFERENCE
3030	W	ACCESSORY RELAY SIGNAL
3031	N	EPB +12 HOT
3032	G	EPB +12 IGNITION
3033	O	EPB MOTOR SUPPLY “A”
3034	Y	EPB POSITION SIGNAL
3035	O	EPB MOTOR SUPPLY “B”
3036	O	EPB SHUTTLE PARK SWITCH INPUT
3037	Y	EPB PROPORTIONAL BRAKE SIGNAL
3038	Y	EPB HAND THROTTLE SWITCH
3039	O	EPB SHUTTLE PARK SWITCH OUTPUT
3045	Y	FOUR WHEEL DRIVE WARNING LAMP
3050	P	AUXILIARY FEED CONNECTOR SUPPLY
3051	P	CIGAR LIGHTER SUPPLY
3052	P	DOME LAMP TO DOOR SWITCH
3053	S	SPEAKER RIGHT HAND
3054	S	SPEAKER NEGATIVE RH
3055	S	SPEAKER LEFT HAND
3056	N	SPEAKER NEGATIVE LH
3057	P	PUDDLE LAMP RETURN
3060	P	IMPLEMENT SOCKET RELAY
3061	P	IMPLEMENT SOCKET
3062	P	IMPLEMENT SOCKET SWITCH
3070	P	’B’ PILLAR SKT SUPPLY
3073	W	MICROPHONE
3074	B	SCREEN FOR 3073

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CIRC	COLOUR	DESCRIPTION
3075	O	TRAILER SOCKET (ACCESSORY FEED)
3076	O	ACCESSORY SWITCH FEED
3077	Y	RADIO +12VB
3078	O	RADIO +12V ILLUMINATION
3079	R	RADIO +12V IGNITION
3080	P	CONSOLE LAMP
3081	Y	TELEPHONE OUT
3082	O	TELEPHONE OUT 1
3083	N	TELEPHONE MUTE
3084	V	AUXILIARY INPUT COMMON RAIL
3085	W	AUXILIARY INPUT (LEFT CHANNEL)
3086	R	AUXILIARY INPUT (RIGHT CHANNEL)
3087	S	BUTTONS COMMON
3088	G	BUTTONS 'TELEPHONE'
3089	U	BUTTONS 'VOICE'
3090	Y	SEAT PUMP SUPPLY
3091	P	SPEAKER RR-RHS +
3092	P	SPEAKER RR-RHS -
3093	S	SPEAKER FRT-RHS +
3094	S	SPEAKER FRT-RHS -
3095	W	SPEAKER FRT-LHS +
3096	S	SPEAKER FRT-LHS -
3097	G	SPEAKER RR-LHS +
3098	G/B	SPEAKER RR-LHS -
3100	G	STEERING SENSOR +5v
3120	K	STEERING SENSOR SIGNAL
3140	LG	STEERING SENSOR GROUND
3150	W	HANDBRAKE SWITCH (N.C CONTACT) OFF SIG
3155	W	HANDBRAKE TRANS INTERLOCK
3160	O/G/Y	AUTO GUIDANCE STEERING PRESS SENSOR SIGNAL
3161	O/G/B	AUTO GUIDANCE STEERING PRESS SENSOR RETURN
3163	O/W	AUTO GUIDANCE STEERING SOLENOID VLV R FEED
3164	O/W/B	AUTO GUIDANCE STEERING SOLENOID VLV R RETURN
3165	O/R	AUTO GUIDANCE STEERING SOLENOID VLV L FEED
3166	O/R/B	AUTO GUIDANCE STEERING SOLENOID VLV L RETURN
3167	O/N	AUTO GUIDANCE STEERING PRESSURE SENSOR +5V REF
3168	O/K	AUTO GUIDANCE DUMP SOLENOID FEED (HSD)
3169	O/S	AUTO GUIDANCE DUMP SOLENOID RETURN (CURSEN)
3170	O	FAST STEER SYSTEM (FSS)- ENABLE
3171	O/R	FSS - LAMP
3172	L	FSS - STEERING PROXIMITY SENSOR POSITION
3173	R/G	FSS - HYD. VALVE HIGH SIDE DRIVER
3174	G/B	FSS - HYD. VALVE LOW SIDE DRIVER
3175	W	FSS - POSITION SENSOR PRIMARY POSITIVE
3176	B	FSS - POSITION SENSOR PRIMARY NEGATIVE
3177	U	FSS - POSITION SENSOR SECONDARY COMMON
3178	G/Y	FSS - POSITION SENSOR SECONDARY POSITIVE
3179	N	FSS - POSITION SENSOR SECONDARY NEGATIVE
3180	B	FSS - SAFETY SWITCH
3181	S/O	AUTO GUIDANCE PPS SIGNAL INPUT TO GPS
3185	N/R/Y	AUTO GUIDANCE REMOTE ENGAGE
3186	S	CERES PPS IN
3187	N/O/Y	AUTO GUIDANCE ROADING SELECT
3200	O	SUSPENSION SWITCH FEED
3210	U	SUSPENSION SWITCH RETURN
3215	U	SUSPENSION LAMP
3220	O	AXLE HEIGHT SENSOR 5V REF

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CIRC	COLOUR	DESCRIPTION
3230	U	AXLE HEIGHT SENSOR POSITION
3235	O/R/S	ACCELEROMETER SIGNAL
3240	O	RAISE SOLENOID PWR
3250	O	RAISE SOLENOID RET
3260	O	LOWER SOLENOID PWR
3270	O	LOWER SOLENOID RET
3271	U	LOADER RELAY FEED
3272	O	LOADER VALVE #1 OUT
3273	O	LOADER VALVE #1 RETURN
3274	R	LOADER VALVE #2 OUT
3275	R	LOADER VALVE #2 RETURN
3276	G	LOADER VALVE
3277	U	LOADER VALVE #3 COIL
3278	U	LOADER VALVE #3 RELAY
3280	O	SUSPENSION LOCKOUT SOLENOID UPPER
3281	LN	SUSPENSION LOCKOUT SOLENOID UPPER RETURN (-)
3285	LN	SUSPENSION LOCKOUT SOLENOID LOWER
3286	LN	SUSPENSION LOCKOUT SOLENOID LOWER RETURN (-)
3290	O	SUSPENSION LOCKOUT LAMP (OR SOLENOID RET)
3295	LN/U/Y	FRONT SUSPENSION PRESSURE SWITCH SIGNAL
3300	O	SENSE LINE CONTROL SOLENOID
3310	U	RAISE LOCKOUT SOLENOID
3500	W	POWER STEERING PRESSURE SIGNAL
4001	R	TRANSMISSION OIL WARNING LAMP (TEMP)
4002	R	TRANSMISSION OIL WARNING LAMP SWITCH
4010	N	RETURN TO DIG
4011	P	ROTATING BEACON SWITCH SUPPLY
4012	P	ROTATING BEACON FEED
4013	U	TRANS CONTROL FEED
4014	U	FORWARD CLUTCH SOLENOID FEED
4015	U	REVERSE CLUTCH SOLENOID FEED
4016	U	TORQUE CONVERTOR LOCK-UP RELAY FEED
4017	U	TORQUE CONVERTOR LOCK-UP LAMP
4018	S	TORQUE CONVERTOR LOCK-UP SOLENOID FEED
4019	S	HYDRAULIC FILTER BY-PASS SWITCH FEED
4020	S	HYDRAULIC FILTER BY-PASS LAMP
4021	S	BACK-UP ALARM RELAY FEED
4022	S	BACK-UP ALARM FEED
4025	Y	4 IN 1 BUCKET FEED
4040	G	LINK LEVEL SWITCH SUPPLY
4050	W	LINK LEVEL RAISE
4051	W	LINK LEVEL LOWER
4052	W	LINK LEVEL EXTEND SIDE
4053	W	LINK LEVEL RETRACT SIDE
4054	W	LINK LEVEL SAFETY VALVE (DUMP)
4055	W	LINK LEVEL TOP LINK EXTEND SOLENOID
4056	W	LINK LEVEL TOP LINK RETRACT SOLENOID
4057	W	LINK LEVEL RIGHT LINK RAISE SOLENOID
4058	W	LINK LEVEL RIGHT LINK LOWER SOLENOID
4060	W/G/Y	HYDRAULIC SELECT FRONT
4061	W/R/Y	HYDRAULIC SELECT REAR
4100	TQ	TRANS RANGE ENABLE SWITCH SUPPLY
4101	TQ	TRANS RANGE ENABLE
4120	P/R	BEACON RELAY COIL
5000	P	EDC MEMORY POWER
5005	N	EDC KEY SWITCH FEED
5010	B/W	EDC EARTH

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CIRC	COLOUR	DESCRIPTION
5011	B	EDC EARTH CASE RFI
5015	R	EDC CONTROLS BACKLIGHTING
5020	LN	EDC PROC +5V REF VOLTAGE DROP POSN/RATE
5021	K	EDC PROCESSOR REF VOLT (+5V) ROCKSHAFT
5022	K	EDC PROCESSOR REF VOLT +5V QUADRANT
5023	K	EDC PROCESSOR REF VOLT +5V HEIGHT LIMIT
5025	LN	EDC LOWER SIGNAL
5030	LN	EDC RAISE SIGNAL
5035	LN	EDC RETURN REF. VOLTAGE EARTH
5040	LN	EDC DRAFT POSITION
5045	LN	EDC DROP RATE
5050	LN	EDC QUADRANT
5055	LN	EDC CLOCK LINE TO DISPLAY
5060	LN	SERIAL DATA TO CLUSTER
5065	LN	EDC RIGHT PIN
5070	LN	EDC LEFT PIN
5075	K	EDC VOLTAGE TO PINS
5080	K	EDC ROCKSHAFT
5085	K/U	EDC VALVE UP
5087	K	EDC VALVE UP RETURN
5090	K	EDC VALVE DOWN
5095	K	EDC EXTERNAL SWITCH DOWN
5097	K	EDC VALVE DOWN RETURN
5100	K	EDC EXTERNAL SWITCH UP
5105	S	EDC IMPLEMENT STATUS SWITCH
5110	K	EDC LAMP SIGNAL
5115	K	EDC SLIP SIGNAL
5120	K	EDC HEIGHT LIMIT SIGNAL
5125	TQ	EDC RAISE SIGNAL-RAISE WORK SWITCH
5130	TQ	EDC WORK SIGNAL-RAISE WORK SWITCH
5132	TQ	EDC FLOAT
5133	TQ	EDC STOP
5135	TQ	EDC +WHEEL SPEED SIGNAL
5140	TQ	EDC -WHEEL SPEED SIGNAL
5145	TQ	EDC SLIP LIMIT POT
5150	G	EDC EXTERNAL SWITCH SUPPLY
5155	U	EDC LOWER LIMIT POT
5160	TQ	EDC HEIGHT LIMIT POT FEED
5170	LN	SERIAL DATA FROM CLUSTER
5175	R	ADIC KEY PAD DISABLE
5180	TQ	EDC SLIP INDICATOR LAMP
5190	R	HPL INTERLOCK / LIFT-O-MATIC
5200	N	EDC VALVE SUPPLY
5205	N	INTERNAL FENDER HITCH SWITCH - UP
5210	N	EDC VALVE ENABLE
5215	N	INTERNAL FENDER HITCH SWITCH - DOWN
5220	Y	EDC RAISE LAMP
5230	Y	EDC LOWER LAMP
5240	O	EDC RAISE SIGNAL-RAISE WORK SWITCH No.2
5250	O	EDC WORK SIGNAL-RAISE WORK SWITCH No.2
5260	LN	HYDRAULIC MASTER SW #1
5265	LN	HYDRAULIC MASTER SW #2
5270	N	JOYSTICK LED – FRONT
5300	K	ECU FLASH PROGRAM SIGNAL
5400	Y	CAN H
5420	G	CAN L
5500	Y	EHR CAN HIGH

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CIRC	COLOUR	DESCRIPTION
5510	G	EHR CAN LOW
5515	S	EHR +12V IGN.
5520	LG	EHR 5V Ref
5521	LG	EHR Motor #1
5522	LG	EHR Motor #2
5523	LG	EHR Motor #3
5524	LG	EHR Motor #4
5531	LG	EHR NEUTRAL SWITCH VALVE #1
5532	G	EHR NEUTRAL SWITCH VALVE #2
5533	K	EHR NEUTRAL SWITCH VALVE #3
5534	LG	EHR NEUTRAL SWITCH VALVE #4
5535	LG	EHR FLOAT SWITCH VALVE#1
5536	LN	EHR FLOAT SWITCH VALVE#2
5537	N	EHR FLOAT SWITCH VALVE#3
5538	O	EHR FLOAT SWITCH VALVE#4
5541	O	EHR MAX.FLOW SWITCH VALVE #1
5542	B	EHR MAX.FLOW SWITCH VALVE #2
5543	S	EHR MAX.FLOW SWITCH VALVE #3
5544	TQ	EHR MAX.FLOW SWITCH VALVE #4
5551	O	EHR POTENTIOMETER SIGNAL VALVE#1
5552	U	EHR POTENTIOMETER SIGNAL VALVE#2
5553	W	EHR POTENTIOMETER SIGNAL VALVE#3
5554	U	EHR POTENTIOMETER SIGNAL VALVE#4
5561	O	EHR TIMED FLOW SWITCH #1
5562	O	EHR TIMED FLOW SWITCH #2
5563	O	EHR TIMED FLOW SWITCH #3
5564	P	EHR TIMED FLOW SWITCH #4
5570	P	FENDER 3RD EHR SWITCH (RES)
5571	P	FENDER 3RD EHR SWITCH (RES)
5572	P	FENDER 3RD EHR SWITCH (RES)
5574	P	FENDER 3RD EHR SWITCH – UP
5576	P	FENDER 3RD EHR SWITCH – DOWN
5580	TQ	JOYSTICK REAR LAMP (MC)
5585	TQ	JOYSTICK FRONT LAMP (MC)
5591	P	EHR WARNING LAMP#1
5592	P	EHR WARNING LAMP#2
5593	P	EHR WARNING LAMP#3
5594	P	EHR WARNING LAMP#4
5595	S	EHR MASTER STOP SWITCH
5596	S	EHR MASTER STOP LAMP
5597	S	EHR MASTER ENABLE
5600	R	HTS LIVE SIGNAL
5610	R	HTS PROGRAM
5620	R	HTS ON/OFF SWITCH
5625	R	LIFT-O-MATIC SWITCH
5630	R/U/Y	HTS MANUAL SWITCH
5640	R/S/Y	HTS AUTO SWITCH
5700	W	EHR J-STICK X+
5710	W	EHR J-STICK X ACTIVE SWITCH
5720	W	EHR J-STICK X FULL FLOW SWITCH
5730	W	EHR J-STICK X FLOAT SWITCH
5740	W	EHR J-STICK Y+
5750	W	EHR J-STICK Y ACTIVE SWITCH
5760	W	EHR J-STICK Y FULL FLOW SWITCH
5770	W	EHR J-STICK Y FLOAT SWITCH
5820	S	EDC ROCKSHAFT POT
5830	S/R/Y	HIGH FLOW PUMP LINK

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CIRC	COLOUR	DESCRIPTION
5835	S/U/Y	HYDRAULIC MASTER SWITCH HIGH FLOW PUMP LINK
5840	W	FRONT HITCH DETECT INPUT
5900	G	ISO BUS CAN SIGNAL LOW
5910	Y	ISO BUS CAN SIGNAL HIGH
5915	B	ISO BUS CAN SUPPLY GROUND
5920	R	ISO BUS CAN SUPPLY POSITIVE
5930	LN	ROTARY ENCODER SUPPLY
5935	O	ROTARY ENCODER SIGNAL - "HOME"
5940	O	ROTARY ENCODER SIGNAL - "ESC"
5945	TQ	ROTARY ENCODER SIGNAL - "P1"
5950	TQ	ROTARY ENCODER SIGNAL - "P2"
5955	B/LN	RS232 INPUT T.E.C.U.
5960	W/LN	RS232 OUTPUT T.E.C.U.
5962	R	USB + 5V REF.
5964	W	USB DATA -
5966	G	USB DATA +
5968	B	USB GROUND
5970	O	ISO BUS ECU SIGNAL
5975	O	ISO RELAY 2 POWER OUT
5980	U	ISO BUS IMPLEMENT SIGNAL
5985	U	ISO RELAY 1 POWER OUT
5990	O	ROTARY ENCODER SIGNAL - "ENTER"
6000	K	ENGINE SPEED SIGNAL
6001	B	ENGINE ECU RESISTOR #1
6002	W	ENGINE ECU RESISTOR #2
6003	R	ENGINE ECU RESISTOR #3
6004	G	ENGINE ECU RESISTOR #4
6057	TQ	ENGINE STARTER RELAY GROUND
6010	Y	THROTTLE POSITION SWITCH
6100	U	ENGINE COLD ADVANCE CONTROL
6200	R	MANIFOLD (GRID) HEATER SUPPLY
6300	N	FAN SPEED
6305	N	REVERSIBLE FAN OPTION - MOTOR FEED
6310	N	FAN SOLENOID
6315	N	REVERSIBLE FAN OPTION - RELAY CONTROL
6320	N	FAN 5V REF.
6325	N	REVERSIBLE FAN OPTION - RELAY FEED
6327	R	REVERSIBLE FAN RELAY POWER OUT
6330	N	VISTRONIC FAN INPUT
6355	N	+5V LOW POWER REFERENCE
6400	LN	ECU BATTERY SUPPLY
6401	G	ECU TO THROTTLE POT.+5V
6402	G	ECU TO THROTTLE POT. VAR
6403	G	ECU TO THROTTLE POT.-
6404	G	THROTTLE POT. TO LOW IDLE SWITCH
6405	G	ECU TO THROTTLE POT. SWITCH
6407	O/Y/B	ENGINE SHUTDOWN SIGNAL (EDC16)
6408	G	FUSED B+ TO ECU (1)
6409	G	FUSED B+ TO ECU (2)
6410	G	FUSED B+ TO ECU (3)
6411	G	FUSED B+ TO ECU (4)
6413	O	ENGINE SHUTDOWN RELAY SUPPLY
6414	G	FUSED IGN.+ TO ECU
6415	G	ECU TO J1939 INTERFACE CAN#1 CONN.(HI)
6416	G	ECU TO J1939 INTERFACE CAN#1 CONN.(LO)
6417	N/A	SCREEN BRAID FOR 6415 & 6416

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CIRC	COLOUR	DESCRIPTION
6418	K	ECU TO J1941(ISO) INTERFACE #2 CONNECTOR ISO K
6419	K	ECU TO J1941(ISO) INTERFACE #2 CONNECTOR ISO L
6420	K	ECU SINK DRIVER#6 TO DIAGNOSTIC LAMP
6421	K	ECU SINK DRIVER#6 TO DIAGNOSTIC LAMP
6422	K	ENGINE MOUNTED B- TO ECU (1)
6423	K	ENGINE MOUNTED B- TO ECU (2)
6424	K	ENGINE MOUNTED B- TO ECU (3)
6425	K	ENGINE MOUNTED B- TO ECU (4)
6427	K	ECU TO MULTIPLE STATE SWITCH (PASS.INPUT#06)
6428	K	ECU TO MULTIPLE STATE SWITCH (PASS.INPUT#06)
6431	K	ECU TO DIAGNOSTIC REQUEST SWITCH (DIG 15)
6432	K	ECU SWITCHED BATTERY OUTPUT TO DIAGNOSTIC REQUEST SWITCH
6440	S	HAND THROTTLE POSITION 1
6450	S	HAND THROTTLE POSITION 2
6460	S	HAND THROTTLE SWITCH (NOT IDLE)
6500	N	CONSTANT ERPM ON/OFF
6510	N	CONSTANT ERPM SET 1
6520	N	CONSTANT ERPM SET 2
6530	N	CONSTANT ERPM INCREASE
6540	N	CONSTANT ERPM DECREASE
6550	N	CONSTANT ERPM SET LAMP
6560	U	ECU TO FUEL FILTER HEATER
6570	G	ECU TO FUEL FILTER HEATER RETURN
6580	K	ECU TO GRID HEATER RELAY#1
6585	O	ECU TO GRID HEATER RELAY#2
6586	P	ECU TO GRID HEATER RELAY RETURN
6590	LG	ECU DIGITAL GROUND
6600	LN	ECU BATTERY SUPPLY
6610	N	ECU IGNITION SUPPLY
6620	O	ECU COOLANT TEMP. SIGNAL
6630	O	ECU COOLANT TEMP. GROUND
6640	O	ECU AC PRESSURE NOT HIGH SWITCH
6650	O	ECU BOOST GROUND
6660	O	ECU BOOST TEMP.
6670	O	ECU 5V BOOST
6680	O	ECU BOOST PRESSURE
6690	O	ECU SOLENOID VALVE SHUT OFF
6700	O	ECU CRANK SHAFT OUTPUT SHAFT
6710	O	ECU ENGINE SPEED
7000	U	TRANS CONTROL SUPPLY
7001	U	TRANS DISPLAY ILLUMINATION
7002	U	TRANS MAIN CLUTCH SOL (C3/C4)
7003	U	TRANS DUMP SOL
7004	U	TRANS FRONT CLUTCH SOL (C1/C2)
7005	U	TRANS CREEPER GR SOL
7007	R	TRANS DUAL POWER PRESSURE SWITCH HIGH
7008	R	TRANS DUAL POWER PRESSURE SWITCH LOW
7009	W	TRANS RANGE DISABLE SWITCH
7010	U	TRANS RANGE INDICATOR SWITCH (GR 1-4)
7020	U	TRANS RANGE INDICATOR SWITCH (GR 5-8)
7025	R/TQ/Y	TRANS DISPLAY ENABLE
7030	U	TRANS RANGE INDICATOR SWITCH COMMON
7035	N	TRANS DUMP SOLENOID FEED
7040	N	TRANS CREEPER SWITCH
7050	R	TRANS RELAY SUPPLY - RUN

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CIRC	COLOUR	DESCRIPTION
7060	R	TRANS RELAY SUPPLY - START
7068	U	TRANS CVT POWER SUPPLY (CVT)
7070	R	TRANS FEED (IGN +)
7071	N	FEED HYD FILTER RESTRICTION IND LAMP
7080	LG	DIFF-LOCK SOLENOID FEED
7090	LG	DIFF-LOCK SWITCH TO BRAKE SWITCH
7100	N	DIFF-LOCK RELAY TO BRAKE SWITCH
7110	R	PTO INHIBITOR SWITCH TO TRANS
7120	Y	DIFF-LOCK WNG LP (MANUAL)
7125	LG	DIFF-LOCK WNG LP (AUTO)
7126	LG	DIFF LOCK PRESSURE SWITCH
7130	N	HYD FILTER WNG LP
7135	N	HYD FILTER PRESSURE SWITCH
7140	O	DIFF-LOCK OFF SOLENOID
7150	S	LOW OIL PRESSURE WRN FEED
7155	U	VANE PUMP PRESSURE SENSOR SIGNAL
7160	R	HYD LOW CHARGE WARNING
7170	W	DIFF LOCK SWITCH (AUTO ON)
7175	Y	DIFF LOCK SWITCH (MANUAL ON)
7180	U	CREEPER SWITCH MOM SIGNAL
7190	K	TRANS SOLENOID VALVE SUPPLY
7195	K	TRANS SOLENOID VALVE RETURN
7196	Y	TRANS FR/REV LOW SIDE RETURN (CVT)
7197	Y	TRANS RANGE LOW SIDE RETURN (CVT)
7198	U	TRANS HYDROSTATIC LOW SIDE RETURN (CVT)
7200	S	TRANSMISSION SHIFT DOWN
7210	S	TRANSMISSION SHIFT UP
7220	S	TRANSMISSION HIGH RANGE
7225	W	TRANS HI RANGE SOL - RET
7230	S	TRANSMISSION LOW RANGE
7235	Y	TRANS LOW RANGE SOL - RET
7240	S	TRANSMISSION DISPLAY SWITCH
7245	LN	DEADMAN
7250	S	TRANSMISSION FORWARD SIGNAL
7260	S	TRANSMISSION REVERSE SIGNAL
7265	K	TRANS NEUTRAL SWITCH TO PROCESSOR (GR.SW 1)
7267	LG	TRANS NEUTRAL SWITCH 2 TO PROCESSOR
7270	R	TCM SERIAL DATA IN-DISPLAY DATA OUT
7275	W	TCM SERIAL DATA OUT-DISPLAY DATA IN
7280	W	LIMP HOME SWITCH 18x18 TRANS.
7290	W	DIRECTIONAL INTERRUPT RELAY TO SOLENOID
7295	W	DRIVE DISABLE SIGNAL
7300	W	SOLENOID 1 18x9 TRANSMISSION
7301	Y	SOLENOID 1 18x9 RETURN
7320	W	SOLENOID 2 18x9 TRANSMISSION
7321	P	SOLENOID 2 18x9 RETURN
7330	W	SOLENOID 3 18x9 TRANSMISSION
7331	Y	SOLENOID 3 18x9 RETURN
7340	W	SOLENOID F1 18x9 TRANSMISSION
7341	Y	SOLENOID F1 18x9 RETURN
7350	W	SOLENOID F2 18x9 TRANSMISSION
7351	S	SOLENOID F2 18x9 RETURN
7355	S	SOLENOID R 18x9 TRANSMISSION
7356	U	SOLENOID R 18x9 RETURN
7360	W	SOLENOID A 18x9 TRANSMISSION
7361	P	SOLENOID A 18x9 RETURN

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CIRC	COLOUR	DESCRIPTION
7370	Y	SOLENOID B 18x9 TRANSMISSION
7371	P	SOLENOID B 18x9 RETURN
7380	Y	SOLENOID C 18x9 TRANSMISSION
7381	P	SOLENOID C 18x9 RETURN
7390	Y	SOLENOID PMW (F1) 18x9 TRANSMISSION
7391	P	SOLENOID PWM (F1) 18x9 RETURN
7392	O	SOLENOID PWM (F2) 18x9 TRANSMISSION
7393	O	SOLENOID PWM (F2) 18x9 RETURN
7395	P	SOLENOID CREEP 18x9 TRANSMISSION
7396	P	SOLENOID CREEP 18x9 RETURN
7400	Y	TRANS RPM SPEED SENSOR TO TCM INPUT
7401	P	TRANS RPM SPEED SENSOR
7402	Y	TRANS WHLSP FORWARD (CVT)
7403	Y	TRANS WHLSP REVERSE (CVT)
7404	Y	TRANS HYDROSTAT FORWARD (CVT)
7405	Y	TRANS HYDROSTAT REVERSE (CVT)
7406	LG	TRANS BI-DI SPEED SENSOR RET (CVT)
7407	K	HYDROSTAT 1 SOLENOID +
7408	L	HYDROSTAT 1 SOLENOID GND
7410	Y	TRANS RPM SPEED SENSOR TO TCM OUTPUT
7411	Y/K/B	TRANS HYDROSTAT INPUT SPEED SENSOR (CVT)
7420	Y	TCM TO CLUTCH POSITION SWITCH
7425	Y	DRIVE SIGNAL
7430	Y	CLUTCH POSITION SIGNAL
7431	TQ	CLUTCH 'A' SUPPLY
7440	Y	TCM TO TRACTOR EIC-AXLE OUTPUT
7450	W	TRANS CREEPER INTERLOCK SUPPLY
7460	W	TRANS CREEPER CLUTCH ENGAGED
7470	S	TRANS CREEPER CLUTCH DISENGAGED
7475	R	TRANS AUTO OFF
7476	R	TRANS AUTO ON
7480	G	TRANS AUTO FUNCTION 1
7482	G	TRANS AUTO ON/INCREASE
7485	K	TRANS AUTO FUNCTION LAMP 1
7490	G	TRANS AUTO FUNCTION 2
7492	G	TRANS AUTO OFF/DECREASE
7495	K	TRANS AUTO FUNCTION LAMP 2
7500	G	TRANS OIL TEMP. SENSOR
7520	G	TRANS SENSOR SUPPLY 8v
7525	G	TRANS SENSOR SUPPLY 5v
7560	G	TRANS WARNING LAMP
7570	B/W	SIGNAL GROUND
7579	U	PARKLOCK SWITCH
7580	U	CREEPER SOLENOID MONITOR
7581	O	CREEPER POSITION SIGNAL
7582	U	CREEPER RAIL SWITCH NOT
7583	U	PARKLOCK SWITCH #2
7584	U	PARKLOCK SENSOR SWITCH SIGNAL
7585	U	PARKLOCK SOLENOID #2
7586	U/G/Y	PARKLOCK SOLENOID
7587	U	PARKLOCK OVERRIDE SWITCH
7588	U	PARKLOCK POSITION SIGNAL
7589	U	BRAKE PRESSURE SIGNAL
7590	O	TRANS CREEPER GEAR STATUS LAMP
7600	N	TRANS FEATHERING SOLENOID
7620	N	TRANS FEATHERING SOL. MONITOR

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CIRC	COLOUR	DESCRIPTION
7630	N	TRANS MAIN CLUTCH PRESSURE SWITCH
7640	LN	DIAGNOSTIC PLUG RS232 IN
7650	W	DIAGNOSTIC PLUG RS232 OUT
7655	Y/LN	RS232 GROUND
7660	R	TRANS CLUTCH DISCONNECT
7670	R	TRANS FRONT SYNCHRO POSITION
7700	LN	TRANS SHUTTLE DUMP SWITCH
7710	LN	TRANS OIL TEMPERATURE SWITCH
7730	TN	NOT IN PARKLOCK
7735	LN	TRANS MID SPEED SIGNAL +
7740	LN	TRANS MID SPEED SIGNAL -
7750	R	TCM TO DOG 30/40 KPH SELECT
7755	P/G/S	DOG ENABLE
7760	W	TORQUE SENSOR
7770	U	TRANS FORWARD PRESSURE SWITCH
7775	K	B CLUTCH PRESSURE SIGNAL
7780	U	TRANS FORWARD PRESSURE SWITCH
7785	O	A CLUTCH PRESSURE SIGNAL
7790	TQ	TRANS RANGE INPUT DIGITAL FEEDBACK (CVT)
7800	TQ	TRANS FR / REV INPUT DIGITAL FEEDBACK (CVT)
7810	K	TRANS PWM SOLENOID C1
7815	K	TRANS PWM SOLENOID C1 RETURN
7820	K	TRANS PWM SOLENOID C2
7825	K	TRANS PWM SOLENOID C2 RETURN
7830	K	TRANS PWM SOLENOID C3
7835	K	TRANS PWM SOLENOID C3 RETURN
7840	K	TRANS PWM SOLENOID C4
7845	K	TRANS PWM SOLENOID C4 RETURN
7846	TQ	TRANS BRAKE SOLENOID (CVT)
7847	TQ	TRANS HYDROSTATIC - POSITIVE SOLENOID (CVT)
7848	TQ	TRANS HYDROSTATIC - NEGATIVE SOLENOID (CVT)
7850	G	TRANS DIAGNOSTIC PROGRAM VOLTAGE
7855	G	TRANS DIAGNOSTIC EA
7860	G	TRANS DIAGNOSTIC RCV
7865	G	TRANS DIAGNOSTIC XMT
7870	G	TRANS DIAGNOSTIC RTS
7875	K	TRANS DIAGNOSTIC CTS
7880	B/W	T C M SIGNAL GROUND
7890	TQ	TRANS L-LINE DIAGNOSTIC (CVT)
7900	TQ	CLUTCH 'A' SIGNAL
7910	TQ	CLUTCH 'B' SIGNAL
7915	P	TCM CLUTCH B RETURN
7920	TQ	CLUTCH 'C' SIGNAL
7925	P	TCM CLUTCH C RETURN
7930	TQ	CLUTCH 'D' SIGNAL
7935	P	TCM CLUTCH D RETURN
7940	TQ	CLUTCH 'E' SIGNAL
7945	P	TCM CLUTCH E RETURN
7950	TQ	CLUTCH SUPPLY
7960	P	TRANS SLOW/FAST
7965	P	HI/LO SYNCHRO SIGNAL
7970	P	TRANS MED/REV
7980	K	TRANS MED RANGE
7982	W	TRANS MED RANGE RET
7985	G	TRANS REVERSE RANGE
7990	K	TRANS BRAKE
7995	K	BRAKE FLUID LEVEL

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CIRC	COLOUR	DESCRIPTION
7996	R	BRAKE PEDALS UNLATCHED SIGNAL
8000	N	TRAILER BRAKE SOLENOID
8010	LN	TRAILER BRAKE PRESSURE
8020	LN	TRAILER BRAKE PRESSURE
8030	LG	TRANS FWD SOLENOID
8035	P	TRANS FWD SOL RET
8040	LG	TRANS REV SOLENOID
8045	P	TRANS REV SOL RET
8050	R	TRANS REV PRESSURE
8060	U	TRAILER BRAKE SUPPLY
8070	P/W/S	TRAILER PARK BRAKE SOLENOID
9000	LN	DIVERTER VALVE
9010	LN	DIVERTER VALVE SUPPLY
9020	LN	HYDRAULIC REMOTE VALVE SOL
9025	LN	HYDRAULIC REMOTE VALVE SWITCH
9027	W	CAL/ SEL INPUT ADIC
9028	W	ADIC MEMORY B+
9031	P	ADIC MEMORY B+
9032	Y	IGN.+ TO POWER SKT.
9033	LN	50KPH SOLENOID+
9034	LN	50KPH SOLENOID-
9035	LN	50KPH DUMP SOLENOID
9036	LN	50KPH DUMP SOLENOID RETURN

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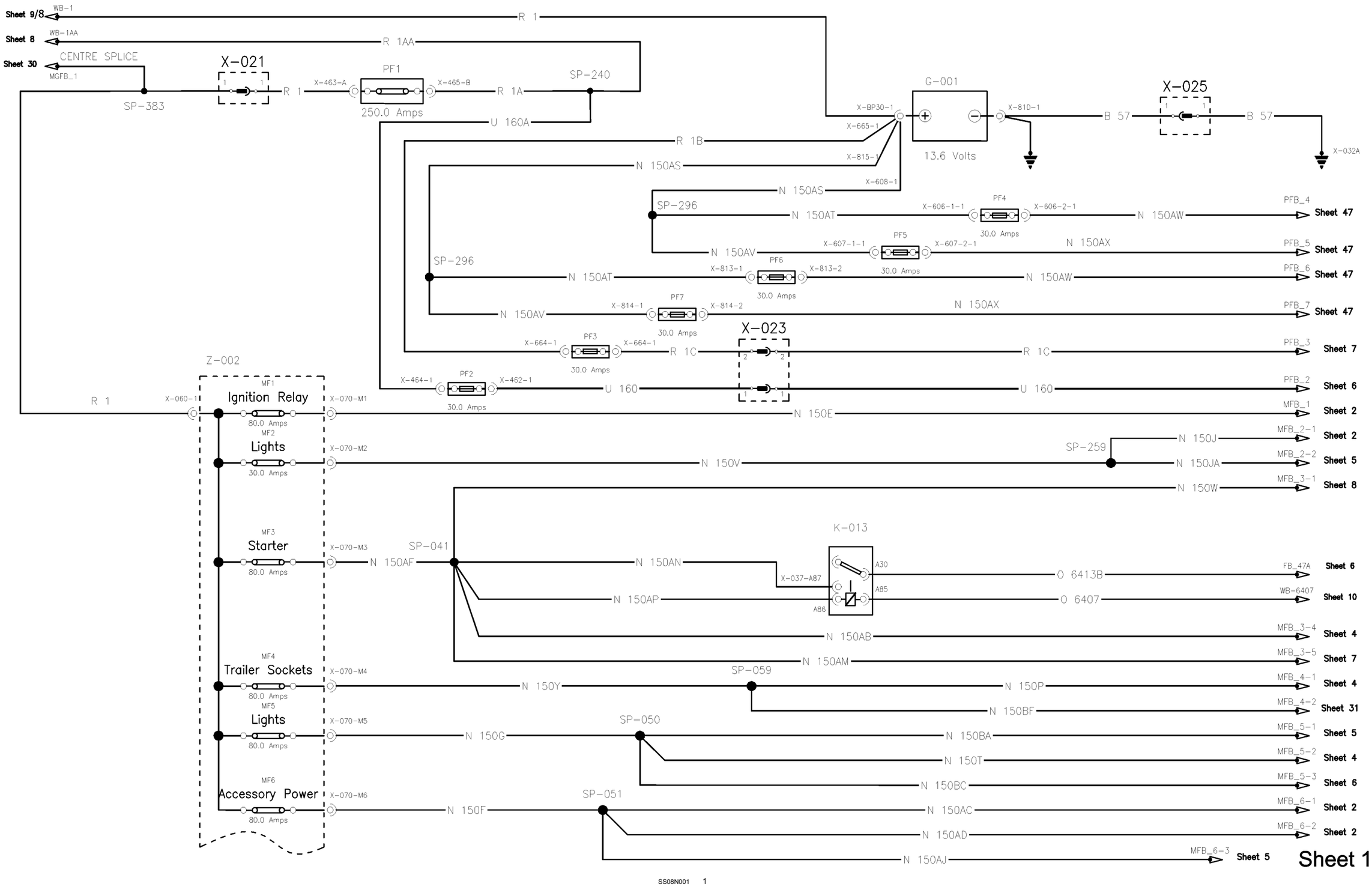
Wiring harness - Electrical schematic frame 01 Power Distribution (Maxi Fuses 1 - 6)

Compo-nent	Connector	Description
G001	**X608**, **X665**, **X815**, XBP30, **X810**	**12 V** Battery
K013	**X037**	Engine Shutdown
MF1	**X060**, **X070**	Supply to F009, F013, F018, F021, F045, F050
MF2	**X070**	Supply to F006, F007, F008, F036, F037, F038
MF3	**X070**	Supply to V019, F030, K005, K013
MF4	**X070**	Supply to F027, K015
MF5	**X070**	Supply to F026, F031, F051
MF6	**X070**	Supply to F001, F002, F003, F004, F005, F044
PF1	**X463**, **X465**	Power Fuse, Main power supply B+ (**250 A**)
PF2	**X462**, **X464**	Power Fuse, Power Supply CCU
PF3	**X664**	Power Fuse, Power Supply Memory
PF4	**X606**	Power Fuse, ISO Bus Rear
PF5	**X607**	Power Fuse, ISO Bus Rear
PF6	**X813**	Power Fuse, ISO Bus Front
PF7	**X814**	Power Fuse, ISO Bus Front
Z002	**X070**	Maxi Fuseholder
Additional Connectors: **X021**, **X023**, **X025**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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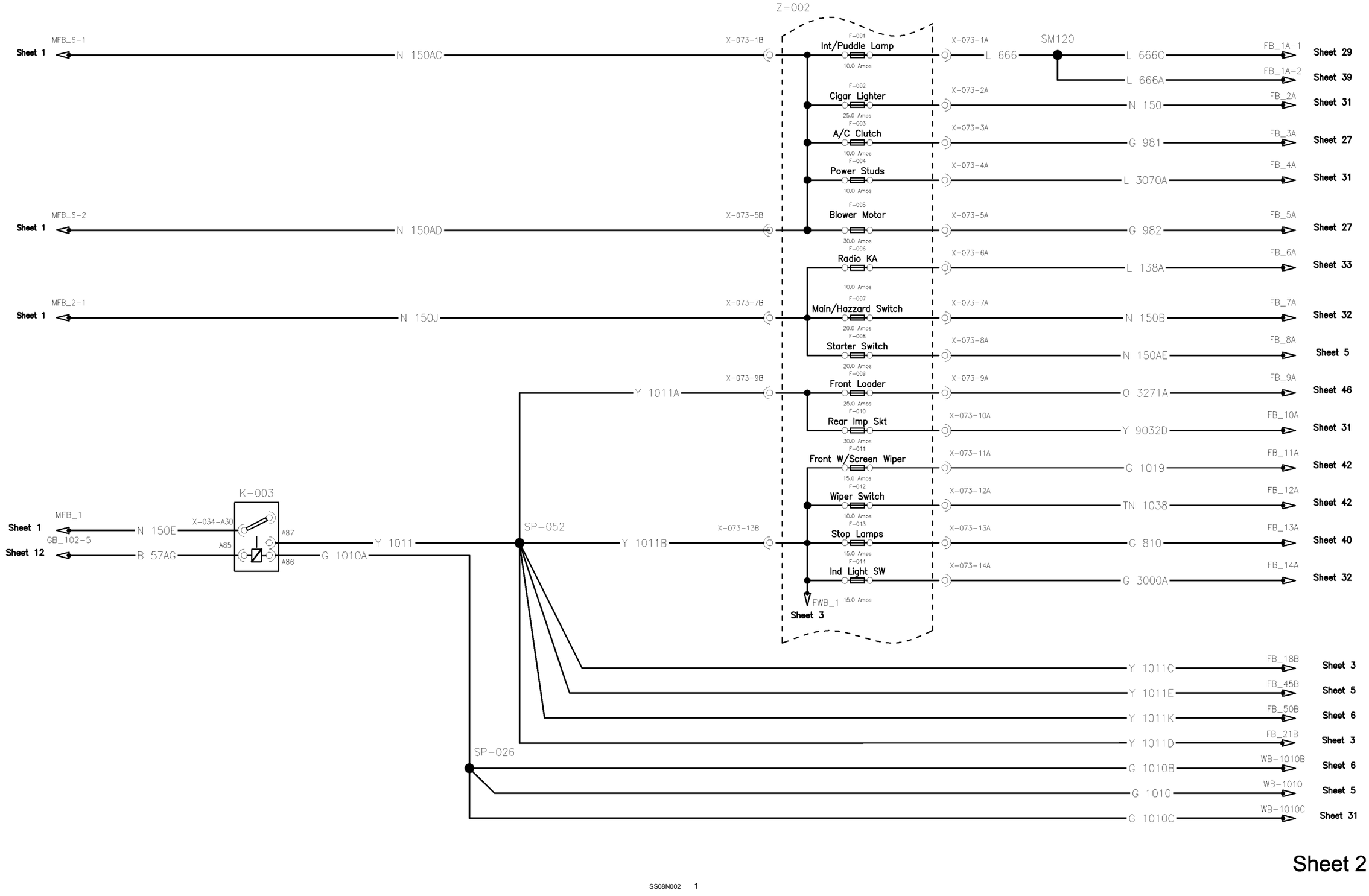
Wiring harness - Electrical schematic frame 02 Power Distribution (Fuses 1 - 14)

Component	Connector	Description
F001	**X073**	Interior and step lighting and relay mirror heating
F002	**X073**	Cigar lighter and power socket, cab (potential 30)
F003	**X073**	Coupling of the A/C compressor
F004	**X073**	Screw terminal red (potential 30)
F005	**X073**	Blower Motor
F006	**X073**	Station memory and work lamp control unit
F007	**X073**	Switch - Main headlights and hazard light switch
F008	**X073**	Starter Switch
F009	**X073**	Front Loader Power
F010	**X073**	Rear Power Socket (Potential 15)
F011	**X073**	Front Windscreen Wiper
F012	**X073**	Rear Windscreen Wiper / Switch, Windscreen Washing System, Front / Rear
F013	**X073**	Relay, Brake Lights
F014	**X073**	Headlight Switch and Flasher
K003	**X034**	Ignition Relay
Z002	**X073**	Fusemodul
Additional Connectors: -		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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Sheet 2

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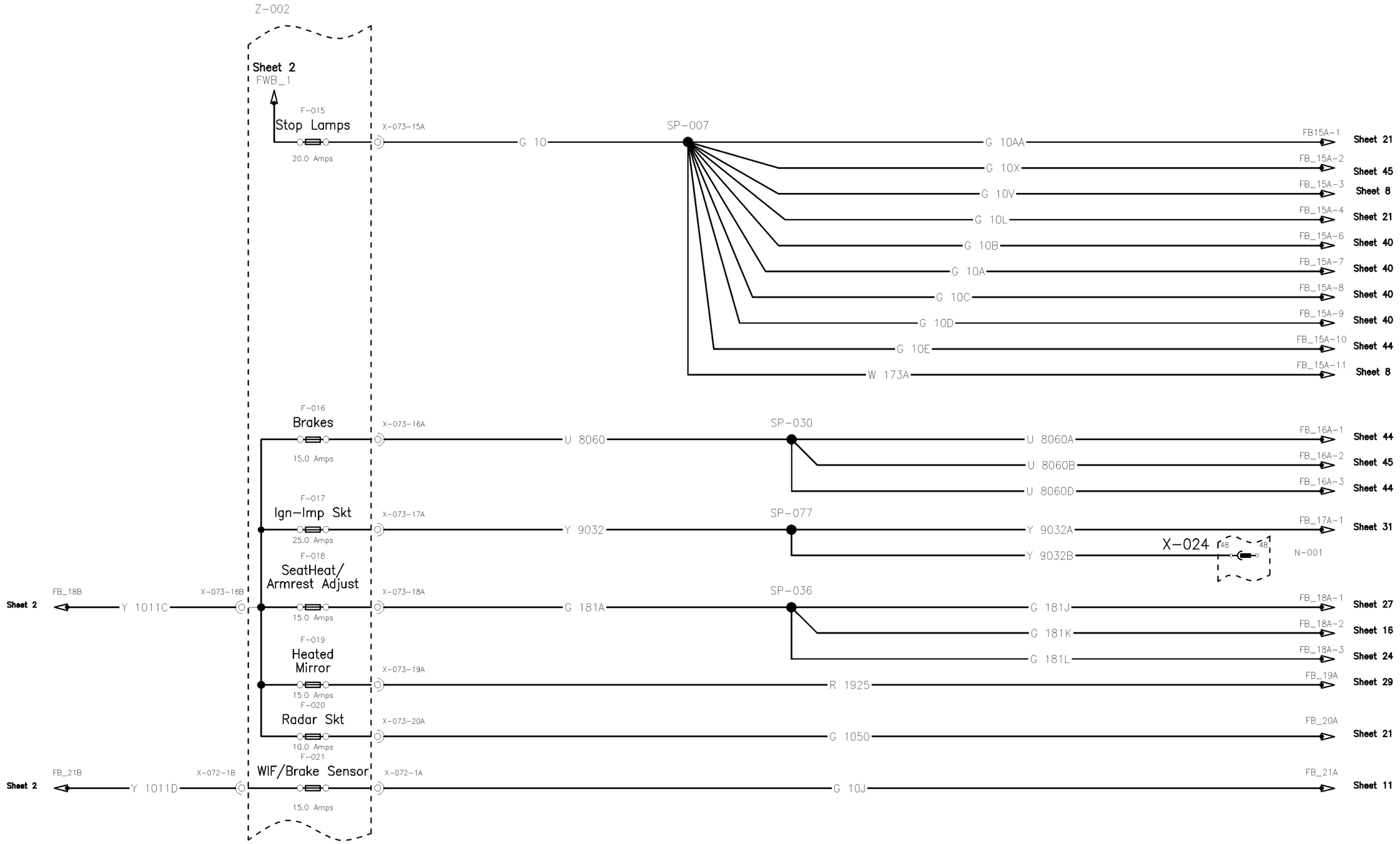
Wiring harness - Electrical schematic frame 03 Power Distribution (Fuses 15 - 21)

Component	Connector	Description
F015	**X073**	Brake light switch and pedal lock
F016	**X073**	Trailer brake
F017	**X073**	Power socket, cab (potential 15)
F018	**X073**	Air blower motor relay and driver’s seat / Armrest adjust
F019	**X073**	Heated mirrors
F020	**X073**	Radar sensor, normal signal socket / keypad
F021	**X072**	Water sensor for the fuel filter, Brake fluid level switch
Z002	**X073**	Fusemodul
Z002	**X072**	Fusemodul
Additional Connectors: **X024**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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Sheet 3

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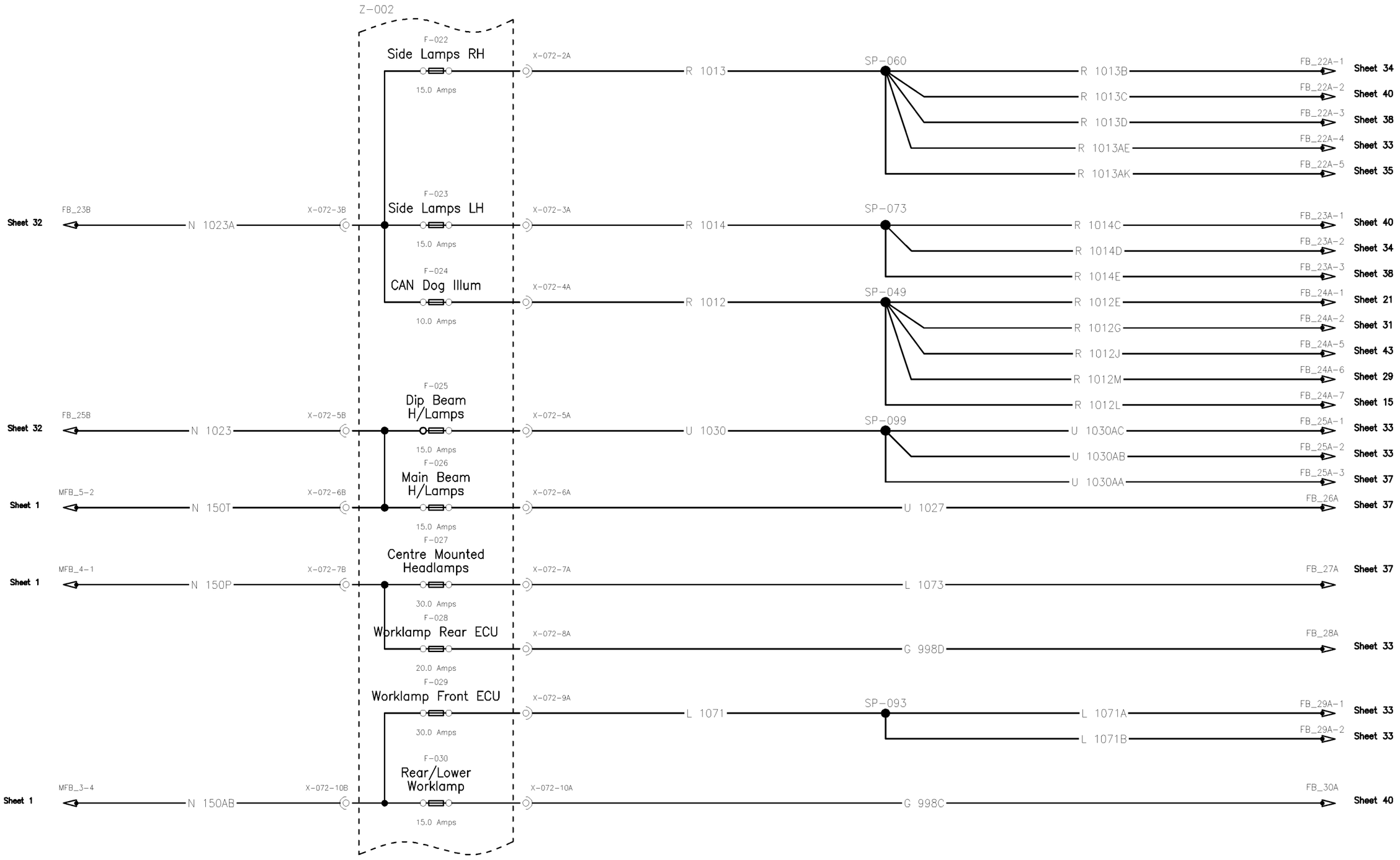
Wiring harness - Electrical schematic frame 04 Power Distribution (Fuses 22 - 30)

Component	Connector	Description
F022	**X072**	Side marker lights, right
F023	**X072**	Side marker lights, left / licence plate lights
F024	**X072**	Illumination - Lighting / cigar lighter - ICU - VT - heated mirror switch - EHR-lock switch
F025	**X072**	Dipped beam headlights relay, get you home
F026	**X072**	Main beam headlights
F027	**X072**	Front work lamp (bonnet)
F028	**X072**	Work lamp control unit / Roof rear worklamps
F029	**X072**	Work lamp control unit / Roof front worklamps and grabrail
F030	**X072**	Work lamp (C-pillar)
Z002	**X072**	Fusemodul
Additional Connectors: -		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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Sheet 4

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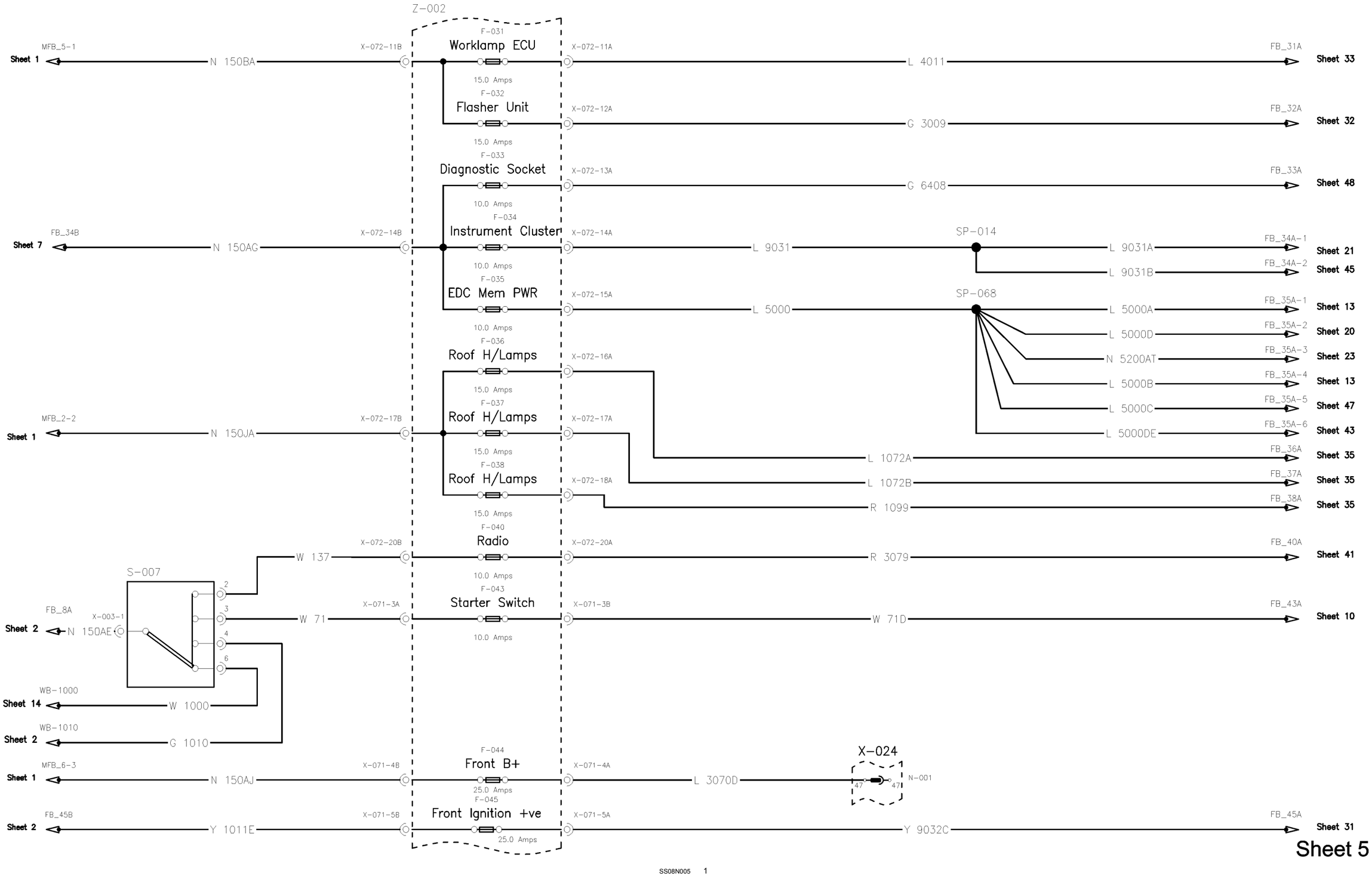
Wiring harness - Electrical schematic frame 05 Power Distribution (Fuses 31 - 45)

Component	Connector	Description
F031	**X072**	Rotating beacon (via work lamp control unit)
F032	**X072**	Flasher unit
F033	**X072**	Diagnostics plug 1/2
F034	**X072**	ICU 3 and hand brake switch
F035	**X072**	Potential 30 for electronics
F036	**X072**	4 Work lamps front roof relay
F037	**X072**	4 Work lamps rear roof relay
F038	**X072**	6 Work lamps front roof relay
F040	**X072**	Radio memory
F043	**X071**	Engine electronics (potential 15)
F044	**X071**	Front-mounted equipment socket (B+)
F045	**X071**	Power supply - 8 A socket (potential 15) C-pillar left
S007	**X003**	Starter Switch
Z002	**X072**	Fusemodul
Z002	**X071**	Fusemodul
Additional Connectors: **X024**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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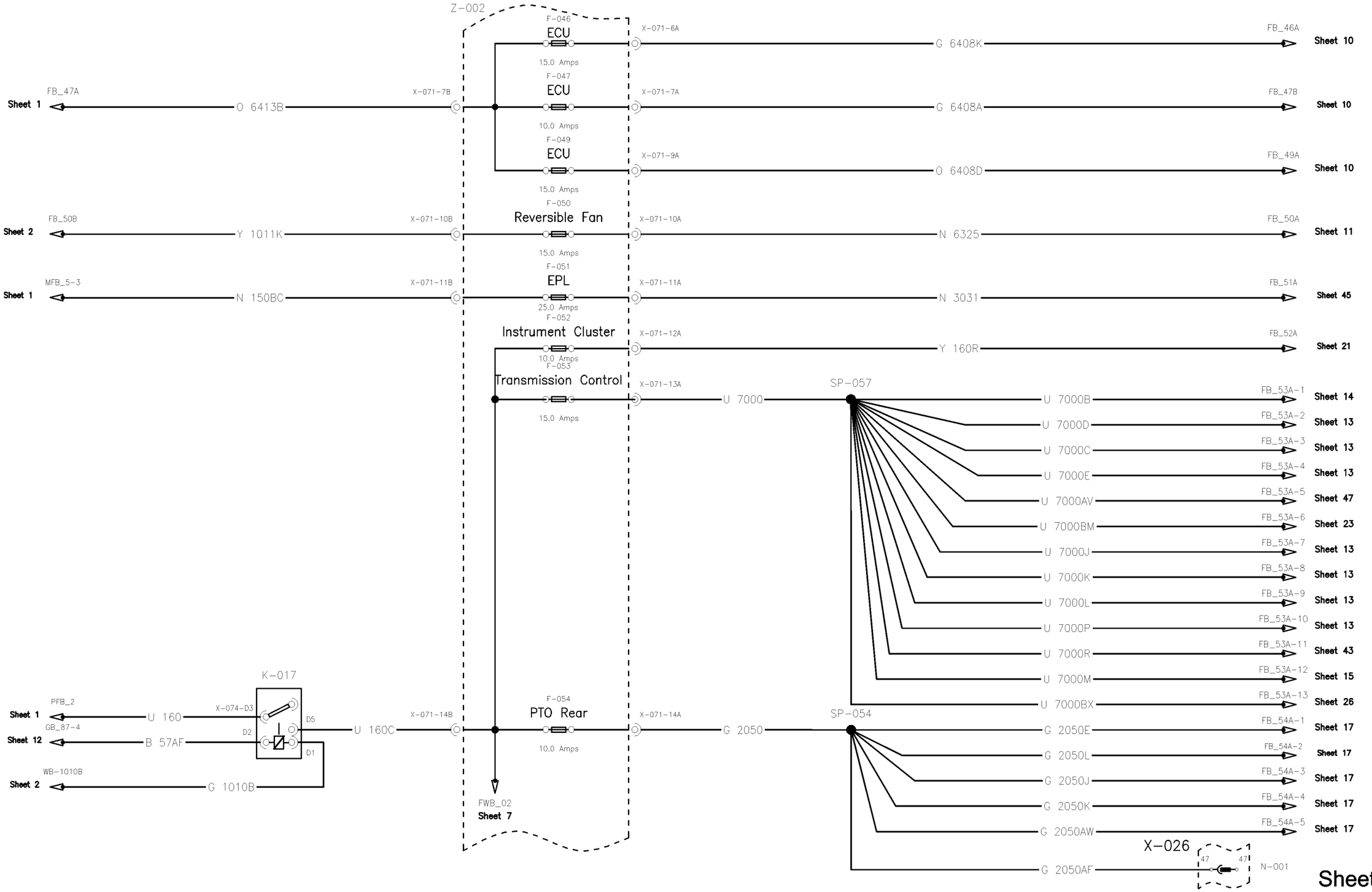
Wiring harness - Electrical schematic frame 06 Power Distribution (Fuses 46 - 54)

Component	Connector	Description
F046	**X071**	Engine controller B+ supply
F047	**X071**	Engine controller B+ supply
F049	**X071**	Viscotronic fan, relay heater grid, relay fuel filter heater, exhaust brake
F050	**X071**	Reversible fan
F051	**X071**	Electronic park brake
F052	**X071**	ICU 3 supply
F053	**X071**	Transmission control supply (potential 15)
F054	**X071**	PTO rear
K017	**X074**	Power Supply ECU
Z002	**X071**	Fusemodul
Additional Connectors: **X026**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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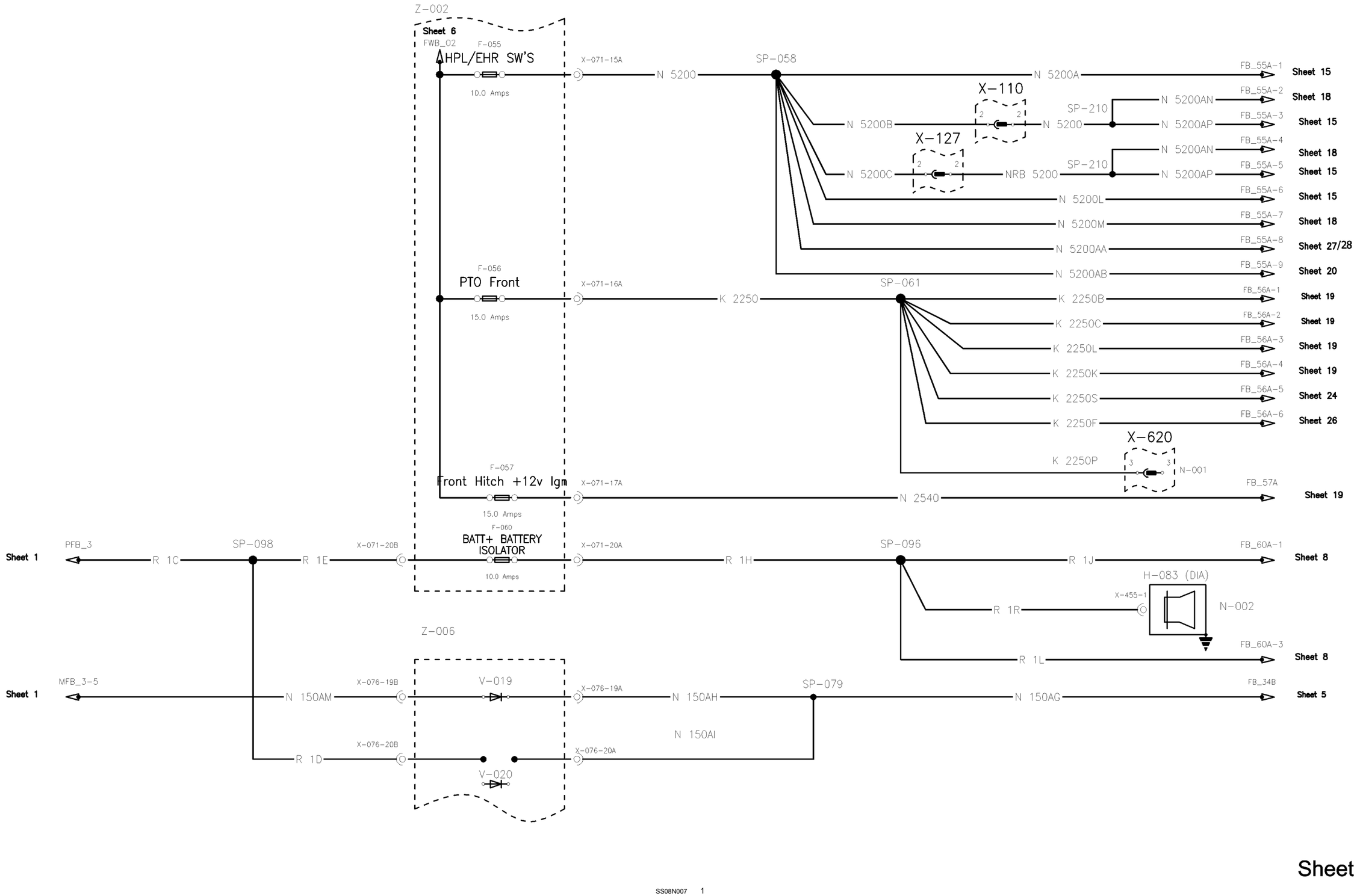
Wiring harness - Electrical schematic frame 07 Power Distribution (Fuses 55 - 60)

Component	Connector	Description
F055	**X071**	Supply Ignition Fast Steer / ARU 1 / A/C pressure switch / ACU-CN1a / CCM-CN1a
F056	**X071**	PTO front
F057	**X071**	Supply Ignition / ACU auxiliary unit CN1a front hitch
F060	**X071**	Time relay battery isolator - battery isolator control switch
H083	**X455**	Reverse Alarm
V019	**X076**	Less El. Battery Isolator Diode
V020	**X076**	With El. Battery Isolator Doide
Z002	**X071**	Fusemodul
Z006	**X076**	Diode Block
Additional Connectors: **X110**, **X127**, **X620**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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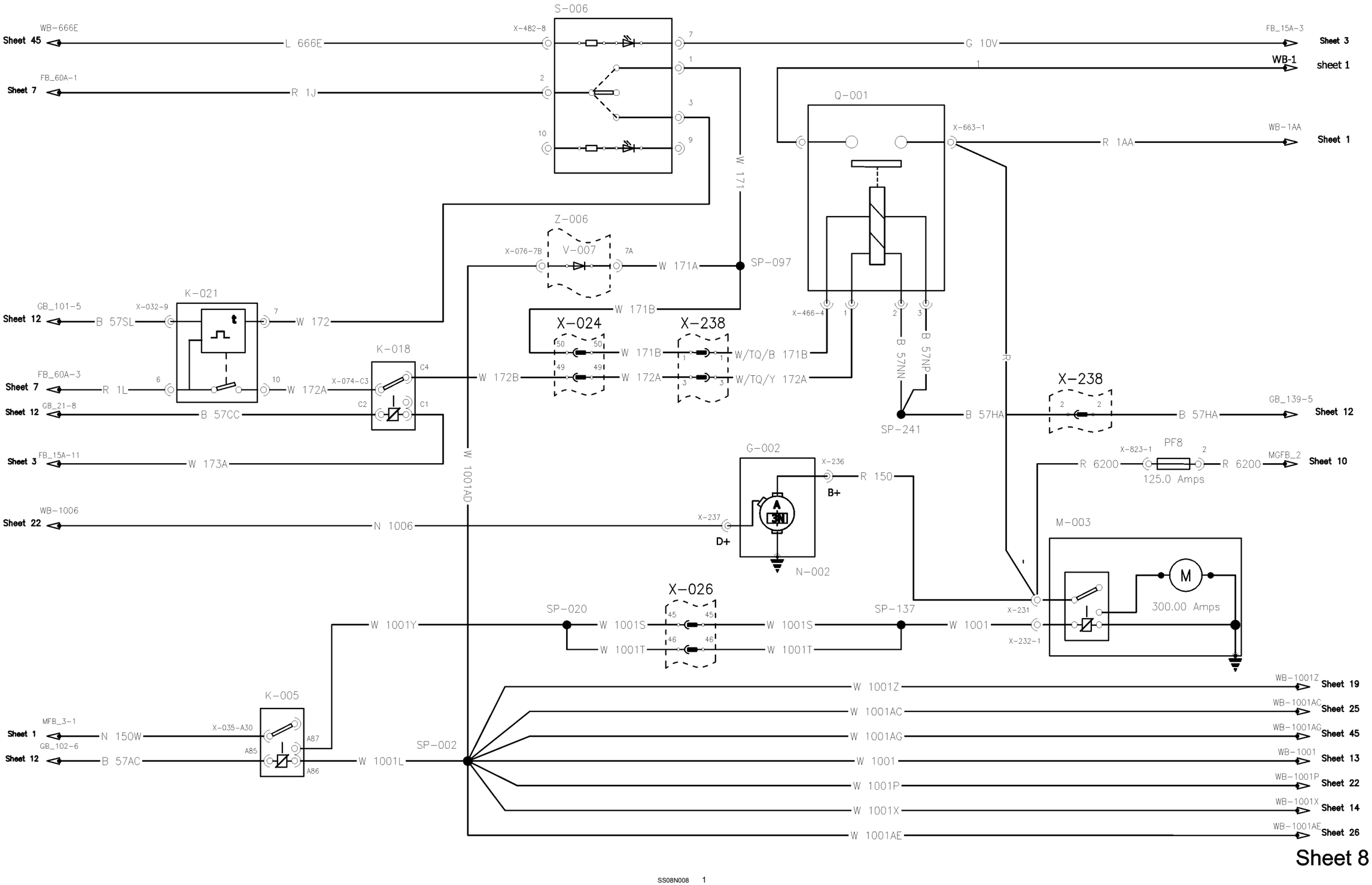
Wiring harness - Electrical schematic frame 08 Start/Charging (Start & Charging W/Isolator)

Component	Connector	Description
G002	**X236**, **X237**	Alternator
K005	**X035**	Starter Motor On
K018	**X074**	EL.Battery Isolator
K021	**X032**	Timer Relay Battery Isolator
M003	**X231**, **X232**	Starter Motor
PF8	**X823**	Mega Fuse, Grid & Fuel Heater (**125 A**)
Q001	**X466**, **X663**	Battery Isolator
S006	**X482**	Battery Isolator Control Switch
V007	**X076**	El. Battery Isolator Diode
Z006	**X076**	Diode Block
Additional Connectors: **X024**, **X026**, **X238**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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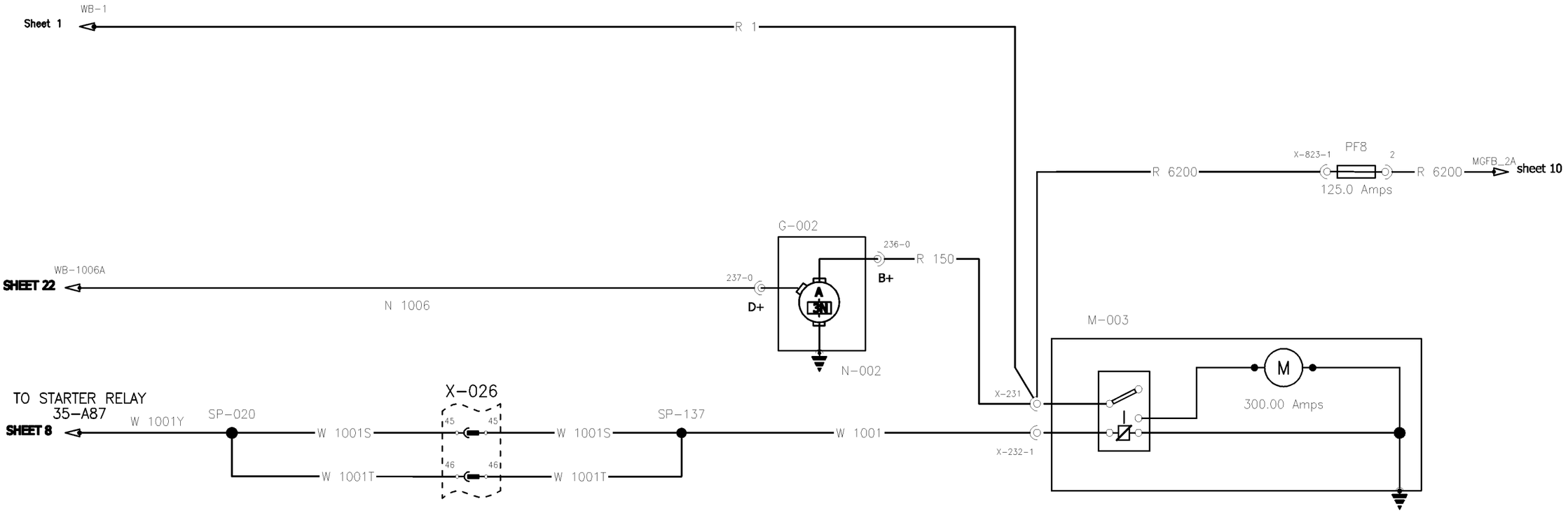
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Wiring harness - Electrical schematic frame 09 Start/Charging (without Isolator)

Component	Connector	Description
G002	**X236**, **X237**	Alternator
M003	**X231**, **X232**	Starter Motor
PF8	**X823**	Mega Fuse, Grid & Fuel Heater (**125 A**)
Additional Connectors: **X026**		

Wire Colour Codes							
B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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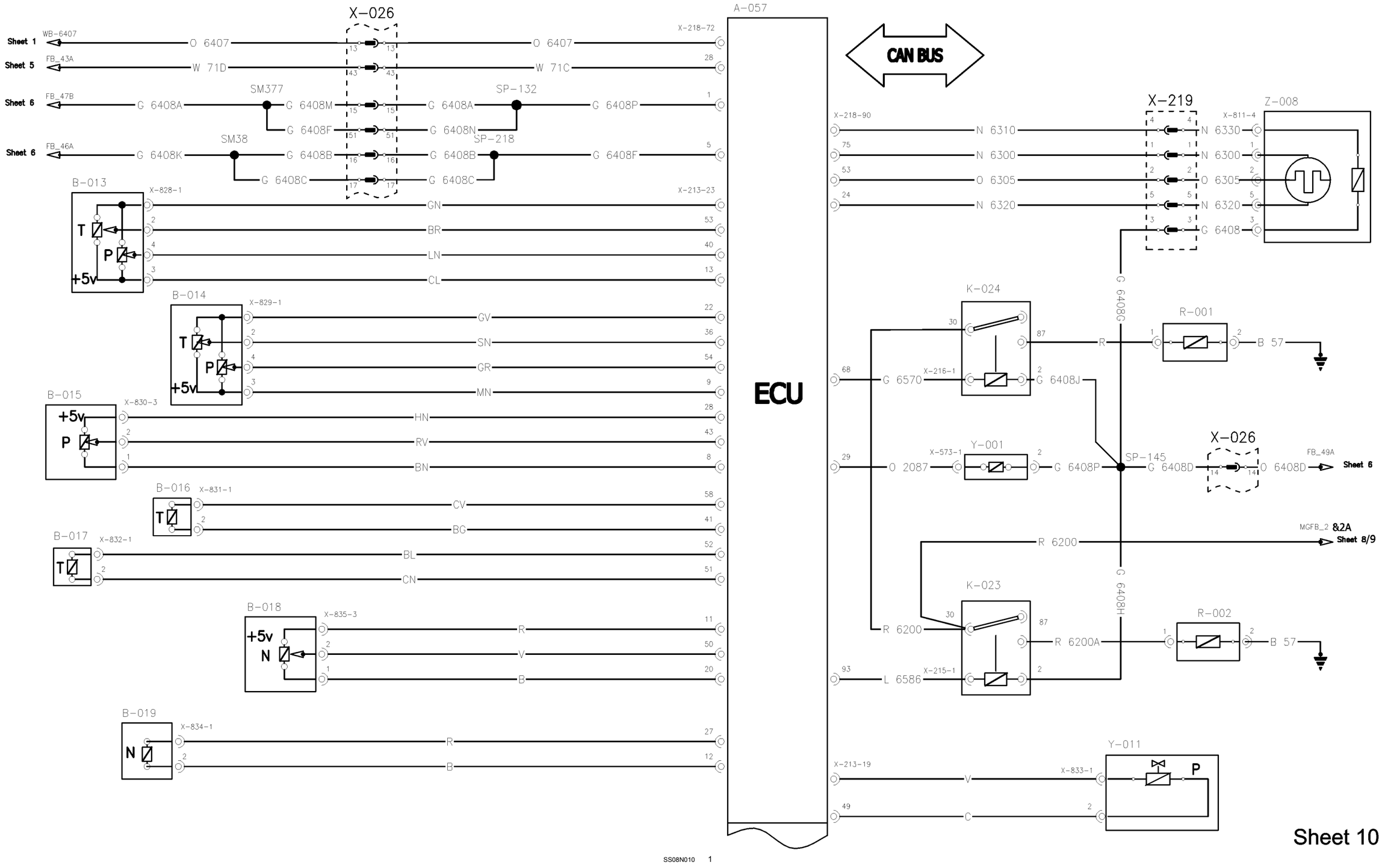
Wiring harness - Electrical schematic frame 10 ECU (Engine ECU)

Component	Connector	Description
A057	**X213**, **X218**	Engine Control Unit
B013	**X828**	Boost Pressure Sensor
B014	**X829**	Oil Pressure Sensor
B015	**X830**	Rail Pressure Sensor
B016	**X831**	Coolant Temperature Sensor
B017	**X832**	Fuel Temperature Sensor
B018	**X835**	Camshaft Speed Sensor
B019	**X834**	Increment Speed Sensor
K023	**X215**	Grid Heater Relay
K024	**X216**	Fuel Heater Relay
R001	-	Fuel Heater
R002	-	Grid Heater
Y001	**X573**	Exhaust Brake Solenoid
Y011	**X833**	High Pressure Pump
Z008	**X811**	Visctronic Fan
Additional Connectors: **X026**, **X219**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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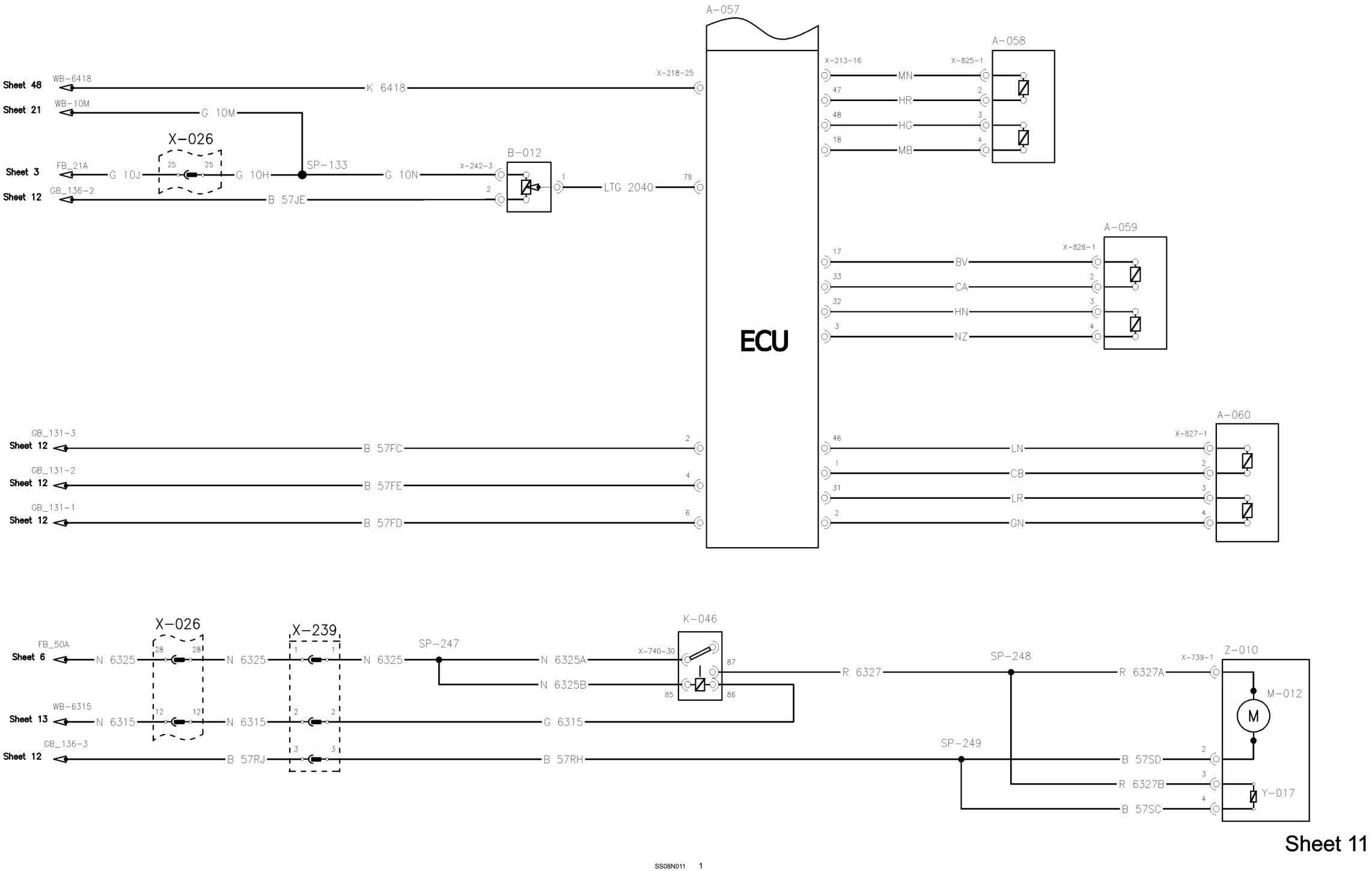
Wiring harness - Electrical schematic frame 11 Engine Control Unit (Engine ECU)

Component	Connector	Description
A057	**X213**, **X218**	Engine Control Unit
A058	**X825**	Cylinders 1 & 2
A059	**X826**	Cylinders 3 & 4
A060	**X827**	Cylinders 5 & 6
B012	**X242**	Water In Fuel Sensor
K046	**X740**	Reversible Fan Relay
M012	**X739**	Reversible Fan Compressor
Y017	**X739**	Reversible Fan Valve
Z010	**X739**	Reversible Fan Compressor / Valve
Additional Connectors: **X026**, **X239**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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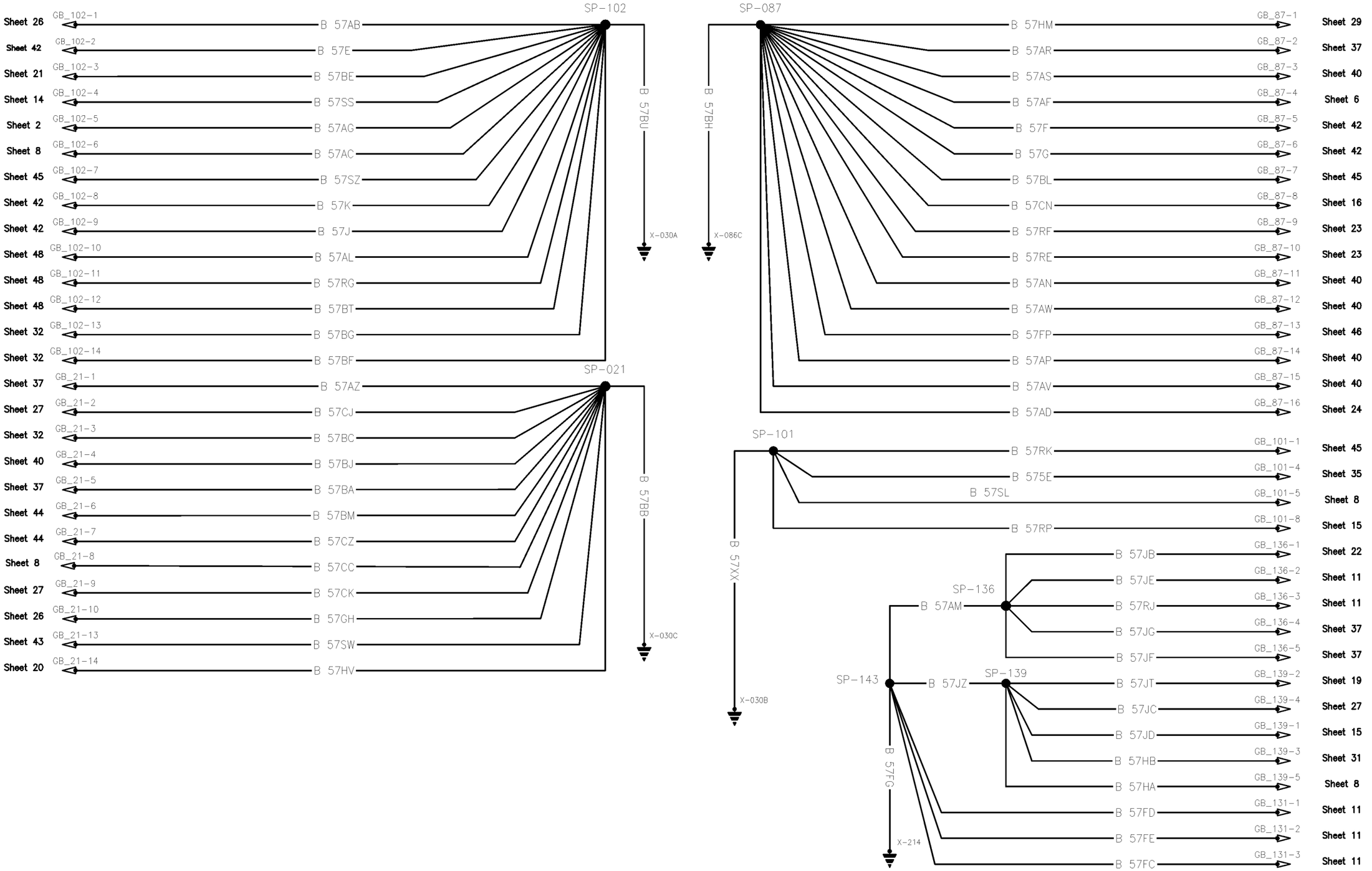
Wiring harness - Electrical schematic frame 12 Power Distribution (Power Earthing)

Component	Connector	Description
-	**X030A**	Earth Header 2 to SP102
-	**X030B**	Earth Header 2 to SP101
-	**X030C**	Earth Header 2 to SP021
-	**X086C**	Earth Header 1 to SP087
-	**X214**	Earth Point - Electronic Module to SP143, 136, 139
Additional Connectors: -		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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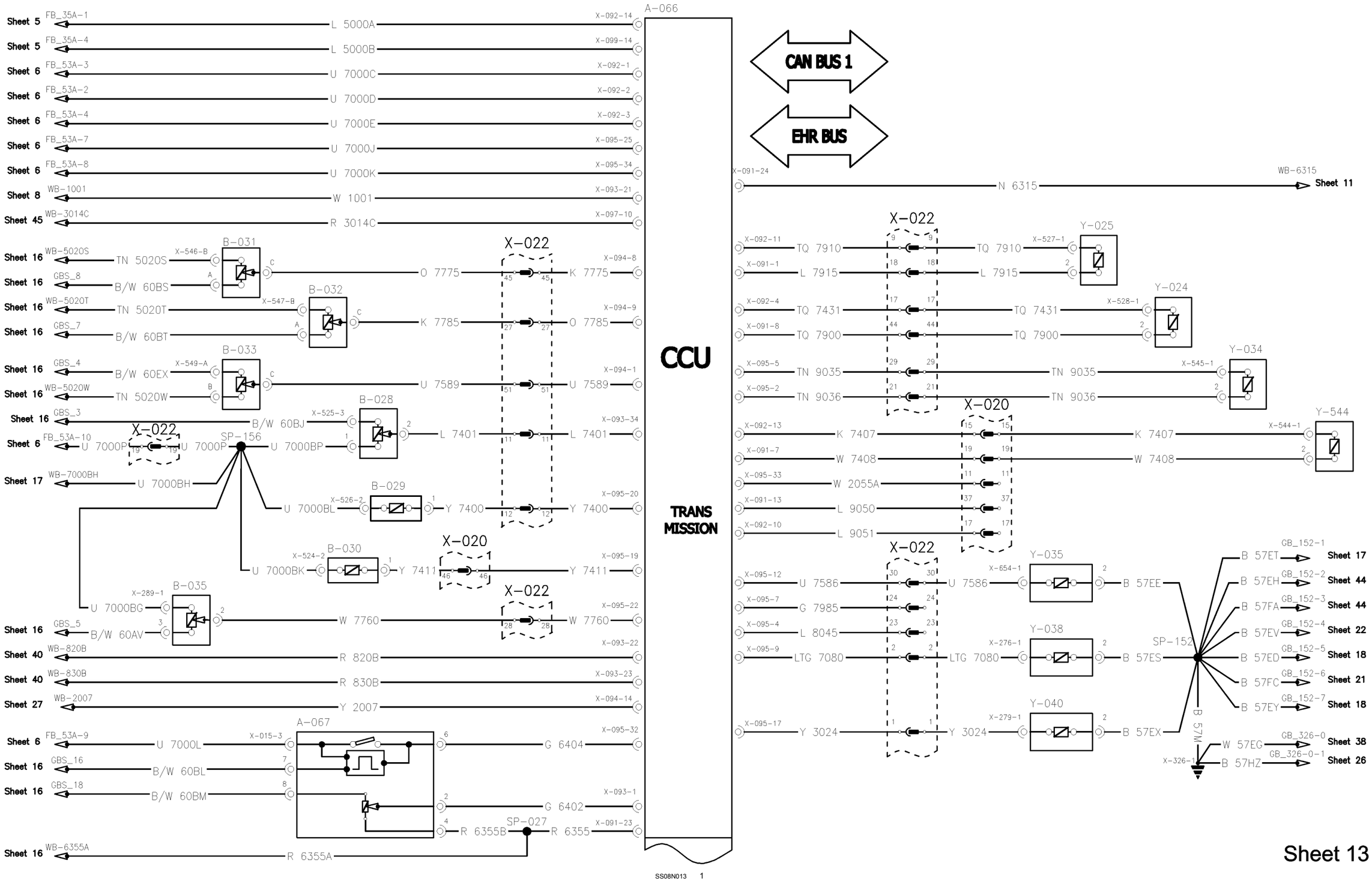
Wiring harness - Electrical schematic frame 13 Transmission (Transmission Controller)

Component	Connector	Description
A066	**X091**, **X092**, **X093**, **X094**, **X095**, **X097**, **X099**	Central Control Unit
A067	**X015**	Foot Throttle
B028	**X525**	Hydrostat Input Speed Sensor
B029	**X526**	Ring Speed Sensor
B030	**X524**	Output Wheel Speed Sensor
B031	**X546**	A Clutch Pressure Sensor
B032	**X547**	B Clutch Pressure Sensor
B033	**X549**	Brake Pressure Sensor
B035	**X289**	Fly Wheel Speed Sensor
Y024	**X528**	Clutch Solenoid B
Y025	**X527**	Clutch Solenoid A
Y034	**X545**	Solenoid Valve Dump
Y035	**X654**	Brake Lubrication Control Solenoid
Y038	**X276**	Diff Lock Solenoid
Y040	**X279**	4WD Solenoid
Y544	**X544**	Solenoid Valve Hydrostat 1
-	**X326**	Earth Transmission to SP152, 161
Additional Connectors: **X020**, **X022**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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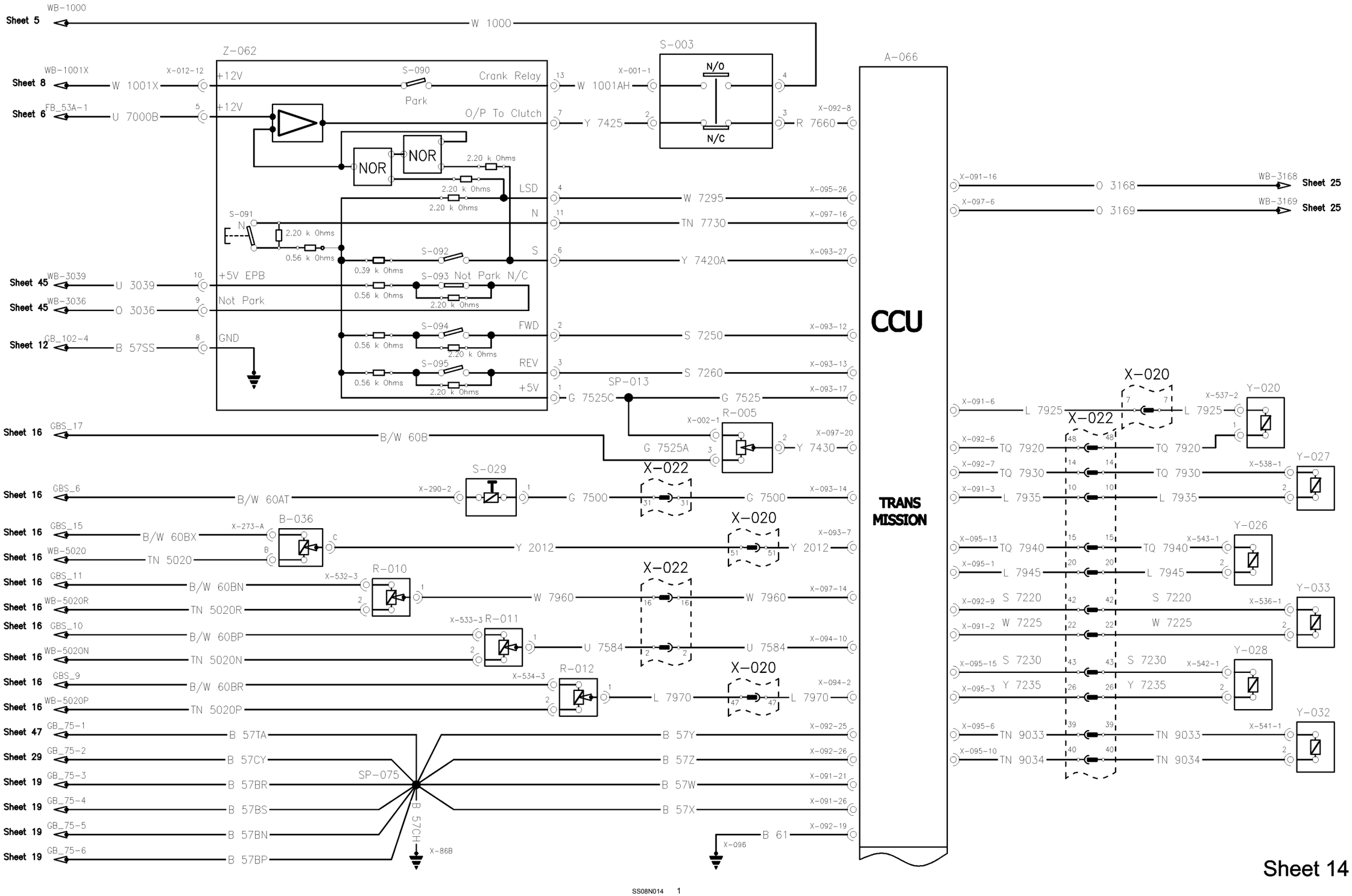
Wiring harness - Electrical schematic frame 14 Transmission (Transmission Controller)

Component	Connector	Description
A066	**X091**, **X092**, **X093**, **X094**, **X095**, **X097**	Central Control Unit
B036	**X273**	Transmission Oil Pressure Sensor
B041	**X290**	Transmission Oil Temp Sensor
R005	**X002**	Clutch Potentiometer
R010	**X532**	Potentiometer Synchroniser F1-F3
R011	**X533**	Potentiometer Synchroniser F2-R1
R012	**X534**	Potentiometer Synchroniser F4-R2
S003	**X001**	Clutch Switch
S090	**X012**	Park Switch
S091	**X012**	Neutral- Switch
S092	**X012**	FWD- OR- REV Switch
S093	**X012**	Not Park- Switch
S094	**X012**	FWD- Switch
S095	**X012**	REV- Switch
Y020	**X537**	Solenoid Valve F1
Y026	**X543**	Solenoid Valve F2
Y027	**X538**	Solenoid Valve F3
Y028	**X542**	Solenoid Valve F4
Y032	**X541**	Solenoid Valve R2
Y033	**X536**	Solenoid Valve R1
Z062	**X012**	Shuttle Lever
-	**X086B**	Earth Header 1 to SP075
-	**X096**	Case Earth CCM & ACU
Additional Connectors: **X020**, **X022**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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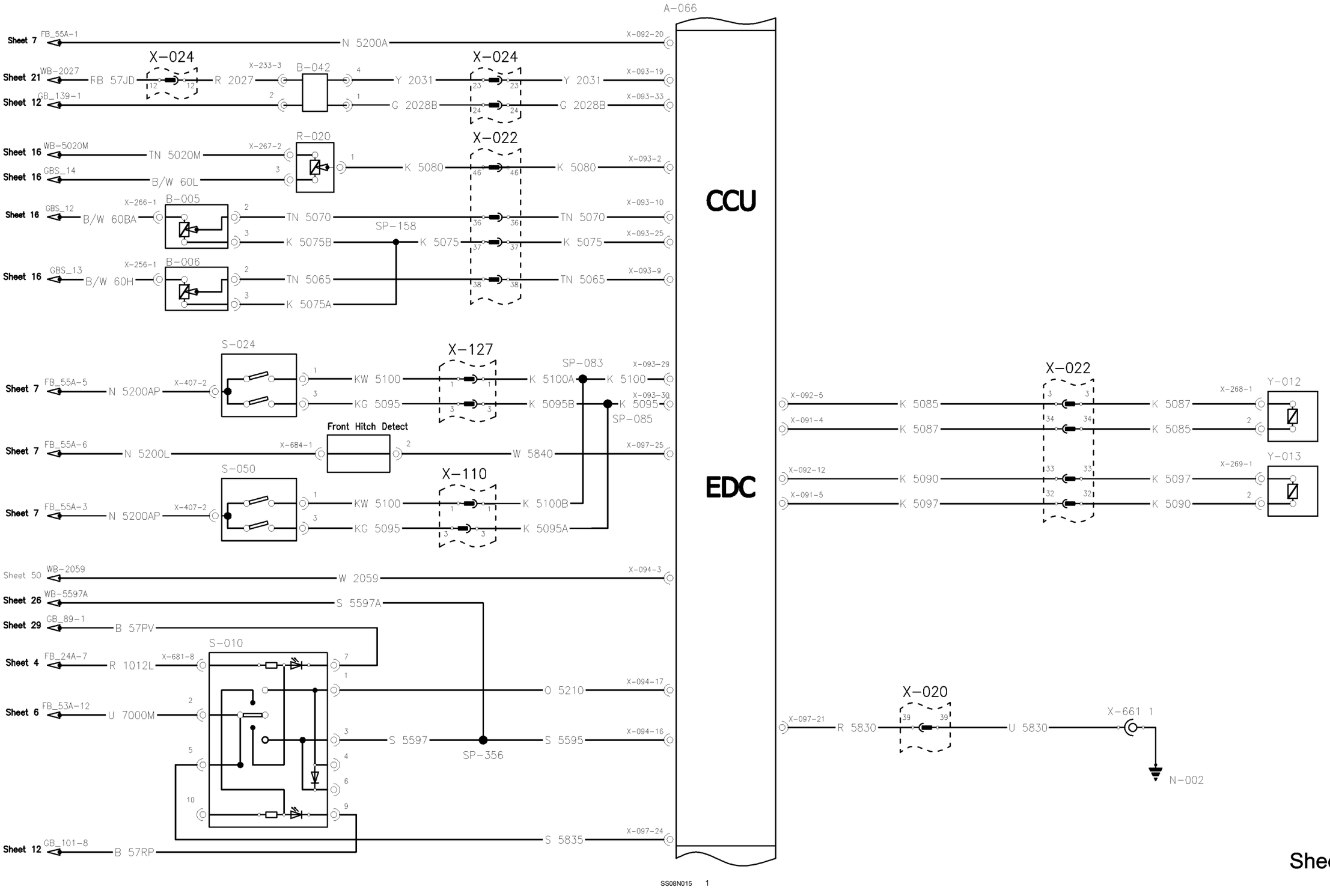
Wiring harness - Electrical schematic frame 15 Electronic Draft Control (Transmission Controller)

Component	Connector	Description
A066	**X091**, **X092**, **X093**, **X094**, **X097**	Central Control Unit
B005	**X266**	Draft Pin Left Hand
B006	**X256**	Draft Pin Right Hand
B042	**X233**	Radar Sensor
R020	**X267**	Rockshaft Potentiometer
S010	**X681**	Hydraulics Master Switch
S024	**X407**	Rear Hitch Switch Left Hand
S050	**X407**	Rear Hitch Switch Right Hand
-	**X661**	High Flow Pump (detection)
-	**X684**	Front Hitch Detect
Y012	**X268**	EDC Valve Raise
Y013	**X269**	EDC Valve Lower
Additional Connectors: **X022**, **X024**, **X110**, **X127**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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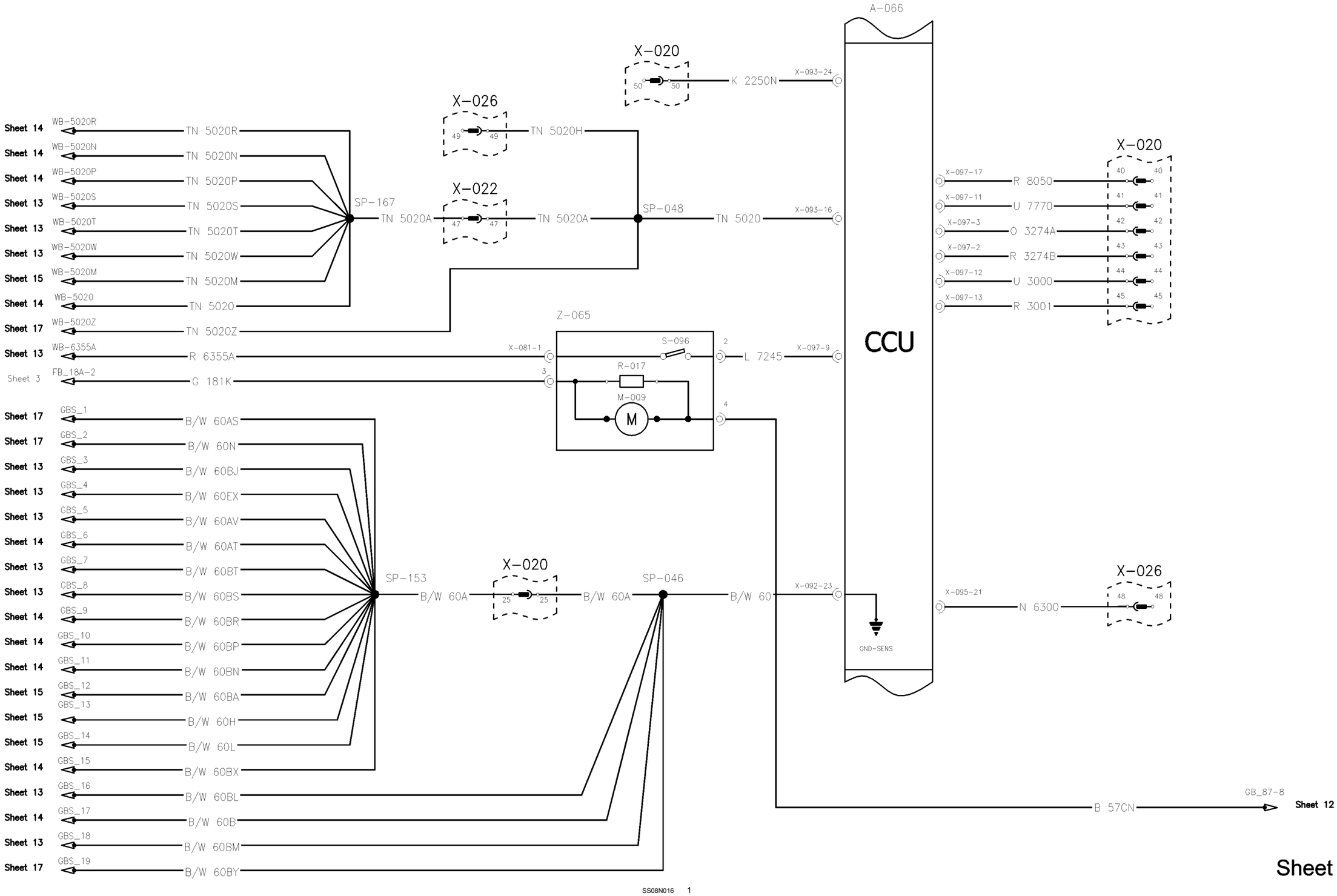
Wiring harness - Electrical schematic frame 16 5V Supply, Sensor Ground, Seat (Transmission Controller)

Component	Connector	Description
A066	**X092**, **X093**, **X095**, **X097**	Central Control Unit
M009	**X081**	Seat- Compressor
R017	**X081**	Seat- Heating
S096	**X081**	Seat- Switch
Z065	**X081**	Seat Assembly
Additional Connectors: **X020**, **X022**, **X026**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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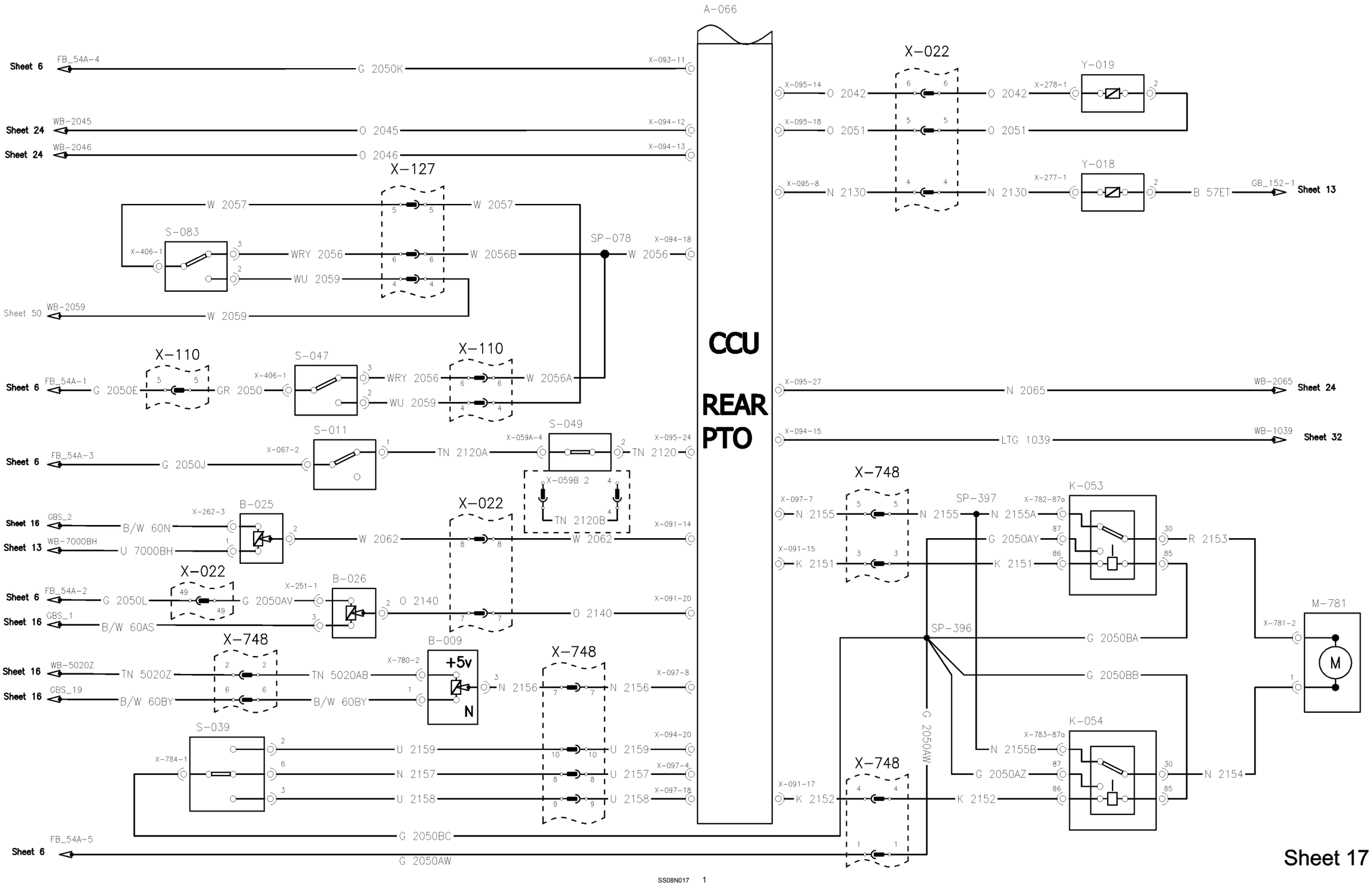
Wiring harness - Electrical schematic frame 17 Transmission (Power Take Off)

Component	Connector	Description
A066	**X091**, **X093**, **X094**, **X095**, **X097**	Central Control Unit
B009	**X780**	Rear PTO Shift Position Sensor
B025	**X262**	PTO Twist Sensor
B026	**X251**	PTO Speed Sensor
K053	**X782**	EL.Shiftable PTO Drive Upper Speed Relay
K054	**X783**	EL.Shiftable PTO Drive Lower Speed Relay
M781	**X781**	Actuator PTO Shift
S011	**X067**	Rear PTO Brake Switch
S039	**X784**	PTO Speed Select Switch
S047	**X406**	Rear PTO Switch Right Hand
S049	**X059A**	Lever Mounted PTO Brake Switch
S083	**X406**	Rear PTO Switch Left Hand
Y018	**X277**	Rear PTO Brake Solenoid
Y019	**X278**	Rear PTO Solenoid
-	**X059B**	Lever Mounted PTO Mating Half
Additional Connectors: **X022**, **X059B**, **X110**, **X127**, **X748**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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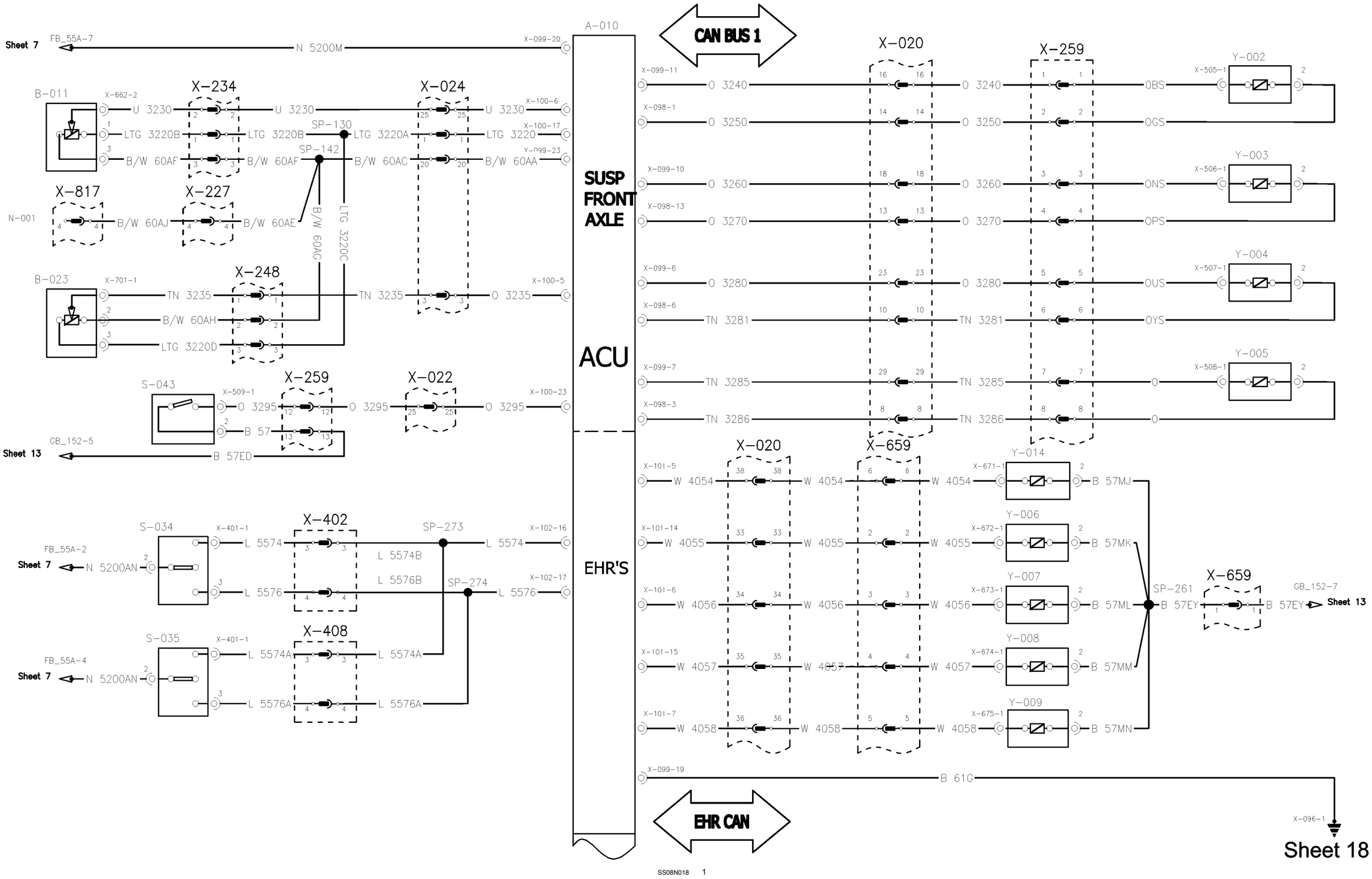
Wiring harness - Electrical schematic frame 18 SFA, EHR'S, Link Leveling (Auxiliary Control Unit)

Component	Connector	Description
A010	**X098**, **X099**, **X100**, **X101**, **X102**	Auxiliary Control Unit
B011	**X662**	Front Axle Position Sensor
B023	**X701**	Suspension Accelerometer
S034	**X401**	EHR 3 Switch Fender Right
S035	**X401**	EHR 3 Switch Fender Left
S043	**X509**	Front Suspension Not Pressure
Y002	**X505**	Suspension Raise Solenoid
Y003	**X506**	Suspension Lower Solenoid
Y004	**X507**	Upper Lockout Solenoid
Y005	**X508**	Lower Lockout Solenoid
Y006	**X672**	Link Levelling Solenoid 2
Y007	**X673**	Link Levelling Solenoid 3
Y008	**X674**	Link Levelling Solenoid 4
Y009	**X675**	Link Levelling Solenoid 5
Y014	**X671**	Link Levelling Solenoid 1
Additional Connectors: **X020**, **X022**, **X024**, **X227**, **X234**, **X248**, **X259**, **X402**, **X408**, **X659**, **X817**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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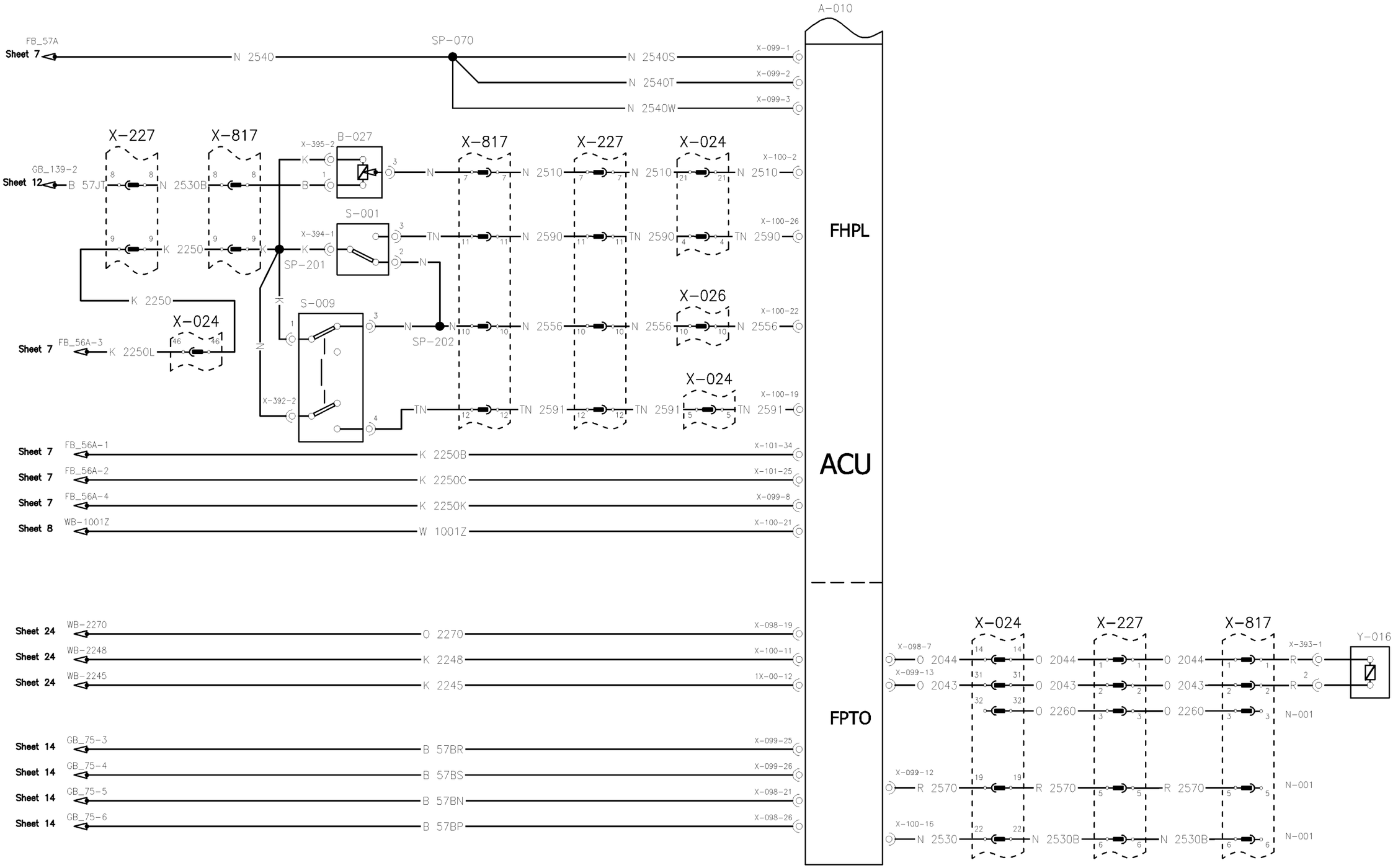
Wiring harness - Electrical schematic frame 19 Front Hitch, PTO (Auxiliary Control Unit)

Component	Connector	Description
A010	**X098**, **X099**, **X100**, **X101**	Auxiliary Control Unit
B027	**X395**	Front Hitch Position Sensor
S001	**X394**	Front Hitch Raise
S009	**X392**	Front Hitch Lower
Y016	**X393**	Front PTO Solenoid
Additional Connectors: **X024**, **X026**, **X227**, **X817**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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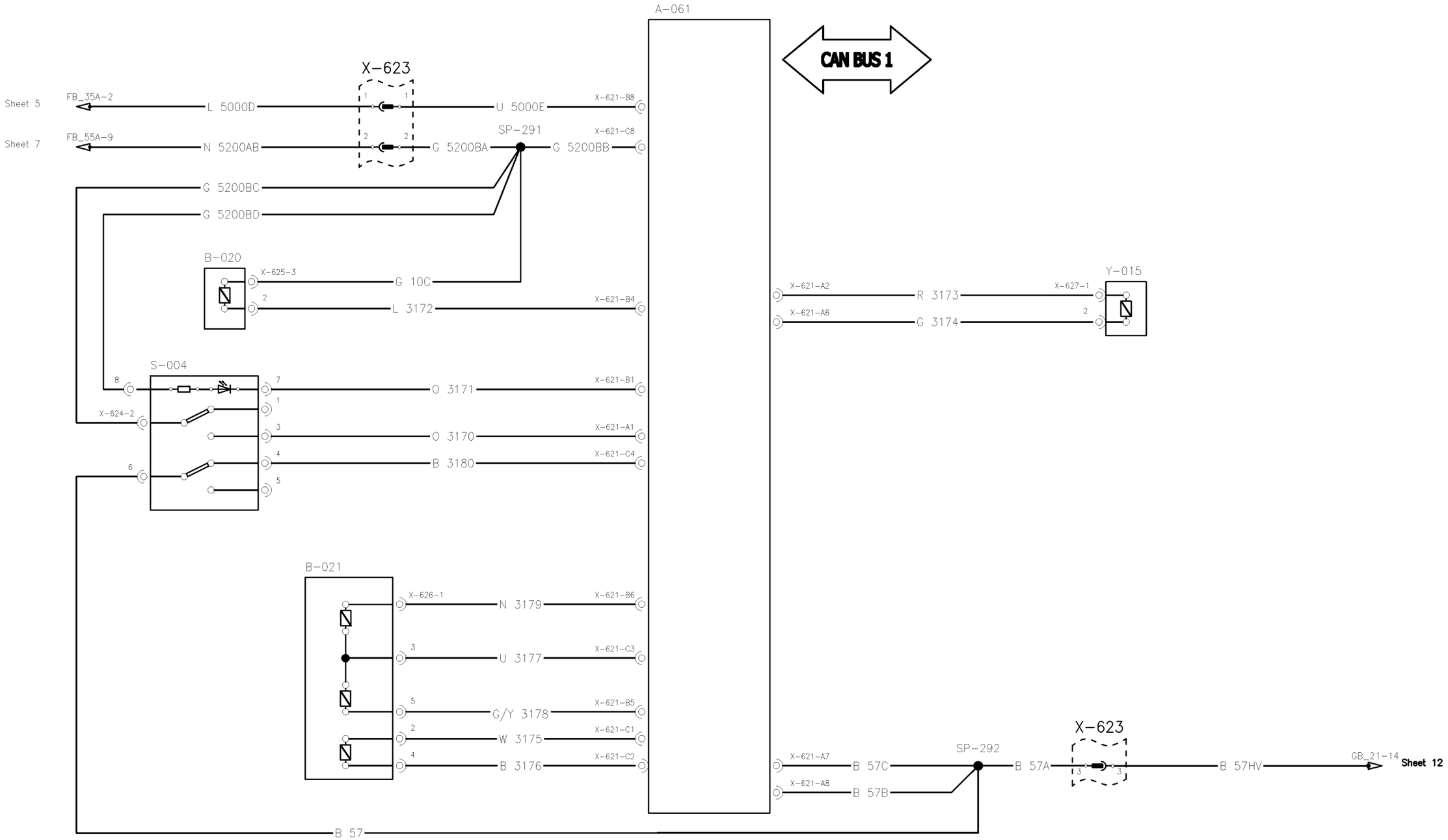
Wiring harness - Electrical schematic frame 20 Fast Steer (Steering Control Unit)

Component	Connector	Description
A061	**X621**	Control Unit Fast Steer
B020	**X625**	Proximity Sensor
B021	**X626**	Position Transducer
S004	**X624**	Fast Steer Control Switch
Y015	**X627**	Fast Steer Solenoid
Additional Connectors: **X623**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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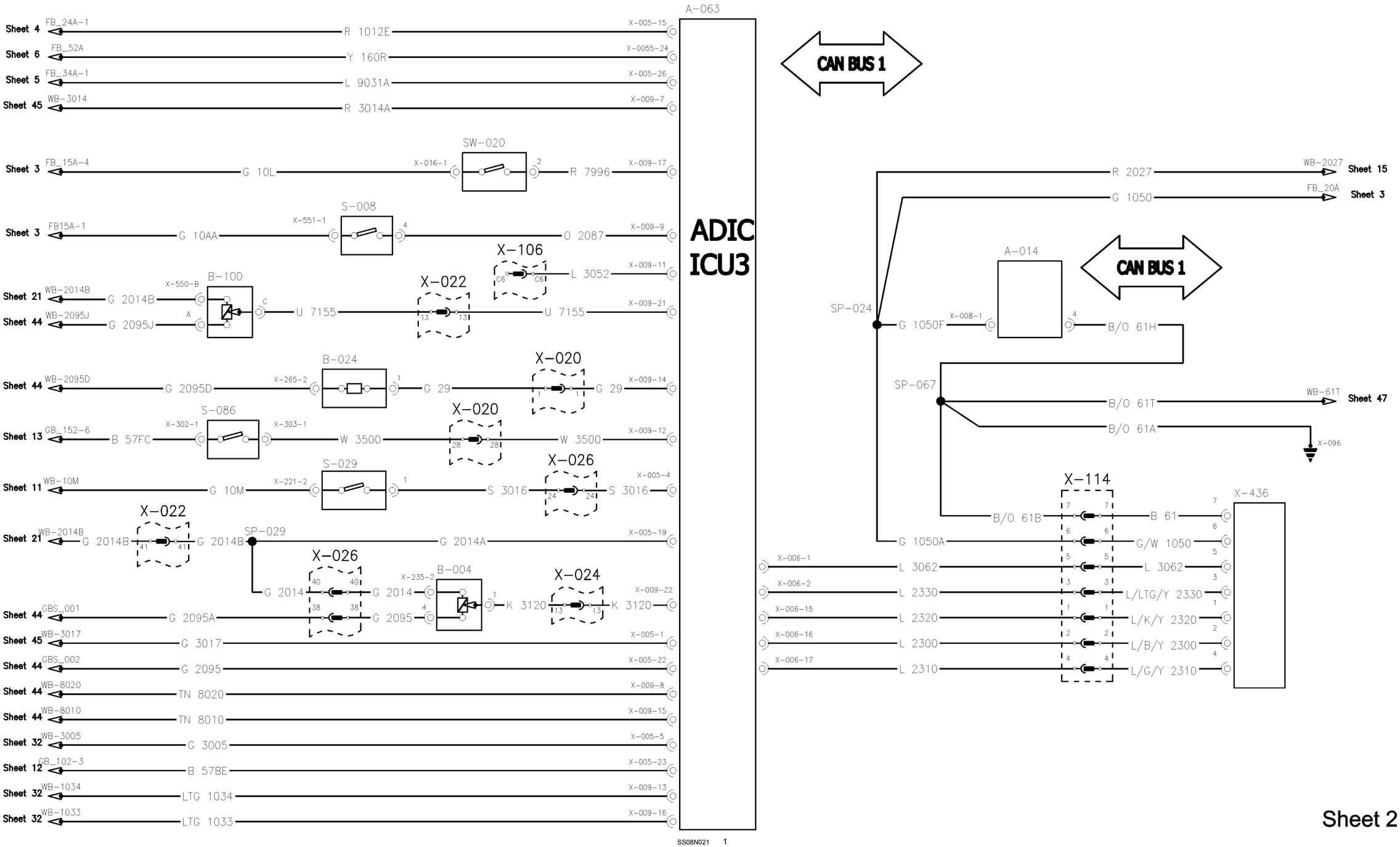
Wiring harness - Electrical schematic frame 21 Lighting (Instrument Cluster)

Component	Connector	Description
A014	**X008**	Keypad
A063	**X005**, **X006**, **X009**	Instrument Cluster Unit
B004	**X235**	Steering Angle Sensor (Auto Guidance)
B024	**X265**	Fuel Tank Sensor
B100	**X550**	Vane Pump Pressure Sensor
S008	**X551**	Exhaust Brake
S020	**X016**	Brake Pedals Latched switch
S029	**X221**	Brake Fluid Level
S086	**X302**, **X303**	Power Steering Pressure Switch
X436	**X114**	ISO 11786 Signal Socket
-	**X096**	Case Earth CCM & ACU to SP067
Additional Connectors: **X020**, **X022**, **X024**, **X026**, **X106**, **X114**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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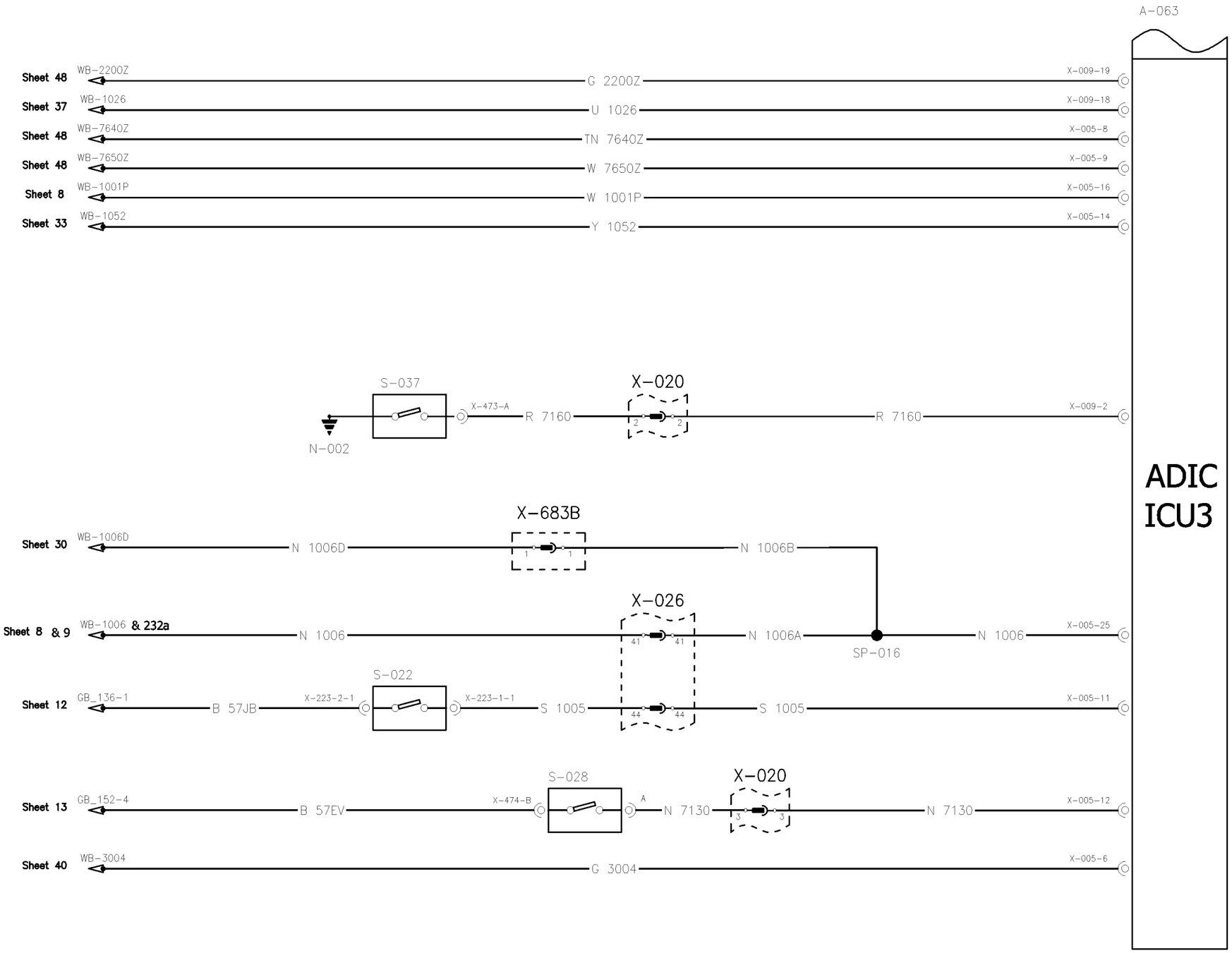
Wiring harness - Electrical schematic frame 22 Instruments (Instrument Cluster)

Component	Connector	Description
A063	**X005**, **X009**	Instrument Cluster Unit
S022	**X223**	Air Cleaner Switch
S028	**X474**	Hydraulic Filter Blocked (Vacuum Switch)
S037	**X473**	Low Hydraulic Charge Switch
Additional Connectors: **X020**, **X026**, **X683B**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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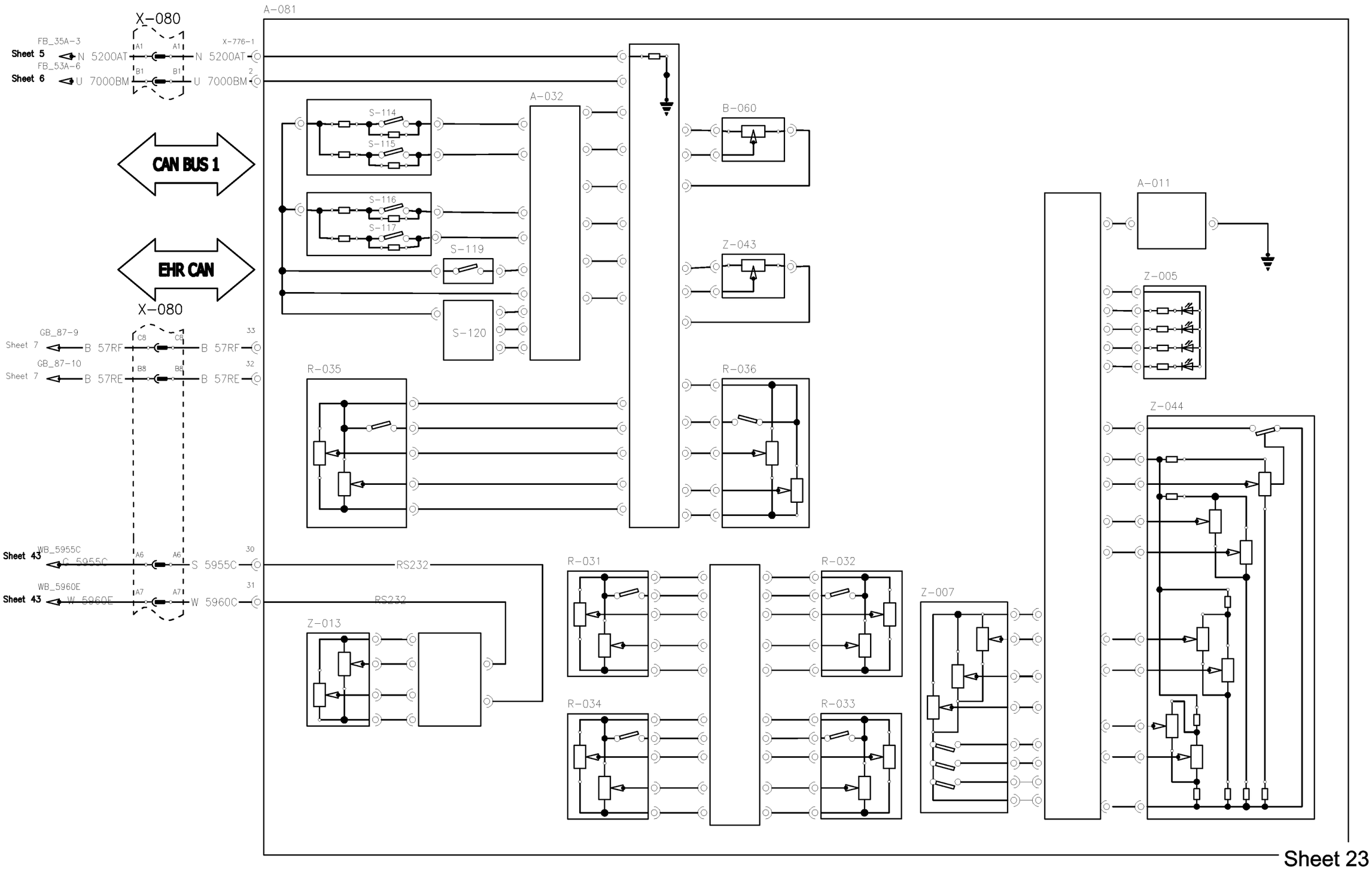
Wiring harness - Electrical schematic frame 23 ECU (Armrest)

Component	Connector	Description
A011	X847	Integrated Control Switch Panel
A032	X846	Multi Function Handle Elektonic Modul
A081	**X776**	Armrest Control Unit (GARU)
B060	X846	Sensor Transmission Ratio
R031	X853	El.Hydraulic Remote 1 Control
R032	X853	El.Hydraulic Remote 2 Control
R033	X855	El.Hydraulic Remote 3 Control
R034	X855	El.Hydraulic Remote 4 Control
R035	X857	El.Hydraulic Remote 5 Control
R036	X858	El.Hydraulic Remote 6 Control
S114	X846	EHR1/5 Extend Switch
S115	X846	EHR1/5 Retract Switch
S116	X846	Rear Hitch Fast Raise Switch
S117	X846	Rear Hitch Fast Lower Switch
S119	X846	Float Control EHR1/5 Switch
S120	X846	Multi Function Handle Encoder
Z005	X858 / X861	El.Hydraulic Remote Lamps 5 & 6 & Swich
Z007	X845	Joystick 2
Z013	X852	Dual Throttle
Z032	X846	Multi Function Handle
Z043	X849	Front Hitch Setting
Z044	X850	Rear Hitch Setting
Additional Connectors: **X080**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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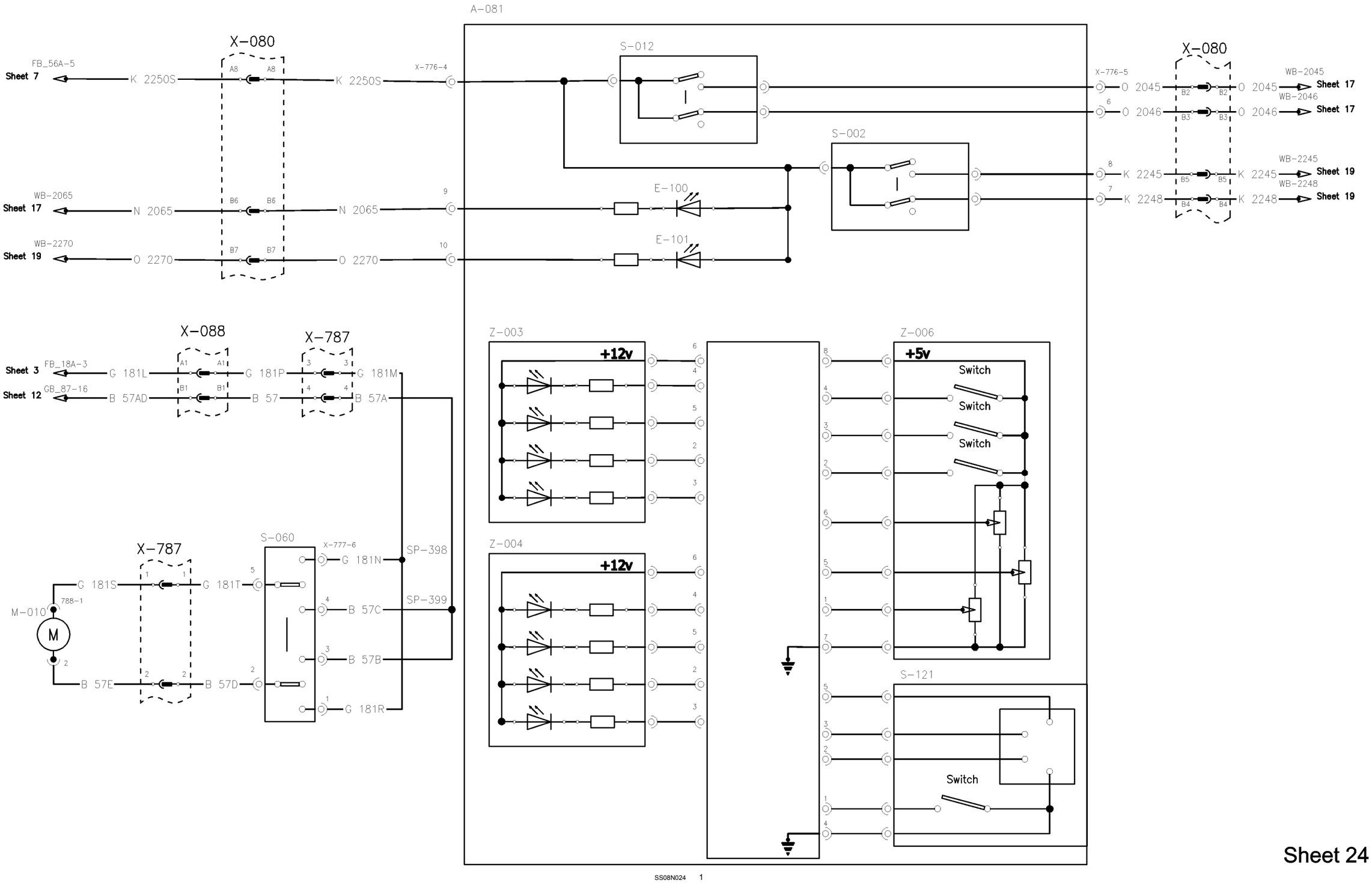
Wiring harness - Electrical schematic frame 24 ECU (Armrest)

Component	Connector	Description
A081	**X776**	Armrest Control Unit (GARU)
E100	X840	Rear PTO Lamp
E101	X841	Front PTO Lamp
M010	**X788**	Armrest Control Unit (GARU)
S002	X841	Front PTO Switch
S012	X840	Rear PTO Switch
S060	**X777**	Switch Adjust Motor
S121	X842	EHR Flow Control Encoder
Z003	X854 / X859	El.Hydraulic Remote Lamps 1 & 2 & Swich
Z004	X856 / X860	El.Hydraulic Remote Lamps 3 & 4 & Swich
Z006	X844	Joystick 1
Additional Connectors: **X080**, **X088**, **X787**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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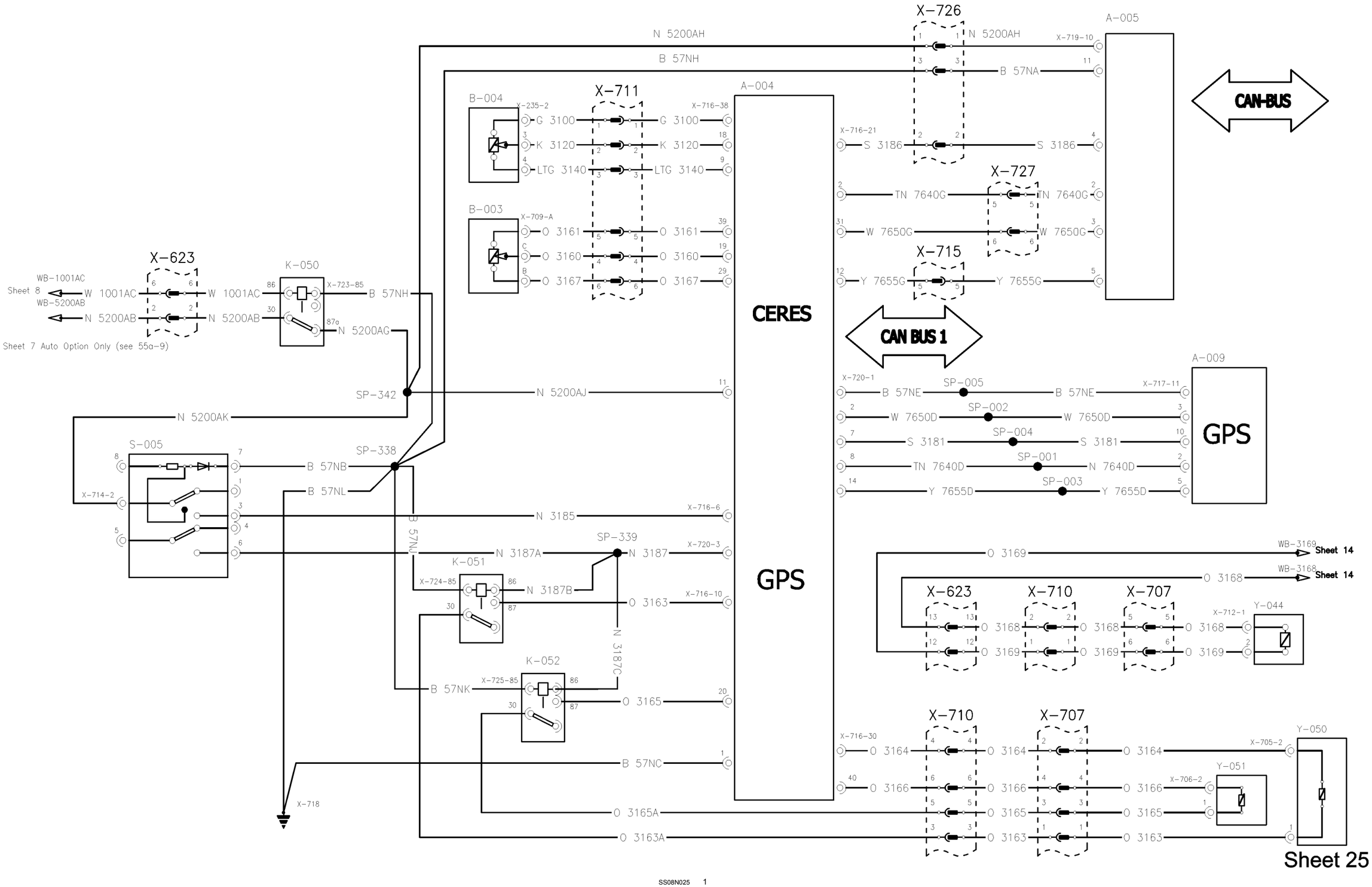
Wiring harness - Electrical schematic frame 25 Steering (Auto Guidance)

Component	Connector	Description
A004	**X716**	Navigation Controller
A004	**X720**	Navigation Controller
A005	**X719**	GPS Receiver
A009	**X717**	Auto Guidance Data Logger
B003	**X709**	Steering Pressure Sensor
B004	**X235**	Steering Angle Sensor
K050	**X723**	Relay Base Crank Isolate
K051	**X724**	Relay Base Solenoid B
K052	**X725**	Relay Base Solenoid A
S005	**X714**	Auto Guidance Control Switch
Y044	**X712**	Auto Guidance Dump Solenoid
Y050	**X705**	Steering Solenoid Right Hand
Y051	**X706**	Steering Solenoid Left Hand
-	**X718**	Earth to SP338
Additional Connectors: **X623**, **X707**, **X710**, **X711**, **X715**, **X726**, **X727**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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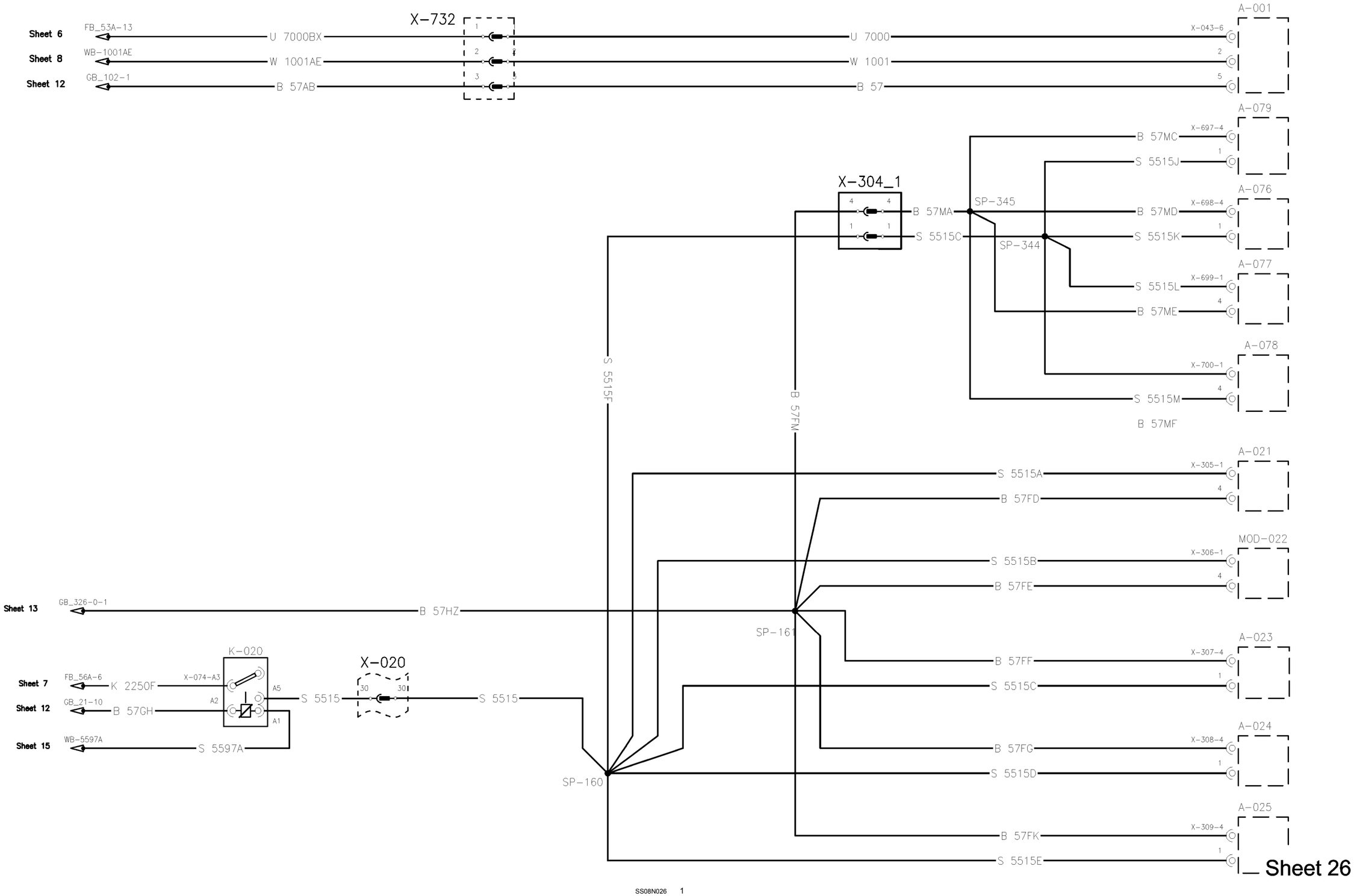
Wiring harness - Electrical schematic frame 26 Can Power (Can System)

Component	Connector	Description
-	**X732**	Can Dog Power
A001	X043	NH Display of Gear
A021	**X305**	El.Hydraulic Remote Valve 1
A022	**X306**	El.Hydraulic Remote Valve 2
A023	**X307**	El.Hydraulic Remote Valve 3
A024	**X308**	El.Hydraulic Remote Valve 4
A025	**X309**	El.Hydraulic Remote Valve 5
A076	**X698**	Mid Mount El.Hydraulic Remote Valve 2
A077	**X699**	Mid Mount El.Hydraulic Remote Valve 3
A078	**X700**	Mid Mount El.Hydraulic Remote Valve 4
A079	**X697**	Mid Mount El.Hydraulic Remote Valve 1
K020	**X074**	El.Hydraulic Remote Lock Relay
Additional Connectors: **X020**, **X304**, **X732**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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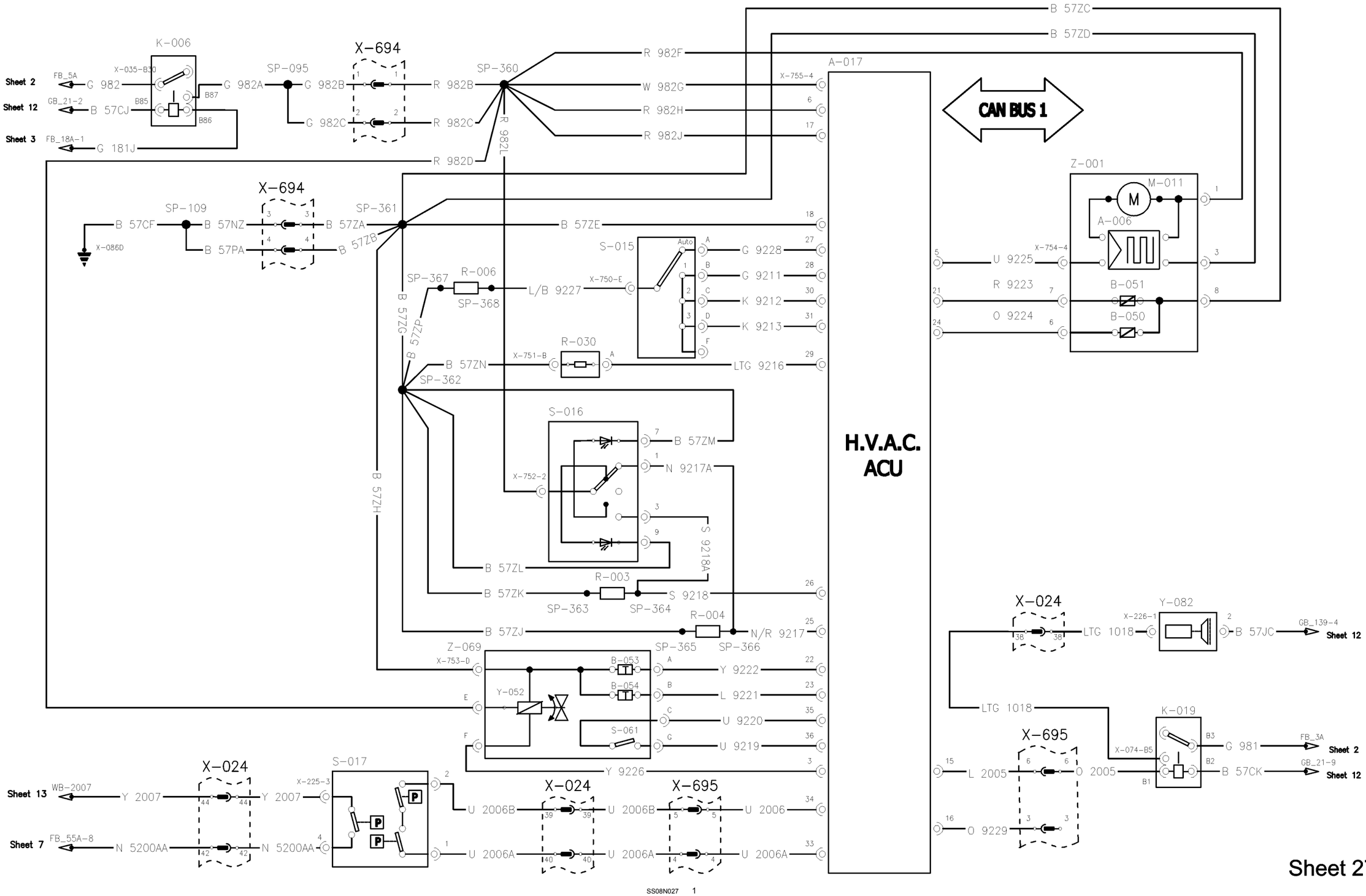
Wiring harness - Electrical schematic frame 27 Heating (Climate Control Auto)

Component	Connector	Description
A006	**X754**	Blower Motor Treiber
A017	**X755**	Air Condition Control Unit
B050	**X754**	Temperature Outside
B051	**X754**	Temperature Cabin
B053	**X753**	Temperature Outlet Sensor
B054	**X753**	Temperature Evaporator Sensor
K006	**X035**	Blower Motor
K019	**X074**	Air Condition Clutch Relay
M011	**X754**	Blower Motor
R003	-	Resistor SJ5
R004	-	Resistor SJ4
R006	-	Resistor SJ6
R030	**X751**	Potentiometer Temperature Adjustment
S015	**X750**	Heater Blower Speed Switch ATC
S016	**X752**	Air Conditioning Mode Switch ATC
S017	**X225**	Air Condition Pressure Switch
S061	**X753**	Low Pressure Switch
Y052	**X753**	Heating Valve
Y082	**X226**	Air Condition Clutch
Z001	**X754**	Blower Assembly
Z069	**X753**	Air Condition Assembly
Additional Connectors: **X024**, **X694**, **X695**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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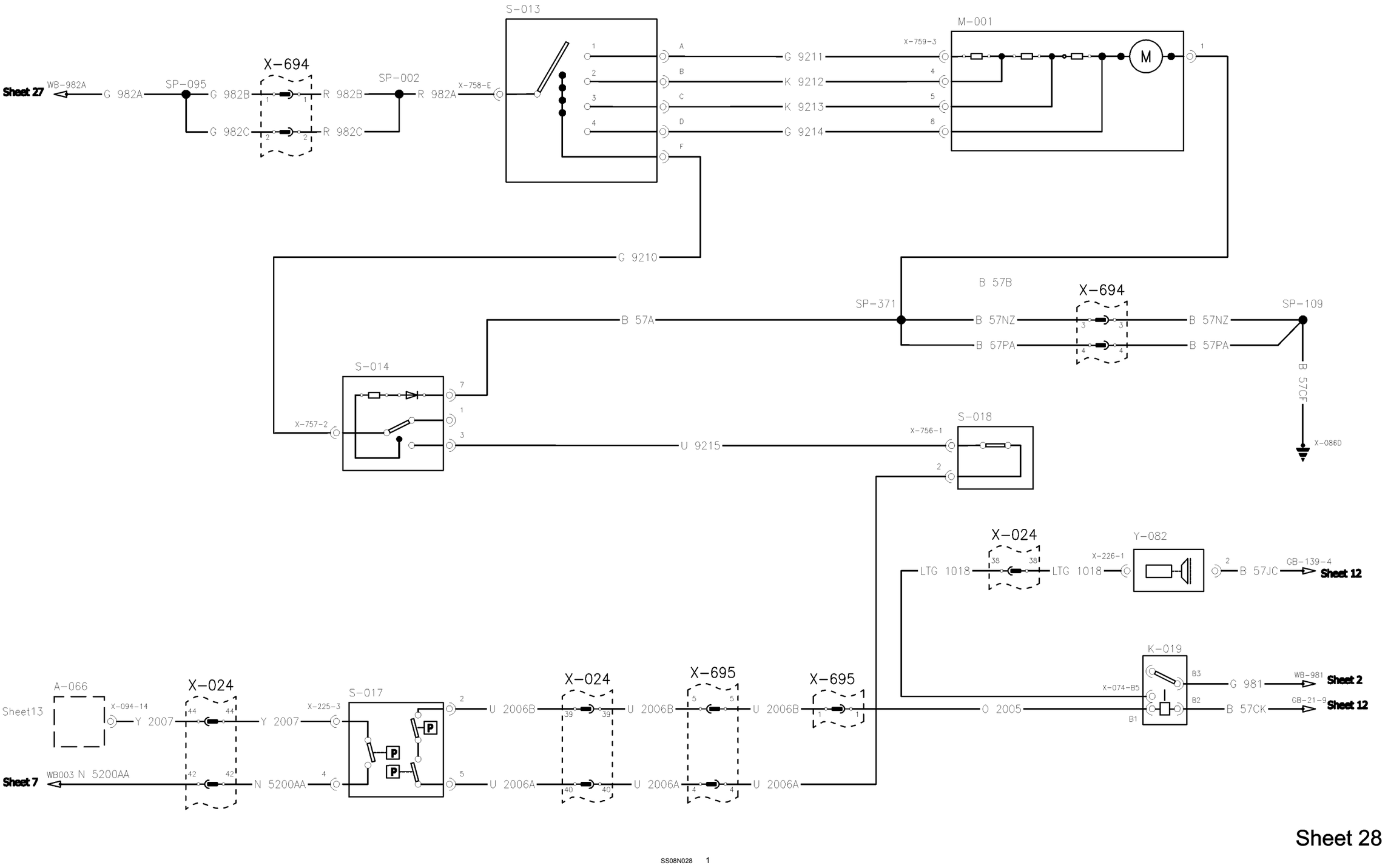
Wiring harness - Electrical schematic frame 28 Heating (Climate Control Manual)

Component	Connector	Description
A066	**X094**	Central Control Unit
K019	**X074**	Air Condition Clutch Relay
M001	**X759**	Blower Motor H.V.A.C System manual
S013	**X758**	Blower Speed Switch HVAC System manual
S014	**X757**	Operating Mode Switch H.V.A.C System manual
S017	**X225**	Air Condition Pressure Switch
S018	**X756**	Low Pressure Switch H.V.A.C System manual
Y082	**X226**	Air Condition Clutch
-	**X086D**	Earth Header 1 to SP109
Additional Connectors: **X024**, **X694**, **X695**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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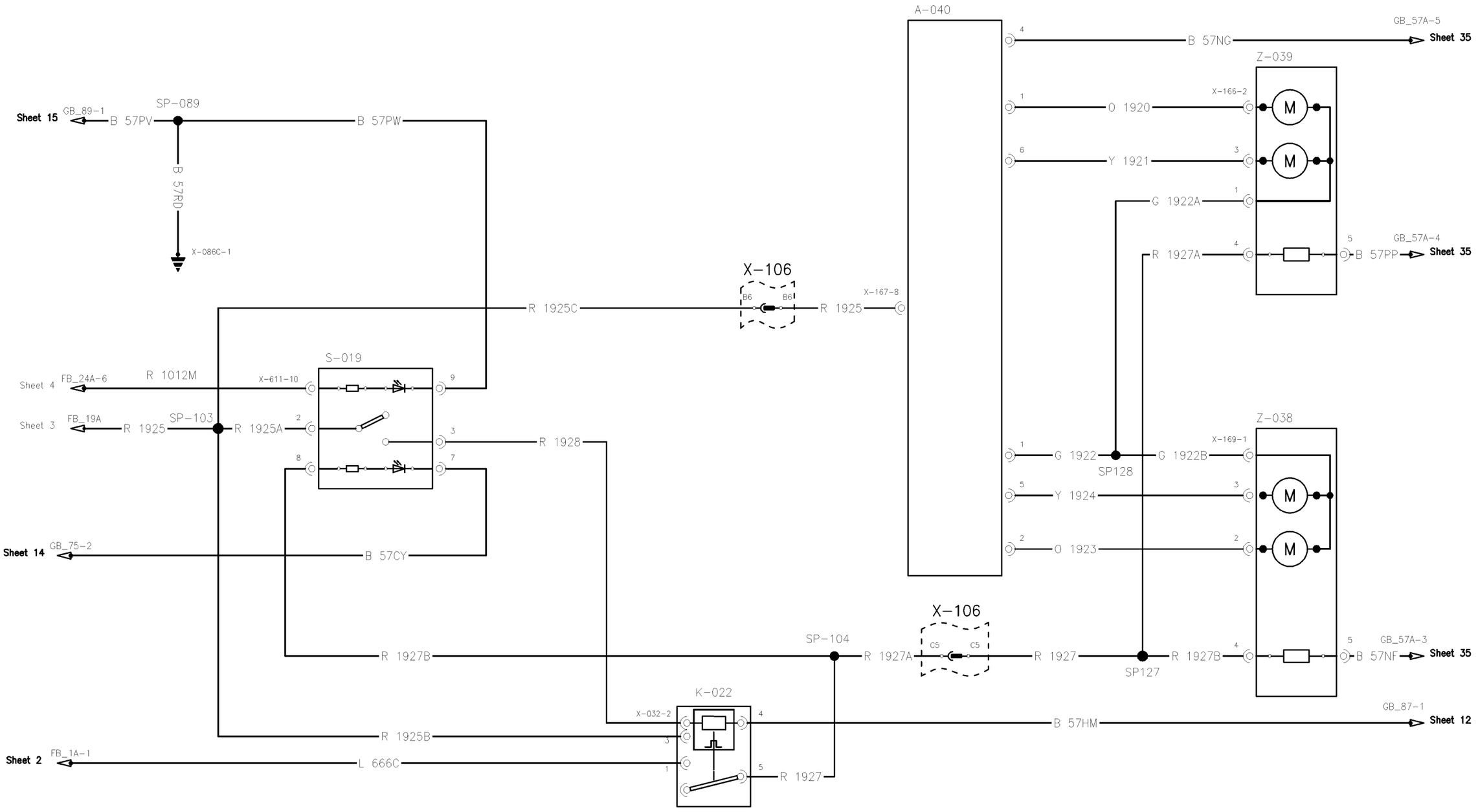
Wiring harness - Electrical schematic frame 29 Heated Mirrors

Component	Connector	Description
A040	**X167**	Mirror Control
K022	**X032**	Heated Mirror Timer Relay
S019	**X611**	Heated Mirror Switch
Z038	**X169**	Electric Mirror Right Hand
Z039	**X166**	Electric Mirror Left Hand
-	**X086C**	Earth Header 1 to SP089
Additional Connectors: **X106**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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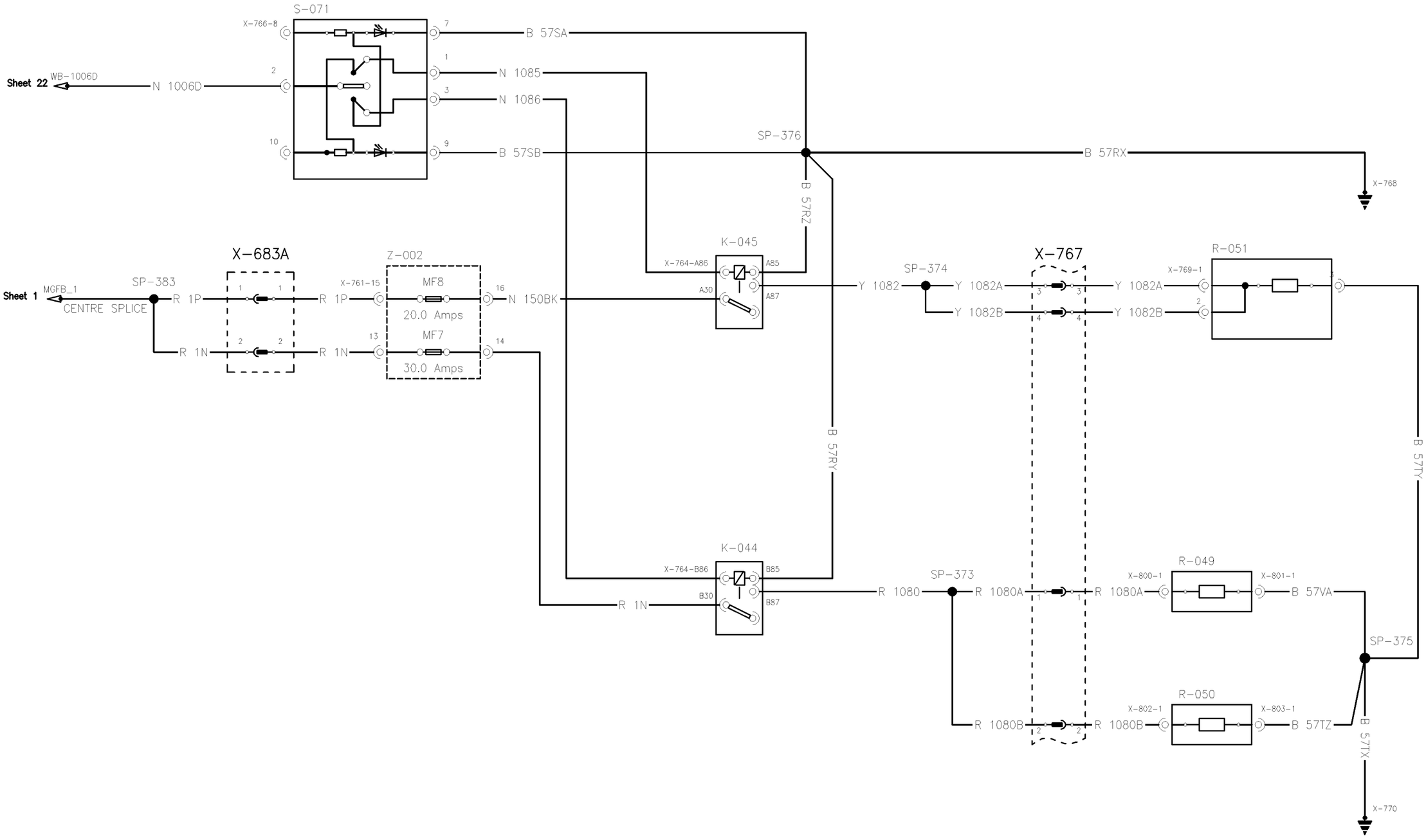
Wiring harness - Electrical schematic frame 30 Heating (Heated Screen)

Component	Connector	Description
K044	**X764**	Front Screen Heater Relay
K045	**X764**	Rear Screen Heater Relay
MF7	**X761**	Supply heated windscreen front
MF8	**X761**	Supply heated screen rear
R049	**X800**, **X801**	Front Screen Heater A
R050	**X802**, **X803**	Front Screen Heater B
R051	**X769**	Rear Screen Heater
S071	**X766**	Screen Heater Switch
Z002	**X761**	Maxi Fuseholder
-	**X768**	Main Earth Point to SP376
-	**X770**	Earth Connector to SP375
Additional Connectors: **X683A**, **X767**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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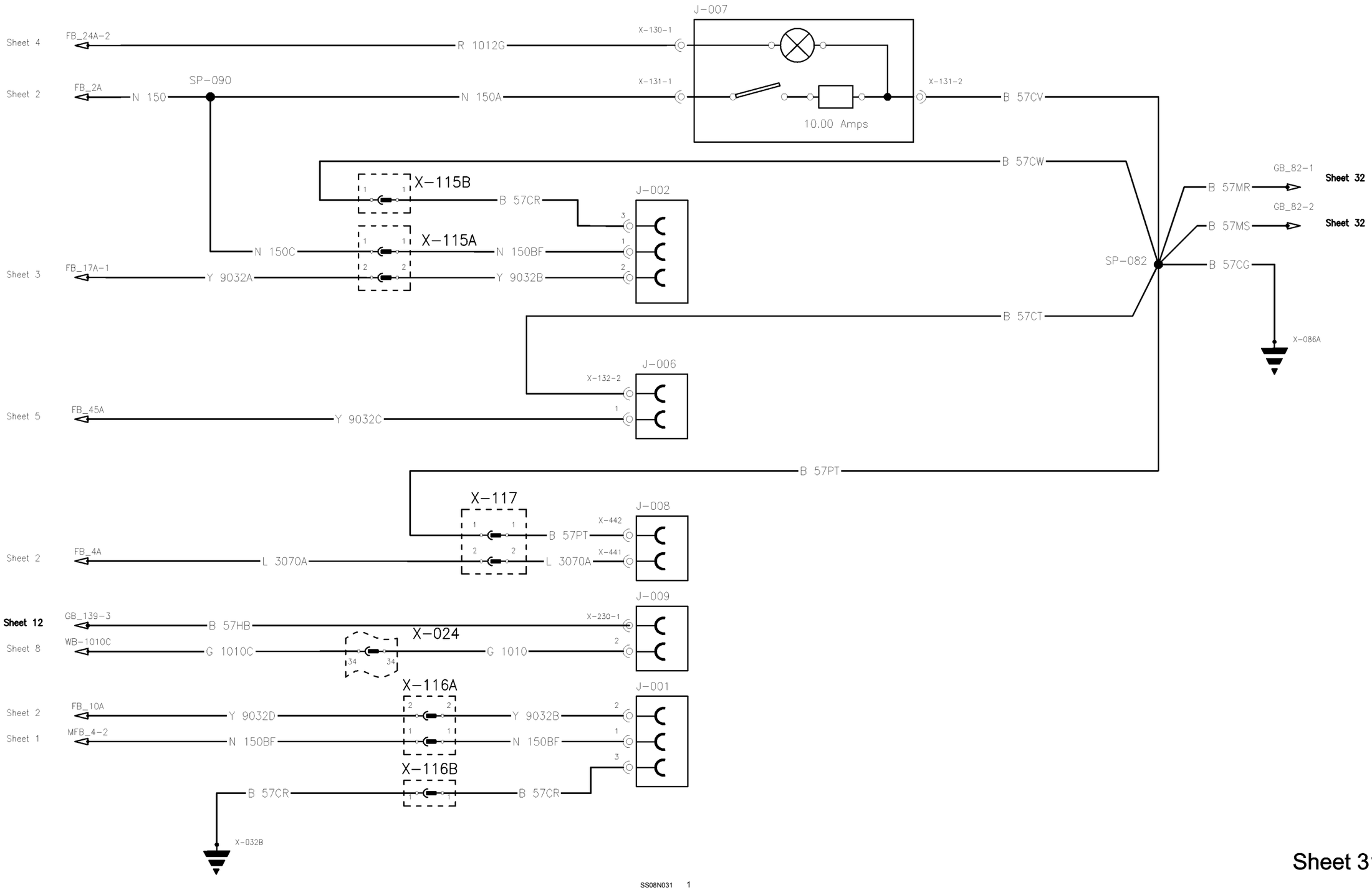
Wiring harness - Electrical schematic frame 31 Cigar Lighter (Implement Sockets)

Component	Connector	Description
J001	**X116A**, **X116B**	Rear Power Socket Implement
J002	**X115A**, **X115B**	30Amp Power Socket
J006	**X132**	8 Amp Socket
J007	**X130**, **X131**	Cigar Lighter
J008	**X441**, **X442**	Power Studs
J009	**X230**	DIA Engine Inline
-	**X032B**	Earth Header 2
-	**X086A**	Earth Header 1 to SP082
Additional Connectors: **X024**, **X115A**, **X115B**, **X116A**, **X116B**, **X117**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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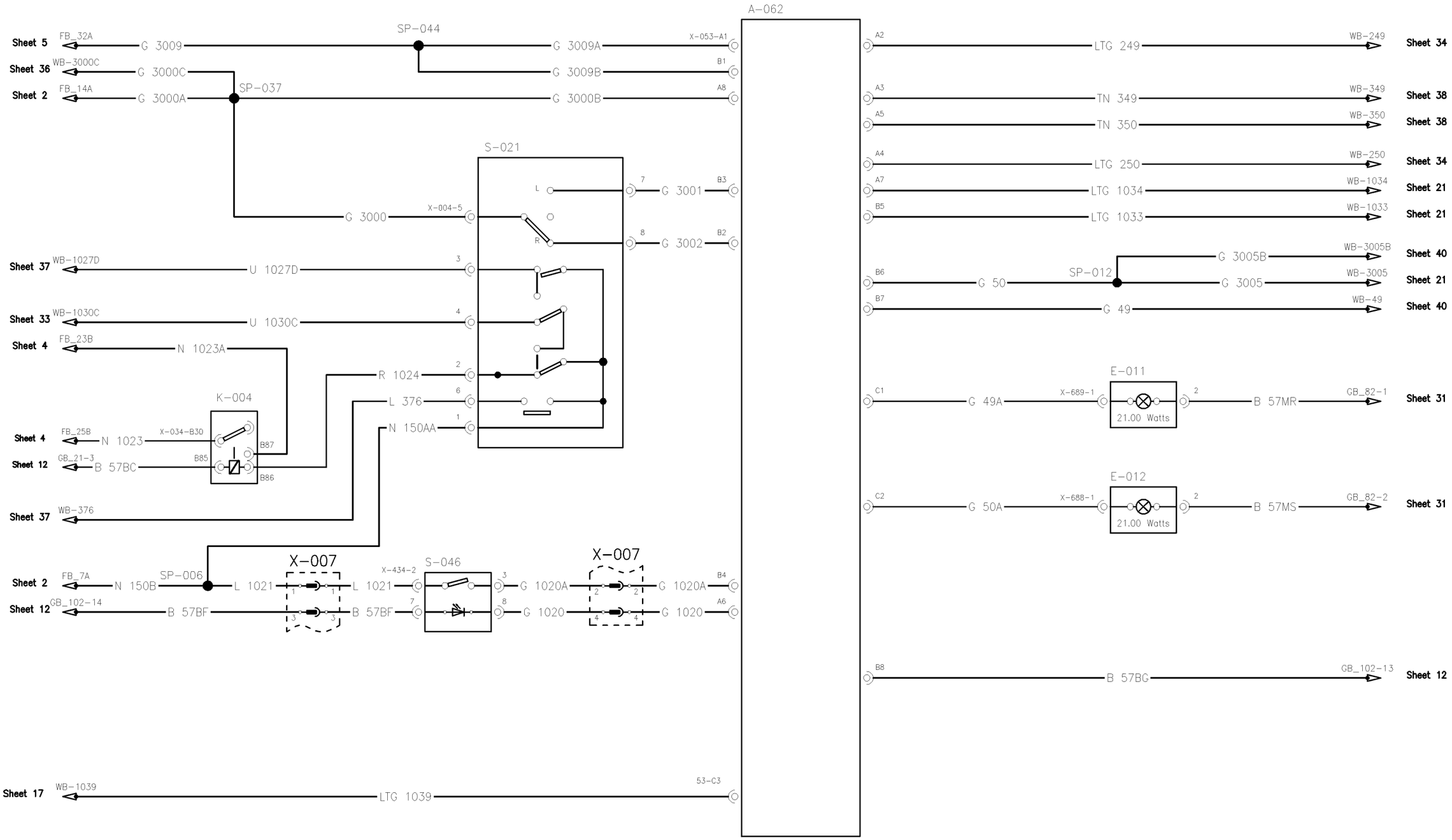
Wiring harness - Electrical schematic frame 32 Lighting

Component	Connector	Description
A062	**X053**	Flasher Unit
E011	**X689**	Extremity Light Right Hand
E012	**X688**	Extremity Light Left Hand
K004	**X034**	Lights Relay
S021	**X004**	Main Light Switch
S046	**X434**	Hazard Switch
Additional Connectors: **X007**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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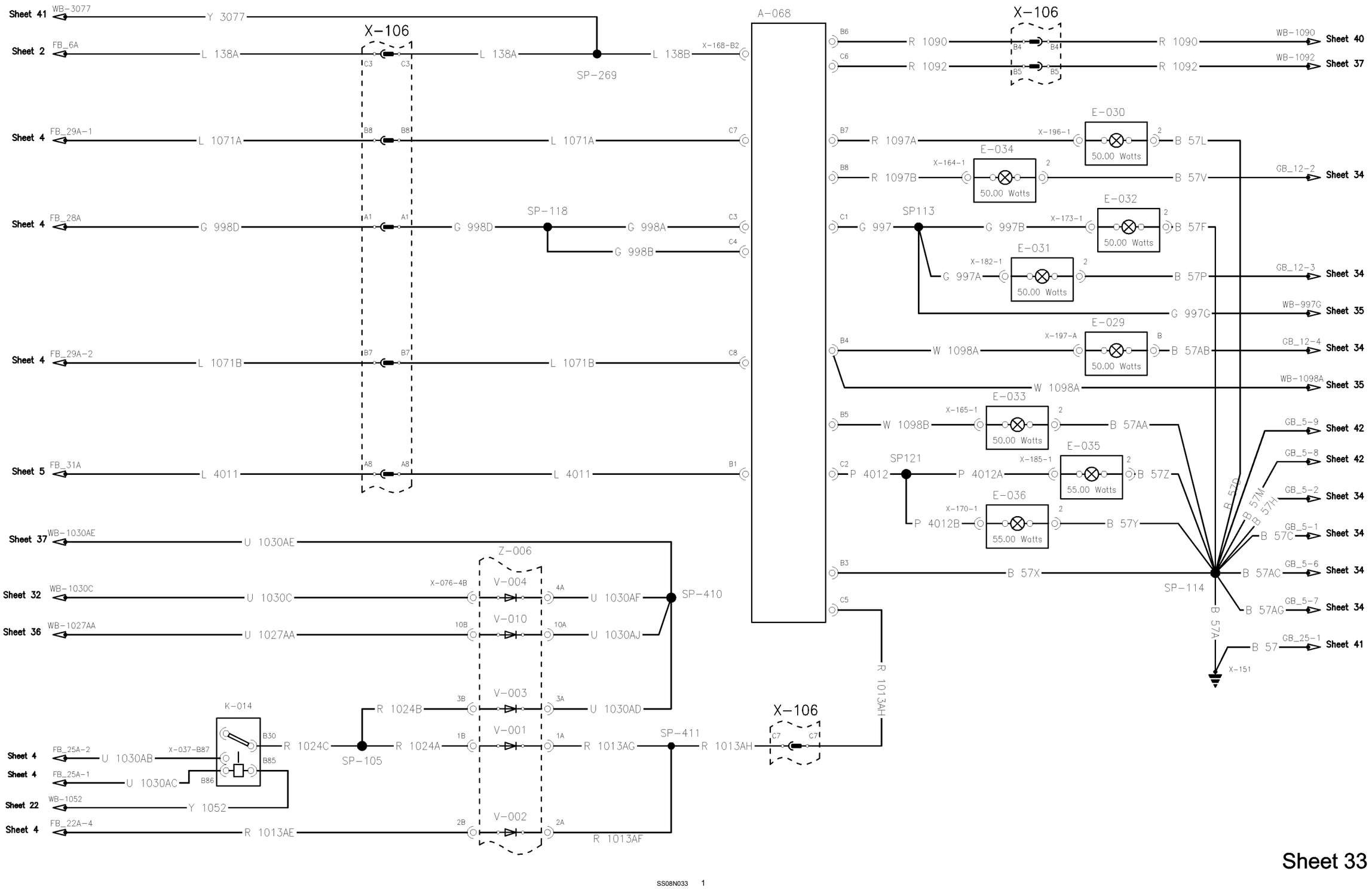
Wiring harness - Electrical schematic frame 33 Lighting Auxiliary (Worklamps/Beacons)

Component	Connector	Description
A068	**X168**	Worklamps Control Unit
E029	**X197**	Worklamp Roof Front Left Hand 2
E030	**X196**	Worklamp Grabrail Left Hand
E031	**X182**	Worklamp Left Hand Rear
E032	**X173**	Worklamp Rear Right Hand
E033	**X165**	Worklamp Roof Front Left Hand 2
E034	**X164**	Worklamp Grabrail Right Hand Front
E035	**X185**	Rotating Beacon Left Hand
E036	**X170**	Rotating Beacon Right Hand
K014	**X037**	Get U Home
V001	**X076**	Get U Home Diode
V002	**X076**	Get U Home Diode
V003	**X076**	Get U Home Diode
V004	**X076**	Dipped Beam Headlamps Diode
V010	**X076**	Main Beam Headlamps Diode
Z006	**X076**	Diode Block
-	**X151**	Roof Earth to SP114
Additional Connectors: **X106**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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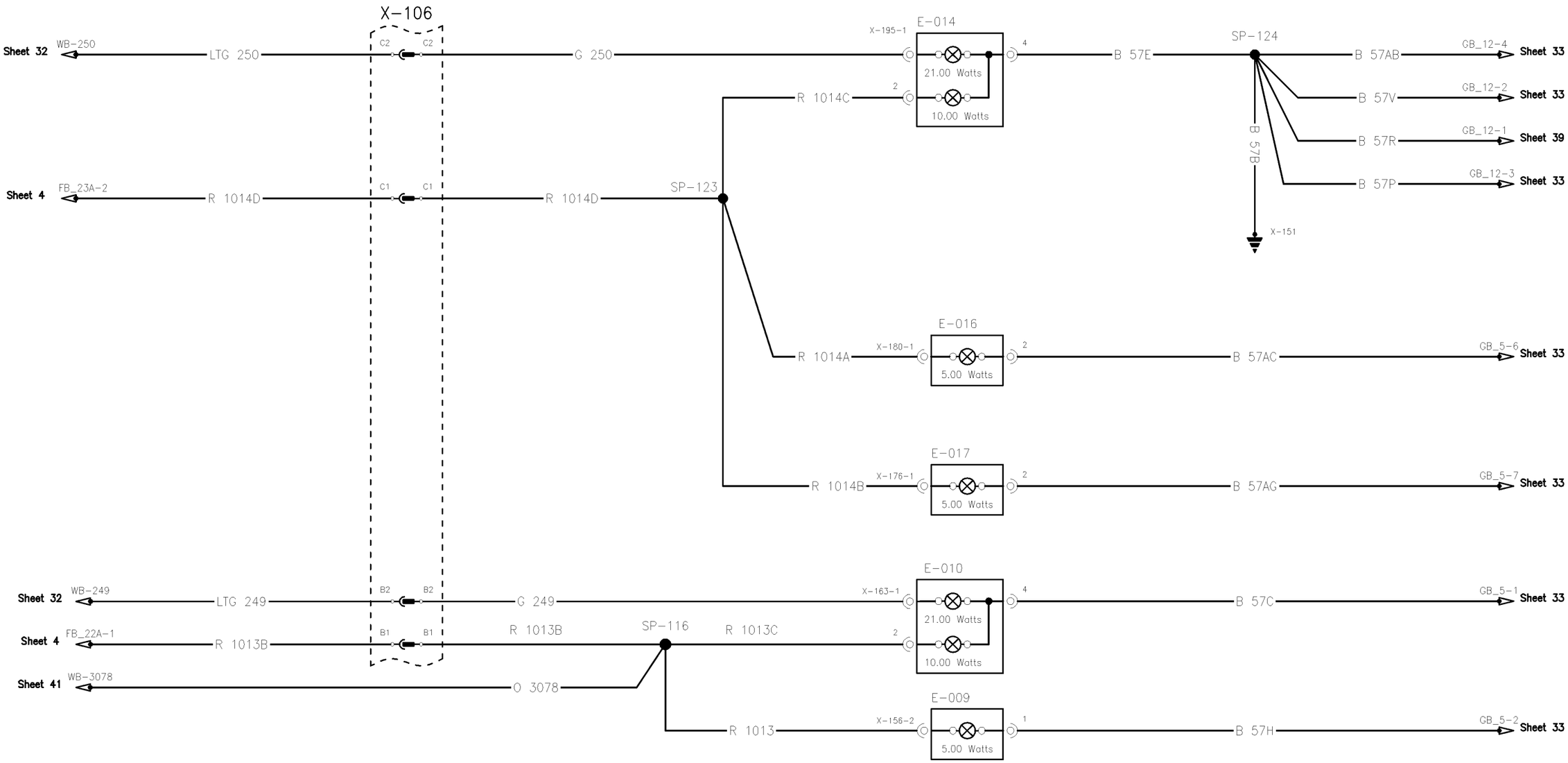
Wiring harness - Electrical schematic frame 34 Lighting (Side, Console & Licence Plate Lamps)

Component	Connector	Description
E009	**X156**	Console Lamp Right Hand
E010	**X163**	Grabrail Side Lamp RH / SM Vehicle RF
E014	**X195**	Side Lamp Grabrail LH / SM Vehicle LF
E016	**X180**	License Plate Left Hand
E017	**X176**	License Plate Right Hand
-	**X151**	Roof Earth to SP124
Additional Connectors: **X106**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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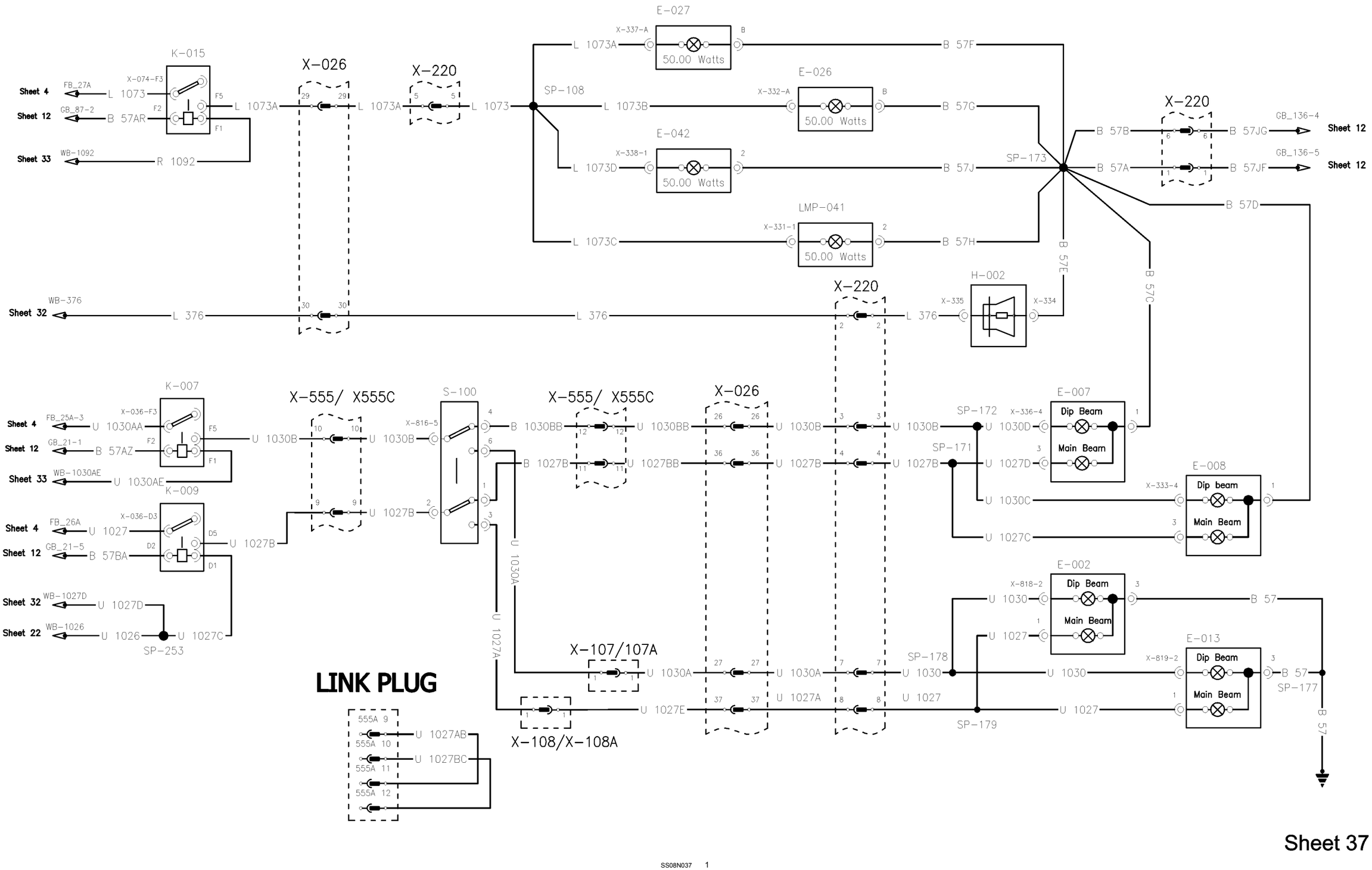
Wiring harness - Electrical schematic frame 37 Lighting (Headlamps / Worklamps Hood)

Component	Connector	Description
E002	**X818**	Headlamp 2 Left Hand Grabrail
E007	**X336**	Headlamp Left Hand
E008	**X333**	Headlamp Right Hand
E013	**X819**	Headlamp 1 Right Hand Grabrail
E026	**X332**	Corner Lamp Right Hand
E027	**X337**	Corner Lamp Left Hand
E041	**X331**	Worklamp Right Hand
E042	X338	Worklamp Left Hand
H002	**X334**, **X335**	Horn
K007	**X036**	Dipped Beam Headlamps
K009	**X036**	Main Beam Headlamps
K015	**X074**	Front Worklamps Hood
S100	**X816**	High Mount Headlamp Switch
Additional Connectors: **X026**, **X107**, **X107_A**, **X108**, **X108_A**, **X220**, **X555**, **X555A**, **X555C**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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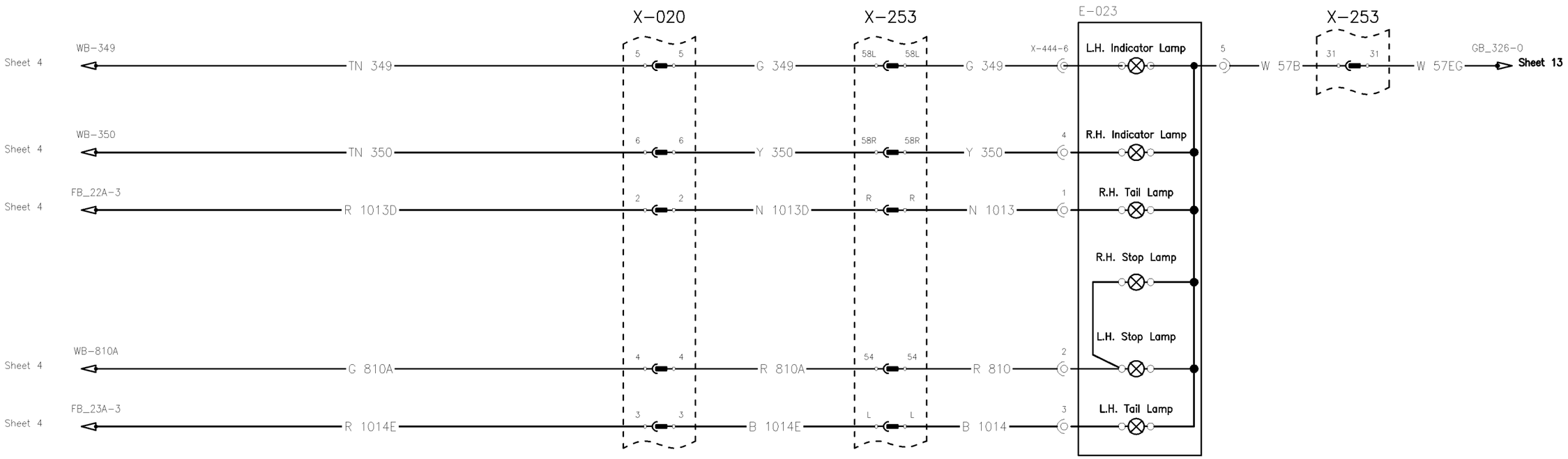
Wiring harness - Electrical schematic frame 38 Lighting (Trailer)

Component	Connector	Description
E023	X444	Trailer Lamps
Additional Connectors: **X020**, **X253**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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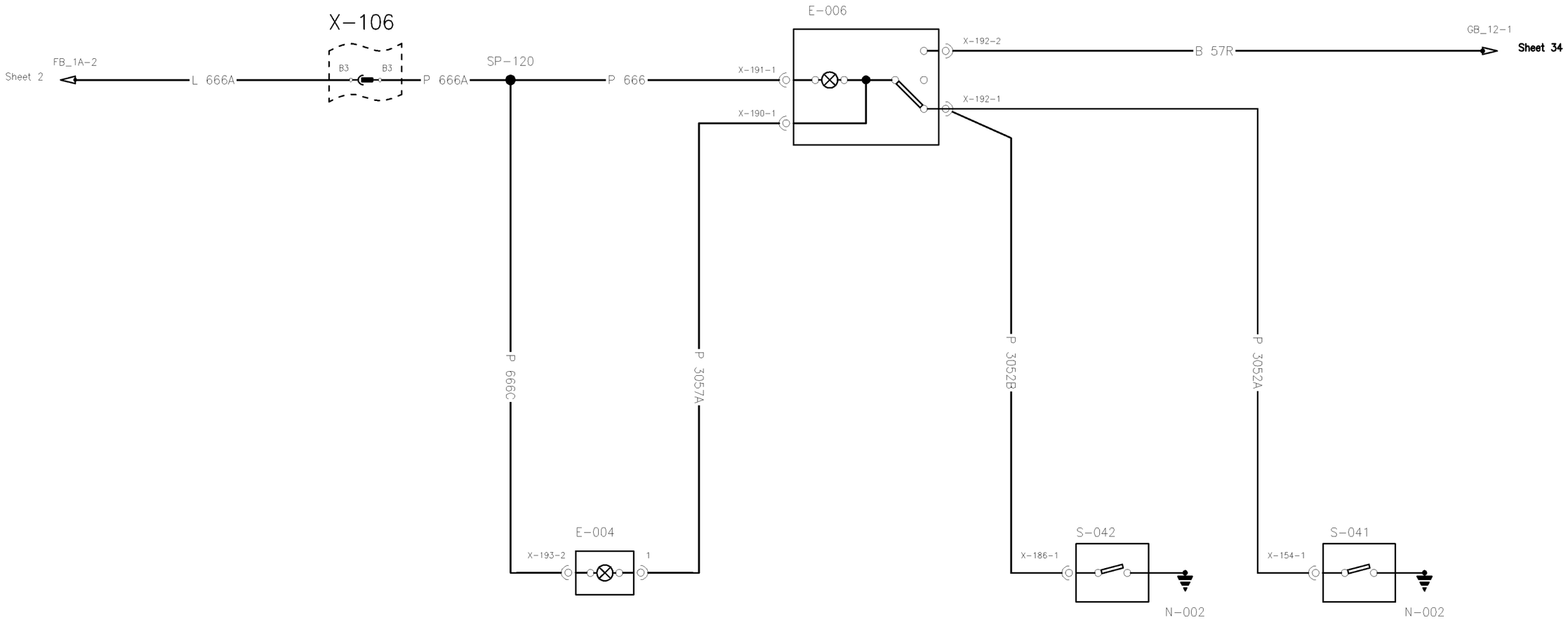
Wiring harness - Electrical schematic frame 39 Lighting (Interior Lights)

Component	Connector	Description
E004	**X193**	Puddle Lamp Left Hand
E006	**X190**, **X191**, **X192**	Interior Lamp
S041	X154	Door Switch Right Hand
S042	**X186**	Door Switch Left Hand
Additional Connectors: **X106**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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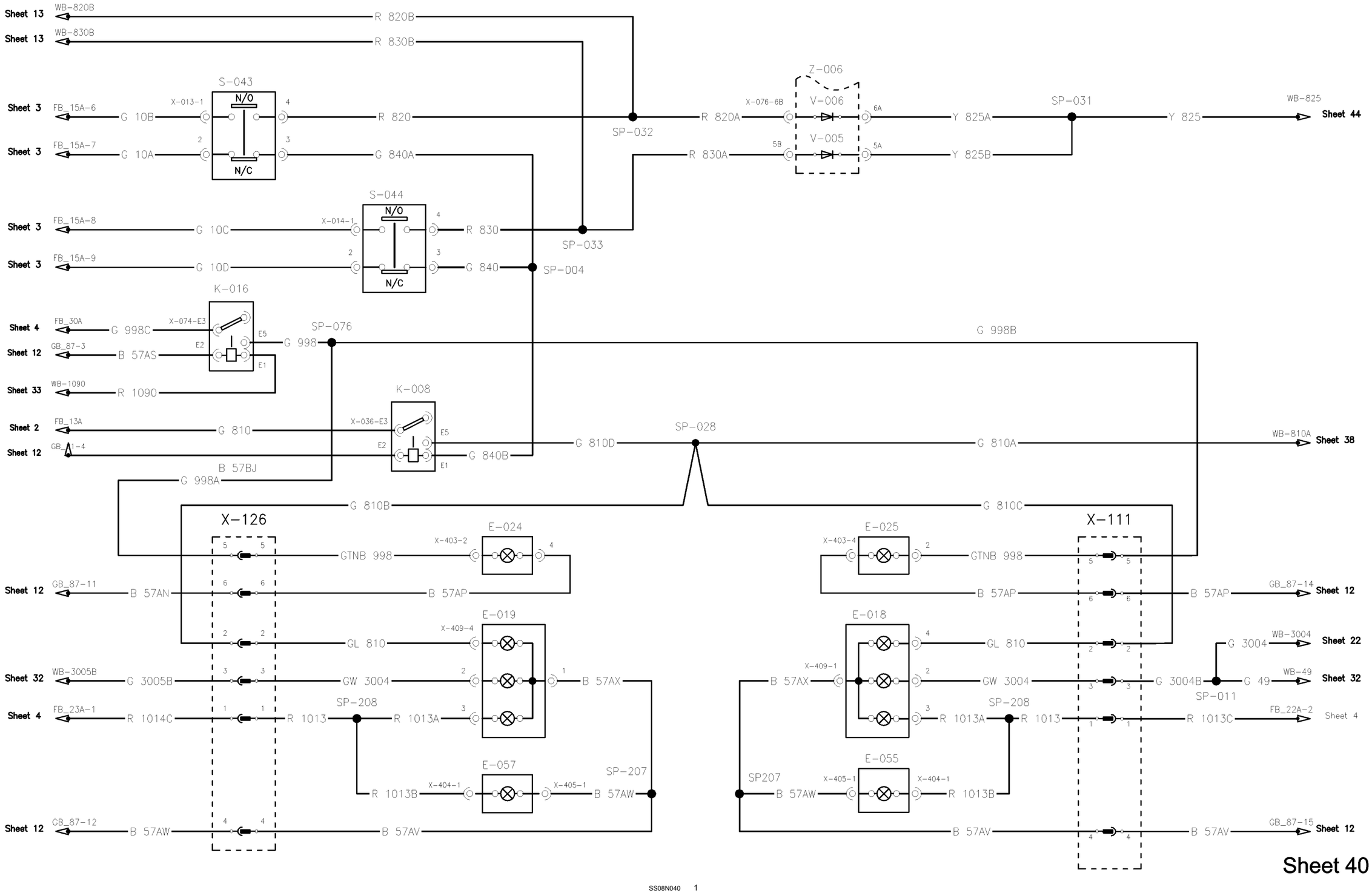
Wiring harness - Electrical schematic frame 40 Lighting (Stop / Tail Lamps & Worklamps)

Component	Connector	Description
E018	**X409**	Stop & Tail Lamp Right Hand
E019	**X409**	Stop & Tail Lamp Left Hand
E024	**X403**	Worklamp C Pillar Left Hand
E025	**X403**	Worklamp C Pillar Right Hand
E055	**X404**, **X405**	License Lamp Right Hand
E057	**X404**, **X405**	License Lamp Left Hand
K008	**X036**	Stop Lamps Relay
K016	**X074**	Rear Worklamps C Pillar Relay
S043	**X013**	Stop Lamp switch Left Hand
S044	**X014**	Stop Lamp Switch Right Hand
V005	**X076**	Brake Light Diode
V006	**X076**	Brake Light Diode
Z006	**X076**	Diode Block
Additional Connectors: **X111**, **X126**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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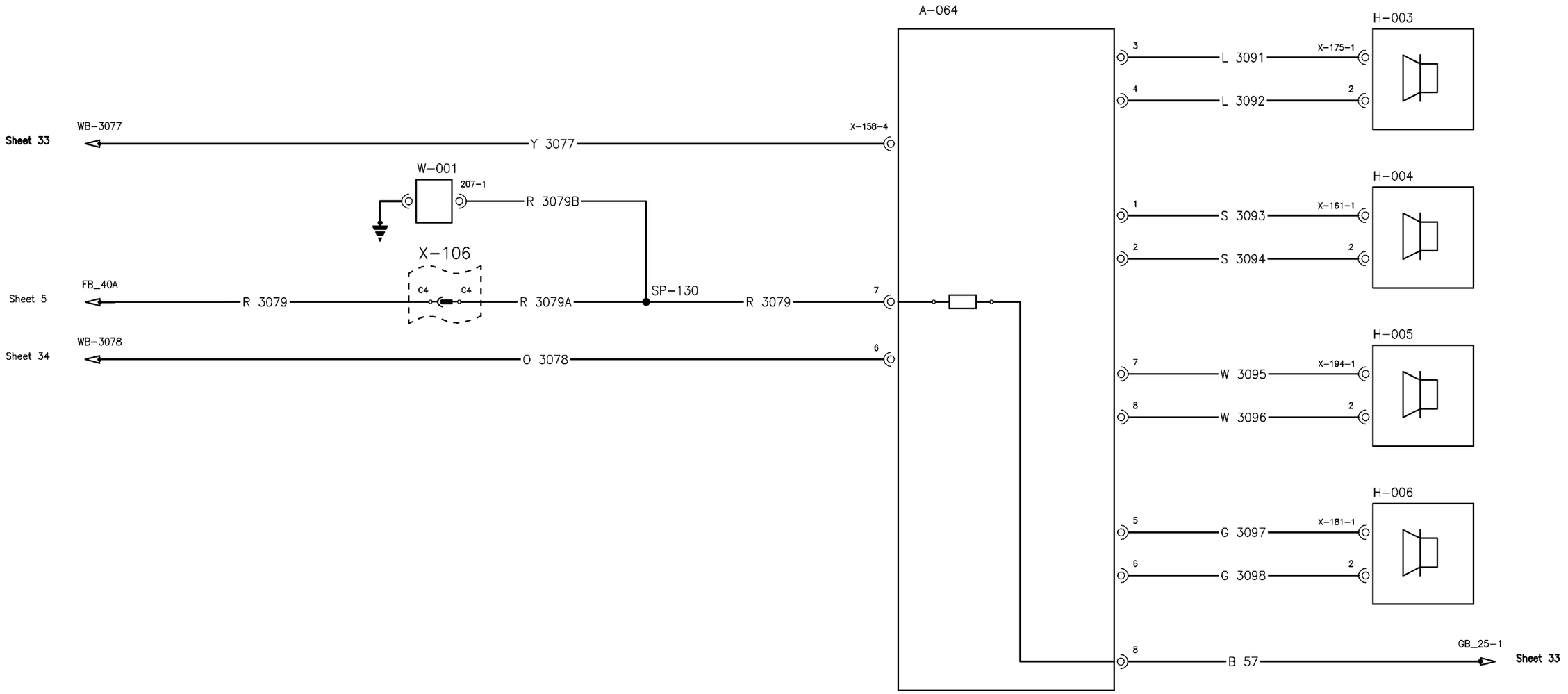
Wiring harness - Electrical schematic frame 41 I.C.E (Radio)

Component	Connector	Description
A064	**X157**, **X158**	Radio
H003	**X175**	Radio Speaker RHR
H004	X161	Radio Speaker RHF
H005	X194	Radio Speaker LHF
H006	**X181**	Radio Speaker LHR
W001	**X207**	Antenna Plus
Additional Connectors: **X106**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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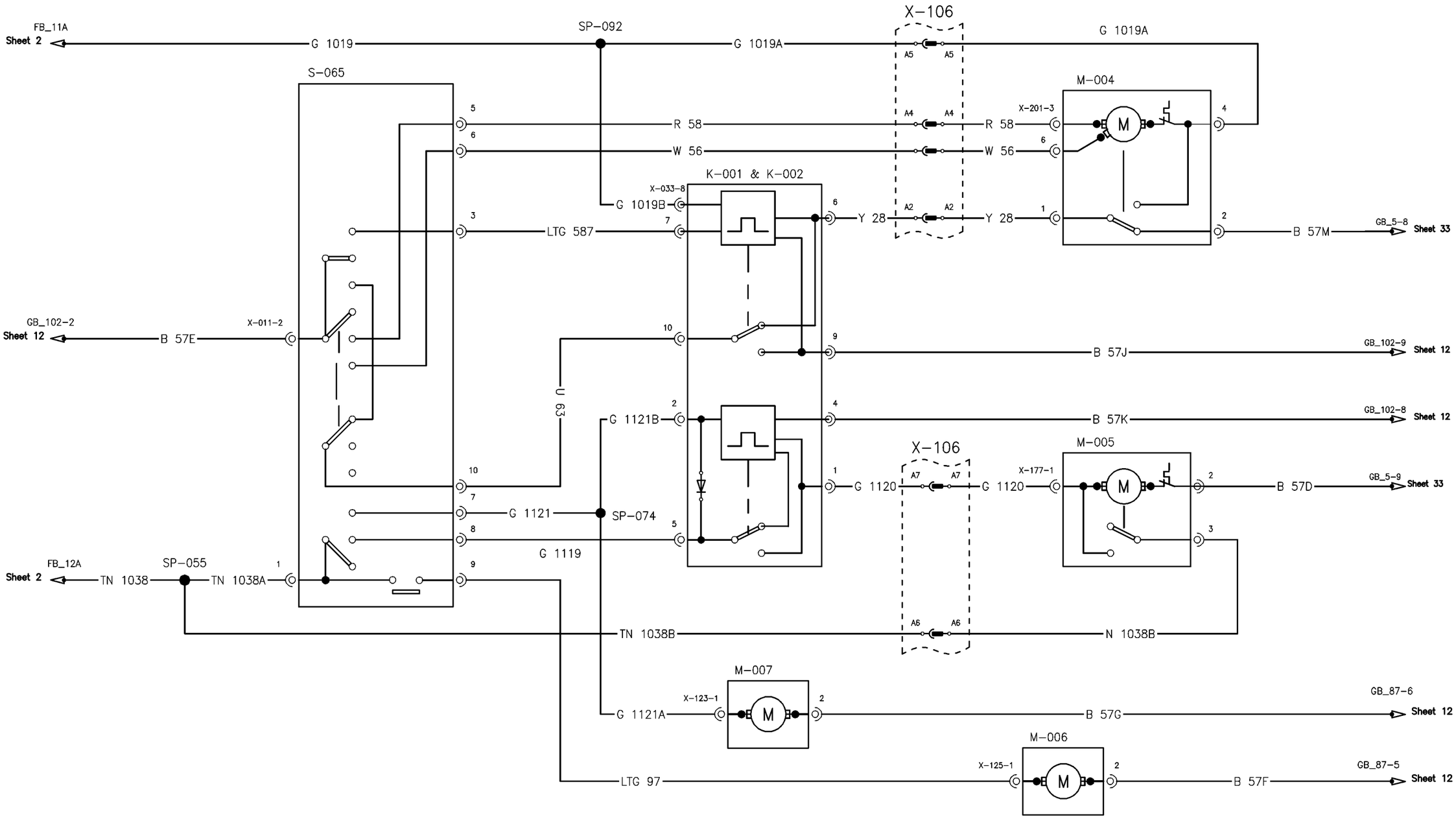
Wiring harness - Electrical schematic frame 42 Washers & Wipers

Component	Connector	Description
K001 & K002	**X033** (1-5)	Wiper Module Front & Rear
K001 & K002	**X033** (6-10)	Wiper Module Front & Rear
M004	**X201**	Wiper Motor Front
M005	**X177**	Wiper Motor Rear
M006	**X125**	Washer Motor Front
M007	**X123**	Washer Motor Rear
S065	**X011**	Front and Rear Wiper Switch
Additional Connectors: **X106**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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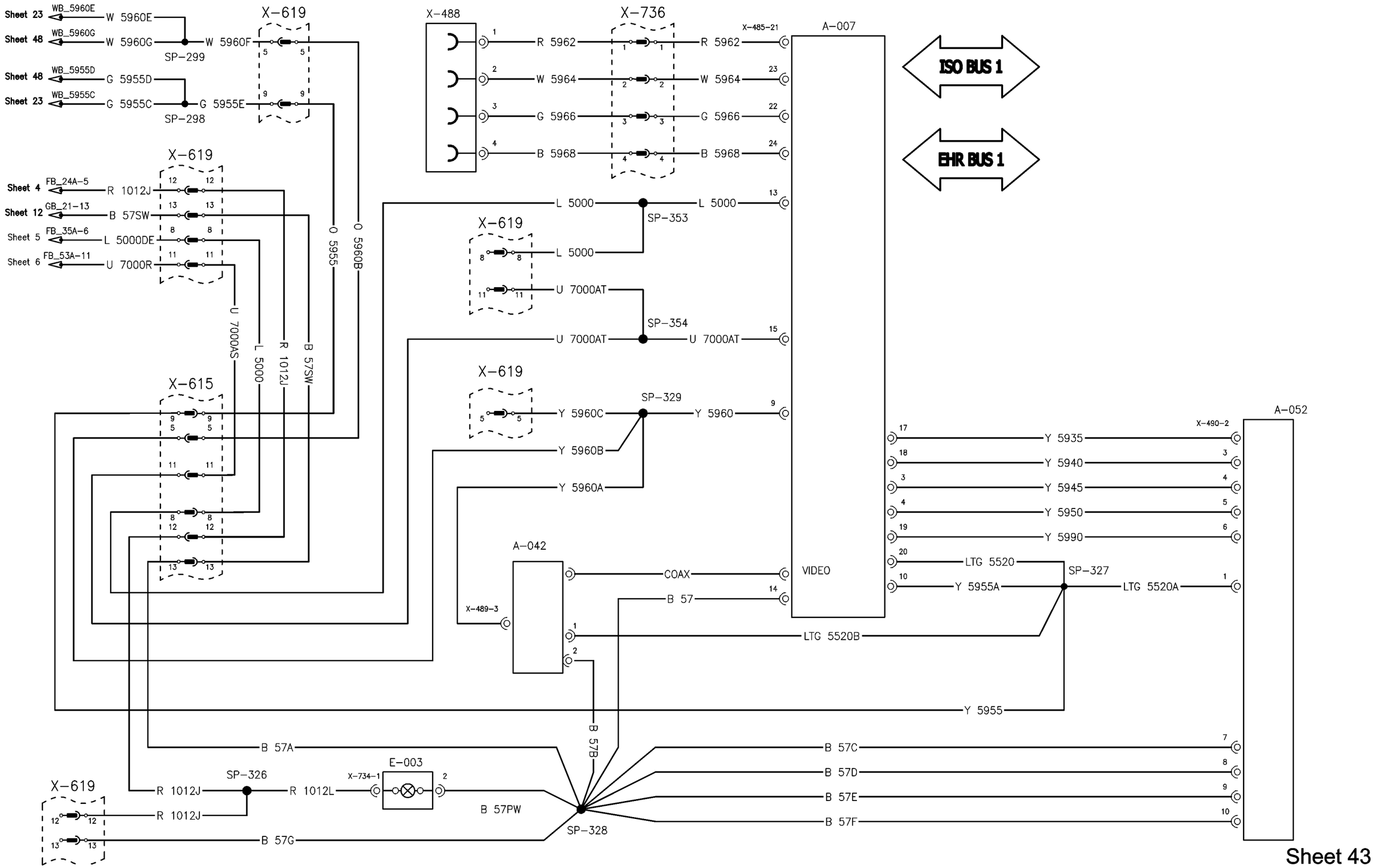
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Wiring harness - Electrical schematic frame 43 Colour Display (Instruments)

Component	Connector	Description
A007	**X485**	Colour Display
A042	**X489**	Rear View Camera
A052	**X490**	Encoder & Switches
E003	**X734**	Lamp Feed
-	X488	USB Connector
Additional Connectors: **X615**, **X619**, X736		

Wire Colour Codes							
B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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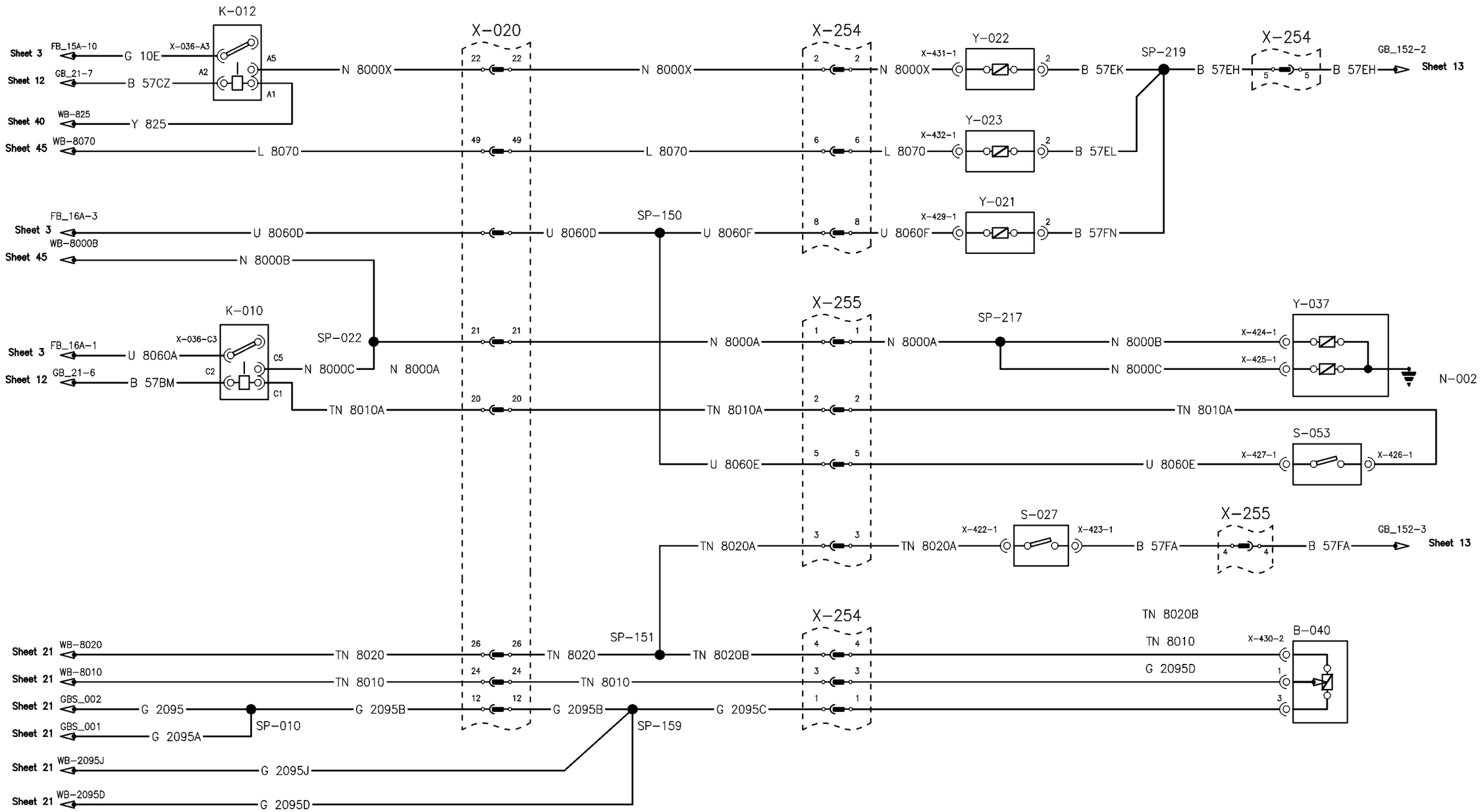
Wiring harness - Electrical schematic frame 44 Braking (Trailer Brakes)

Component	Connector	Description
B040	**X430**	Air Brake Pressure Sensor
K010	**X036**	Hydraulic Trailer Brake
K012	**X036**	Pneumatic Trailer Brake
S027	**X422**, **X423**	Low Brake Pressure Line Switch 1/ 2
S053	**X426**, **X427**	Low Pump Output Press Switch 1 / 2
Y021	**X429**	Brake De-Icer
Y022	**X431**	Pneumatic Trailer Brake Solenoid
Y023	**X432**	Park Brake Solenoid
Y037	**X424**, **X425**	Hydraulic Trailer Brake Solenoid 1 / 2
Additional Connectors: **X020**, **X254**, **X255**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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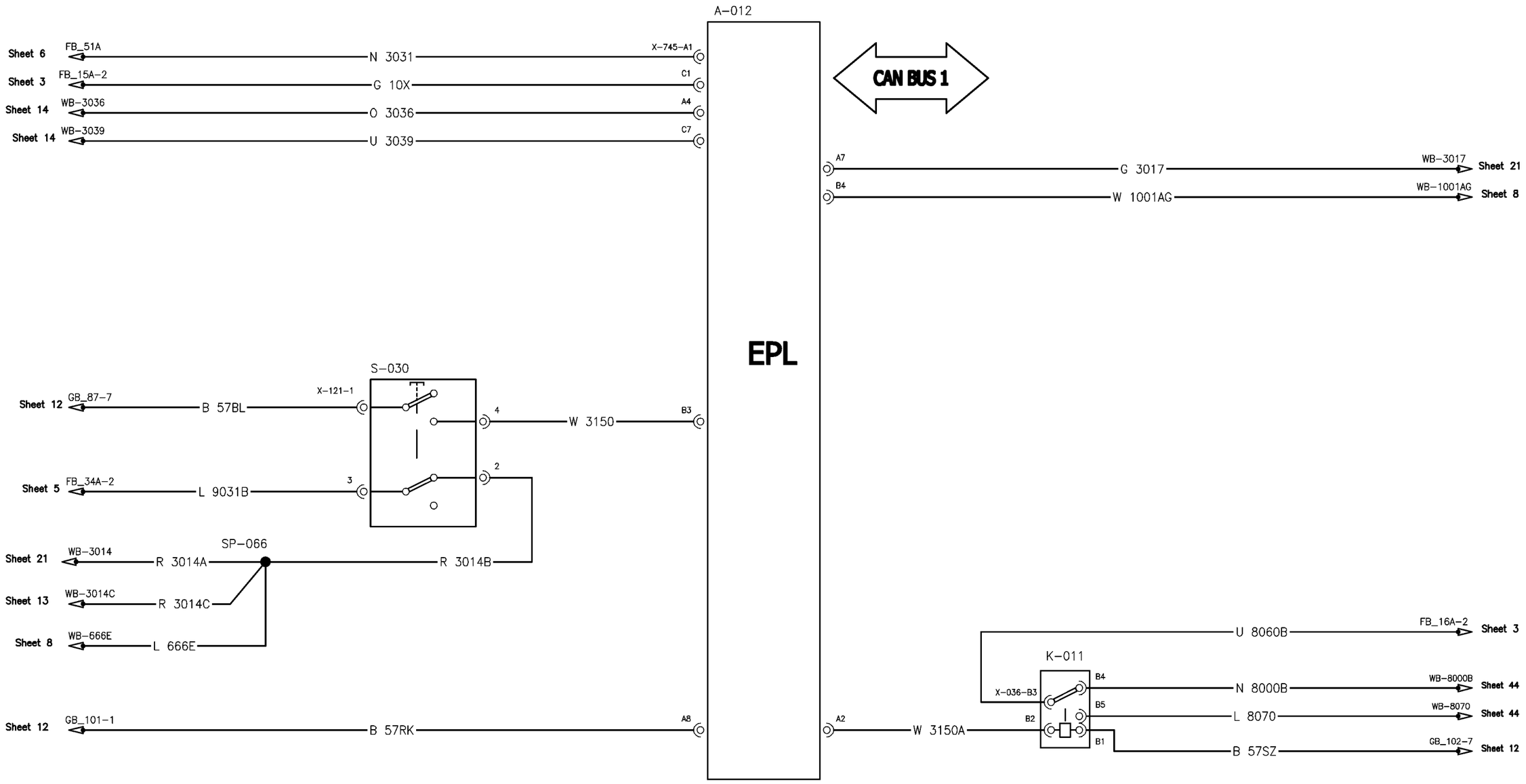
Wiring harness - Electrical schematic frame 45 Braking (Electronic Park Lock)

Component	Connector	Description
A012	**X745**	Electronic Park Brake Interface Conn
K011	**X036**	Electronic Park Brake
S030	**X121**	Hand Brake Switch
Additional Connectors: -		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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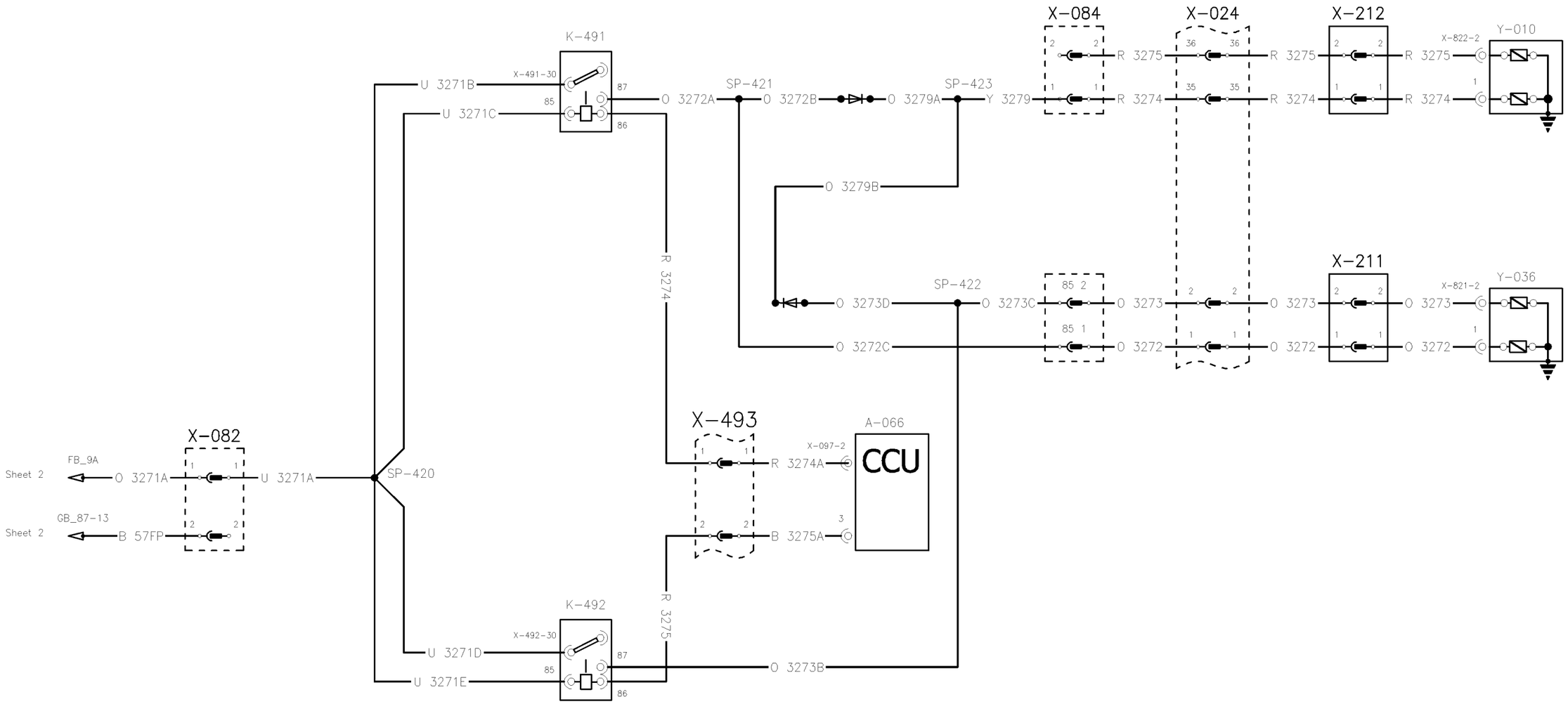
Wiring harness - Electrical schematic frame 46 Front Loader Relays

Component	Connector	Description
A066	**X097**	Central Control Unit
K491	X491	Front Loader Relay 1
K492	X492	Front Loader Relay 2
Y010	X822	Loader Valve Option B
Y036	X821	Loader Valve Option A
Additional Connectors: **X024**, **X082**, **X084**, **X211**, **X212**, X493		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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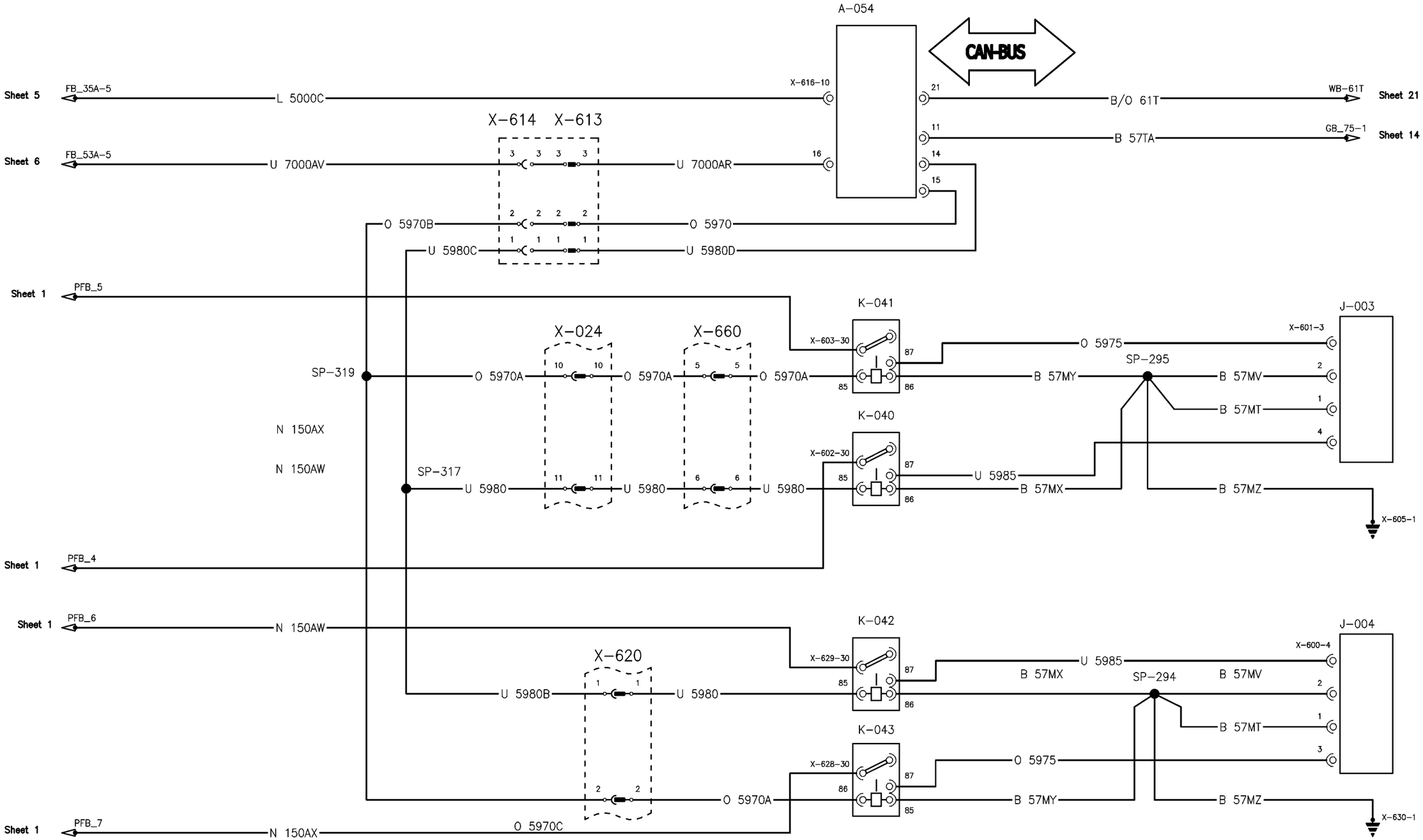
Wiring harness - Electrical schematic frame 47 Isobus (Isobus Power)

Component	Connector	Description
A054	**X616**	Iso Bus Control Unit
J003	**X601**	Iso Implement Socket (Rear)
J004	**X600**	Iso Implement Socket (Front)
K040	**X602**	ISO Relay 1 Rear
K041	**X603**	ISO Relay 2 Rear
K042	**X629**	ISO Relay 1 Front
K043	**X628**	ISO Relay 2 Front
-	**X605**	Earth to SP295
-	**X630**	Earth to SP294
Additional Connectors: **X024**, **X613**, **X614**, **X620**, **X660**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
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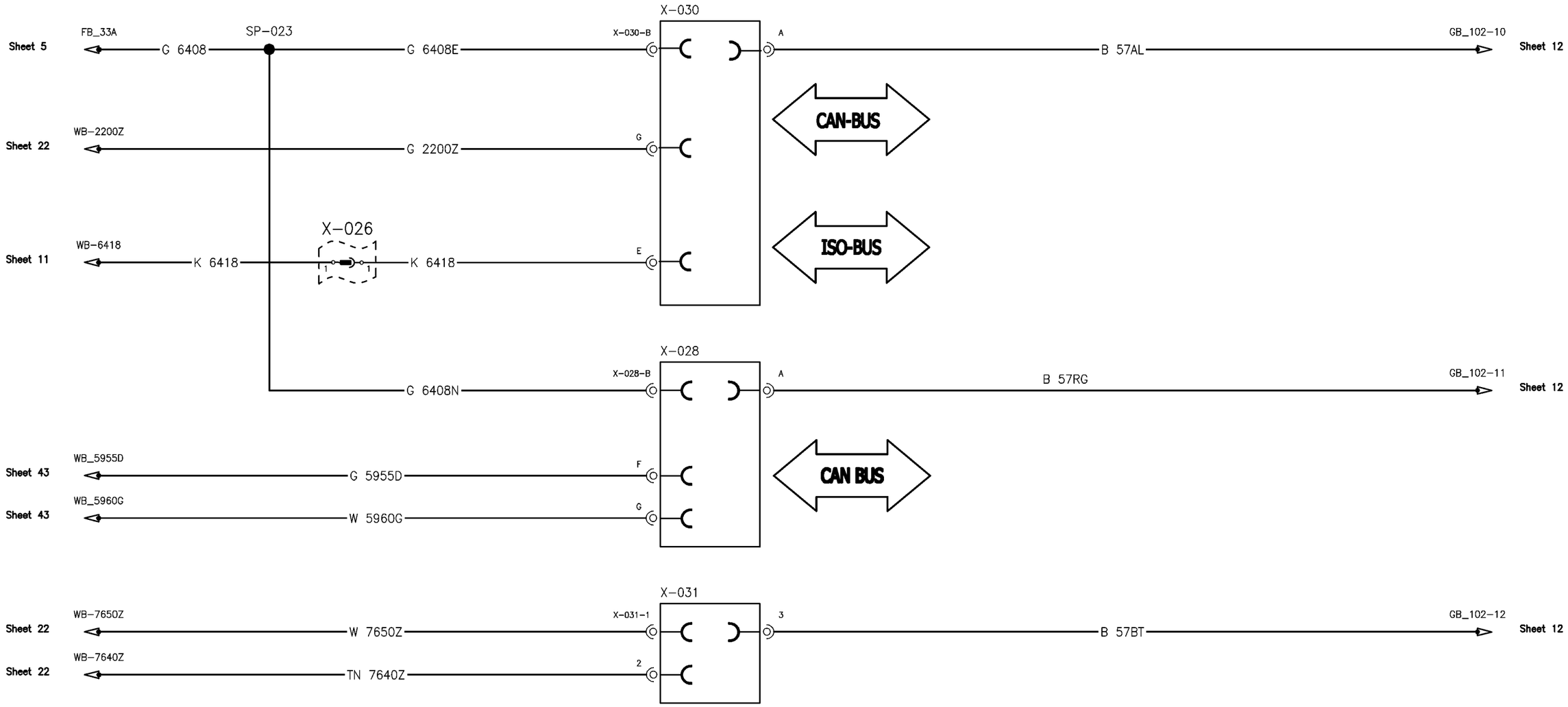
Wiring harness - Electrical schematic frame 48 Diagnostics

Component	Connector	Description
-	**X028**	Diagnostic Connector 2
-	**X030**	Diagnostic Connector 1
-	**X031**	ADIC Diagnostic Connector
Additional Connectors: **X026**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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SS08N048 1

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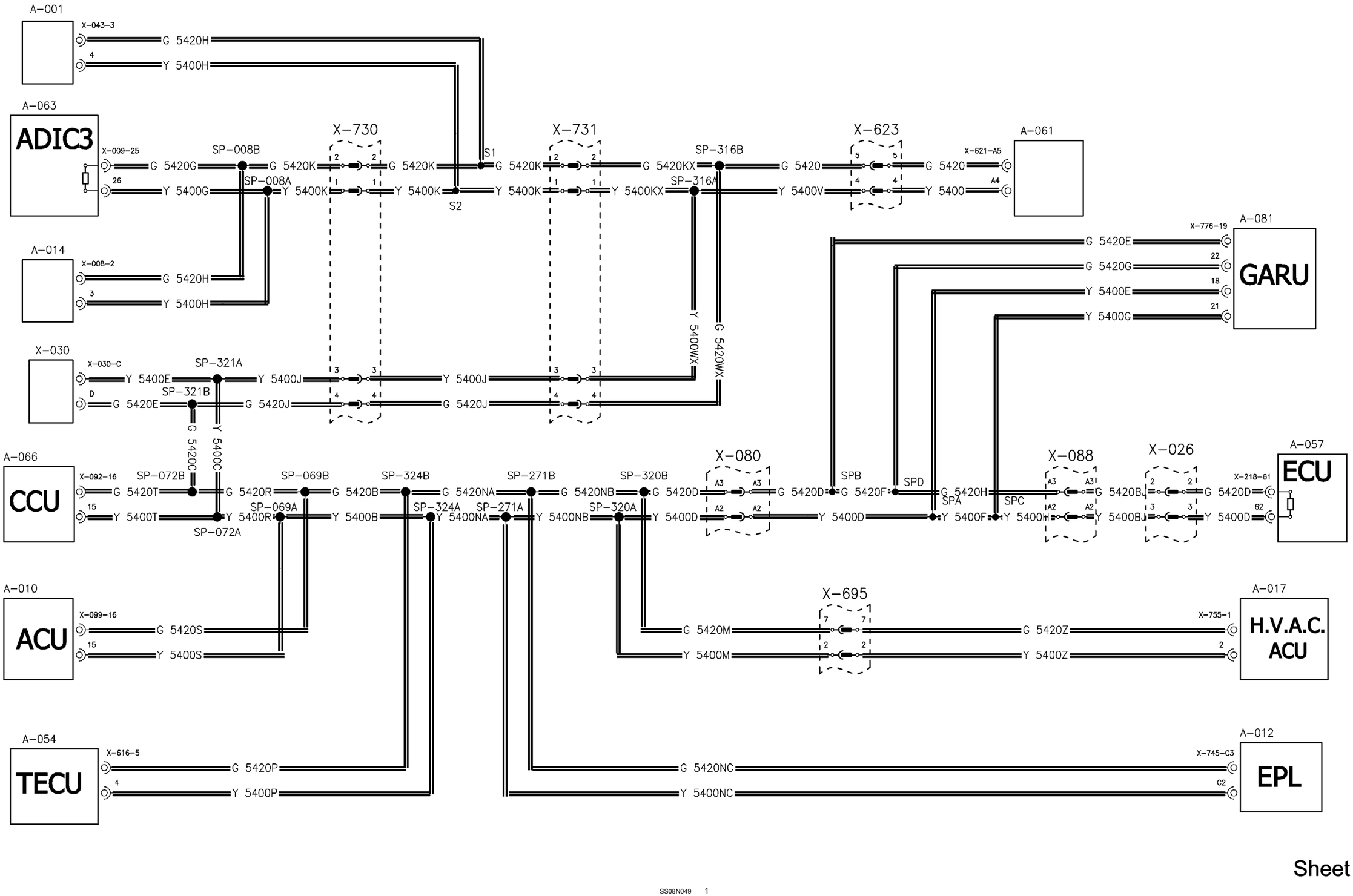
Wiring harness - Electrical schematic frame 49 CAN System (CAN BUS 1)

Component	Connector	Description
A001	X043	NH Display of Gear
A010	**X099**	Auxilary Control Unit
A012	**X745**	Electronic Park Brake Interface Conn
A014	**X008**	Keypad
A017	**X755**	Air Condition Control Unit
A054	**X616**	Iso Bus Control Unit
A057	**X218**	Engine Control Unit
A061	**X621**	Control Unit Fast Steer
A063	**X009**	Instrument Cluster Unit
A066	**X092**	Central Control Unit
A081	**X776**	Armrest Control Unit (GARU)
-	**X030**	Diagnostic Connector 1
Additional Connectors: **X026**, **X080**, **X088**, **X623**, **X695**, **X730**, **X731**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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SS08N049 1

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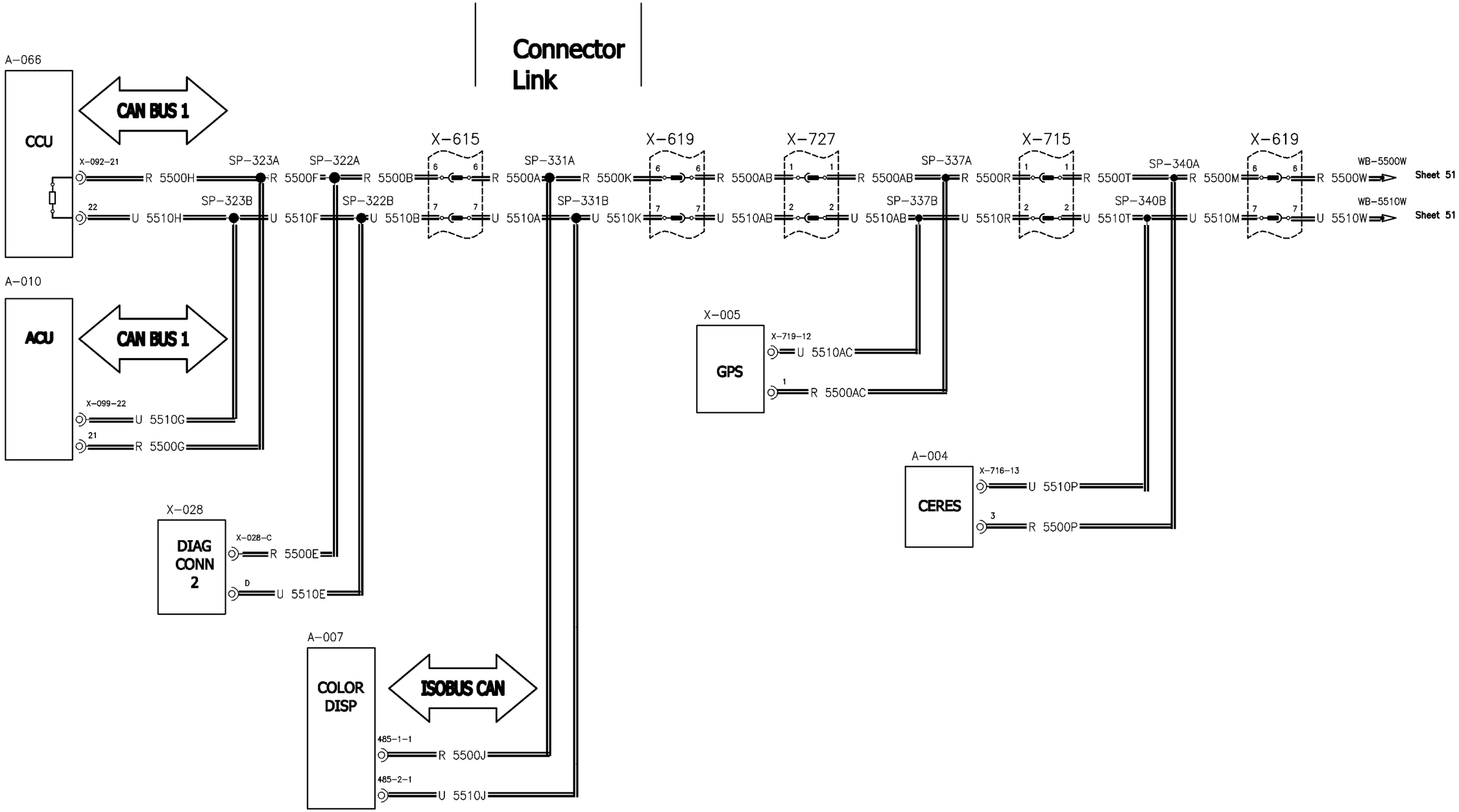
Wiring harness - Electrical schematic frame 50 CAN System (EHR CAN)

Component	Connector	Description
A004	**X716**	Navigation Controller
A007	**X485**	Colour Display
A010	**X099**	Auxiliary Control Unit
A066	**X092**	Central Control Unit
X005	**X719**	GPS Receiver
-	**X028**	Diagnostic Connector 2
Additional Connectors: **X615**, **X619**, **X715**, **X727**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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SS08N050 1

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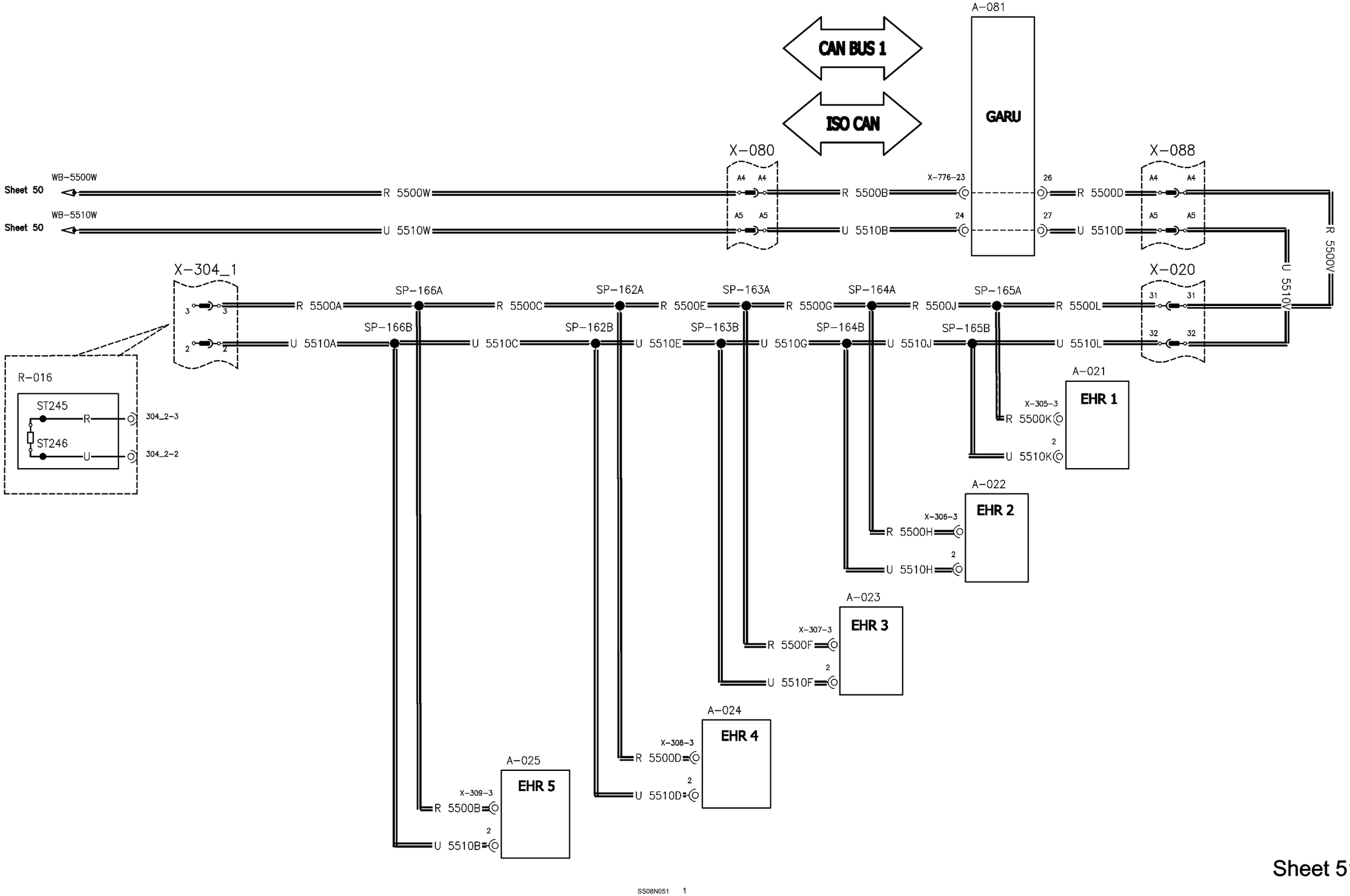
Wiring harness - Electrical schematic frame 51 CAN System (EHR CAN)

Component	Connector	Description
A021	**X305**	El.Hydraulic Remote Valve 1
A022	**X306**	El.Hydraulic Remote Valve 2
A023	**X307**	El.Hydraulic Remote Valve 3
A024	**X308**	El.Hydraulic Remote Valve 4
A025	**X309**	El.Hydraulic Remote Valve 5
A081	**X776**	Armrest Control Unit (GARU)
R016	**X304**	CAN Terminating Resistor
Additional Connectors: **X020**, **X080**, **X088**, **X304**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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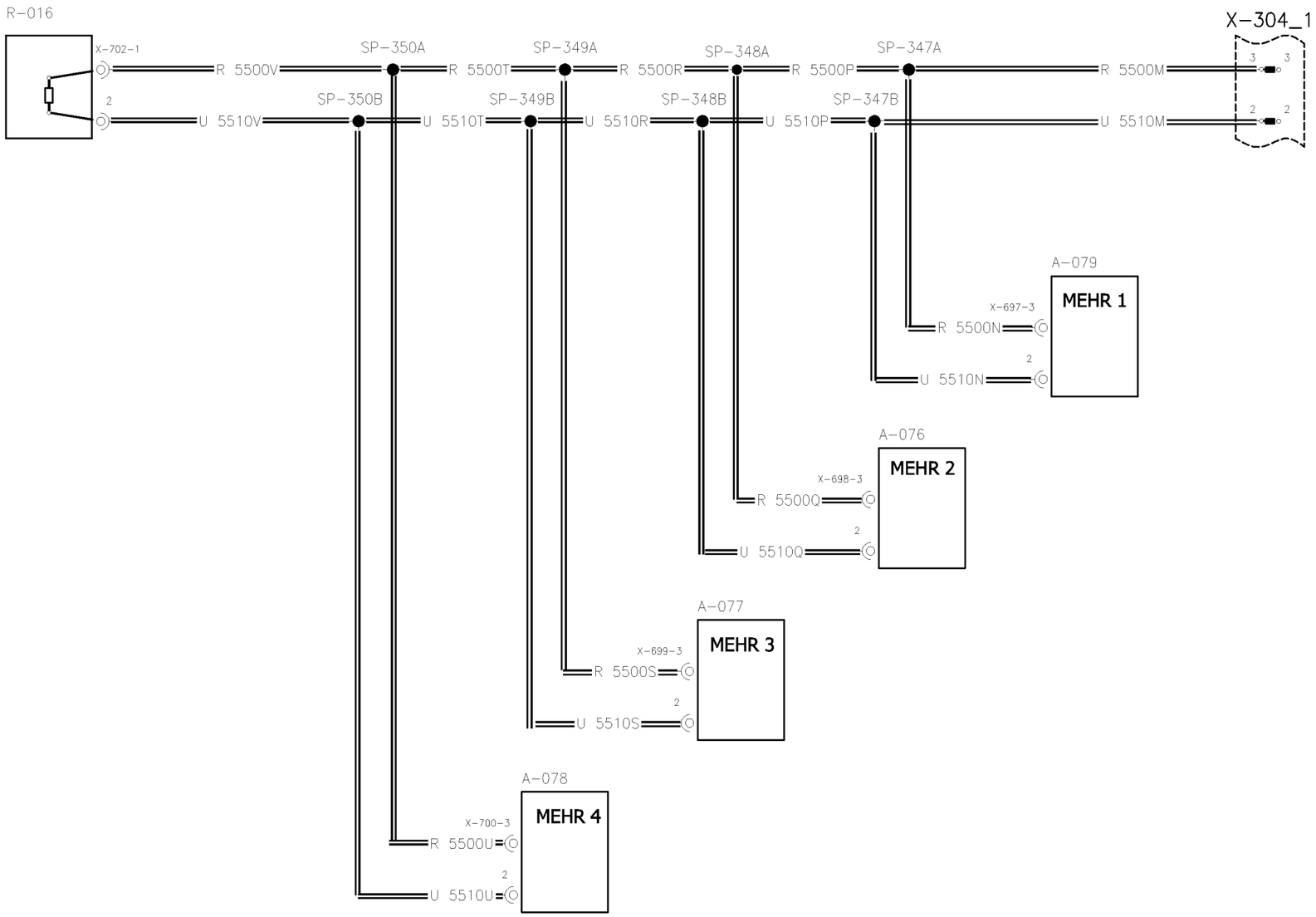
Wiring harness - Electrical schematic frame 52 CAN System (EHR CAN)

Component	Connector	Description
A076	**X698**	Mid.Mount El.Hydraulic Remote Valve 2
A077	**X699**	Mid.Mount El.Hydraulic Remote Valve 3
A078	**X700**	Mid.Mount El.Hydraulic Remote Valve 4
A079	**X697**	Mid.Mount El.Hydraulic Remote Valve 1
R016	**X702**	CAN Terminating Resistor
Additional Connectors: **X304**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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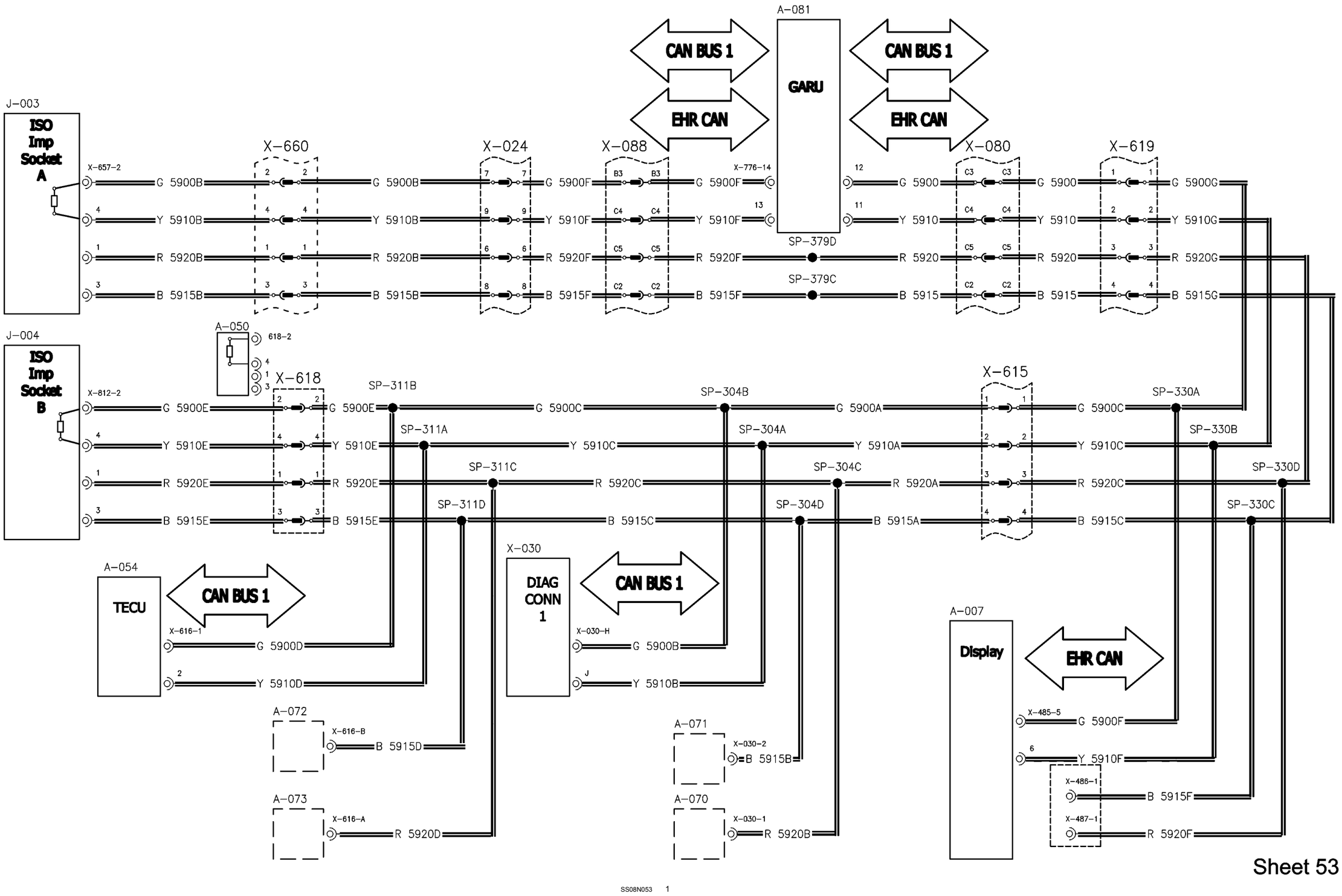
Wiring harness - Electrical schematic frame 53 CAN System (ISO BUS CAN)

Component	Connector	Description
A007	**X485**	Colour Display
A050	**X618**	Active CAN Terminator
A054	**X616**	Iso Bus Control Unit
A070	X030-1	Iso Bus Control Unit CAN Plus
A071	X030-2	Iso Bus Control Unit CAN Minus
A072	X616B	Iso Bus Control Unit CAN Minus
A073	X616A	Iso Bus Control Unit CAN Plus
A081	**X776**	Armrest Control Unit (GARU)
J003	**X657**	Iso Bus Implement Socket Rear
J004	**X812**	Iso Bus Implement Socket Front
-	**X030**	Diagnostic Connector 1
Additional Connectors: **X024**, **X080**, **X088**, **X615**, **X618**, **X619**, **X660**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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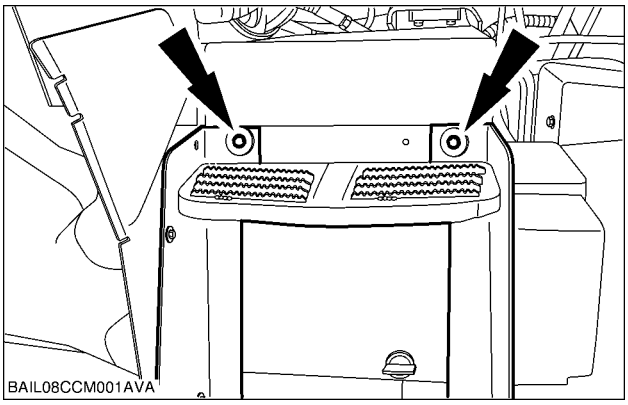
SS08N053 1

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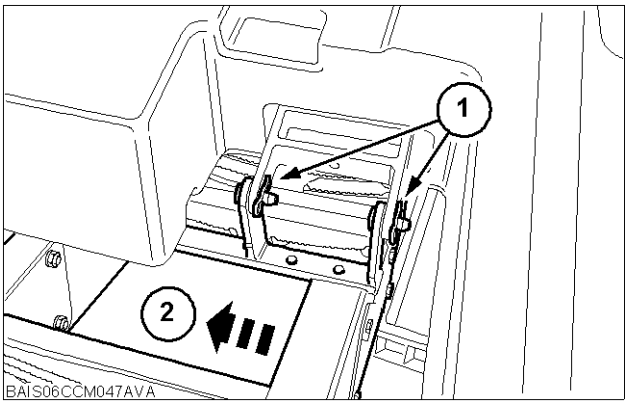
Battery - Disconnect

1. Remove retaining bolts and lower the right-hand steps.



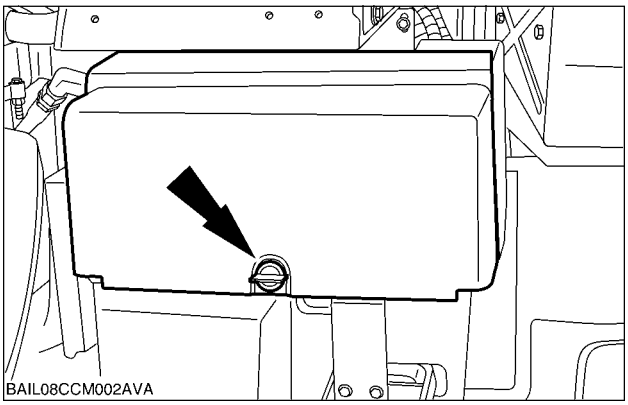
BAIL08CCM001AVA 1

2. Remove the R-clips **(1)** and remove the right-hand steps **(2)**.



BAIS06CCM047AVA 2

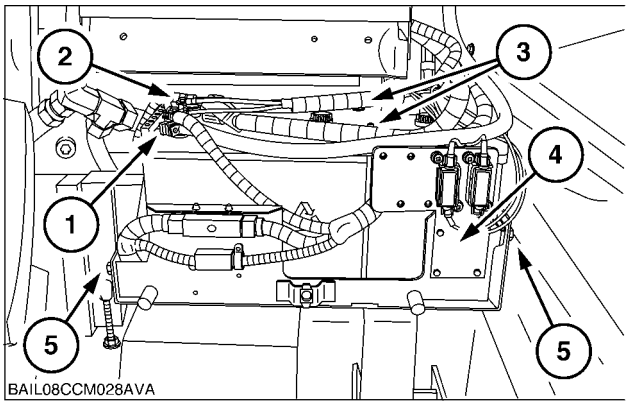
3. Remove the battery cover.



BAIL08CCM002AVA 3

4. Disconnect the negative lead **(1)** from the battery terminal and position to one side.
   Disconnect the positive lead **(2)** from the battery terminal and position to one side.
   .

NOTE: *Always disconnect the lead from the negative terminal first.*



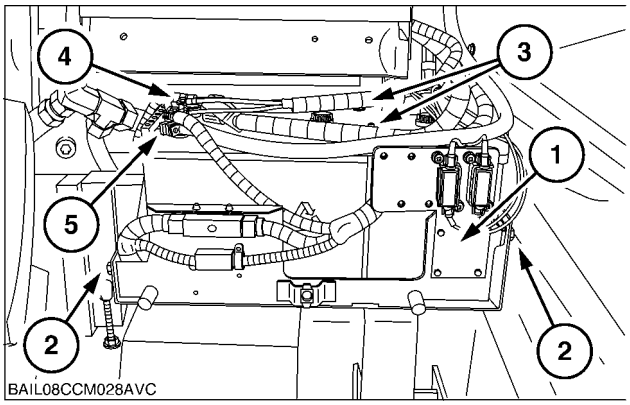
BAIL08CCM028AVA 4

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Battery - Connect

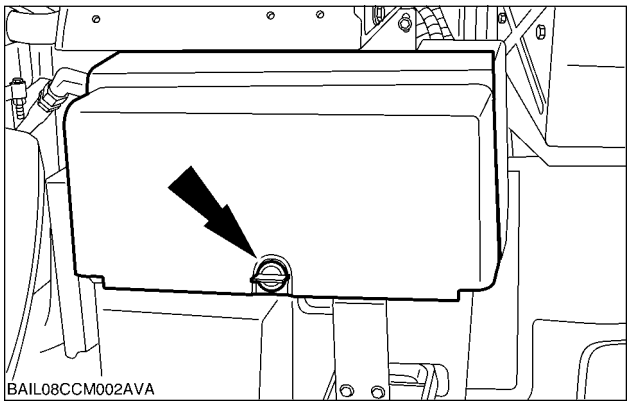
1. Connect the positive battery lead **(4)**.
   Connect the battery negative lead **(5)**.

NOTE: *Always connect the lead to the negative terminal last.*



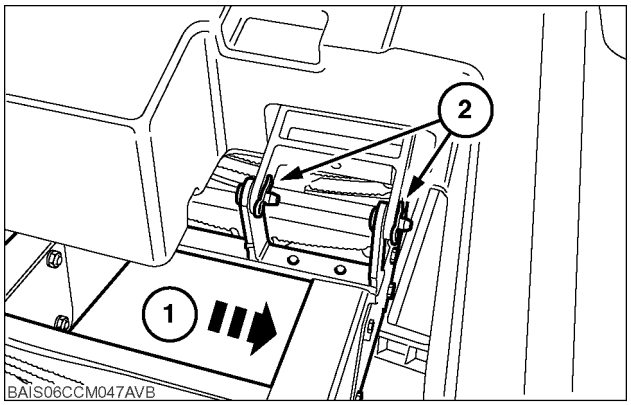
BAIL08CCM028AVC 1

2. Install the battery cover.



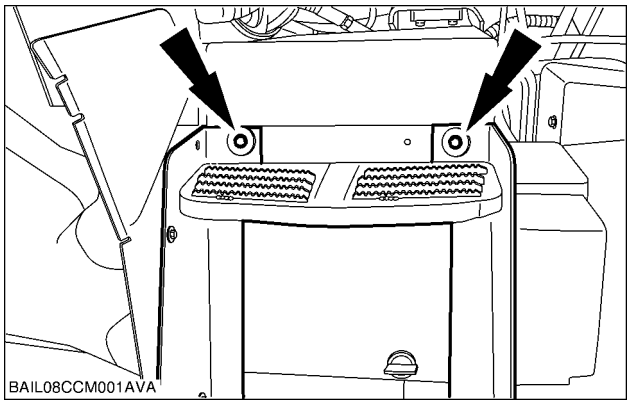
BAIL08CCM002AVA 2

3. Install the right-hand steps **(1)** and install the R-clips **(2)**.



BAIS06CCM047AVB 3

4. Raise the steps and install the retaining bolts.



BAIL08CCM001AVA 4

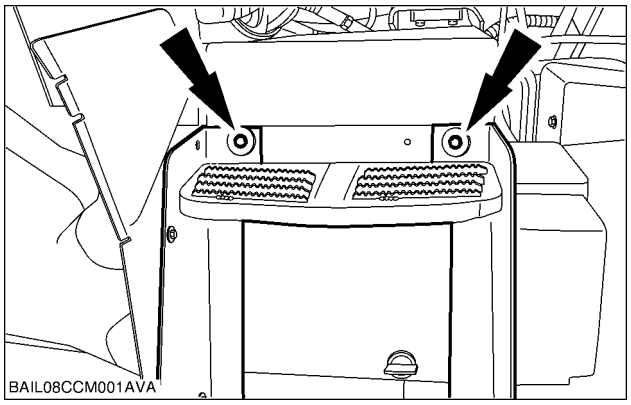
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5. The radio, if fitted, will lose its stored information and will require reprogramming. It should be noted that on models with electronic instrument panel and microprocessors, that these components will not lose their memories, i.e, electronic height control and transmission calibrations will not be affected.

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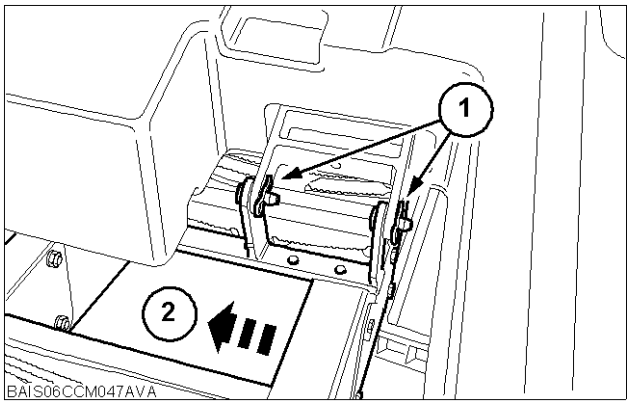
Battery - Remove

1. Remove retaining bolts and lower the right-hand steps.



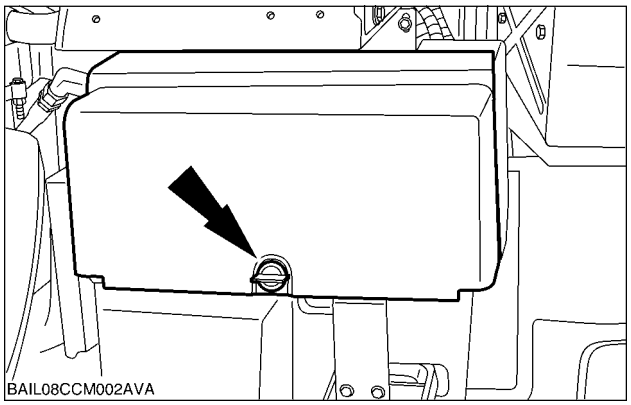
BAIL08CCM001AVA 1

2. Remove the R-clips **(1)** and remove the right-hand steps **(2)**.



BAIS06CCM047AVA 2

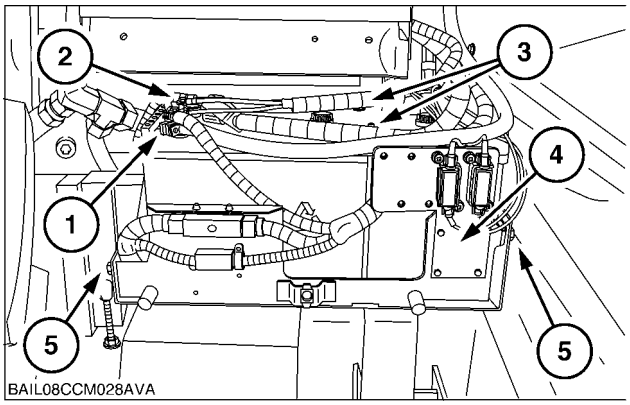
3. Remove the battery cover.



BAIL08CCM002AVA 3

4. Disconnect the negative lead **(1)** from the battery terminal and position to one side.
   Disconnect the positive lead **(2)** from the battery terminal and position to one side.
   Loosen the retaining nuts **(3)** and remove the battery clamp.
   Remove the retaining bolts **(5)** from the side plate **(4)** and position to one side taking care not to damage the wiring on the maxi fuse block.

NOTE: *Always disconnect the lead from the negative terminal first.*



BAIL08CCM028AVA 4

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5. Carefully slide the battery out of the carrier.

⚠ CAUTION ⚠

The component is heavy. ALWAYS use a hoist or get assistance to lift the component. Failure to comply could result in serious injury or death.

M944

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Battery - Install

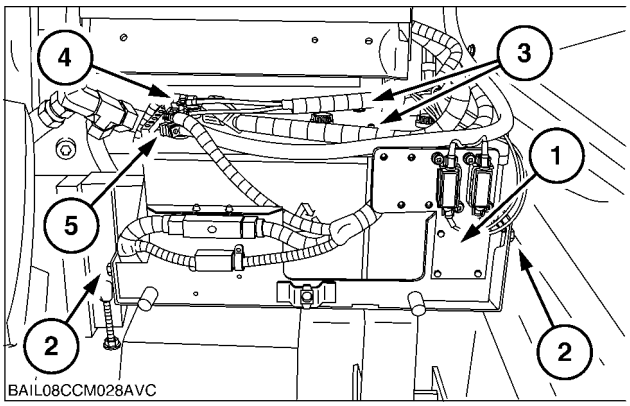
⚠ CAUTION ⚠

The component is heavy. ALWAYS use a hoist or get assistance to lift the component. Failure to comply could result in serious injury or death.

M944

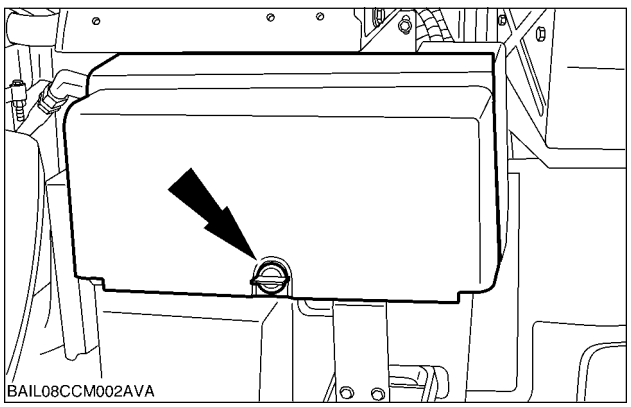
1. Before installing the battery check the following:
   - Make sure the battery is clean and dry and the vent caps are properly installed.
   - Smear the terminals with petroleum jelly, do not use conventional lubricating greases as these can promote electrolytic corrosion.
   - Make sure the battery tray and clamps are clean and free from stones or small objects which may puncture the battery casing.
   - Make sure the battery terminal polarity is correct and that the terminal connections are sufficiently tight, but not overtightened.
2. Carefully slide the battery into the carrier.
3. Reposition the side plate **(1)** and install the retaining bolts **(2)**.
   Install the battery clamp and tighten the retaining nuts **(3)**.
   Connect the positive battery lead **(4)**.
   Connect the battery negative lead **(5)**.

NOTE: *Always connect the lead to the negative terminal last.*



BAIL08CCM028AVC 1

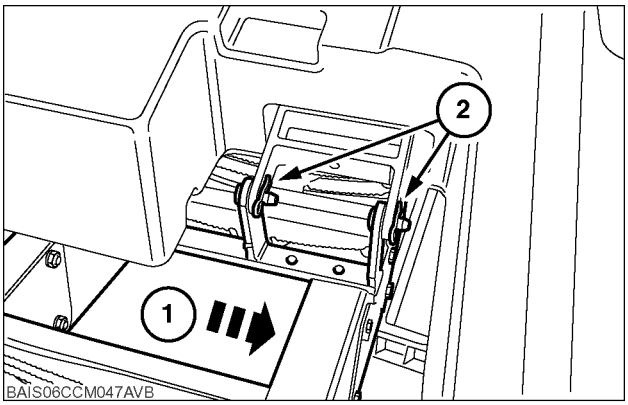
4. Install the battery cover.



BAIL08CCM002AVA 2

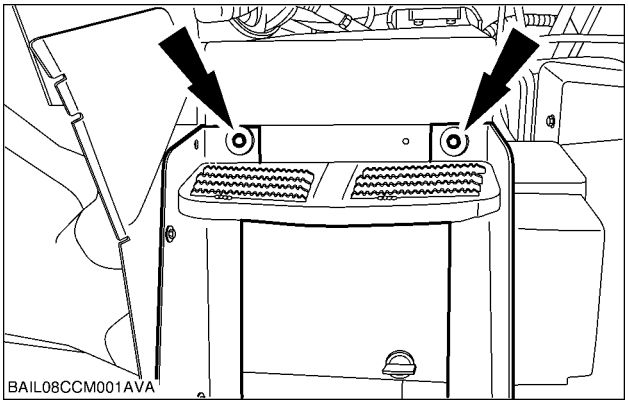
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5. Install the right-hand steps **(1)** and install the R-clips **(2)**.



BAIS06CCM047AVB 3

6. Raise the steps and install the retaining bolts.



BAIL08CCM001AVA 4

7. The radio, if fitted, will lose its stored information and will require reprogramming. It should be noted that on models with electronic instrument panel and microprocessors, that these components will not lose their memories, i.e, electronic height control and transmission calibrations will not be affected.

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DISTRIBUTION SYSTEMS - A

ELECTRONIC SYSTEM - 50.A

Puma 165 CVX
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Calibrate ’U’ Code Listing 234

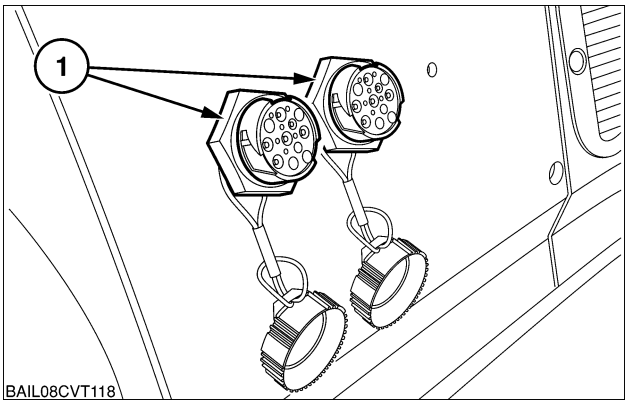
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Control module - Configure H-Menu Overview

Identifier	Controller Functions
IE	Enhanced ICU3 Instrument Cluster
IF	Basic ICU3 Instrument Cluster
RE	CVT Transmission, Electronic Draft Control, Rear PTO, Front Wheel Drive, Differential Lock, Midmount Electronic Hydraulic Remote Valves, Engine
RM	Front Axle Suspension, Rear Electronic Hydraulic Remote Valves, Front PTO, Front Hitch
JA	Keypad
KA	Fast Steer System
LC	Armrest Controller
XA	Electronic Park Lock

INTRODUCTION

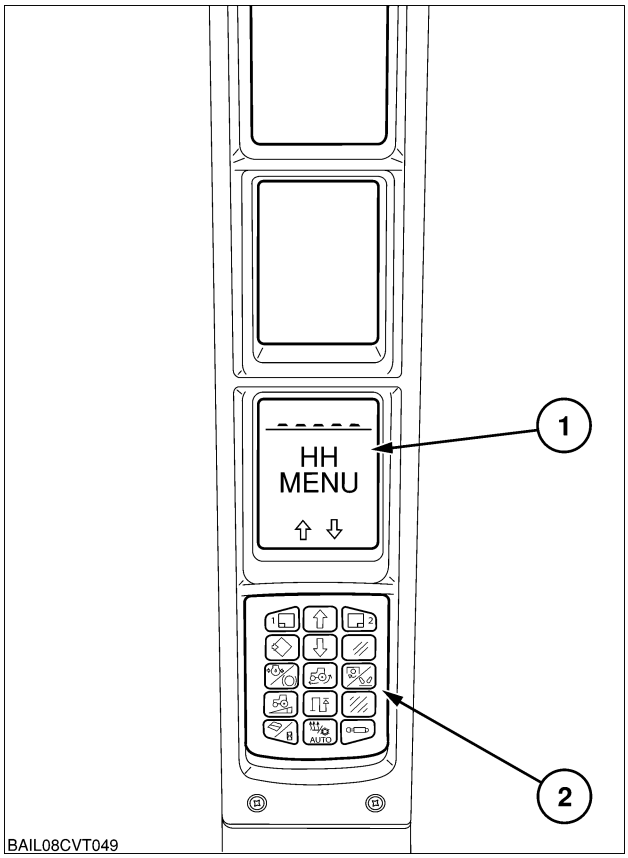
To gain access to the diagnostic “H" menu mode routine, it is necessary to use the diagnostic test switch, special tool **380000843 (1)** in the tractor diagnostic connector **X030**. There are two diagnostics connectors located in the trim panel behind the operators seat. The left hand connector is used to access the on board diagnostics. with the test switch via the main vehicle CAN Bus system. The other diagnostic connector is used by the EST for accessing the secondary CAN Bus system.



BAIL08CVT118A 1

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The instrument cluster (ICU3) dot matrix display **(1)** is located on the right hand ’A’ pillar, the dot matrix displays all the “H" menu information.
The "H" menu navigation keys **(2)** are located on the key pad.

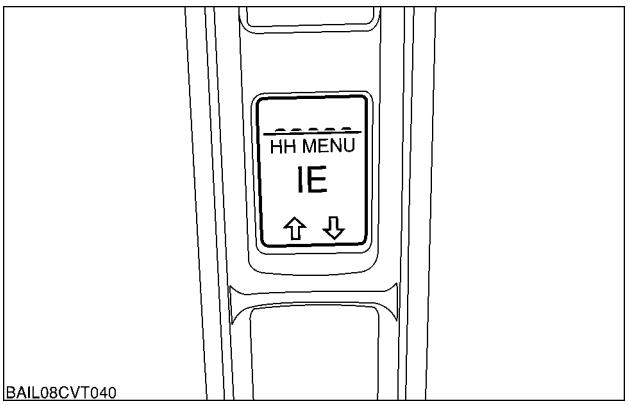


BAIL08CVT049 2

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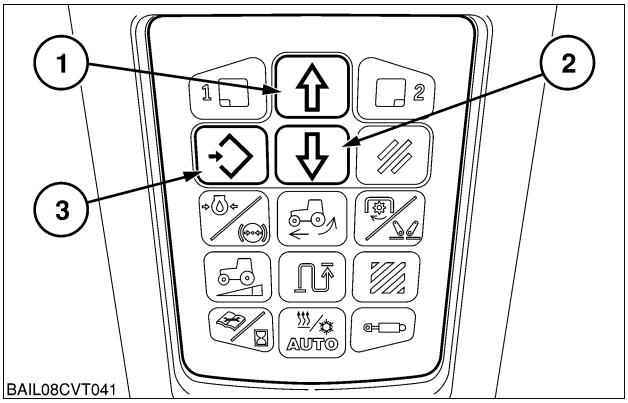
H Menu Navigation Procedure

Connect the special tool **380000843** to the diagnostic connector and turn the key start switch ON.
At key ON the ICU3 will automatically build a list of the controllers connected on the Controller Area Network (CAN), and will store it in the Electrically Erasable Programmable Read Only Memory (EEPROM).
The dot matrix display will show “HH MENU" to indicate that the “H" menu has been activated.



BAIL08CVT040 3

To navigate the “H" menus use the navigation “up" key and “down" key to scroll through the options, and the “menu" key to select the required controller or “H" menu.
(1) "up" key
(2) "down" key
(3) "menu" key (return/escape)



BAIL08CVT041 4

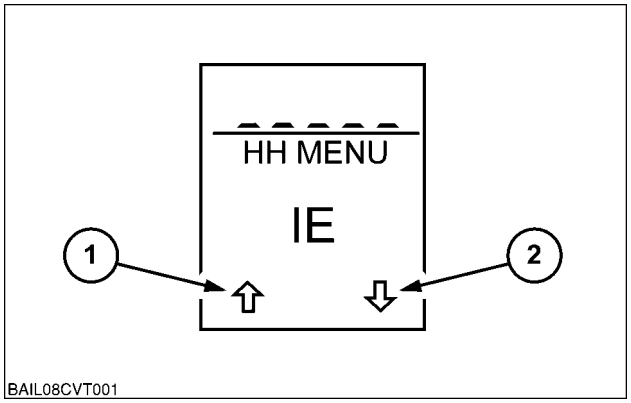
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Controller Identifier Code Table

The controller is identified with a two letter code, i.e. IE - Enhanced ICU3.

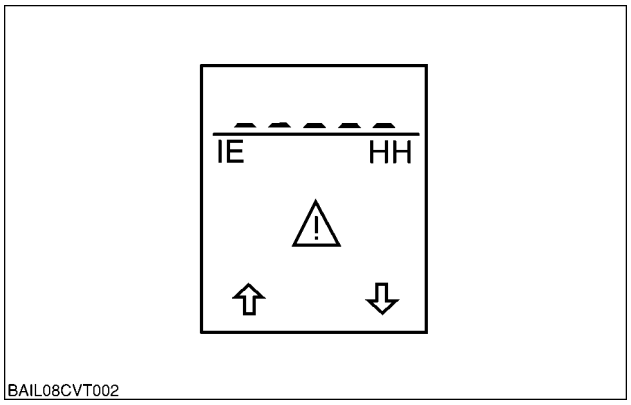
Identifier	Controller Functions
IE	Enhanced ICU3 Instrument Cluster
IF	Basic ICU3 Instrument Cluster
RE	CVT Transmission, Electronic Draft Control, Rear PTO, Front Wheel Drive, Differential Lock, Midmount Electronic Hydraulic Remote Valves, Engine
RM	Front Axle Suspension, Rear Electronic Hydraulic Remote Valves, Front PTO, Front Hitch
JA	Keypad
KA	Fast Steer System
LC	Armrest Controller
XA	Electronic Park Lock

Select the controller that requires diagnostics or configuration.
Depress the “menu" key to show the first controller identifier code in the list.
The up arrow **(1)** and the down arrow **(2)** indicate there are other controllers available.
To navigate through the list of controllers use the “up" and "down" key.



BAIL08CVT001 5

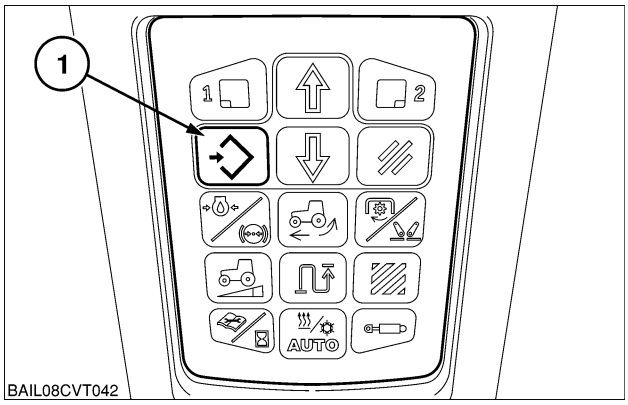
If a controller cannot be found on the CAN, a symbol will be displayed to indicate that there is no communication between the ICU3 and the selected controller.



BAIL08CVT002 6

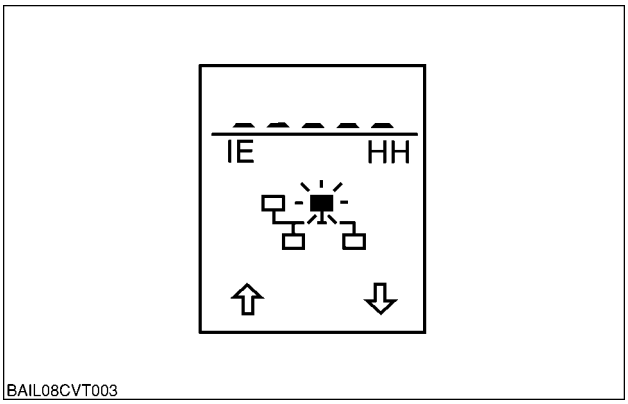
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When the required controller is located in the list, depress the menu key **(1)** to select it.



BAIL08CVT042 7

The display will change to show the “HH menu" select screen.



BAIL08CVT003 8

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H Menu Common Features

The “H“ menus consist of the following menu codes.

NOTE: *Not all the following “H" menus are available for all controllers.*

HH	Service Menu
H1	Calibration procedures
H2	View stored calibration values
H3	Configurations and options
H4	View software revision level
H5	Switch operation test
H6	Vehicle information view
H7	Vehicle test modes
H8	Clear stored calibration information
H9	Voltmeter diagnostics
HA	Demonstration mode
HB	Display stored fault codes
HC	Clear all stored fault codes
HE	Display frequency inputs
HF	View controller hardware information
HJ	Electronic hydraulic remote control valve number programming
HK	Rear electronic hydraulic remote control valve diagnostics

Dot Matrix Display Symbols

1. Engine 

2. Transmission 

3. Differential lock 

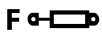
4. Electronic draft control 

5. Front hitch 

6. Rear P.T.O. system 

6a. Front P.T.O. system 

7. Rear Electronic remote valves 

7a Front EHRs 

8. Front suspension 

9. Four wheel drive 

10. Fast steer system 

11. HTS 

12. Engine shutdown 

13. Air brake 

14. Steering sensor 

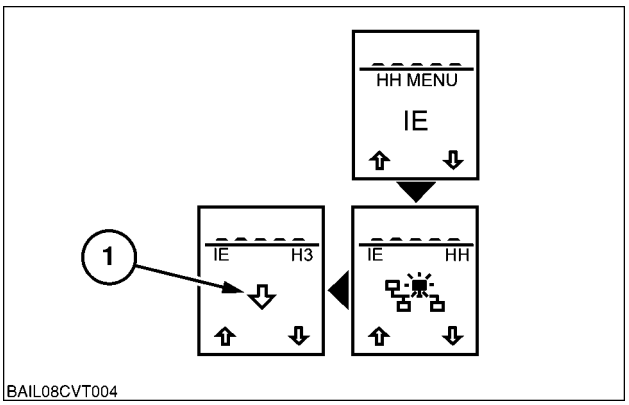
16. Error code management 

17. SWCD 

18. Front electronic remote valves

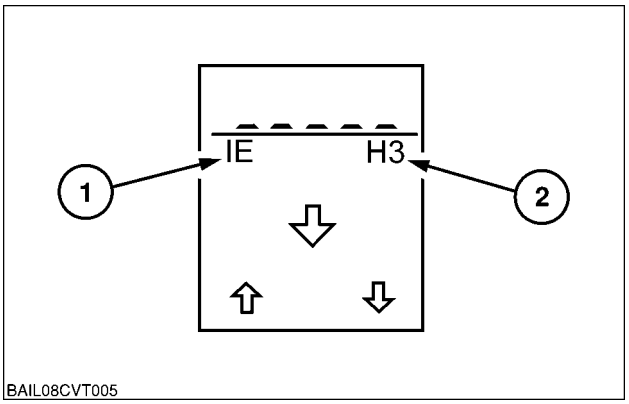
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The up and down arrows indicate there are other “H" menus available.
To navigate through the list of "H" menus use the “up" and "down" key.
The downward arrow **(1)** indicates there is more than one sub-system that uses the same menu (multi-functional “H" menu).
Depress the “menu" key to select the “H" menu required.



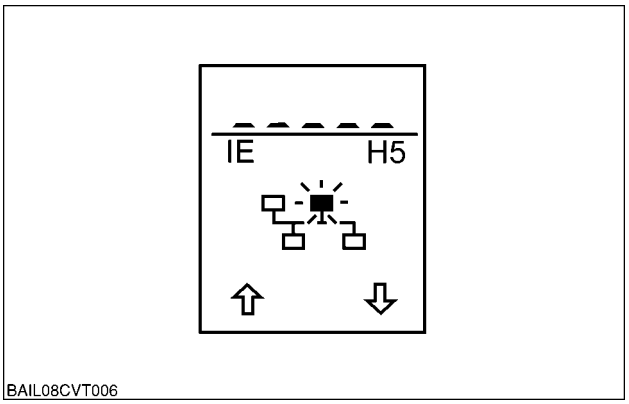
BAIL08CVT004 9

The controller selected will be displayed in the top left hand corner of the dot matrix display **(1)**.
The “H" menu will be displayed in the top right hand corner of the dot matrix display **(2)**.



BAIL08CVT005 10

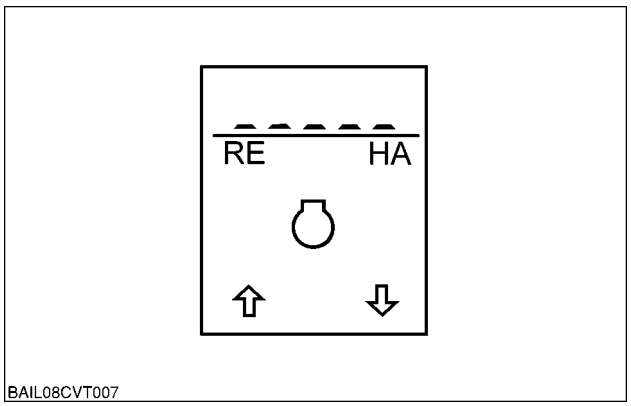
The “H" menu select screen will be displayed if the menu is common to all sub-systems, i.e. H5 - Switch test and H9 - Voltmeter.



BAIL08CVT006 11

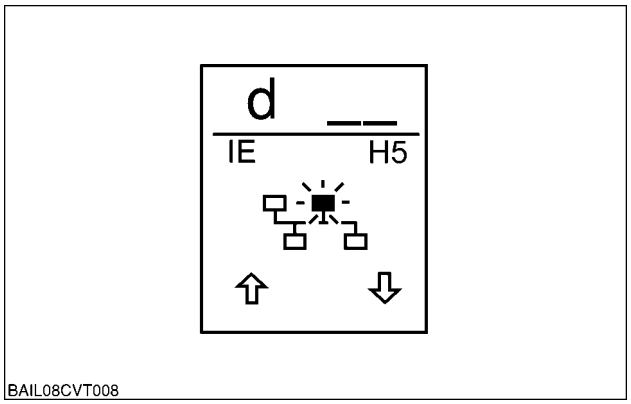
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If the menu is specific to only one sub-system, the relevant icon will be displayed in the centre of the dot matrix display, i.e. engine icon for HA - Demonstration mode.



BAIL08CVT007 12

When the sub-system has been selected, the navigation arrows will no longer be displayed.
The top section of the dot matrix display will be used to display the set-ups or values for the selected sub-system.



BAIL08CVT008 13

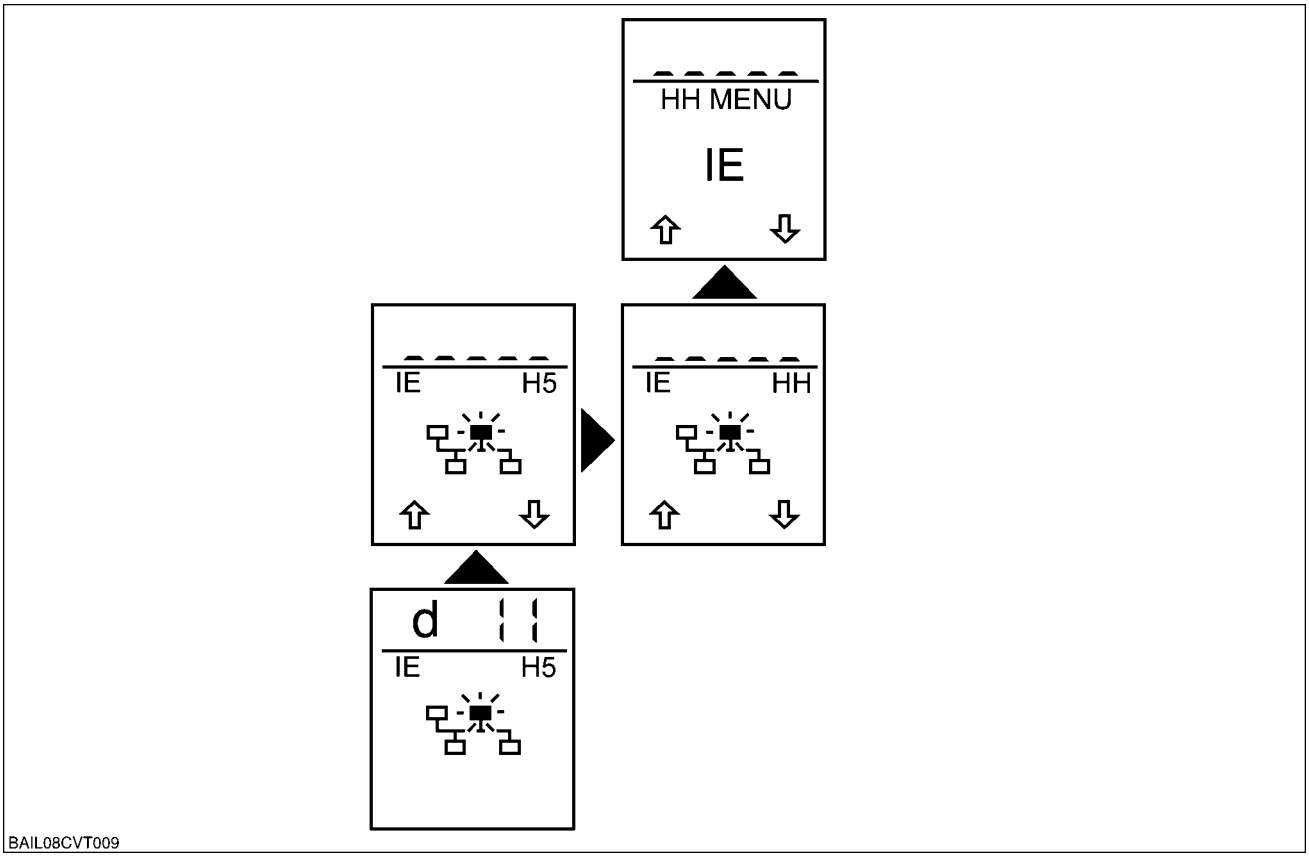
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NOTE: *To return to the “H" menu select screen from H1 - Calibrations the keystart needs to be turned OFF. This will store the completed calibrations.*

To return back to the “H" menu select screen, depress the "menu" key.

NOTE: *To return to the controller select screen, “HH" must be indicated in the top right hand corner of the dot matrix display.*

To return back to the controller select screen, depress the “menu" key again.



BAIL08CVT009 14

Control module - Configure Instrument Cluster

Instrument Cluster Unit (ICU3)

IE - Enhanced ICU3
IF - Basic ICU3

NOTE: *IE Enhanced ICU3 is shown in the screen displays.*

HH	Service Menu	Figure Number
H1	Not used	-
H2	Not used	-
H3	Configurations	**1**
H4	View software revision level	**14**
H5	Switch operation test	**17**
H6	Not used	-
H7	Not used	-
H8	Clear Electrically Erasable Programmable Read Only Memory (EEPROM)	**21**
H9	Voltmeter	**25**
HA	Not used	-
HB	Display stored fault codes	**28**

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HH	Service Menu	Figure Number
HC	Clear all stored fault codes	**31**
HD	Not used	-
HE	Display frequency inputs	**34**
HF	View controller hardware information	**36**
HH	Return to main menu	-

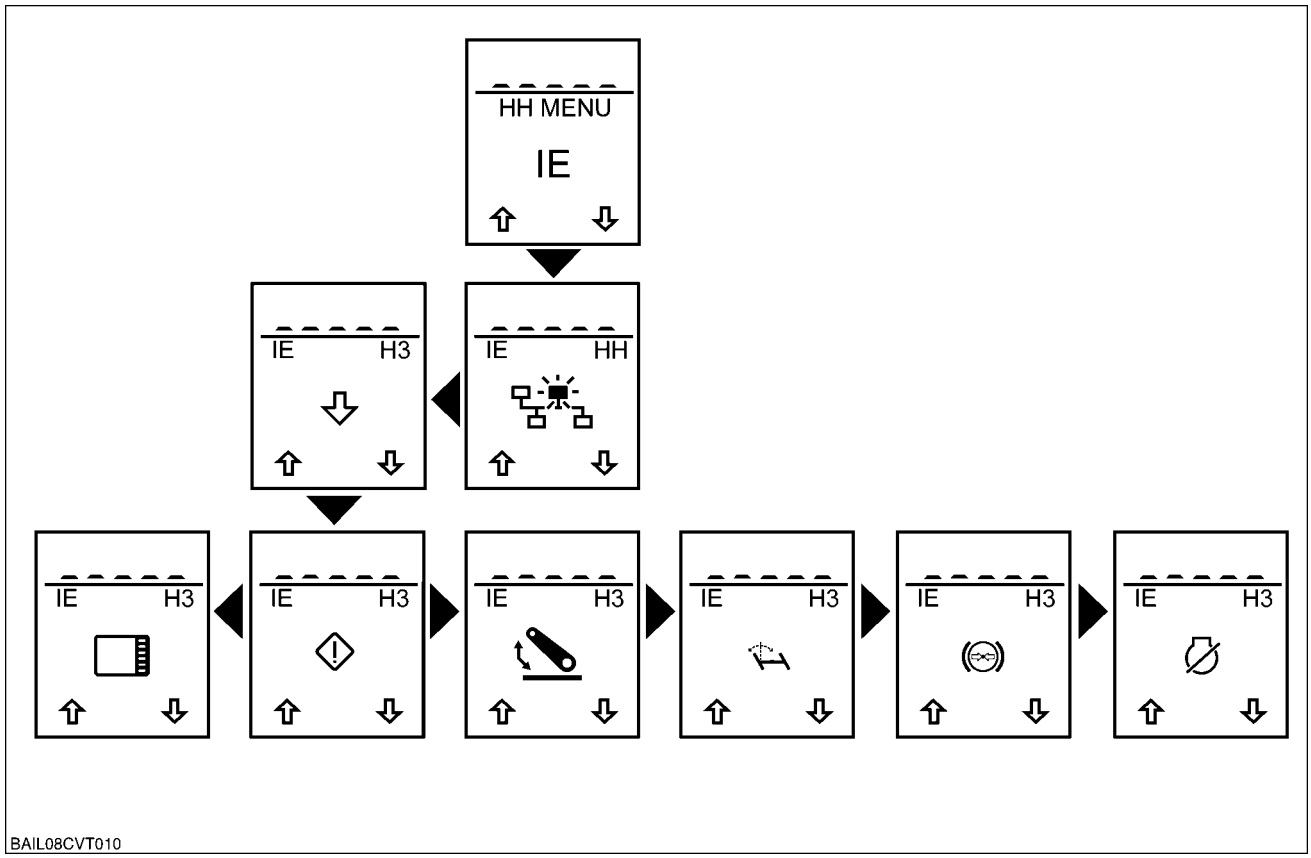
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H3 - CONFIGURATIONS

This menu displays the configurations available for:

- Engine shutdown
- Error code reduction
- Electronic front hitch option
- AFS 200
- Steering sensor selection
- Air brake selection

H3 Menu Screen Select Diagram

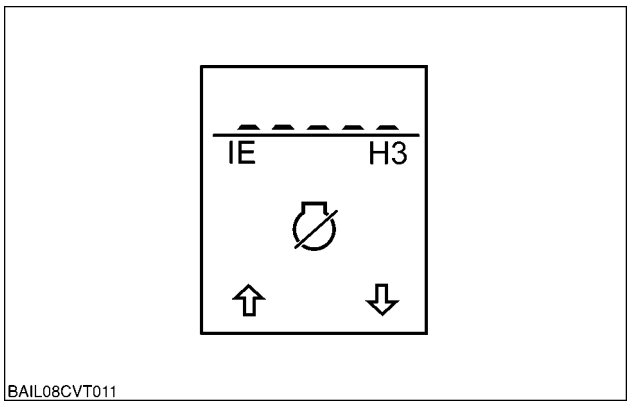


BAIL08CVT010 1

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ENGINE SHUTDOWN OPTIONS

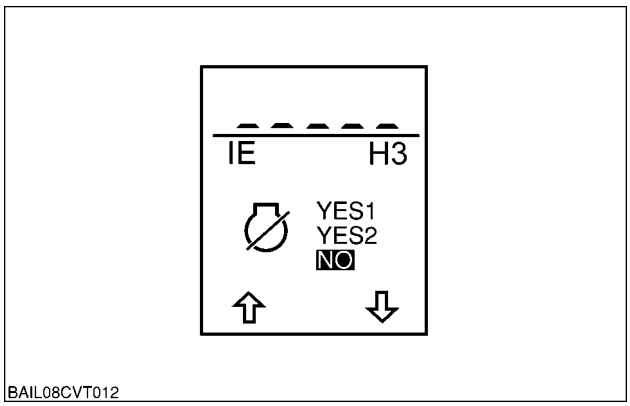
Select the engine shutdown sub-system by depressing the “menu" key.



BAIL08CVT011 2

NOTE: *The default setting is NO.*

Scroll through the available options using the navigation “up" or “down" key.
Refer to the engine shutdown options table below.



BAIL08CVT012 3

Depress and hold the navigation “up" or “down" key to store the selection, an audible tone will be heard to confirm the selection.
Depress the “menu" key to continue navigating through the “HH" menus.

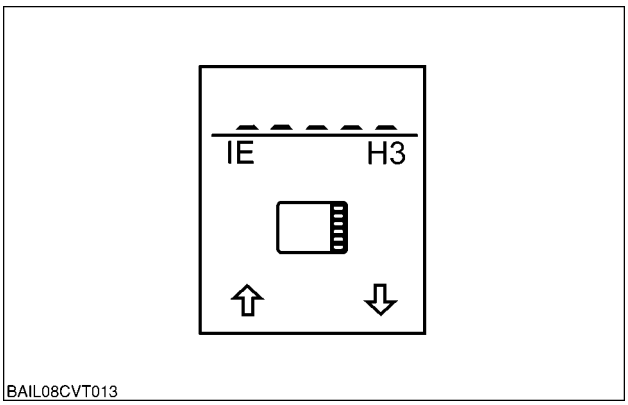
Engine Shutdown Options

Options		CONDITIONS REQUIRED FOR ENGINE SHUTDOWN	CONDITIONS WHICH OVERRIDE ENGINE SHUTDOWN OPTIONS (All conditions must be met)			
		Operating Condition	Operator Present	Operator Not Present	Vehicle Station-ary	Vehicle Moving
NO	**No engine shutdown**	**The engine will not shut down**	**-**	**-**	**-**	**-**
YES1	Always shutdown engine	Engine oil pressure - Low	*	*	*	*
		Engine coolant temperature - High	*	*	*	*
		Driveline oil temperature - High		*	*	
		Driveline oil pressure - Low		*	*	
YES2	Stationary engine shutdown	Engine oil pressure - Low		*	*	
		Engine coolant temperature - High		*	*	
		An external device is requesting the engine to shutdown		*	*	
		Driveline oil temperature - High		*	*	
		Driveline oil pressure - Low		*	*	

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AFS 200 OPTIONS

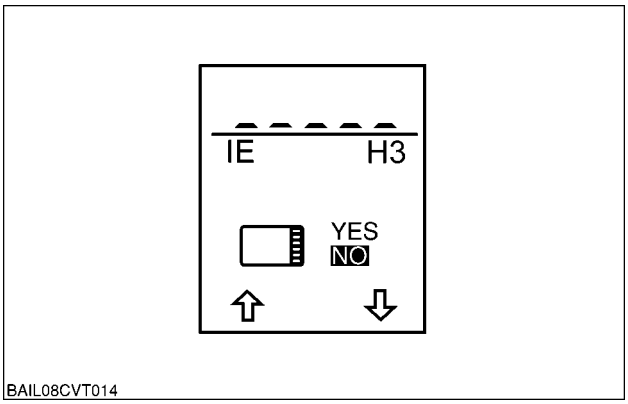
Select the AFS 200 sub-system by depressing the “menu" key.



BAIL08CVT013 4

NOTE: *The default setting is “No" without AFS 200.*

Scroll through the available options using the navigation “up" or “down" key.



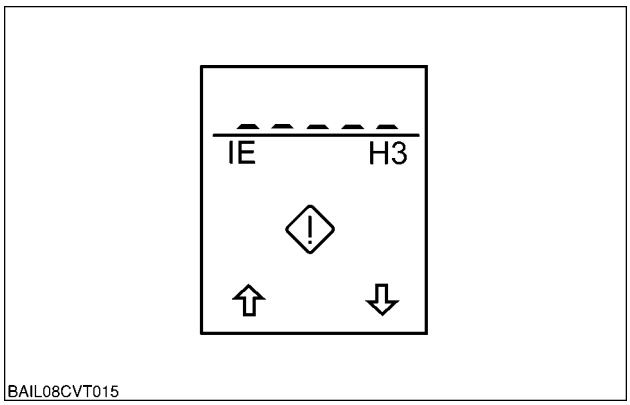
BAIL08CVT014 5

Depress and hold the navigation “up" or “down" key to store the selection, an audible tone will be heard to confirm the selection.
Depress the “menu" key to continue navigating through the “HH" menus.

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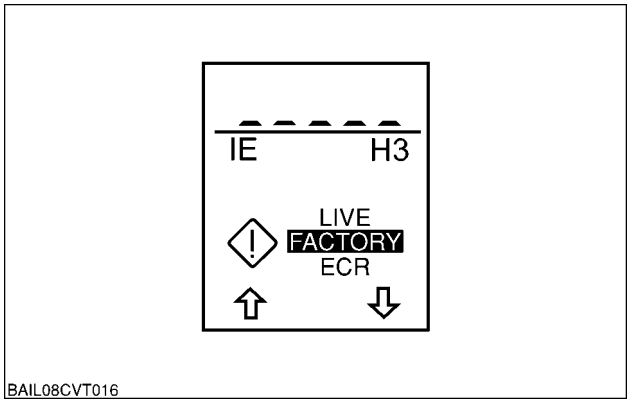
ERROR CODE REDUCTION OPTIONS

Select the error code reduction sub-system by depressing the “menu" key.



BAIL08CVT015 6

Scroll through the available options using the navigation “up" or “down" key.
"Factory" - factory error mode, displays all error codes for a period of 6 minutes then reverts to error code reduction (ECR).
"ECR" - error code reduction mode, only displays critical errors.
"Live" - live error code mode, displays all error codes.



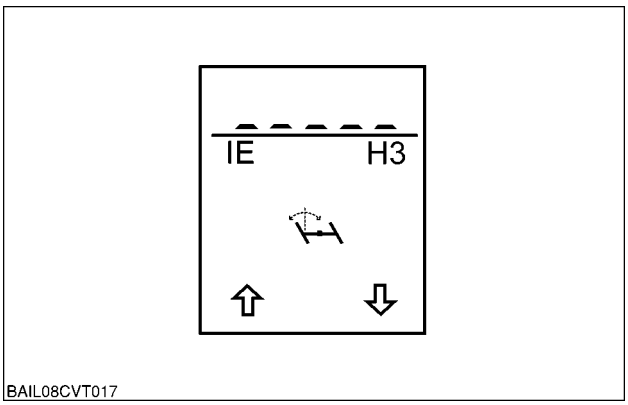
BAIL08CVT016 7

Depress and hold the navigation “up" or “down" key to store the selection, an audible tone will be heard to confirm the selection.
Depress the “menu" key to continue navigating through the “HH" menus.

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STEERING SENSOR SELECTION OPTIONS

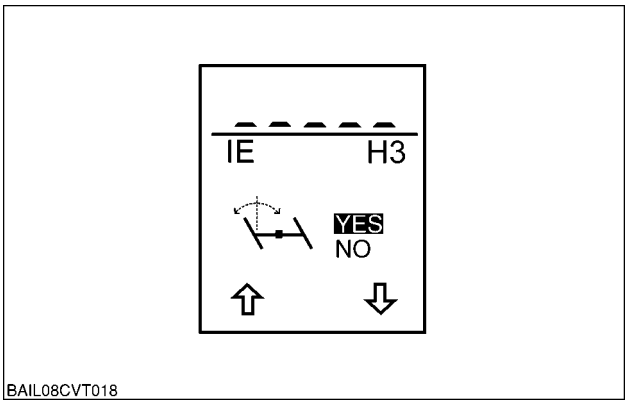
Select the steering sensor sub-system by depressing the “menu" key.



BAIL08CVT017 8

NOTE: *The default setting is “No" without steering sensor.*

Scroll through the available options using the navigation “up" or “down" key.



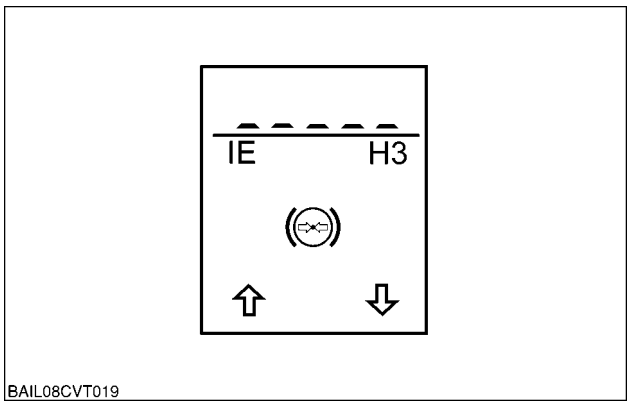
BAIL08CVT018 9

Depress and hold the navigation “up" or “down" key to store the selection, an audible tone will be heard to confirm the selection.
Depress the “menu" key to continue navigating through the “HH" menus.

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AIR BRAKE OPTIONS

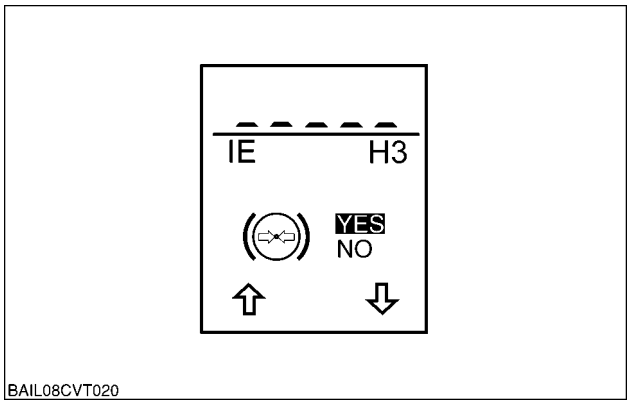
Select the air brake sub-system by depressing the “menu" key.



BAIL08CVT019 10

NOTE: *The default setting is “No" without air brakes.*

Scroll through the available options using the navigation “up" or “down" key.



BAIL08CVT020 11

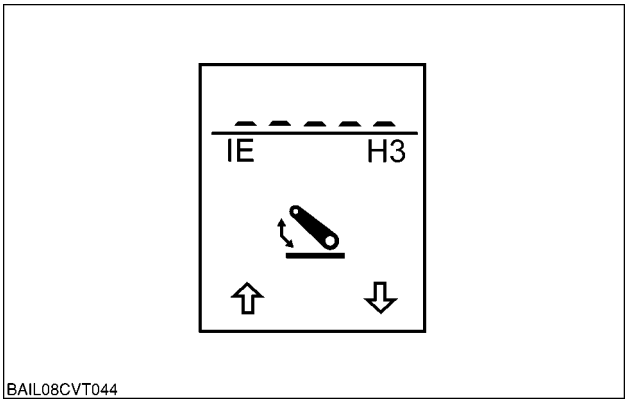
Depress and hold the navigation “up" or “down" key to store the selection, an audible tone will be heard to confirm the selection.
Depress the “menu" key to continue navigating through the “HH" menus.

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Electronic Front Hitch Option

This section is used to configure the Electronic front hitch option.

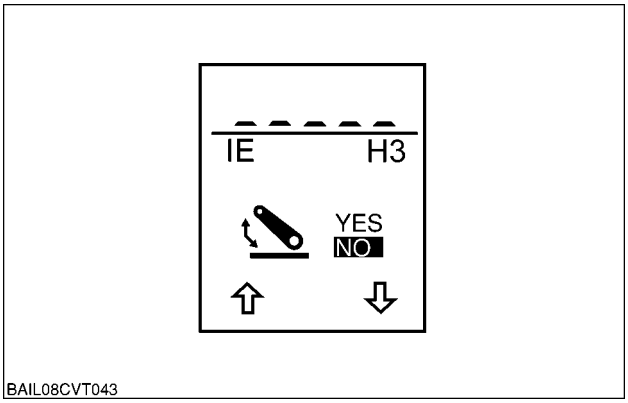
Select the Electronic front hitch sub-system by depressing the “menu" key.



BAIL08CVT044 12

NOTE: *The default setting is “No". Electronic front hitch not present..*

Scroll through the available options using the navigation “up" or “down" key.



BAIL08CVT043 13

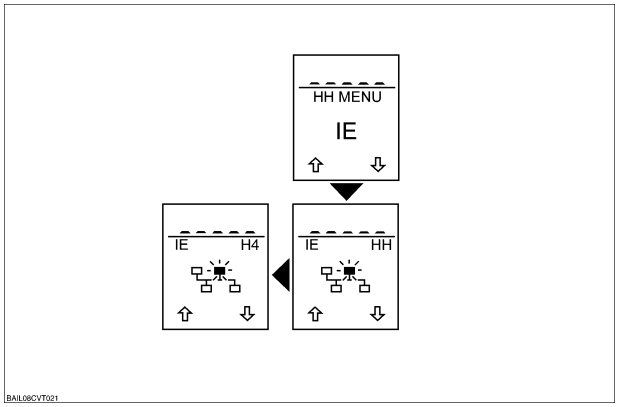
Depress and hold the navigation “up" or “down" key to store the selection, an audible tone will be heard to confirm the selection.
Depress the “menu" key to continue navigating through the “HH" menus.

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H4 - VIEW SOFTWARE REVISION LEVEL

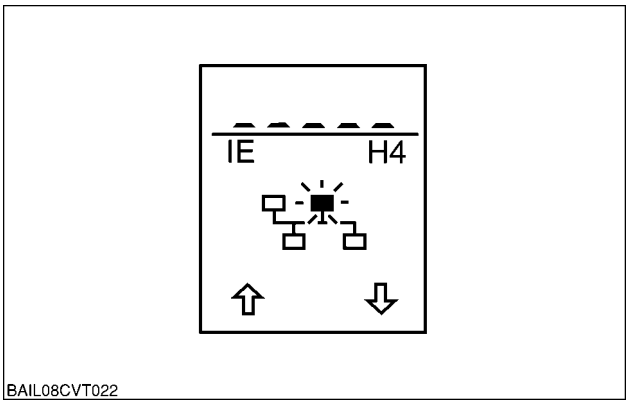
This menu displays the software release of the unit.

H4 Menu Screen Select Diagram



BAIL08CVT021 14

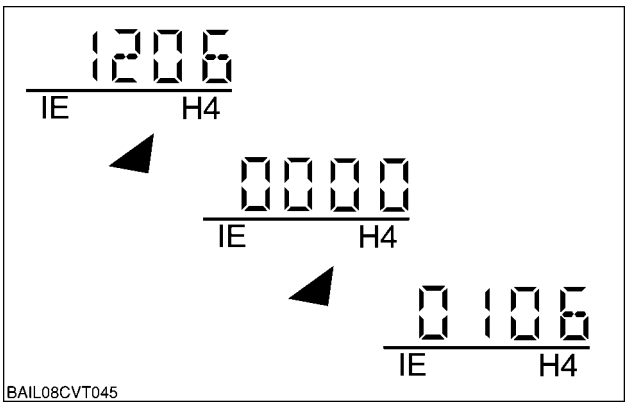
Select the H4 menu by depressing the “menu" key.



BAIL08CVT022 15

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The display will automatically cycle through the software release as the example shown below, and will then return to allow navigation of the “HH" menus.



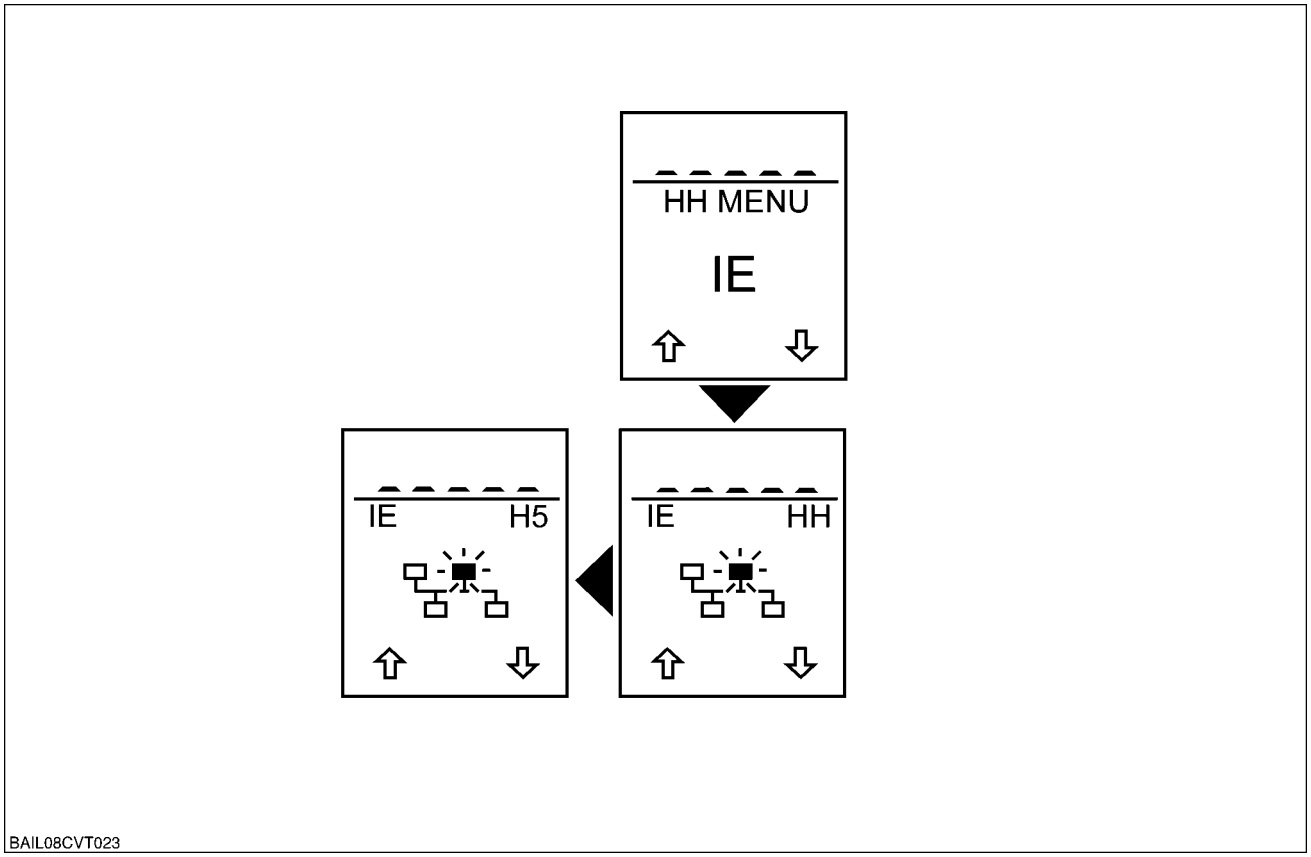
BAIL08CVT045 16

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H5 - SWITCH OPERATION TEST

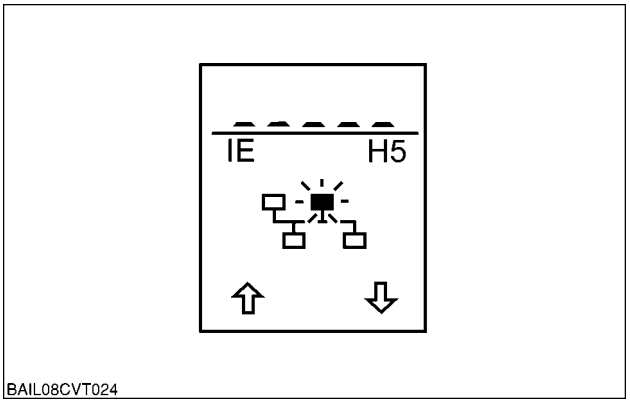
This menu displays a designated code when a switch transition is detected.

H5 Menu Screen Select Diagram



BAIL08CVT023 17

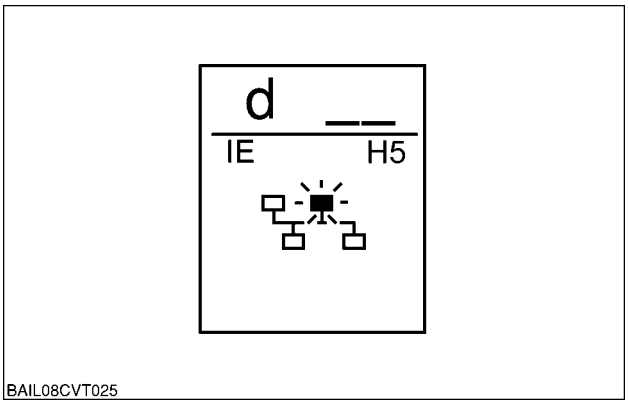
Select the H5 menu by depressing the “menu" key.



BAIL08CVT024 18

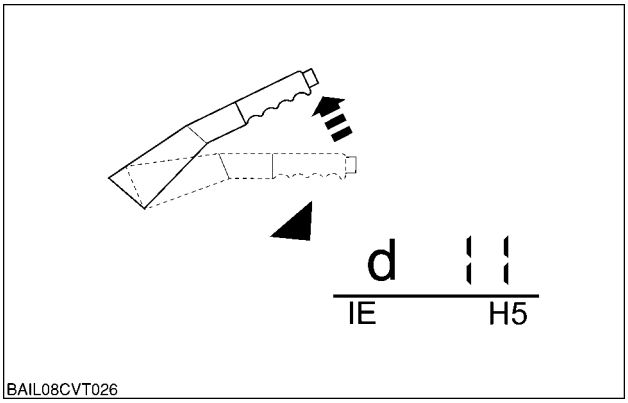
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The top section of the display will display “d _ _".



BAIL08CVT025 19

When a switch is operated, a code will be displayed and an audible tone should be heard to indicate the correct function.
If a switch code is not displayed and the audible tone not heard, a ’wiggle’ test can be performed on the related wiring while watching the display or listening for the audible tone, to help locate the fault.



BAIL08CVT026 20

NOTE: *If the keystart switch is turned to the “crank" position, with the shuttle lever in neutral and the clutch pedal down, a switch disagreement error may occur.*

Identifier	Controller Connector	Pin Number	Switch / Input	Special Requirements
d0	No switch or two switches activated at the same time			-
d11	CN3	7	Handbrake switch	-
d66	CN3	18	Main high beam switch	-
d67	CN1	15	Side lights	-
d68	CN3	17	Brakes not latched (Japan ONLY)	-
d70	CN1	5	Left turn signal indicator	-
d71	CN1	6	Right turn signal indicator	-
d74	CN3	9	Exhaust brake switch	Not Applicable
d110	CN1	7	CAL/SEL switch (ADIC without keypad)	-

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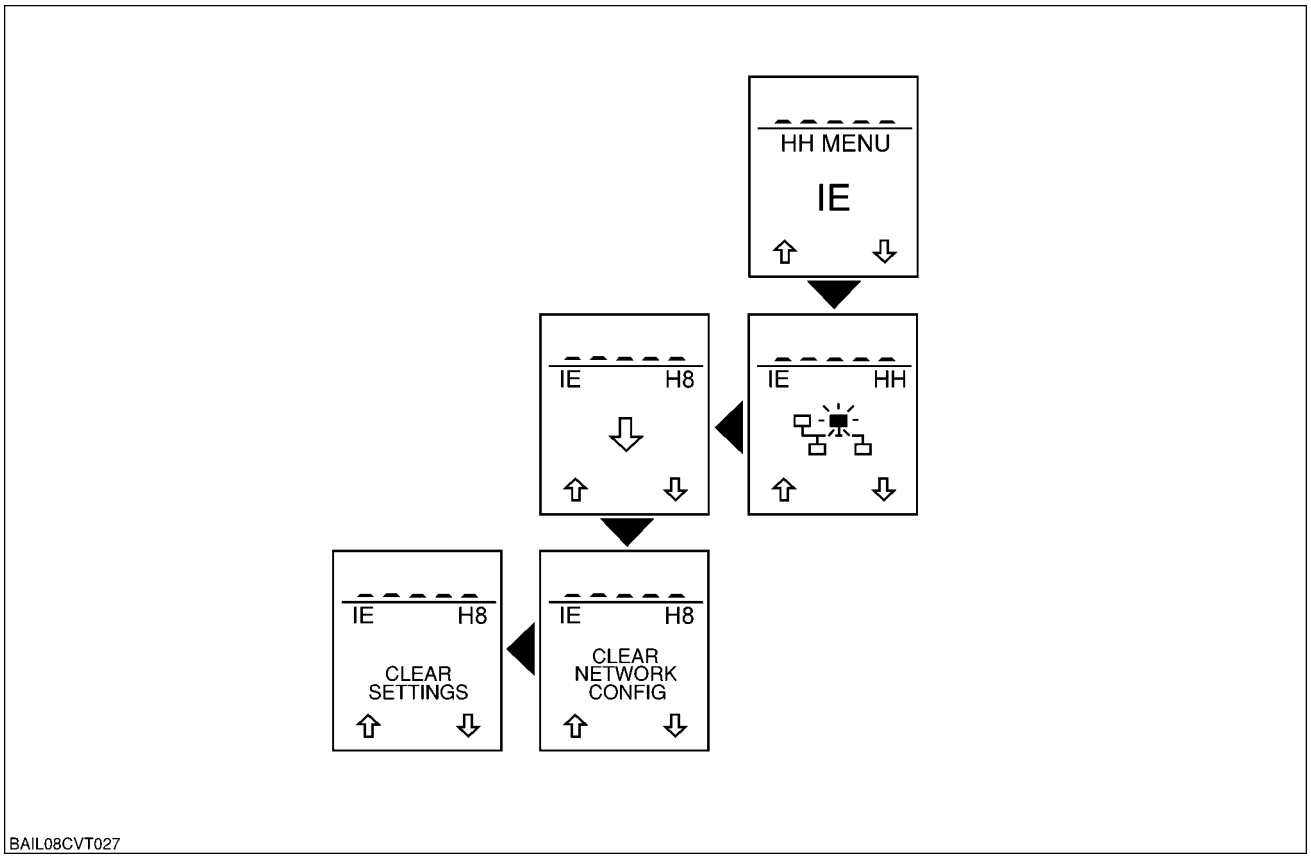
H8 - CLEAR ELECTRICAL ERASABLE PROGRAMMABLE READ ONLY MEMORY (EEPROM)

This menu clears calibration values and stored error codes by resetting all EEPROM values back to default. EEPROM is where all calibration values and error codes are stored. This memory is retained even if there is no power to the controller, i.e. if the battery is disconnected. There are two options available. "Clear net config" and "clear settings". "Clear net config" is used to erase the stored network configuration, this will clear the current configuration stored in the instrument cluster and rebuild the configuration at the next key ON. This should be used if the cluster has been changed or if the HH menus are showing modules which are not fitted to the machine.
"Clear settings" will return all instrument cluster settings back to their default setting.

NOTE: *To change any configuration settings H3 menu mode must be used. H8 will not affect these settings.*

NOTE: *To remove all stored error codes without erasing the calibration values use the HC menu.*

H8 Menu Screen Select Diagram

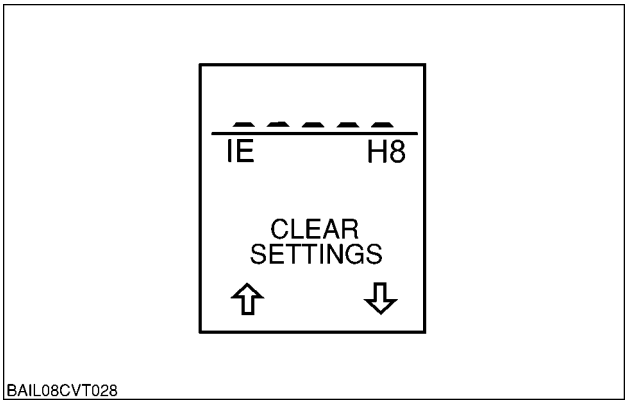


BAIL08CVT027 21

Select the H8 menu by depressing the “menu" key.
Scroll through the available options using the navigation “up" or “down" key.

Select "Clear Settings" by depressing the “menu" key

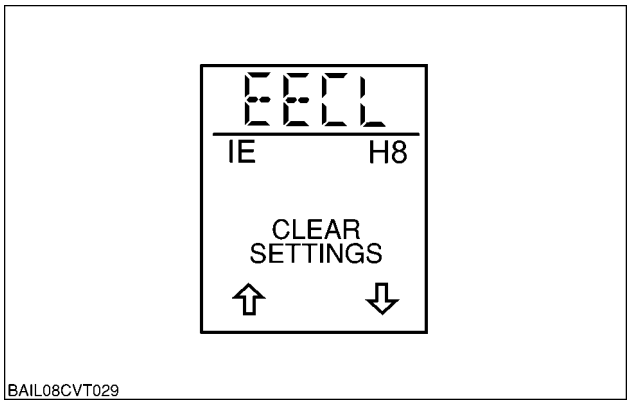
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The top section of the display will display “EECL"



BAIL08CVT029 23

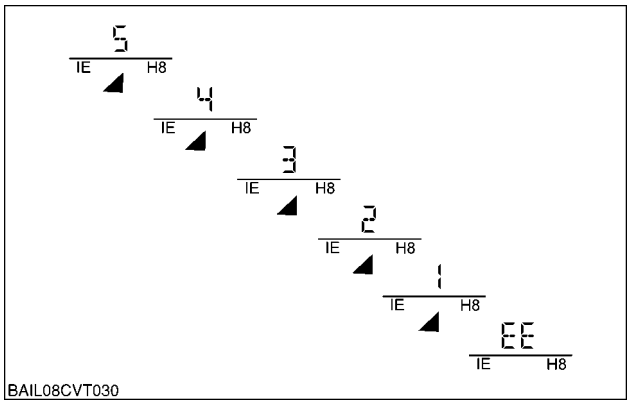
⚠ CAUTION ⚠

H8 will clear all calibrations values and stored error codes.

B006

NOTE: *If the navigation “down" key is released before the countdown finishes, the procedure will be aborted..*

Depress and hold the navigation “down" key to confirm the resetting of the EEPROM.
The top section of the display will countdown from 05 to 01, then “EE" will be displayed to indicate the EEPROM has been cleared.



BAIL08CVT030 24

Turn the keystart OFF to exit H8.

NOTE: *The ’Clear Network Config’ .procedure is carried out in the same way as ’Clear Settings’*

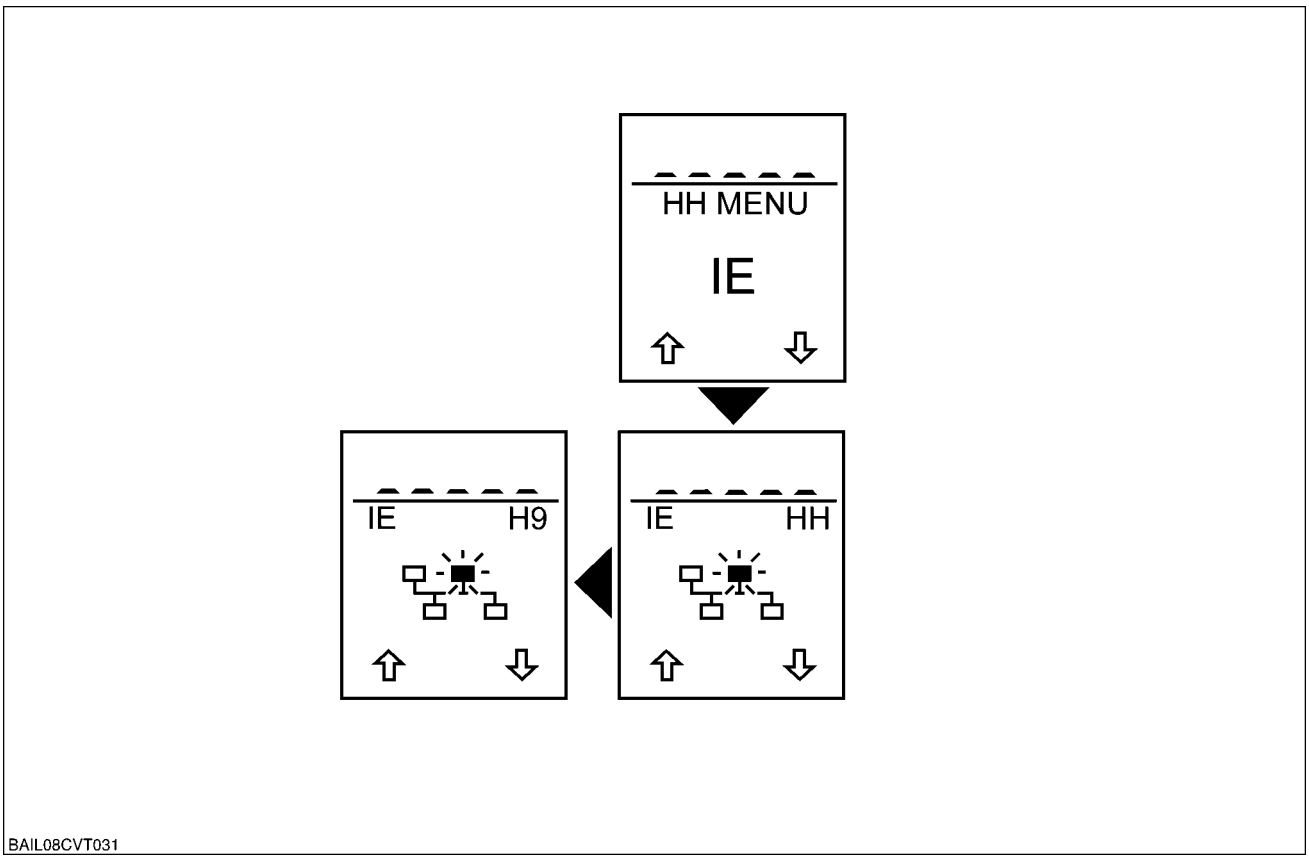
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H9 - VOLTMETER

This menu is used to verify the operation of various potentiometers, voltage supplies, and solenoid current circuits. If an intermittent fault is detected within a circuit, a 'wiggle' test can be performed on the related wiring while watching the display for sudden changes in values, to help locate the area where the fault exists.

NOTE: *The vehicle may be driven while in this menu.*

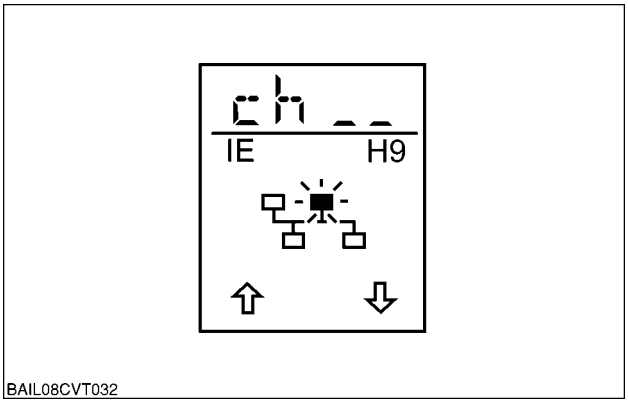
H9 Menu Screen Select Diagram



BAIL08CVT031 25

Select the H9 menu by depressing the "menu" key.

The top section of the display will display "ch _ _".



BAIL08CVT032 26

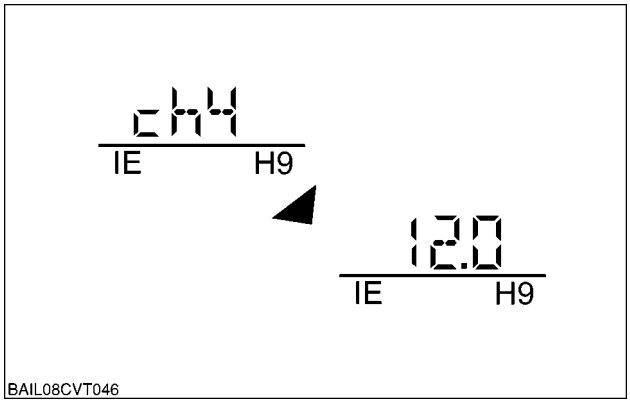
The required channel can be selected by using the navigation "up" and "down" keys.
After a delay the value will be displayed. Compare the value displayed with the typical reading shown in the table below.

NOTE: *The value is the input voltage or signal into the controller. This cannot be directly translated into a voltage due to the internal processes of the controller. A zero equates to* ***0 volts****.*

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If the value displayed varies by more than **10 %** to that shown in the table below, a fault is indicated in either the component or the wiring harness relevant to that channel.

NOTE: *Check the connectors of the effected circuit, including the controller connectors, prior to replacing any components.*



BAIL08CVT046 27

Channel	Description	Typical Reading	Notes
4	Programming voltage Vpp	12.0	See explanations below
5	+5 Volt sensor supply	5.0	
10	+12 Volt VT input	12.0 (voltage in Volts)	See explanations below
21	Steering angle potentiometer	23.0 full right lock 128.0 full left lock	
24	Air brake pressure	**9.0 bar**	Low pressure warning at **5.4 bar**
25	Fuel level sensor	30 - 270	30 = Full 270 = Empty
51	Vane pump	23.5	

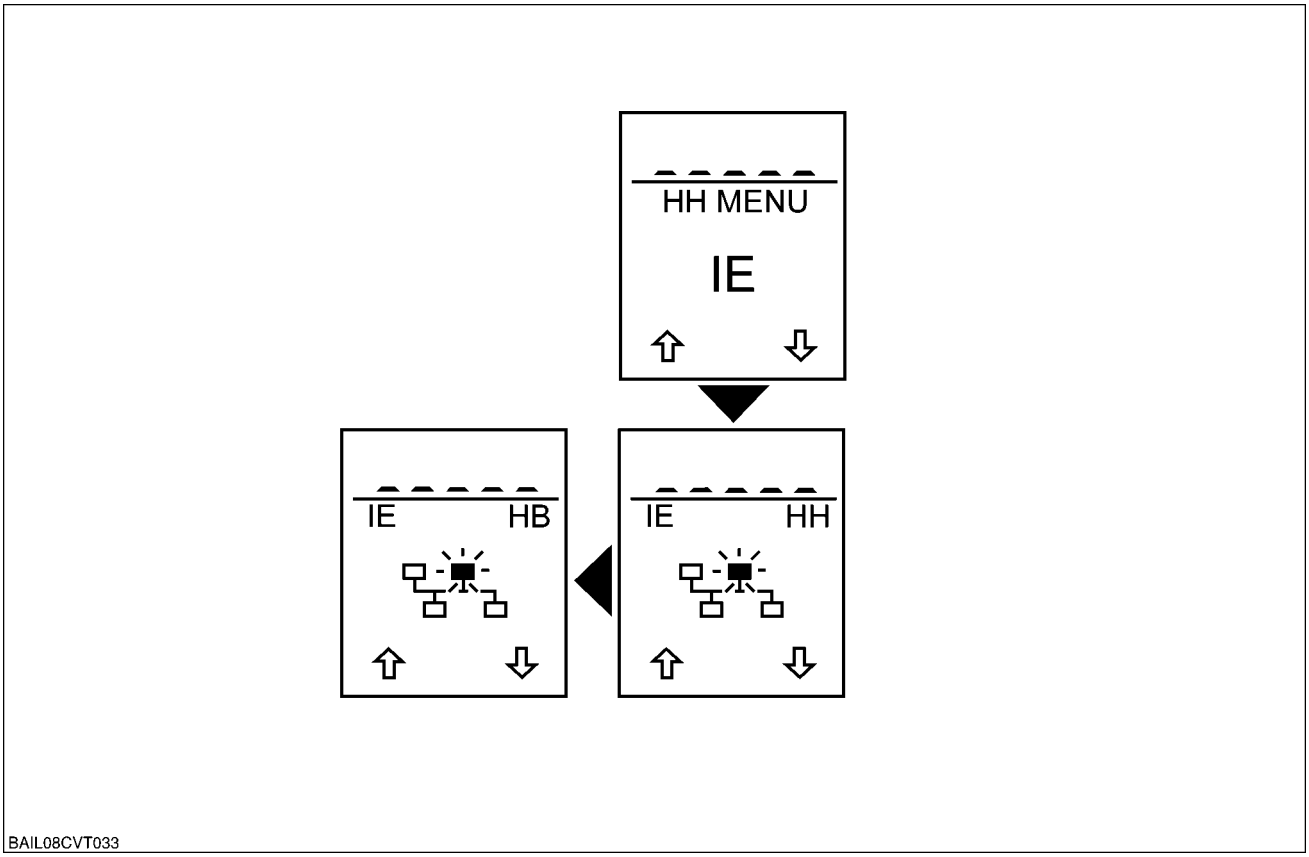
Explanations:
Vpp Input: This is the input voltage into the controller to retain the volatile memory.
VT Input: This is a second input voltage into the controller.

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HB - DISPLAY STORED FAULT CODES

This menu is used to display fault codes which are stored in the EEPROM of the controller.

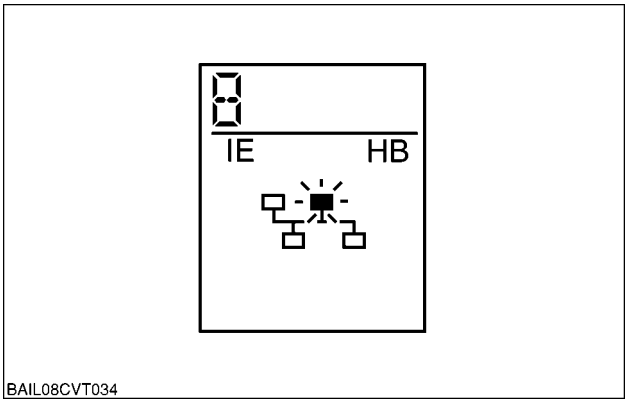
HB Menu Screen Select Diagram



BAIL08CVT033 28

Select the HB menu by depressing the “menu" key.

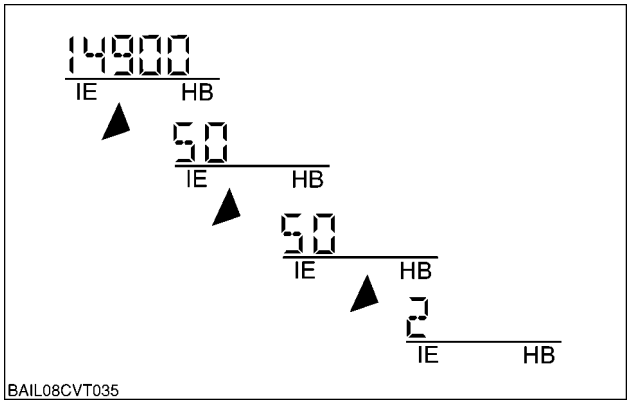
"0" will flash in the top section of the display if no fault code is stored.



BAIL08CVT034 29

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The top section of the display will cycle through the fault code, if a fault code is stored.
The following is an example fault code:
14900 Fault code
50 Hour of first occurrence
50 Hour of last occurrence
2 Number of occurrences of the fault



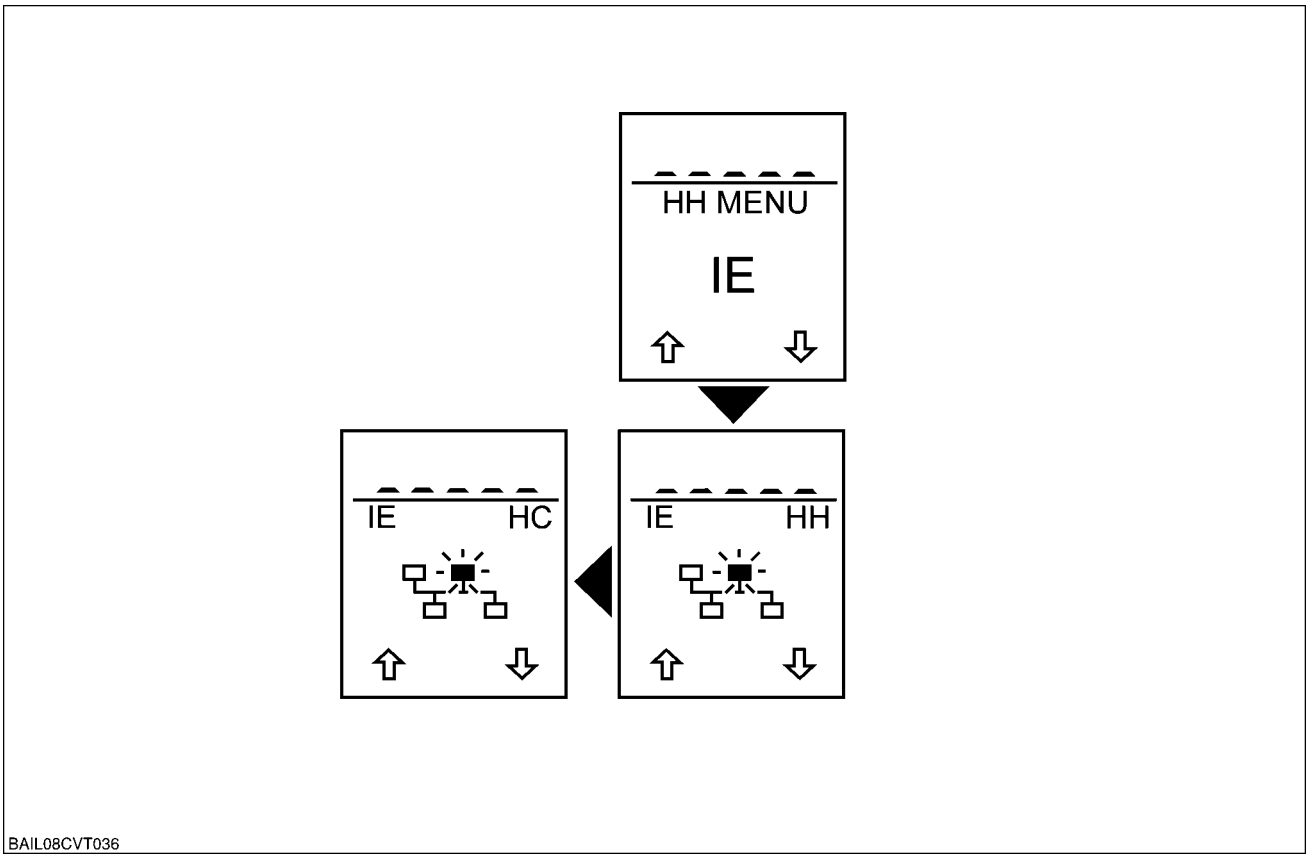
BAIL08CVT035 30

Depress the navigation “up" or “down" key to change to the next fault code in the list.
The top section of the display will display “_ _ _" at the end of the list.
Depress the “menu" key to continue navigating through the “HH" menus.

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HC - CLEAR STORED FAULT CODES

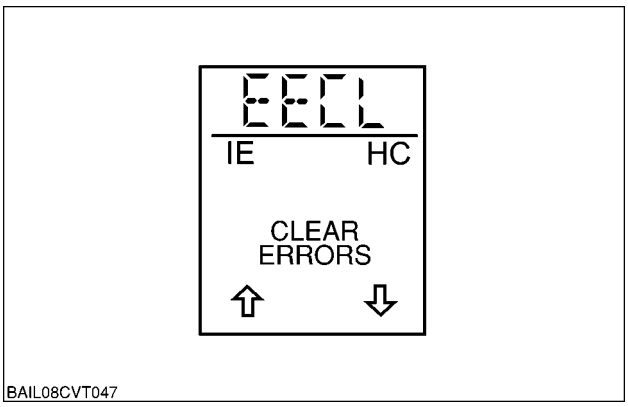
HC Menu Screen Select Diagram



BAIL08CVT036 31

NOTE: *Always make a note of the fault codes stored, before clearing the memory.*

Select the HC menu by depressing the “menu" key.
The top section of the display will display “EE CL".

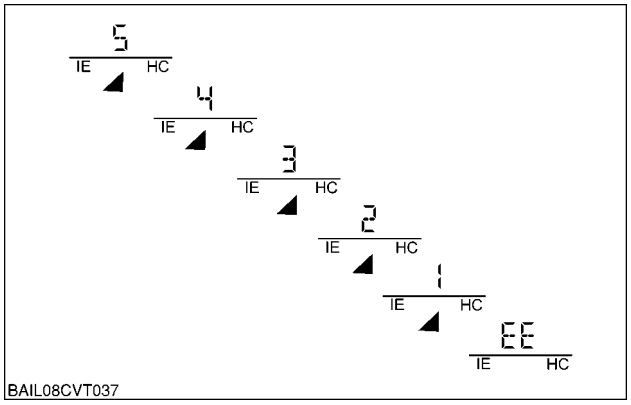


BAIL08CVT047 32

NOTE: *If the navigation “down" key is released before the countdown finishes, the procedure will be aborted.*

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Depress and hold the navigation “down" key to confirm the clearing of the memory.
The top section of the display will countdown from 05 to 01, then “EE" will be displayed to indicate the fault codes have been cleared.
Depress the “menu" key to continue navigating through the “HH" menus.



BAIL08CVT037 33

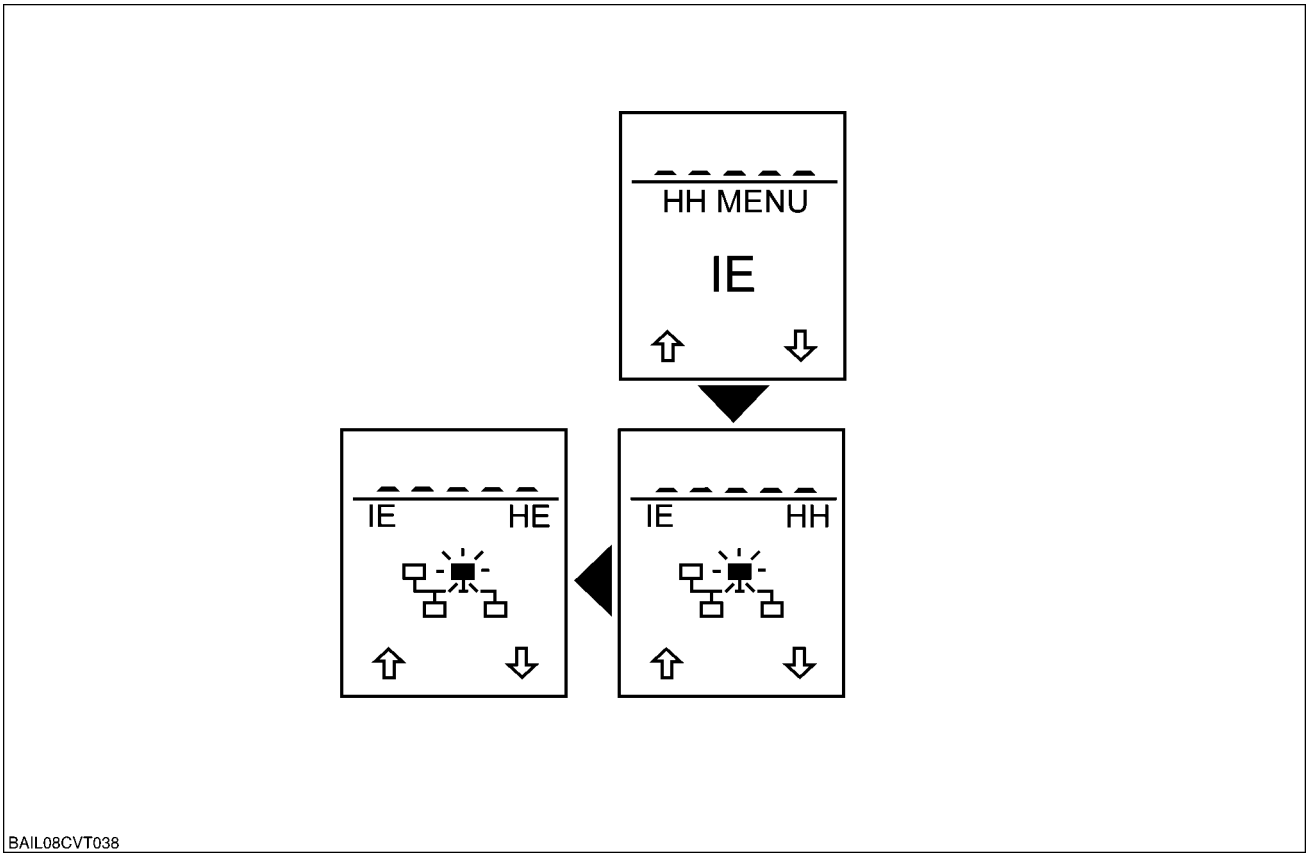
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HE - DISPLAY ALL SPEED INPUTS

This menu is used to verify the operation of various frequency inputs.

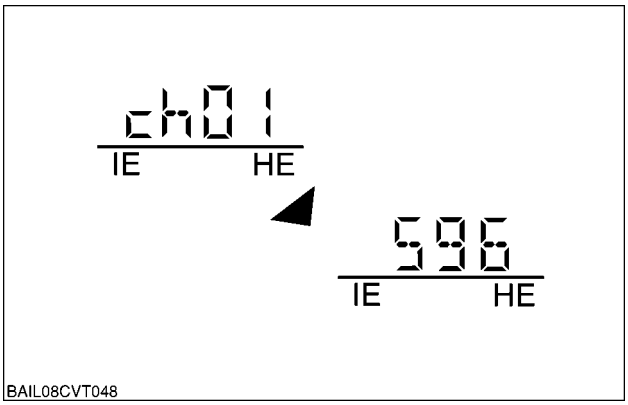
NOTE: *The vehicle may be driven while in this menu.*

HE Menu Screen Select Diagram



BAIL08CVT038 34

Select the HE menu by depressing the “menu" key.
The required channel can be selected by using the navigation “up" and “down" keys.
Refer to the table below for the available channels.
After a delay the value will be displayed.



BAIL08CVT048 35

Depress the “menu" key to continue navigating through the “HH" menus.

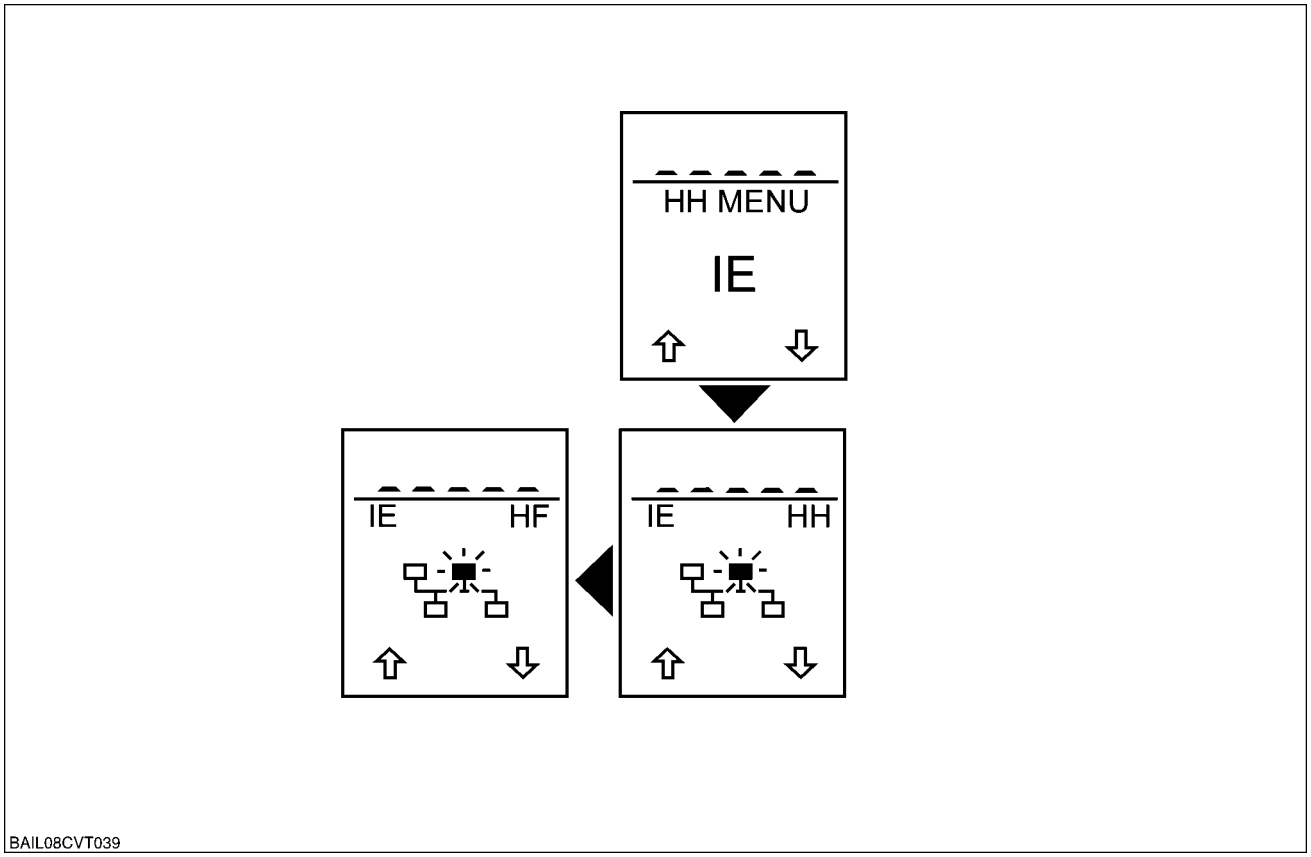
Channel	Description	Typical Reading	Notes
1	H_Rec_status from EPL	**0 - 4000 Hz**.	

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HF - VIEW CONTROLLER HARDWARE INFORMATION

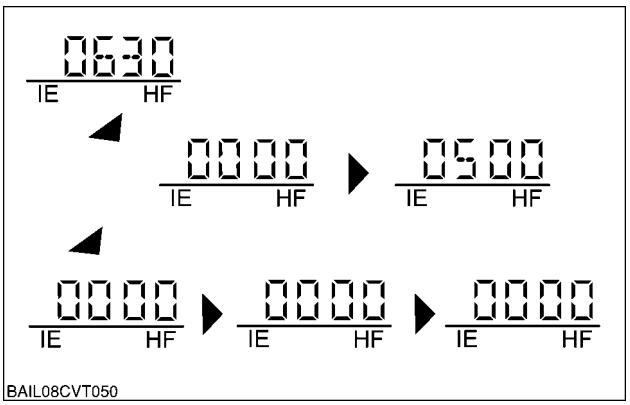
This menu allows the hardware identification, hardware version and serial number to be displayed.

HF Menu Screen Select Diagram



BAIL08CVT039 36

There is a sequence of six numbers. The first set indicates the hardware identification.
The second and third sets indicate the hardware version
The fourth, fifth and sixth sets indicate the 12 digit module serial number
562 Hardware identification
0000 0500 Hardware version
0000 0000 0000 Serial number
and return to allow navigation of the “HH" menus.



BAIL08CVT050 37

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Control module - Configure - Front Axle Suspension, Rear Electronic Hydraulic Remote Valves, Front PTO, Front Hitch

RM Control Module

HH	Service Menu	Figure Number
H1	Calibration procedures	**1**
H2	View stored calibration values	**2**
H3	Configurations	**9**
H4	View software revision level	**25**
H5	Switch operation test	**28**
H6	Not used	-
H7	Not used	-
H8	Clear Electrically Erasable Programmable Read Only Memory (EEPROM)	**32**
H9	Voltmeter	**36**
HA	Demonstration mode	**40**
HB	Display stored fault codes	**44**
HC	Clear all stored fault codes	**48**
HD	Not used	-
HE	Display frequency inputs	**52**
HF	View controller hardware information	**55**
HJ	Electronic hydraulic remote control valve set-up	**58**
HK	CNH Electronic hydraulic remote control valve diagnostic functions	**62**

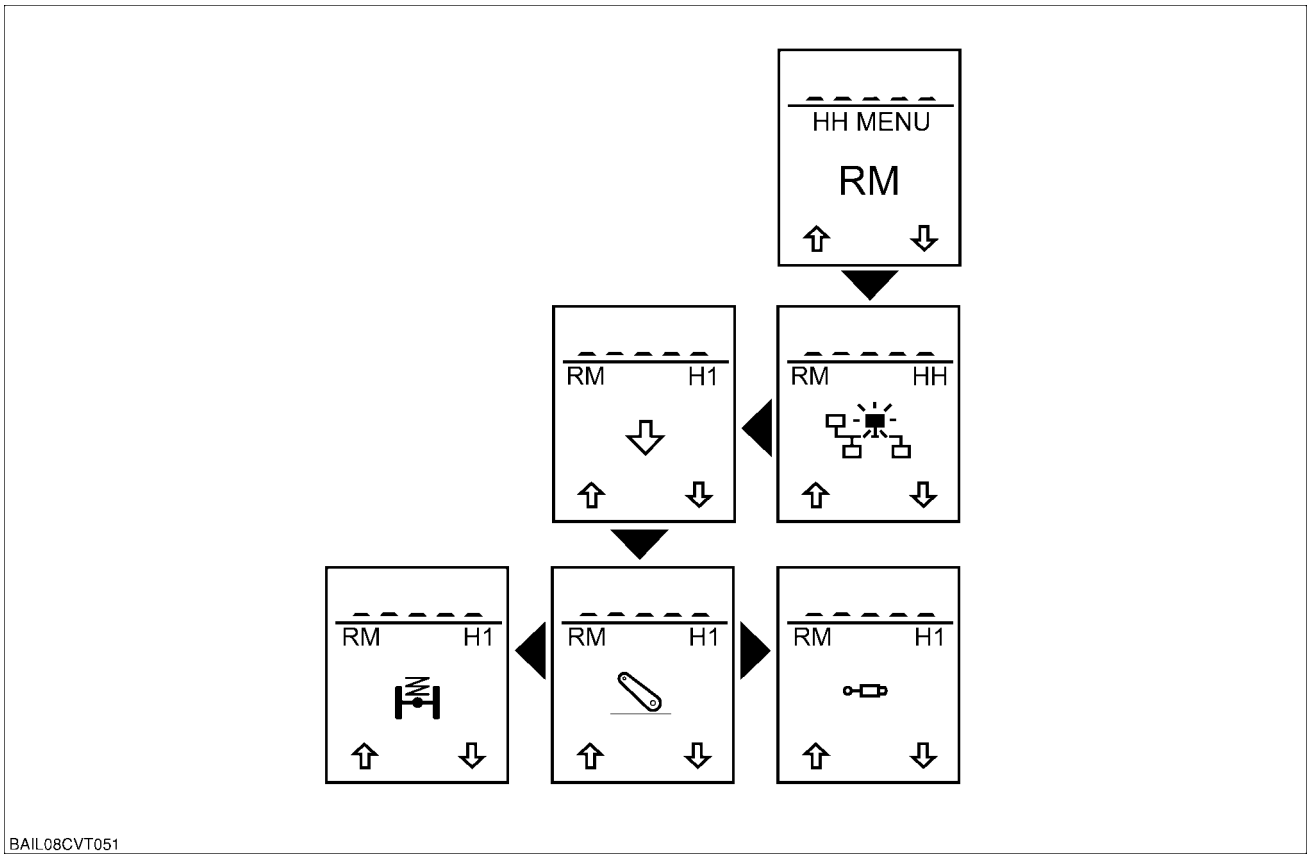
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H1 - CALIBRATION PROCEDURES

This menu is used to calibrate:

1. Electronic Hydraulic Remote levers. Refer to **PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Calibrate (A.10.C)**.
2. Front axle suspension. Refer to **Control valve - Calibrate (D.40.C)**.
3. Front hitch. Refer to **HITCH Front hitch - Calibrate (H.10.B)**.

H1 Menu Screen Select Diagram



BAIL08CVT051 1

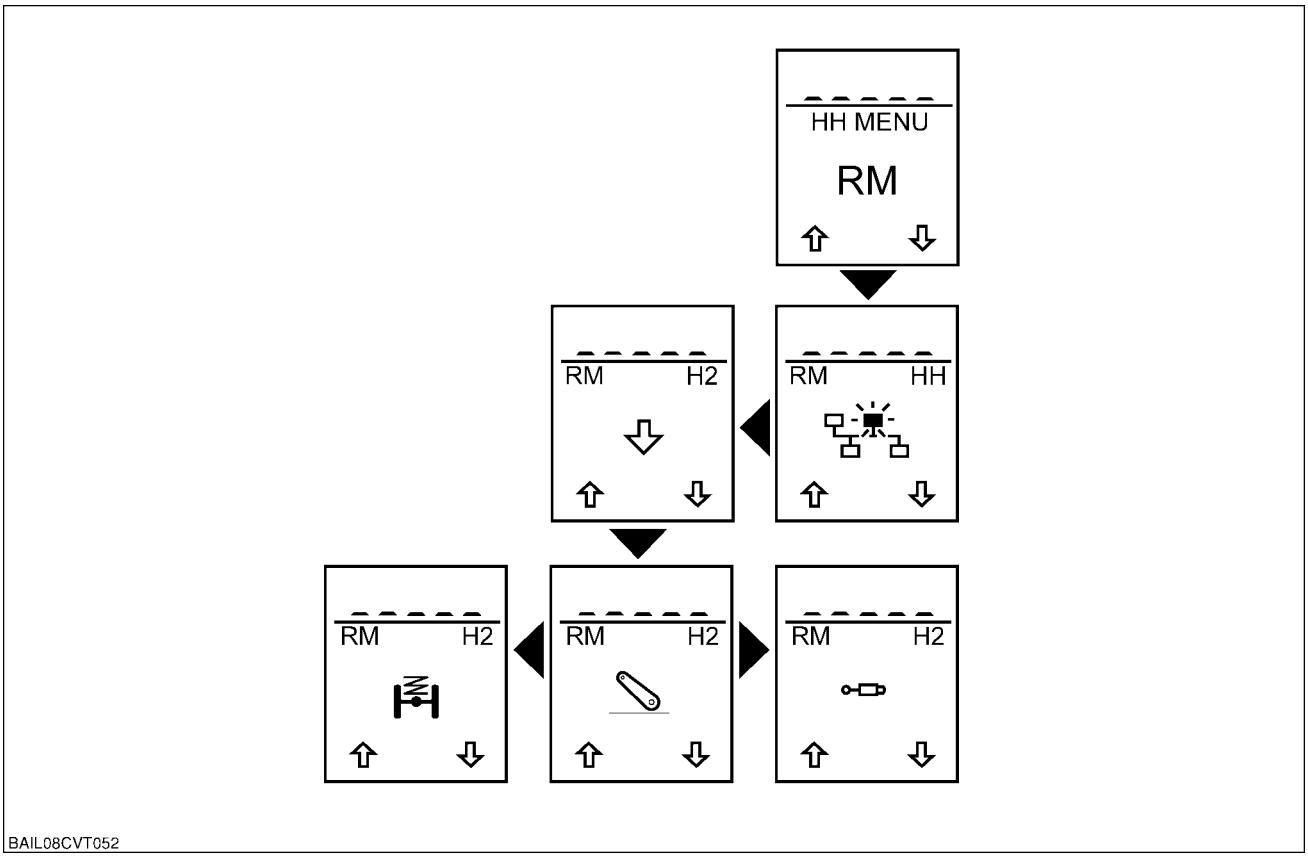
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H2 - VIEW STORED CALIBRATION VALUES

This menu is used to display the calibration values stored in the controllers for:

1. Electronic Hydraulic Remote levers
2. Front axle suspension
3. Front hitch

H2 Menu Screen Select Diagram

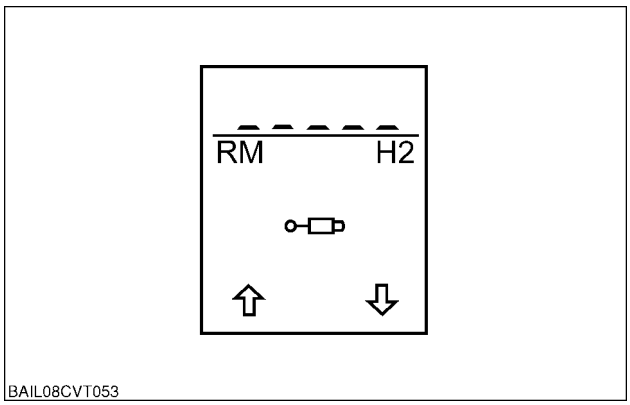


BAIL08CVT052 2

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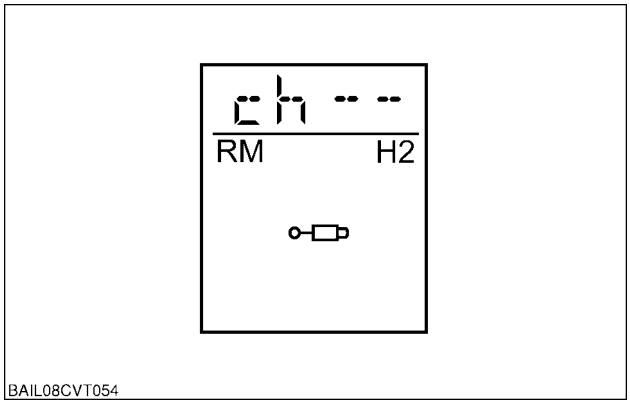
ELECTRONIC HYDRAULIC REMOTE LEVER VALUES

Select the electronic hydraulic remote sub-system by depressing the "menu" key.



BAIL08CVT053 3

The upper section of the display will display "ch - -".
The required channel can be selected by using the navigation "up" and "down" keys.



BAIL08CVT054 4

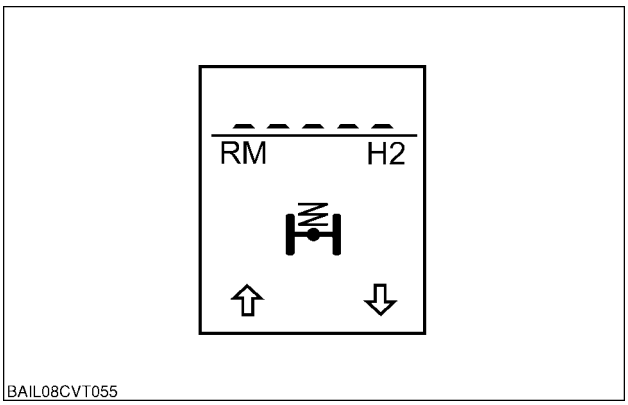
After a delay the code followed by the calibration value will be displayed, (refer to the table below for the description of each channel).
Depress the "menu" key to continue navigating through the "HH" menus.

Channel	Description	Code	Value Range
Ch 1	Lever 1 - Neutral position	n	520 - 560
	Lever 1 - Float position	F	0 - 20
	Lever 1 - Lower (retract) position	L	160- 220
	Lever 1 - Raise (extend) position	R	890 - 930
Ch 2	Lever 2 - Neutral position	n	520 - 560
	Lever 2 - Float position	F	0 - 20
	Lever 2 - Lower (retract) position	L	160- 220
	Lever 2 - Raise (extend) position	R	890 - 930
Ch 3	Lever 3 - Neutral position	n	520 - 560
	Lever 3 - Float position	F	0 - 20
	Lever 3 - Lower (retract) position	L	160- 220
	Lever 3 - Raise (extend) position	R	890 - 930
Ch 4	Lever 4 - Neutral position	n	520 - 560
	Lever 4 - Float position	F	0 - 20
	Lever 4 - Lower (retract) position	L	160- 220
	Lever 4 - Raise (extend) position	R	890 - 930

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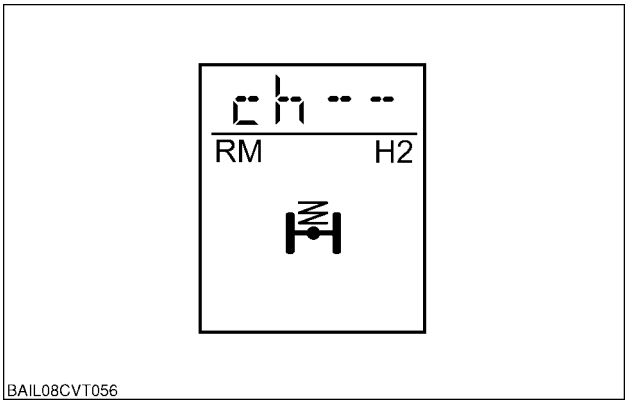
FRONT AXLE SUSPENSION VALUES

Select the front axle suspension sub-system by depressing the "menu" key.



BAIL08CVT055 5

The upper section of the display will display "ch - -".
The required channel can be selected by using the navigation "up" and "down" keys.



BAIL08CVT056 6

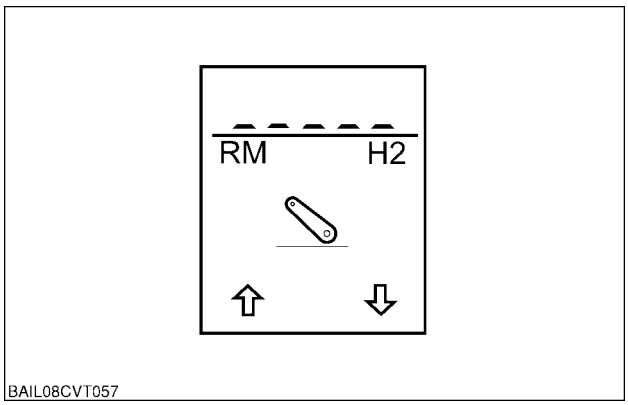
After a delay the code followed by the calibration value will be displayed, (refer to the table below for the description of each channel).
Depress the "menu" key to continue navigating through the "HH" menus.

Channel	Description	Code	Value Range
Ch 1	Front axle upper limit	u	512 - 972
	Front axle lower limit	d	150 - 512

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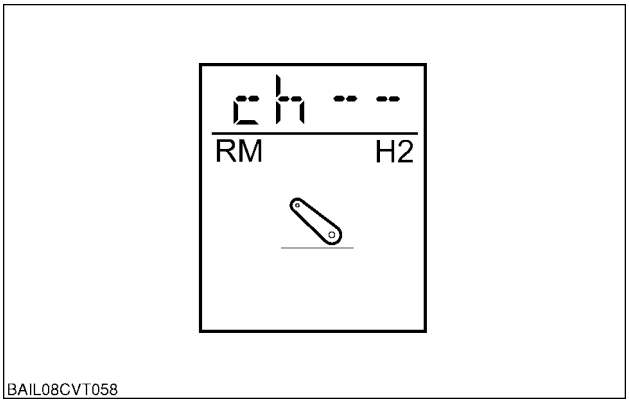
FRONT HITCH VALUES

Select the front hitch sub-system by depressing the "menu" key.



BAIL08CVT057 7

The upper section of the display will display "ch - - ".
The required channel can be selected by using the navigation "up" and "down" keys.



BAIL08CVT058 8

After a delay the code followed by the calibration value will be displayed, (refer to the table below for the description of each channel).
Depress the "menu" key to continue navigating through the "HH" menus.

Channel	Description	Code	Value Range
Ch 1	Front hitch upper limit	u	700 - 963
	Front hitch lower limit	d	41 - 400

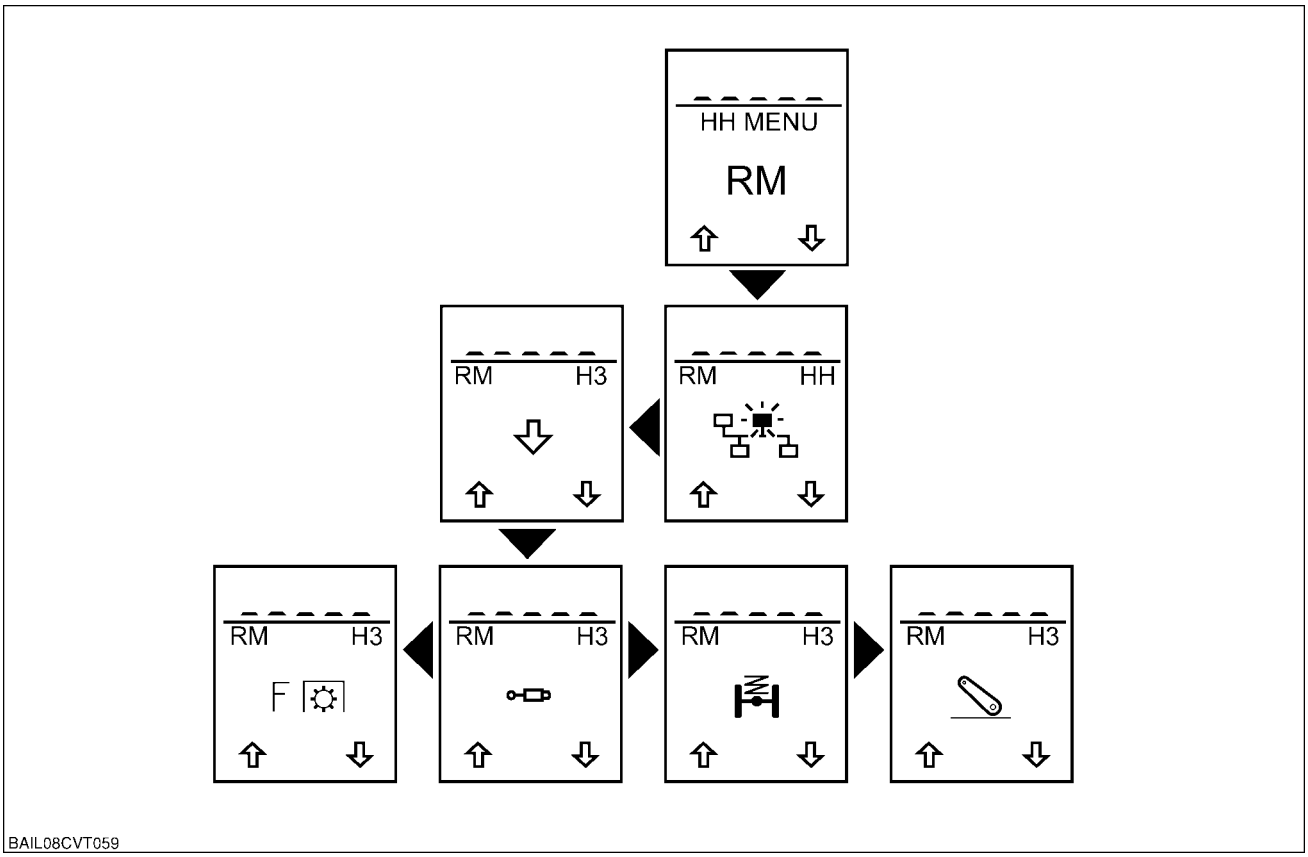
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H3 - CONFIGURATIONS

Used to display the configurations available for:

1. Electronic Hydraulic Remotes (EHR)
   - Ch.1 Enable / Disable EHR
   - Ch.2 Not used
   - Ch.3 Not used
   - Ch.4 Number of EHR's present - setup
   - Ch.5 Enable / Disable top and side link control
2. Front Axle Suspension
   - Ch.1 Enable / Disable front axle suspension
3. Front Hitch
   - Ch.1 Enable / Disable front hitch
   - Ch.2 Enable / Disable front hitch fender switches
4. Front PTO
   - Ch.1 Enable / Disable front PTO

H3 Menu Screen Select Diagram

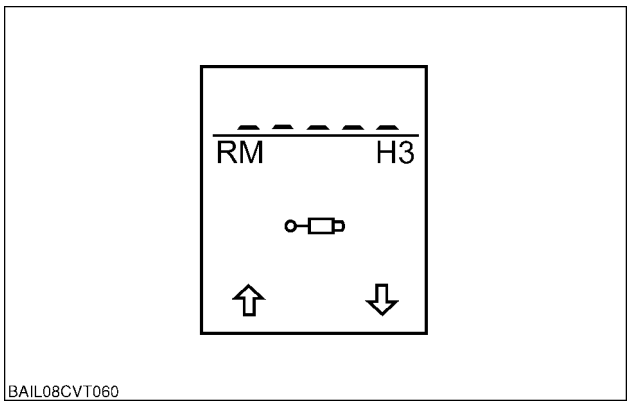


BAIL08CVT059 9

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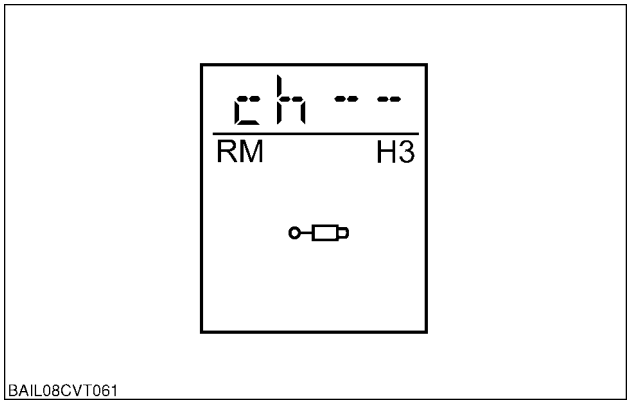
ELECTRONIC HYDRAULIC REMOTES (EHR) OPTIONS

Select the EHR sub-system by depressing the "menu" key.



BAIL08CVT060 10

The lower central display will display "ch - -".
The required channel can be selected by using the "h" and "m" keys.



BAIL08CVT061 11

After a delay the current setting will be displayed. (see the table below for the description of each channel).

Channel	Description
Ch 1	Enable / Disable rear EHR
Ch 2	Not Used
Ch 3	Not Used
Ch 4	Number of EHR's present - setup
Ch 5	Enable / Disable top and side link control

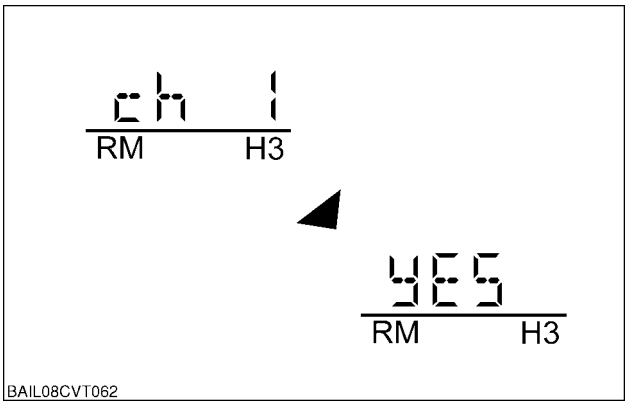
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Channel 1 - Enable / Disable Rear EHR

Scroll through the available options using the navigation "up" or "down" key.

The options available are:

- YES - Enable Rear EHR
- NO - Disable Rear EHR



BAIL08CVT062 12

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the "menu" key to continue navigating through the "HH" menus.

Channel 2 - Not Used

This channel is not used

Channel 3 - Not Used

This channel is not used.

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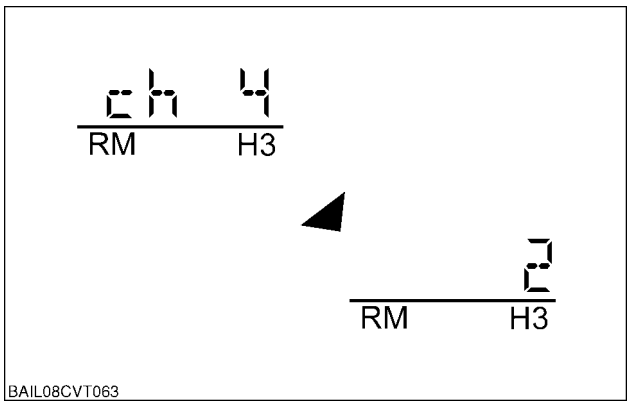
Channel 4- Number of EHR’s Present - Setup

When a new module is installed or the H8 procedure is completed, automatic detection for the number of remotes is used. If at any time the number of fitted remotes needs to be changed then this setup channel is used.

Scroll through the available options using the navigation "up" or "down" key.

The options available are:

- 2
- 3
- 4
- 5



BAIL08CVT063 13

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the "menu" key to continue navigating through the "HH" menus.

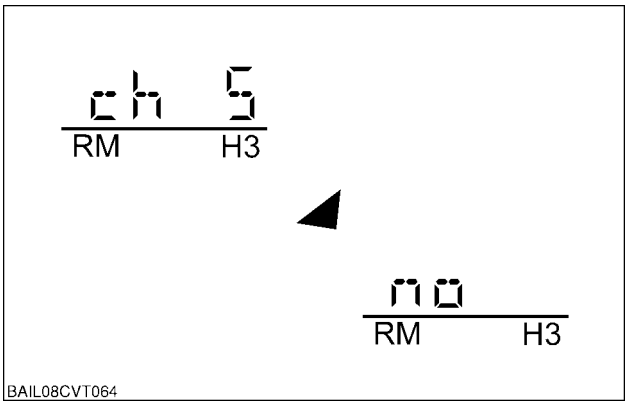
www.truck-freeworkshop.com

Channel 5- Enable / Disable Top and Side Link Control

Scroll through the available options using the navigation "up" or "down" key.

The options available are:

- YES - Enable top/side link control
- NO - Disable top/side link control



BAIL08CVT064 14

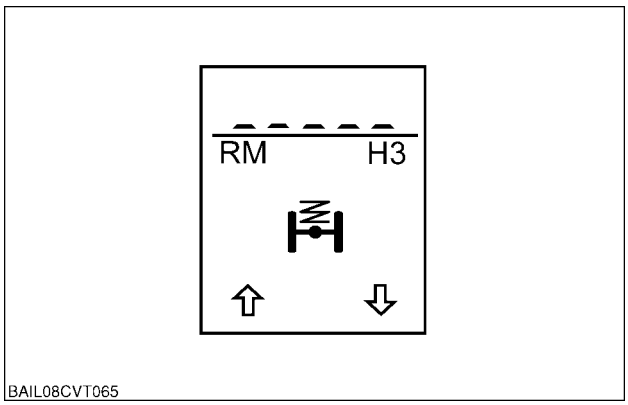
To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the "menu" key to continue navigating through the "HH" menus.

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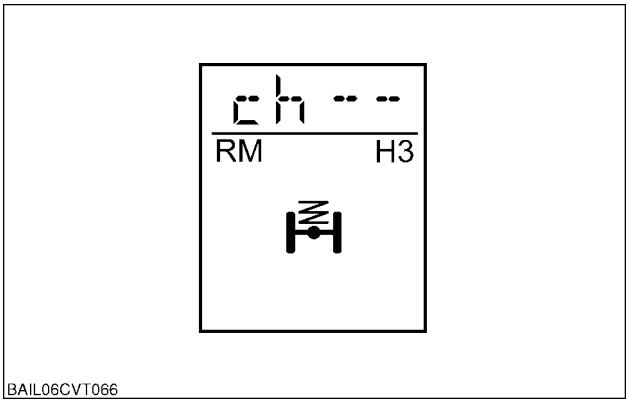
FRONT AXLE SUSPENSION OPTIONS

Select the front axle suspension sub-system by depressing the "menu" key.



BAIL08CVT065 15

The upper section of the display will display "ch - -".
The required channel can be selected by using the navigation "up" and "down" keys.



BAIL08CVT066 16

After a delay the current setting will be displayed. (see the table below for the description of the channel).

Channel	Description
Ch 1	Enable / Disable front axle suspension

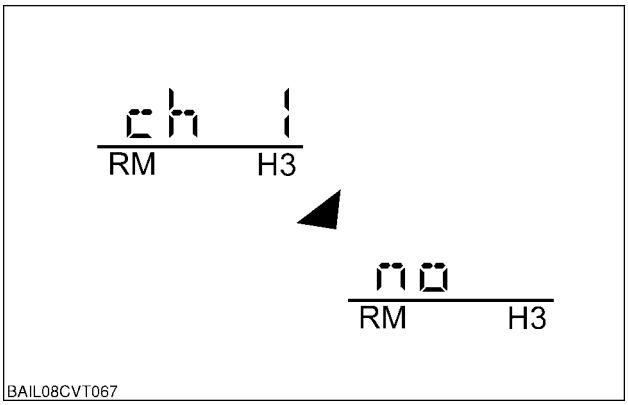
www.truck-freeworkshop.com

Channel 1 - Enable / Disable Front Axle Suspension

Scroll through the available options using the navigation "up" or "down" key.

The options available are:

- YES - Enable front axle suspension
- NO - Disable front axle suspension



BAIL08CVT067 17

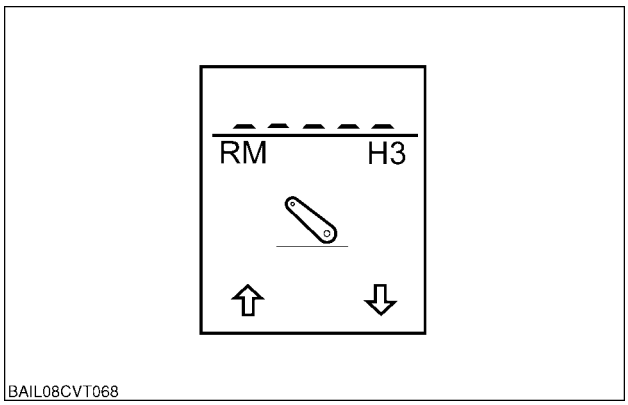
To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the "menu" key to continue navigating through the "HH" menus.

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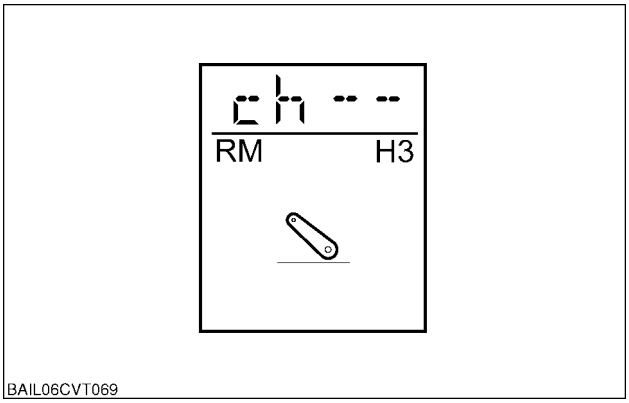
FRONT HITCH OPTIONS

Select the front hitch sub-system by depressing the "menu" key.



BAIL08CVT068 18

The upper section of the display will display "ch - -".
The required channel can be selected by using the navigation "up" and "down" keys.



BAIL08CVT069 19

After a delay the current setting will be displayed. (see the table below for the description of the channel).

Channel	Description
Ch 1	Enable / Disable front hitch
Ch 2	Enable / Disable front hitch fender switches

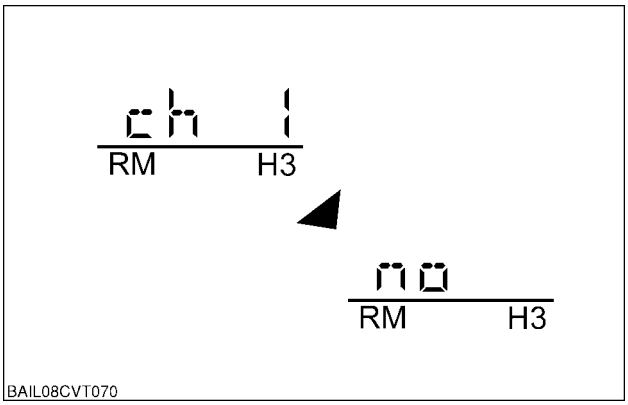
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Channel 1 - Enable / Disable Front Hitch

Scroll through the available options using the navigation "up" or "down" key.

The options available are:

- YES - Enable front hitch
- NO - Disable front hitch



BAIL08CVT070 20

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

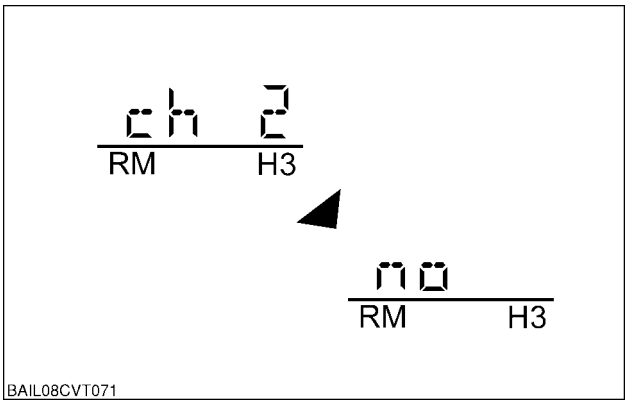
Depress the "menu" key to continue navigating through the "HH" menus.

Channel 2 - Enable / Disable Front Hitch Fender Switches

Scroll through the available options using the navigation "up" or "down" key.

The options available are:

- YES - Enable front hitch fender switches
- NO - Disable front hitch fender switches



BAIL08CVT071 21

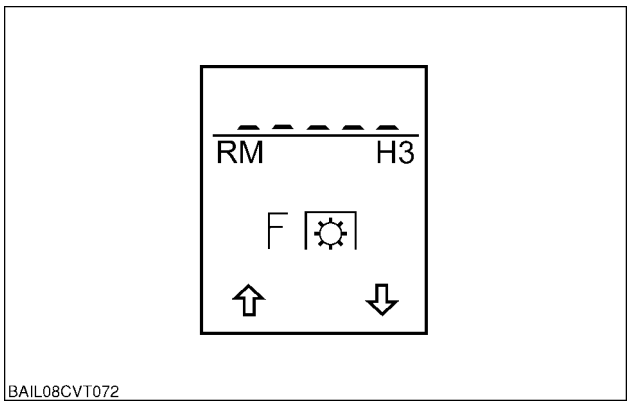
To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the "menu" key to continue navigating through the "HH" menus.

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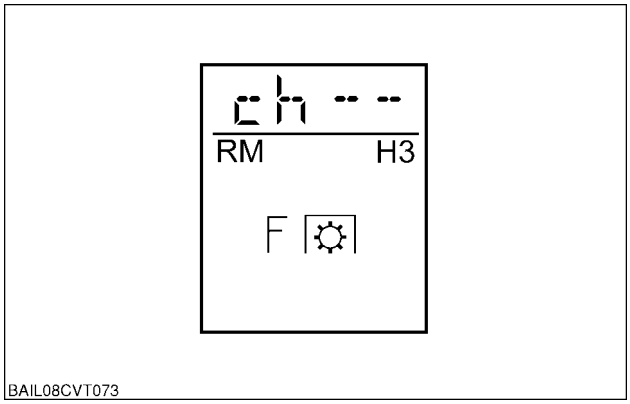
FRONT PTO OPTIONS

Select the front PTO sub-system by depressing the "menu" key.



BAIL08CVT072 22

The upper section of the display will display "ch - -".
The required channel can be selected by using the navigation "up" and "down" keys.



BAIL08CVT073 23

After a delay the current setting will be displayed. (see the table below for the description of each channel).

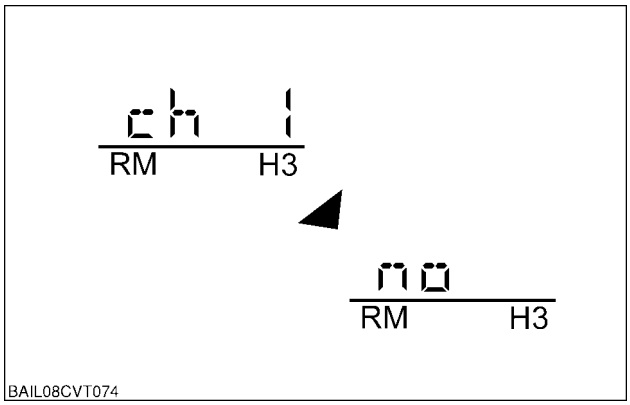
Channel	Description
Ch 1	Enable / Disable front PTO

Channel 1- Enable / Disable Front PTO

Scroll through the available options using the navigation "up" or "down" key.

The options available are:

- YES - Enable front PTO
- NO - Disable front PTO



BAIL08CVT074 24

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To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

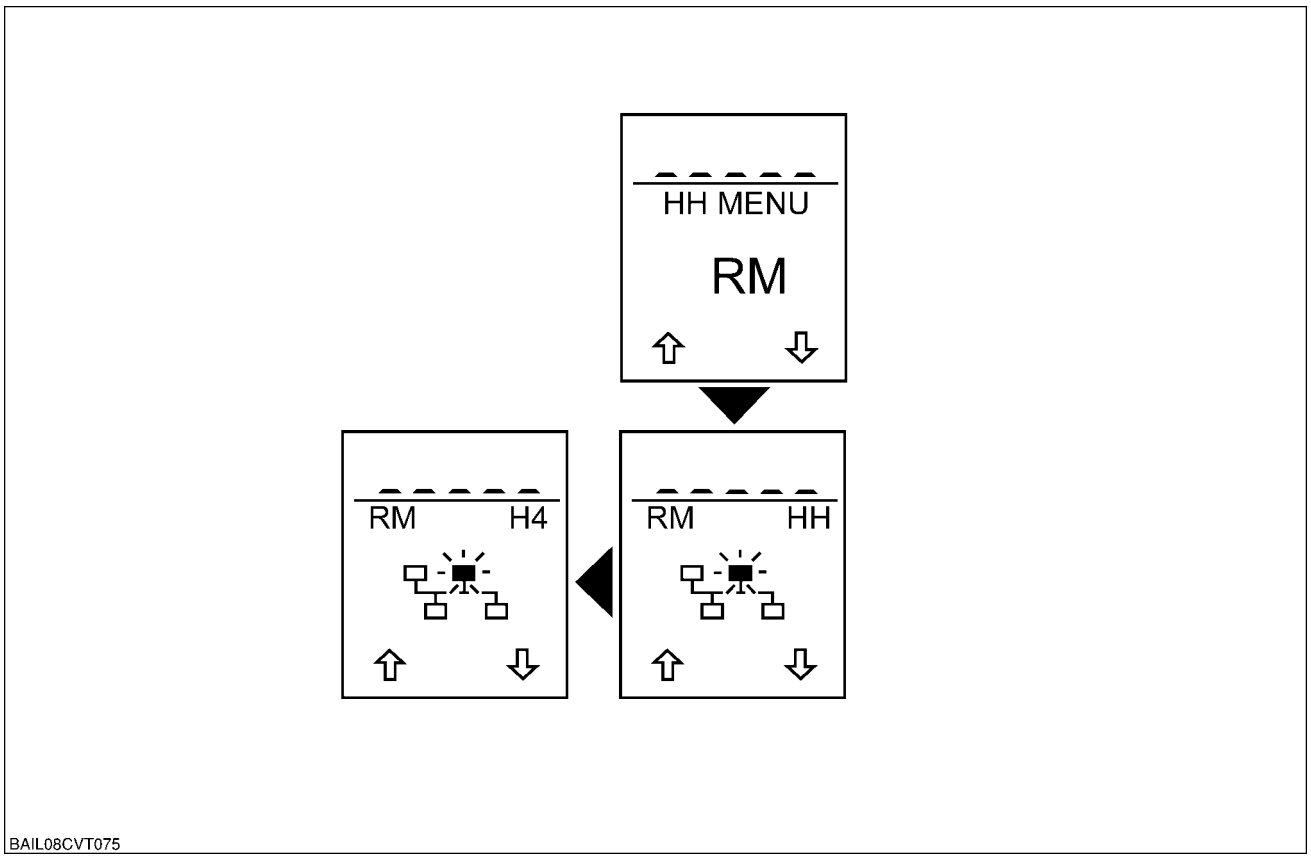
Depress the "menu" key to continue navigating through the "HH" menus.

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H4 - VIEW SOFTWARE REVISION LEVEL

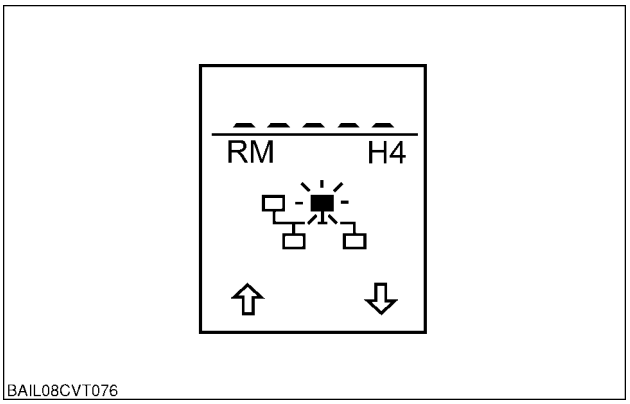
Common to all sub-systems.

H4 Menu Screen Select Diagram



BAIL08CVT075 25

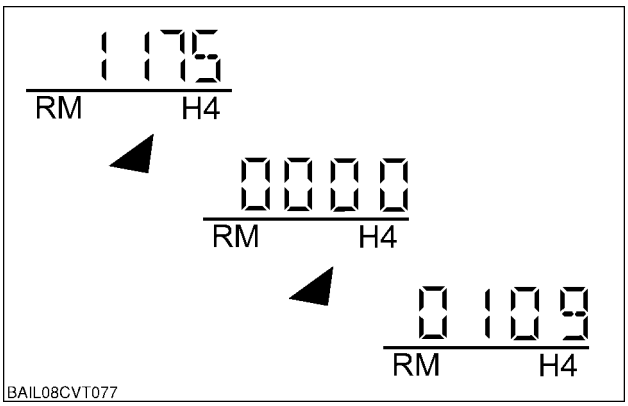
Select the H4 menu by depressing the "menu" key.



BAIL08CVT076 26

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The upper section of the display will automatically cycle through the software release, as the example shown and return to allow navigation of the "HH" menus.



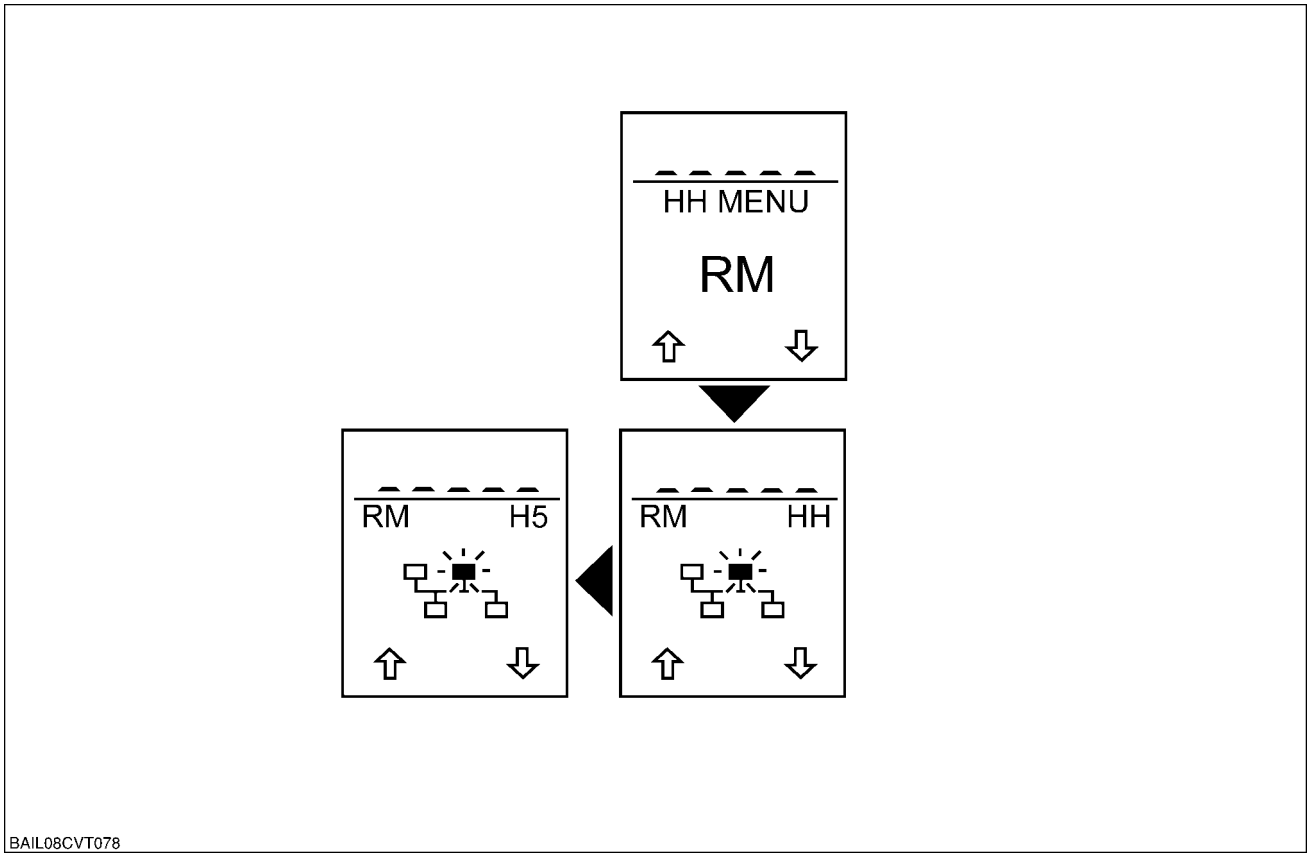
BAIL08CVT077 27

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H5 - SWITCH OPERATION TEST

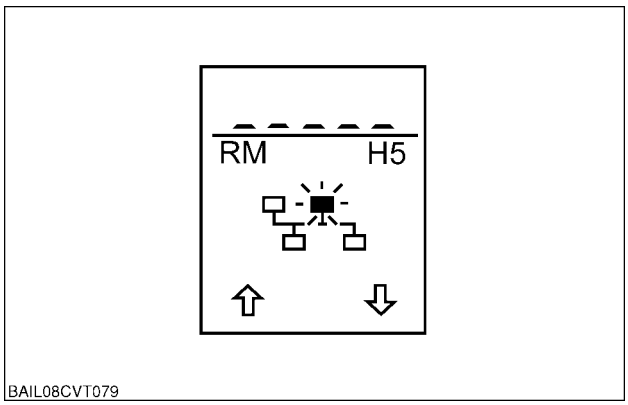
This menu displays a designated code when a switch transition is detected.
Common to all sub-systems.

H5 Menu Screen Select Diagram



BAIL08CVT078 28

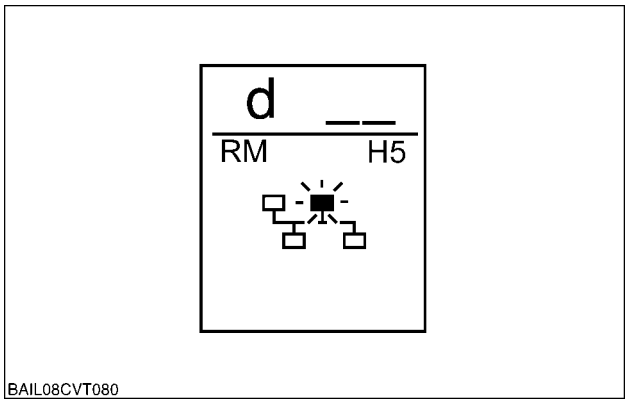
Select the H menu by depressing the "menu" key.



BAIL08CVT079 29

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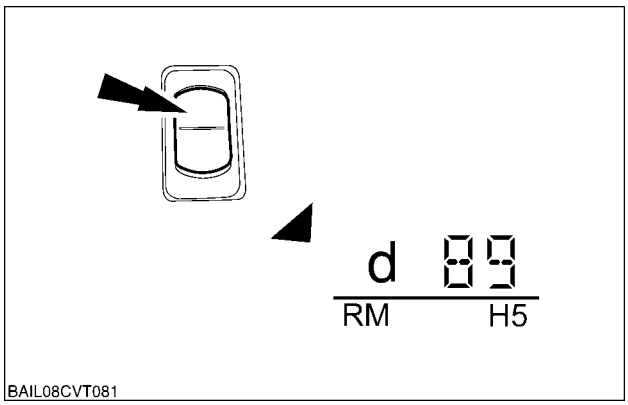
The upper section of the display will display "d_ _"



BAIL08CVT080 30

When a switch is operated, a code will be displayed and an audible tone should be heard to indicate the correct function.
If a switch code is not displayed and the audible tone not heard, a 'wiggle' test can be performed on the related wiring, while watching the display or listening for the audible tone, to help locate the fault.

NOTE: *If the keystart switch is turned to the "crank" position, with the shuttle lever in neutral and the clutch pedal down, a switch disagreement error may occur.*



BAIL08CVT081 31

Identifier	Controller Connector	Pin Number	Switch / Input	Special Requirements
d0	No switch or two switches activated at the same time			-
d8	CN1B	21	Crank detect switch	-
d69	CN1B	23	Front suspension pressure switch	-
d75	via CAN		Right hand link extend switch	-
d76	via CAN		Right hand link retract switch	-
d77	CN1B	22	Front hitch external common switch	-
d78	CN1B	26	Front hitch external raise switch	-
d79	CN1B	19	Front hitch external lower switch	-
d89	via CAN		Front suspension lock switch	-
d90	CN1B	11	Front PTO switch (normally open)	-
d91	CN1B	12	Front PTO switch (normally closed)	-
d92	via CAN		Front hitch height limit switch	-
d95	via CAN		EHR No. 1 program/motor mode switch	-
d96	via CAN		EHR No. 2 program/motor mode switch	-
d97	via CAN		EHR No. 3 program/motor mode switch	-
d98	via CAN		EHR No. 4 program/motor mode switch	-
d108	via CAN		Top link extend switch	-
d109	via CAN		Top link retract switch	-

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Identifier	Con-troller Connec-tor	Pin Number	Switch / Input	Special Requirements
d159	via CAN		EHR flow encoder switch	-
d165	via CAN		EHR float switch	-
d178	via CAN		EHR 1 extend switch (on hand controller)	-
d179	via CAN		EHR 1 retract switch (on hand controller)	-
d180	via CAN		EHR 2 extend switch on hand controller)	-
d181	via CAN		EHR 2 retract switch (on hand controller)	-
d183	CN3A	16	EHR 3 extend switch (on rear fender)	-
d184	CN3A	17	EHR 3 retract switch (on rear fender)	-

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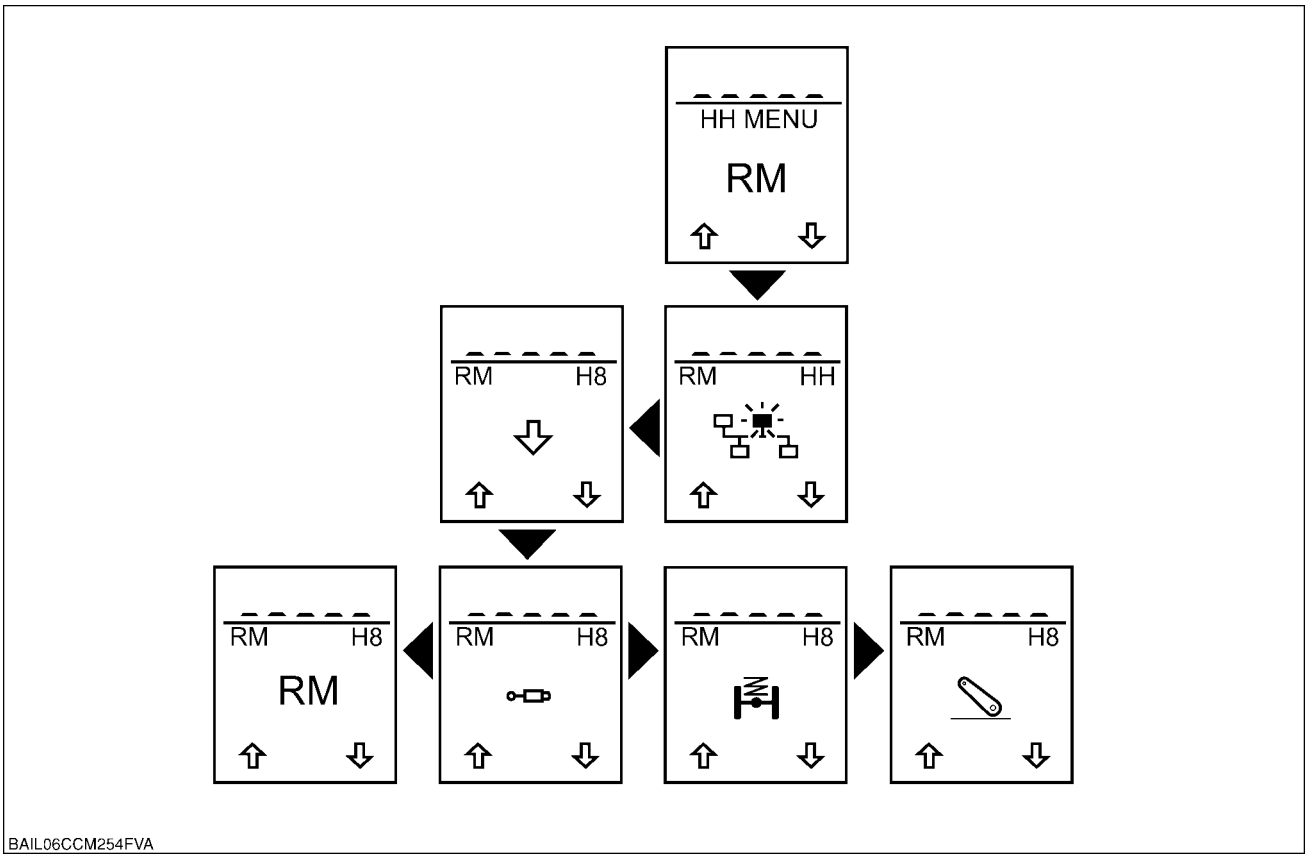
H8 - CLEAR ELECTRICAL ERASABLE PROGRAMMABLE READ ONLY MEMORY (EEPROM)

This menu clears calibration values and stored error codes by resetting all EEPROM values back to default. EEPROM is where all calibration values and error codes are stored. This memory is retained even if there is no power to the controller, i.e. if the battery is disconnected.

NOTE: *H8 will not change the configuration settings. The H3 menu mode must be used for this.*

NOTE: *To erase only the stored error codes and not affect the calibration data use the HC menu mode.*

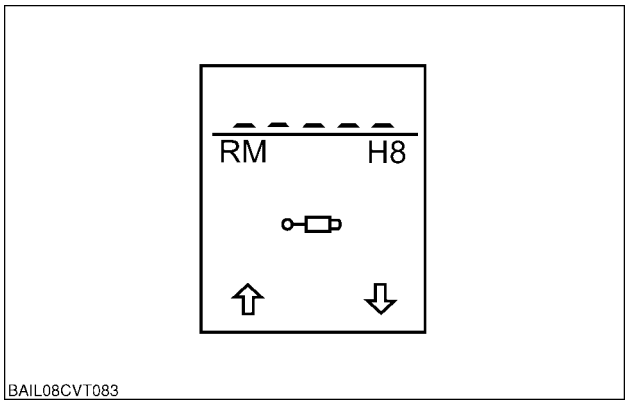
H8 Menu Screen Select Diagram



BAIL08CVT082 32

IMPORTANT: *By selecting the screen display with the controller identifier "RM" displayed this will reset the EEPROM in all the sub-systems.*

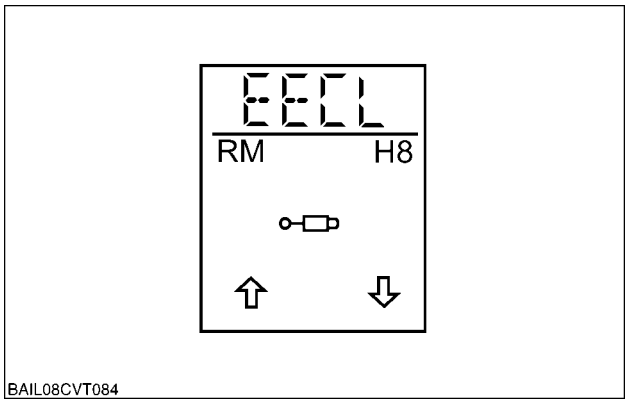
If only a specific sub-system EEPROM requires to be reset, select the sub-system that requires the EEPROM to be reset by depressing the "menu" key, as the example shown.



BAIL08CVT083 33

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The upper section of the display will display "EECL".



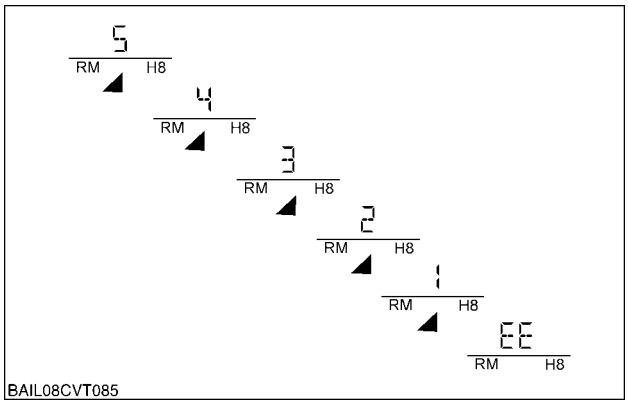
BAIL08CVT084 34

⚠ CAUTION ⚠

H8 will clear all calibrations values and stored error codes.

B006

Depress and hold the navigation "down" key to confirm the resetting of the EEPROM.
The upper section of the display will countdown from 5 to 1, then "EE" will be displayed to indicate the EEPROM has been cleared.



BAIL08CVT085 35

NOTE: *If the "down" key is released before the countdown finishes, the procedure will be aborted.*

Turn the keystart OFF.

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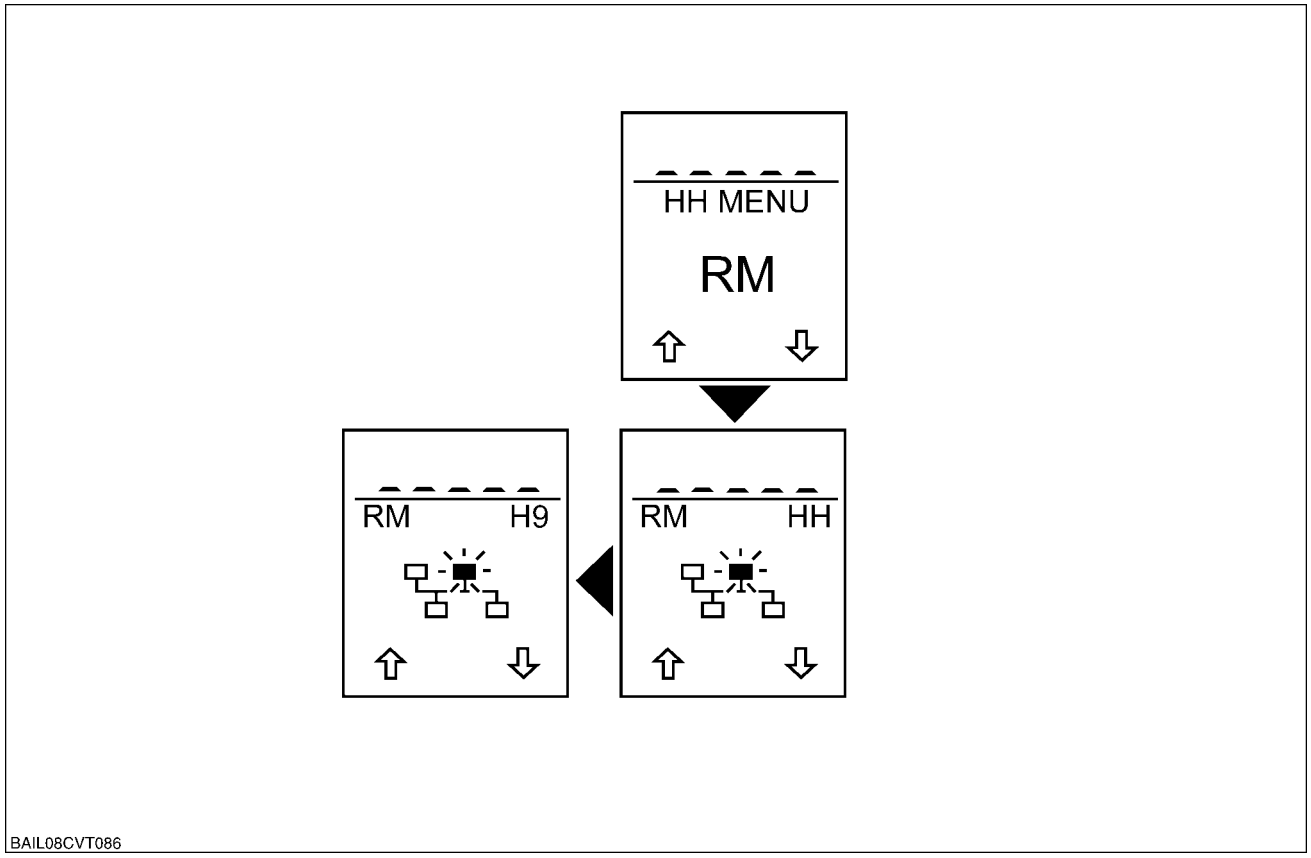
H9 - VOLTMETER

This menu is used to verify the operation of various potentiometers, voltage supplies, and solenoid current circuits. If an intermittent fault is detected within a circuit, a 'wiggle' test can be performed on the related wiring while watching the display for sudden changes in values, to help locate the area where the fault exists.

NOTE: *The vehicle may be driven while in this menu.*

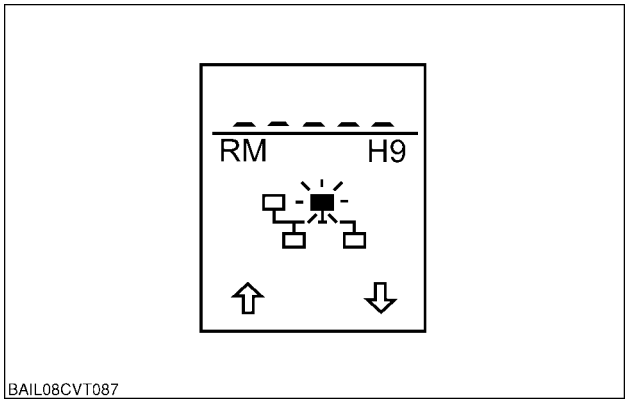
Common to all sub-systems.

H9 Menu Screen Select Diagram



BAIL08CVT086 36

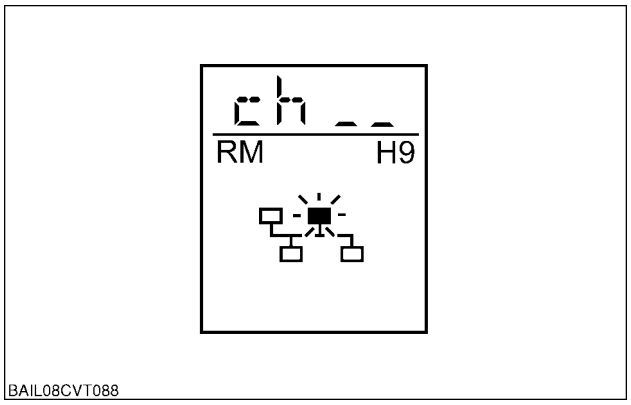
Select the H9 menu by depressing the "menu" key.



BAIL08CVT087 37

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The upper section of the display will display "ch - -"



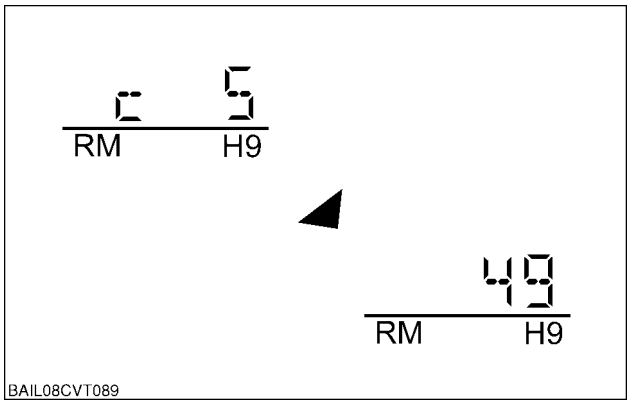
BAIL08CVT088 38

The required channel can be selected by using the navigation "up" and "down" keys.
After a delay the value will be displayed. Compare the value displayed with the typical reading shown in the table below.

NOTE: *The value is the input voltage or signal into the controller. This cannot be directly translated into a voltage due to the internal processes of the controller. A zero equates to* ***0 volts****.*

If the value displayed varies by more than **10 %** to that shown in the table below, a fault is indicated in either the component or the wiring harness relevant to that channel.

NOTE: *Check the connectors of the effected circuit, including the controller connectors, prior to replacing any components.*



BAIL08CVT089 39

Chan-nel	Description	Connec-tor	Pin	Typical Reading	Comments
5	**+5 Volts** voltage supply to the sensors	CN1B	16	49	
7	**+12 Volt** VF input signal (see explanation)	CN1A	1	45	
8	**+12 Volt** VD input signal (see explanation	CN1A	8	45	The tractor moves, when the engine is running
9	**+12 Volt** VH input signal (see explanation)	CN1A	20	45	
10	**+12 Volt** VT input signal (see explanation)	CN3B	24	45	
14	Amperage of the front PTO solenoid valve	CN2	7	0 when FPTO is Off 99 when FPTO is On	
15	Amperage of the upper lock solenoid suspended front axle	CN2	6	0 when locked out 30 to 55 when active	

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Chan-nel	Description	Connec-tor	Pin	Typical Reading	Comments
16	Amperage of the lower lock solenoid suspended front axle	CN2	13	0 when locked out 30 to 46when active	
17	Accelerometer suspended front axle	CN1B	5	40 when vehicle stationary	
26	Front axle position	CN1B	6	120 lower limit 950 upper limit	
28	Front powerlift position	CN1B	2	10 lower limit 90 upper limit	
97	EHR 1 Joystick (X) green	via CAN		100 < 0 > 100	
98	EHR 2 Joystick (Y) blue	via CAN		100 < 0 > 100	

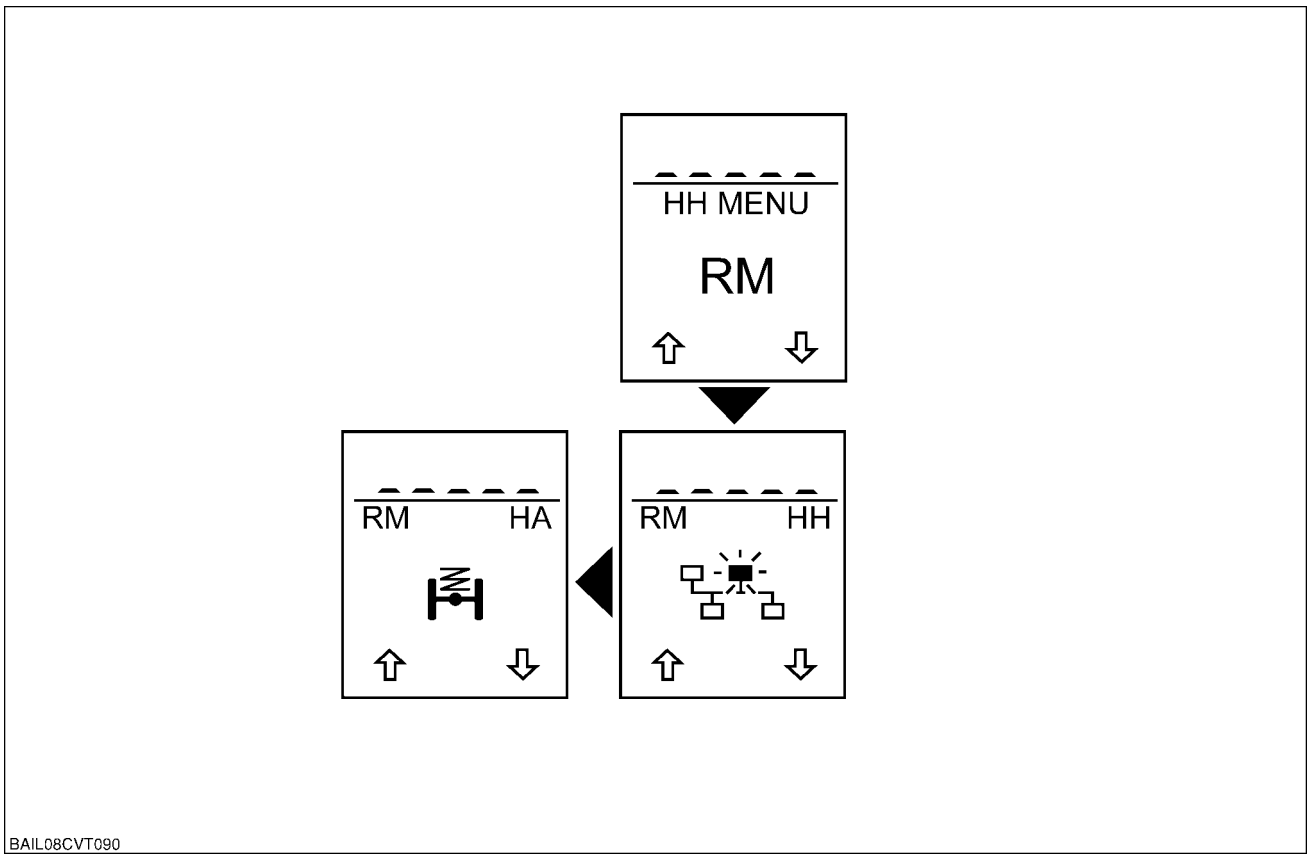
Explanations:
VF Input: This is the input voltage into the controller to suspended front axle components, i.e. Front axle lower and lockout solenoids.
VD Input: This is the input voltage into the controller to suspended front axle raise solenoid.
VH Input: This is the input voltage into the controller to front PTO and front hitch components, i.e. Front PTO solenoid and front hitch height solenoid.
VT Input: This is a second input voltage into the controller.

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HA - DEMONSTRATION MENU

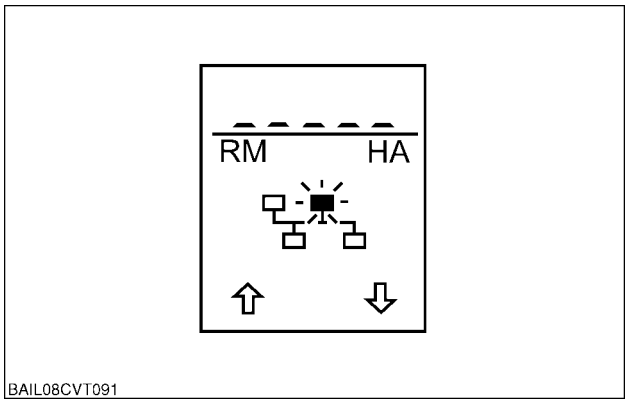
Used to demonstrate front axle suspension.

HA Menu Screen Select Diagram



BAIL08CVT090 40

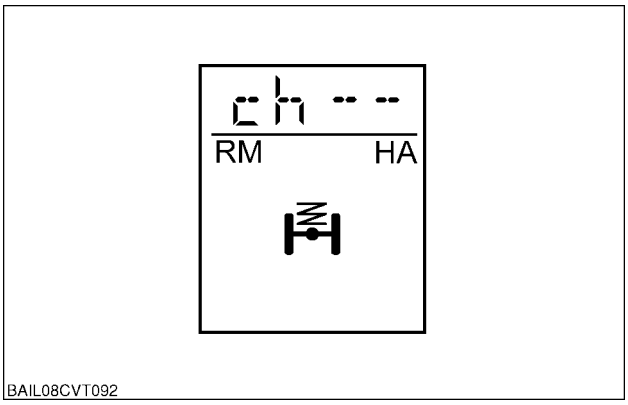
Select the HA menu by depressing the "menu" key.



BAIL08CVT091 41

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The upper section of the display will display "ch - -"



BAIL08CVT092 42

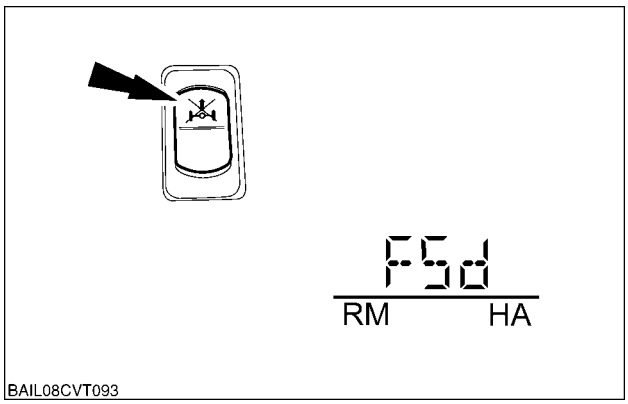
The required channel can be selected by using the navigation "up" and "down" keys.
After a delay the current setting will be displayed. (see the table below for the description of the channel).

Channel	Description
Ch 1	Front Axle Suspension demonstration

Channel 1 - Front Axle Suspension Demonstration

This demonstration mode allows the suspension to be locked at speeds above the normal **12 Km/h** automatic engagement parameter.
The lower central display will display "FSd" (Front Axle Suspension demonstration).
Start the engine and operate the vehicle to demonstrate front axle suspension.
Use the lockout switch to lock the suspension as normal. The light in the switch will be illuminated to indicate the front axle suspension had been locked.

NOTE: *Front axle suspension demonstration will be disabled after turning the keystart OFF.*



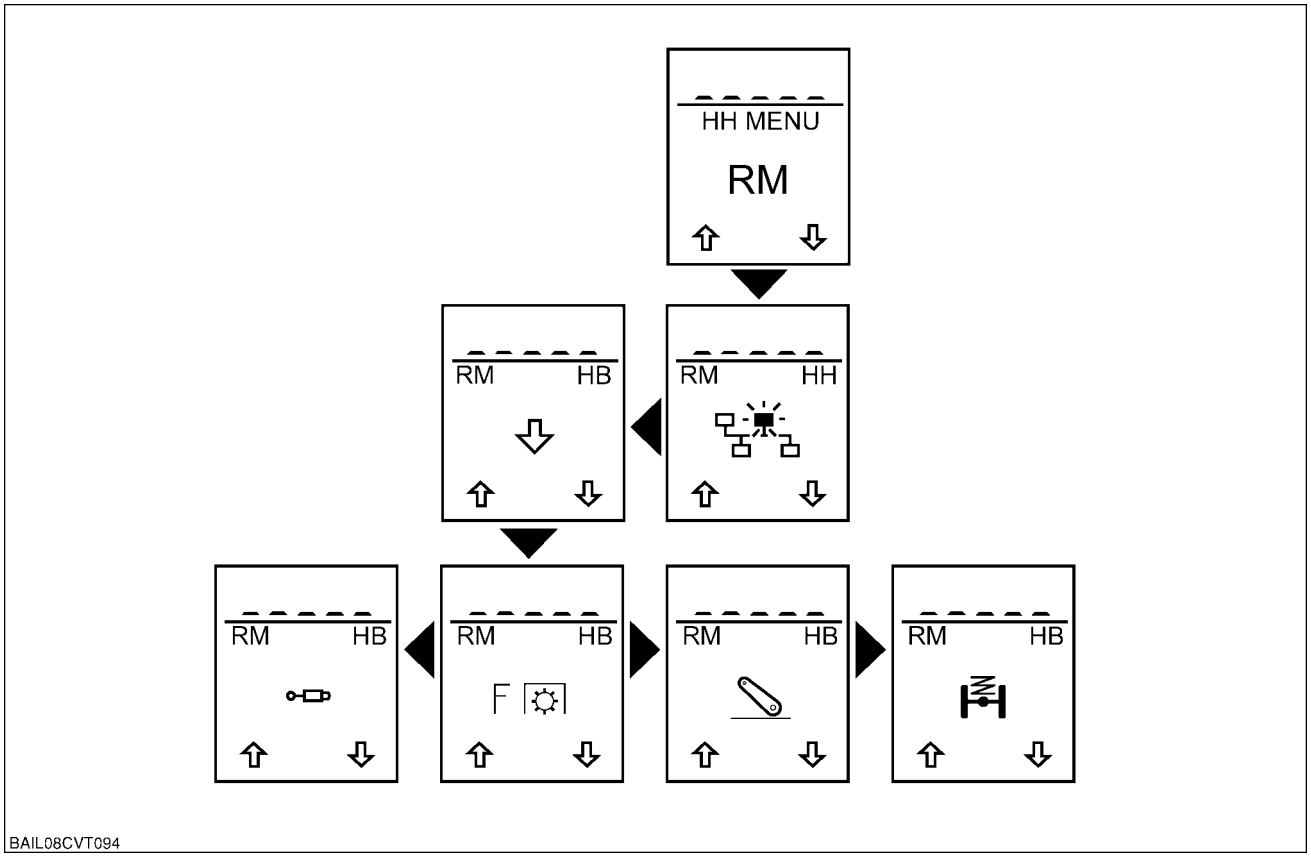
BAIL08CVT093 43

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HB - DISPLAY STORED FAULT CODES

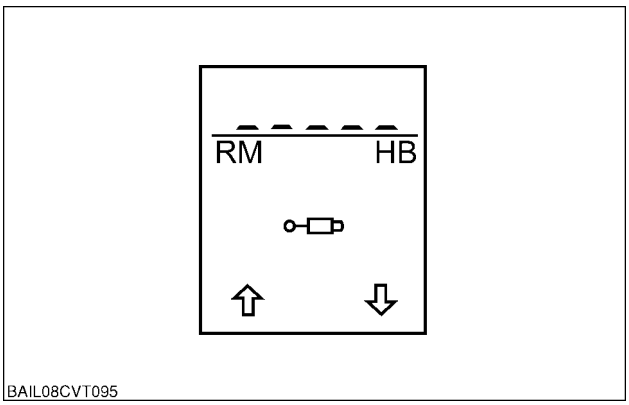
This menu is used to display fault codes which are stored in the EEPROM of the controller. Common to all sub-systems.

HB Menu Screen Select Diagram



BAIL08CVT094 44

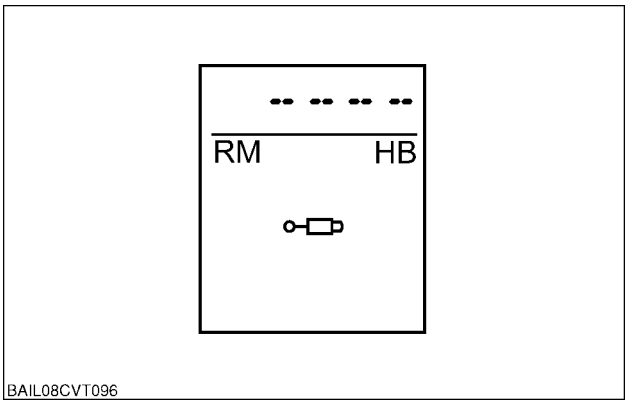
Select the HB menu by depressing the "menu" key.



BAIL08CVT095 45

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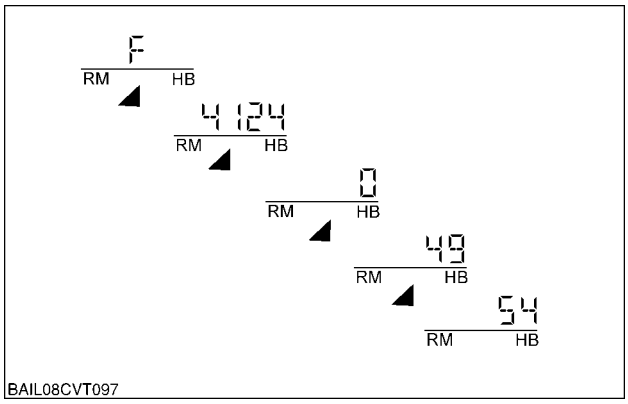
The upper section of the display will display "- - - -", if no fault is stored in the selected sub-system.



BAIL08CVT096 46

The upper section of the display will display "F", if a fault code is stored in the selected sub-system.
The upper section of the display will then automatically cycle through as the example:

4124Fault code
00 Hour of first occurrence
49 Hour of last occurrence
54 Number of occurrences of the fault



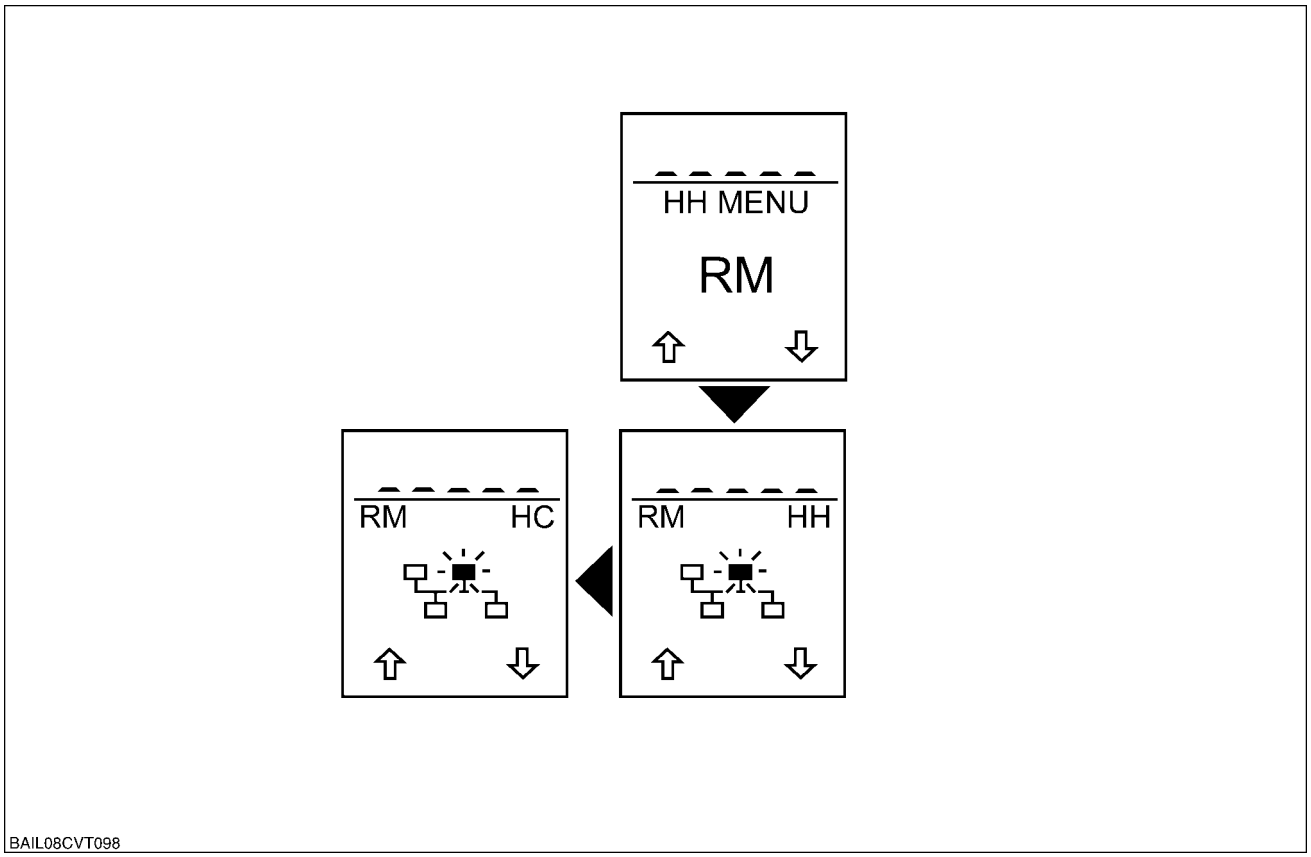
BAIL08CVT097 47

Depress the navigation "up" or "down" key to change to the next fault code in the list.
The upper section of the display will display "_ _ _" at the end of the list.
Depress the "menu" key to continue navigating through the "HH" menus.

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HC - CLEAR STORED FAULT CODES

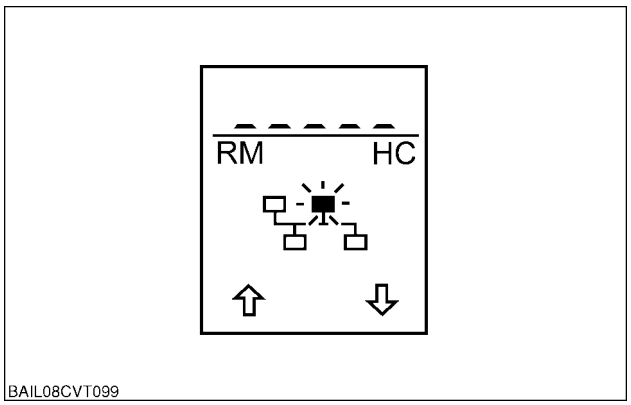
HC Menu Screen Select Diagram



BAIL08CVT098 48

NOTE: *Always make a note of the fault codes stored, before clearing.*

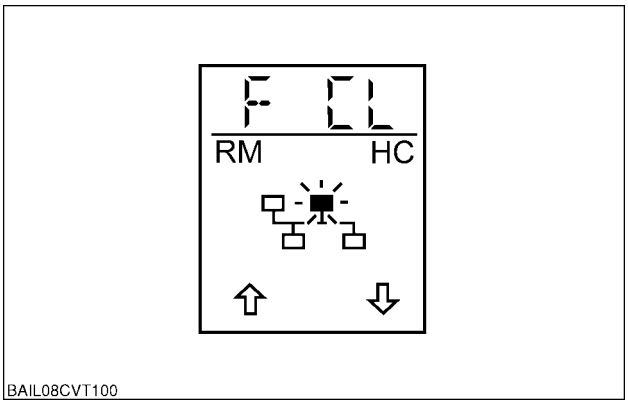
Select the HC menu by depressing the "menu" key.



BAIL08CVT099 49

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The upper section of the display will display "F CL".



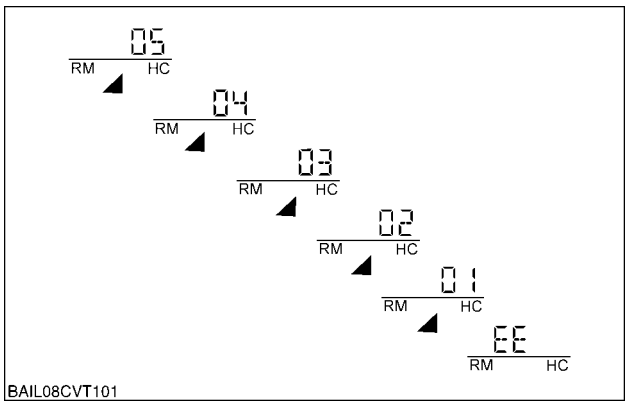
BAIL08CVT100 50

NOTE: *If the navigation "down" key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the navigation "down" key to confirm the clearing of the memory.

NOTE: *The upper section of the display will countdown from 05 to 01, then "EE" will be displayed to indicate the fault codes have been cleared.*

Depress the "menu" key to continue navigating through the "HH" menus.



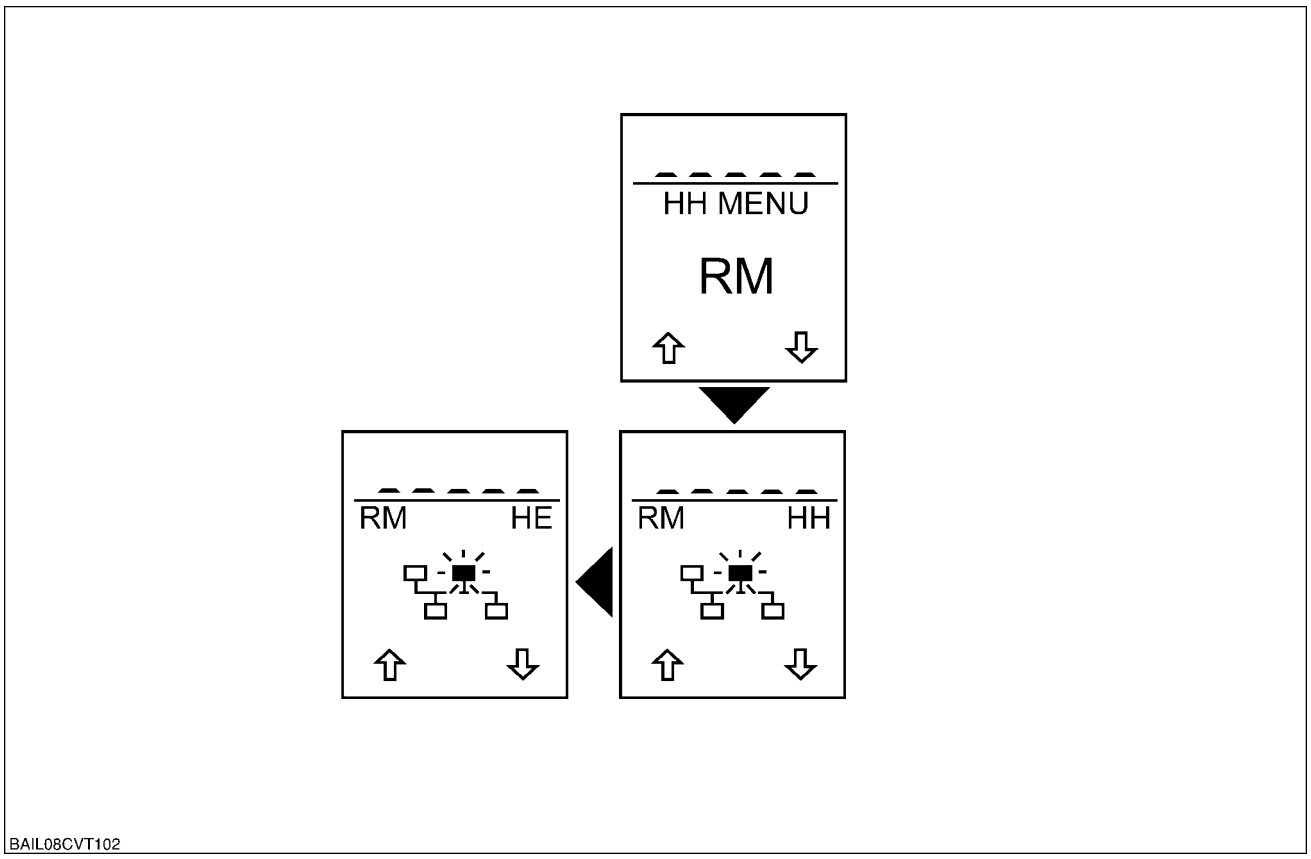
BAIL08CVT101 51

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HE - DISPLAY ALL SPEED INPUTS

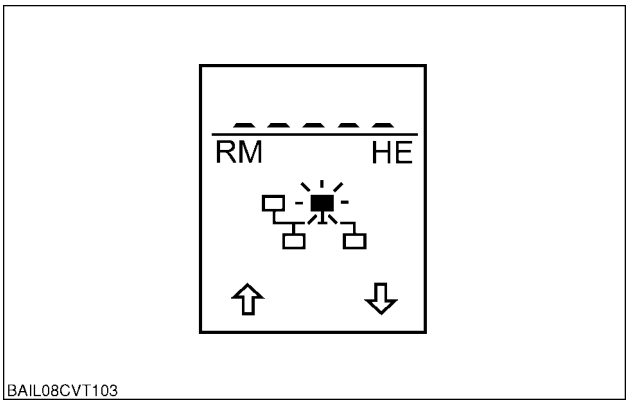
Common to all sub-systems.

HE Menu Screen Select Diagram



BAIL08CVT102 52

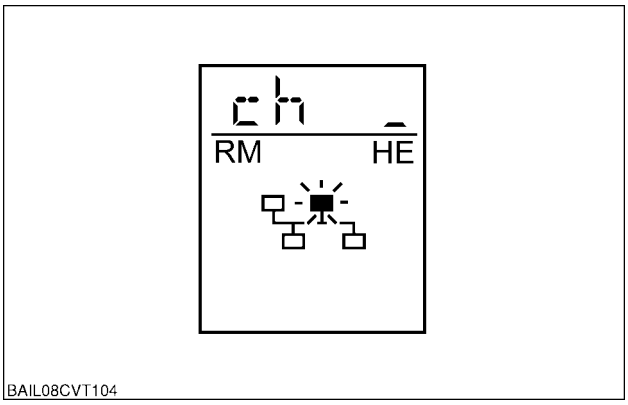
Select the HE menu by depressing the "menu" key.



BAIL08CVT103 53

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The upper section of the display will display "ch _".



BAIL08CVT104 54

The required channel can be selected by using the navigation "up" and "down" keys.
Refer to the table below for the available channels.
After a delay the value will be displayed.
Depress the "menu" key to continue navigating through the "HH" menus.

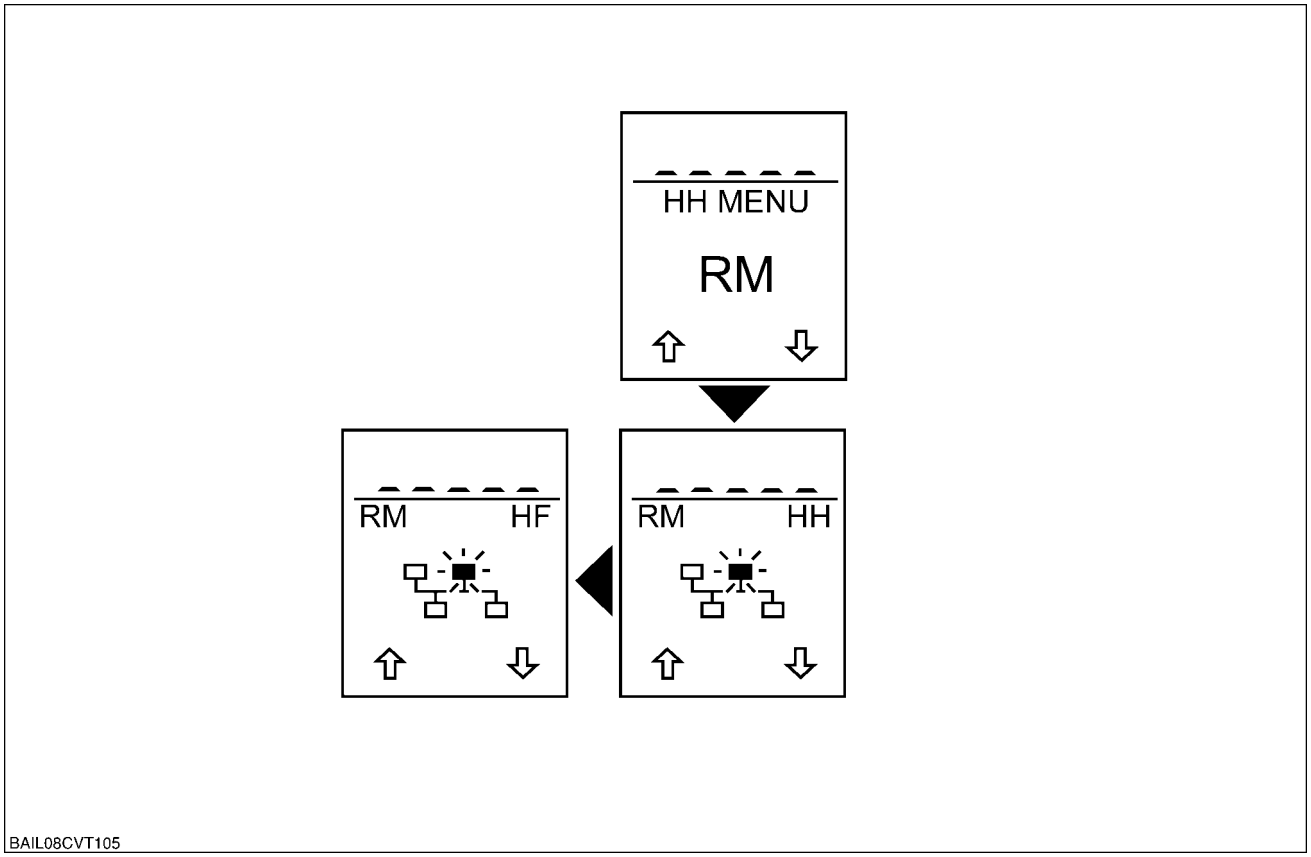
Channel	Description	Typical Reading	Notes
0	Not used		
1	Not used		
2	Not used		
3	Not used		
4	Not used		
5	Not used		
6	Not used		
7	Not used		
8	Not used		

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HF - VIEW CONTROLLER HARDWARE INFORMATION

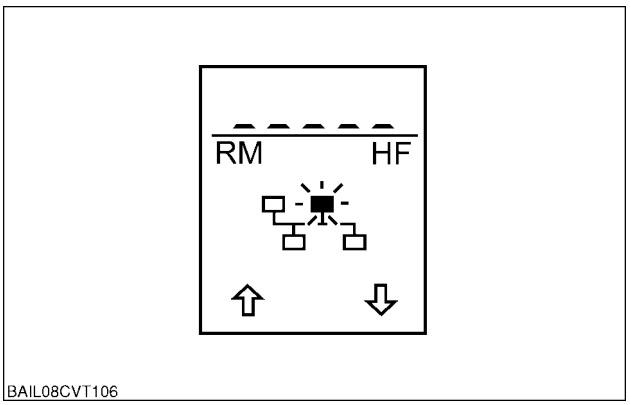
This menu allows the hardware identification, hardware version and serial number to be displayed. Common to all sub-systems.

HF Menu Screen Select Diagram



BAIL08CVT105 55

Select the HF menu by depressing the "menu" key.

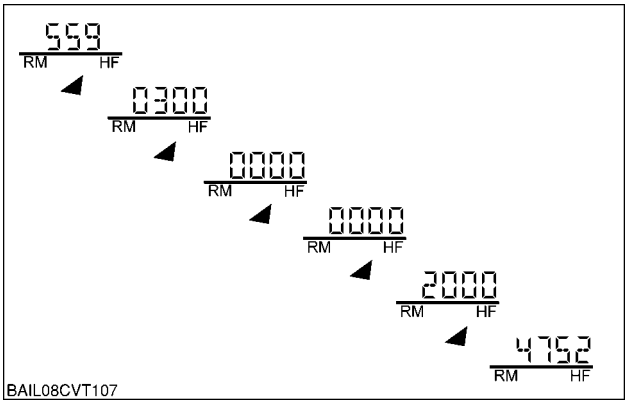


BAIL08CVT106 56

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The upper section of the display will automatically cycle through as the example:

559 Hardware identification
0300 Hardware version
0000 Hardware version
0000 Serial number
2000 Serial number
4752 Serial number
and return to allow navigation of the "HH" menus.



BAIL08CVT107 57

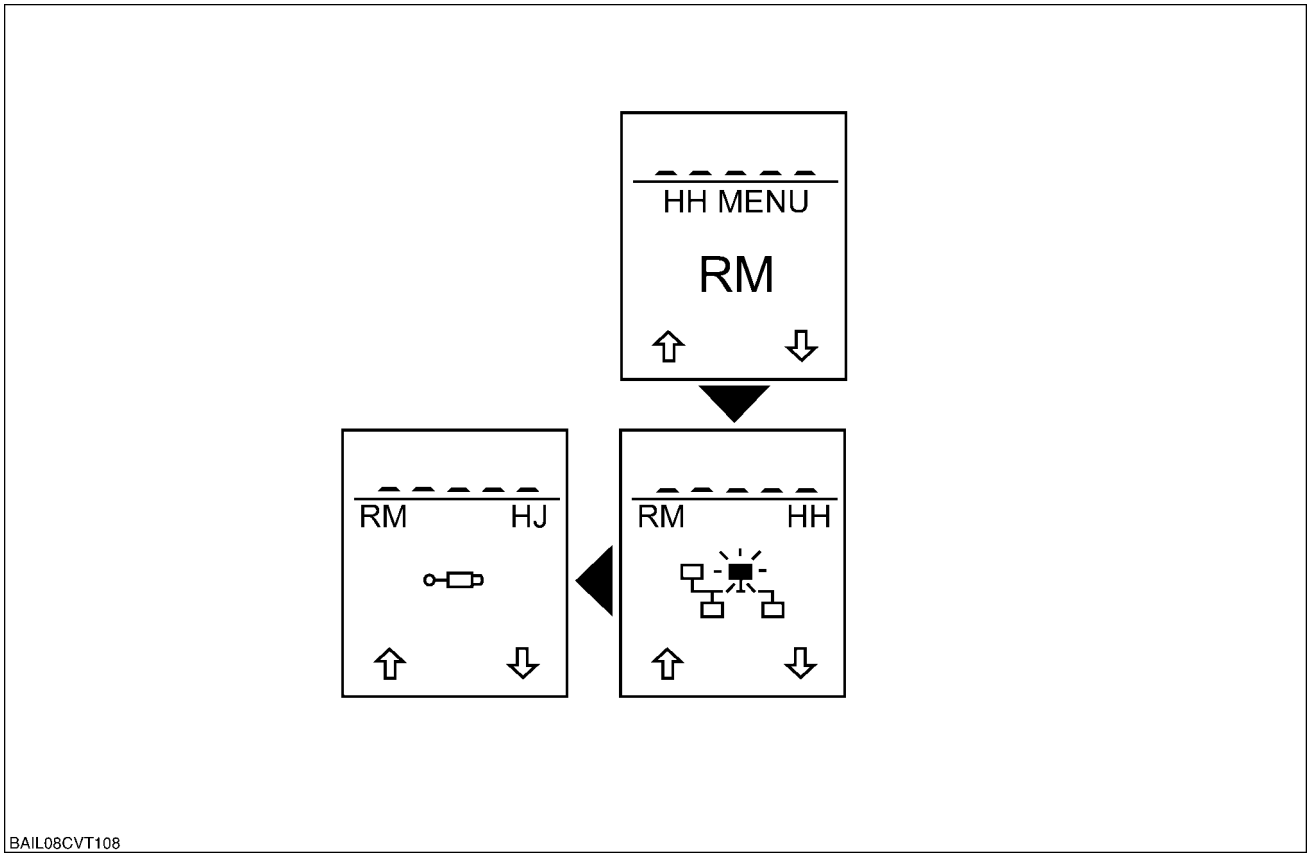
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HJ - ELECTRONIC HYDRAULIC REMOTE CONTROL VALVE SET-UP

This menu allows the Electronic Hydraulic Remote (EHR) control valve numbers to be reset.
The EHR valve stores a number to indicate its position in the remote control valve stack, i.e. valve number 1,2, 3, 4 or 5. If a valve assembly has been replaced it will be necessary to reprogram the number of each valve within the complete assembly. New valves are supplied without an assigned number.

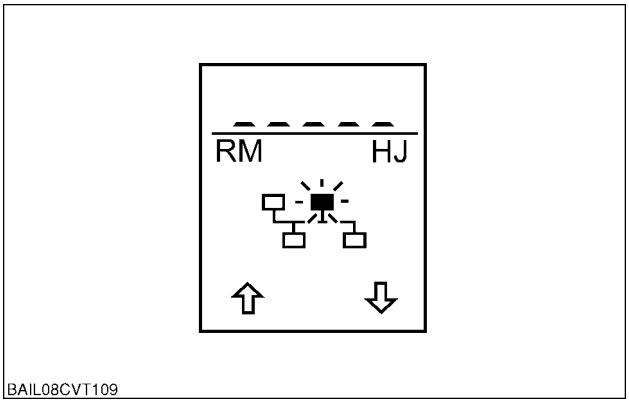
NOTE: *The renumbering procedure for all of the valves, either rear or mid mount valves, must be completed before commencing the procedure for the other set of valves.*

HJ Menu Screen Select Diagram



BAIL08CVT108 58

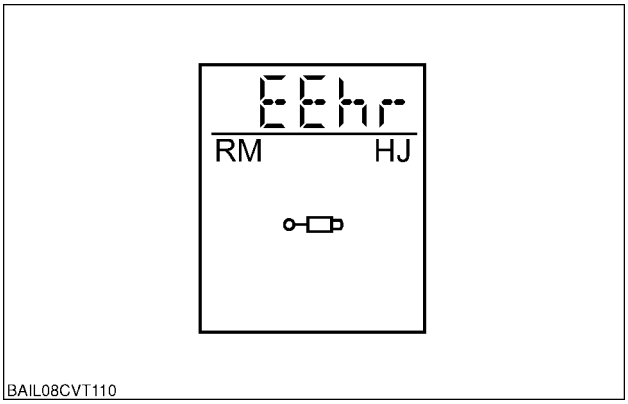
With all of the rear remotes connected, navigate the H-menus and select the HJ menu by depressing the "menu" key.



BAIL08CVT109 59

The upper section of the display will display "EEhr".

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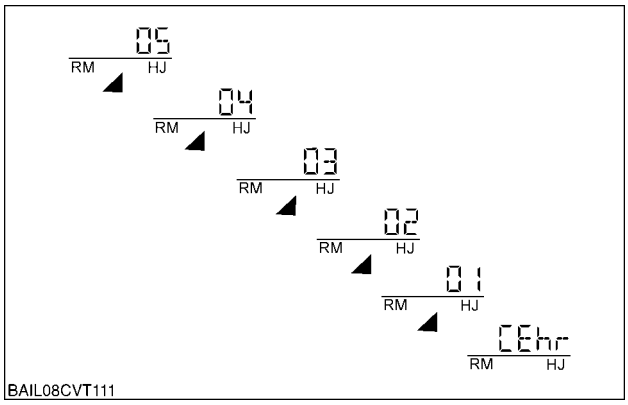


BAIL08CVT110 60

NOTE: *HJ will clear all the EHR valve numbers.*

NOTE: *If the navigation "down" key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the navigation "down" key to confirm the resetting of the valve numbers.
The upper section of the display will countdown from 05 to 01, then "CEhr" will be displayed to indicate the valve numbers have been reset.



BAIL08CVT111 61

Turn the keystart OFF.

Disconnect the connectors from each of the remote valves, except for valve number 1.

Turn the keystart ON and enter HJ menu again. The cluster display will momentarily flash ’Ehr_’ followed by ’Ehr1’, an audible beep will be heard, indicating that number 1 valve has been recognised and renumbered. The display will then change to flash ’Ehr2’ to signify that the controller is ready for the next valve to be connected..

Connect each remote valve in the correct order. As each valve is connected an audible beep will signify the valve is recognised.

As each valve is connected the display will change to show the next valve number to be connected until ’Ehr_5’ is displayed.

If there are less than 5 rear remotes then the procedure can be exited by depressing and holding the navigation ’down’ key , the display will change to ’End’ to indicate programming is complete. If the maximum number of valves are fitted then the procedure will end automatically and display ’End’.

Turn the keystart OFF to store the new valve numbers.

Calibrate the remote valves. Refer to **PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Calibrate (A.10.C)**.

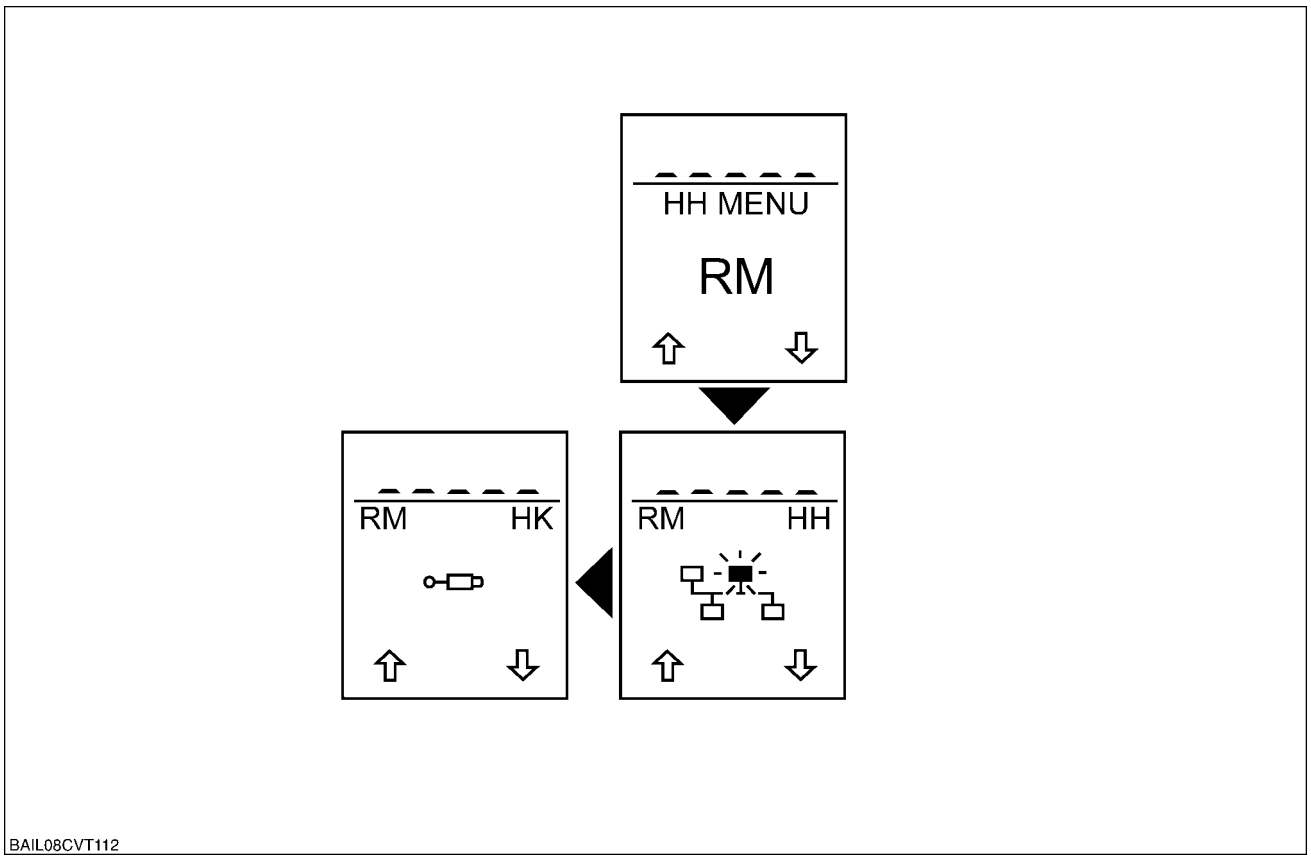
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HK - Rear Electro Hydraulic Remote Valve Diagnostic Functions

This menu is used to provide a number of diagnostic functions for the Rear EHR valves.

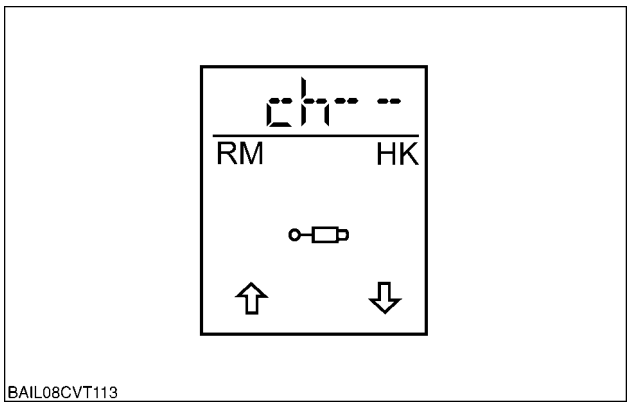
NOTE: *If this procedure is to be carried out following the change of a pilot head, then the HJ procedure should first be carried out in order to renumber the valves.*

HK Menu Screen Select Diagram



BAIL08CVT112 62

Select the HK menu by depressing the "menu" key. Depressing the Menu Key again will display "ch--". Use the "up" or "down" key to navigate to the required channel.



BAIL08CVT113 63

Channel	Description	Comments
Ch 1	Valve Calibration	Required when installing a new valve pilot head. Requires the use of special tools **380001903** pressure transducer and **84148258** jumper harness.

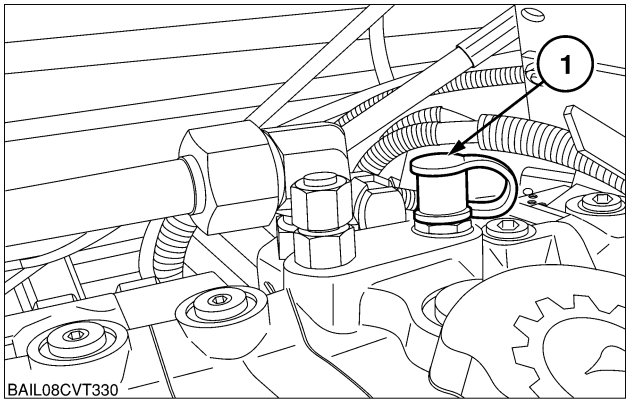
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Channel	Description	Comments
Ch 2	Read Calibration Data	For information only. Reads the valve calibration data

Channel 1 - Valve Calibration

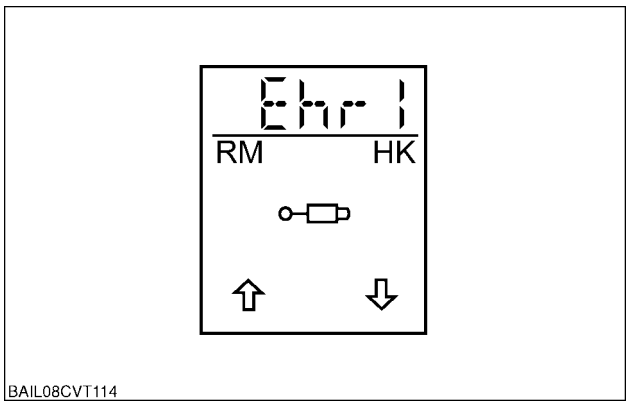
This channel is used to perform the on-board calibration of the rear EHR valves

1. Connect the pressure transducer, special tool **380001903**, with jumper harness, special tool **84148258**. Connect the pressure transducer to the quick release coupler located on the top of the valve block **(1)**, and using the jumper harness, connected to the transducer harness, connect to the "front hitch and PTO" connector, **X227**, located on the left side of the vehicle under the hood on top of the engine.



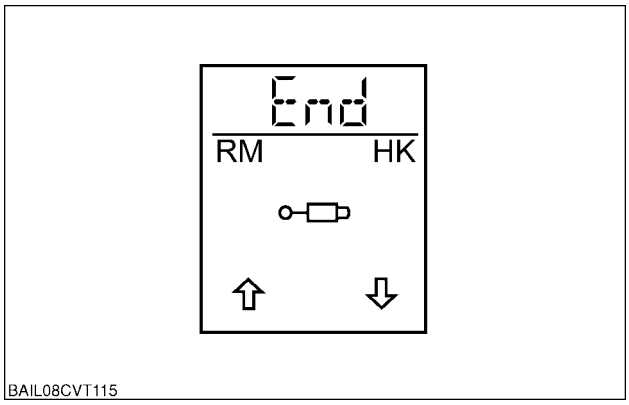
BAIL08CVT330 64

2. Select the EHR to be calibrated by using the "up" and "down" keys.



BAIL08CVT114 65

3. Start the engine. Depress and hold the "down" key for 2 seconds, calibration will start automatically. During calibration the valve position data will be displayed. The display will show "End" if the procedure was successful.



BAIL08CVT115 66

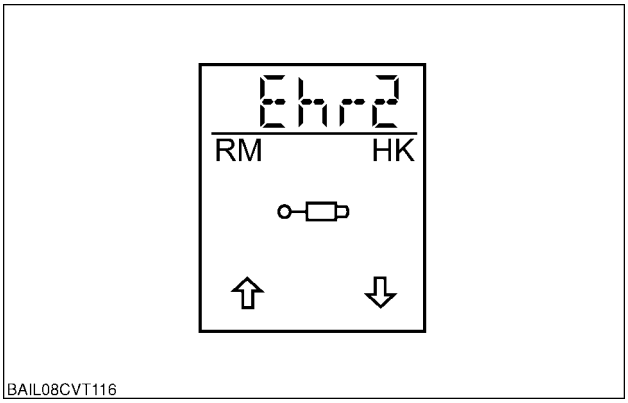
4. To calibrate another valve use the "up" and "down" key to select the required valve and repeat step 3.

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Channel 2 - Read Calibration Data

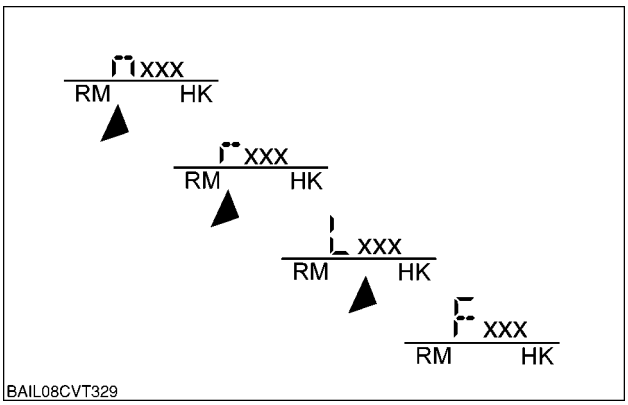
This channel is for information purposes only to read the calibration data of each valve

1. Select the EHR valve number which is to be read by depressing the "up" and "down" keys.



BAIL08CVT116 67

2. Depress and hold the "down" key for 2 seconds. The display will show the calibration data for each position prefixed by 'n' (neutral), 'R' (raise), 'L' (lower), 'F' (float).



BAIL08CVT329 68

3. To read the calibration values from another valve use the "up" and "down" keys to select the required valve number and repeat step 2.

Control module - Configure - CVT Transmission, Electronic Draft Control, Rear PTO, Front Wheel Drive, Differential Lock, Front Electronic Hydraulic Remote Valves, Engine.

Control Module RE

HH	Service Menu	Figure Number
H1	Calibration procedures	**1**
H2	View stored calibration values	**2**
H3	Configurations	**8**
H4	View software revision level	**35**
H5	Switch operation test	**38**
H6	Vehicle information view	**42**
H7	Vehicle test modes	**45**
H8	Clear Electrically Erasable Programmable Read Only Memory (EEPROM)	**58**
H9	Voltmeter	**64**
HA	Demonstration mode	
HB	Display stored fault codes	**67**
HC	Clear all stored fault codes	**71**

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HH	Service Menu	Figure Number
HE	Display frequency inputs	**75**
HF	View controller hardware information	**79**
HJ	Electronic hydraulic remote control valve set-up	**82**

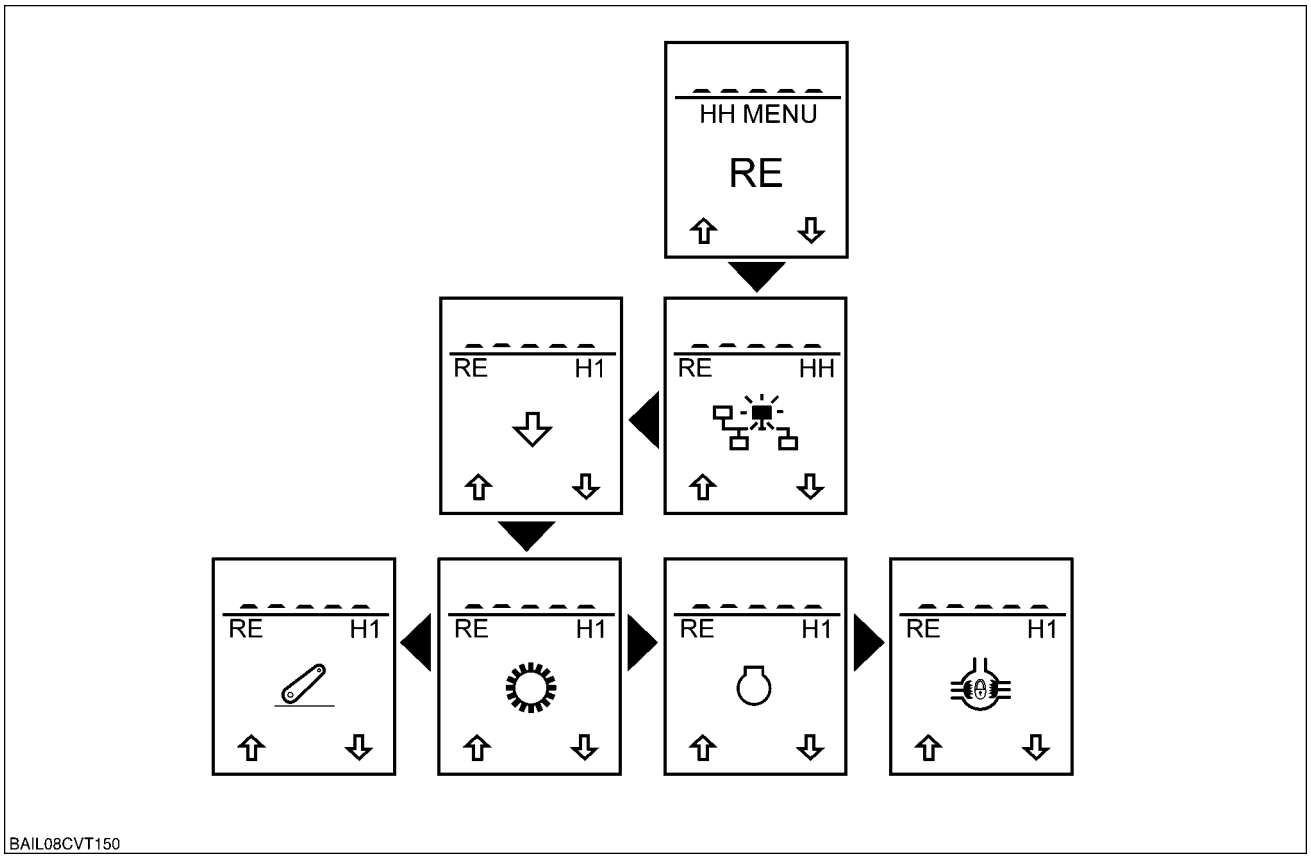
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H1 - CALIBRATION PROCEDURES

This menu is used to calibrate:

1. Electronic Draft Control Valve. Refer to **HITCH Electronic draft control - Calibrate (H.10.D)**.
2. Transmission Clutches, determining the current required to turn the input / output shaft at the required speed. Flywheel speed sensor and PTO torque sensor, Refer to **TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate (C.20.G)**.
3. Engine (for PTO torque sensor). Refer to **REAR PTO Hydraulic - Calibrate (C.40.C)**.
4. Differential lock (for steering angle sensor). Refer to **FRONT AXLE - Calibrate (D.10.A)**.

H1 Menu Screen Select Diagram



BAIL08CVT150 1

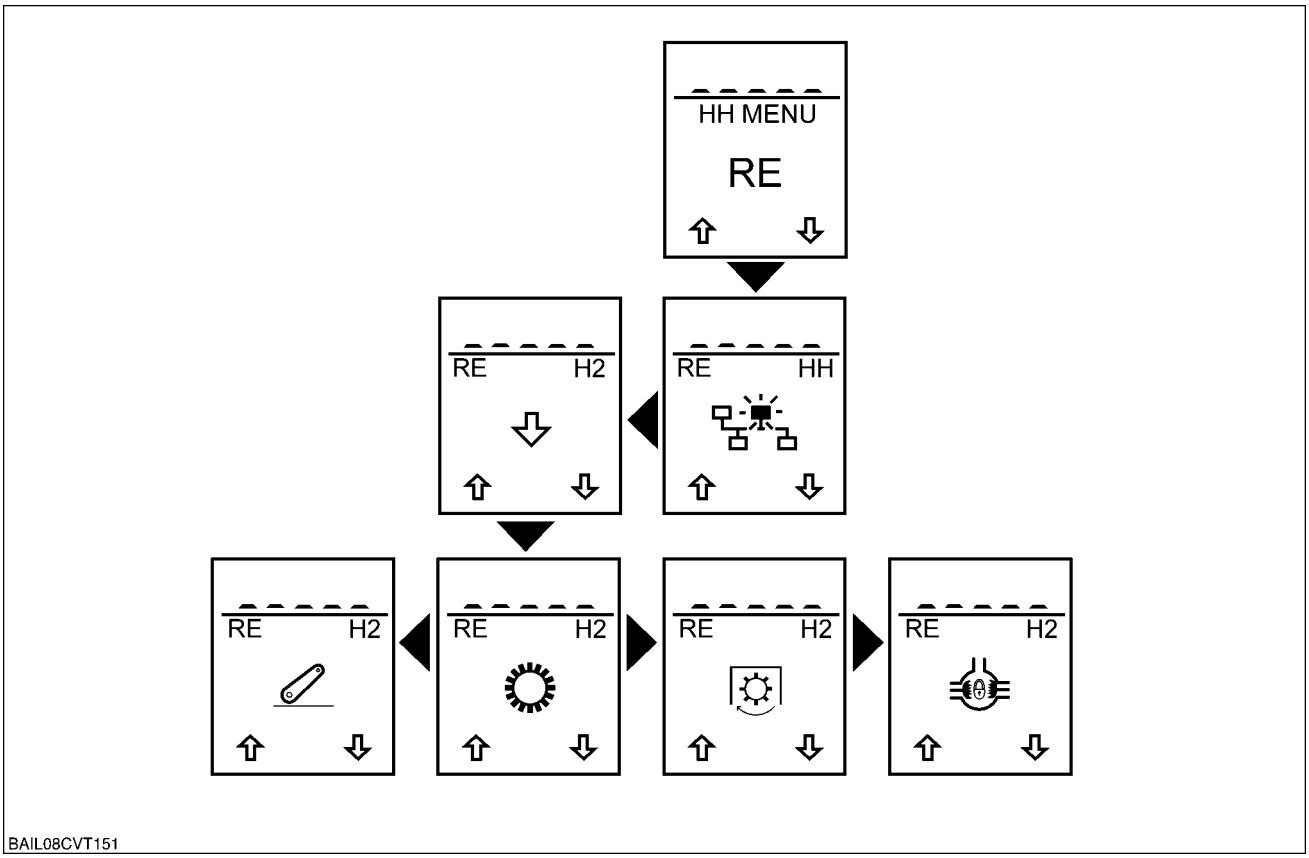
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H2 - VIEW STORED CALIBRATION VALUES

This menu is used to display the calibration values stored in the controllers for:

1. Transmission clutches and synchronisers
2. Differential lock (for steering angle sensor)
3. Electronic draft control valve
4. Rear PTO clutch

H2 Menu Screen Select Diagram

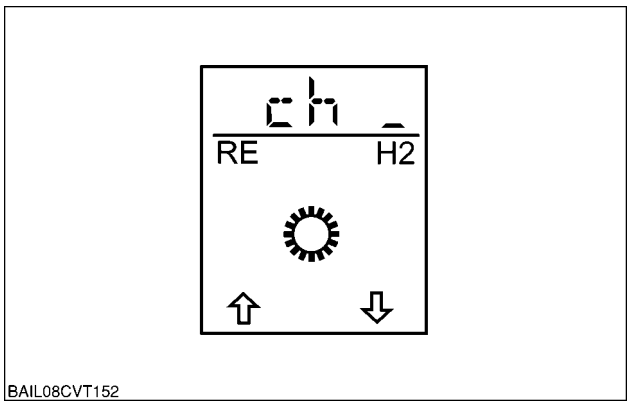


BAIL08CVT151 2

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TRANSMISSION VALUES

Select the transmission sub-system by depressing the “menu" key.
The upper section of the display will display “ch _ _".
The required channel can be selected by using the navigation “up" and “down" keys.



BAIL08CVT152 3

After a delay the channel number followed by the clutch letter and calibration value will be displayed (refer to the table below for a description of each channel).
The solenoid current values are displayed in units of milliamps and the synchro position value is displayed proportional to a voltage where the value 1025 = 5V.
Depress the “menu" key to continue navigating through the “HH" menus.

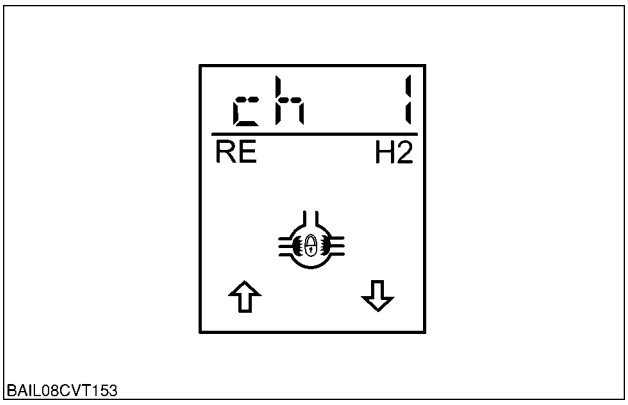
Channel	Description	Code	Approx Value
Ch 1	Clutch A calibration current	cl A	200mA-400mA
Ch 2	Clutch B calibration current	cl B	200mA-400mA
Ch 3	F1 synchro position potentiometer calibration value	F1 P	61 to 249
Ch 4	F2 synchro position potentiometer calibration value	F2 P	61 to 249
Ch 5	F3 synchro position potentiometer calibration value	F3 P	731 to 963
Ch 6	F4 synchro position potentiometer calibration value (4x2 transmission only)	F4 P	731 to 963
Ch 7	R1 synchro position potentiometer calibration value	r1 P	731 to 963
Ch 8	R2 synchro position potentiometer calibration value (4x2 transmission only)	r2 P	61 to 249
Ch 9	F1/F3 neutral position calibration value	n1 P	420 to 580
Ch 10	F2/R1 neutral position calibration value	n2 P	420 to 580
Ch 11	F4/R2 neutral position calibration value (4x2 transmission only)	n3 P	420 to 580
Ch 12	Damper torque calibration value	dt	11 to 244
Ch 13	PTO twist calibration value	Pt	4400 to 13600

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DIFFERENTIAL LOCK (FOR STEERING ANGLE SENSOR) VALUES

NOTE: *The default calibration value is 12287 for the steering angle sensor.*

Select the differential lock sub-system by depressing the “menu" key.
The lower central display will display “ch 1".



BAIL08CVT153 4

After a delay the calibration value will be displayed. (see the table below for the description of the channel).
Depress the “menu" key to continue navigating through the “HH" menus.

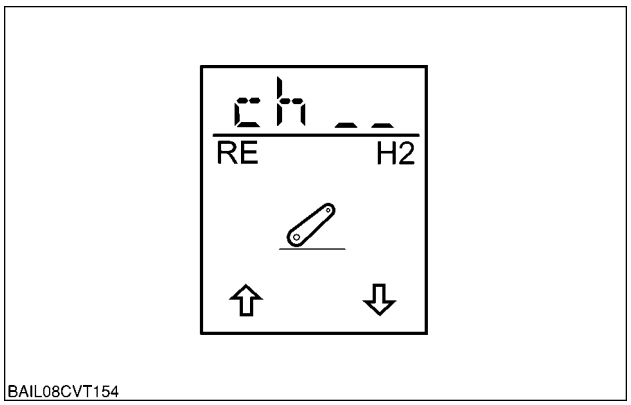
Channel	Description	Value Range
Ch 1	Steering angle sensor	7000 - 10000

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ELECTRONIC DRAFT CONTROL VALVE VALUES

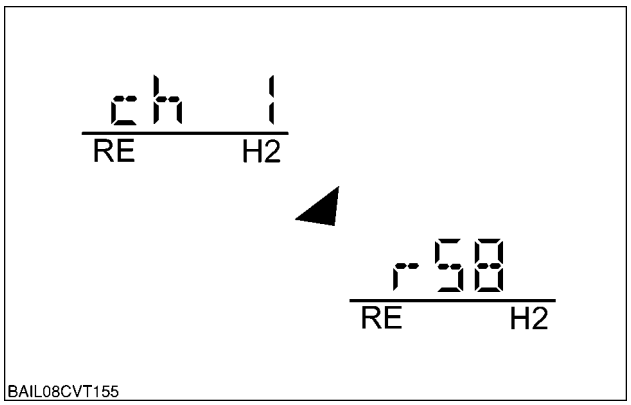
NOTE: *The default calibration value is 50 for both the raise and lower solenoids.*

Select the Electronic Draft Control sub-system by depressing the “menu" key.
The upper section of the display will display “ch _ _".
The required channel can be selected by using the navigation “up" and “down" keys.



BAIL08CVT154 5

After a delay the code followed by the calibration value will be displayed. (see the table below for the description of each channel).
Depress the “menu" key to continue navigating through the “HH" menus.



BAIL08CVT155 6

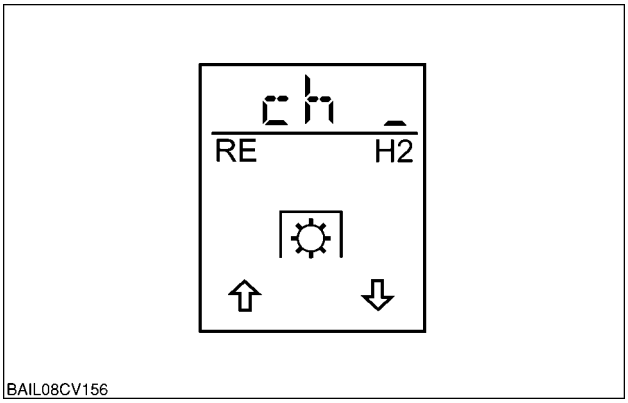
Channel	Description	Code	Value Range
Ch 1	Raise solenoid	R	20 - 80
Ch 2	Lower solenoid	L	20 - 80

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PTO VALUES

NOTE: *The default calibration value is 212 for the PTO solenoid.*

Select the PTO sub-system by depressing the “menu" key.
The upper section of the display will display “ch _ _".
The required channel can be selected by using the navigation “up" and “down" keys.



BAIL08CVT156 7

After a delay the calibration value will be displayed. (see the table below for the description of each channel).
Depress the “menu" key to continue navigating through the “HH" menus.

Channel	Description	Value Range
Ch 1	PTO oil temperature	Temperature dependant
Ch 2	PTO solenoid	100 to 420
Ch 3	Shiftable PTO extend value	700 to 900
Ch 4	Shiftable PTO retract position	100 to 300
Ch 5	Shiftable PTO neutral position	450 to 600
Ch 6	Shiftable PTO optional speed setting	1000, 540E, 540, 1000E

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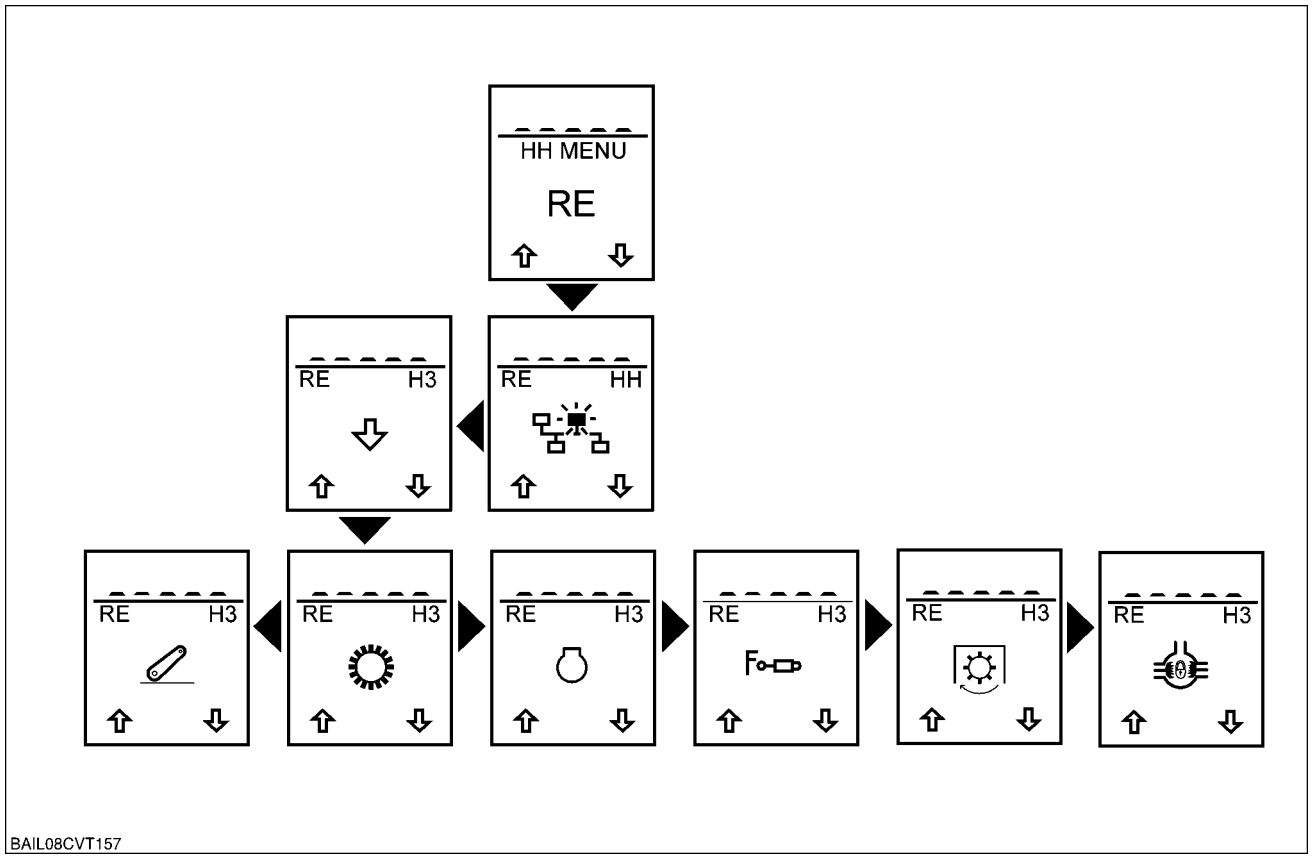
H3 - CONFIGURATIONS

This menu is used to display the configurations available for:

1. Electronic Draft Control
   - Ch.1 Diameter of the external hydraulic lift rams
   - Ch.2 Enable / Disable Electronic Draft Control
   - Ch.3 Enable / Disable Slip Control
2. Transmission
   - Ch.1 Not used
   - Ch.2 Not used
   - Ch.3 **40 Km/h** maximum speed restriction (Yes = Restricted)
   - Ch.4 Not used
   - Ch.5 Clutch A quickfill value adjustment
   - Ch.6 Clutch B quickfill value adjustment
3. Electronic engine
   - Ch.1 PTO dynamometer power boost test
   - Ch.2 Not used
   - Ch.3 Grid heater selection (Yes = fitted)
   - Ch.4 Fuel filter heater selection (Yes = fitted)
   - Ch.5 Engine brake selection (Yes = fitted)
   - Ch.6 Engine fan selection (V = viscous type, r = reversible type)
4. Front EHR
   - Ch.1 Front EHR option selection (Yes = Enabled)
   - Ch.2 Front Loader / Front Hitch selection
   - Ch.3 not used
   - Ch.4 Number of EHR setup
   - Ch.5 High flow pump selection (Yes = Enabled)
5. Rear PTO
   - Ch.1 Not used
   - Ch.2 PTO fender switches selection
   - Ch.3 PTO drop out speed option
   - Ch.4 Electronic shiftable PTO option
6. Differential Lock and Four Wheel Drive
   - Ch.1 Axle type
   - Ch.2 Not used
   - Ch.3 Front axle angles (Terralock)
   - Ch.4 Four wheel drive brake engagement speed selection

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H3 Menu Screen Select Diagram

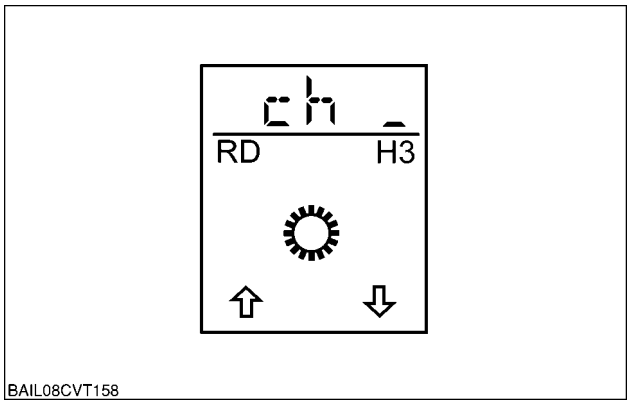


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TRANSMISSION OPTIONS

Select the transmission sub-system by depressing the “menu" key.
The upper section of the display will display “ch _ _".



BAIL08CVT158 9

The required channel can be selected by using the navigation “up" and “down" keys (see the table below for the description of each channel).

Channel	Description
Ch 1	Not used
Ch 2	Not used
Ch 3	**40 Km/h** maximum speed restriction
Ch 4	Not used
Ch 5	Clutch A quickfill value adjustment
Ch 6	Clutch B quickfill value adjustment
Ch 7	Not used
Ch 8	Not used

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Channel 1 - Not used

This channel is not used and "---" will be displayed.

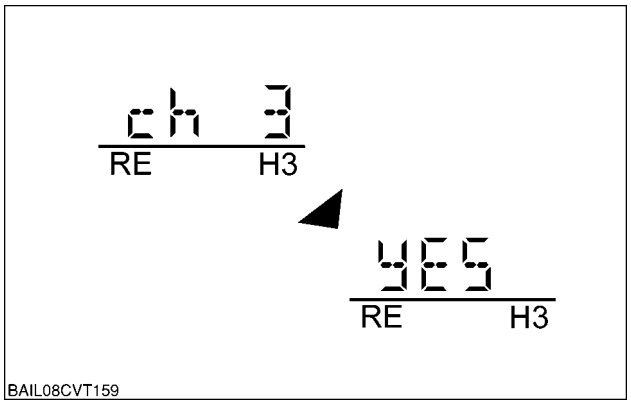
Channel 2 - Not used

This channel is not used and "---" will be displayed.

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Channel 3 - 40 Km/h maximum speed restriction

This channel is used to select whether the **40 Km/h** maximum speed restriction option is enabled or disabled.
After a delay the current stored value will be displayed.



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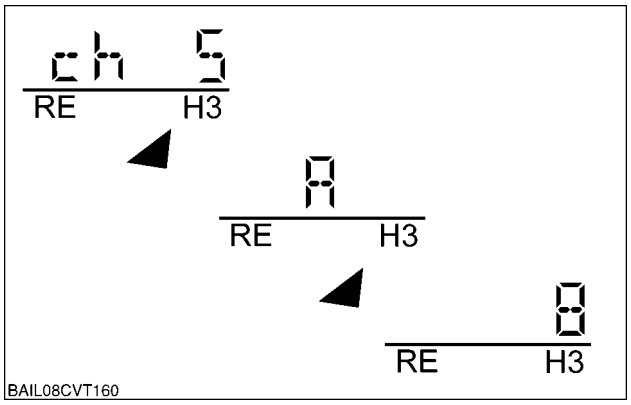
Use the navigation "up" and "down" keys to toggle between "Yes" and "No", indicating whether the **40 Km/h** maximum speed restriction option is restricted to **40 Km/h** (Yes) or unrestricted (No).
To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
The default setting for this option is "YES".
Depress the “menu" key to continue navigating through the “HH" menus.

Channels 5and 6- Clutch quick fill adjustment

These channels are used to adjust the quick fill value for the transmission solenoids.
Scroll through the available channels using the navigation "up" and "down" keys. (see the table below for the description of each channel)

Channel	Description
Ch 5	A clutch solenoid quick fill adjustment
Ch 6	B clutch solenoid quick fill adjustment

After a delay the clutch solenoid code then current stored value will be displayed.



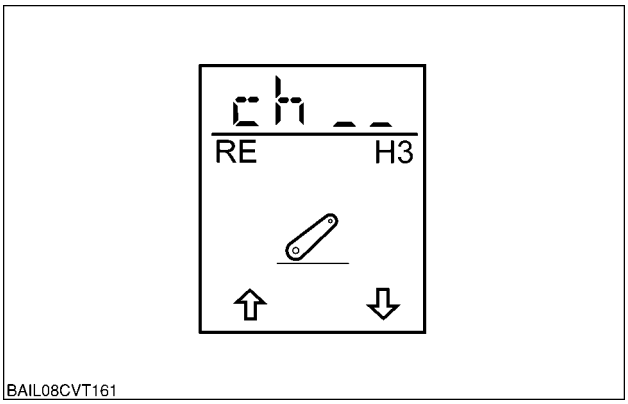
BAIL08CVT160 11

Use the navigation "up" and "down" keys to change the quick fill value between "0" and "255".
To save the desired value, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
Depress the “menu" key to continue navigating through the “HH" menus.

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ELECTRONIC DRAFT CONTROL OPTIONS

Select the Electronic Draft Control sub-system by depressing the "menu" key.
The upper section of the display will display “ch _ _".



BAIL08CVT161 12

The required channel can be selected by using the navigation “up" and “down" keys (see the table below for the description of each channel).

Channel	Description
Ch 1	Diameter of the external hydraulic lift rams
Ch 2	Enable / Disable Electronic Draft Control
Ch 3	Enable / Disable Slip Control

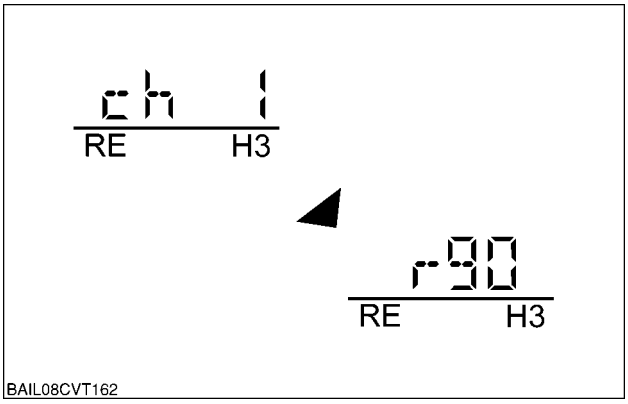
Channel 1 - Diameter Of The External Hydraulic Lift Rams

Scroll through the available options using the navigation “up" or “down" key

The options available are in **(mm)**:

- 90
- 100
- 110

The default setting for this option is "def", corresponding to 90mm. If "def" is displayed then this channel must be used to select the appropriate ram size, otherwise fault code 1070 (hydraulic ram configuration not set) will be generated.



BAIL08CVT162 13

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the “menu" key to continue navigating through the “HH" menus.

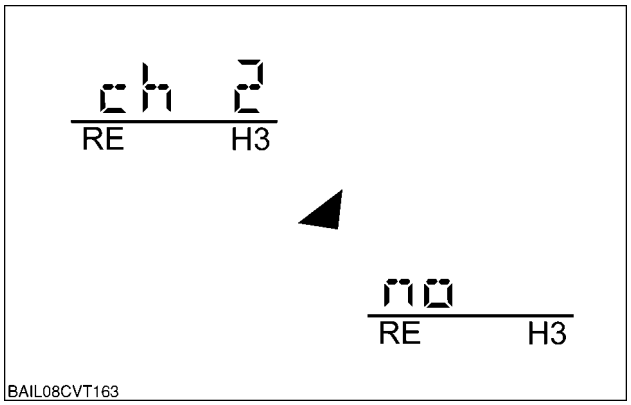
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Channel 2 - Enable / Disable Electronic Draft Control

Scroll through the available options using the navigation “up" or “down" key

The options available are:

- YES - Enable Electronic Draft Control
- NO - Disable Electronic Draft Control



BAIL08CVT163 14

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the “menu" key to continue navigating through the “HH" menus.

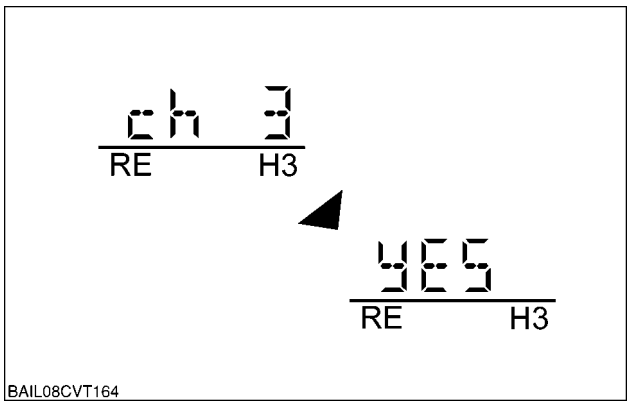
Channel 3 - Enable / Disable Slip Control

Scroll through the available options using the navigation “up" or “down" key.

The options available are:

- YES - Enable Slip Control
- NO - Disable Slip Control

The default setting is NO but will be set to YES automatically if the slip control system is detected.
If the EDC option is disabled in channel 2 then this channel will not be available.



BAIL08CVT164 15

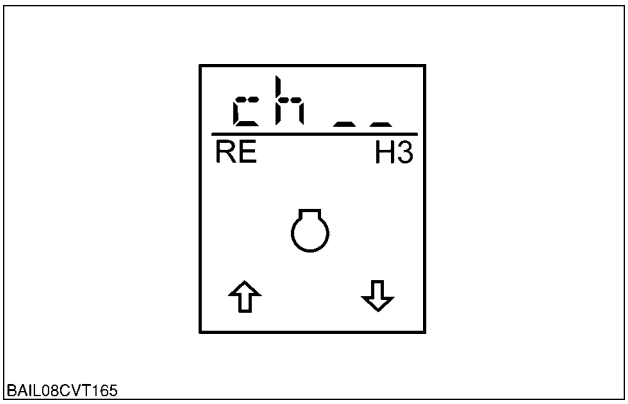
To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the “menu" key to continue navigating through the “HH" menus.

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ELECTRONIC ENGINE OPTIONS

Select the electronic engine sub-system by depressing the “menu" key.
The upper section of the display will display “ch _ _".



BAIL08CVT165 16

The required channel can be selected by using the navigation “up" and “down" keys (see the table below for the description of each channel).

Channel	Description
Ch 1	Dynamometer power boost test
Ch 2	Auto Modes Option
Ch 3	Grid heater selection
Ch 4	Fuel filter heater selection
Ch 5	Engine brake selection
Ch 6	Engine fan selection

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Channel 1 - Dynamometer Power Boost Test

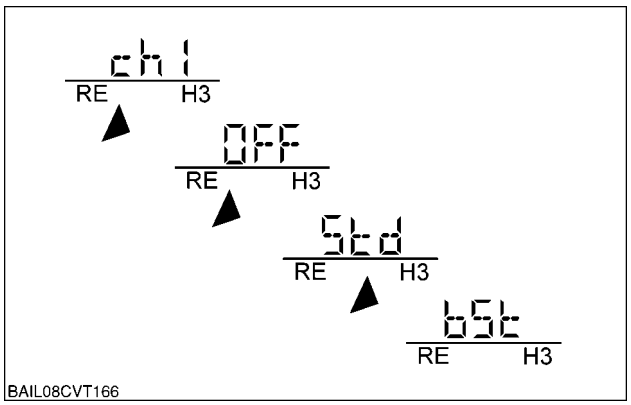
This channel is used to allow the tractor to be dynamometer tested with maximum powerboost.

NOTE: *The powerboost is only active for* ***45 minutes****.*

Scroll through the available options using the “up" or “down" key.

The options available are:

- "OFF"- dyno power boost test mode is off (normal vehicle operation)
- "Std" - dyno power boost test mode is on (straight unboosted curve without any limitations)
- "bSt" - dyno power boost test mode is on (straight boosted curve without any limitations)



BAIL08CVT166 17

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the “menu" key to continue navigating through the “HH" menus.

Channel 2 - Not used

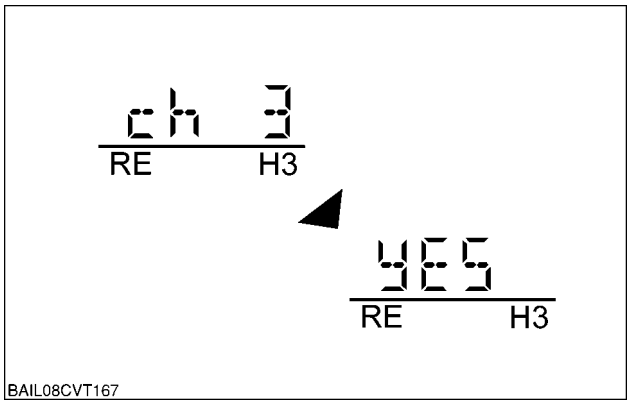
This channel is not used and "---" will be displayed.

Channel 3 - Grid heater selection

Scroll through the available options using the navigation “up" or “down" key.

The options available are:

- YES - Grid heater fitted
- NO - Grid heater not fitted



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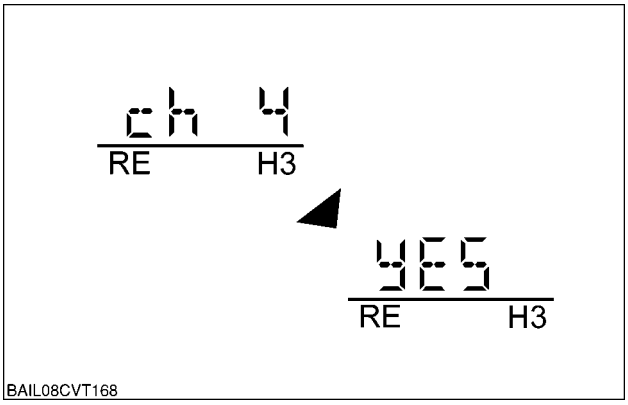
To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
The default setting for this option is "YES".
Depress the “menu" key to continue navigating through the “HH" menus.

Channel 4- Fuel filter heater selection

Scroll through the available options using the navigation “up" or “down" key.

The options available are:

- YES - Fuel filter heater fitted
- NO - Fuel filter heater not fitted



BAIL08CVT168 19

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
The default setting for this option is "NO".
Depress the “menu" key to continue navigating through the “HH" menus.

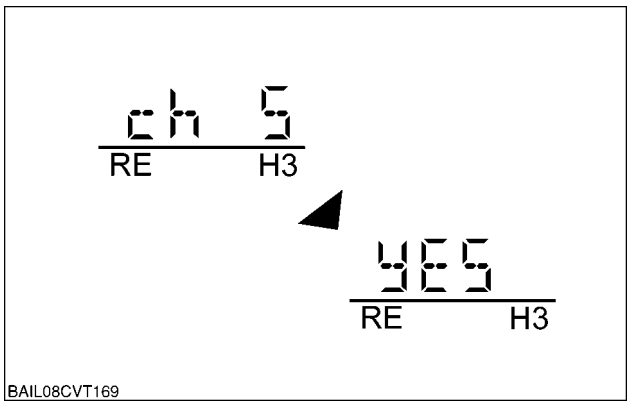
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Channel 5- Engine brake selection

Scroll through the available options using the navigation “up" or “down" key.

The options available are:

- YES - Engine brake fitted
- NO - Engine brake not fitted



BAIL08CVT169 20

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
The default setting for this option is "NO".
Depress the “menu" key to continue navigating through the “HH" menus.

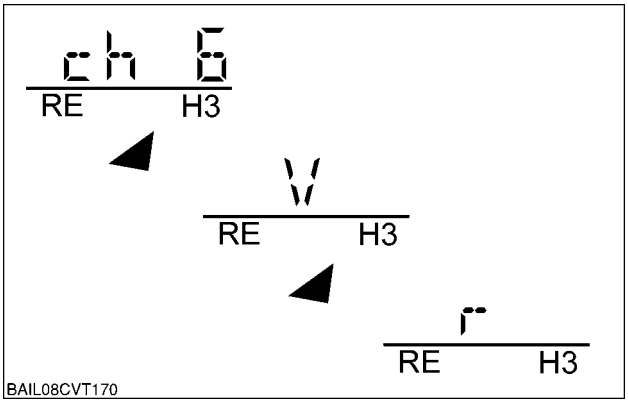
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Channel 6- Engine fan selection

Scroll through the available options using the navigation “up" or “down" key.

The options available are:

- V- Vistronic type fan fitted
- r- Reversible type fan fitted

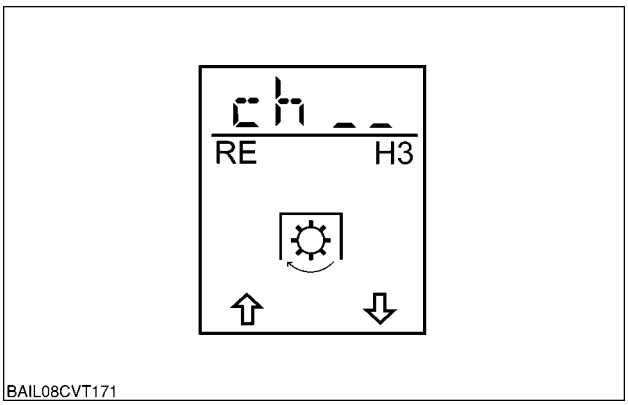


BAIL08CVT170 21

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
The default setting for this option is "V" (vistronic fan type).
Depress the “menu" key to continue navigating through the “HH" menus.

REAR PTO OPTIONS

Select the Rear PTO sub-system by depressing the “menu" key.
The upper section of the display will display “ch _ _".



BAIL08CVT171 22

The required channel can be selected by using the navigation “up" and “down" keys (see the table below for the description of each channel).

Channel	Description
Ch 1	Not used
Ch 2	PTO fender switches selection
Ch 3	PTO drop out speed selection
Ch 4	Electronic shiftable PTO option

Channel 1 - Not used

This channel is not used and "---" will be displayed.

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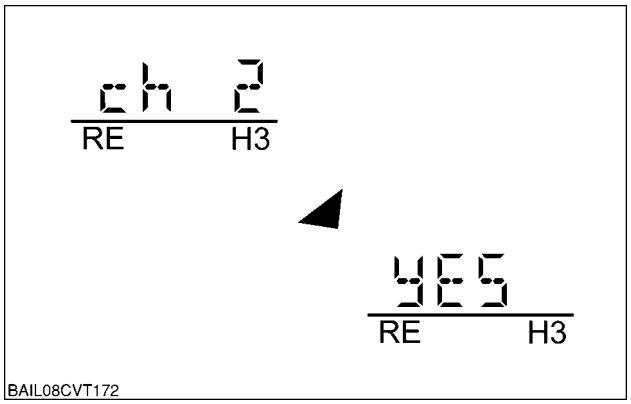
Channel 2 - PTO Fender Switches Selection

This channel is used to disable/enable the rear PTO fender switch.
Scroll through the available options using the navigation “up" or “down" key

The options available are:

- YES - Enable rear PTO fender switches
- NO - Disable rear PTO fender switches

If the vehicle is fitted with external rear fender PTO switches then this option must be setup before the PTO is calibrated.



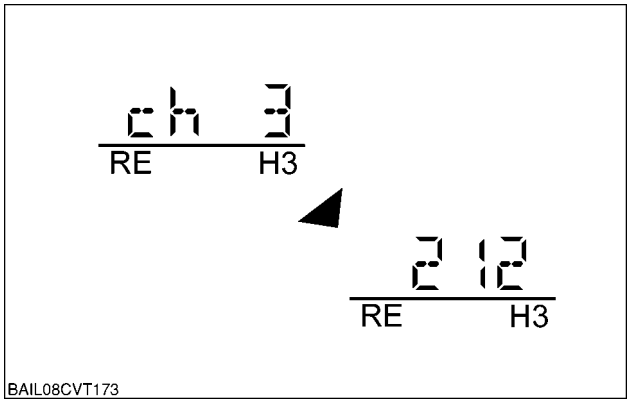
BAIL08CVT172 23

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the “menu" key to continue navigating through the “HH" menus.

Channel 3 - PTO Drop Out Speed Selection

This channel is used to adjust the engine speed below which the PTO will drop out.
After a delay the current setting will be displayed.



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Use the navigation "up" and "down" keys to increase or decrease the setting in **10 RPM** increments between **0 - 550 RPM**.
To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
The default value on a new module or after an H8 operation is **0 RPM**.
Depress the “menu" key to continue navigating through the “HH" menus.

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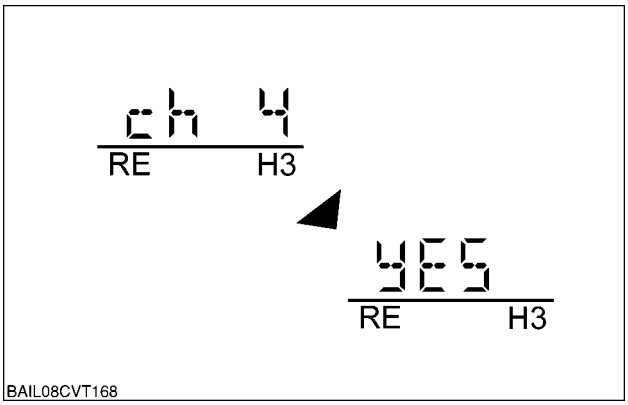
Channel 4- Electronic shiftable PTO option

This channel is used to select the electronic shiftable PTO if fitted to the vehicle.
Scroll through the available options using the navigation “up" or “down" key

The options available are:

- YES - Electronic shiftable PTO fitted
- NO - Electronic shiftable PTO not fitted

The default value is "YES".



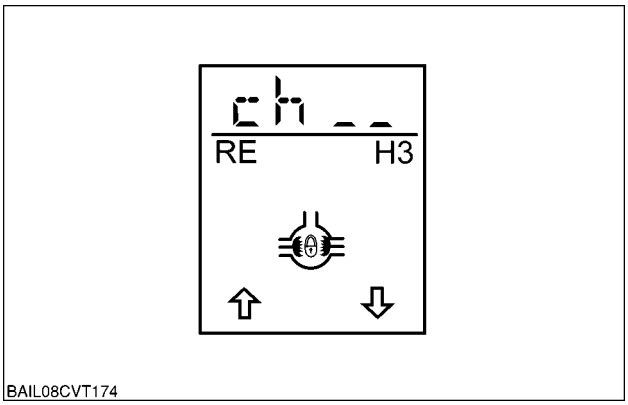
BAIL08CVT168 25

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the “menu" key to continue navigating through the “HH" menus.

DIFFERENTIAL LOCK AND FOUR WHEEL DRIVE OPTIONS

Select the differential lock and four wheel drive sub-system by depressing the “menu" key.
The upper section of the display will display “ch _ _".



BAIL08CVT174 26

The required channel can be selected by using the navigation “up" and “down" keys (see the table below for the description of each channel).

Channel	Description
Ch 1	Axle type
Ch 2	Not used
Ch 3	Front axle angles
Ch 4	Four wheel drive brake engagement speed selection

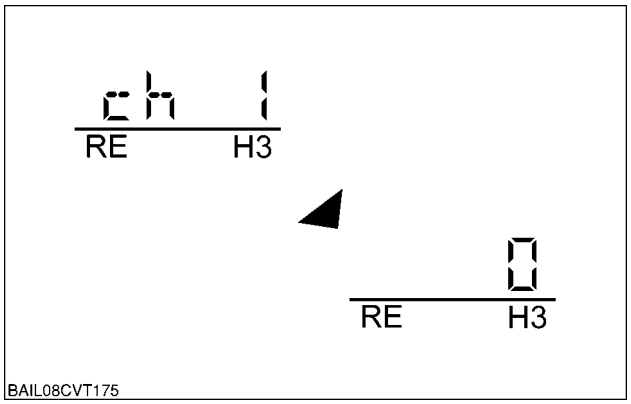
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Channel 1 - Axle Type

This channel is used to select the front axle type.
Scroll through the available options using the navigation “up" or “down" key

The options available are:

- 0 - Standard front axle
- 1 - Super Steer front axle



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To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
The default setting for this option is "0".
Depress the “menu" key to continue navigating through the “HH" menus.

Channel 2- Four Wheel Drive Selection

This channel is not used and "---" will be displayed.

Channel 3 - Front Axle Angles

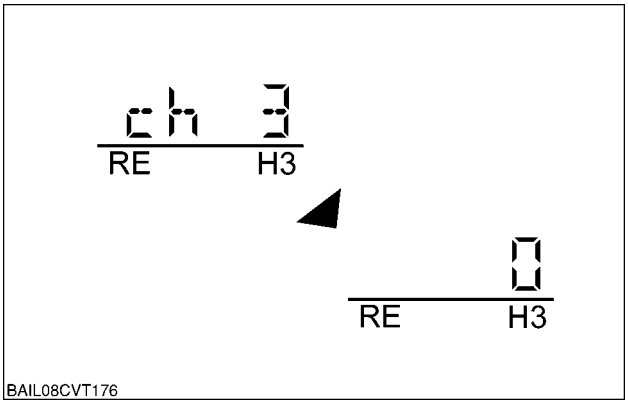
This channel is used to select the steering angle at which the Auto Difflock and Auto Four Wheel Drive functions engage and disengage.

Scroll through the available options using the navigation “up" or “down" key.
The available options (0, 1, 2 or 3) are shown in the table below with a description of each option.

Standard Axle

	0-10Km/h	0-10Km/h	0-10Km/h	0-10Km/h	10-15Km/h	10-15Km/h	10-20Km/h	10-20Km/h
	Auto Four Wheel Drive	Auto Four Wheel Drive	Auto Difflock	Auto Difflock	Auto Difflock	Auto Difflock	Auto Four Wheel Drive	Auto Four Wheel Drive
	Degrees Right	Degrees Left	Degrees Right	Degrees Left	Degrees Right	Degrees Left	Degrees Right	Degrees Left
Option 0	20º	18.5º	15º	14.25º	10º	9.5º	15º	14.2º
Option 1	45º	37.5º	20º	18.5º	10º	9.5º	40º	34º
Option 2	15º	14.2º	10º	9.5º	10º	9.5º	15º	14.2º
Option 3	11.7º	10.9º	5º	4.5º	10º	9.5º	15º	14.2º

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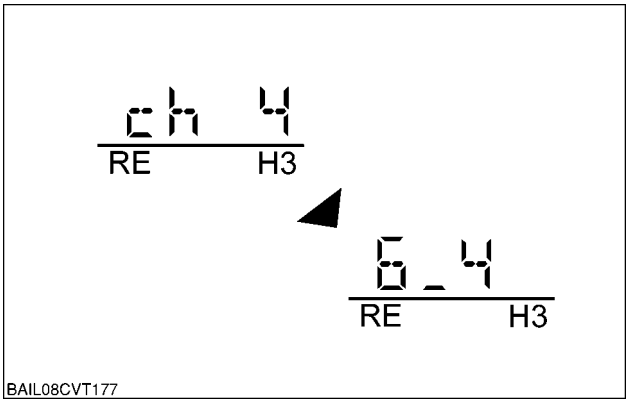
To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
Depress the “menu" key to continue navigating through the “HH" menus.

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Channel 4 - Four Wheel Drive Brake Engagement Speed Selection

This channel is used to select the ground speed below which four wheel drive braking will not occur.
Scroll through the available options using the navigation “up" or “down" key.
The available options (0, 1, 2, 3 or 4) are shown in the table below with a description of each option.

	Option 4	Option 3	Option 2	Option 1	Option 0
Four wheel braking engagement, if wheel speed is greater than or equal to:	Default **6.4 Km/h**.	**4.8 Km/h**.	**3.2 Km/h**.	**1.6 Km/h**.	**0 Km/h**.



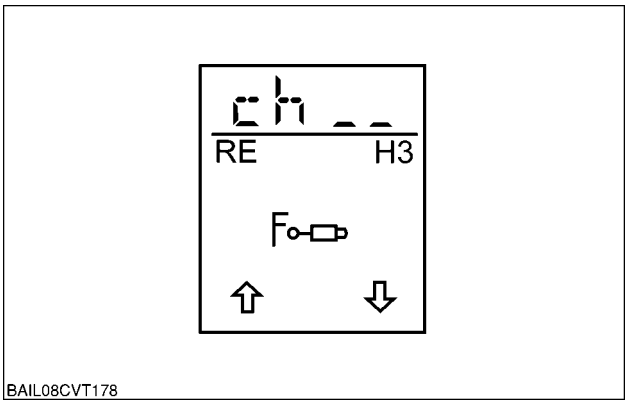
BAIL08CVT177 29

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
Depress the “menu" key to continue navigating through the “HH" menus.

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FRONT EHR OPTIONS

Select the Front EHR sub-system by depressing the “menu" key.
The upper section of the display will display “ch _ _".



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The required channel can be selected by using the navigation “up" and “down" keys (see the table below for the description of each channel).

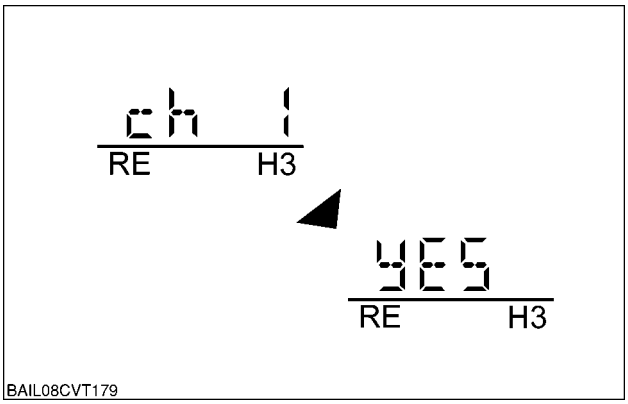
Channel	Description
Ch 1	Front EHR option selection
Ch 2	Front Loader / Front Hitch selection
Ch 3	not used
Ch 4	Number of EHR setup
Ch 5	High flow pump selection

Channel 1 - Front EHR Option Selection

This channel is used to disable/enable the front EHR.
Scroll through the available options using the navigation “up" or “down" key.

The options available are:

- Yes - Enable front EHR
- No - Disable front EHR



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To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the “menu" key to continue navigating through the “HH" menus.

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Channel 2 - Front Loader / Front Hitch Selection

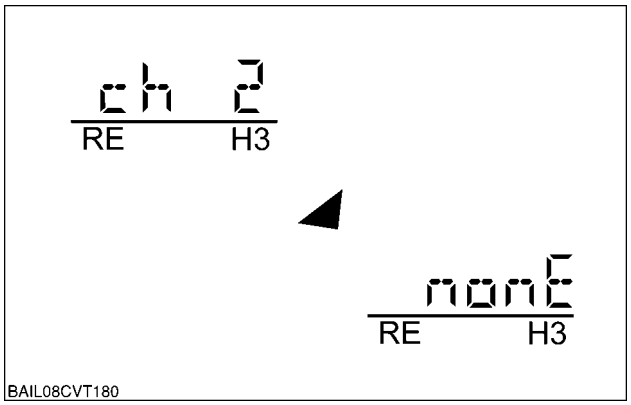
This channel is used to select if the front EHRs are used in conjunction with the front hitch or the front loader. Scroll through the available options using the navigation “up" or “down" key.

The options available are:

- nonE - Neither selected
- Htch - Front hitch selected
- LOAd - Front loader selected

NOTE: *If the front EHR’s are to be used to control the front hitch then the front hitch option must also be enabled in the "RM" module.*

NOTE: *If Front Hitch is selected then the Front EHR valve 1 will be reserved for front hitch operation. If Front Loader is selected then the front EHR valves 1-3 will be reserved for front loader operation. If None is selected then all the front EHR valves will be available for use.*



BAIL08CVT180 32

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
Depress the “menu" key to continue navigating through the “HH" menus.

Channel 3

This channel is not used and "---" will be displayed.

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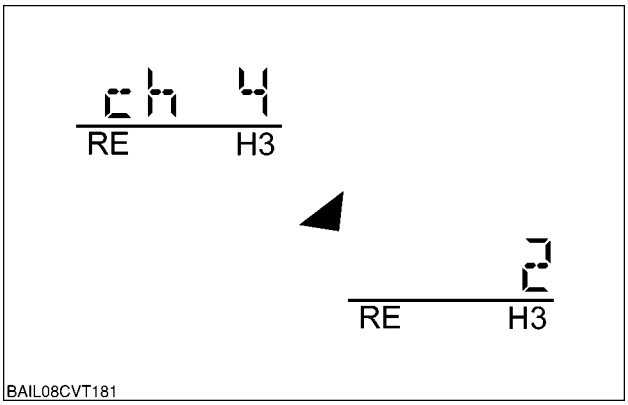
Channel 4 - Number of EHR Setup

When a new module is installed or the H8 procedure is completed, automatic detection for the number of remotes is used. If at any time the number of fitted remotes needs to be changed then this setup channel is used.

Scroll through the available options using the navigation “up" or “down" key.

The options available are:

- 2
- 3
- 4



BAIL08CVT181 33

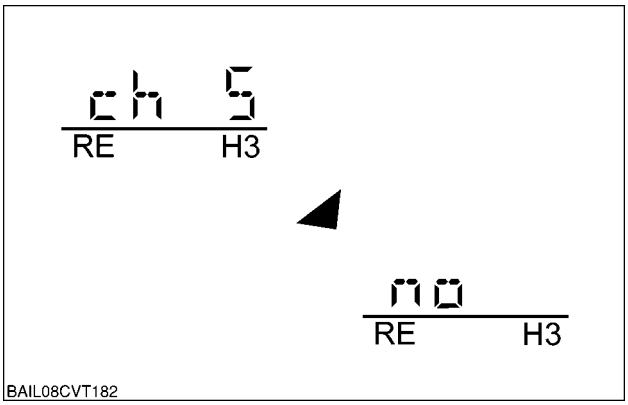
To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.
Depress the “menu" key to continue navigating through the “HH" menus.

Channel 5 - High Flow Pump Selection

This channel is used to disable/enable the high flow pump.
Scroll through the available options using the navigation “up" or “down" key.

The options available are:

- Yes - Enable high flow pump
- No - Disable high flow pump



BAIL08CVT182 34

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

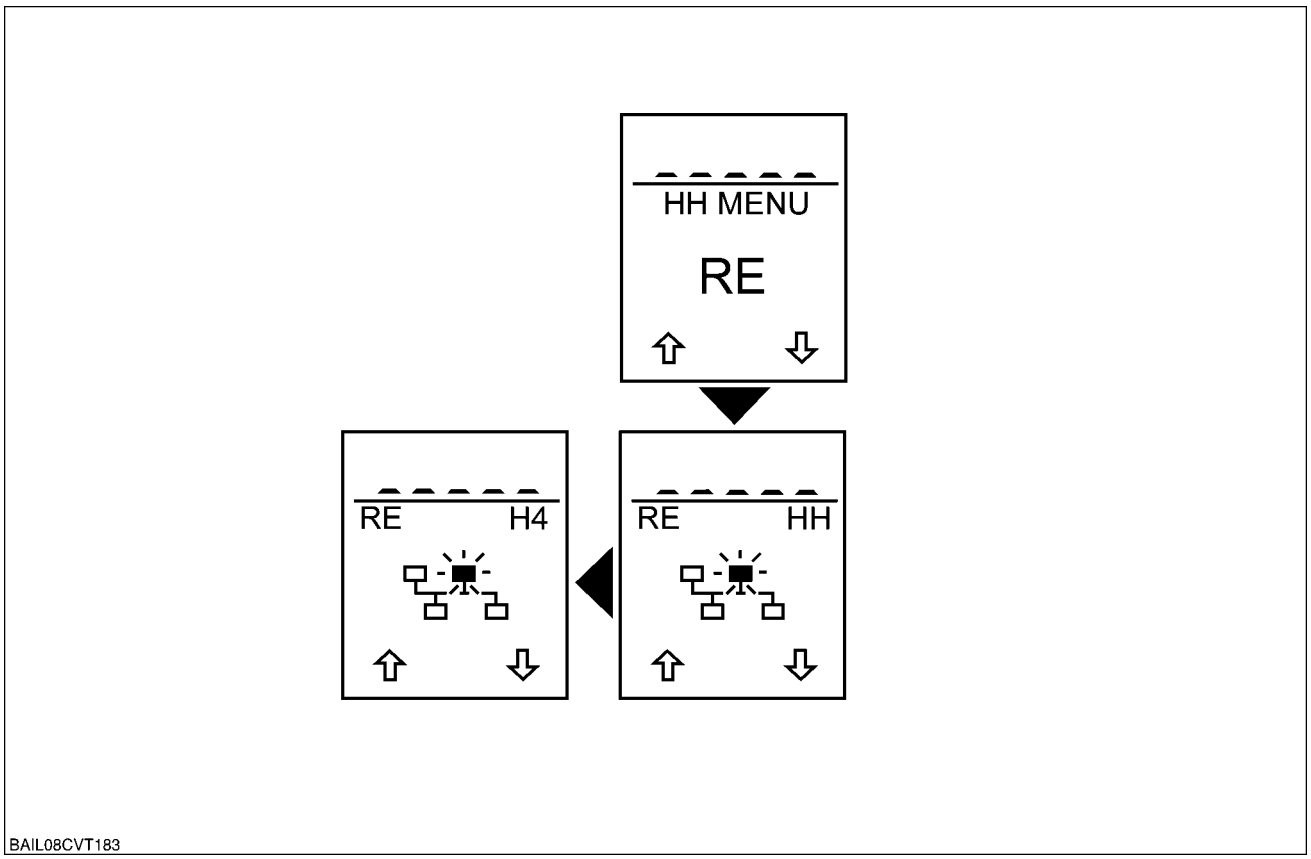
Depress the “menu" key to continue navigating through the “HH" menus.

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H4 - VIEW SOFTWARE REVISION LEVEL

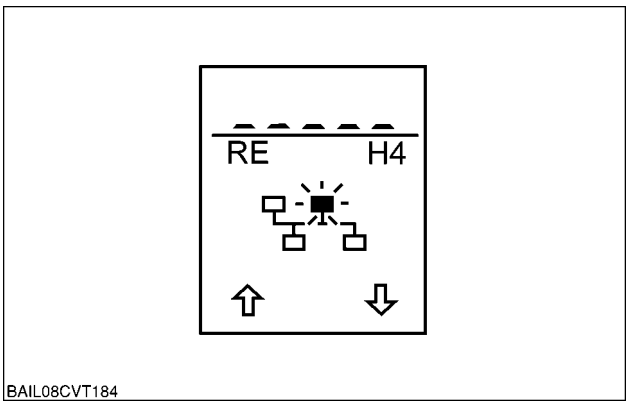
Common to all sub-systems.

H4 Menu Screen Select Diagram



BAIL08CVT183 35

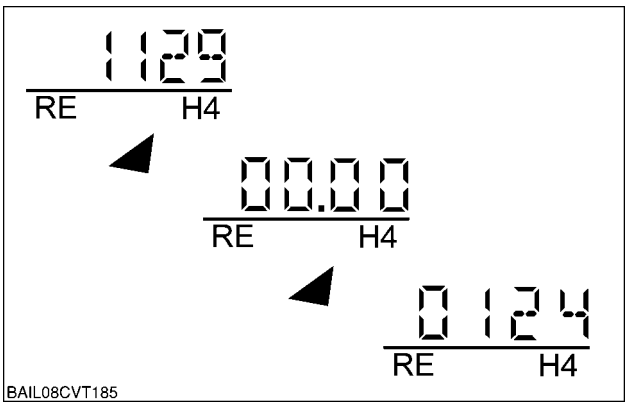
Select the H4 menu by depressing the "menu" key.



BAIL08CVT184 36

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The upper section of the display will automatically cycle through the software release, as the example shown and return to allow navigation of the "HH" menus.



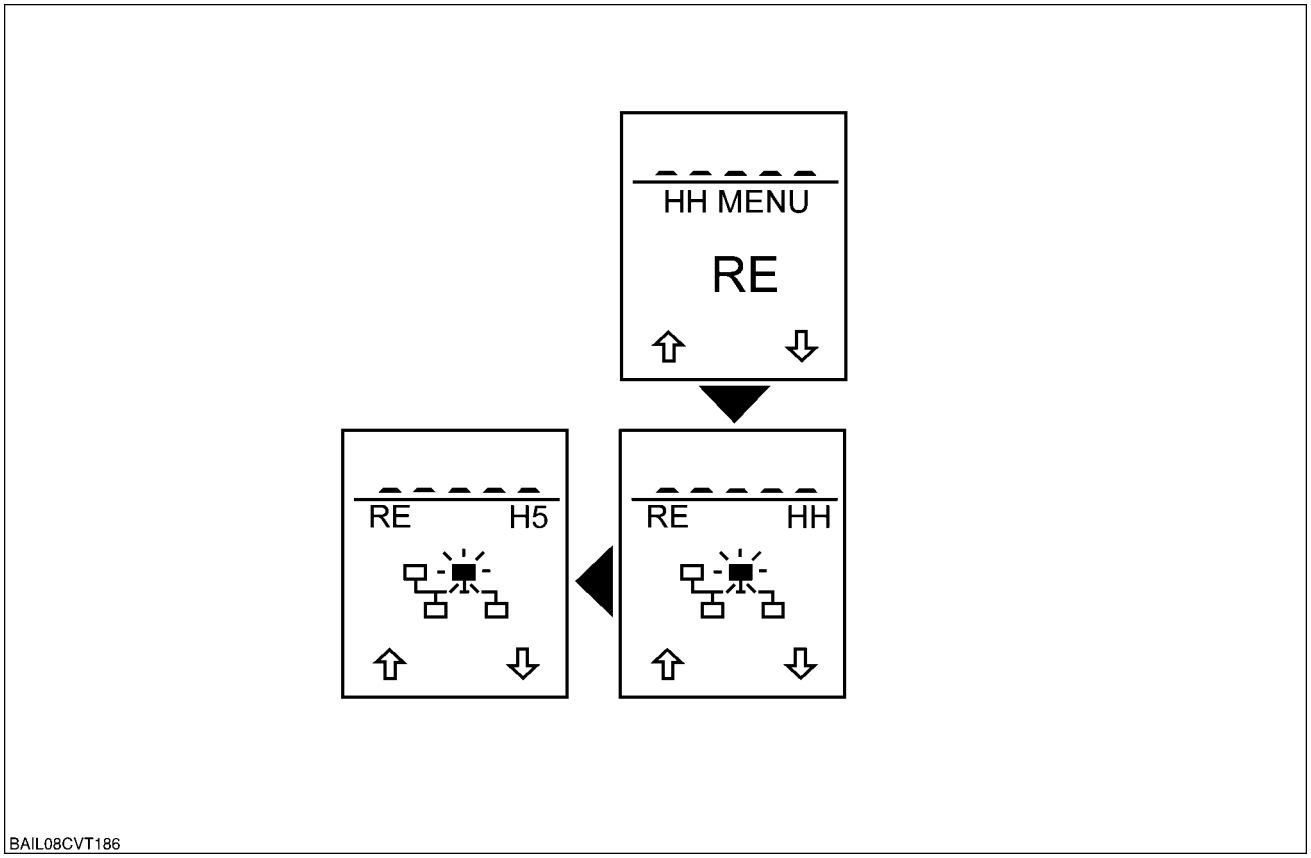
BAIL08CVT185 37

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H5 - SWITCH OPERATION TEST

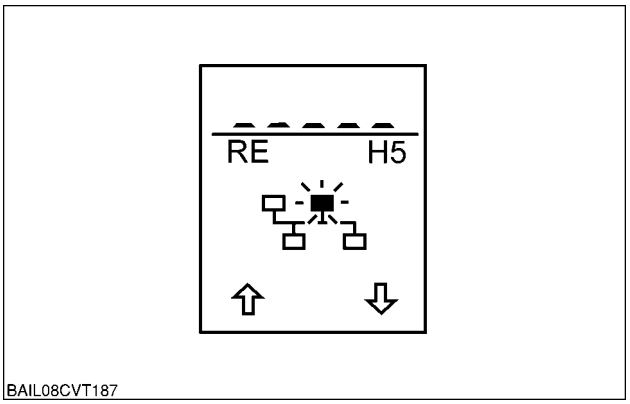
This menu displays a designated code when a switch transition is detected.
Common to all sub-systems.

H5 Menu Screen Select Diagram



BAIL08CVT186 38

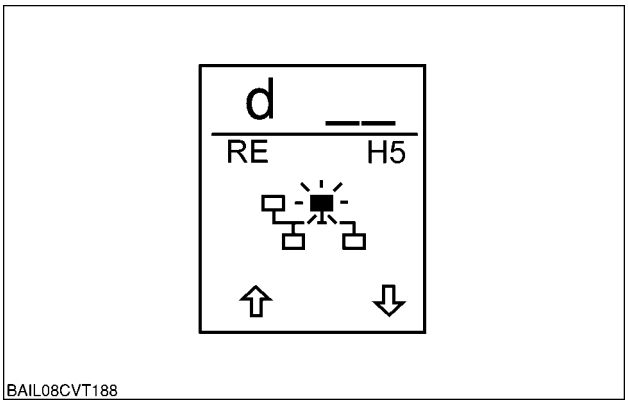
Select the H5 menu by depressing the "menu" key.



BAIL08CVT187 39

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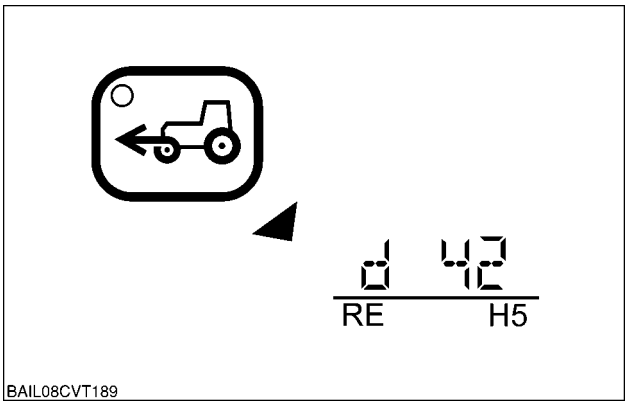
The upper section of the display will display "d _ _"



BAIL08CVT188 40

When a switch is operated, a code will be displayed and an audible tone should be heard to indicate the correct function.
If a switch code is not displayed and the audible tone not heard, a 'wiggle' test can be performed on the related wiring, while watching the display or listening for the audible tone, to help locate the fault.

NOTE: *If the keystart switch is turned to the "crank" position, with the shuttle lever in neutral and the clutch pedal down, a switch disagreement error may occur.*



BAIL08CVT189 41

Channel	Control unit plug connection	Pin number	Description
d0	**-**	**-**	**No switch activated or two switches activated at the same time**
d1	CN1B	30	Rear control switch for the EDC - Lower
d2	CN1B	29	Rear control switch for the EDC - Raise
d3	via CAN		EDC work switch (on hand controller)
d4	via CAN		EDC raise switch (on hand controller)
d7	CN3A	15	Connection of the NASO lighting (disconnect and reconnect the flasher unit)
d8	CN1B	21	Crank detect switch
d10	CN4	9	Seat switch
d11	CN4	10	Handbrake switch
d12	CN1B	22	Left brake pedal switch
d13	CN1B	23	Right brake pedal switch
d14	CN1A	8	Clutch pedal switch (engine running and transmission in forward or reverse)
d15	CN1B	12	Switch for the shuttle lever - Forwards
d16	CN1B	13	Switch for the shuttle lever - Reverse
d23	CN1B	27	Momentary shuttle lever forward/reverse switch
d24	CN4	16	Momentary shuttle lever neutral switch

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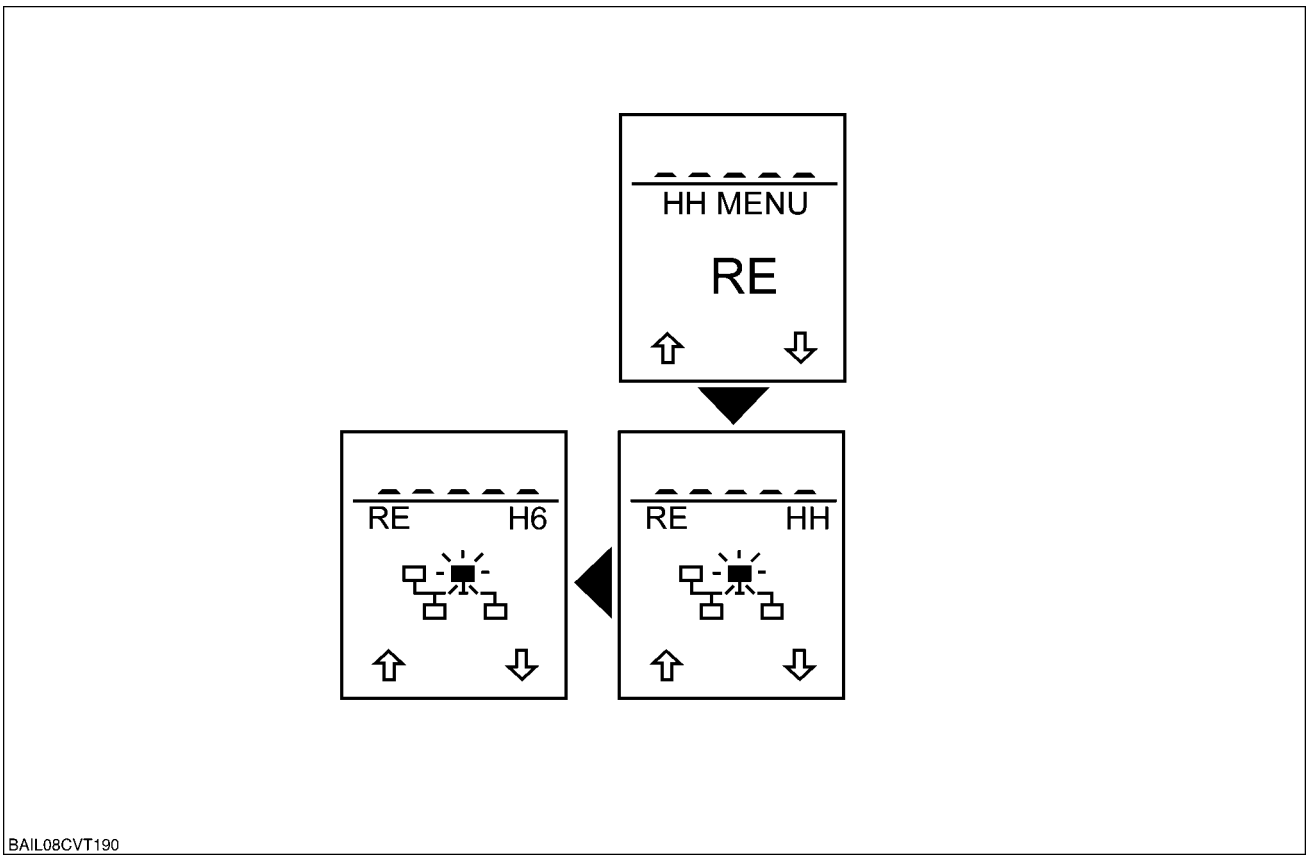
Channel	Control unit plug connection	Pin number	Description
d0	**-**	**-**	**No switch activated or two switches activated at the same time**
d31	CN3A	14	Air conditioning pressure switch (bridge switch to test with engine off)
d32	CN3A	17	EDC lock switch
d33	CN1B	19	Radar present input (disconnect radar to test)
d38	via CAN	-	Differential lock switch - Manual
d39	via CAN	-	Differential lock switch - Automatic
d41	via CAN	-	All-wheel drive switch - Manual
d42	via CAN	-	All-wheel drive switch - Automatic
d44	CN3A	12	Rear PTO switch - normally open
d45	CN3A	13	Rear PTO switch - normally closed
d46	CN4	24	Hi flow not present input
d47	CN3B	24	Switch for rear PTO brake
d49	via CAN	-	Rear PTO switch - management
d50	via CAN	-	HTS switch record mode
d53	CN1B	24	Transmission oil pressure switch (bridge switch to test with engine off)
d55	via CAN	-	Engine speed switch - decrease
d56	via CAN	-	Engine speed switch - Increase
d60	CN3B	32	Foot throttle not at idle switch
d63	CN3A	18	Fender switch of the rear PTO - normally open
d64	CN3A	3	Fender switch of the rear PTO - normally closed
d80	via CAN	-	HTS AUTO switch
d81	via CAN	-	HTS Manual switch
d93	CN4	25	Front HPL present link (disconnect and reconnect the 13-way connector)
d94	CN3A	16	EHR lock switch
d95	via CAN	-	EHR 1 program / motor mode switch
d96	via CAN	-	EHR 1 program / motor mode switch
d104	via CAN	-	HTS step switch on hand controller
d105	via CAN	-	Cruise switch on hand controller
d111	CN3A	20	PTO speed select switch - speed 1 (1000)
d112	CN4	18	PTO speed select switch - speed 2 (1000E)
d113	CN4	4	PTO speed select switch - neutral
d122	via CAN	-	CRPM speed 1 selection switch
d123	via CAN	-	CRPM speed 2 selection switch
d125	via CAN	-	Auto engine brake switch
d126	via CAN	-	Engine brake pedal switch
d127	via CAN	-	Reversible fan switch
d136	via CAN	-	Arm rest unit forward switch
d137	via CAN	-	Arm rest unit reverse switch
d138	via CAN	-	Accelerator/shuttle speed switch
d139	via CAN	-	Switching button EPC F1/F2 to F3/F4 on the joystick
d165	via CAN	-	EHR float control switch
d169	via CAN	-	Range increase switch (on hand controller)
d170	via CAN	-	Range decrease switch (on hand controller)

CN1a = **X092**
CN1b = **X093**
CN2 = **X091**
CN3a = **X094**
CN3b = **X095**
CN4 = **X097**

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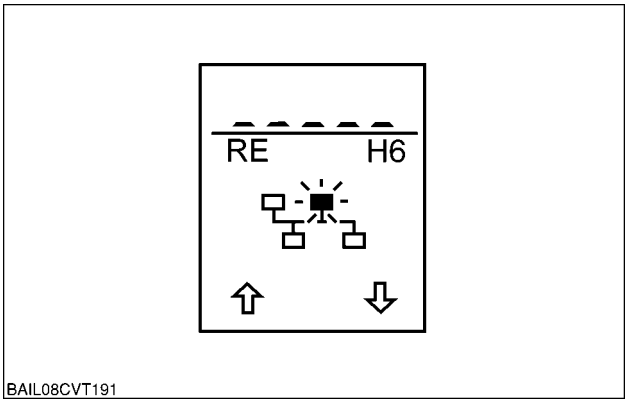
H6 - VEHICLE INFORMATION VIEW

H6 Menu Screen Select Diagram



BAIL08CVT190 42

Select the H6 menu by depressing the "menu" key.

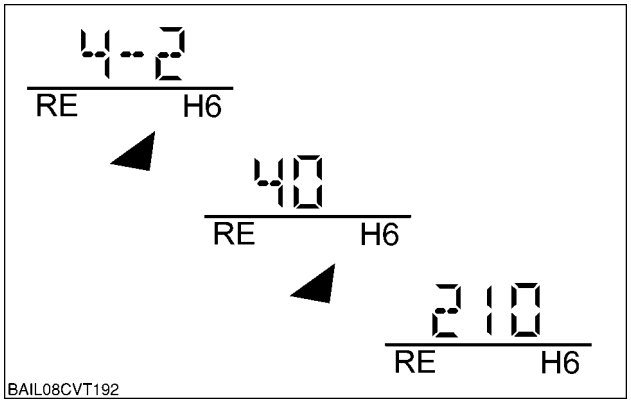


BAIL08CVT191 43

The upper section of the display will automatically cycle through as the example:

- 4 - 2 = Driveline ranges
- 40 = Transmission speed
- 210 = Engine power

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BAIL08CVT192 44

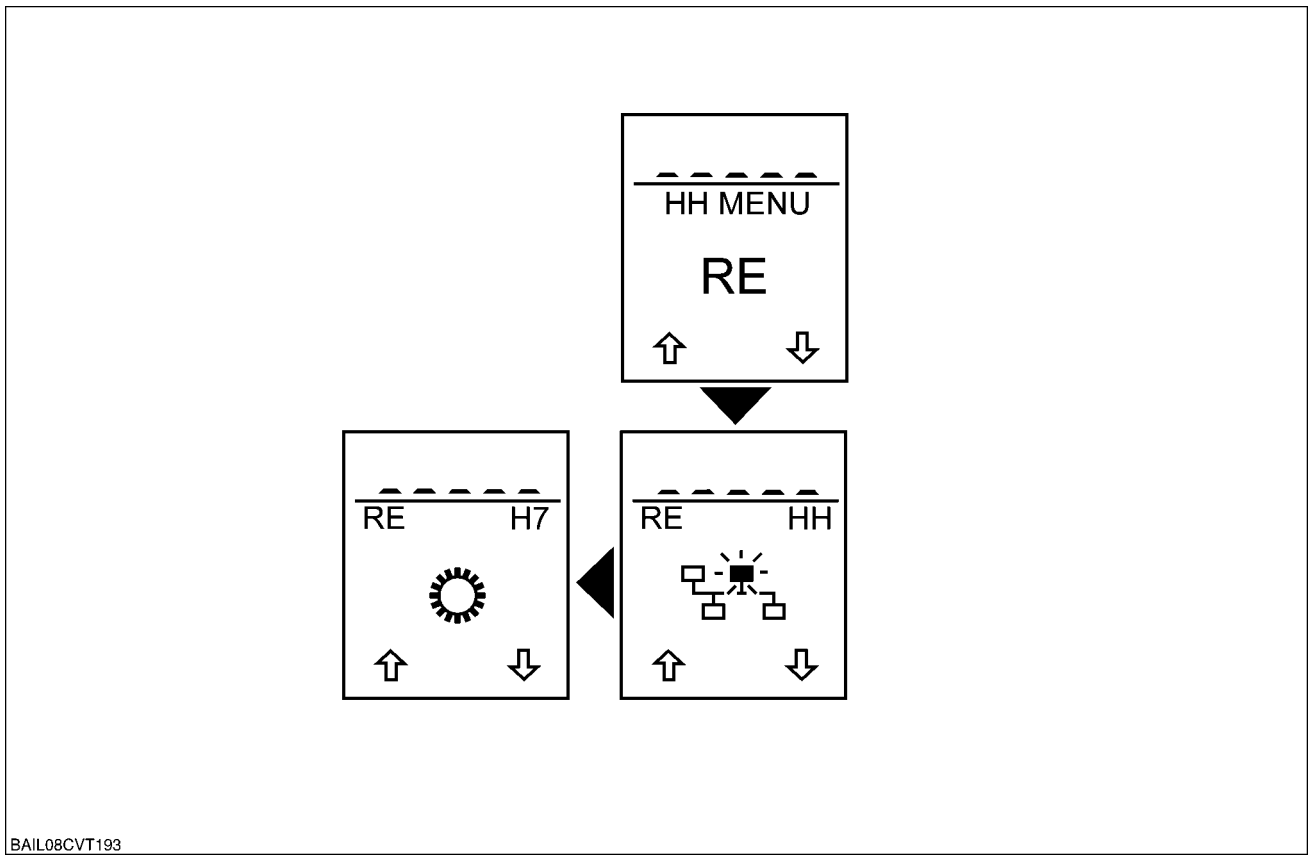
At the end of the cycle the display will return to continue navigating through the “HH" menus.

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H7 - TEST MODES

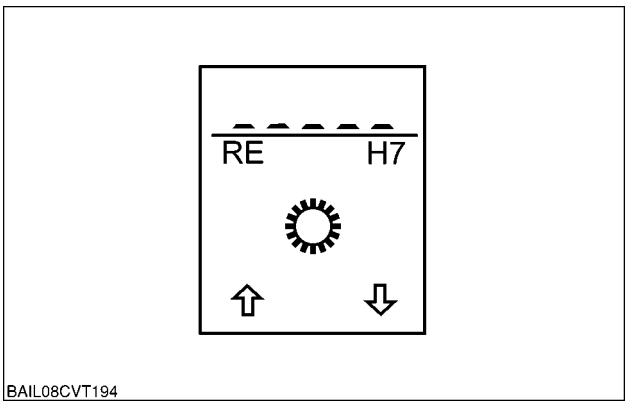
This menu is used to check the clutch disconnect switch adjustment and to test the transmission synchronisers.

H7 Menu Screen Select Diagram



BAIL08CVT193 45

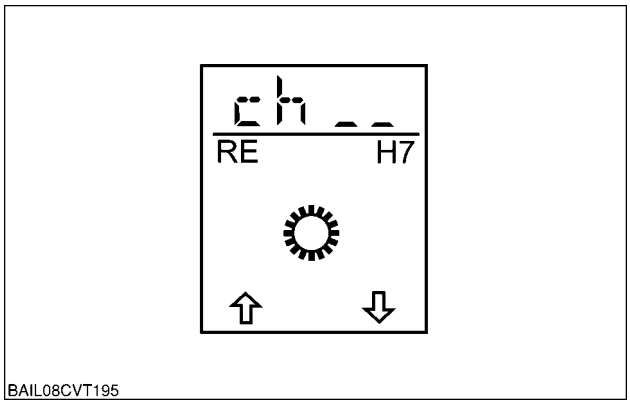
Select the H7 menu by depressing the "menu" key.



BAIL08CVT194 46

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The upper section of the display will display "ch _ _"



BAIL08CVT195 47

The required channel can be selected by using the navigation “up" and “down" keys (see the table below for the description of each channel).

Channel	Description
Ch 1	Clutch disconnect switch test
Ch 2	Manual clutch adjustment
Ch 3	Manual quick fill adjustment
Ch 4	Clutch pressure test
Ch 5	Synchroniser test
Ch 6	Not used

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Channel 1 - Clutch Disconnect Switch Test

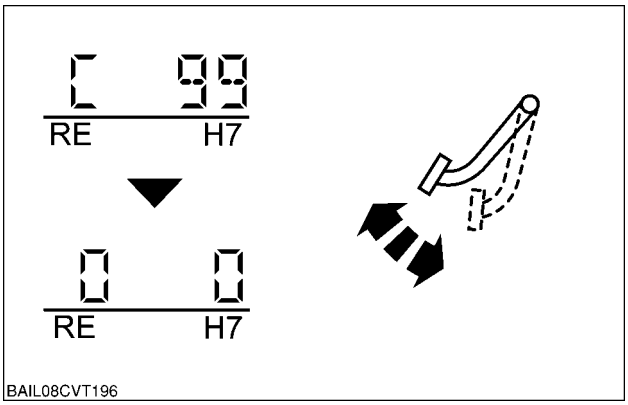
This channel is used to display the clutch pedal position and status. In addition it also displays the oil temperature.

The clutch position is shown as a percentage of travel between (99-0):

- 99 = Clutch pedal is fully up
- 0 = Clutch pedal is fully down

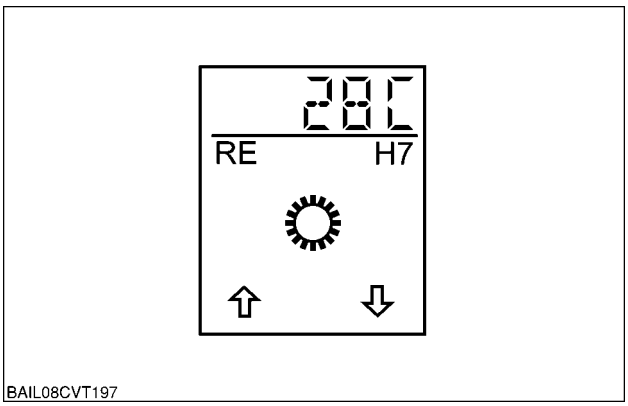
The clutch position is also shown as in it’s switch state:

- O = Clutch pedal switch is open
- C = Clutch pedal switch is closed



BAIL08CVT196 48

If the clutch pedal has been left in the fully up position for more than 5 seconds, the oil temperature will be displayed in the upper section of the display.



BAIL08CVT197 49

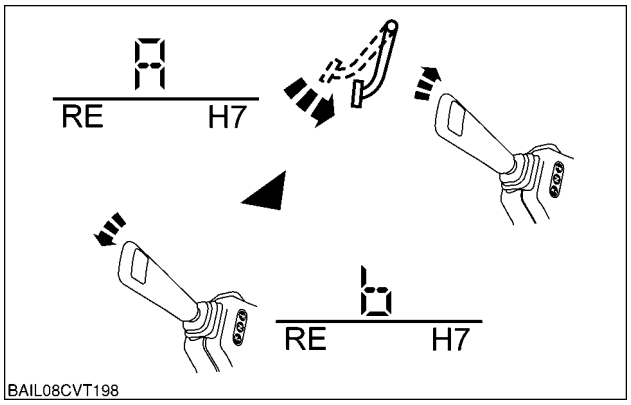
Depress the “menu" key to continue navigating through the “HH" menus.

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Channel 2 - Manual Clutch Adjustment

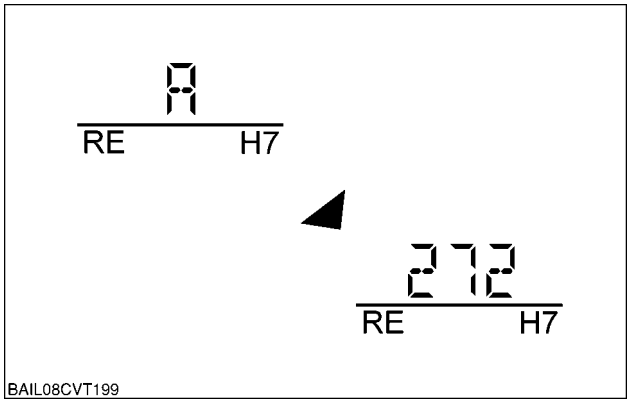
This channel is used to manually adjust and test the calibration values for each clutch.

Select the clutch to be adjusted by depressing the clutch pedal and cycling the shuttle lever.
Shifting the shuttle lever forward will select clutch A..
Shifting the shuttle lever into reverse will select clutch B.



BAIL08CVT198A 50

After a delay when the required clutch is selected, the current stored value will be shown in the upper section of the display.



BAIL08CVT199 51

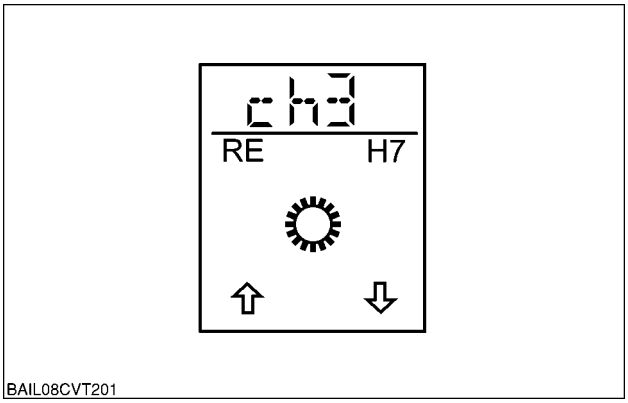
The calibration values can be adjusted using the forward and reverse buttons on the hand controller.
To test the calibration, leave the shuttle lever out of neutral and fully release the clutch pedal. one clutch will be applied at low pressure to provide a torque path through the transmission, then the clutch that is being adjusted will be applied at it's bite point pressure so that it should just begin to engage.
To test the same clutch, depress the clutch pedal slightly and release it again.

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Channel 3 - Manual Quick Fill Adjustment

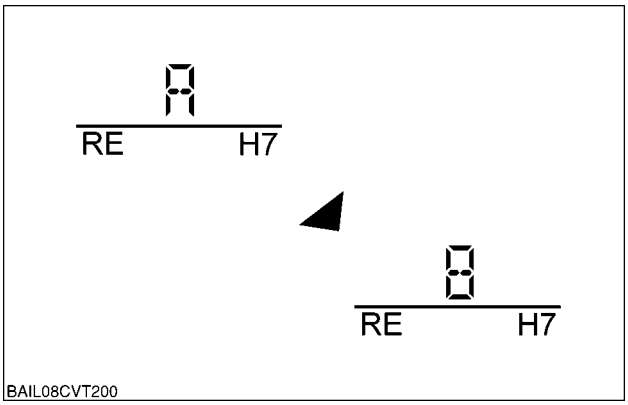
This channel is used to adjust and test the quick fill settings for each clutch.

Select channel 3 using the menu button.



BAIL08CVT201 52

Select the clutch to be adjusted by depressing the clutch pedal and shifting the shuttle lever into forward for clutch A and shifting into reverse for Clutch B.
The display will show the current quick fill value for the selected clutch. To adjust the quickfill depress the forward button on the hand controller to increase the value and the reverse button to decrease the value.



BAIL08CVT200 53

Depress the “menu" key to continue navigating through the “HH" menus.

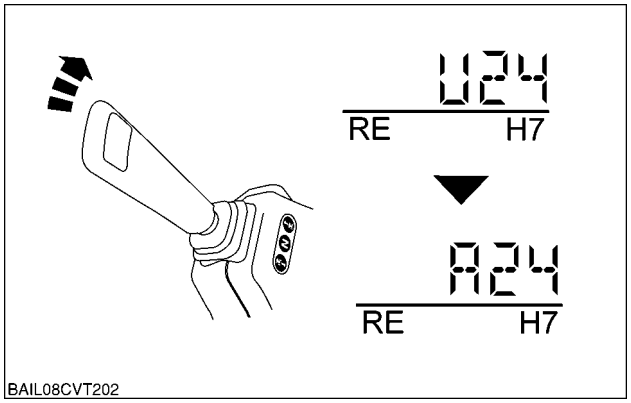
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Channel 4- Clutch Pressure Test

This channel is used to test the pressure for each clutch.

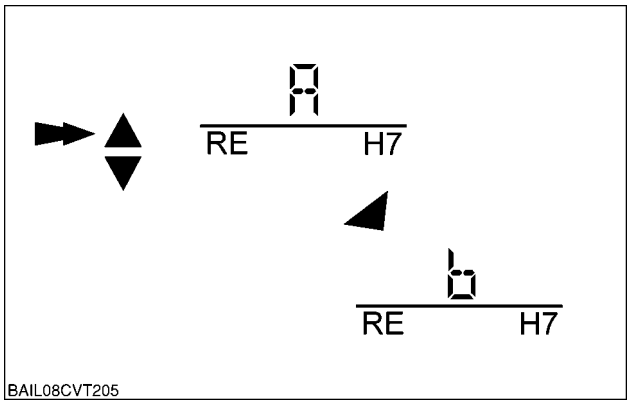
With the diagnostic tool installed start the engine and select channel 4 of H7 for the RE module.

Ensure that the handbrake is applied and place the shuttle lever into the forward position.
The handbrake must be ON, If the handbrake is in the OFF position the code ’U20’ will be shown on the display.



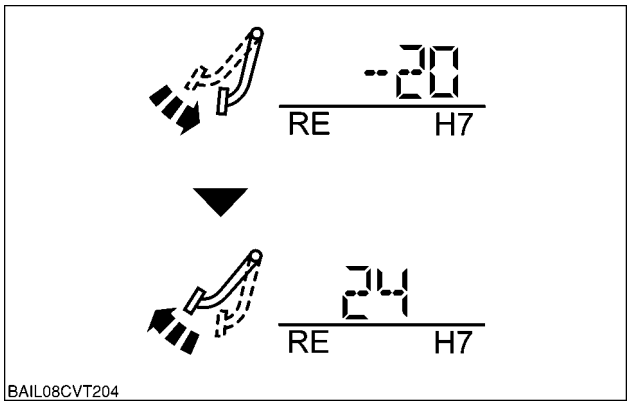
BAIL08CVT202 54

Select the clutch to be tested by depressing the forward button on the hand controller. The display will change between ’A’ and ’b’ each time the button is pressed



BAIL08CVT205 55

The clutch pedal is used to select the test pressure. Pressing the reverse direction button on the hand controller will energise the selected valve at the pressure determined by the clutch pedal position and display the clutch pressure value.
If the clutch pedal position is less than **30 %** then the display will show **-20 bar**.
At **30 %** pedal position the clutch pressure is set at **0 bar** and this rises linearly to **24 bar** as the clutch pedal is lifted to **85 %**.
Above **75 %** of clutch pedal travel the pressure is set to the maximum pressure of **24 bar**.
As the clutch pedal is raised from fully depressed to fully released the display will show ’-20’ rising to ’24’.



BAIL08CVT204 56

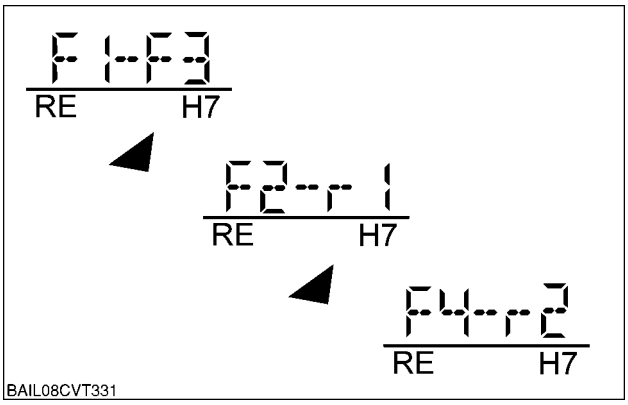
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Channel 5- Synchroniser test

This channel tests the transmission synchronisers.

Ensure that the handbrake is applied and place the shuttle lever into the forward position.
The handbrake must be ON, If the handbrake is in the OFF position the code ’U20’ will be shown on the display.
The transmission is disabled during this procedure.

1. Select the synchroniser to test by pressing the forward/reverse buttons on the hand controller, the display will change between, ’F1-F3’, ’F2-R1’ and ’F4-R2’, each time the button is pressed.



BAIL08CVT331 57

2. Once the synchroniser has been selected, move the shuttle lever forward to test the engagement position, or press the neutral button on the shuttle lever to test the synchroniser position when in neutral.

   NOTE: *The synchroniser will require a few seconds to complete the test.*

3. The display will then show the synchroniser position according to the table below.
4. When a synchroniser is engaged the corresponding valve can be activated by using the clutch pedal. The display will show the solenoid current.

Synchroniser position	Minimum allowed value	Maximum allowed value
F1	62	249
F2	62	249
F3	731	962
F4	731	962
R1	731	962
R2	62	249
N	420	580

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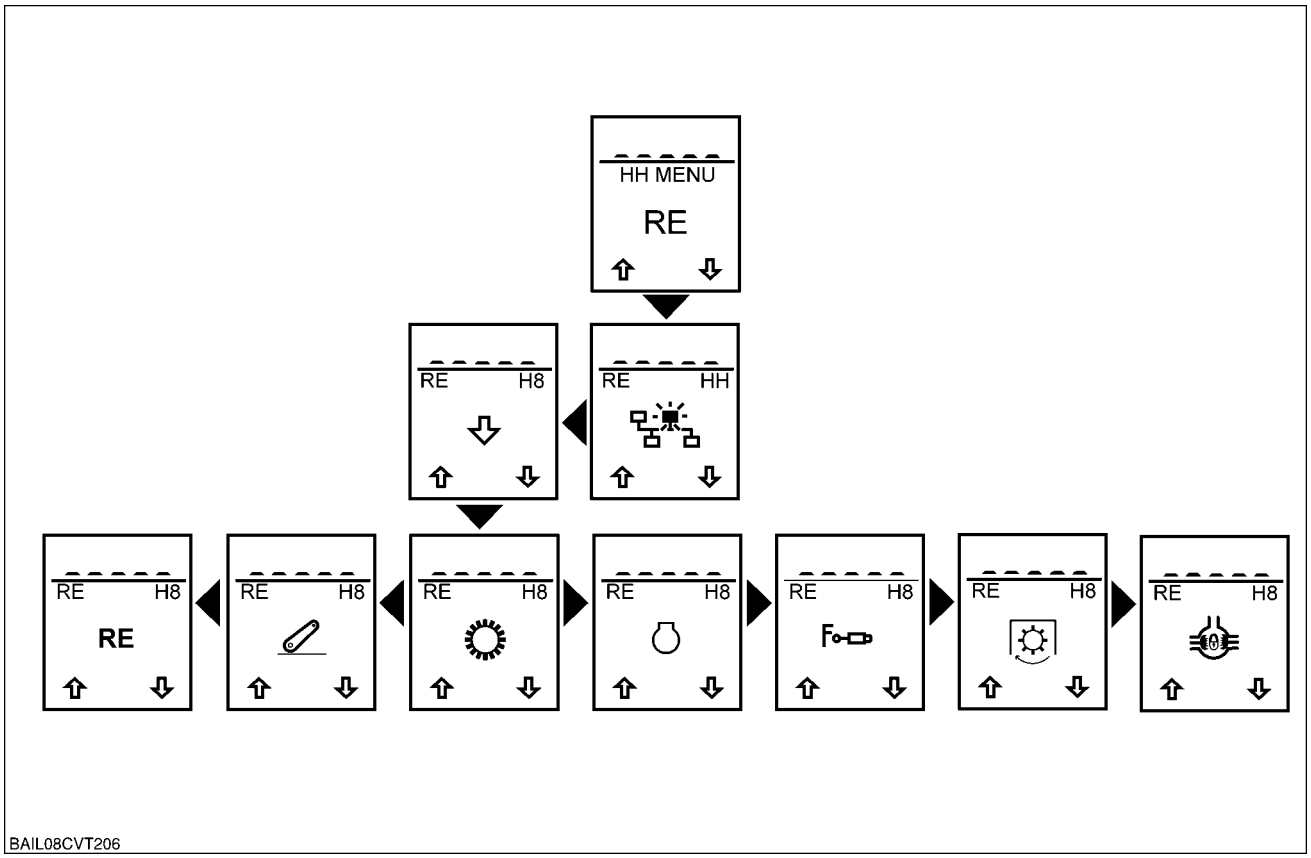
H8 - CLEAR ELECTRICAL ERASABLE PROGRAMMABLE READ ONLY MEMORY (EEPROM)

This menu clears calibration values and stored error codes by resetting all EEPROM values back to default. EEPROM is where all calibration values and error codes are stored. This memory is retained even if there is no power to the controller, i.e. if the battery is disconnected.

NOTE: *H8 will not change the configuration settings. The H3 menu mode must be used for this.*

NOTE: *To erase only the stored error codes and not affect the calibration data use the HC menu mode.*

H8 Menu Screen Select Diagram

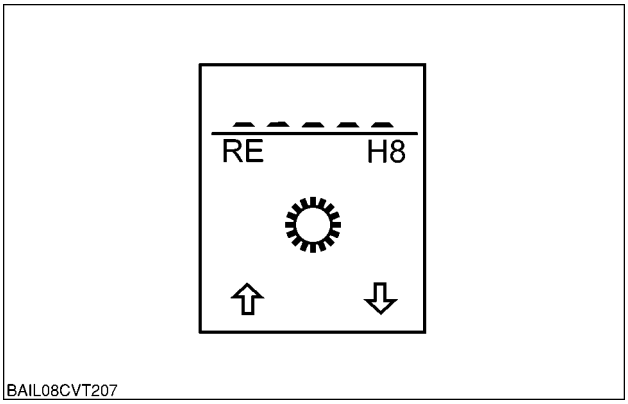


BAIL08CVT206 58

IMPORTANT: *By selecting the screen display with the controller identifier "RE" displayed will reset the EEPROM in all the sub-systems.*

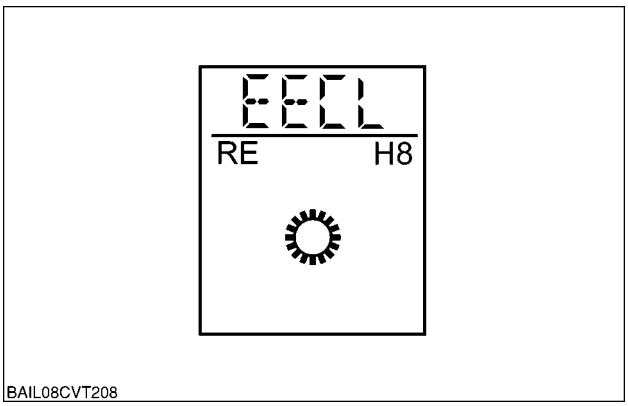
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If only a specific sub-system EEPROM requires to be reset, select the sub-system that requires the EEPROM to be reset by depressing the "menu" key, as the example shown.



BAIL08CVT207 59

The upper section of the display will display “EECL" .



BAIL08CVT208 60

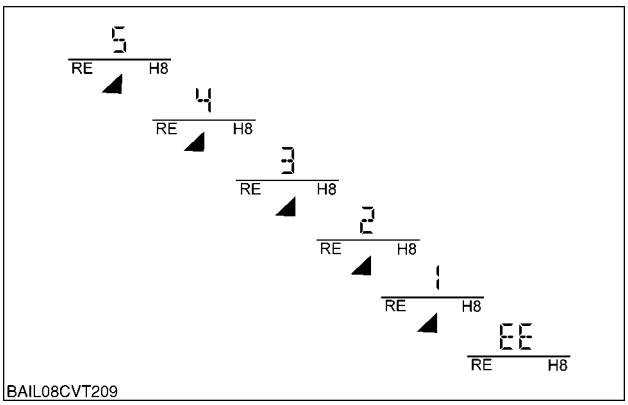
⚠ CAUTION ⚠

H8 will clear all calibrations values and stored error codes.

B006

NOTE: *If the navigation “down" key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the navigation “down" key to confirm the resetting of the EEPROM.
The upper section of the display will countdown from 5 to 1, then “EE" will be displayed to indicate the EEPROM has been cleared.
Turn the keystart OFF.



BAIL08CVT209 61

NOTE: *If the "down" key is released before the countdown finishes, the procedure will be aborted.*

Turn the keystart OFF.

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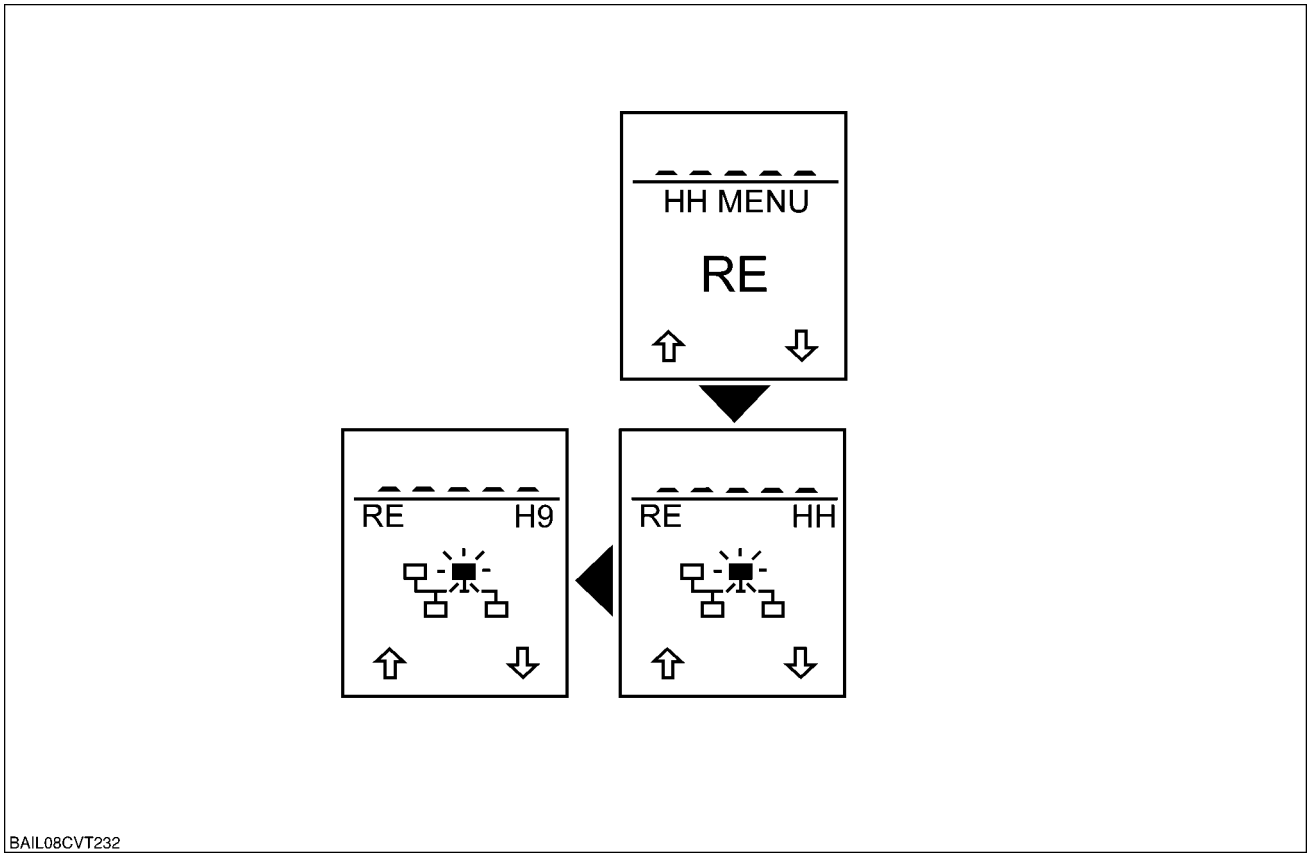
H9 - VOLTMETER

This menu is used to verify the operation of various potentiometers, voltage supplies, and solenoid current circuits. If an intermittent fault is detected within a circuit, a 'wiggle' test can be performed on the related wiring while watching the display for sudden changes in values, to help locate the area where the fault exists.

NOTE: *The vehicle may be driven while in this menu.*

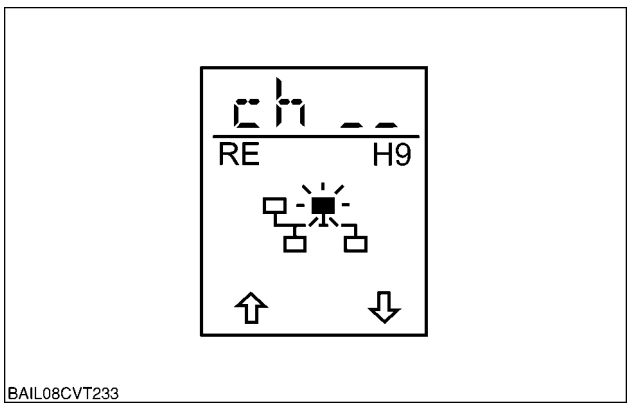
Common to all sub-systems.

H9 Menu Screen Select Diagram



BAIL08CVT232 62

Select the H9 menu by depressing the "menu" key.
The upper section of the display will display "ch _ _"



BAIL08CVT233 63

The required channel can be selected by using the navigation "up" and "down" keys.
After a delay the value will be displayed. Compare the value displayed with the typical reading shown in the table below.

NOTE: *The value is the input voltage or signal into the controller. This cannot be directly translated into a voltage due to the internal processes of the controller. A zero equates to* ***0 volts****.*

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If the value displayed varies by more than **10 %** to that shown in the table below, a fault is indicated in either the component or the wiring harness relevant to that channel.

NOTE: *Check the connectors of the effected circuit, including the controller connectors, prior to replacing any components.*

Chan-nel	Description	Control module connector and pin	Standard value	Comments
1	Clutch pedal position	CN4-20	75 Not depressed 26 Depressed	
2	Transmission temperature sensor	CN1B-14	**75 %** at **40 °C**. **67 %** at **28 °C**.	
3	Fuse 38 interrogation line	CN2B-11	99	
5	**+5 Volt** voltage supply to the sensors	CN1B-16	48	
6	**+8 Volt** voltage supply to the sensors	CN1B-25	79	
7	**+12 Volt** VF input signal (see explanation)	CN1A-1	42	
8	**+12 Volt** VD input signal (see explanation)	CN1A-8	42	Shuttle lever in Forwards position
9	**+12 Volt** VH input signal (see explanation)	CN1A-20	42	
10	**+12 Volt** VT input signal (see explanation)	CN3B-24	42	
11	Seat switch	CN4-9	69 in seat 36 not in seat	
12	Transmission output speed sensor	CN3B-19	20 (engine not running)	
13	Flywheel speed sensor	CN3B-22	50 (engine not running)	
18	Engine speed	-	850 rev/min - 2350 rev/min	
19	Wheel speed	-	2780 @ 10 kph	
20	Radar speed	-	2780 @ 10 kph	
30	Raise solenoid for the EDC control valve	CN2-4	0 Off - 70 On	
31	Lower solenoid for the EDC control valve	CN2-5	0 Off - 70 On	
32	Lifting arm position potentiometer	CN1B-2	9Lowered 78 Raised	
33	Position control knob	via CAN	0 Lowered 100 Raised	
34	Drop rate potentiometer	via CAN	0 anticlockwise, 100 clockwise	
35	Height limit potentiometer	via CAN	0 anticlockwise, 100 clockwise	
36	Sensitivity potentiometer	via CAN	0 anticlockwise, 100 clockwise	
37	Slip limit potentiometer	via CAN	0 anticlockwise, 100 clockwise	
38	Right hand draft load pin	CN1B-9	46	No mounted implement
39	Left hand draft load pin	CN1B-10	46	No mounted implement
40	Draft load potentiometerl	via CAN	0 anticlockwise, 100 clockwise	
49	Rear PTO solenoid current	CN3B-18	0 Off - 99 On	
50	Neutral switch (shuttle lever)	CN4-16	29 released, 66 depressed	
76	Forward switch (shuttle lever)	CN1B-12	30 Neutral, 68 forward	
77	Reverse switch (shuttle lever)	CN1B-13	30 Neutral, 68 forward	
80	Park lock switch of the shuttle lever	CN3A-11	30 Park lock On 68 Park lock Off	
89	Max engine speed potentiometer	via CAN	0 at idle 100 at max speed	

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Chan-nel	Description	Control module connector and pin	Standard value	Comments
90	Hand throttle potentiometer	via CAN	0 at idle 100 at max speed	
91	Accelerator pedal potentiometer	CN1B-1	10 at idle, 85 at max speed	
97	EHR joystick (X)	via CAN	0 at centre, - 100 left/right	
98	EHR joystick (Y)		0 at centre, - 100 left/right	
107	Rear PTO speed selection position sensor	CN4-8	75@1000 33@1000E	
112	Clutch A current	CN2-1	3 Not Engaged - 72 Engaged	
113	Clutch B current	CN2-5	3 Not Engaged - 72 Engaged	
114	F1 synchroniser current	CN2-6	3 Off 72 On	
115	F3 synchroniser current	CN2-3	3 Off 72 On	
116	F2 synchroniser current	CN3B-1	3 Off 72 On	
117	F4 synchroniser current	CN3B-3	3 Off 72 On	
118	R1 synchroniser current	CN2-2	3 Off 72 On	
119	R2 synchroniser current	CN3B-10	3 Off 72 On	
120	Dump solenoid current	CN3B-2	3 Off 72 On	
122	Hydro solenoid current	CN2-7	27 to 68	
123	F1/F3 synchroniser position potentiometer	CN4-14	6 to 24 in F1, 41 to 56 in N, 71 to 94 in F3	
124	F2/R1 synchroniser position potentiometer	CN4-21	6 to 24 in F2, 41 to 56 in N, 71 to 94 in R1	
125	F4/R2 synchroniser position potentiometer	CN3A-2	6 to 24 in R2, 41 to 56 in N, 71 to 94 in F4	
126	Clutch A pressure transducer	CN3A-8	10 in F2, F4, R1 54 in F2, F3, R2	
127	Clutch B pressure transducer	CN3A-9	16 in F1, R3, R2 54 in F2, F4, R1	
133	PTO twist sensor	CN2-14	50 engine not running	
134	Brake pressure sensor	CN3A-17	10 brake released 23 brake applied	

Explanations:
VF Input: This is the input voltage into the controller to transmission components not directly affected by the clutch pedal switch, i.e. forward and reverse synchroniser solenoids, creeper solenoid and four wheel drive solenoid.
VD Input: This is the input voltage into the controller to transmission components which are affected by the clutch pedal switch, i.e. PWM solenoids.
VH Input: This is the input voltage into the controller to electronic draft control components, i.e. raise and lower solenoids.
VT Input: This is the input voltage into the controller to rear PTO and Differential lock, i.e. rear PTO clutch, Rear PTO brake, and differential lock solenoids.

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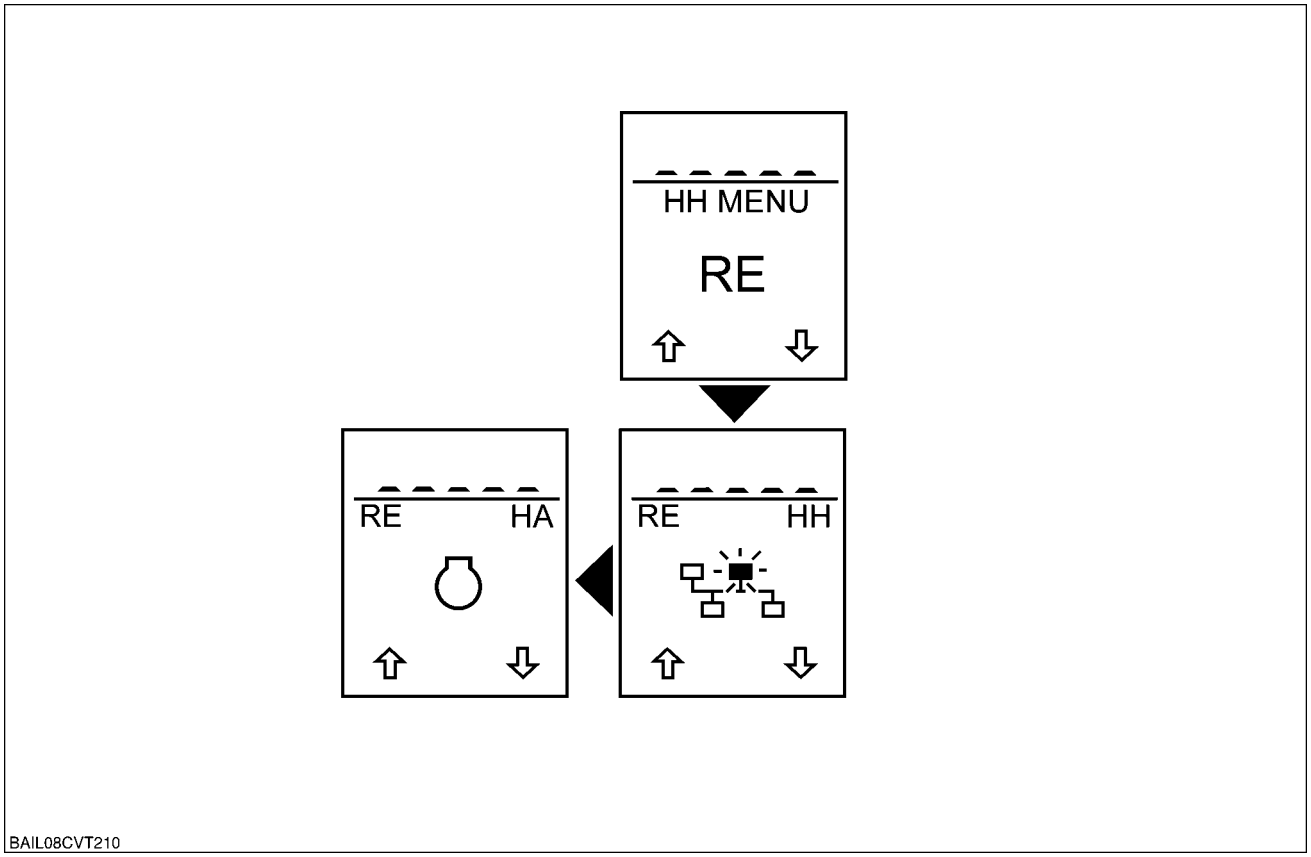
CN1a = **X092**
CN1b = **X093**
CN2 = **X091**
CN3a = **X094**
CN3b = **X095**
CN4 = **X097**

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HA - DEMONSTRATION MENU

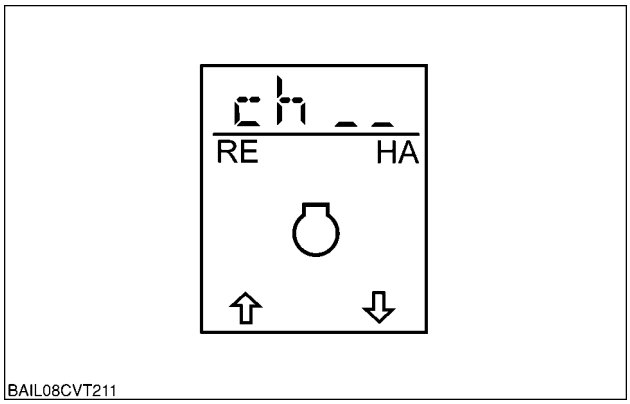
Used to demonstrate engine power boost.

HA Menu Screen Select Diagram



BAIL08CVT210 64

Select the HA sub-system by depressing the "menu" key.
The upper section of the display will display "ch _ _"



BAIL08CVT211 65

The required channel can be selected by using the navigation “up" and “down" keys (see the table below for the description of each channel).

Channel	Description
Ch 1	Engine power boost demonstration

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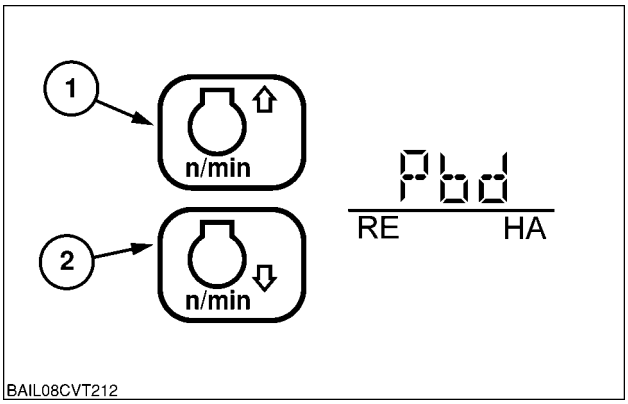
Channel 1 - Engine Power Boost Demonstration

Power boost will only be active under the following conditions:

- No PTO torque sensor or calibration fault codes
- PTO is fully engaged
- Wheel speed is greater than **0.5 Km/h**.
- Engine speed is greater than **1300 rev/min**.
- Coolant temperature is below **105 °C**.
- PTO has at least **250 Nm** torque applied

The upper section of the display will display “Pbd" (Power boost demonstration).
Start the engine and operate the vehicle to activate engine power boost. The power boost lamp on the ICU3 will be illuminated when power boost is enabled.
Engine power boost will work as normal, but using the CRPM adjustment switch will turn the powerboost on and off.
CRPM increase switch **(1)** to turn power boost ON
CRPM decrease switch **(2)** to turn power boost OFF

NOTE: *Power boost demonstration will be disabled after turning the keystart OFF.*



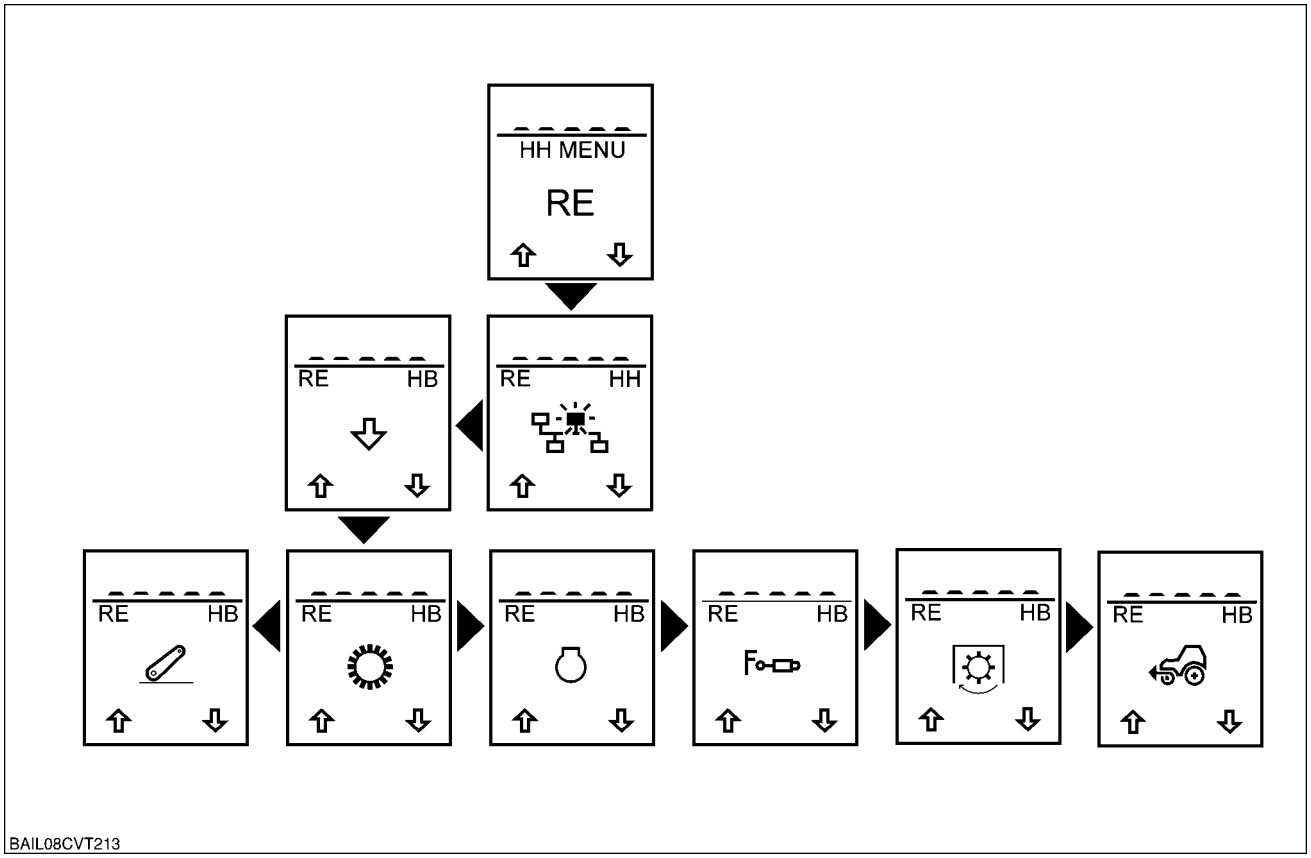
BAIL08CVT212 66

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HB - DISPLAY STORED FAULT CODES

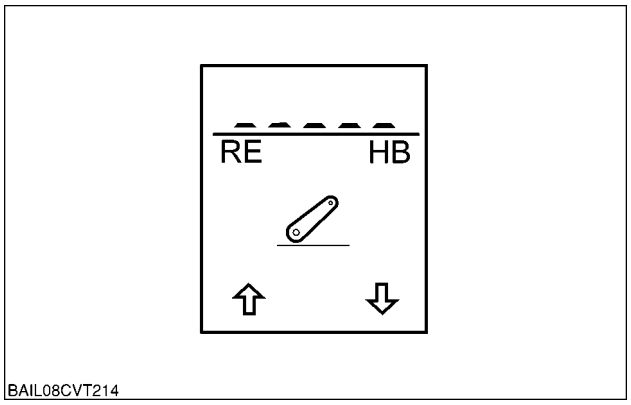
This menu is used to display fault codes which are stored in the EEPROM of the controller.
A maximum of ten fault codes for each sub-system can be stored.
Common to all sub-systems.

HB Menu Screen Select Diagram



BAIL08CVT213 67

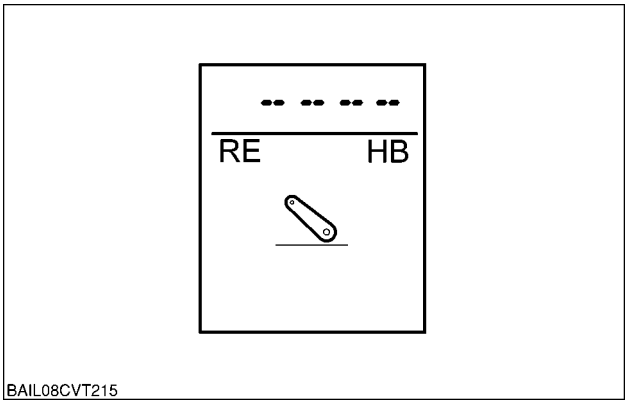
Select the required sub-system by depressing the "menu" key, as the example shown.



BAIL08CVT214 68

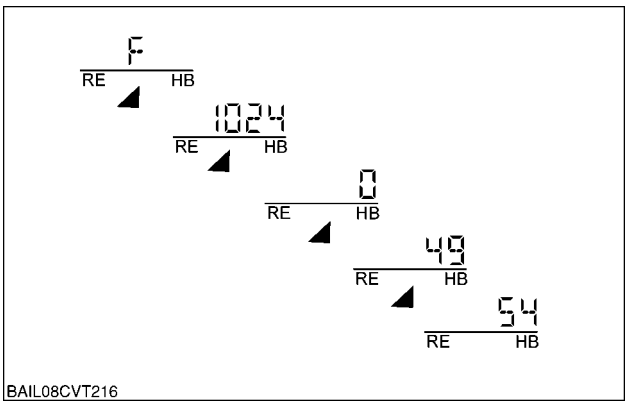
The upper section of the display will display "- - - -", if no fault code is stored in the selected sub-system.

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BAIL08CVT215 69

The upper section of the display will display "F", if a fault code is stored in the selected sub-system.
The fault code would then automatically cycle through as the example:
1024 Fault code
0 Hour of first occurrence
49 Hour of last occurrence
54 Number of occurrences of the fault
Depress the navigation “up" or “down" key to change to the next fault code in the list.
The upper section of the display will display “- - -" at the end of the list.
Depress the “menu" key to continue navigating through the “HH" menus.

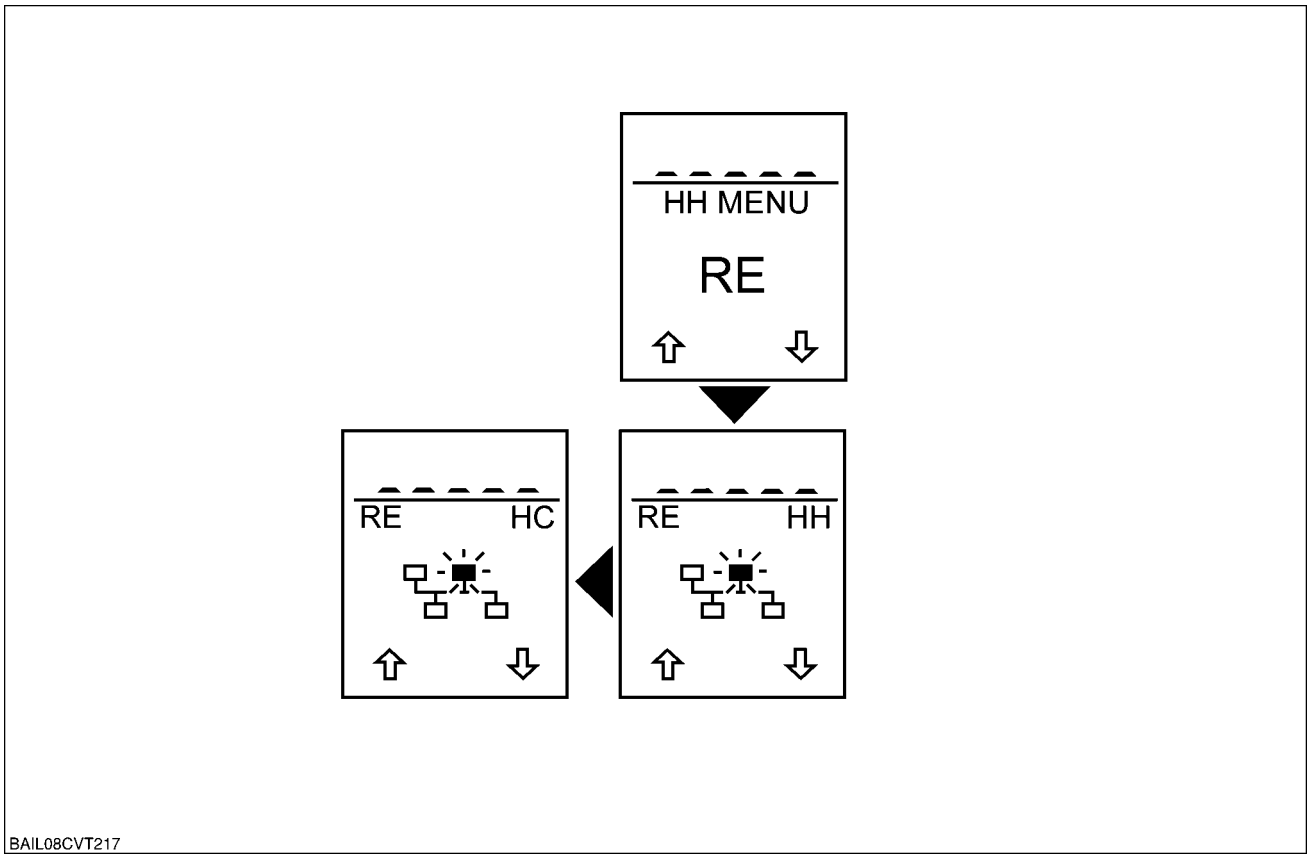


BAIL08CVT216 70

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HC - CLEAR STORED FAULT CODES

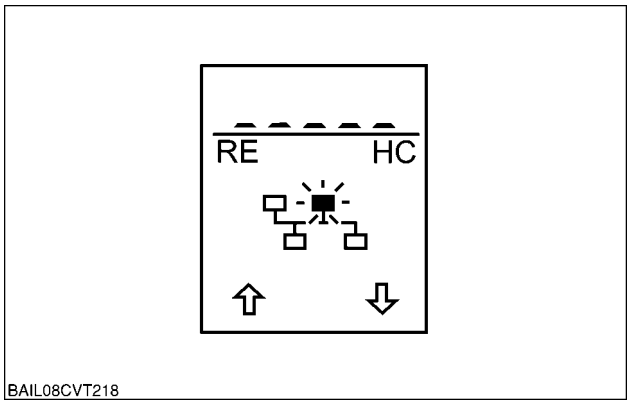
HC Menu Screen Select Diagram



BAIL08CVT217 71

NOTE: *Always make a note of the fault codes stored, before clearing.*

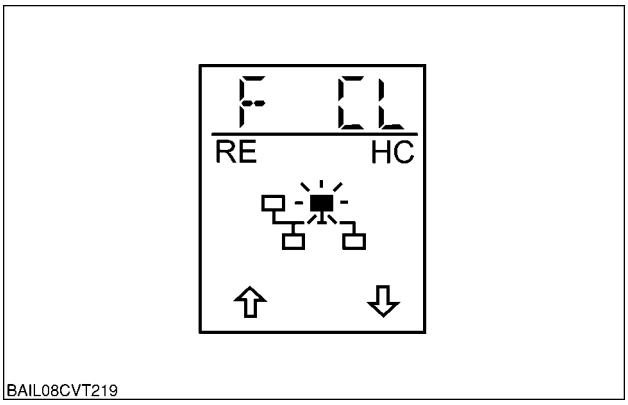
Select the HC menu by depressing the “menu" key.



BAIL08CVT218 72

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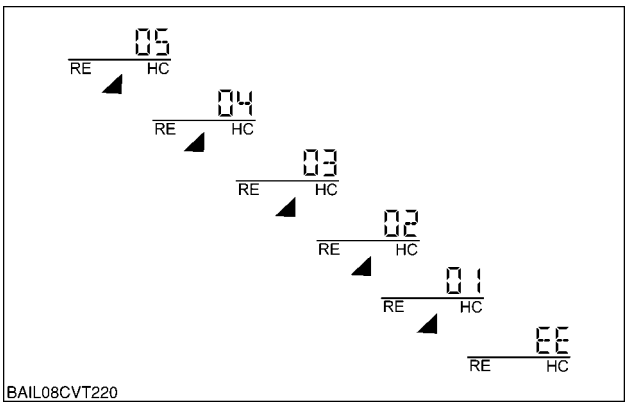
The upper section of the display will display “F CL".



BAIL08CVT219 73

NOTE: *If the navigation “down" key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the navigation “down" key to confirm the resetting of the EEPROM.
The upper section of the display will countdown from 05 to 01, then “EE" will be displayed to indicate the EEPROM has been cleared.



BAIL08CVT220 74

Depress the “menu" key to continue navigating through the “HH" menus.

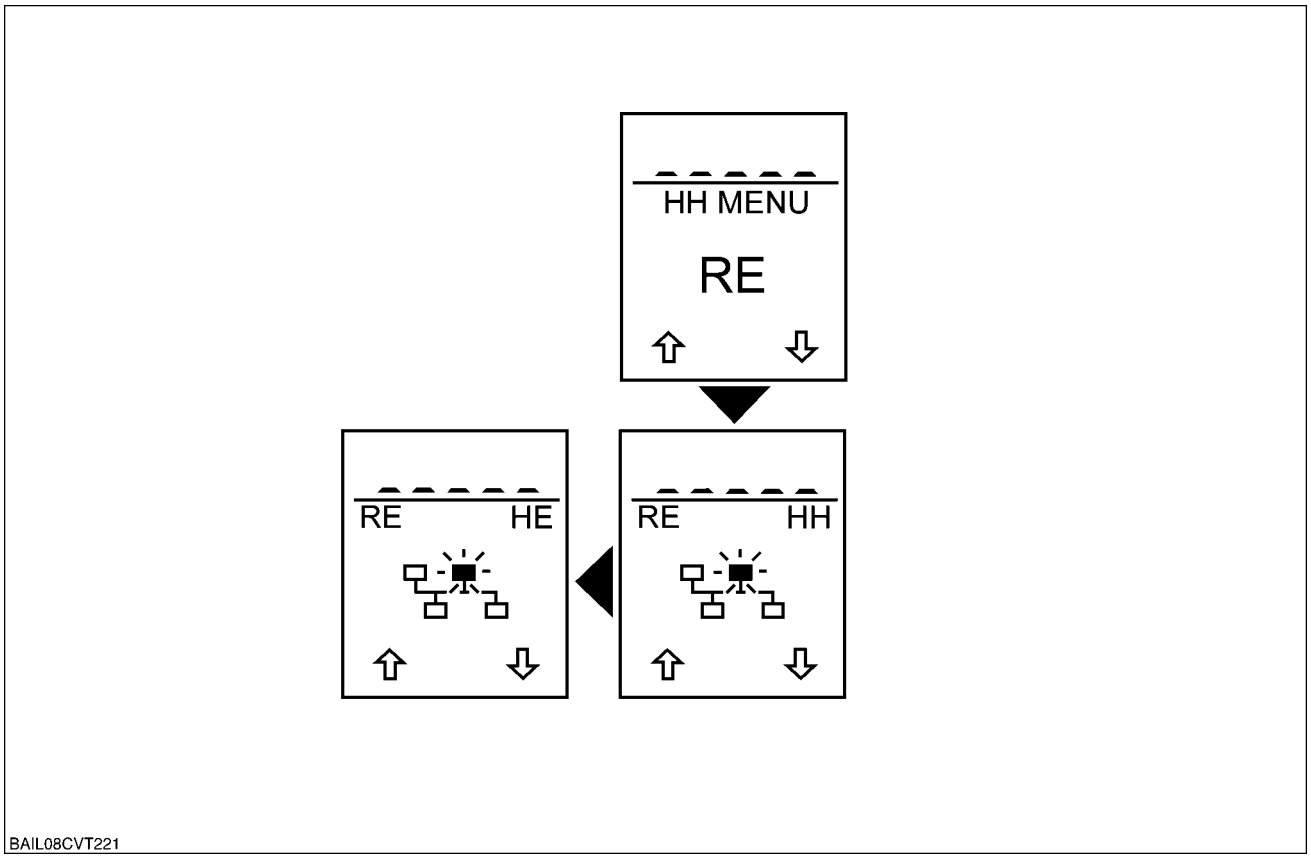
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HE - DISPLAY ALL SPEED INPUTS

This menu is used to verify the operation of various frequency inputs.

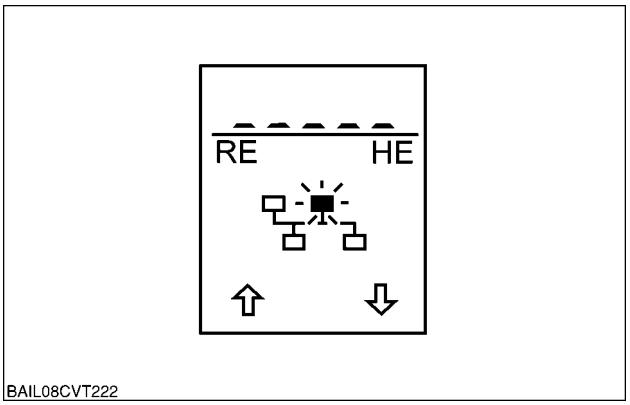
NOTE: *The vehicle may be driven while in this menu.*

Common to all sub-systems.
HE Menu Screen Select Diagram



BAIL08CVT221 75

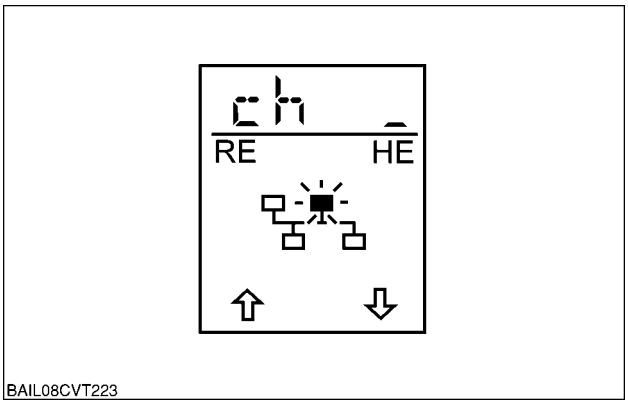
Select the HE menu by depressing the "menu" key.



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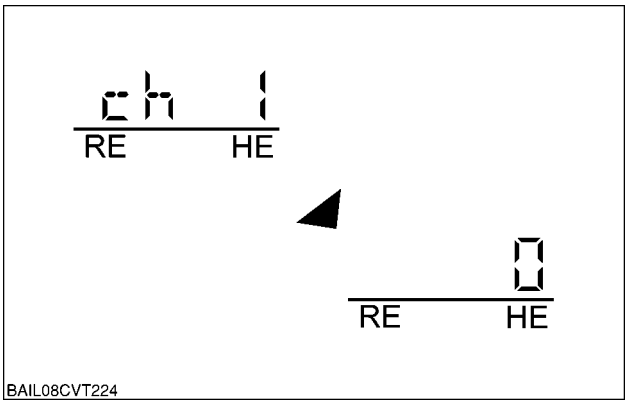
The upper section of the display will display "ch _"
The required channel can be selected by using the navigation “up" and “down" keys (see the table below for the description of each channel).



BAIL08CVT223 77

Channel	Description	Typical Reading	Notes
1	Hydro in sensor frequency	0 to 4000	
2	Radar	**3700 @ 10 km/h**.	
3	Not used	-	
4	Rear PTO speed	2000 @ 1000 erpm	
5	Wheel speed sensor frequency	**8000 @ 10 km/h**.	
6	Ring speed speed sensor frequency (CVT transmission)	15000 @ powered zero	
7	PTO twist angle (relative to damper)	4500 to 13500 (degrees x 100)	
8	Engine flywheel speed	560@850erpm	
9	PTO Shaft twist (relative to reference)	**15 - 140 °**	

After a delay the value will be displayed.
Depress the “menu" key to continue navigating through the “HH" menus.



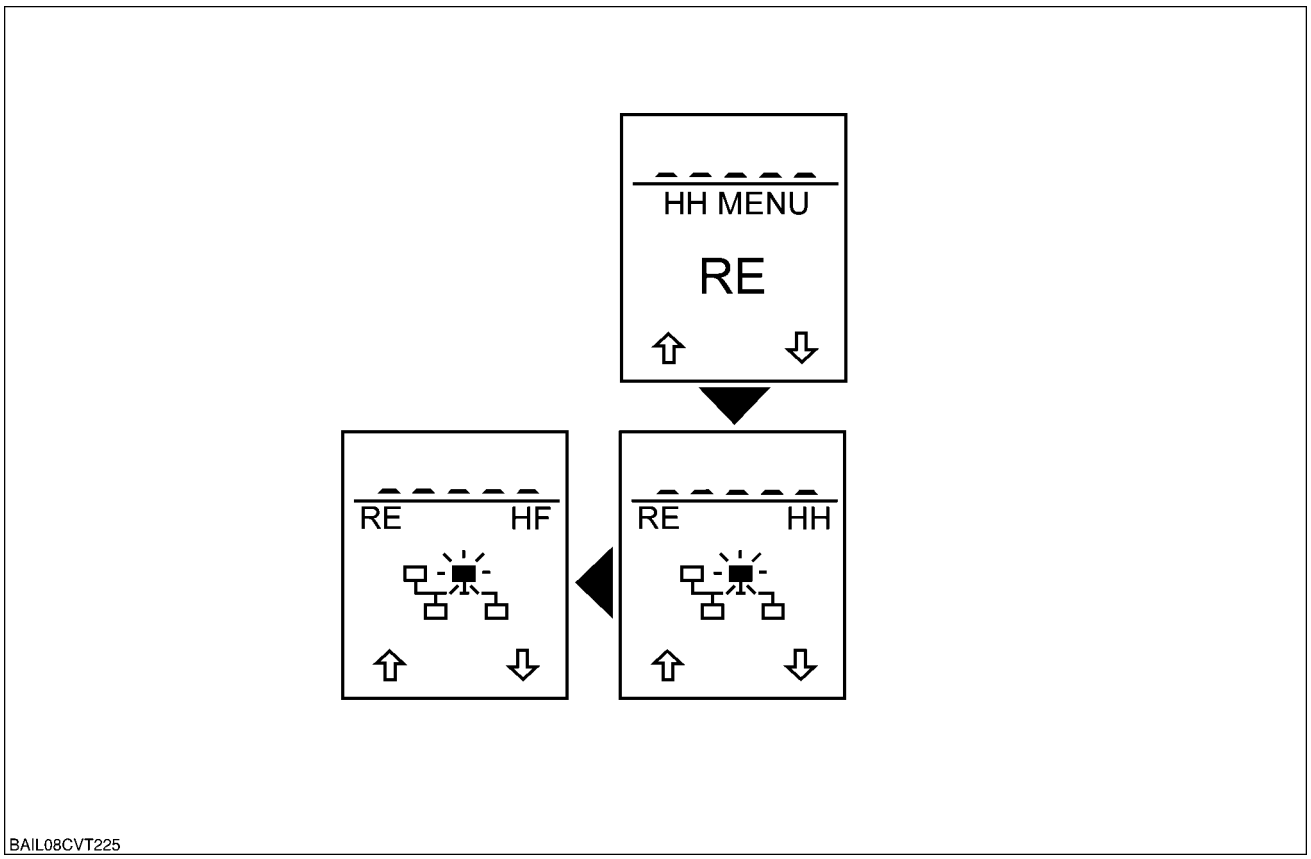
BAIL08CVT224 78

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HF - VIEW CONTROLLER HARDWARE INFORMATION

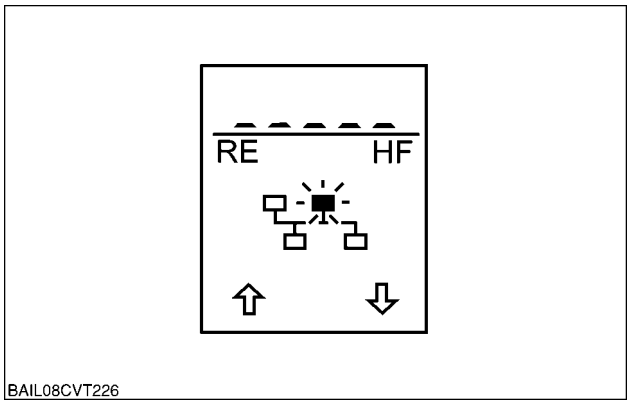
This menu allows the hardware identification, hardware version and serial number to be displayed. Common to all sub-systems.

HF Menu Screen Select Diagram



BAIL08CVT225 79

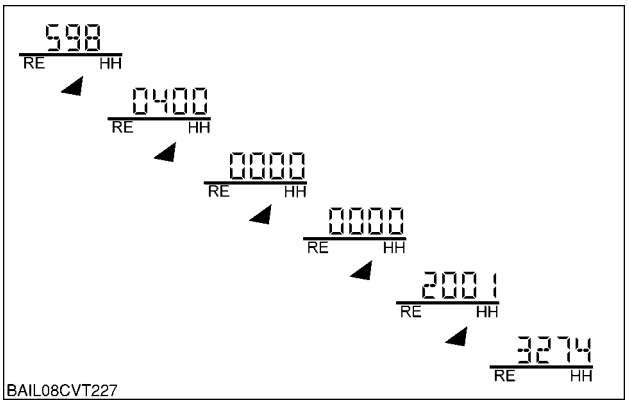
Select the HF menu by depressing the "menu" key.



BAIL08CVT226 80

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The upper section of the display will automatically cycle through as the example:
598 Module identification
0400 Hardware version
0000 Hardware version
0000 Serial number
2001 Serial number
3274 Serial number
and return to allow navigation of the “HH" menus.



BAIL08CVT227 81

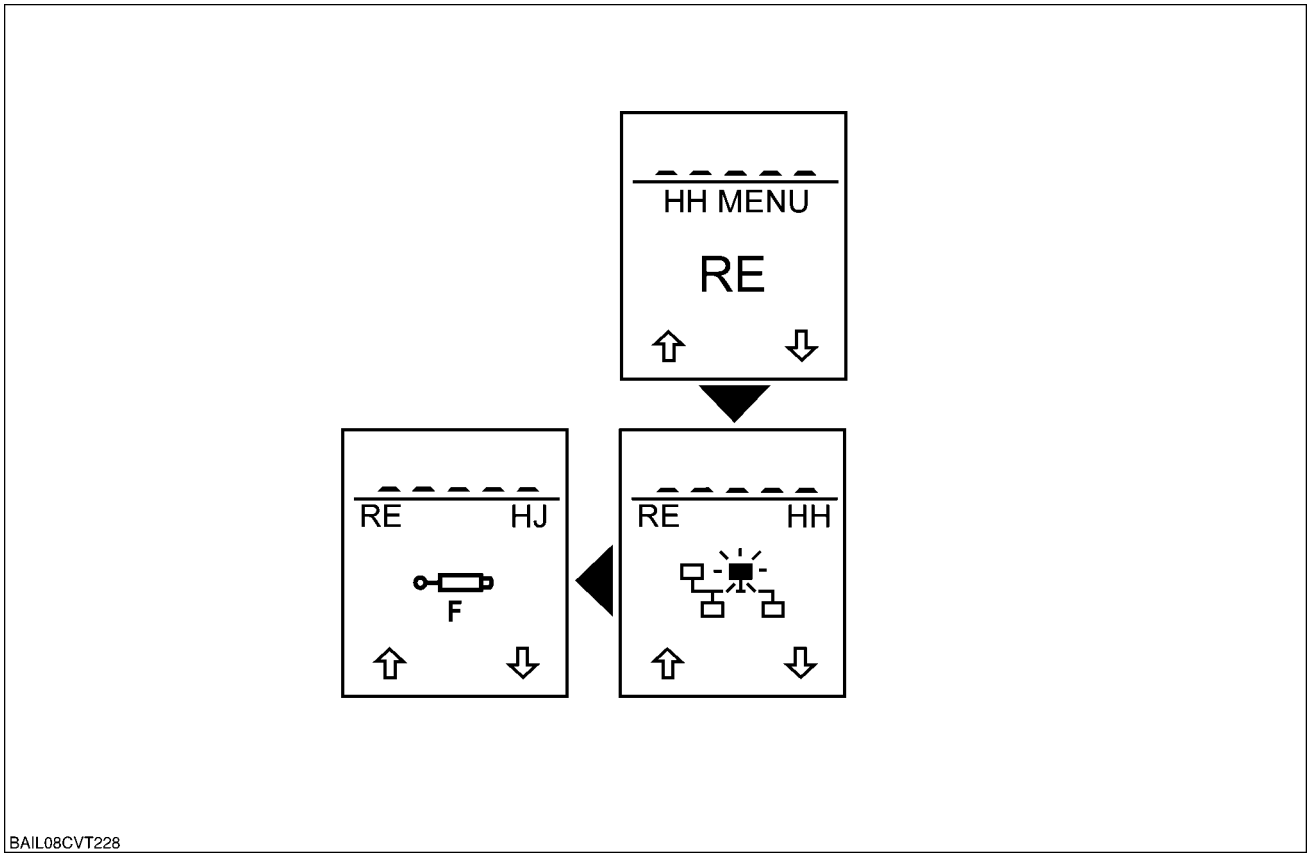
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HJ - ELECTRONIC HYDRAULIC REMOTE CONTROL VALVE SET-UP

This menu allows the front Electronic Hydraulic Remote (EHR) control valve numbers to be reset.
The EHR valve stores a number to indicate its position in the remote control valve stack, i.e. valve number 1,2, 3, 4 or 5. If a valve assembly has been replaced it will be necessary to reprogram the number of each valve within the complete assembly. New valves are supplied without an assigned number.

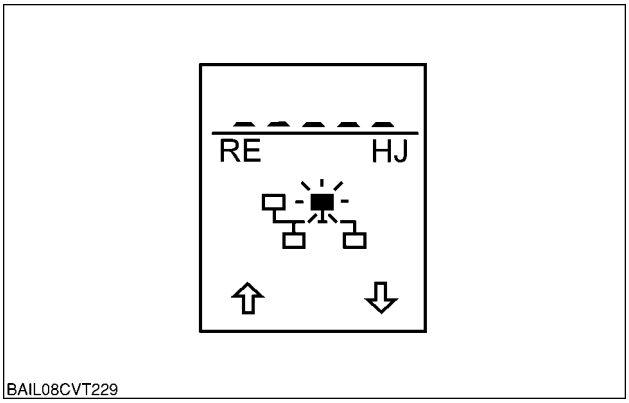
NOTE: *The renumbering procedure for all of the valves, either rear or mid mount valves, must be completed before commencing the procedure for the other set of valves.*

HJ Menu Screen Select Diagram



BAIL08CVT228 82

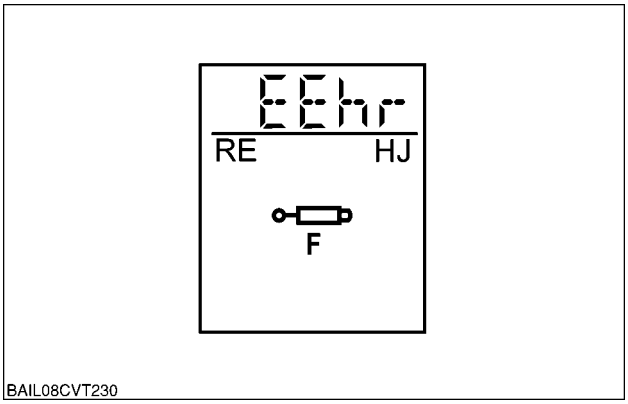
With all of the rear remotes connected, navigate the H-menus and select the HJ menu by depressing the "menu" key.



BAIL08CVT229 83

The upper section of the display will display "EEhr".

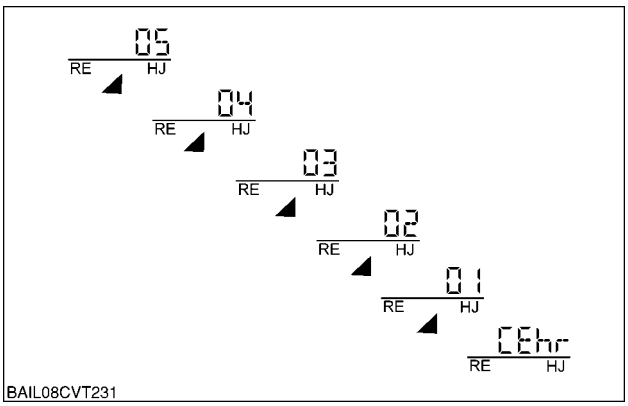
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BAIL08CVT230 84

NOTE: *HJ will clear all the EHR valve numbers.*

Depress and hold the down button, the display will change to show ’5’ and countdown to ’1’ then change to ’Cehr’, this signifies that the valve numbers have been cleared.



BAIL08CVT231 85

NOTE: *If the navigation "down" key is released before the countdown finishes, the procedure will be aborted.*

Disconnect the connectors from each of the remote valves, except for valve number 1.

Turn the keystart ON and enter HJ menu again. The cluster display will momentarily flash ’Ehr_’ followed by ’Ehr1’, an audible beep will be heard, indicating that number 1 valve has been recognised and renumbered. The display will then change to flash ’Ehr2’ to signify that the controller is ready for the next valve to be connected..

Connect each remote valve in the correct order. As each valve is connected an audible beep will signify the valve is recognised.

As each valve is connected the display will change to show the next valve number to be connected until ’Ehr_5’ is displayed.

If there are less than 5 rear remotes then the procedure can be exited by depressing and holding the navigation ’down’ key , the display will change to ’End’ to indicate programming is complete. If the maximum number of valves are fitted then the procedure will end automatically and display ’End’.

Turn the keystart OFF to store the new valve numbers.

Calibrate the remote valves. Refer to **PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Calibrate (A.10.C)**.

Control module - Configure KA - Steering Control

HH	Service Menu	Figure Number
H1	Calibration procedures	**1**
H2	View stored calibration values	**2**

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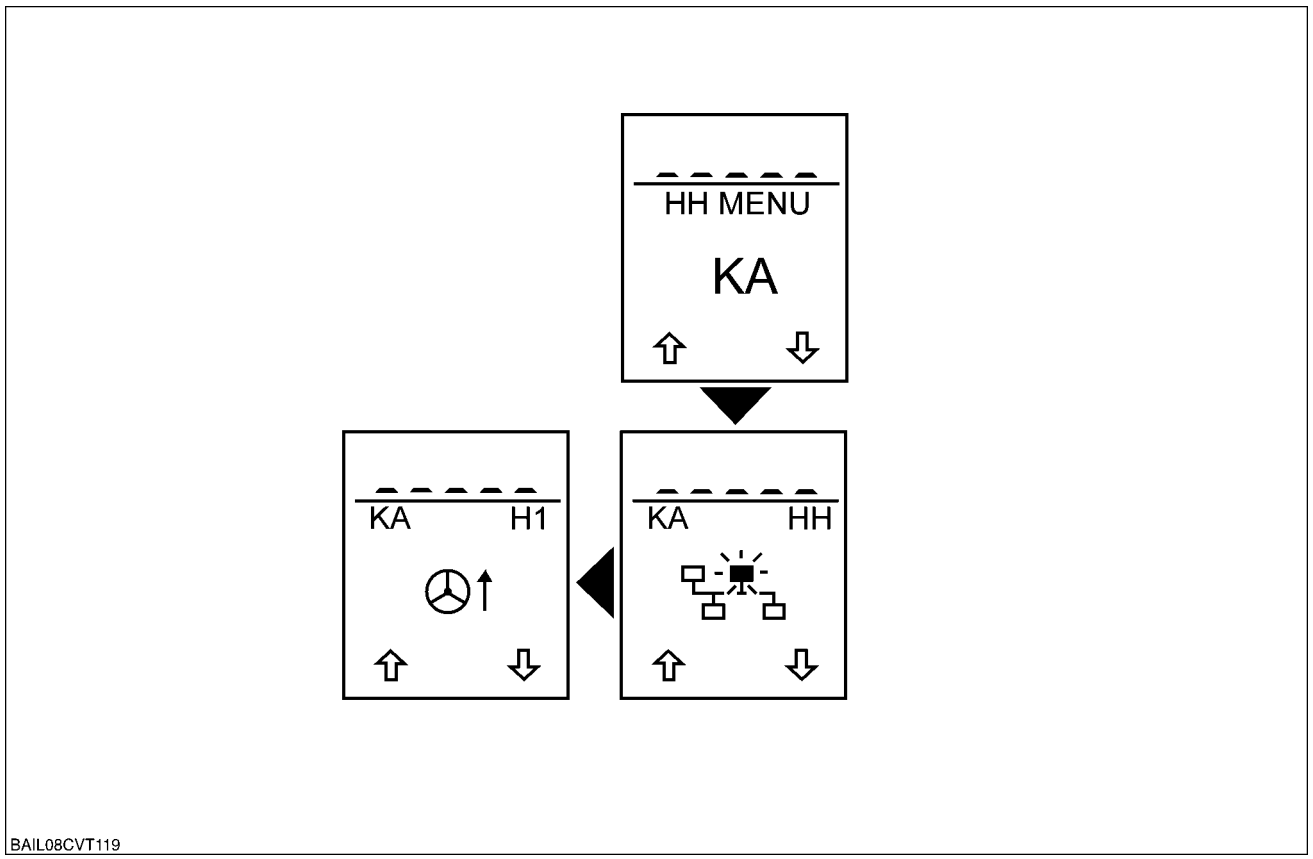
HH	Service Menu	Figure Number
H3	Not Used	
H4	View software revision level	**5**
H5	Switch operation test	**8**
H6	Not used	-
H7	Not used	-
H8	Clear Electrically Erasable Programmable Read Only Memory (EEPROM)	**12**
H9	Voltmeter	**15**
HA	Not used	
HB	Display stored fault codes	**18**
HC	Clear all stored fault codes	**22**
HD	Not used	-
HE	Display frequency inputs	**26**
HF	View controller hardware information	**29**

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H1 - CALIBRATION PROCEDURES

This menu is used to calibration the steering controller. Refer to **Fast steer system - Calibrate (D.20.C)**.

H1 Menu Screen Select Diagram



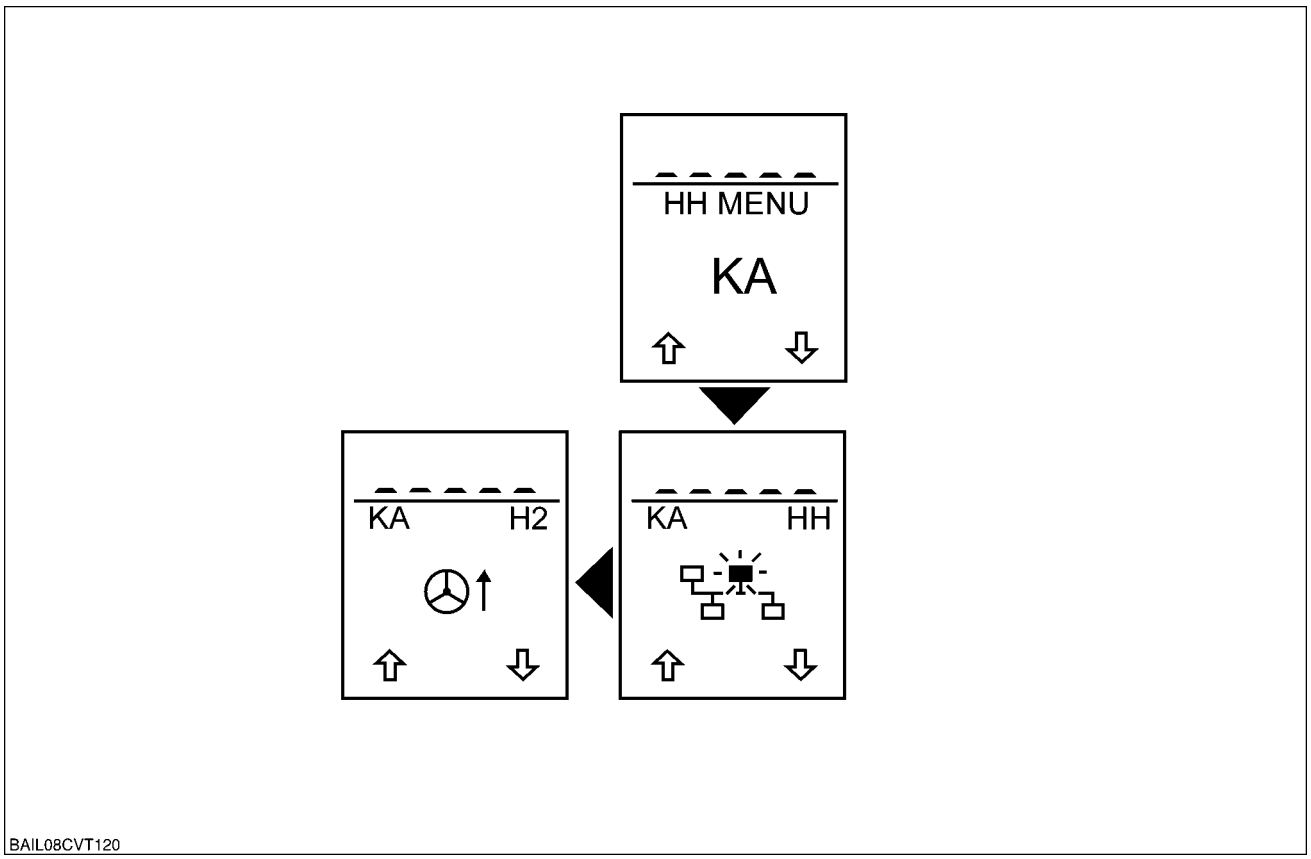
BAIL08CVT119 1

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H2 - VIEW STORED CALIBRATION VALUES

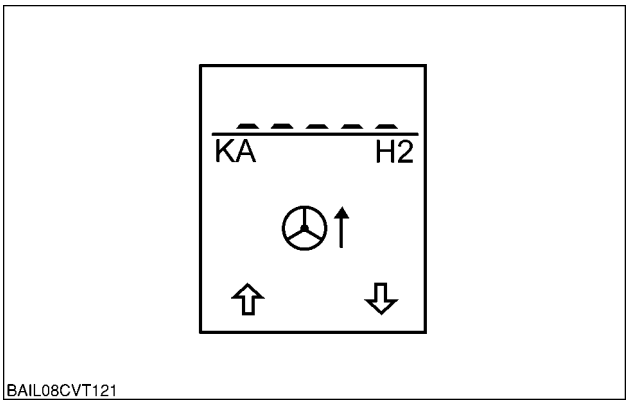
This menu is used to display the calibration values stored in the steering controller.

H2 Menu Screen Select Diagram



BAIL08CVT120 2

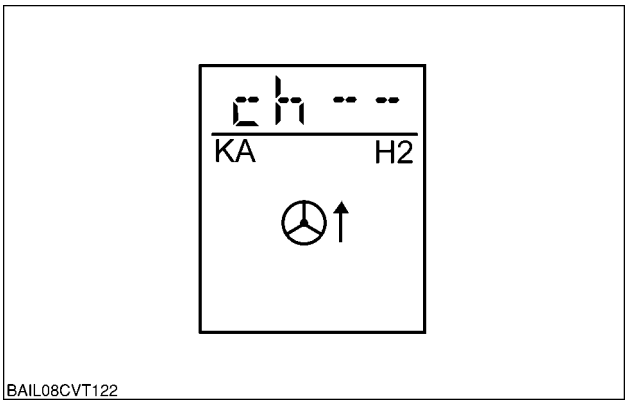
Select the steering sub-system by depressing the “menu" key.



BAIL08CVT121 3

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The display will show“ch _".



BAIL08CVT122 4

The required channel can be selected by using the “up" and “down" keys.
After a delay the calibration value will be displayed. (see the table below for the description of the channel).
Depress the “menu" key to continue navigating through the “HH" menus.

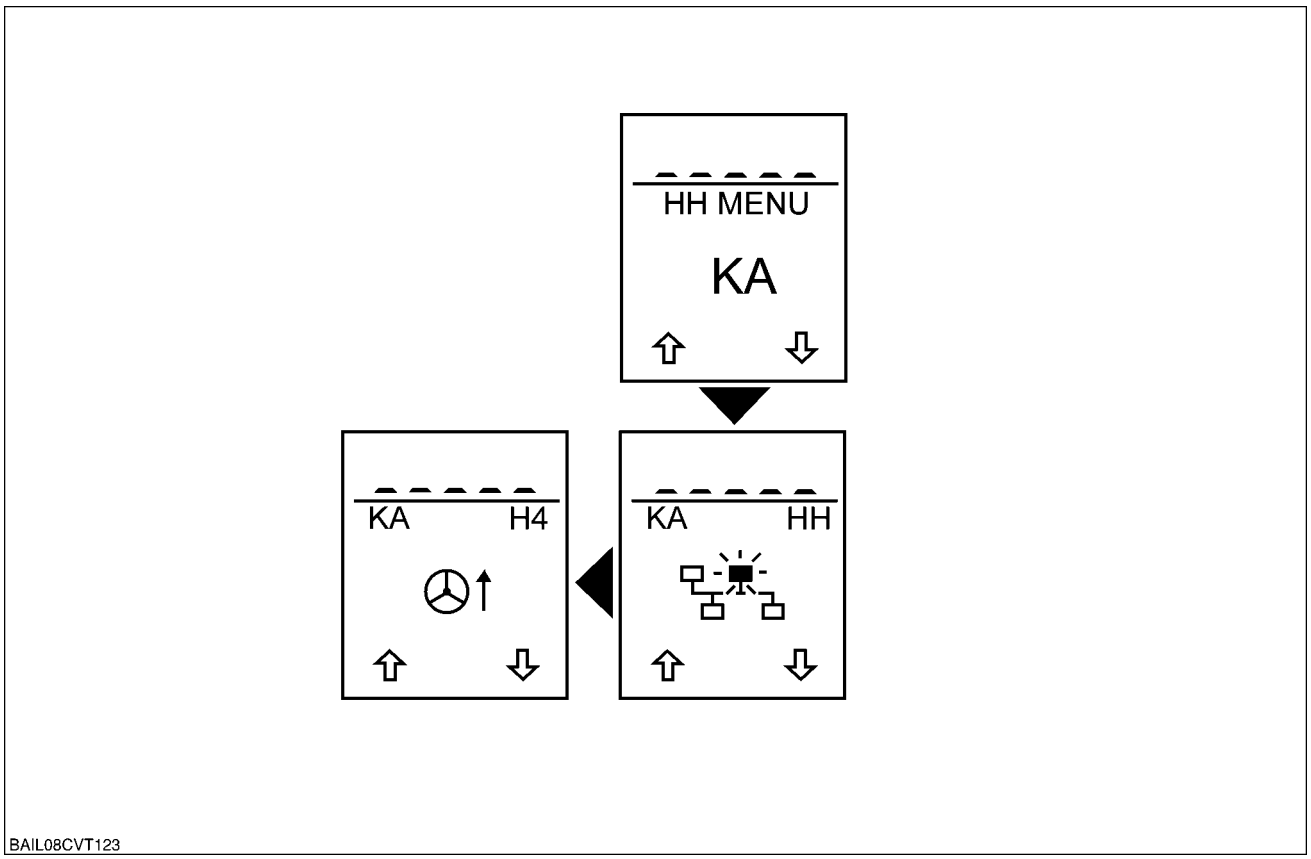
Channel	Description	Default	Value Range
Ch 1	Proximity switch open	350	0 to 999
Ch 2	Proximity switch closed	295	0 to 999
Ch 3	LVDT secondary signal 1 open	400	400 to 750
Ch 4	LVDT secondary signal 2 open	500	400 to 750
Ch 5	LVDT secondary signal 1 closed	500	400 to 750
Ch 6	LVDT secondary signal 2 closed	400	400 to 750

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H4 - VIEW SOFTWARE REVISION LEVEL

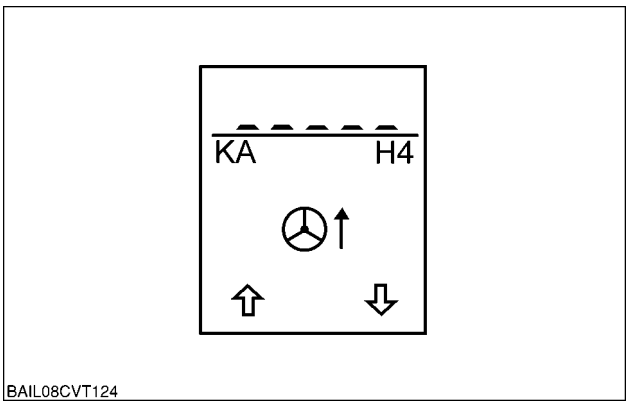
Common to all sub-systems.

H4 Menu Screen Select Diagram



BAIL08CVT123 5

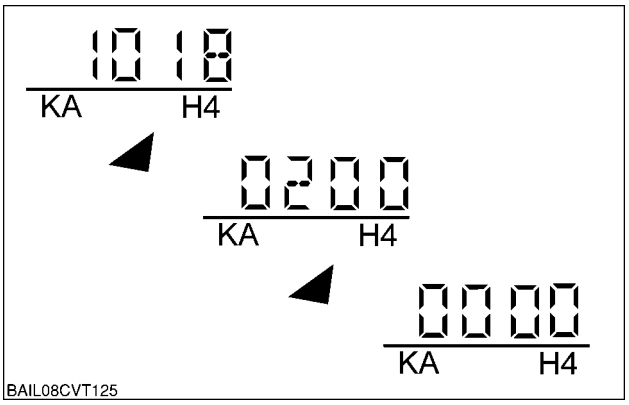
Select the H4 menu by depressing the "menu" key.



BAIL08CVT124 6

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The display will automatically cycle through the software release, as the example shown and return to allow navigation of the "HH" menus.



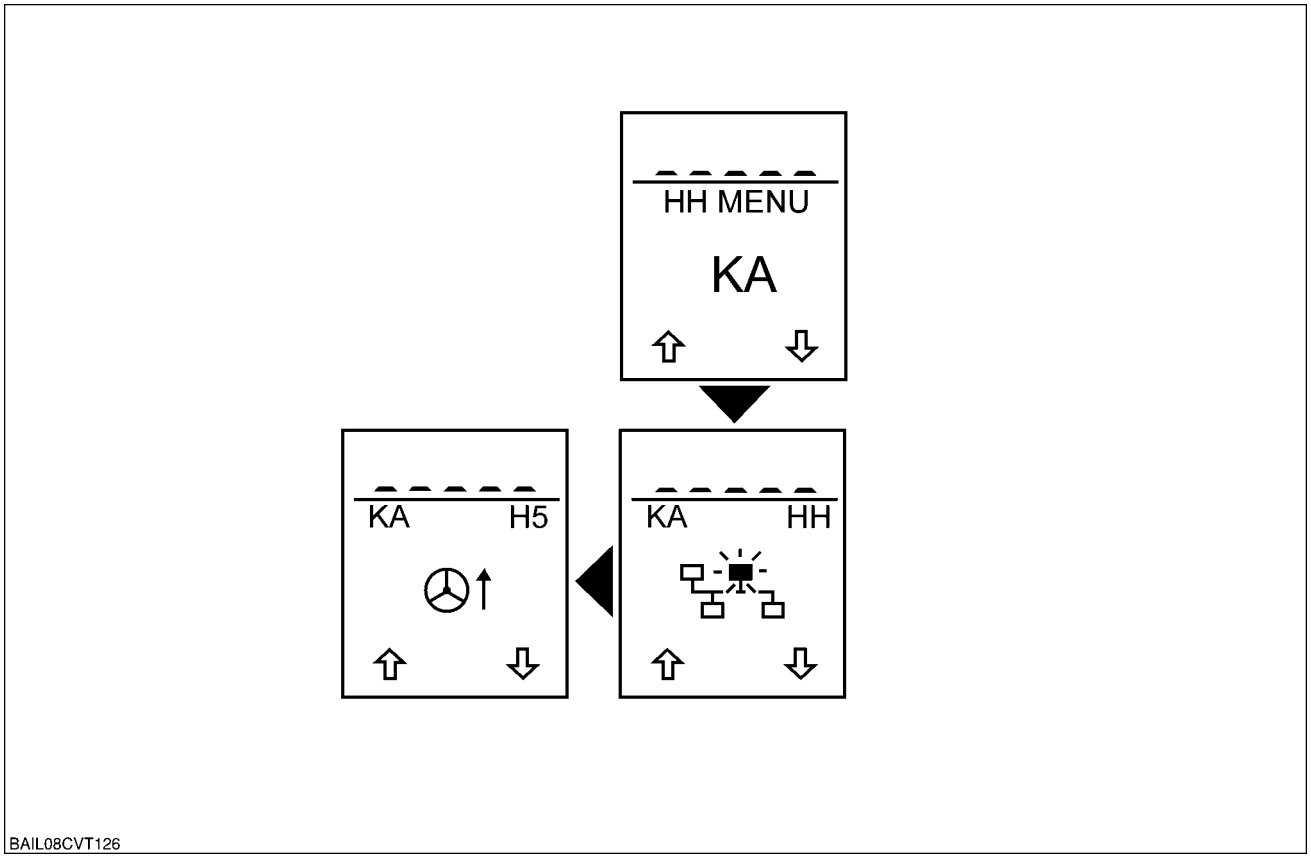
BAIL08CVT125 7

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H5 - SWITCH OPERATION TEST

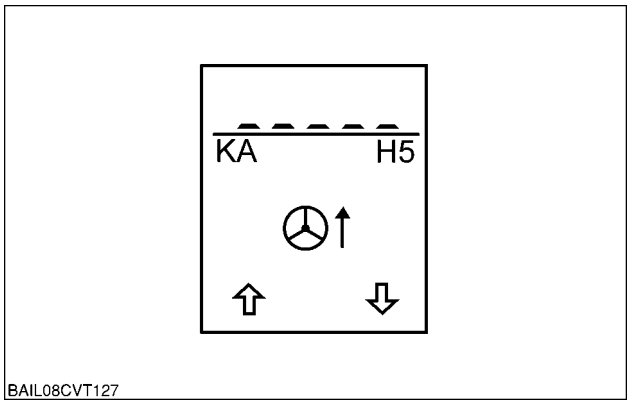
This menu displays a designated code when a switch transition is detected.
Common to all sub-systems.

H5 Menu Screen Select Diagram



BAIL08CVT126 8

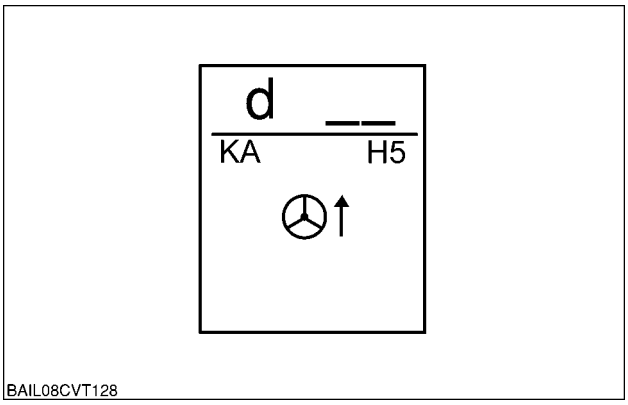
Select the H5 menu by depressing the "menu" key.



BAIL08CVT127 9

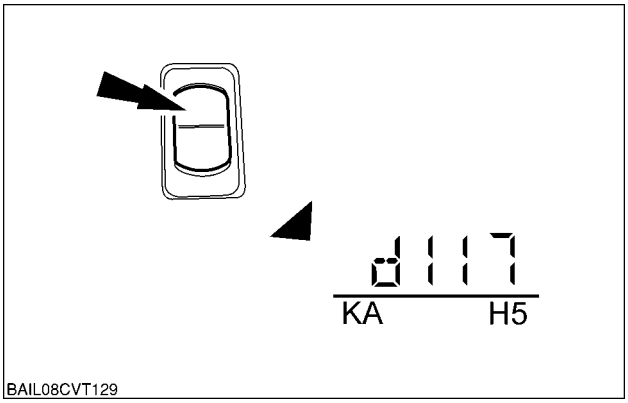
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The display will show "d _ _"



BAIL08CVT128 10

When a switch is operated, a code will be displayed and an audible tone should be heard to indicate the correct function.
If a switch code is not displayed and the audible tone not heard, a 'wiggle' test can be performed on the related wiring, while watching the display or listening for the audible tone, to help locate the fault.



BAIL08CVT129 11

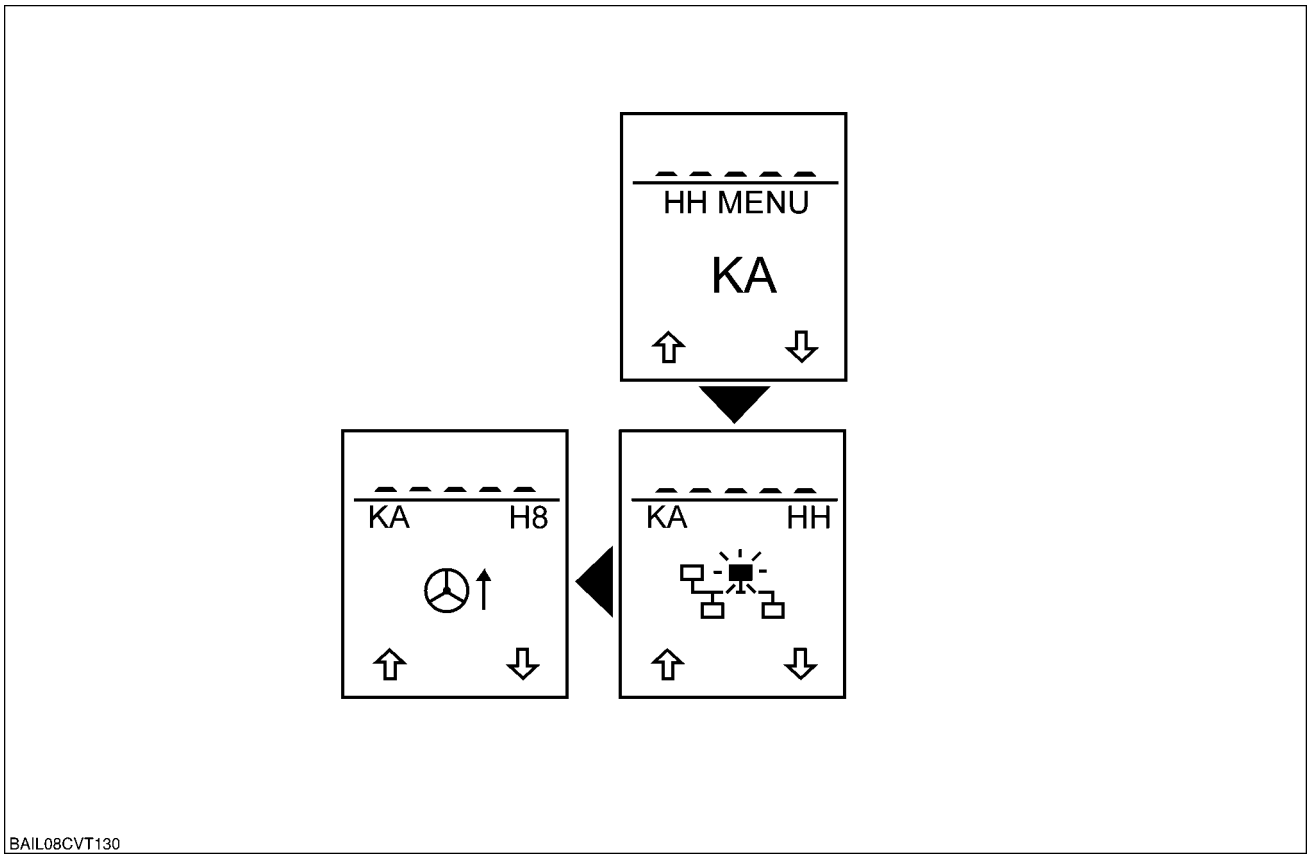
Identifier	Controller Connector	Switch / Input	Special Requirements
d117	A1	Enable switch	-
d118	C4	Safety switch	-
d119	B4	Proximity switch	-
d120	-	LVDT	-

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H8 - CLEAR ELECTRICAL ERASABLE PROGRAMMABLE READ ONLY MEMORY (EEPROM)

This menu clears calibration values and stored error codes by resetting all EEPROM values back to default. EEPROM is where all calibration values and error codes are stored. This memory is retained even if there is no power to the controller, i.e. if the battery is disconnected.

H8 Menu Screen Select Diagram



BAIL08CVT130 12

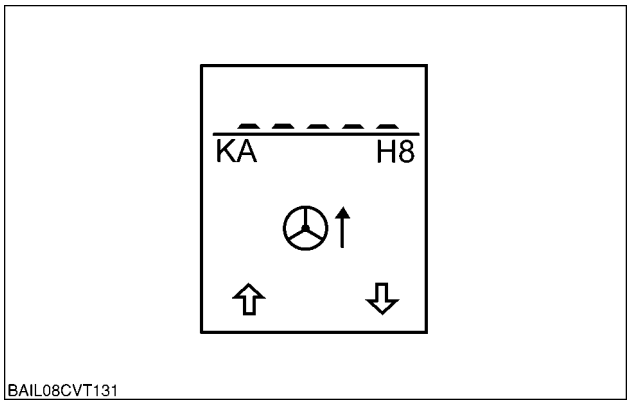
⚠ CAUTION ⚠

H8 will clear all calibrations values and stored error codes.

B006

NOTE: *If the navigation “down" key is released before the countdown finishes, the procedure will be aborted.*

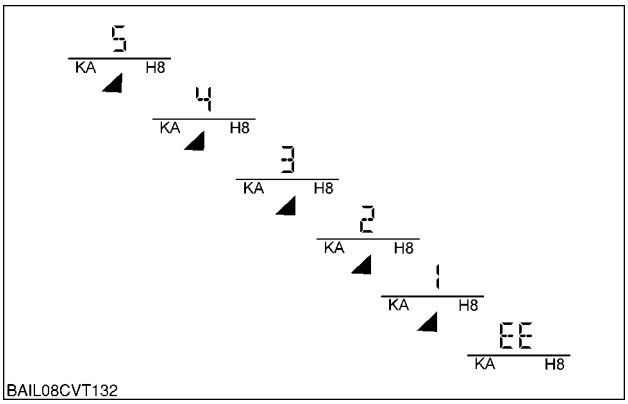
Select the H8 menu by depressing the "menu" key.



BAIL08CVT131 13

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Depress and hold the “down" key to confirm the resetting of the EEPROM.
The display will countdown from 05 to 01, then “EE" will be displayed to indicate the EEPROM has been cleared.
Turn the keystart OFF.



BAIL08CVT132 14

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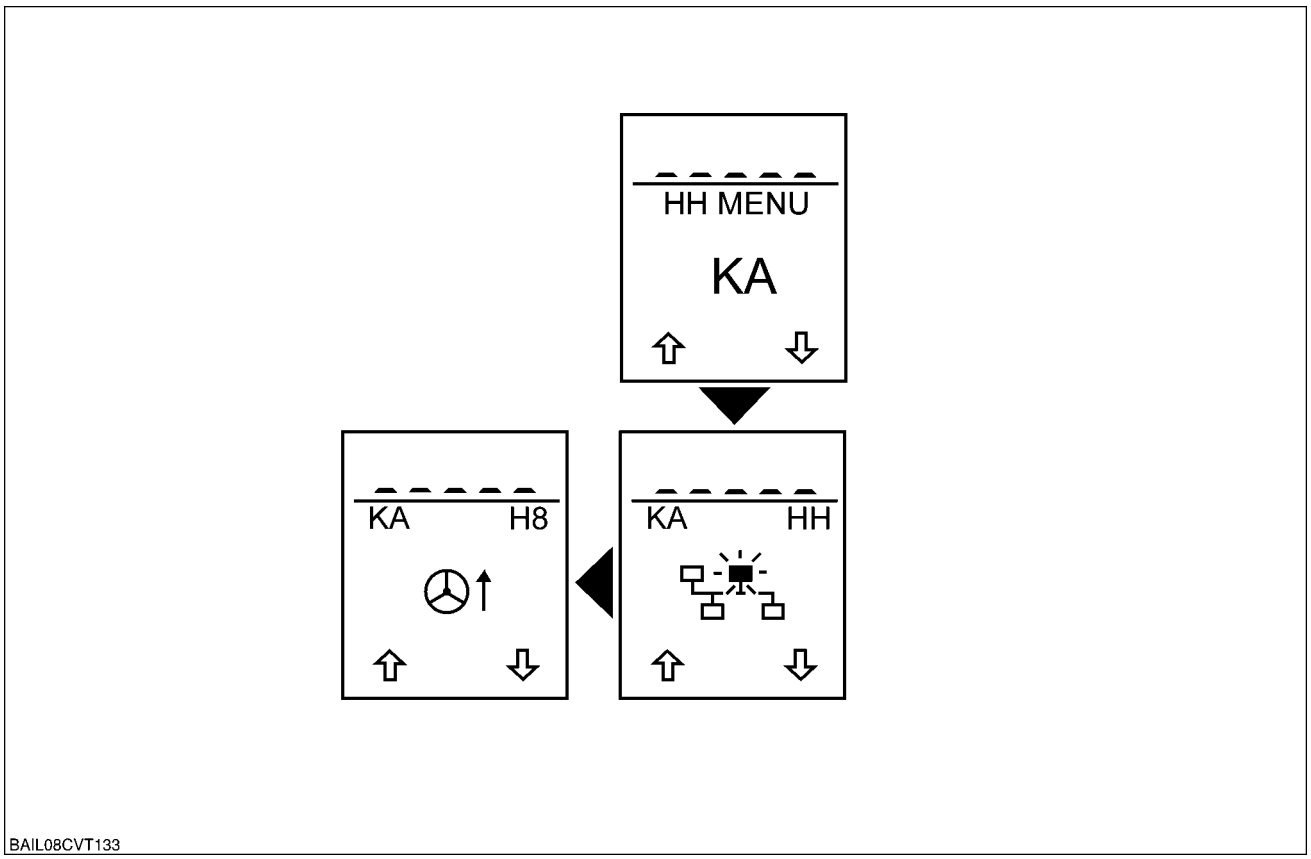
H9 - VOLTMETER

This menu is used to verify the operation of various potentiometers, voltage supplies, and solenoid current circuits. If an intermittent fault is detected within a circuit, a 'wiggle' test can be performed on the related wiring while watching the display for sudden changes in values, to help locate the area where the fault exists.

NOTE: *The vehicle may be driven while in this menu.*

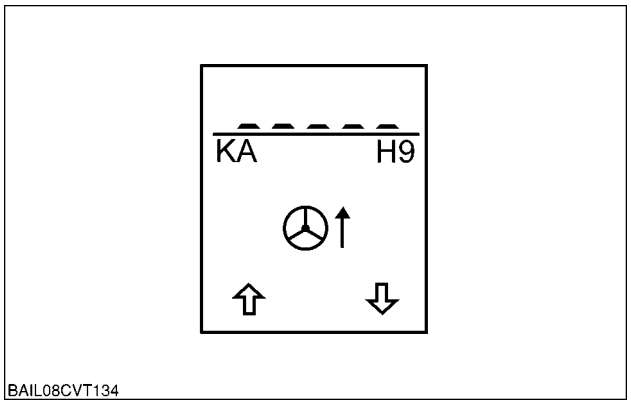
Common to all sub-systems.

H9 Menu Screen Select Diagram



BAIL08CVT133 15

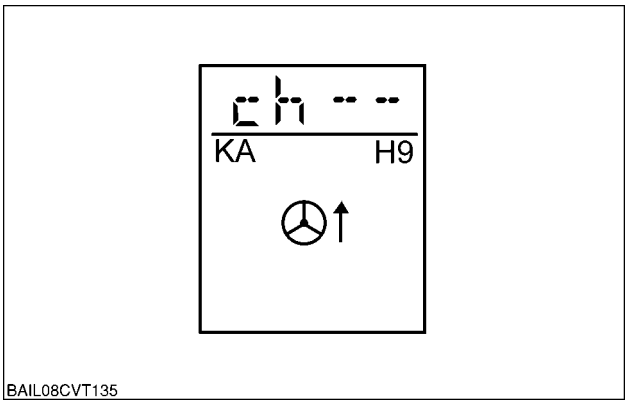
Select the H9 menu by depressing the "menu" key.



BAIL08CVT134 16

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The display will show"ch _"



BAIL08CVT135 17

The required channel can be selected by using the "up" and "down" keys.
After a delay the value will be displayed. Compare the value displayed with the typical reading shown in the table below.

NOTE: *The value is the input voltage or signal into the controller. This cannot be directly translated into a voltage due to the internal processes of the controller. A zero equates to* ***0 volts****.*

If the value displayed varies by more than **10 %** to that shown in the table below, a fault is indicated in either the component or the wiring harness relevant to that channel.

NOTE: *Check the connectors of the effected circuit, including the controller connectors, prior to replacing any components.*

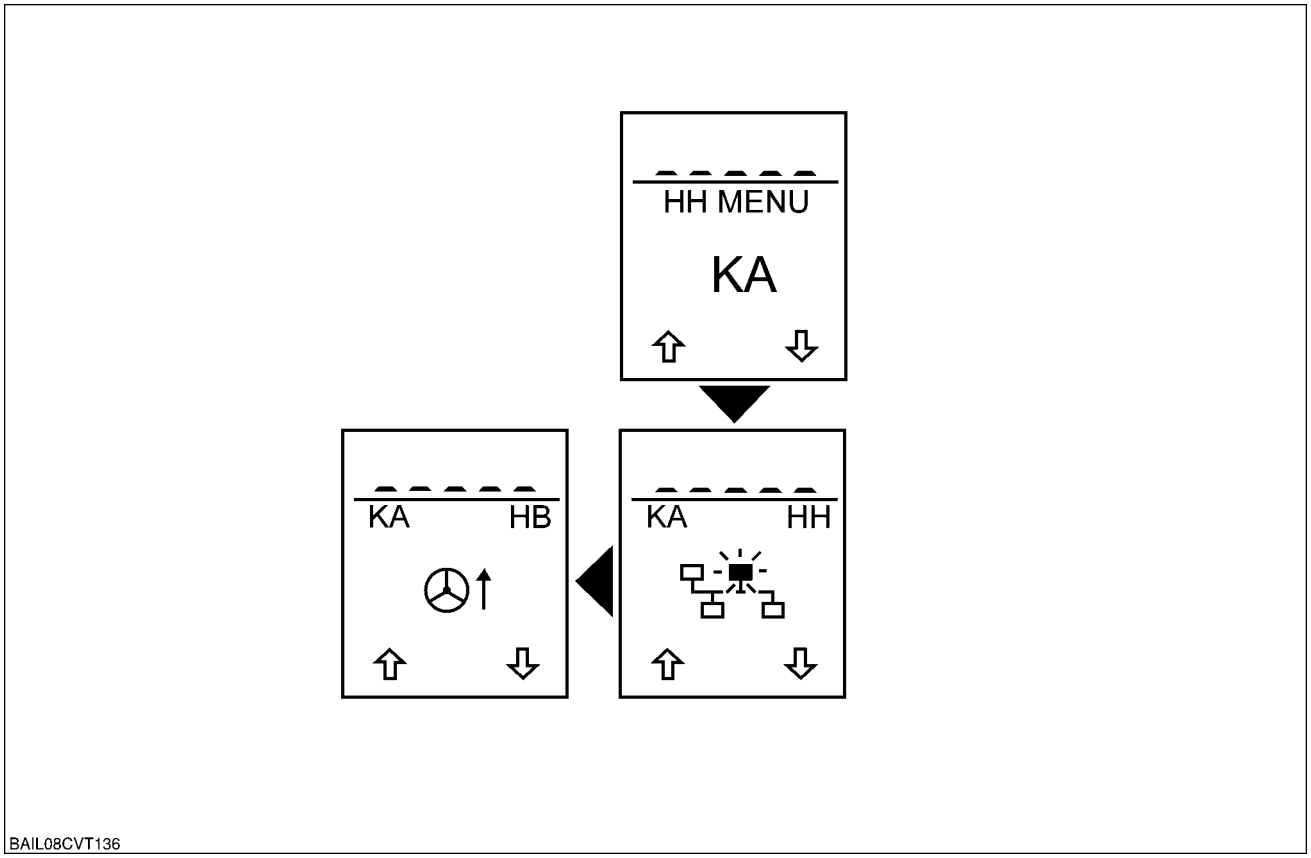
Chan-nel	Description	Module Pin	Typical Reading	Notes
1	LVDT secondary winding 1	B5	450 to 750	
2	LVDT secondary winding 2	B6	450 to 750	
3	Proximity sensor	B4	50 to 800	
4	Electrovalve	A6	350 to 500 mA	

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HB - DISPLAY STORED FAULT CODES

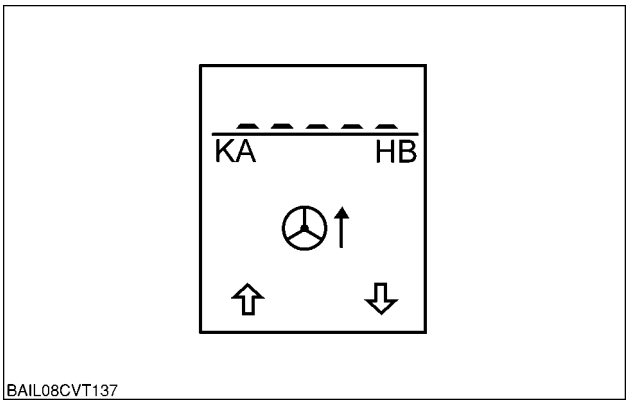
This menu is used to display fault codes which are stored in the EEPROM of the controller.
A maximum of ten fault codes for each sub-system can be stored.
Common to all sub-systems.

HB Menu Screen Select Diagram



BAIL08CVT136 18

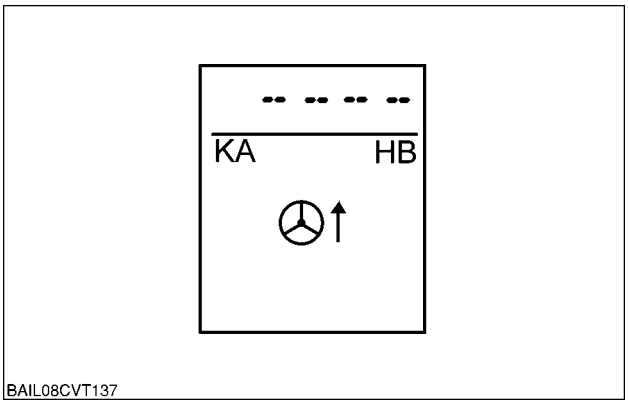
Select the steering sub-system by depressing the "menu" key, as the example shown.



BAIL08CVT137 19

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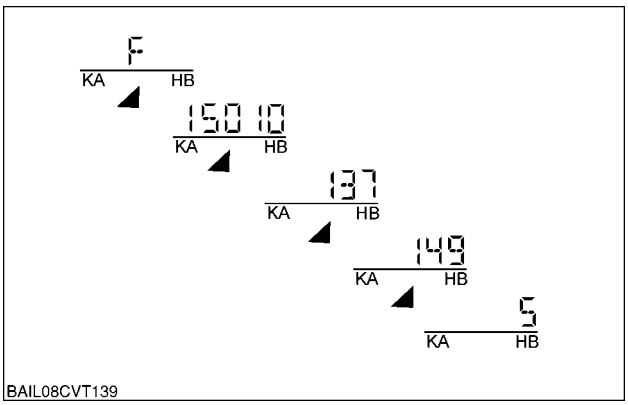
The display will show "_ _ _", if no fault code is stored in the selected sub-system.



BAIL08CVT138 20

The display will show "F", if a fault code is stored in the selected sub-system.

The display will then automatically cycle through as the example:
15010 Fault code
137 Hour of first occurrence
149 Hour of last occurrence
5 Number of occurrences of the fault



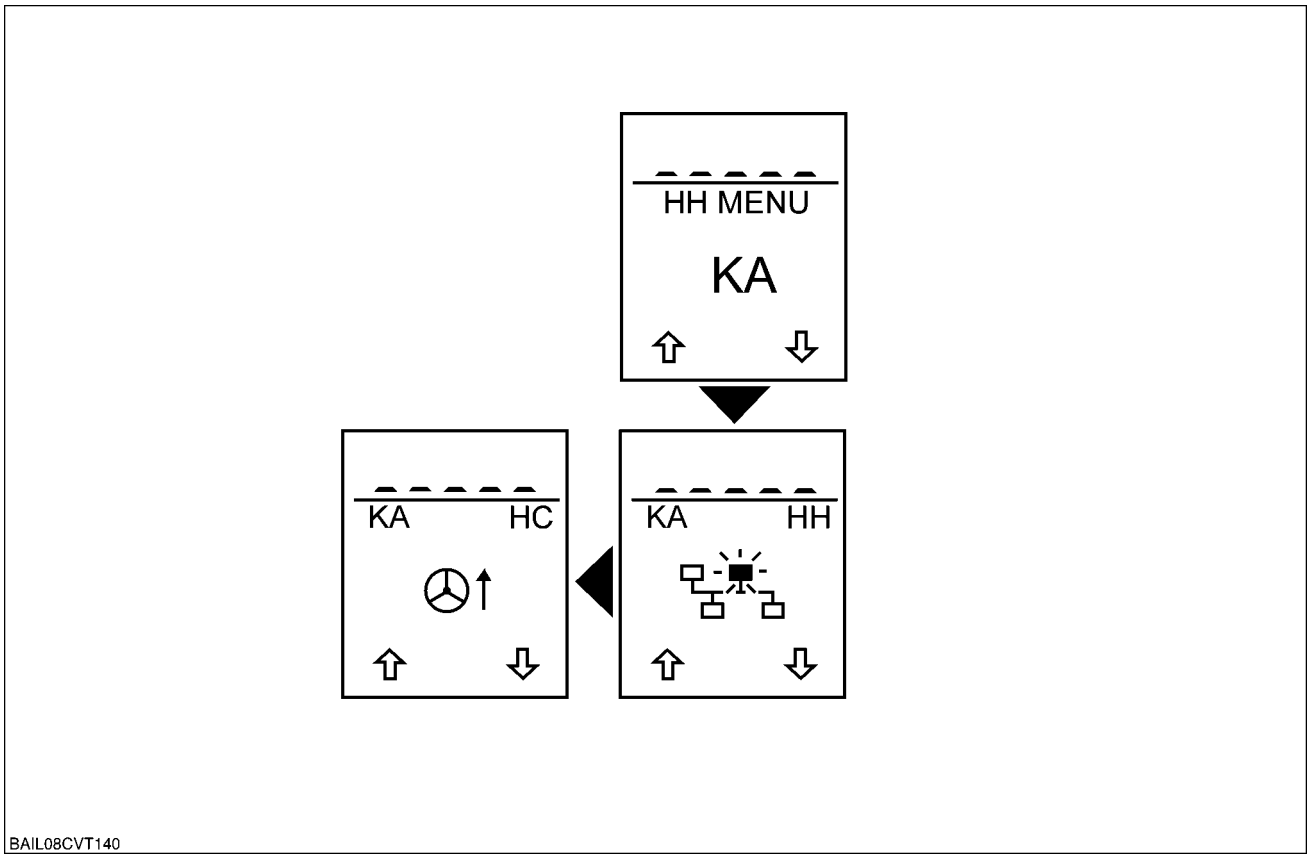
BAIL08CVT139 21

Depress the “up" or “down" key to change to the next fault code in the list.
The lower central display will display “_ _ _" at the end of the list.
Depress the “menu" key to continue navigating through the “HH" menus.

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HC - CLEAR STORED FAULT CODES

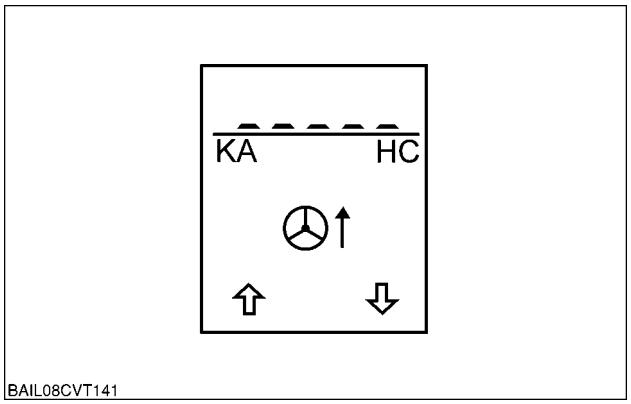
HC Menu Screen Select Diagram



BAIL08CVT140 22

NOTE: *Always make a note of the fault codes stored, before clearing.*

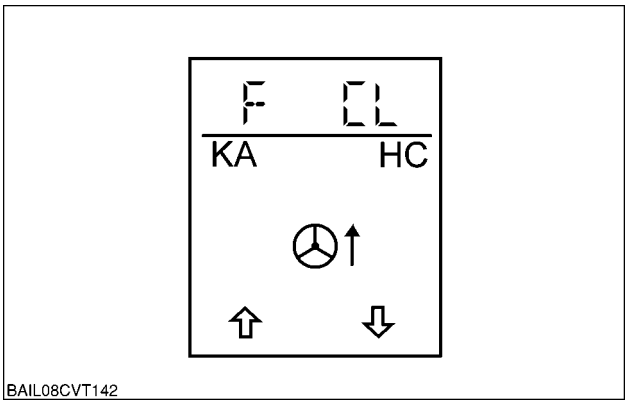
Select the HC menu by depressing the “menu" key.



BAIL08CVT141 23

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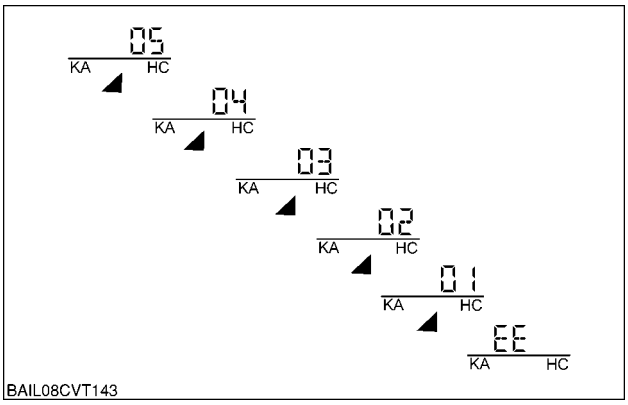
The display will show “F CL".



BAIL08CVT142 24

NOTE: *If the navigation “down" key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the “down" key to confirm the clearing of the memory.
The display will countdown from 05 to 01, then “EE" will be displayed to indicate the fault codes have been cleared.
Depress the “menu" key to continue navigating through the “HH" menus.



BAIL08CVT143 25

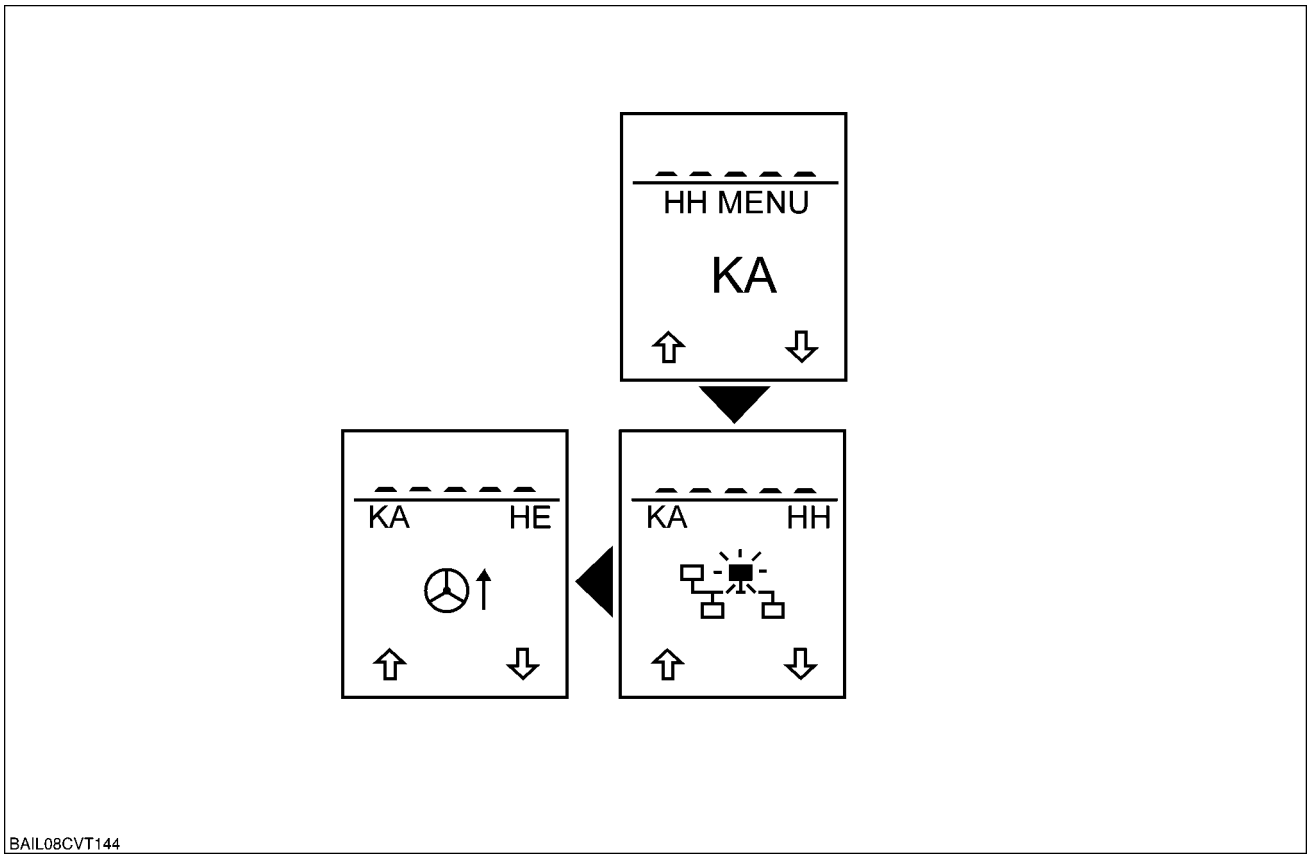
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HE - DISPLAY ALL SPEED INPUTS

This menu is used to verify the operation of various frequency inputs.

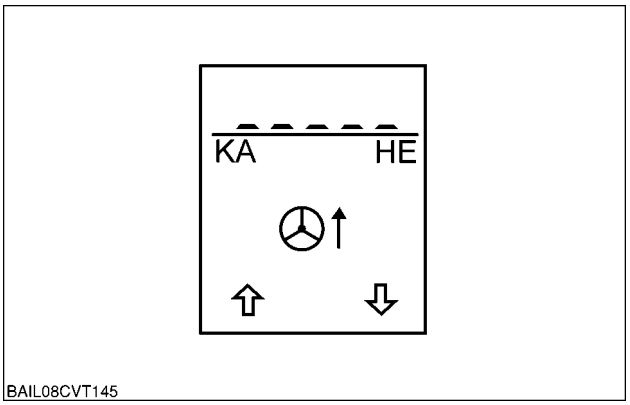
NOTE: *The vehicle may be driven while in this menu.*

Common to all sub-systems.
HE Menu Screen Select Diagram



BAIL08CVT144 26

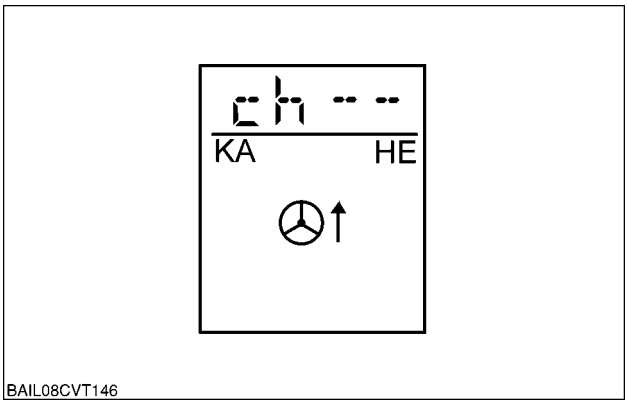
Select the HE menu by depressing the "menu" key.



BAIL08CVT145 27

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The display will show"ch _"
The required channel can be selected by using the “up" and “down" keys.
Refer to the table below for the available channels.



BAIL08CVT146 28

After a delay the value will be displayed.
Depress the “dimming" key to continue navigating through the “HH" menus.

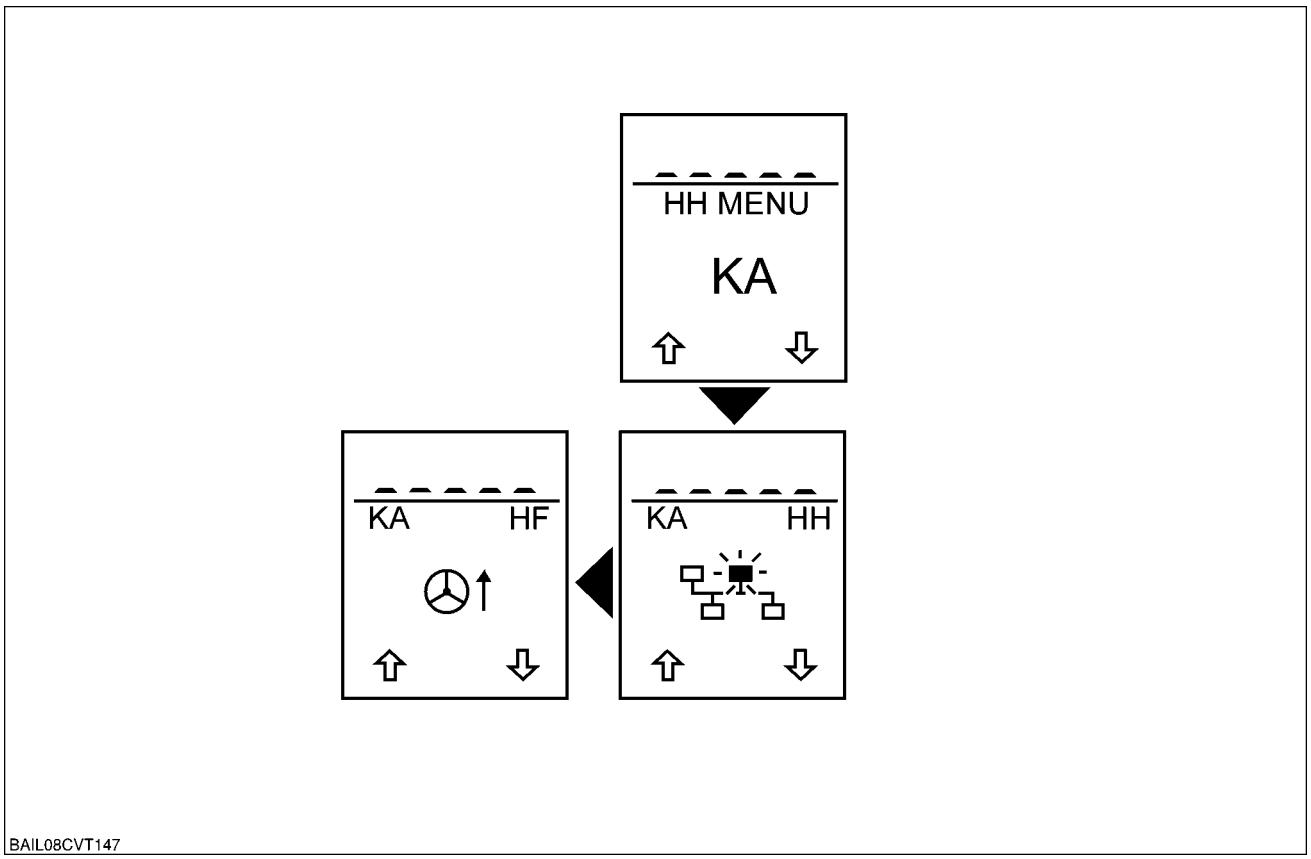
Channel	Description	Typical Reading	Notes
1			
2			

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HF - VIEW CONTROLLER HARDWARE INFORMATION

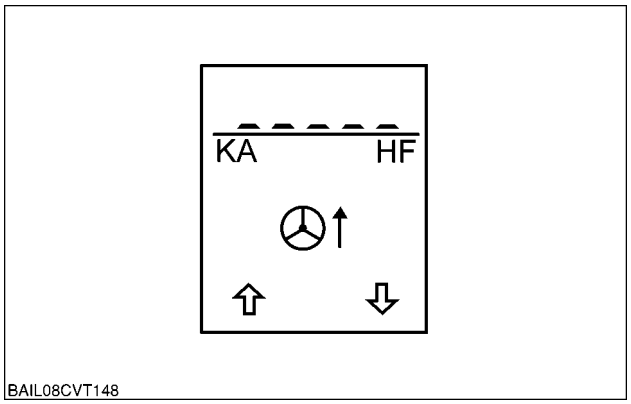
This menu allows the hardware identification, hardware version and serial number to be displayed. Common to all sub-systems.

HF Menu Screen Select Diagram



BAIL08CVT147 29

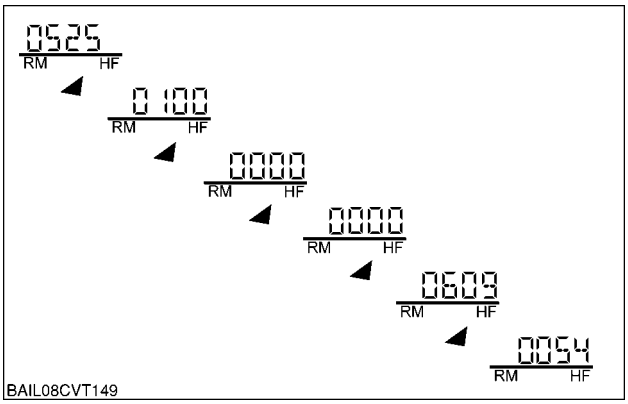
Select the HF menu by depressing the "menu" key.



BAIL08CVT148 30

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The display will automatically cycle through as the example:
0525 Hardware identification
0100 Hardware version
0000 Hardware version
0000 Serial number
0609 Serial number
0054 Serial number
and return to allow navigation of the “HH" menus.



BAIL08CVT149 31

Control module - Configure Armrest

LC - Armrest (ARU)

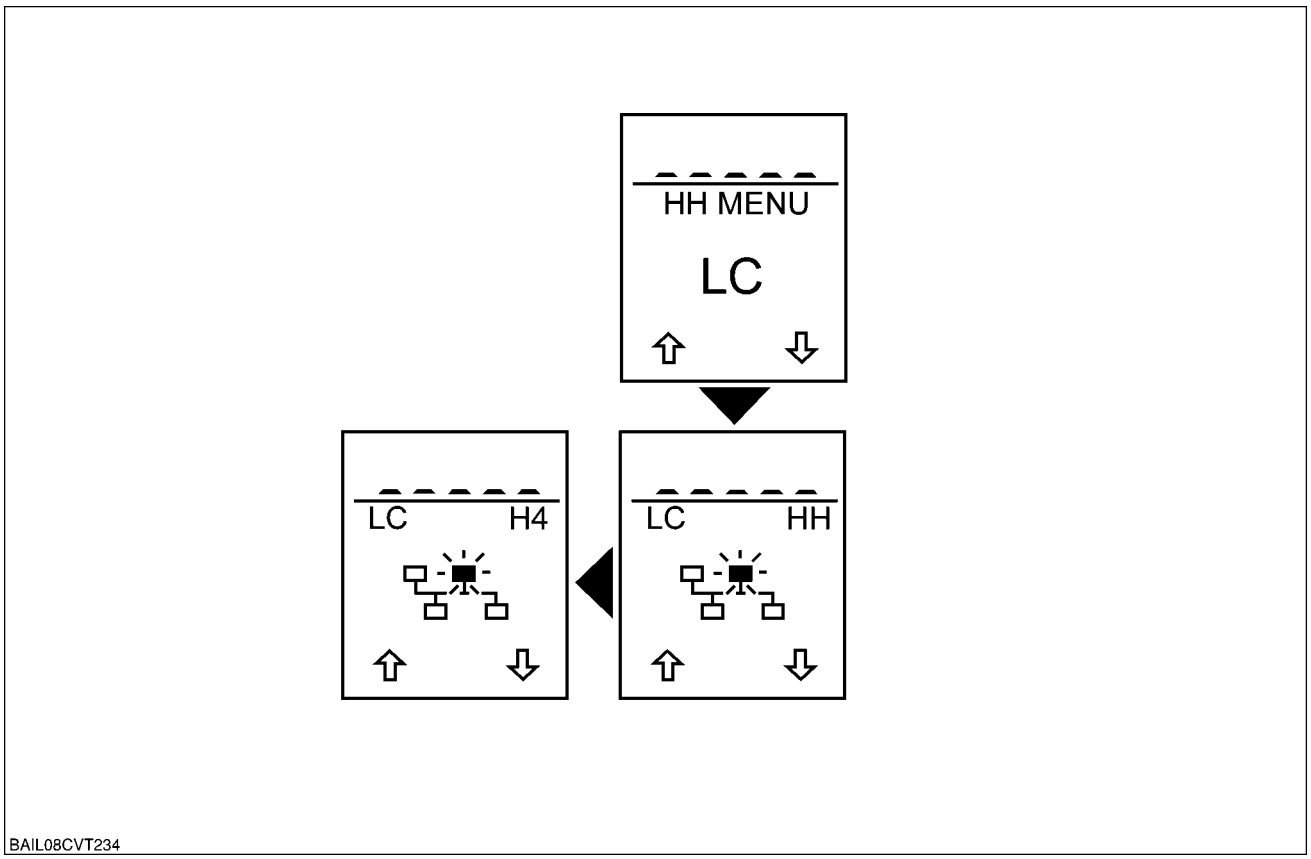
HH	Service menu	Figure
H1	Not used	-
H2	Not used	-
H3	Not used	-
H4	Display software version number	**1**
H5	Switch diagnostics	**4**
H6	Not used	-
H7	Not used	-
H8	Not used	-
H9	Voltmeter diagnostics	**8**
HA	Not used	-
HB	Display stored fault codes	**11**
HC	Clear all stored fault codes	**15**
HD	Not used	-
HE	Not used	-
HF	Display controller hardware information	**19**
HJ	Not used	-

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H4 - DISPLAY SOFTWARE VERSION NUMBER

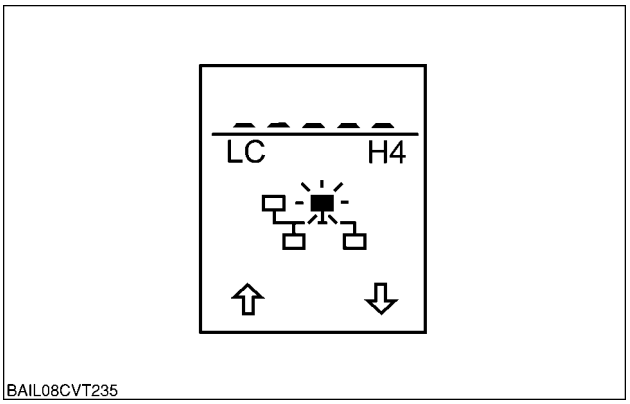
This function is available in all sub-systems.

H4 Menu page selection diagram



BAIL08CVT234 1

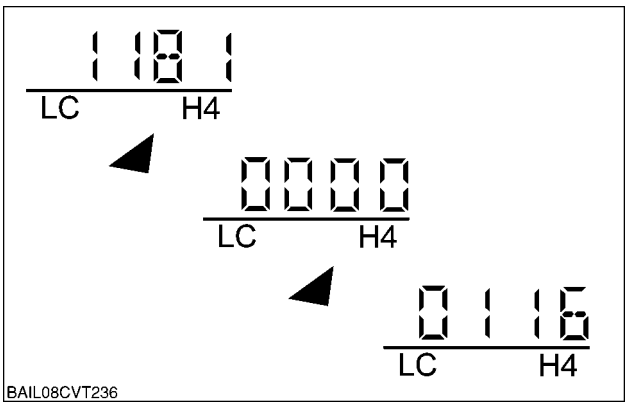
Press the Menu button to call up the H4 Menu.



BAIL08CVT235 2

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The software version is automatically displayed in the upper section of the display (as in the illustrated example). After that the "HH" menu can be used again.



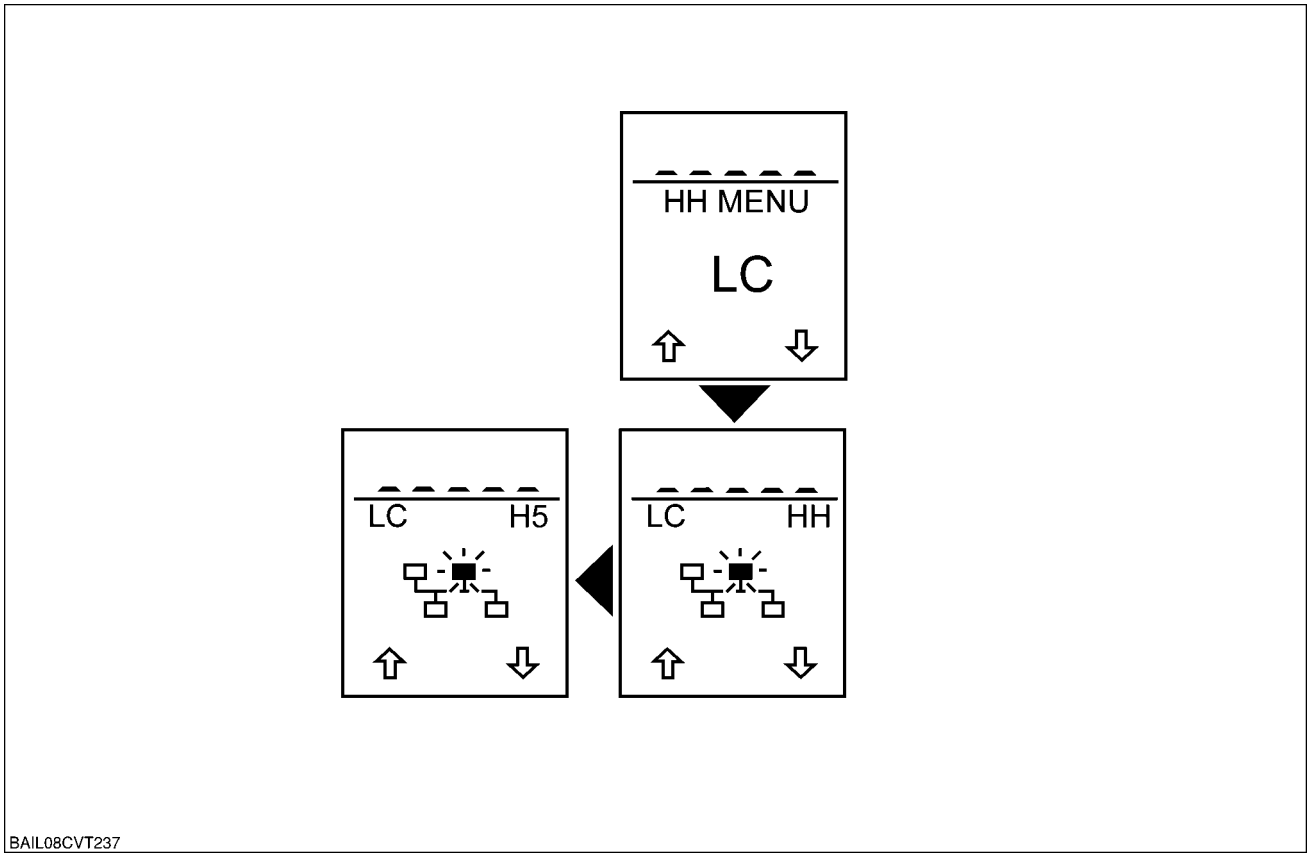
BAIL08CVT236 3

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H5 - SWITCH OPERATION TEST

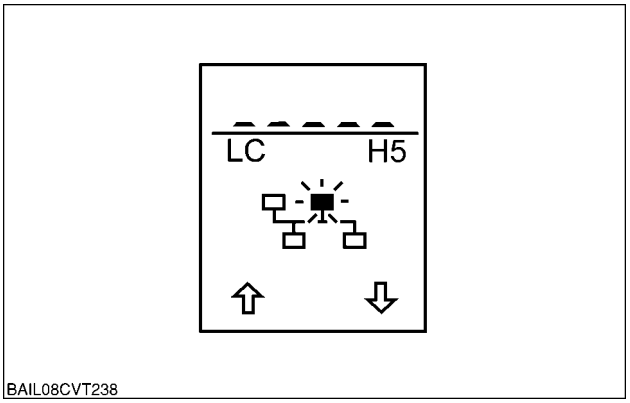
This menu displays a designated code when a switch transition is detected.

H5 Menu Screen Select Diagram



BAIL08CVT237 4

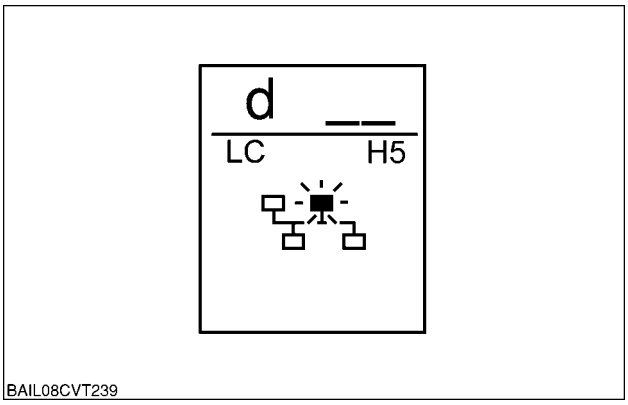
Select the H5 menu by depressing the “menu" key.



BAIL08CVT238 5

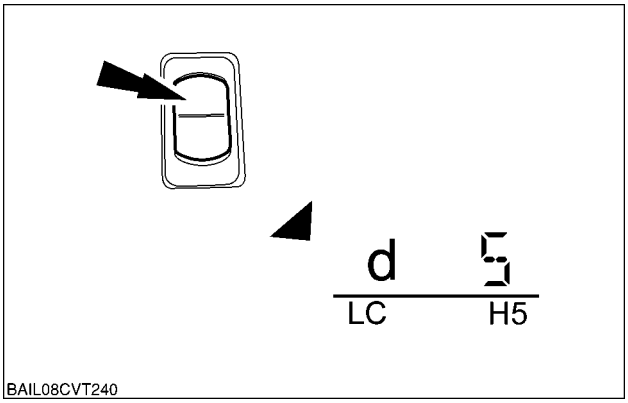
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The top section of the display will display “d _ _".



BAIL08CVT239 6

When a switch is operated, a code will be displayed and an audible tone should be heard to indicate the correct function.
If a switch code is not displayed and the audible tone not heard, a ’wiggle’ test can be performed on the related wiring while watching the display or listening for the audible tone, to help locate the fault.



BAIL08CVT240 7

Identifier	Switch / Input	Notes
d5	Multi function handle (MFH) - Rear hitch work switch	
d6	MFH - Rear hitch raise switch	
d19	MFH - 2nd function handle	
d92	Front hitch height limit enable switch	
d95	EHR 1 program / motor mode switch	
d96	EHR 2 program / motor mode switch	
d97	EHR 3 program / motor mode switch	
d98	EHR 4 program / motor mode switch	
d104	MFH - Headland Turn system (HTS) step switch	
d136	MFH - Reverse switch	
d137	MFH - Forward switch	
d153	Joystick 1 - switch 1	
d154	Joystick 1 - switch 2	
d155	Joystick 1 - switch 3	
d156	Joystick 2 - switch 1	
d157	Joystick 2 - switch 2	
d158	Joystick 2 - switch 3	
d159	EHR flow control encoder switch	
d165	EHR float control switch	
d169	MFH - CVT range increase switch	
d170	MFH - CVT range decrease switch	
d177	MFH - Autoguidance engage on/off switch	
d178	MFH EHR 1 extend switch	
d179	MFH EHR 1 retract switch	

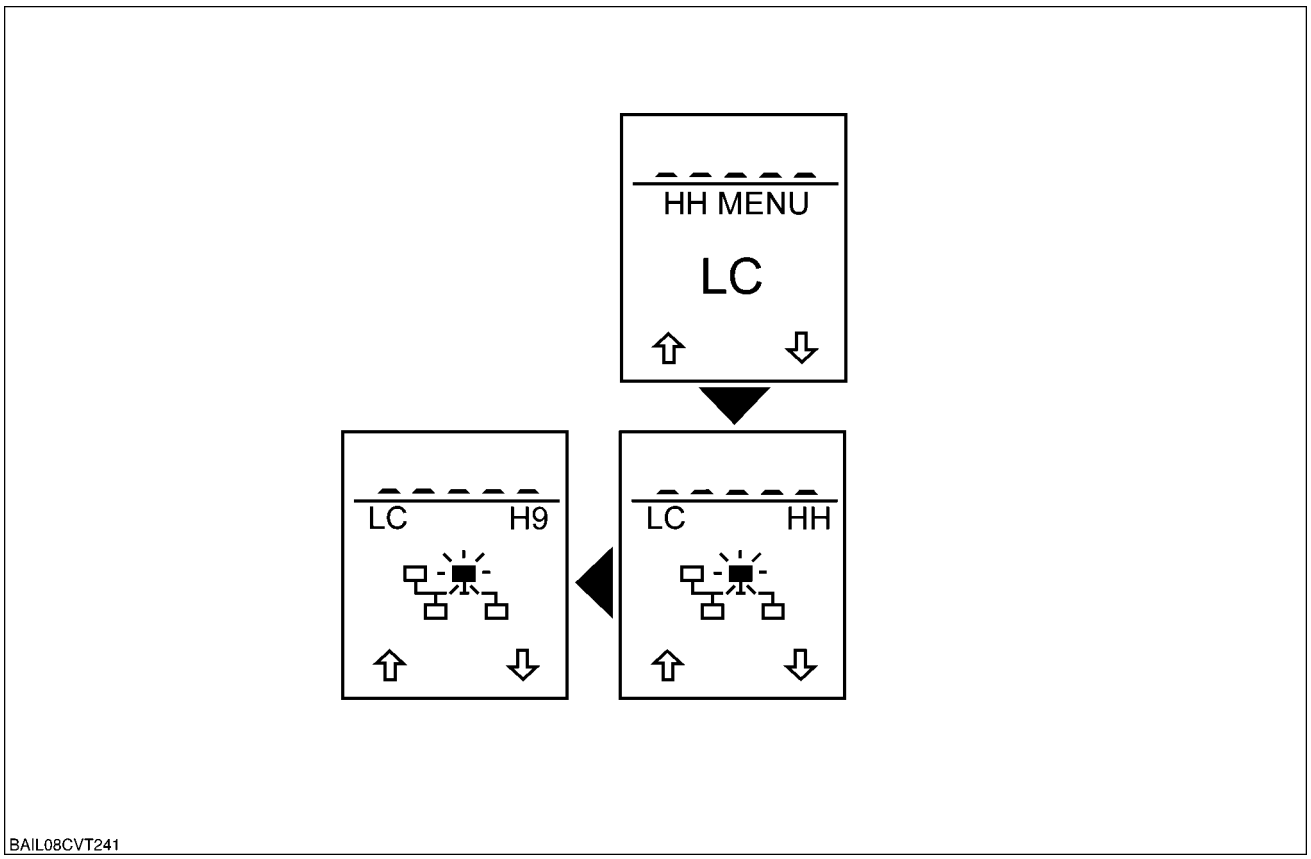
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H9 - VOLTMETER

This menu is used to verify the operation of various potentiometers, voltage supplies, and solenoid current circuits. If an intermittent fault is detected within a circuit, a 'wiggle' test can be performed on the related wiring while watching the display for sudden changes in values, to help locate the area where the fault exists.

NOTE: *The vehicle may be driven while in this menu.*

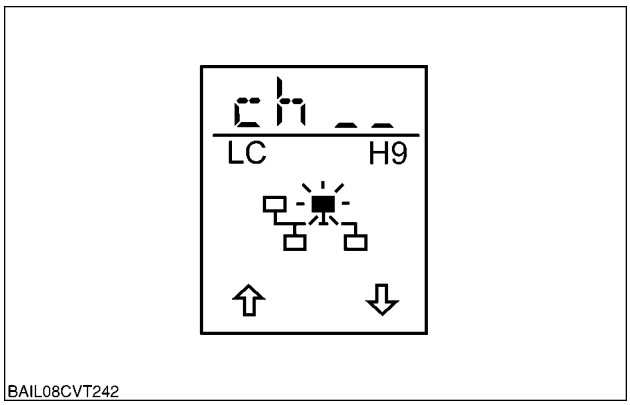
H9 Menu Screen Select Diagram



BAIL08CVT241 8

Select the H9 menu by depressing the "menu" key.

The top section of the display will display "ch _ _".



BAIL08CVT242 9

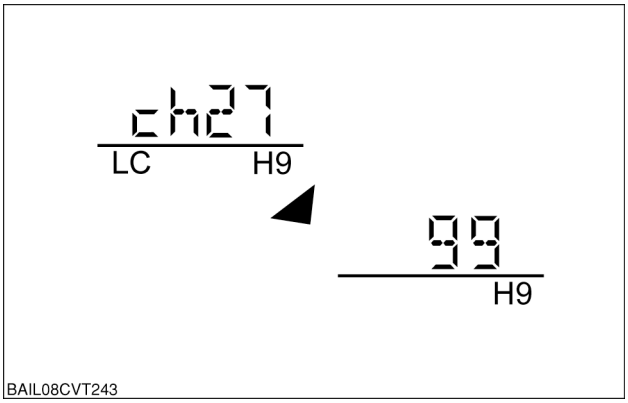
The required channel can be selected by using the navigation "up" and "down" keys.
After a delay the value will be displayed. Compare the value displayed with the typical reading shown in the table below.

NOTE: *The value is the input voltage or signal into the controller. This cannot be directly translated into a voltage due to the internal processes of the controller. A zero equates to* ***0 volts****.*

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If the value displayed varies by more than **10 %** to that shown in the table below, a fault is indicated in either the component or the wiring harness relevant to that channel.

NOTE: *Check the connectors of the effected circuit, including the controller connectors, prior to replacing any components.*



BAIL08CVT243 10

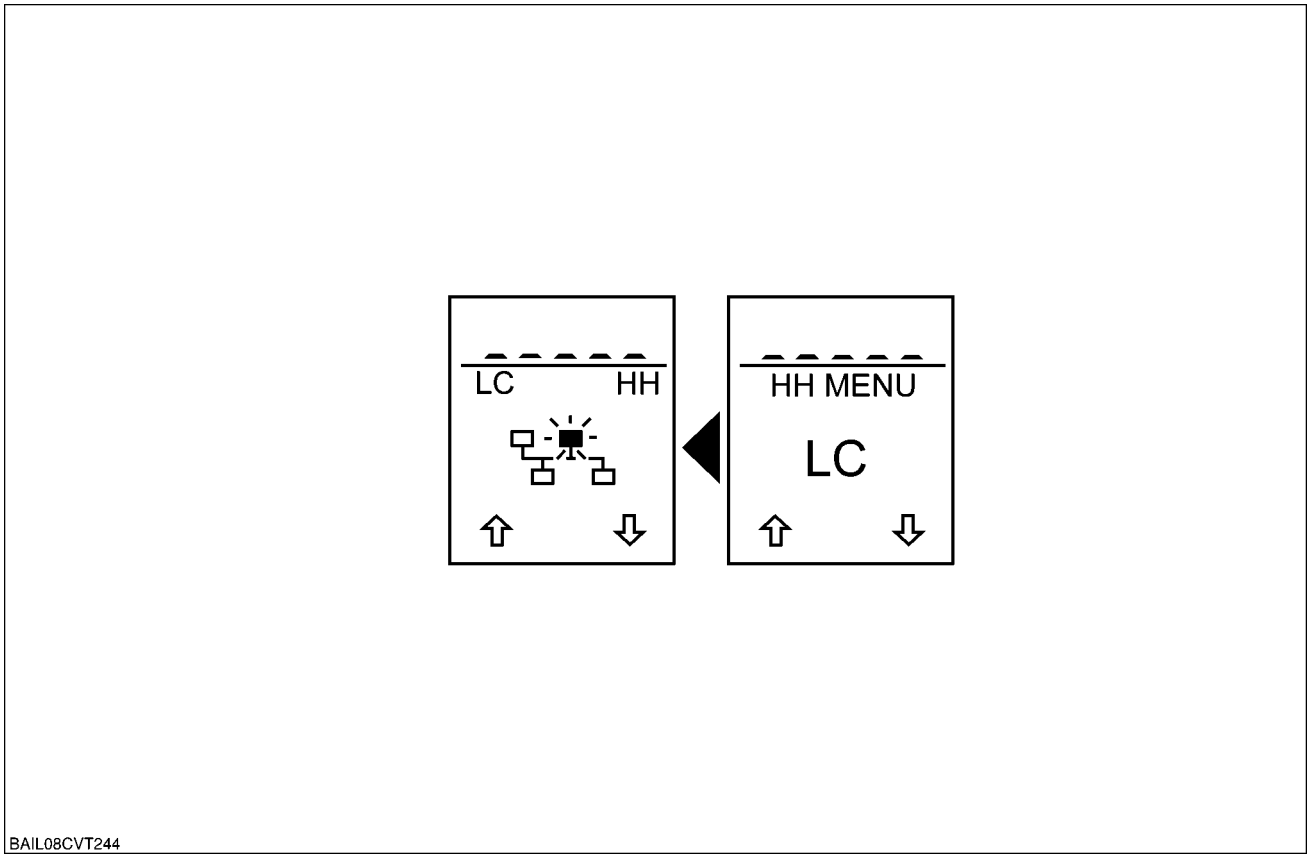
Channel	Description	Typical Reading
27	Front hitch - height limit control	0 anti-clockwise 100 clockwise
33	Rear hitch - draft control	0 anti-clockwise 100 clockwise
34	Rear hitch - drop rate control	0 anti-clockwise 100 clockwise
35	Rear hitch - height limit control	0 anti-clockwise 100 clockwise
36	Rear hitch - sensitivity control	0 anti-clockwise 100 clockwise
37	Rear hitch - slip control	0 anti-clockwise 100 clockwise
40	Rear hitch - position control	0 anti-clockwise 100 clockwise
89	Hand throttle No.2 position	0.0 min throttle 100.0 max throttle
90	Hand throttle No.1 position	0.0 min throttle 100.0 max throttle
97	Joystick 1 - X position	0.0 at centre 100.0 left/right
98	Joystick 1 - Y position	0.0 at centre 100.0 up/down
101	EHR No.1 lever position	97.0 raise, 55.0 neutral 12.0 lower, 1.0 float
102	EHR No.2 lever position	97.0 raise, 55.0 neutral 12.0 lower, 1.0 float
103	EHR No.3 lever position	97.0 raise, 55.0 neutral 12.0 lower, 1.0 float
104	EHR No.4 lever position	97.0 raise, 55.0 neutral 12.0 lower, 1.0 float
140	Multifunction handle position	0.0 fully back 100.0 fully forward
143	Joystick 1 - proportional rocker	50 centre 0 pressed down, 100 pressed up
145	Vref 1	927
149	EHR flow encoder	Not available
150	Multi Function Handle encoder	Not available

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HB - DISPLAY STORED FAULT CODES

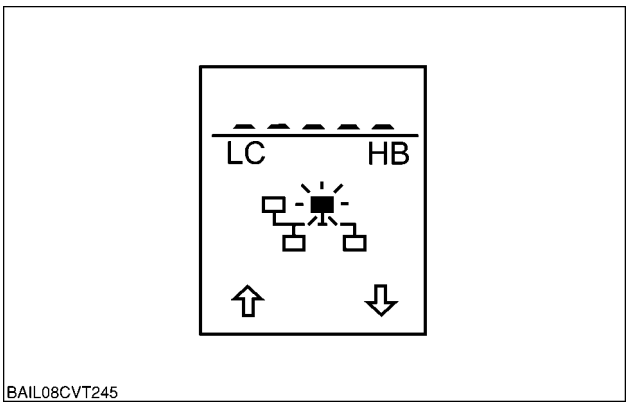
This menu is used to display the fault codes, which are stored in the EEPROM of the electronic control unit. This function is available in all sub-systems.

HB Menu page selection diagram



BAIL08CVT244 11

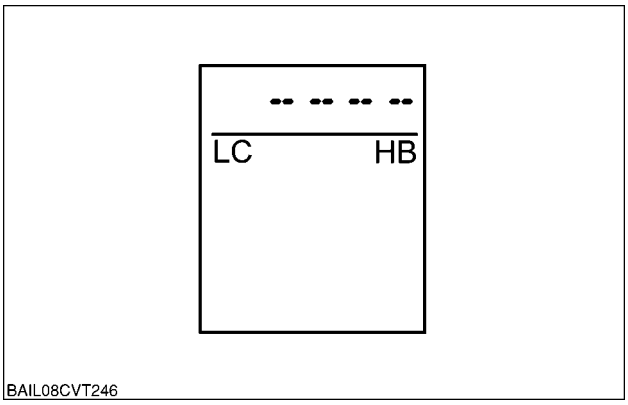
Press the Menu button to call up the HB Menu.



BAIL08CVT245 12

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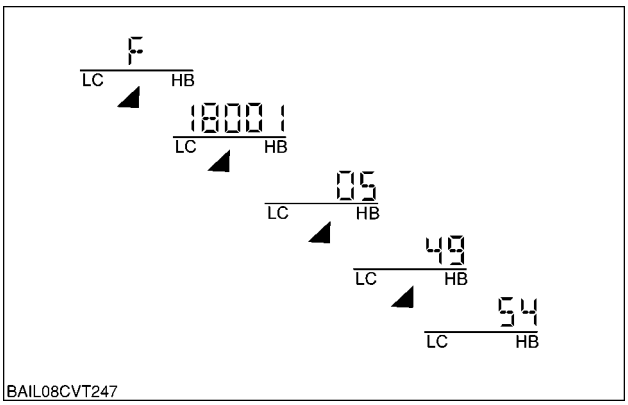
"_ _ _ _" is displayed in the upper section of the display, when no fault code is stored in the selected sub-system.



BAIL08CVT246 13

"F" is displayed in the upper section of the display, if a fault code is stored in the selected sub-system.
The sequence of the data display runs through in the upper section of the display, for example, as follows:

18001 Fault code
05 Operating hours at the time of the first occurrence
49 Operating hours at the time of the last occurrence
54 Frequency of occurrence



BAIL08CVT247 14

Press the "Up" or "Down" navigation button to change to the next fault code in the list.

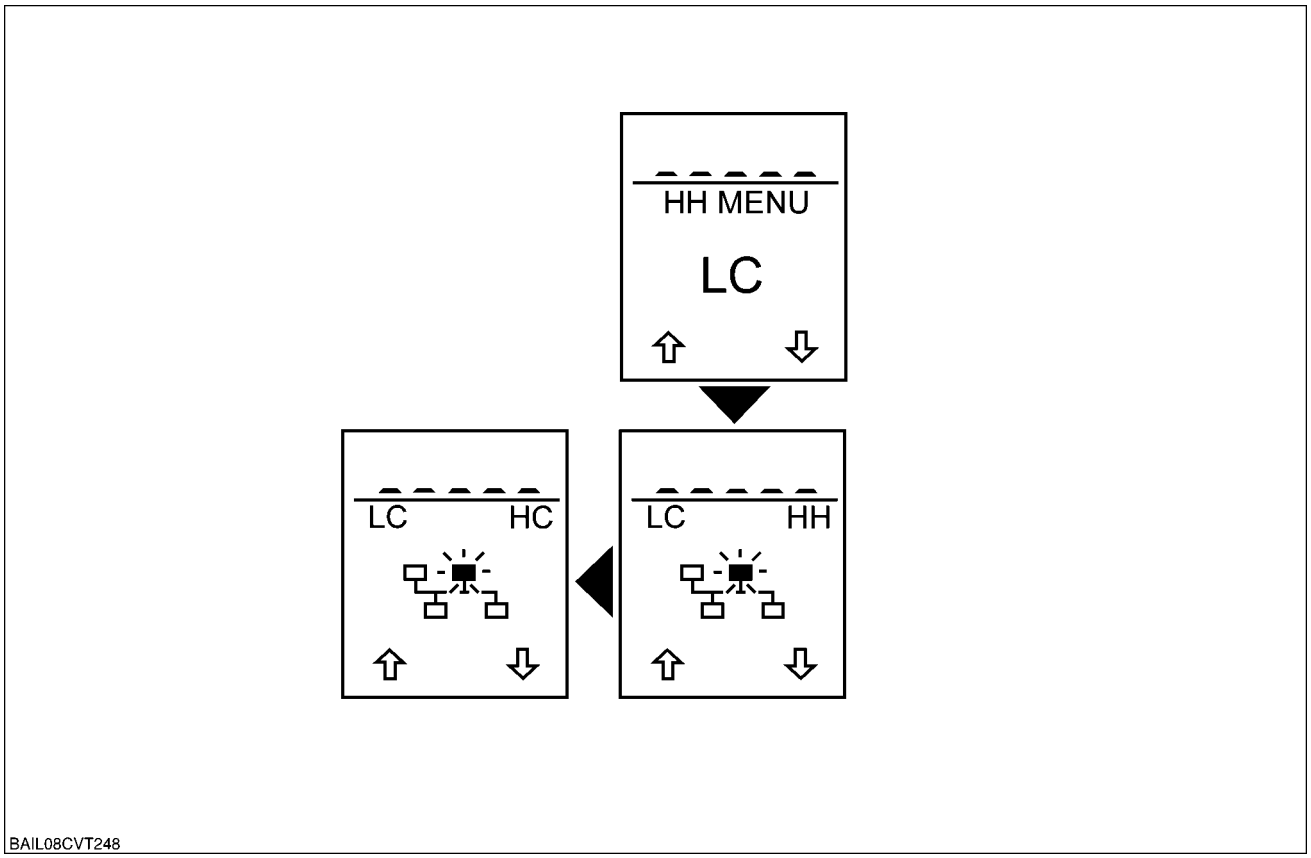
As soon as the end of the list is reached, "_ _ _" is displayed in the upper section of the display.

To use the "HH" menu further, press the Menu button.

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HC - CLEAR ALL STORED FAULT CODES

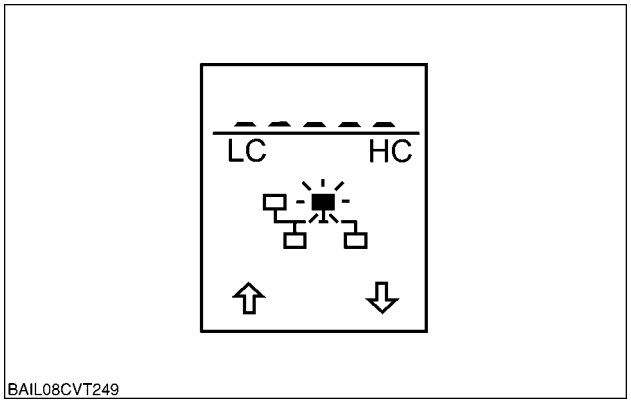
HC Menu page selection diagram



BAIL08CVT248 15

NOTE: *Always write the stored fault codes down before clearing.*

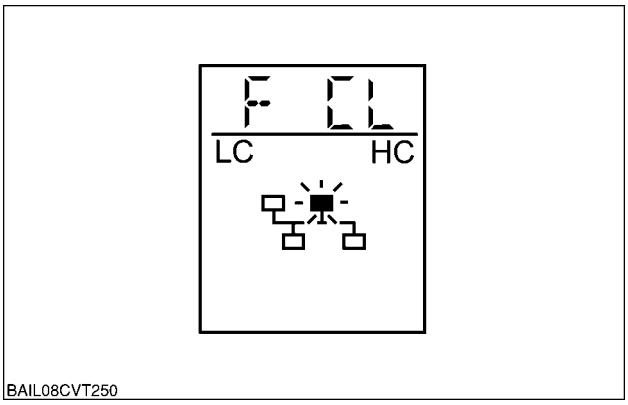
Press the Menu button to call up the HC Menu.



BAIL08CVT249 16

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"F CL" is displayed in the upper section of the display.



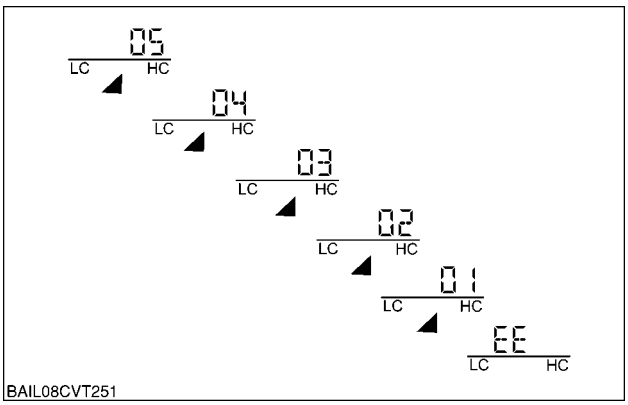
BAIL08CVT250 17

NOTE: *If the "Down" navigation button is released before the end of the countdown, the process is aborted.*

To confirm clearing the memory, press and hold the "Down" navigation button.

NOTE: *The numbers 05 to 01 run backwards in the upper section of the display, then "EE" appears to inform you that the fault codes have been cleared.*

To use the "HH" menu further, press the Menu button.



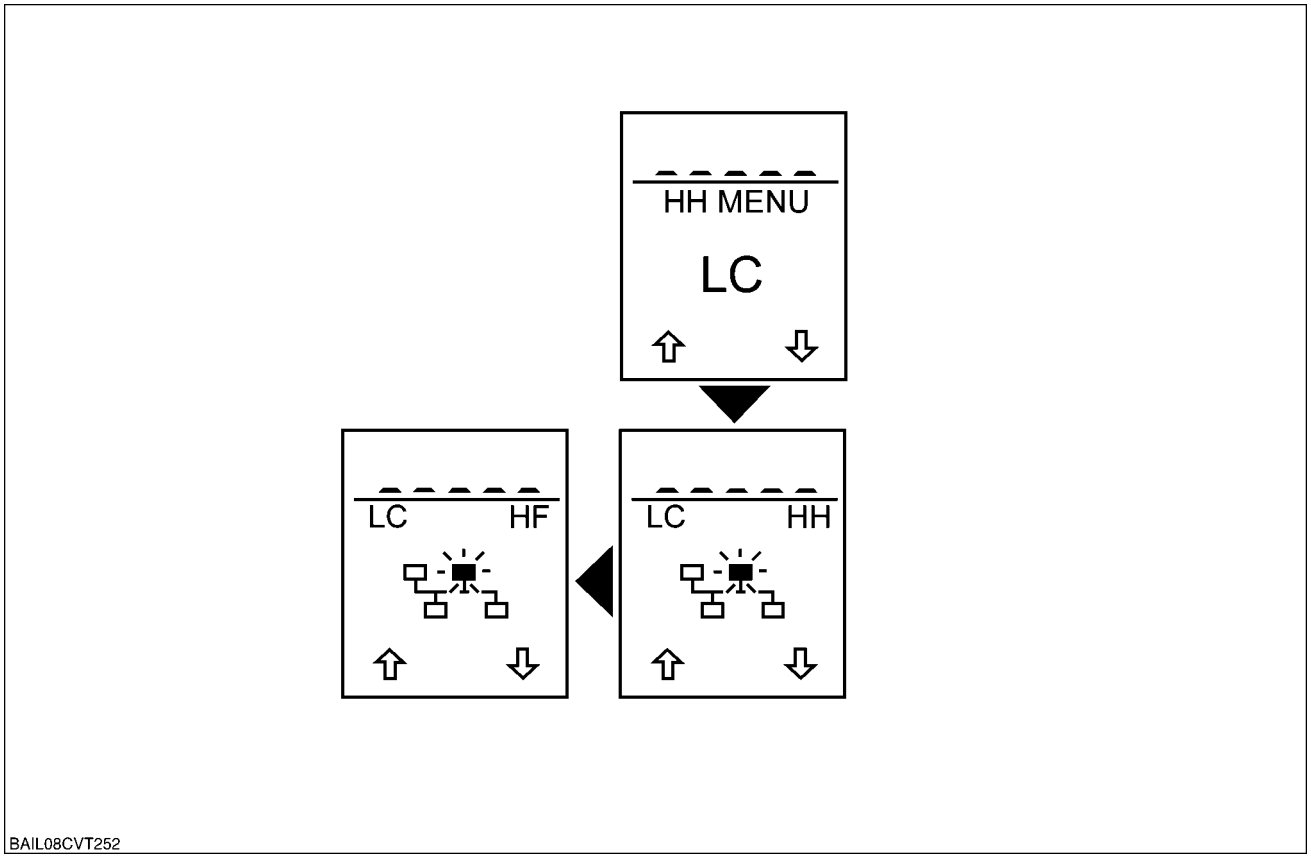
BAIL08CVT251 18

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HF - DISPLAY CONTROLLER HARDWARE INFORMATION

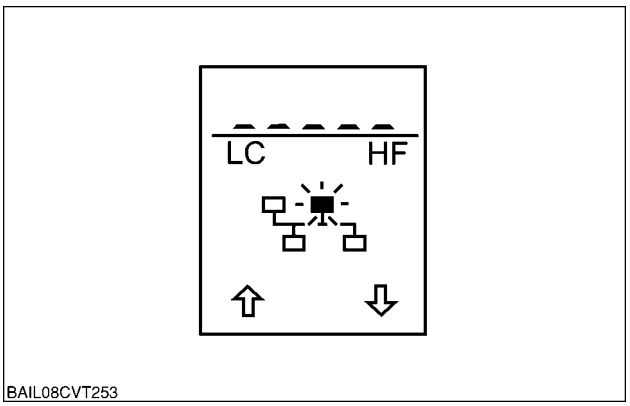
This menu makes possible hardware identification; the hardware version and serial number are displayed. This function is available in all sub-systems.

HF Menu page selection diagram



BAIL08CVT252 19

Press the Menu button to call up the HF Menu.

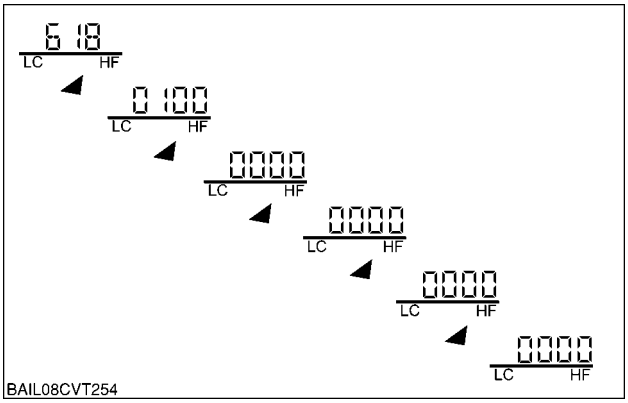


BAIL08CVT253 20

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The sequence of the data display runs through automatically in the upper section of the display, for example, as follows:

618 Hardware identification
0100 Hardware version
0000 Hardware version
0000 Serial number
0000 Serial number
0000 Serial number
After that the "HH" menu can be used again.



BAIL08CVT254 21

Control module - Configure Electronic Park Lock (EPL)

XA Control Module

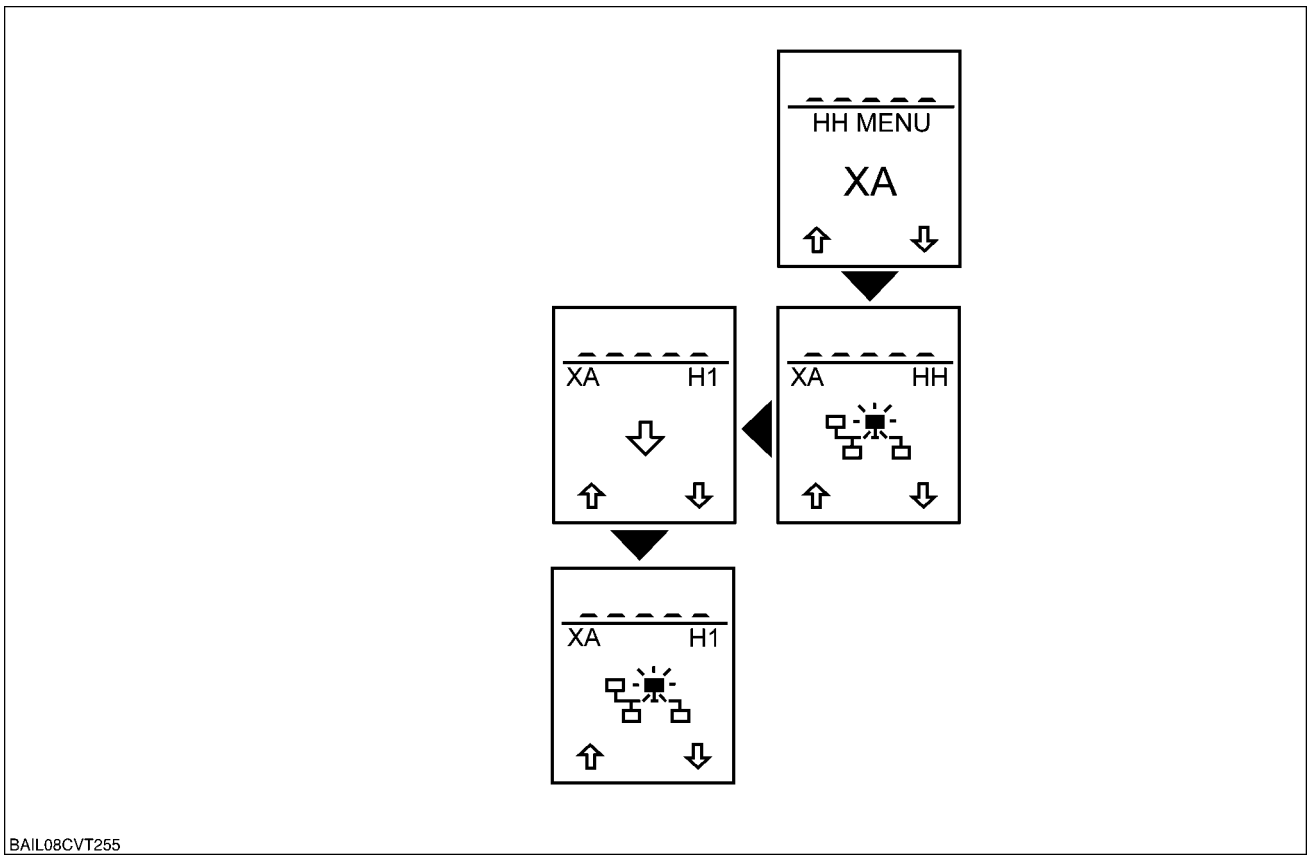
HH	Service Menu	Figure Number
H1	Calibration procedures	**1**
H2	View stored calibration values	**2**
H3	Configurations and options	**5**
H4	View software revision level	**10**
H5	Switch operation test	**13**
H6	Not used	-
H7	Not used	-
H8	Clear Electrically Erasable Programmable Read Only Memory (EEPROM)	**17**
H9	Voltmeter	**21**
HA	Not used	-
HB	Display stored fault codes	**25**
HC	Clear all stored fault codes	**29**
HE	Not used	-
HF	View controller hardware information	**33**
HJ	Not used	-

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H1 - CALIBRATION PROCEDURES

This menu is used to calibrate the Electronic Park Lock, refer to **PARKING BRAKE Electronic - Calibrate (D.32.D)**.

H1 Menu Screen Select Diagram



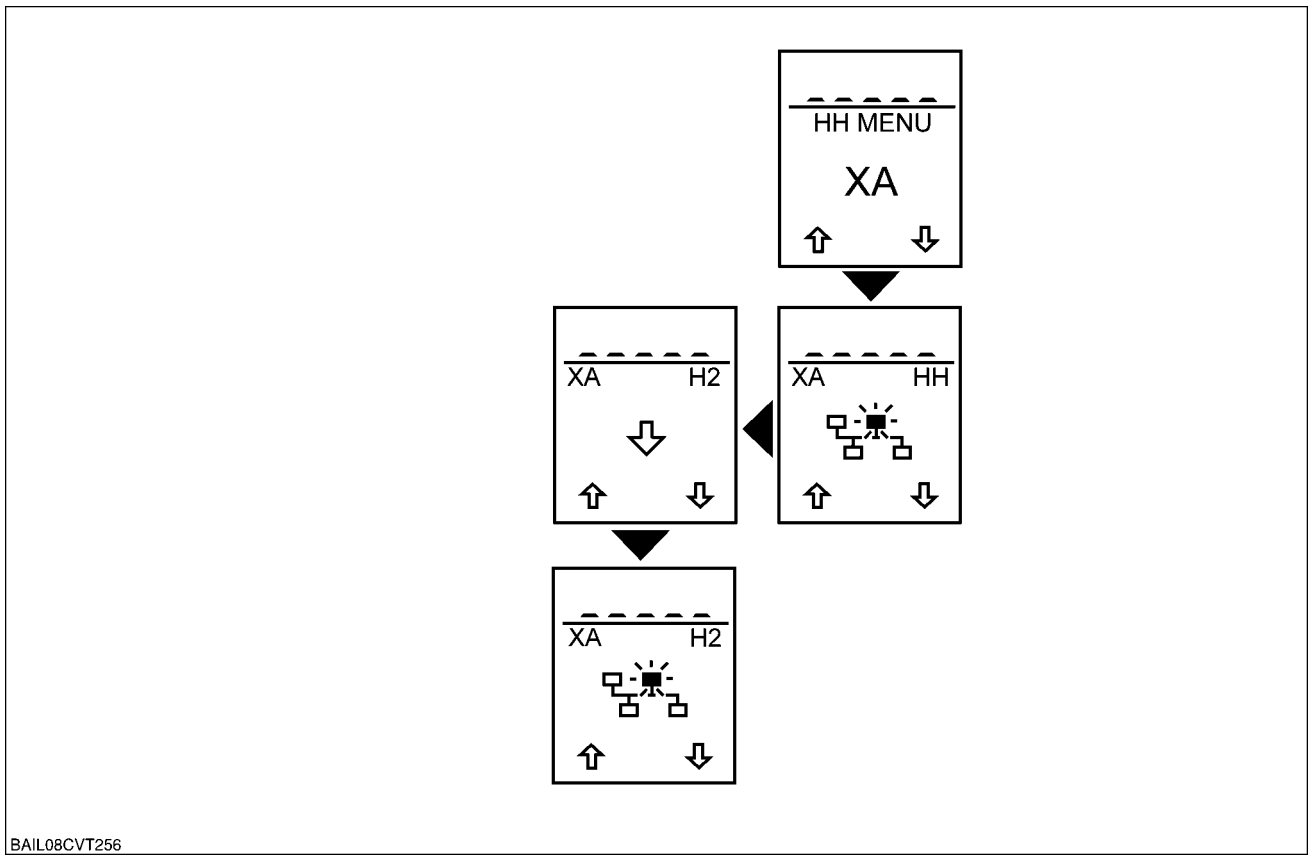
BAIL08CVT255 1

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H2 - VIEW STORED CALIBRATION VALUES

This menu is used to display the calibration values stored in the controller for the Electronic Park Lock

H2 Menu Screen Select Diagram

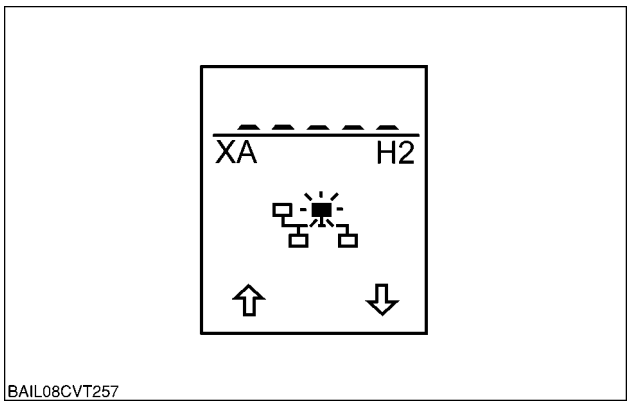


BAIL08CVT256 2

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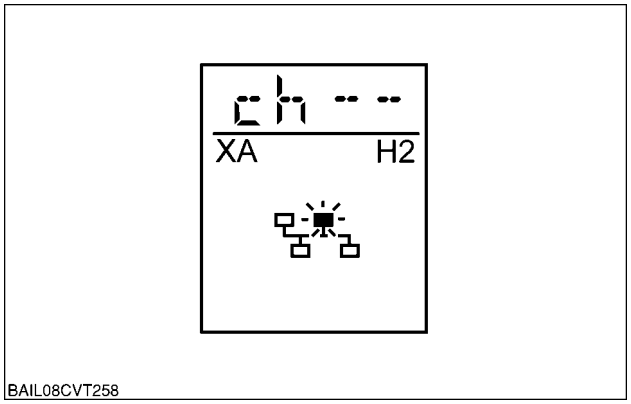
ELECTRONIC PARK LOCK VALUES

Select the electronic park lock sub system by depressing the "menu" key.



BAIL08CVT257 3

The upper section of the display will display "ch - -".
The required channel can be selected by using the navigation "up" and "down" keys.



BAIL08CVT258 4

After a delay the code followed by the calibration value will be displayed, (refer to the table below for the description of each channel).
Depress the "menu" key to continue navigating through the "HH" menus.

Channel	Description	Value Range
Ch 1	Accelerometer offset	-45.0 to 45.0
Ch 2	Applied position	0.0 to 65.0
Ch 3	Released position	0.0 to 65.0
Ch 4	Bite point position	0.0 to 65.0
Ch 5	Number of apply actuations	0 to 99999999
Ch 6	Number of apply actuations while tractor moving	0 to 99999999

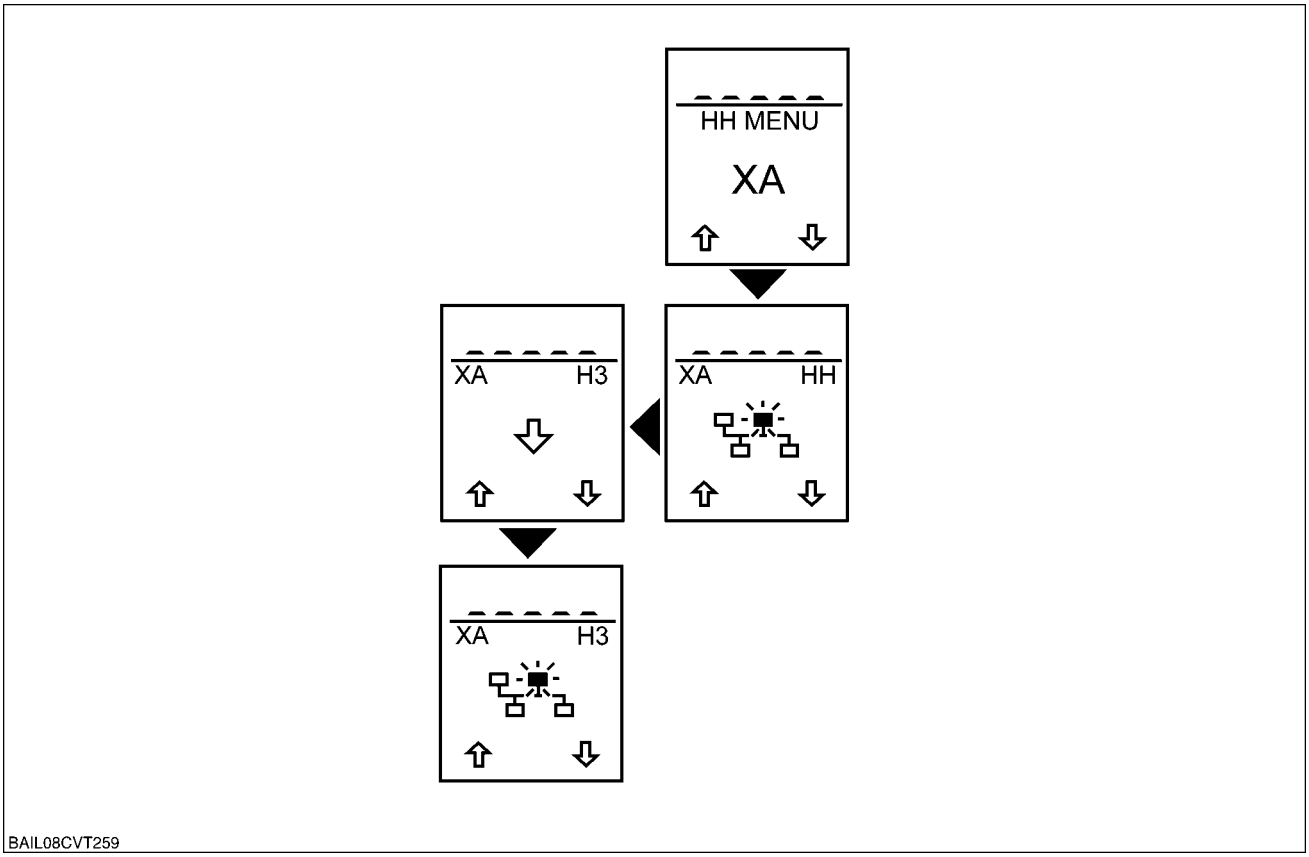
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H3 - CONFIGURATIONS

Used to display the configurations available for the electronic park lock.

1. Electronic park lock
   - Ch.1 Electronic park lock enable option
   - Ch.2 Trailer brake present

H3 Menu Screen Select Diagram

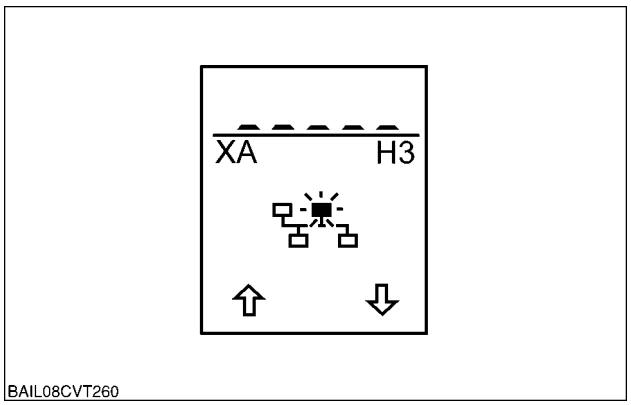


BAIL08CVT259 5

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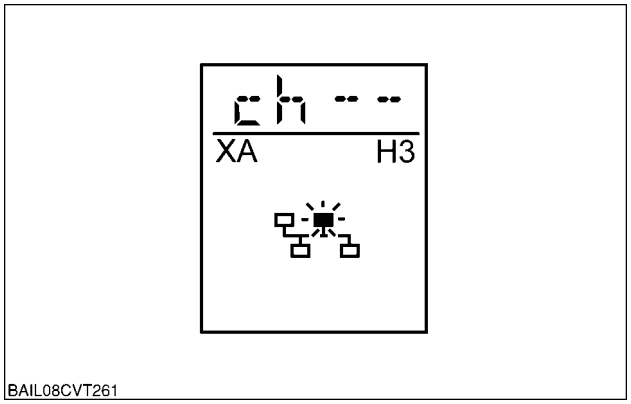
ELECTRONIC PARK BRAKE OPTIONS

Select the EPL sub-system by depressing the "menu" key.



BAIL08CVT260 6

The lower central display will display "ch - -".
The required channel can be selected by using the "up" and "down" keys.



BAIL08CVT261 7

After a delay the current setting will be displayed. (see the table below for the description of each channel).

Channel	Description
Ch 1	Electronic Park Lock enable option
Ch 2	Trailer brake present

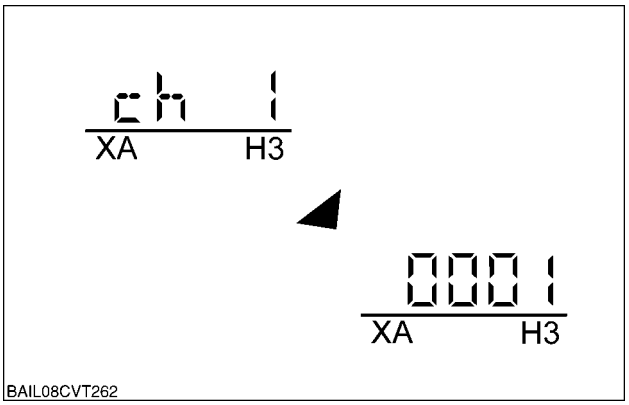
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Channel 1 - Electronic Park Lock Option

Scroll through the available options using the navigation "up" or "down" key.

The options available are:

- 0001 - Enable EPL
- 0000- Disable EPL



BAIL08CVT262 8

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

Depress the "menu" key to continue navigating through the "HH" menus.

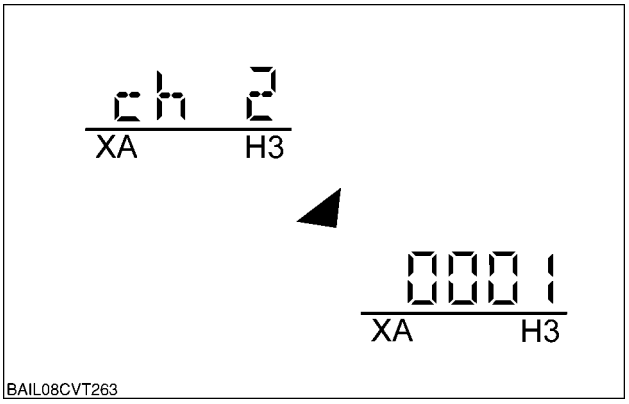
Channel 2 - Trailer Brake Present

This channel is used to select whether trailer brakes are present or not.

Scroll through the available options using the navigation "up" or "down" key.

The options available are:

- 0001 - Trailer brakes present
- 0000- Trailer brakes not present



BAIL08CVT263 9

To save the desired option, depress and hold the navigation "up" or "down" key until the instrument cluster bleeps, indicating that the selection has been saved.

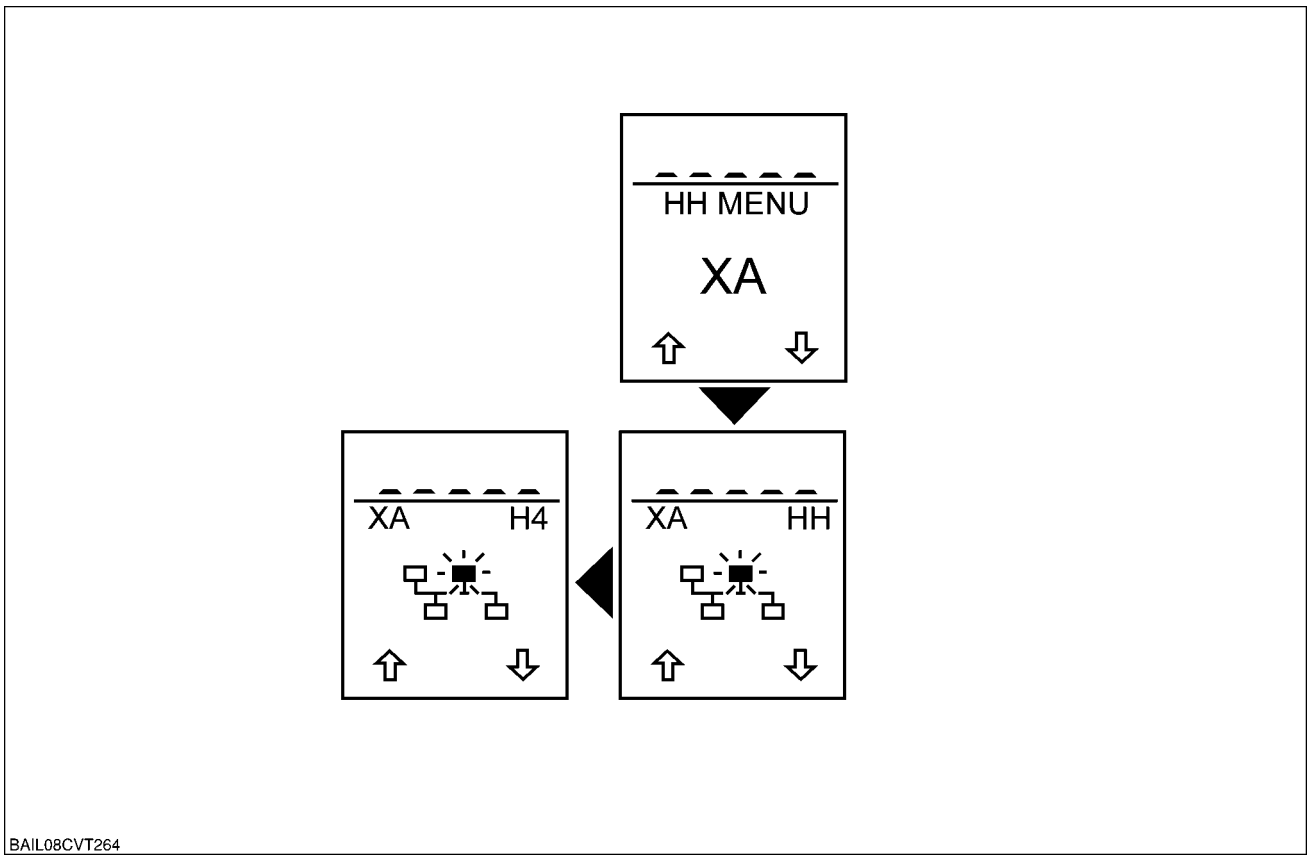
Depress the "menu" key to continue navigating through the "HH" menus.

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H4 - VIEW SOFTWARE REVISION LEVEL

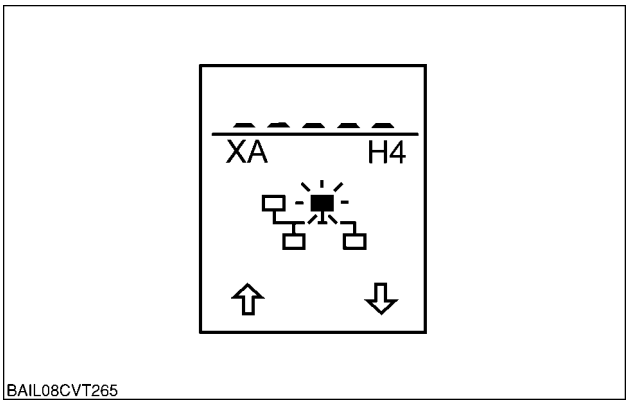
Common to all sub-systems.

H4 Menu Screen Select Diagram



BAIL08CVT264 10

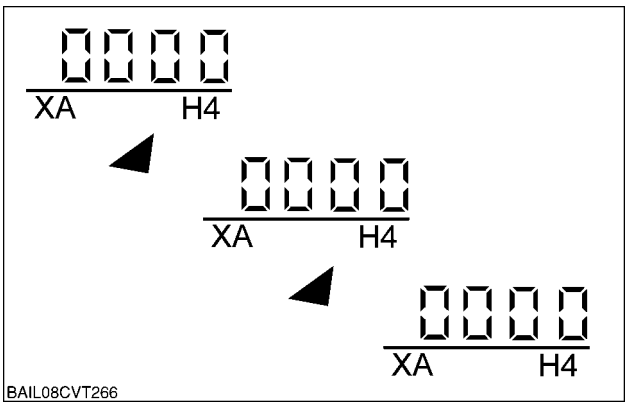
Select the H4 menu by depressing the "menu" key.



BAIL08CVT265 11

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The upper section of the display will automatically cycle through the software release, as the example shown and return to allow navigation of the "HH" menus.



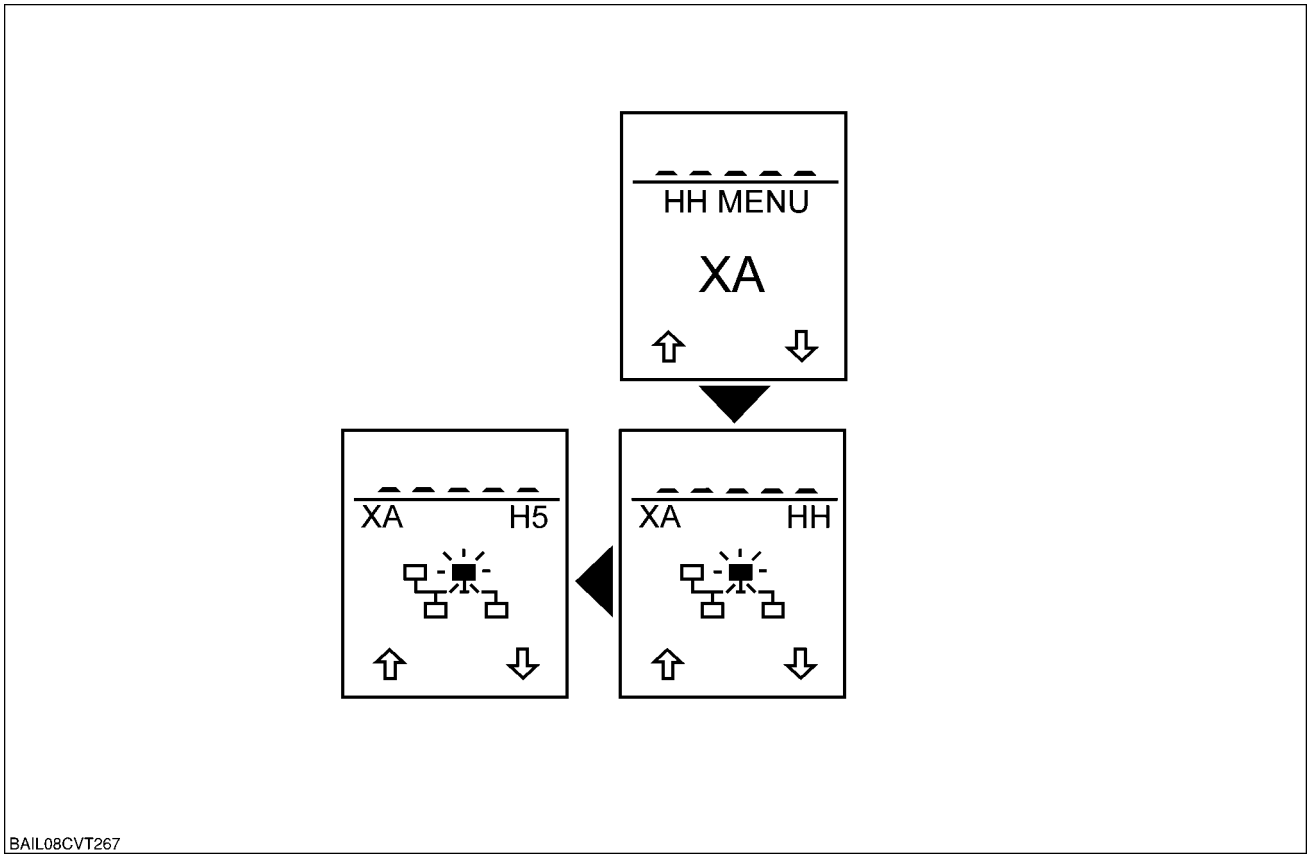
BAIL08CVT266 12

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H5 - SWITCH OPERATION TEST

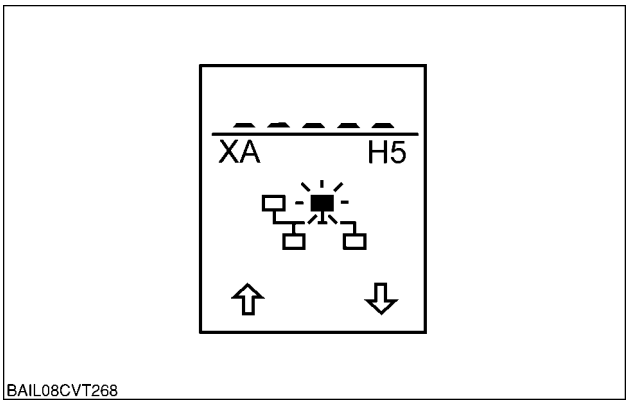
This menu displays a designated code when a switch transition is detected.
Common to all sub-systems.

H5 Menu Screen Select Diagram



BAIL08CVT267 13

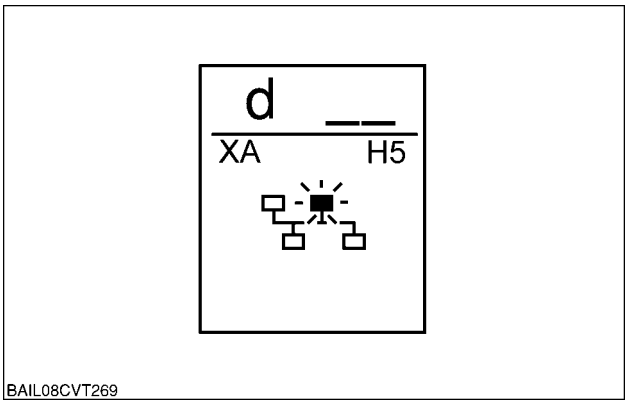
Select the H menu by depressing the "menu" key.



BAIL08CVT268 14

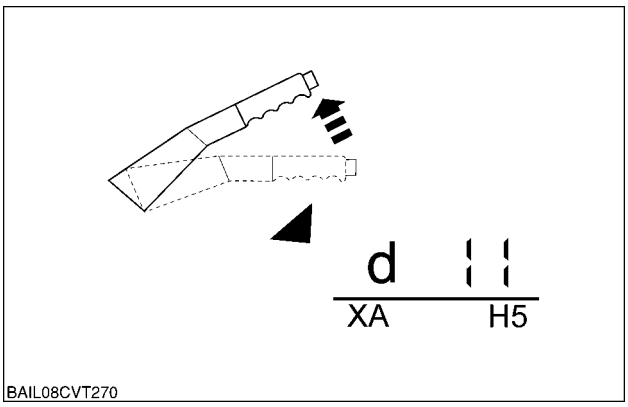
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The upper section of the display will display "d_ _"



BAIL08CVT269 15

When a switch is operated, a code will be displayed and an audible tone should be heard to indicate the correct function.
If a switch code is not displayed and the audible tone not heard, a 'wiggle' test can be performed on the related wiring, while watching the display or listening for the audible tone, to help locate the fault.



BAIL08CVT270 16

Identifier	Controller Pin number	Switch / Input
d0	No switch or two switches activated at the same time	
d8	B4	Cranking status
d11	B3	Handbrake switch
d28	C7	Shuttle lever park switch

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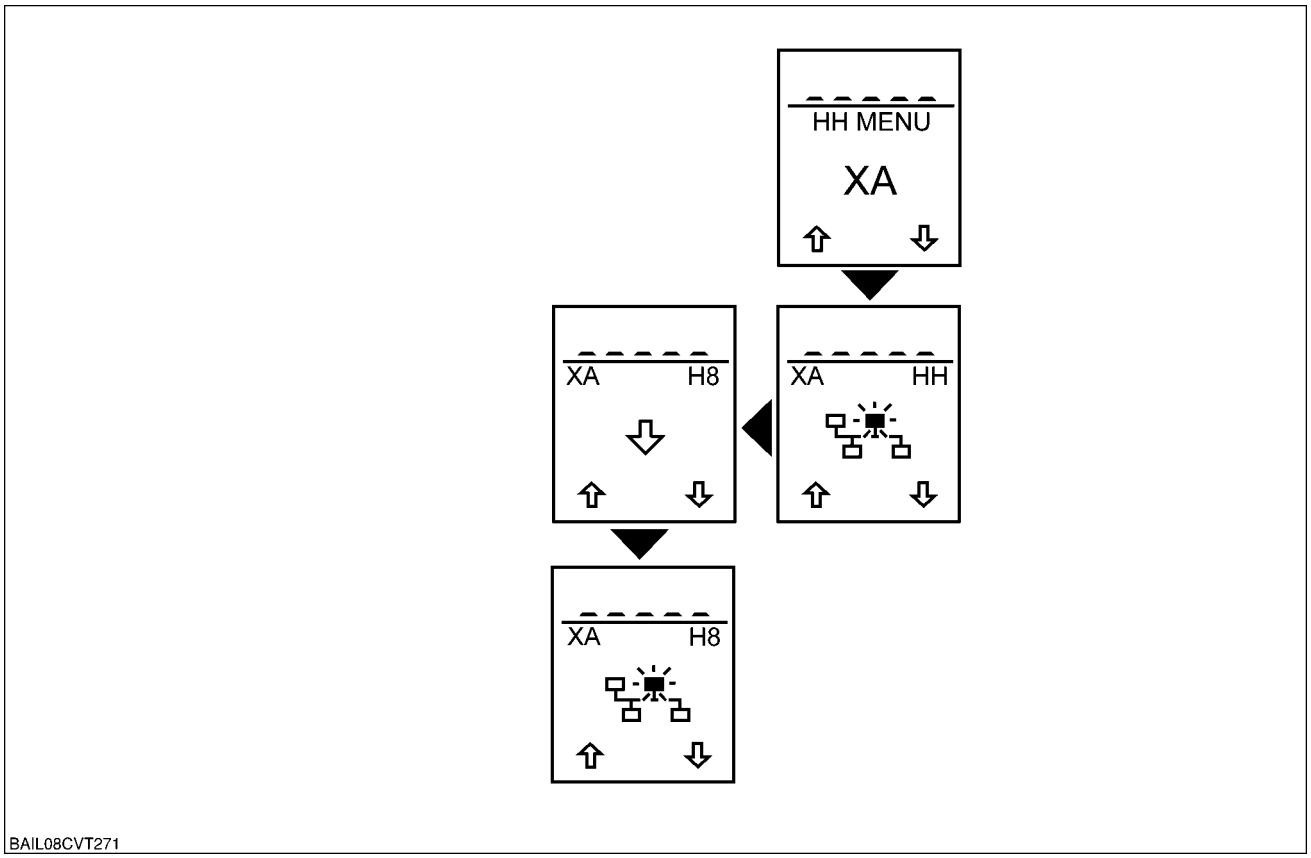
H8 - CLEAR ELECTRICAL ERASABLE PROGRAMMABLE READ ONLY MEMORY (EEPROM)

This menu clears calibration values and stored error codes by resetting all EEPROM values back to default. EEPROM is where all calibration values and error codes are stored. This memory is retained even if there is no power to the controller, i.e. if the battery is disconnected.

NOTE: *H8 will not change the configuration settings. The H3 menu mode must be used for this.*

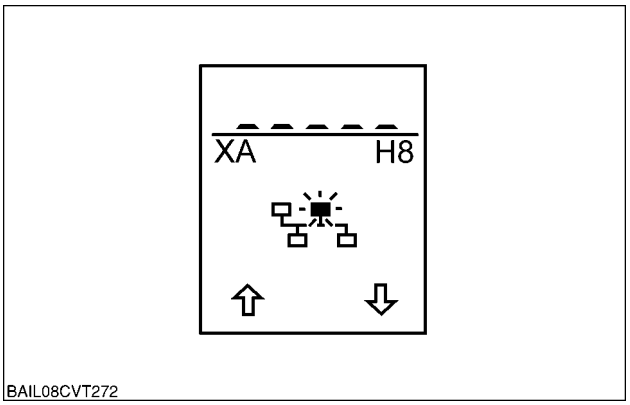
NOTE: *To erase only the stored error codes and not affect the calibration data use the HC menu mode.*

H8 Menu Screen Select Diagram



BAIL08CVT271 17

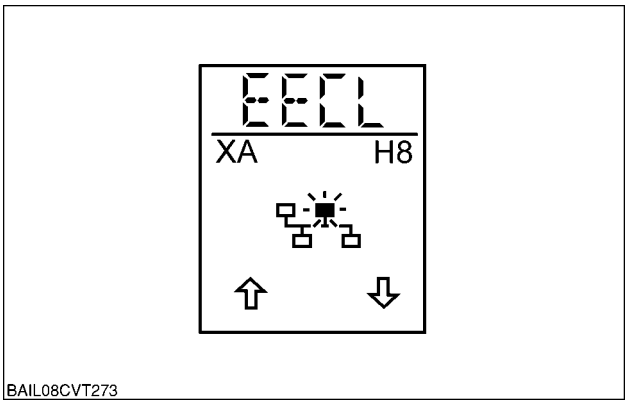
Press the "menu" button to accept the menu selection.



BAIL08CVT272 18

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The upper section of the display will display "EECL".



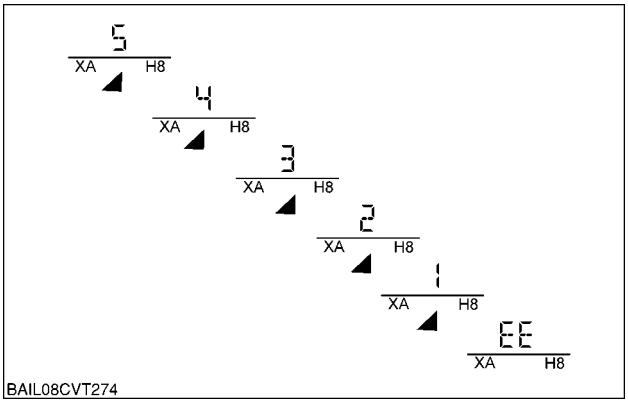
BAIL08CVT273 19

⚠ CAUTION ⚠

H8 will clear all calibrations values and stored error codes.

B006

Depress and hold the navigation "down" key to confirm the resetting of the EEPROM.
The upper section of the display will countdown from 5 to 1, then "EE" will be displayed to indicate the EEPROM has been cleared.



BAIL08CVT274 20

NOTE: *If the "down" key is released before the countdown finishes, the procedure will be aborted.*

Turn the keystart OFF.

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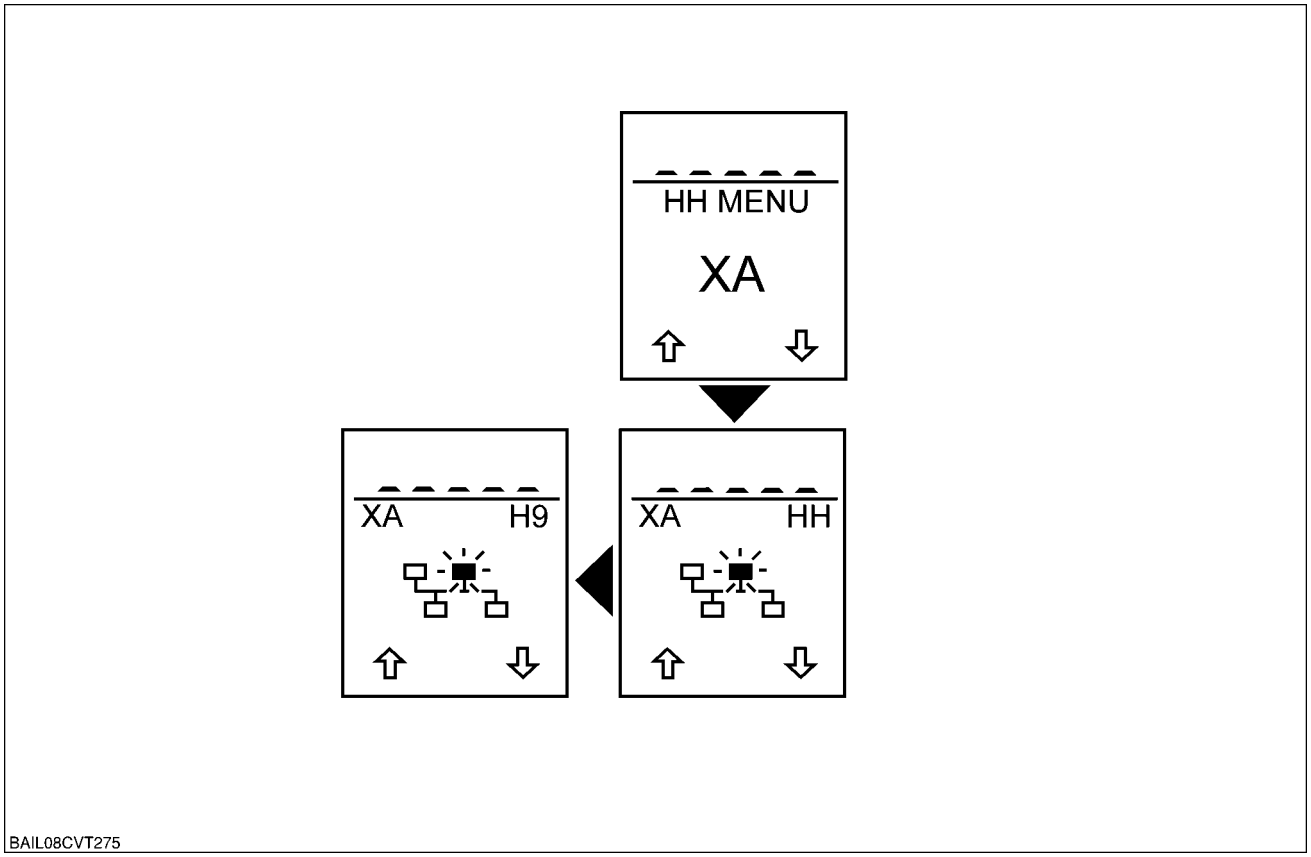
H9 - VOLTMETER

This menu is used to verify the operation of various potentiometers, voltage supplies, and solenoid current circuits. If an intermittent fault is detected within a circuit, a 'wiggle' test can be performed on the related wiring while watching the display for sudden changes in values, to help locate the area where the fault exists.

NOTE: *The vehicle may be driven while in this menu.*

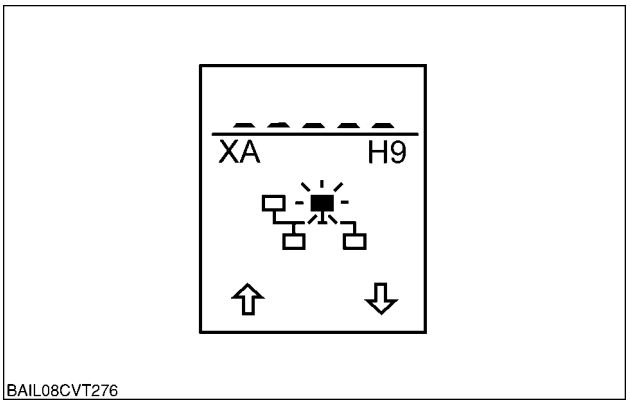
Common to all sub-systems.

H9 Menu Screen Select Diagram



BAIL08CVT275 21

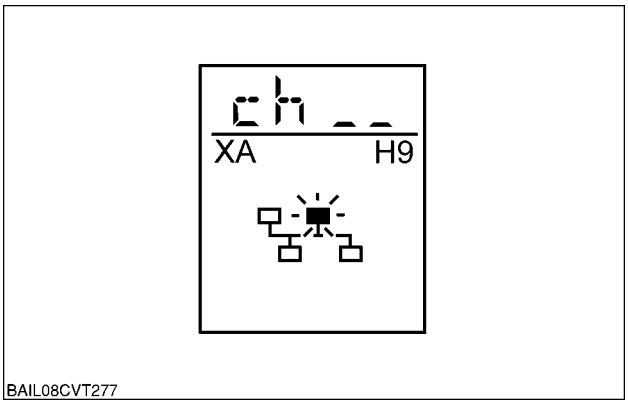
Select the H9 menu by depressing the "menu" key.



BAIL08CVT276 22

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The upper section of the display will display "ch - -"



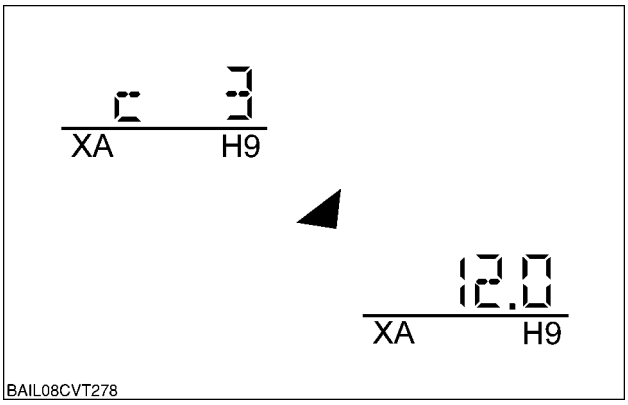
BAIL08CVT277 23

The required channel can be selected by using the navigation "up" and "down" keys.
After a delay the value will be displayed. Compare the value displayed with the typical reading shown in the table below.

NOTE: *The value is the input voltage or signal into the controller. This cannot be directly translated into a voltage due to the internal processes of the controller. A zero equates to* ***0 volts****.*

If the value displayed varies by more than **10 %** to that shown in the table below, a fault is indicated in either the component or the wiring harness relevant to that channel.

NOTE: *Check the connectors of the effected circuit, including the controller connectors, prior to replacing any components.*



BAIL08CVT278 24

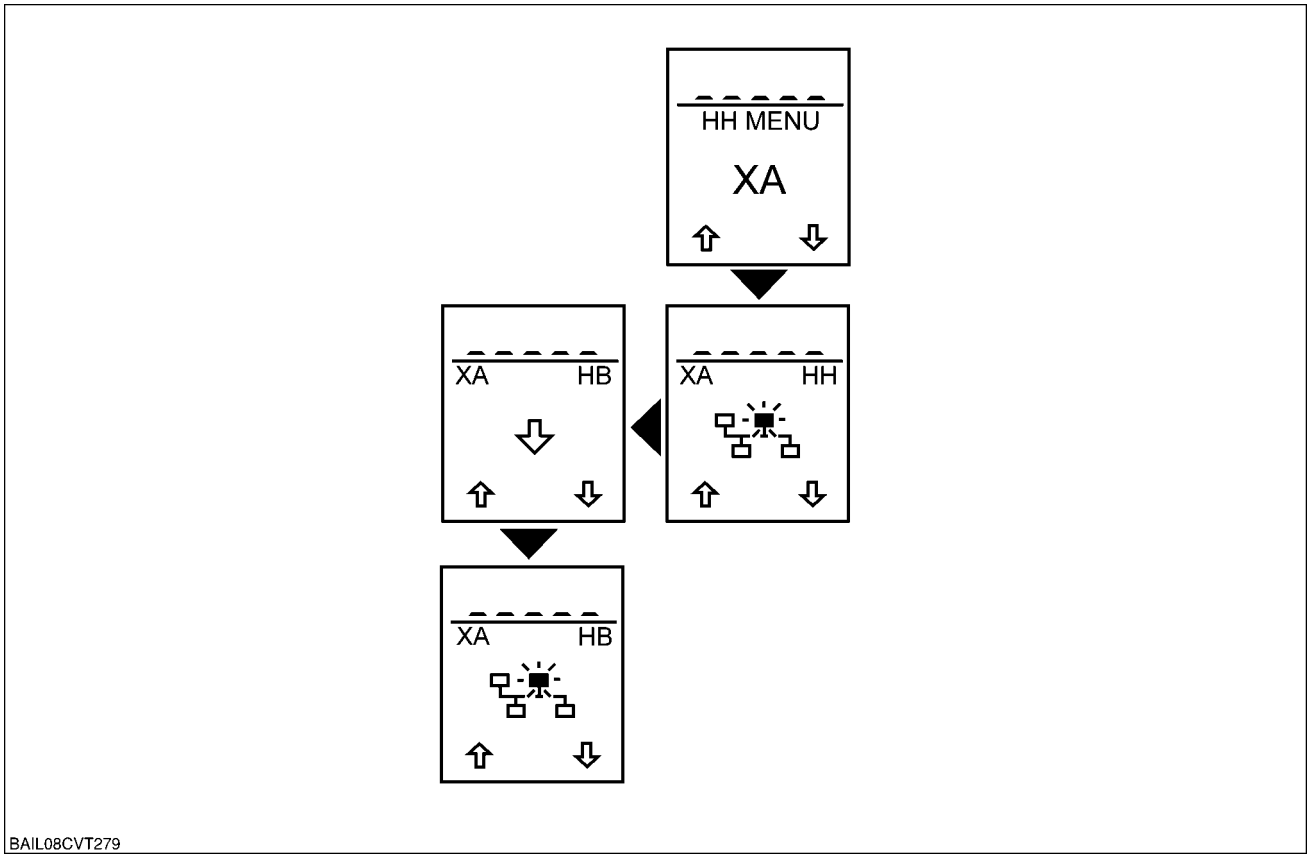
Channel	Description	Typical Reading
1	ASNS_AI_1 input	0 to 5V
2	Shuttle lever park switch	0 to 5V
3	Battery voltage	2.7 to 14.8V
4	Ignition switch voltage	0 to 14.8V
5	Accelerometer	-1.5 to 1.5g
6	Temperature	**-40 °C** to **120 °C**

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HB - DISPLAY STORED FAULT CODES

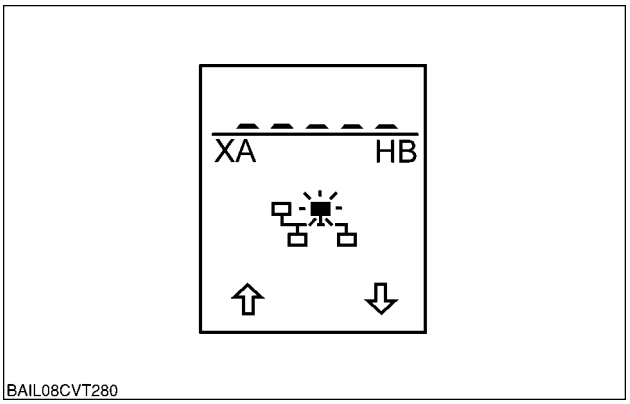
This menu is used to display fault codes which are stored in the EEPROM of the controller. Common to all sub-systems.

HB Menu Screen Select Diagram



BAIL08CVT279 25

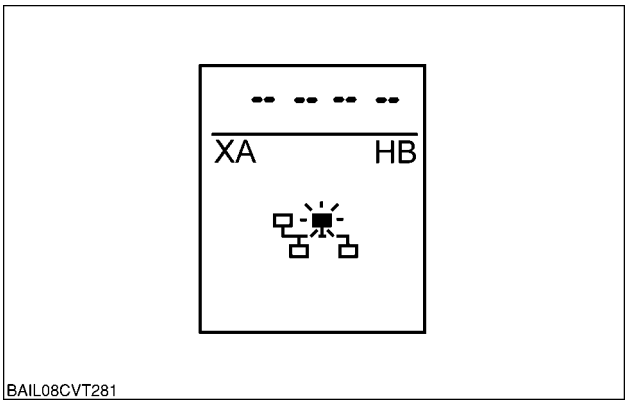
Select the HB menu by depressing the "menu" key.



BAIL08CVT280 26

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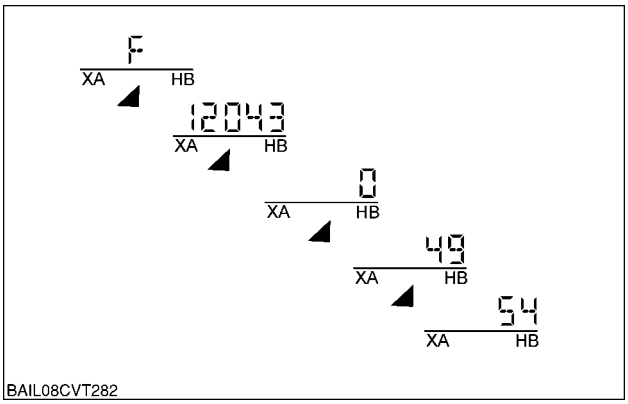
The upper section of the display will display "- - - -", if no fault is stored in the selected sub-system.



BAIL08CVT281 27

The upper section of the display will display "F", if a fault code is stored in the selected sub-system.
The upper section of the display will then automatically cycle through as the example:

12043 Fault code
00 Hour of first occurrence
49 Hour of last occurrence
54 Number of occurrences of the fault



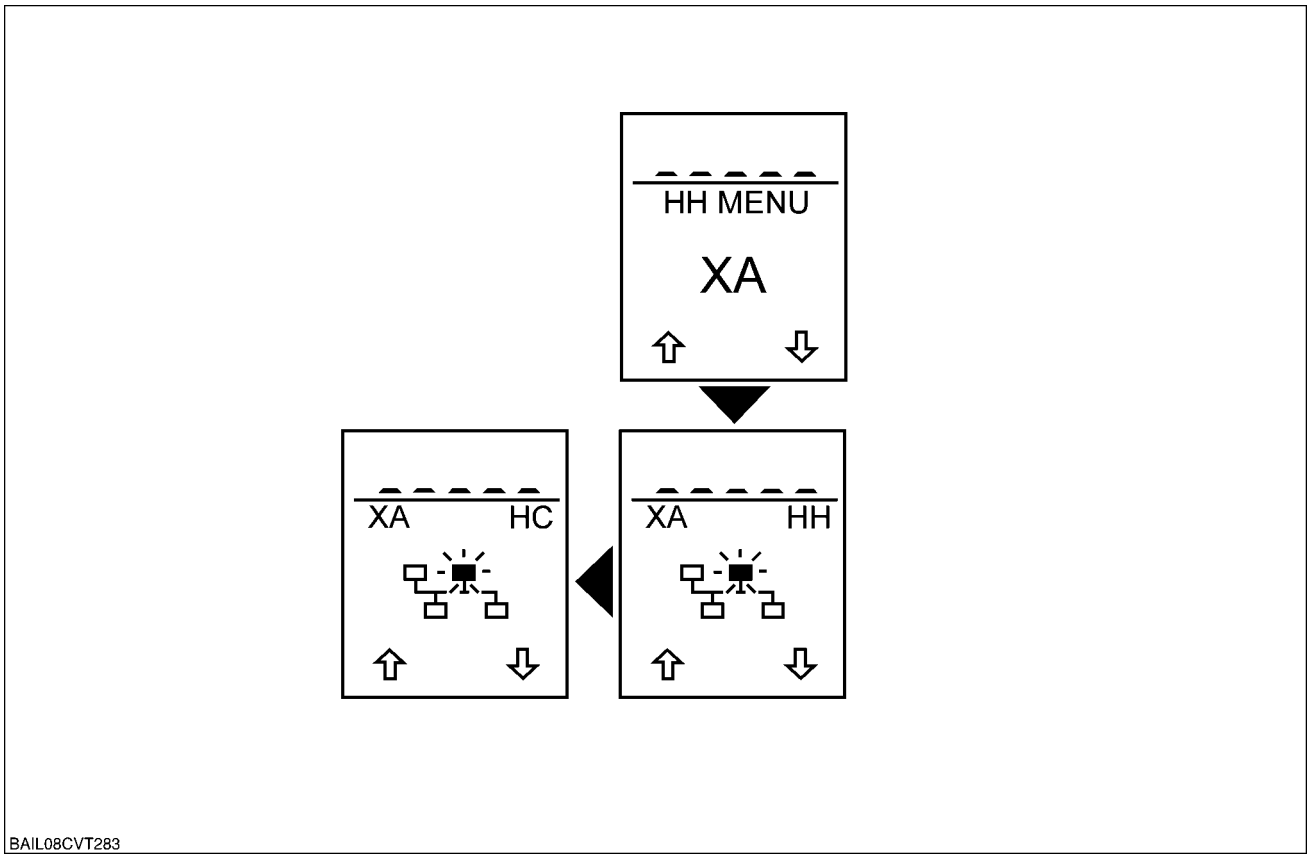
BAIL08CVT282 28

Depress the navigation "up" or "down" key to change to the next fault code in the list.
The upper section of the display will display "_ _ _" at the end of the list.
Depress the "menu" key to continue navigating through the "HH" menus.

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HC - CLEAR STORED FAULT CODES

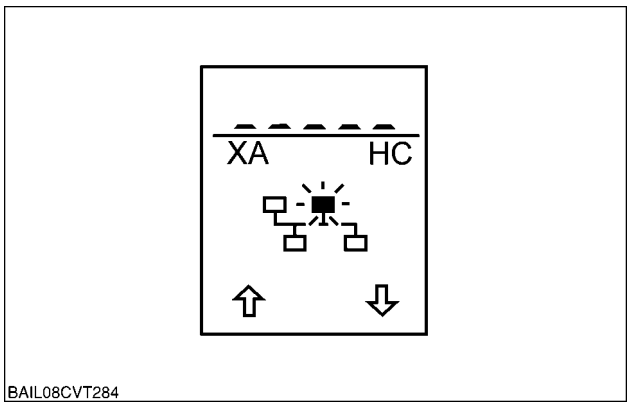
HC Menu Screen Select Diagram



BAIL08CVT283 29

NOTE: *Always make a note of the fault codes stored, before clearing.*

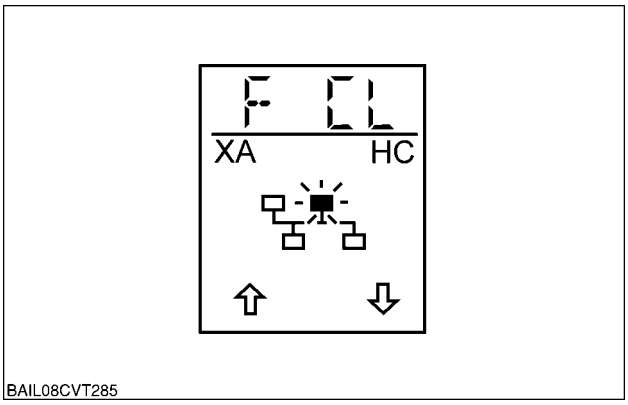
Select the HC menu by depressing the "menu" key.



BAIL08CVT284 30

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The upper section of the display will display "F CL".



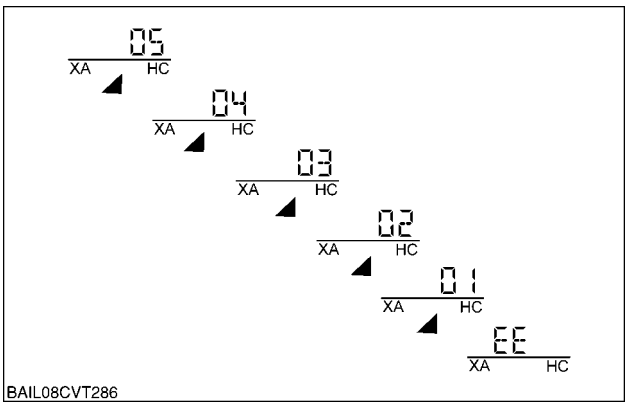
BAIL08CVT285 31

NOTE: *f the navigation "down" key is released before the countdown finishes, the procedure will be aborted.*

Depress and hold the navigation "down" key to confirm the clearing of the memory.

NOTE: *The upper section of the display will countdown from 05 to 01, then "EE" will be displayed to indicate the fault codes have been cleared.*

Depress the "menu" key to continue navigating through the "HH" menus.



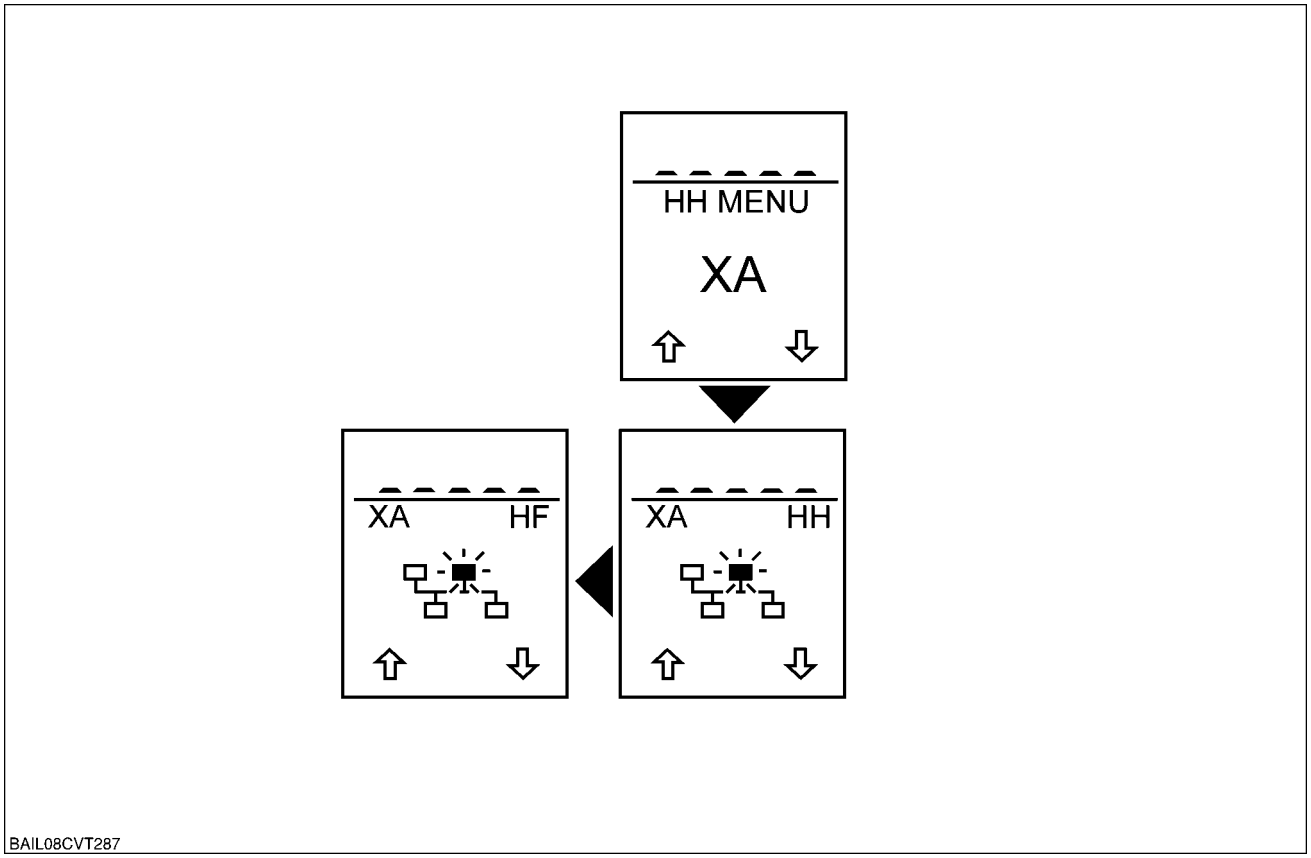
BAIL08CVT286 32

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HF - VIEW CONTROLLER HARDWARE INFORMATION

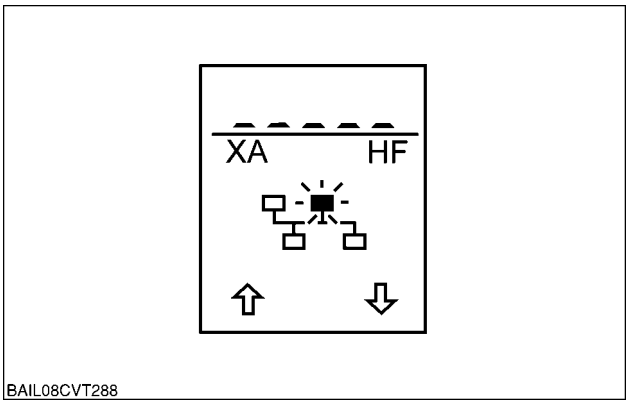
This menu allows the hardware identification, hardware version and serial number to be displayed. Common to all sub-systems.

HF Menu Screen Select Diagram



BAIL08CVT287 33

Select the HF menu by depressing the "menu" key.

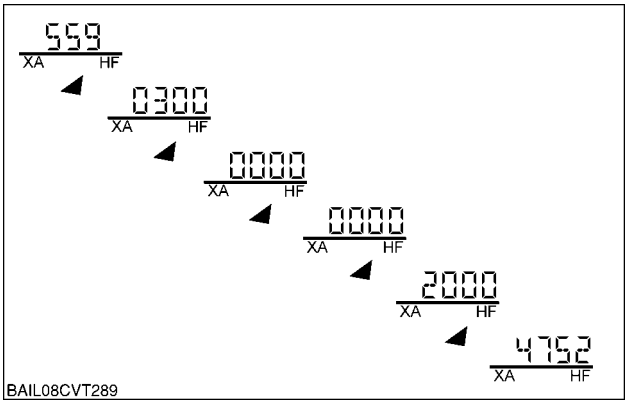


BAIL08CVT288 34

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The upper section of the display will automatically cycle through as the example:

559 Hardware identification
0300 Hardware version
0000 Hardware version
0000 Serial number
2000 Serial number
4752 Serial number
and return to allow navigation of the "HH" menus.



BAIL08CVT289 35

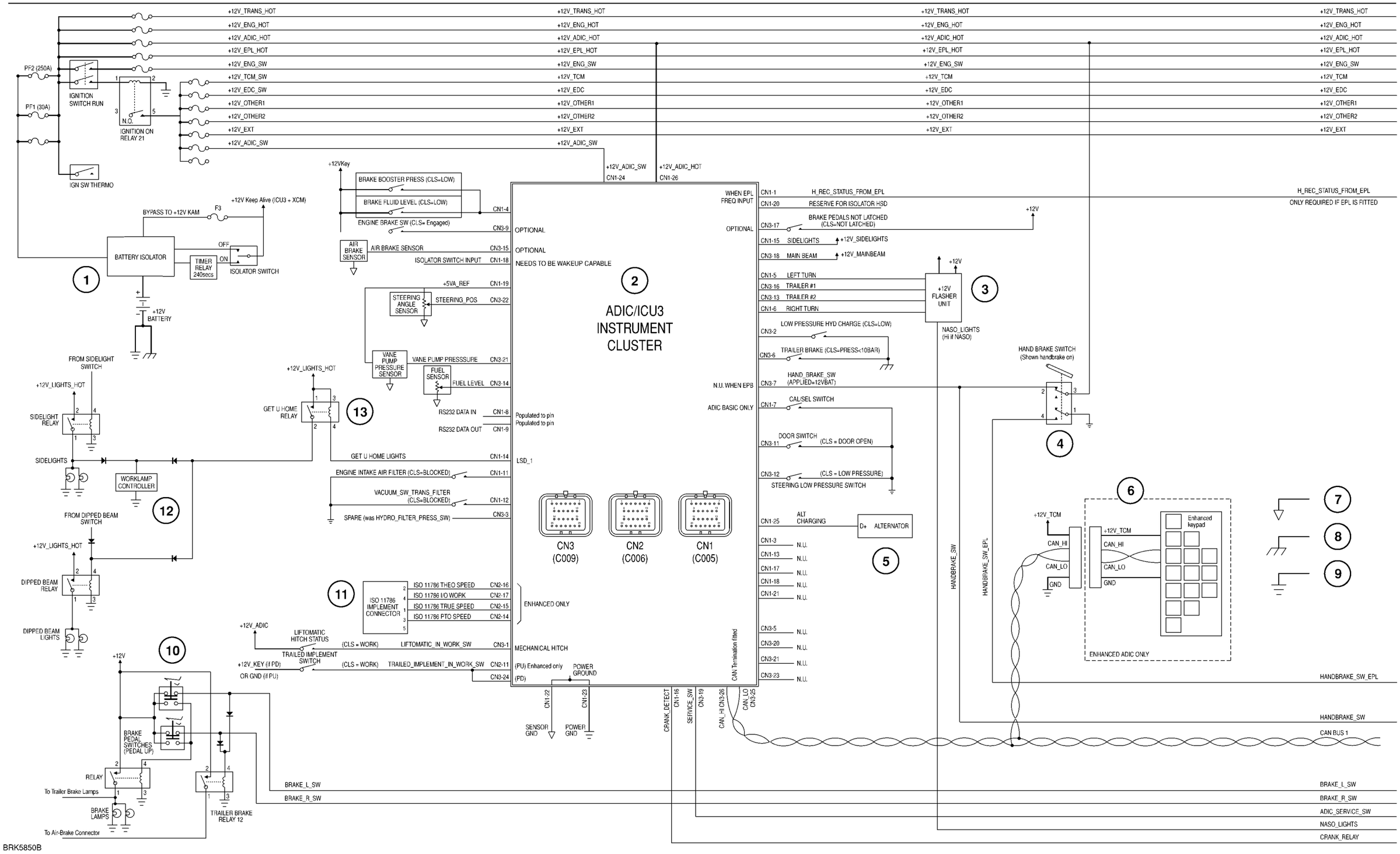
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Control module - Electronic schema Instrument Cluster - ICU3 Module IE

Component Identification

1. BATTERY ISOLATOR
2. INSTRUMENT CLUSTER ASSEMBLY
3. INDICATOR FLASHER UNIT
4. HANDBRAKE SWITCH
5. ALTERNATOR
6. ENHANCED KEYPAD
7. SENSOR SIGNAL GROUND
8. CHASSIS GROUND
9. POWER GROUND
10. BRAKE PEDAL SWITCHES AND TRAILER BRAKE RELAYS
11. IMPLEMENT CONNECTOR
12. WORKLAMP CONTROLLER
13. GET-U-HOME LIGHTS RELAY

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BRK5850B

14_BRK5903 1

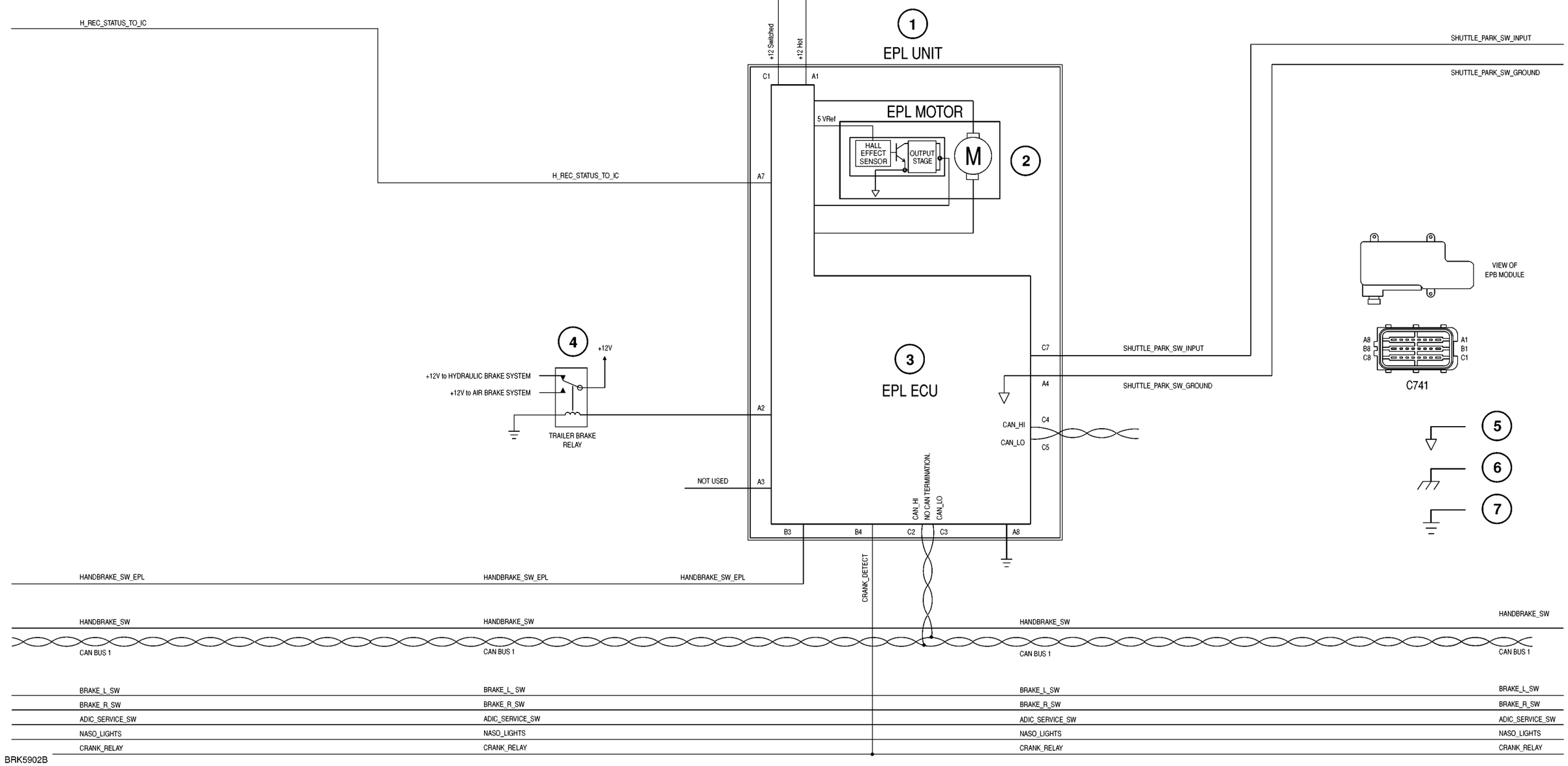
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Control module - Electronic schema Electronic Park Lock (EPL) - Module XA

Component Identification	
1. EPL unit (Module and motor assembly)	
2. EPL Motor	
3. EPL Module	
4. Trailer Brake Relay	
5. Sensor Signal Ground	
6. Chassis Ground	
7. Power Ground	

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+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT
+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT
+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT
+12V_EPL_HOT	+12V_EPL_HOT	+12V_EPL_HOT	+12V_EPL_HOT
+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW
+12V_TCM_SW	+12V_TCM	+12V_TCM	+12V_TCM
+12V_EDC_SW	+12V_EDC	+12V_EDC	+12V_EDC
+12V_OTHER1	+12V_OTHER1	+12V_OTHER1	+12V_OTHER1
+12V_(F38)	+12V_(F38)	+12V_(F38)	+12V_(F38)
+12V_EXT	+12V_EXT	+12V_EXT	+12V_EXT



BRK5902B

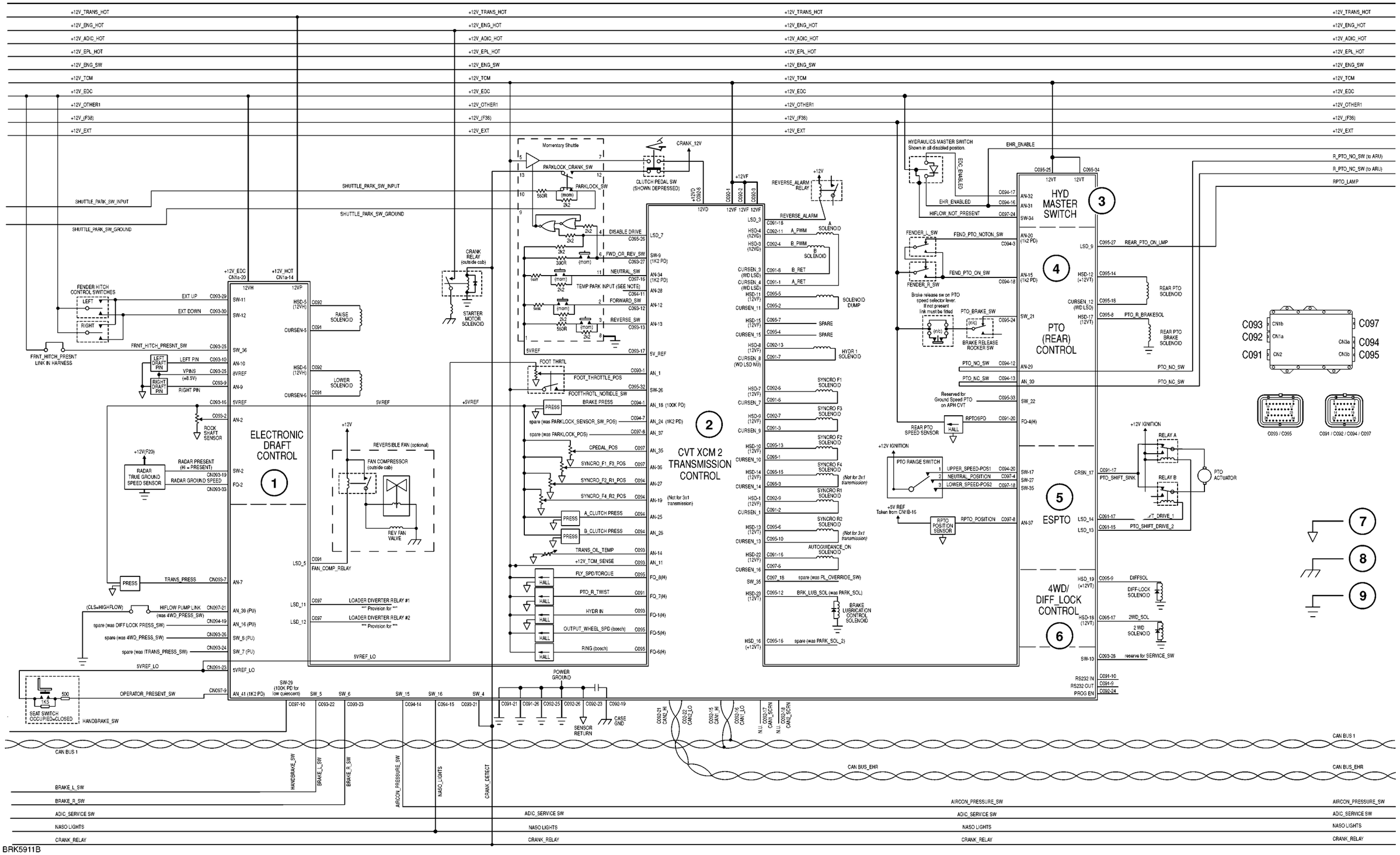
13_BRK5902B 1

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Control module - Electronic schema Central Control Unit (RE module)

Component Identification	
1. Electronic Draft Control	
2. CVT Transmission control	
3. Hydraulic Master switch	
4. PTO (rear) Control	
5. Electronically Shiftable Power Take Off	
6. Four wheel drive / Differential lock control	
7. Sensor Ground	
8. Chassis Ground	
9. Power Ground	

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BRK5911B

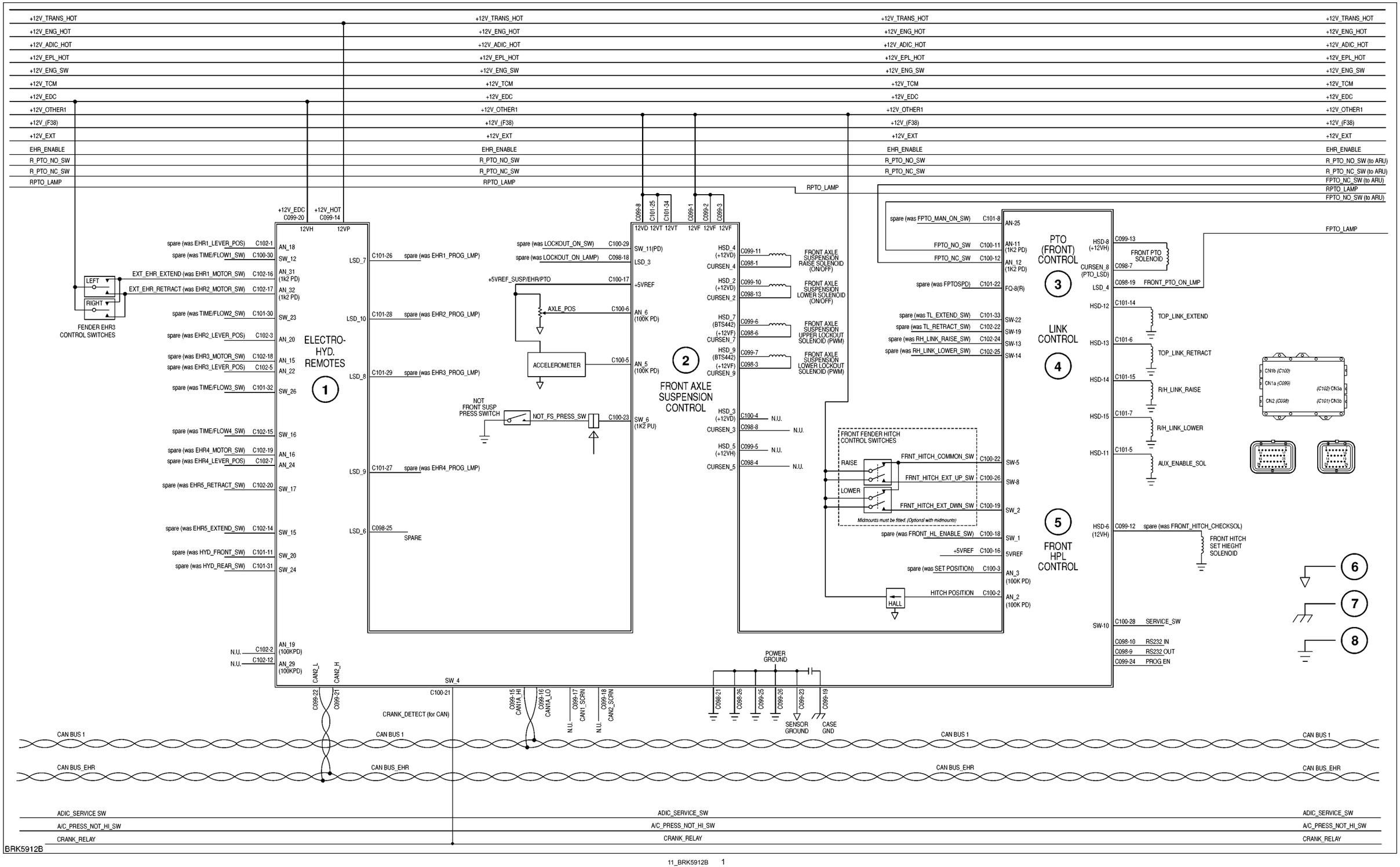
12_BRK5911B 1

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Control module - Electronic schema Auxiliary Control Unit (RM module)

Component Identification	
1. Electro-Hydraulic Remotes (EHR's)	
2. Front Axle Suspension Control	
3. PTO (front) Control	
4. Top Link Lift Rod Control	
5. Front Hydraulic Power Lift (HPL) Control	
6. Sensor Signal Ground	
7. Chassis Ground	
8. Power Ground	

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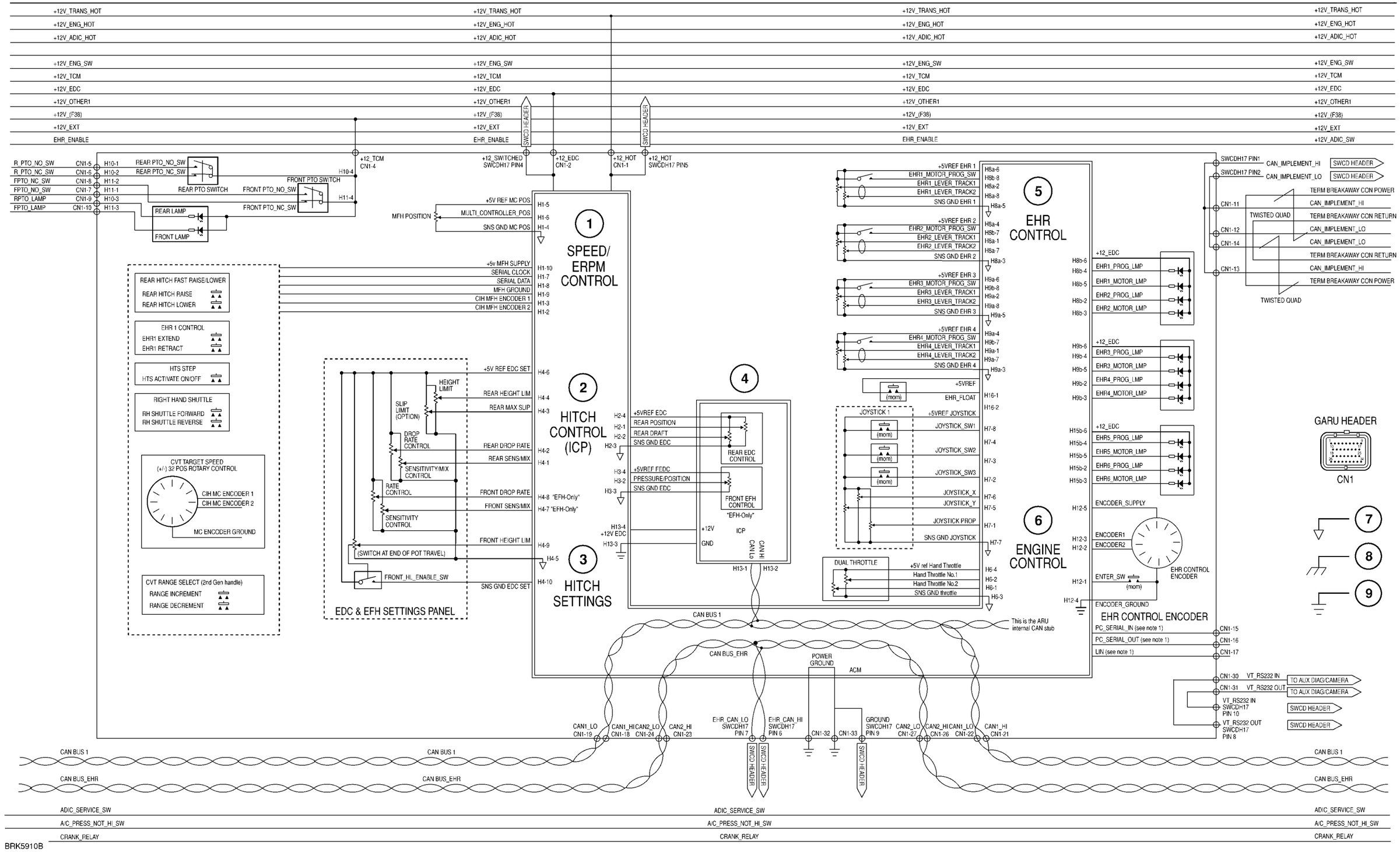
11_BRK5912B 1

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Control module - Electronic schema Arm Rest Control Unit (LC module)

Component Identification	
1. Arm Rest Control Unit	
2. Speed / Engine RPM Control	
3. Hitch Control (Integrated Control Panel)	
4. Hitch Settings	
5. Electronic Draft Control and Electronic Front Hitch Settings Panel	
6. Electro Hydraulic Remotes Control	
7. Engine Control	
8. Multi Function Handle controller	
9. Rear PTO and Front PTO Lamps	
10. Rear PTO Switch	
11. Front PTO Switch	
12. Sensor Ground	
13. Chassis Ground	
14. Power Ground	

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BRK5910B

10_BRK5910B 1

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Control module - Electronic schema Small Wide Colour Display

Component Identification	
1. Small Wide Colour Display (SWCD screen)	
2. USB Socket	
3. Sensor Ground	
4. Chassis Ground	
5. Power Ground	
6. ISO BUS implement Connector	

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+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT
+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT
+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT
+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW
+12V_TCM	+12V_TCM	+12V_TCM	+12V_TCM
+12V_EDC	+12V_EDC	+12V_EDC	+12V_EDC
+12V_OTHER1	+12V_OTHER1	+12V_OTHER1	+12V_OTHER1
+12V_(F38)	+12V_(F38)	+12V_(F38)	+12V_(F38)
+12V_EXT	+12V_EXT	+12V_EXT	+12V_EXT
EHR_ENABLE	EHR_ENABLE	EHR_ENABLE	EHR_ENABLE

TERM BREAKAWAY CON POWER
CAN_IMPLEMENT_HI
TERM BREAKAWAY CON RETURN
CAN_IMPLEMENT_LO
CAN_IMPLEMENT_LO
TERM BREAKAWAY CON RETURN
CAN_IMPLEMENT_HI
TERM BREAKAWAY CON POWER

TERM BREAKAWAY CON POWER
CAN_IMPLEMENT_HI
TERM BREAKAWAY CON RETURN
CAN_IMPLEMENT_LO

TWISTED QUAD

TERM BREAKAWAY CON POWER
CAN_IMPLEMENT_HI
TERM BREAKAWAY CON RETURN
CAN_IMPLEMENT_LO

TWISTED QUAD

TERM BREAKAWAY CON POWER
CAN_IMPLEMENT_HI
TERM BREAKAWAY CON RETURN
CAN_IMPLEMENT_LO
ECU_POWER_RELAY
IMPL_POWER_RELAY

+12V_SWITCHED CN1-15 FROM HEADER Pin4
+12V_HOT CN1-13 FROM HEADER Pin5
CN1-6 CAN_IMPLEMENT_LO FROM HEADER Pin2
CN1-5 CAN_IMPLEMENT_HI FROM HEADER Pin1
5900
5910

SWCD CONNECTOR
CN1
USB Female Connector

1
Small Wide Colour Display (SWCD 1.5)
TOUCH SCREEN

2
USB SOCKET

5V_USB_PWR	Pin1	5962 CN1-21 NOT USED
USB+	Pin3	5966 CN1-22 NOT USED
USB-	Pin2	5964 CN1-23 NOT USED
USB_GND	Pin4	5768 CN1-24 NOT USED

LOCATED ON REAR OF SWCD ENCLOSURE

5595 CN1-10 VT_RS232_IN — FROM HEADER Pin10
5960 CN1-9 VT_RS232_OUT — FROM HEADER Pin8

3
4
5

5500
5510
FROM HEADER Pin9 ECU_GND CN1-14
FROM HEADER Pin6 EHR_CAN_HI CN1-1
FROM HEADER Pin7 EHR_CAN_LO CN1-2

6
ISOBUS IMPLEMENT SIDE CONNECTIONS
PCB
FRONT BREAKAWAY CONNECTOR
FROM MAXIFUSE (Fnn-20A)
POWER GROUND
ECU POWER RELAY
IMPLMNT_ECU_PWR
IMPLMNT_PWR
FROM MAXIFUSE (Fnn-60A)
CHASSIS GND
IMPLEMENT POWER RELAY

CAN_BUS_1
CAN_BUS_EHR
VT_RS232_OUT

ADIC_SERVICE_SW	ADIC_SERVICE_SW	ADIC_SERVICE_SW
A/C_PRESS_NOT_HI_SW	A/C_PRESS_NOT_HI_SW	A/C_PRESS_NOT_HI_SW
CRANK_RELAY	CRANK_RELAY	CRANK_RELAY

BRK5907B

9_BRK5907B 1

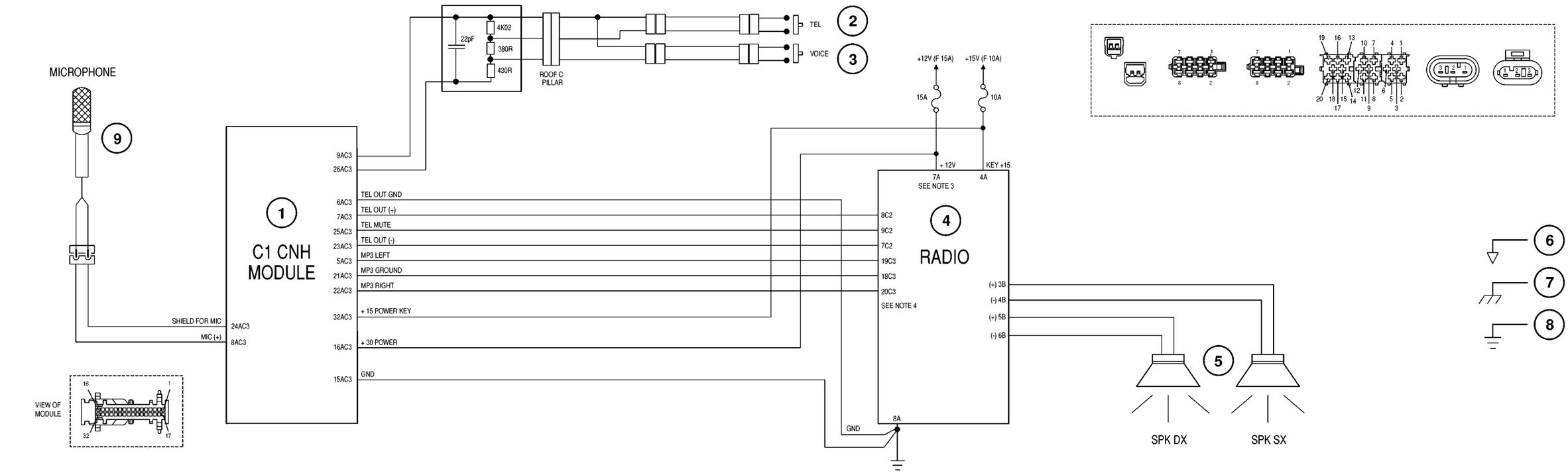
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Control module - Electronic schema Radio and Hands Free module

Component designation	
1. Hands Free Module	
2. Phone Button	
3. Voice Button	
4. Radio	
5. Speakers	
6. Sensor Ground	
7. Chassis Ground	
8. Power Ground	
9. Microphone	

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+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT
+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT
+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT
+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW
+12V_TCM	+12V_TCM	+12V_TCM	+12V_TCM
+12V_EDC	+12V_EDC	+12V_EDC	+12V_EDC
+12V_OTHER1	+12V_OTHER1	+12V_OTHER1	+12V_OTHER1
+12V_(F38)	+12V_(F38)	+12V_(F38)	+12V_(F38)
+12V_EXT	+12V_EXT	+12V_EXT	+12V_EXT
EHR_ENABLE	EHR_ENABLE	EHR_ENABLE	+12V_ADIC_SW
TERM BREAKAWAY CON POWER	TERM BREAKAWAY CON POWER	TERM BREAKAWAY CON POWER	TERM BREAKAWAY CON POWER
CAN_IMPLEMENT_HI	CAN_IMPLEMENT_HI	CAN_IMPLEMENT_HI	CAN_IMPLEMENT_HI
TERM BREAKAWAY CON RETURN	TERM BREAKAWAY CON RETURN	TERM BREAKAWAY CON RETURN	TERM BREAKAWAY CON RETURN
CAN_IMPLEMENT_LO	CAN_IMPLEMENT_LO	CAN_IMPLEMENT_LO	CAN_IMPLEMENT_LO
ECU_POWER_RELAY	ECU_POWER_RELAY	ECU_POWER_RELAY	ECU_POWER_RELAY
IMPL_POWER_RELAY	IMPL_POWER_RELAY	IMPL_POWER_RELAY	IMPL_POWER_RELAY



ADIC_SERVICE SW	ADIC_SERVICE SW	ADIC_SERVICE SW	ADIC_SERVICE SW
A/C_PRESS_NOT_HI_SW	A/C_PRESS_NOT_HI_SW	A/C_PRESS_NOT_HI_SW	A/C_PRESS_NOT_HI_SW
CRANK_RELAY	CRANK_RELAY	CRANK_RELAY	CRANK_RELAY

BRK5904B

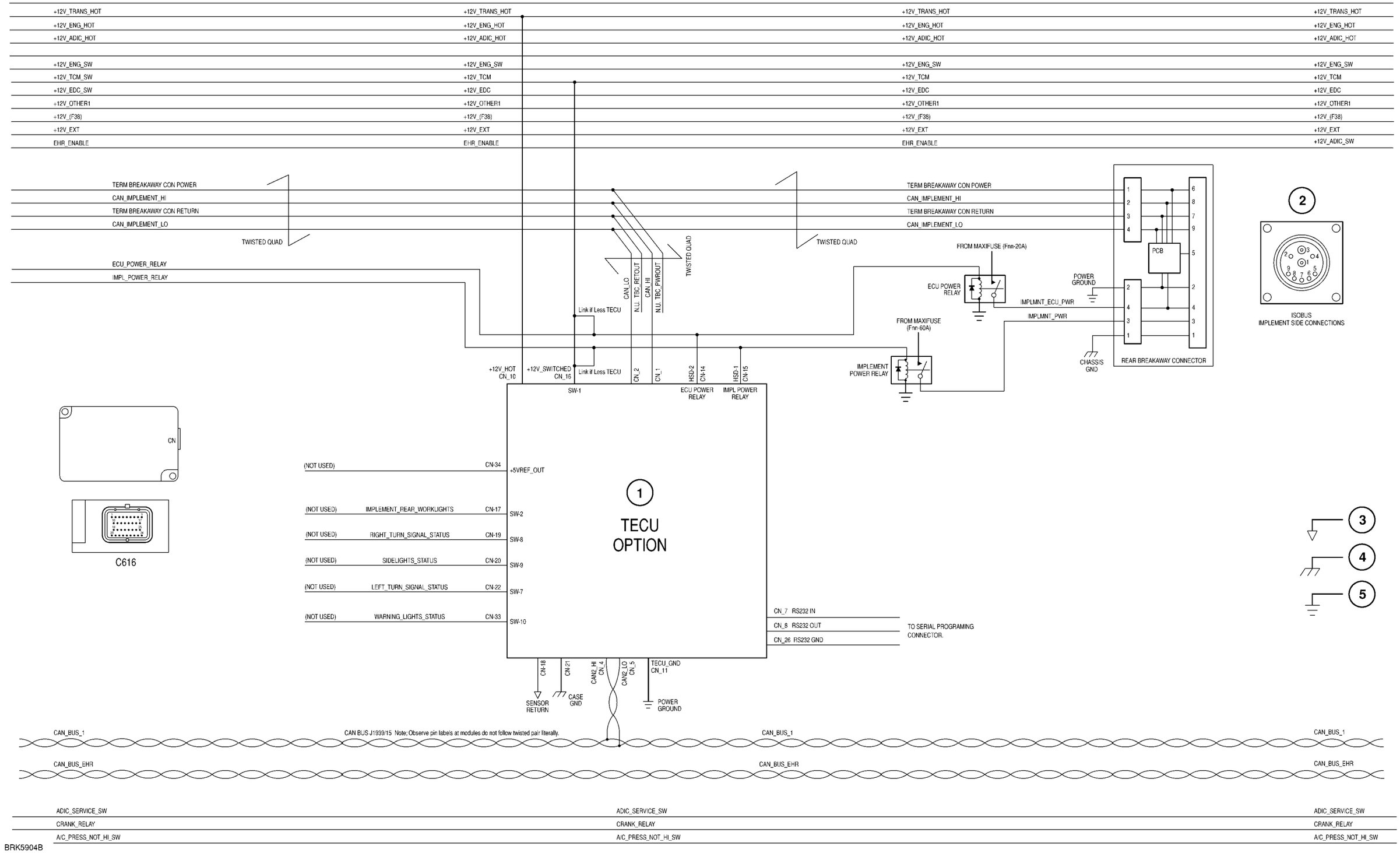
7_BRK5908B 1

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Control module - Electronic schema Tractor Electronic Control Unit (TECU)

Component designation	
1. TECU Module	
2. ISO BUS implement connector	
3. Sensor ground	
4. Chassis ground	
5. Supply ground	

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BRK5904B

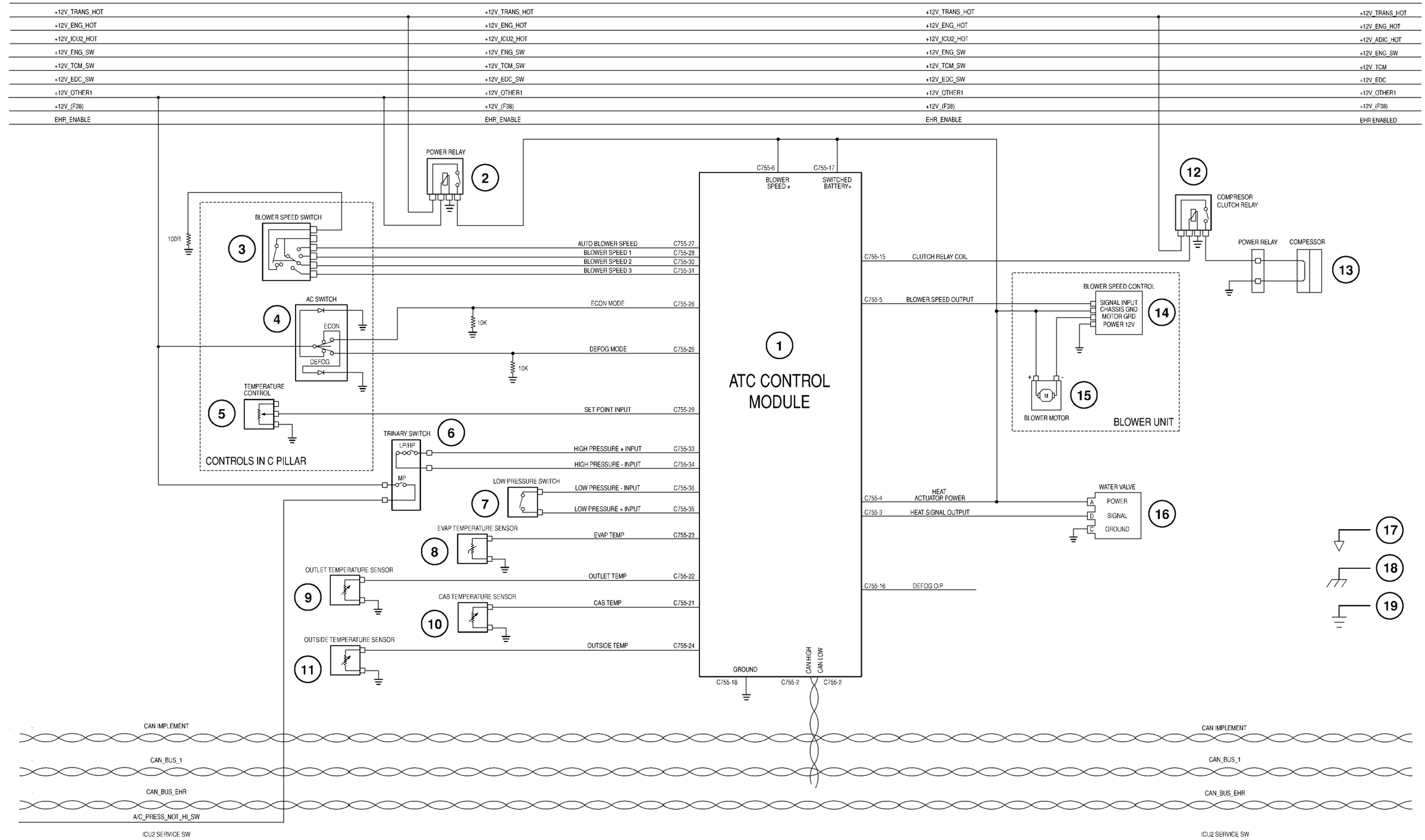
6_BRK5904B 1

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Control module - Electronic schema Automatic Temperature Control

Component designation	
1. Climate control module	
2. Power Relay	
3. Blower speed switch	
4. Air conditioning switch	
5. Temperature transmitter	
6. High pressure switch	
7. Low pressure switch	
8. Evaporator temperature sensor	
9. Outlet temperature sensor	
10. Cab temperature sensor	
11. Outside temperature sensor	
12. A/C compressor clutch relay	
13. Compressor	
14. Blower speed control	
15. Blower motor	
16. Water valve	
17. Sensor Ground	
18. Chassis Ground	
19. Power Ground	

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BRK5909B

5_BRK5909C 1

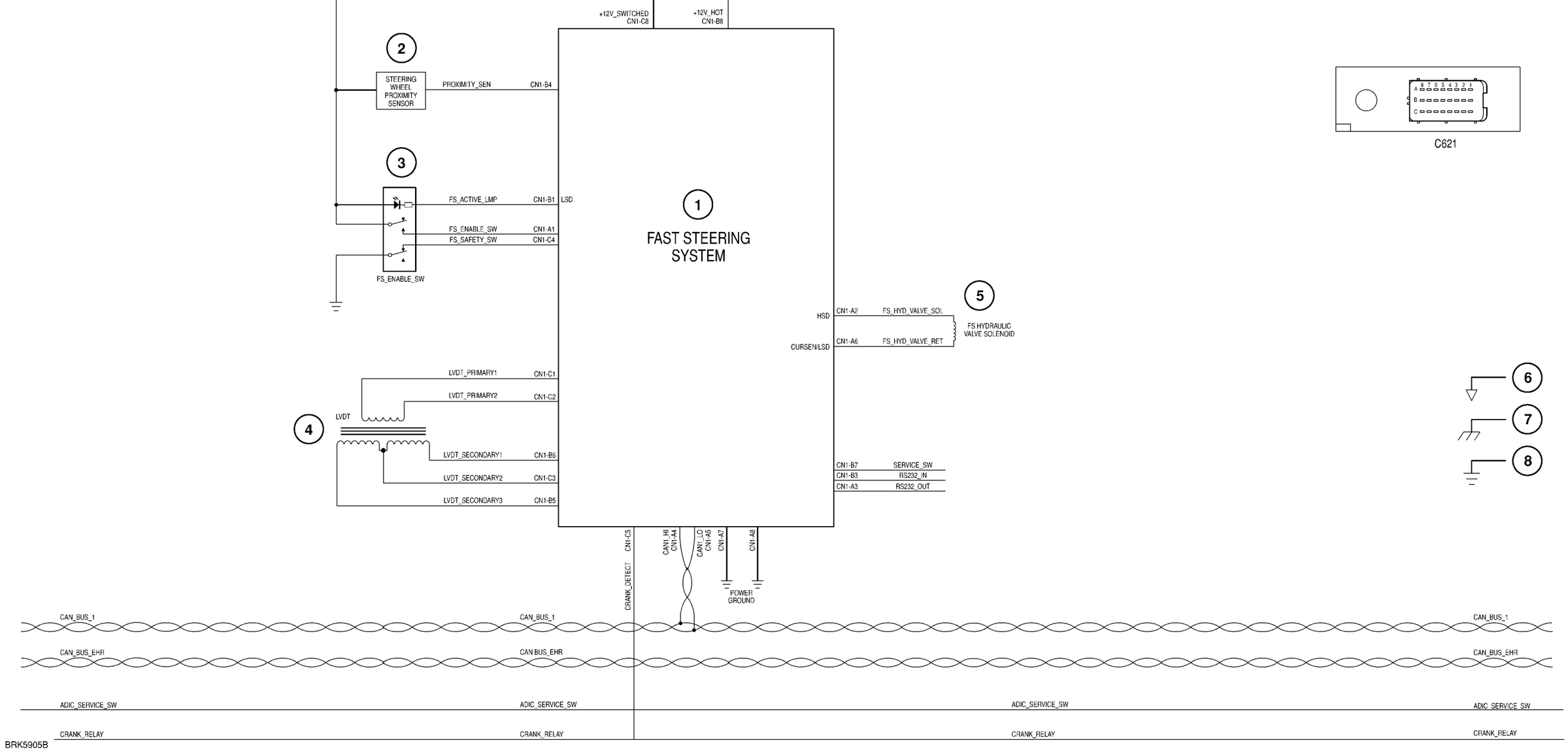
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Control module - Electronic schema Fast Steer (KA Module)

Component designation	
1. Turn Assist electronic control unit	
2. Steering wheel monitor proximity switch	
3. Turn Assist ON/OFF switch	
4. LVDT sensor (position transmitter)	
5. Hydraulics solenoid valve	
6. Sensor signal ground	
7. Chassis ground	
8. Supply ground	

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+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT
+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT
+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT
+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW
+12V_TCM	+12V_TCM	+12V_TCM	+12V_TCM
+12V_EDC	+12V_EDC	+12V_EDC	+12V_EDC
+12V_OTHER1	+12V_OTHER1	+12V_OTHER1	+12V_OTHER1
+12V_(F38)	+12V_(F38)	+12V_(F38)	+12V_(F38)
+12V_EXT	+12V_EXT	+12V_EXT	+12V_EXT
EHR_ENABLE	EHR_ENABLE	EHR_ENABLE	+12V_ADIC_SW



C621

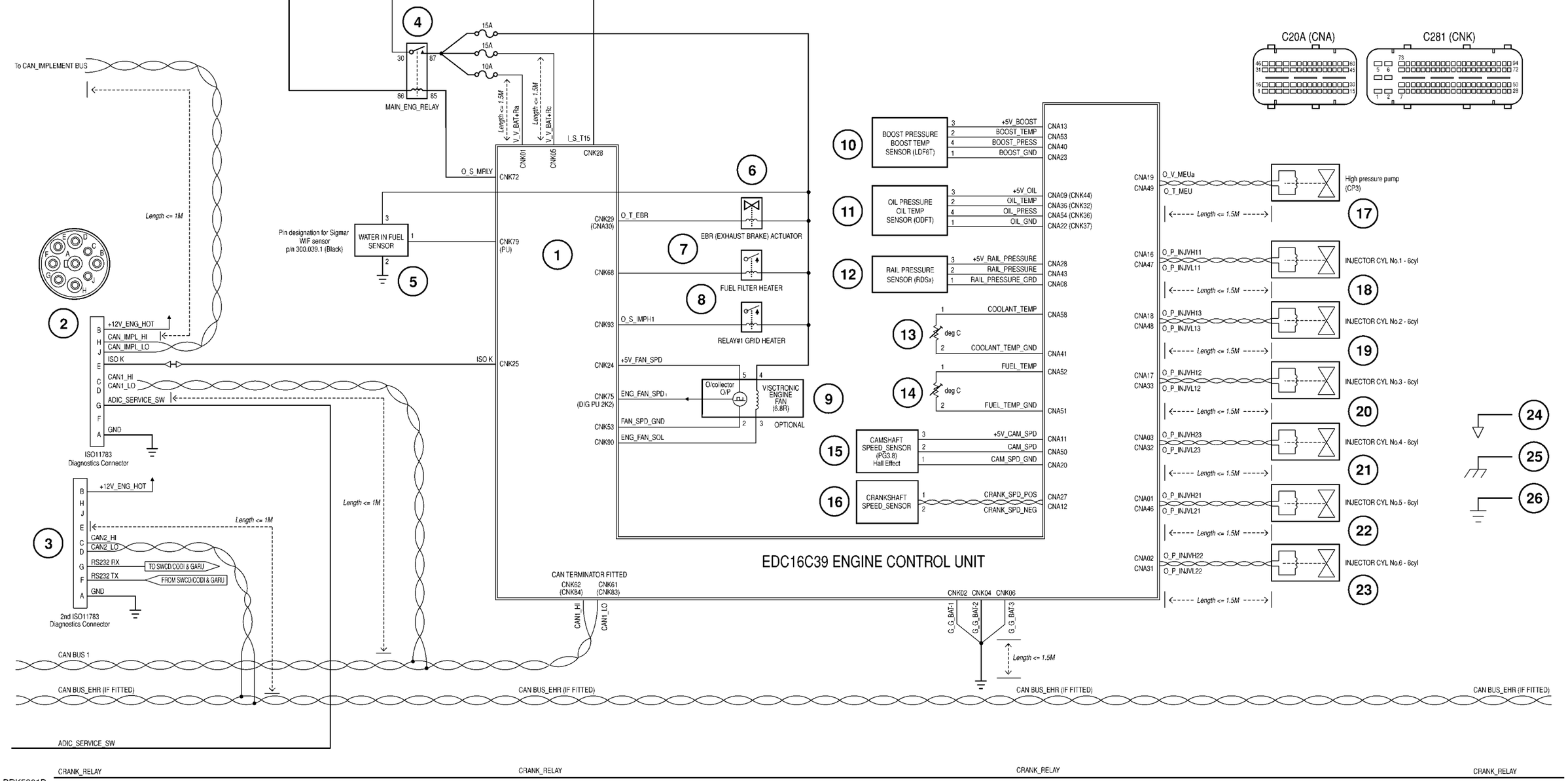
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Control module - Electronic schema Engine control Module (EDC 16)

Component designation	
1. Engine control module(EDC 16)	
2. Diagnostics plug - CAN 1	
3. Diagnostics plug CAN 2	
4. Main relay	
5. Fuel filter water sensor	
6. EBR (Exhaust Brake) actuator	
7. Fuel filter heater relay	
8. Heating element relay	
9. Vistronic fan	
10. Boost pressure / boost temperature sensor	
11. Oil pressure / oil temperature sensor	
12. Rail pressure sensor	
13. Coolant temperature sensor	
14. Fuel temperature sensor	
15. Camshaft speed sensor	
16. Crankshaft speed sensor	
17. High pressure pump	
18. Injector, No. 1 cylinder	
19. Injector, No. 2 cylinder	
20. Injector, No. 3 cylinder	
21. Injector, No. 4 cylinder	
22. Injector, No. 5 cylinder	
23. Injector, No. 6 cylinder	
24. Sensors ground	
25. Chassis ground	
26. Supply ground	

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+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT
+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT
+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT
+12V_EPL_HOT	+12V_EPL_HOT	+12V_EPL_HOT	+12V_EPL_HOT
+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW
+12V_TCM_SW	+12V_TCM	+12V_TCM	+12V_TCM
+12V_EDC_SW	+12V_EDC	+12V_EDC	+12V_EDC
+12V_OTHER1	+12V_OTHER1	+12V_OTHER1	+12V_OTHER1
+12V_OTHER2	+12V_OTHER2	+12V_OTHER2	+12V_OTHER2
+12V_EXT	+12V_EXT	+12V_EXT	+12V_EXT
+12V_ADIC_SW	+12V_ADIC_SW	+12V_ADIC_SW	+12V_ADIC_SW



BRK5901B

3_BRK5901B 1

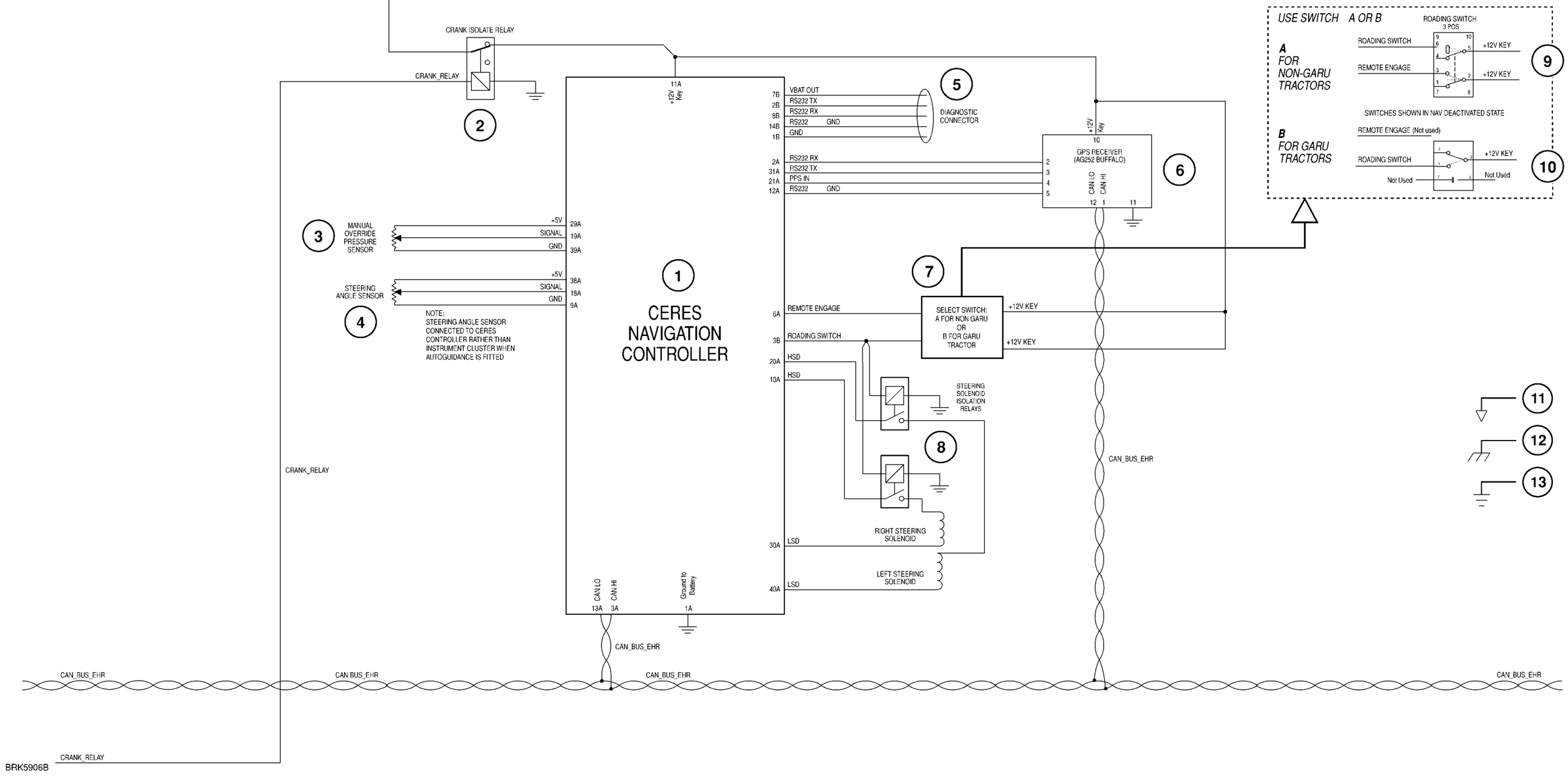
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Control module - Electronic schema Auto Guidance Module

Component designation	
1. Autoguidance module	
2. Crank Relay	
3. Manual override pressure sensor	
4. Steering angle sensor	
5. Diagnostic connector	
6. GPS (global positioning system) receiver	
7. Select switch (A=non GARU, B=with GARU	
8. Steering solenoids	
9. Switch type A	
10. Switch type B	
11. Sensor ground	
12. Chassis Ground	
13. Power Ground	

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+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT
+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT
+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT
+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW
+12V_TCM	+12V_TCM	+12V_TCM	+12V_TCM
+12V_EDC	+12V_EDC	+12V_EDC	+12V_EDC
+12V_OTHER1	+12V_OTHER1	+12V_OTHER1	+12V_OTHER1
+12V_(F38)	+12V_(F38)	+12V_(F38)	+12V_(F38)
+12V_EXT	+12V_EXT	+12V_EXT	+12V_EXT
EHR_ENABLE	EHR_ENABLE	EHR_ENABLE	+12V_ADIC_SW



2_BRK5906B 1

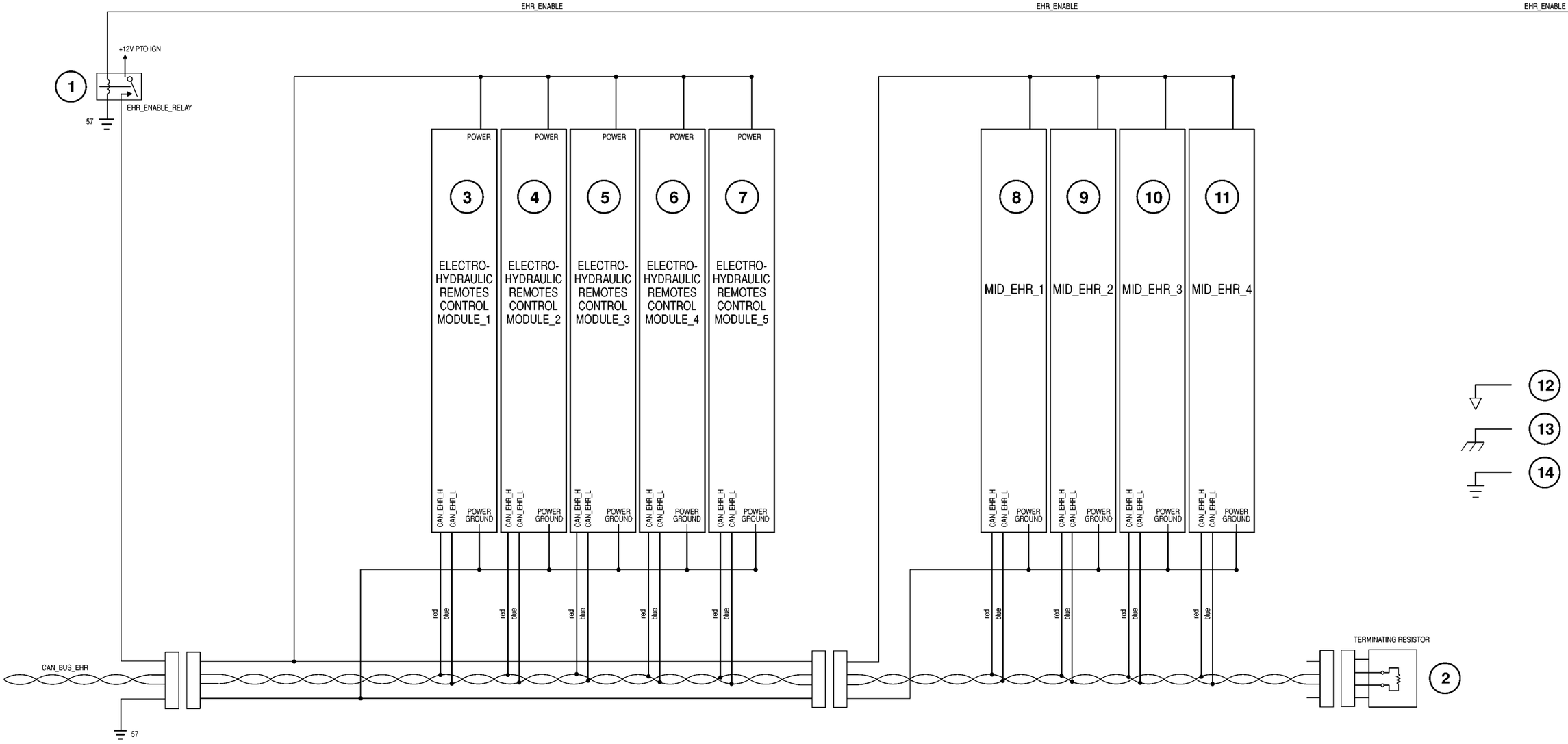
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Control module - Electronic schema Electro-Hydraulic Remotes

Component designation	
1. Supply relay EHRs	
2. CAN BUS terminating resistor	
3. EHR 1 rear	
4. EHR 2 rear	
5. EHR 3 rear	
6. EHR 4 rear	
7. EHR 5 rear	
8. EHR 1 FRONT (MID)	
9. EHR 2 FRONT (MID)	
10. EHR 3 FRONT (MID)	
11. EHR 4 FRONT (MID)	
12. Sensor signal ground	
13. Chassis ground	
14. Supply ground	

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+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT	+12V_TRANS_HOT
+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT	+12V_ENG_HOT
+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT	+12V_ADIC_HOT
+12V_EPL_HOT	+12V_EPL_HOT	+12V_EPL_HOT	+12V_EPL_HOT
+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW	+12V_ENG_SW
+12V_TCM_SW	+12V_TCM	+12V_TCM	+12V_TCM
+12V_EDC_SW	+12V_EDC	+12V_EDC	+12V_EDC
+12V_OTHER1	+12V_OTHER1	+12V_OTHER1	+12V_OTHER1
+12V_OTHER2	+12V_OTHER2	+12V_OTHER2	+12V_OTHER2
+12V_EXT	+12V_EXT	+12V_EXT	+12V_EXT



BRK5900B

1_BRK5900B 1

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Control module - Fault code index

Continuously Variable Transmission (CVT) Calibration 'U' Error Codes

Code	Description	Possible Failure
U16	ERPM dropped too soon during clutch calibration	1) Engine lugged down too soon. Possible PWM valve faulty or a mechanical fault within the transmission
U17	Seat switch not activated	1) Operator not in seat 2) Open circuit for the seat switch input to the transmission module 3) Faulty seat switch 4) Switched 12v supply fuse blown Note: Use the H5 switch diagnostics to detect if the seat switch is connected
U19	Oil temperature below **10 °C**	1) Open circuit for the temperature sensor input to module 2) Faulty temperature sensor 3) Incorrect temperature sensor type set in transmission, H3, channel 7 Note: Use the H9 in the transmission module to see if the temperature sensor input is OK
U20	Handbrake is not set	1) Open circuit for the handbrake feed into the transmission module 2) Faulty handbrake switch 3) Switched 12v supply fuse blown Note: Use the H5 switch diagnostics to detect if the handbrake is connected
U21	ERPM is below 1100, increase throttle	1) Operator has not set the correct engine speed 2) Instrument cluster is not powered 3) Broken CAN Note: Use the H9 in the transmission module to see if the engine speed is being detected
U22	ERPM is above 1300, reduce throttle	1) Operator has not set the correct engine speed
U23	Shuttle lever is in neutral, shift it to forward	1) Operator has not selected forward on the shuttle lever 2) Open circuit between the shuttle lever and the transmission module 3) Switched 12v supply fuse blown Note: Use the H5 switch diagnostics to detect if the switch is connected
U26	Clutch pedal is not up, release clutch pedal	1) Operator has not released the clutch pedal 2) The clutch potentiometer / linkage is sticking or broken Note: Use the H9 in the transmission module to see if the clutch input is OK
U31	Wheel speed sensed - tractor moving	1) Handbrake not applied 2) Brakes not working Note: If the brakes are OK move the vehicle forward slightly and repeat calibration
U36	Max allowed clutch calibration value exceeded	1) Current value exceeded without lugging the engine down. Possible PWM valve faulty or a low hydraulic pressure fault
U51	Engine speed error	1) Engine speed must be between 850 and 950 rpm 2) CAN bus error
U55	PTO started	1) The PTO was started during the PTO twist sensor calibration, ensure the PTO is turned off
U58	PTO sensor open circuit	Wiring or connectors to PTO twist sensor
U59	PTO sensor short circuit to ground	Wiring or connectors to PTO twist sensor
U70	PTO twist sensor not calibrated	Calibration value was too high or too low
U75	Quick fill calibration value too high	1) Wiring problem (on clutch solenoid) 2) Clutch solenoid damaged 3) Clutch mechanical problem
U76	Quick fill calibration value too low	1) Wiring problem (on clutch solenoid) 2) Clutch solenoid damaged 3) Clutch mechanical problem

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Code	Description	Possible Failure
U77	Damper calibration value too high	1) Wiring problem 2) Sensor damaged 3) Wrong damper installation 4) Mechanical problem on driveline
U78	Damper calibration value too low	1) Wiring problem 2) Sensor damaged 3) Wrong damper installation 4) Mechanical problem on driveline
U79	PTO twist sensor not plausible	1) Sensor damaged or incorrectly installed
U91	Syncro potentiometer signal is out of range for F1 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U92	Syncro potentiometer signal is out of range for F3 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U93	F1 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch A or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline
U94	F3 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch A or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline
U95	Syncro potentiometer signal is out of range for F2 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U96	Syncro potentiometer signal is out of range for R1 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U97	F2 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch B or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline
U98	R1 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch B or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline
U99	Syncro potentiometer signal is out of range for R2 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U100	Syncro potentiometer signal is out of range for F4 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U101	R2 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch A or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline
U102	F4 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch B or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline

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Code	Description	Possible Failure
U103	F1/F3 wrong neutral position	1) Wiring problem 2) Potentiometer damaged 3) Mechanical problem on driveline
U104	F2/R1 wrong neutral position	1) Wiring problem 2) Potentiometer damaged 3) Mechanical problem on driveline
U105	F4/R2 wrong neutral position	1) Wiring problem 2) Potentiometer damaged 3) Mechanical problem on driveline
U107	Clutch not working	1) Wiring problem 2) Potentiometer damaged 3) Mechanical problem on driveline
U108	Damper torque not readable	1) Wiring problem 2) Sensor damaged 3) Wrong damper installation 4) Damper not calibrated
U109	Hydro not in position	1) Wiring problem (on hydro–in or hydro–out sensors) 2) Sensor damaged (hydro–in or hydro–out) 3) Low pressure on hydraulic circuit 4) Mechanical problem

Electronic Draft Control Calibration 'U' Error Codes

Code	Description	Possible Failure
Note: There are no 'U' error codes defined for the electronic draft control calibration procedure. However the following error codes may be displayed during the procedure.		
1068	Height limit control not fully clockwise	1) The height limit control is not turned fully clockwise 2) The height limit control is faulty
1070	EDC hydraulic ram size not configured	Ram size not configured on a new controller or following H8 procedure Note: Use EDC H3, channel 1 to configure

Shiftable PTO Calibration 'U' Error Codes

Code	Description	Possible Failure
U112	PTO speed select cable stalled while extending	1) Cable not connected correctly in neutral position 2) Cable jammed 3) Sensor not connected
U113	PTO speed select cable stalled while retracting	1) Cable not connected correctly in neutral position 2) Cable jammed 3) Sensor not connected
U124	PTO speed select switch in optional speed position	1) Speed select switch is in the wrong position – selector switch set to 1000 or N position instead of optional speed position 2) Selector switch wiring incorrect 3) Speed selector switch faulty
U125	Incorrect optional speed calculation	1) PTO speed RPM inaccurate 2) PTO speed select cable not set up correctly
U126	No movement from position sensor	1) -

Front Suspension Calibration 'U' Error Codes

Code	Description	Possible Failure
U01	Front axle potentiometer open circuit – ACP will not work	1) Check the wiring harness 2) Check the displayed potentiometer reading during calibration. If less than 10 then replace the potentiometer
U02	Front axle potentiometer threshold is higher than set limit	1) Check the potentiometer installation 2) Check the displayed potentiometer reading during calibration. If greater than 972 then change the potentiometer 3) Check the wiring harness

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Code	Description	Possible Failure
U03	Front axle potentiometer short circuit – ACP will not work	1) Check the wiring harness 2) Check if signal ground on potentiometer is open circuit 3) Change the potentiometer
U04	Front axle potentiometer threshold is lower than set limit	1) Change the potentiometer
U05	Suspension is not reaching its minimum / maximum position during ACP procedure	1) Check the range of the potentiometer, calibration will not work if the range of the potentiometer is less than 150 2) Check the suspension mechanics 3) Check the potentiometer linkage
U07	Suspension is stationary during the raise command in the ACP procedure	1) Check the raise solenoid harness 2) Check the suspension mechanics 3) Check the potentiometer linkage 4) Check the pressure of the accumulators 5) Check the hydraulic pressure 6) Disconnect implement
U08	Suspension unable to reach maximum height within 20 seconds	1) Check the raise valve installation 2) Check the unload solenoid installation 3) Check the suspension mechanics 4) Check the hydraulic pressure 5) Disconnect implement
U09	Suspension is stationary during the lowering command in the ACP procedure	1) Check the unload solenoid harness 2) Check the suspension mechanics 3) Check the potentiometer linkage 4) Check the hydraulic pressure 5) Disconnect implement
U10	Suspension unable to reach minimum height within 25 seconds	1) Check unload solenoid installation 2) Check the hydraulic pressure 3) Disconnect implement
U11	Unable to calibrate suspension	1) The lockout switch was pressed more than 3 times to initiate calibration 2) Check the suspension mechanics 3) Check the hydraulic pressure
U12	ACP stopped, vehicle not stationary	1) Handbrake not applied 2) Rear axle speed sensor faulty
U13	Valve 30 (upper lockout) solenoid open circuit	1) Check the wiring harness
U14	Valve 31 (lower lockout) solenoid open circuit	1) Check the wiring harness
U15	Valve 30 (upper lockout) and Valve 31 (lower lockout) solenoid connectors swapped	1) Check the wiring harness
U16	Valve 30 (upper lockout) and Valve 31 (lower lockout) current sense inputs swapped	1) Check the wiring harness
U17	Front suspension pressure switch open circuit	1) Check the wiring harness
U18	Front suspension pressure switch short circuit	1) Check the wiring harness

Rear Electronic Hydraulic Remote Valves Calibration 'U' Error Codes

Code	Description	Possible Failure
U61	Lever No.1 not in neutral	–
U62	Lever No.2 not in neutral	–
U63	Lever No.3 not in neutral	–
U64	Lever No.4 not in neutral	–

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Front Hitch Calibration 'U' Error Codes

Code	Description	Possible Failure
U110	Position potentiometer value too low or the hitch is not raised	Hitch was not raised before height limit control was changed from ON to OFF position

Steering Calibration 'U' Error Codes

Code	Description	Possible Failure
U19	Oil temperature below **5 °C**	1) Open circuit for the temperature sensor input to the transmission module 2) Faulty temperature sensor Note: Use the H9 menu in the transmission module to see if the temperature sensor input is okay
U21	ERPM is below 1300, increase throttle	1) Operator has not set the correct engine speed 2) Open circuit for the engine speed sensor going to the cluster – mechanical engines only 3) Instrument cluster is not powered 4) Broken CAN bus Note: Use the HE menu to see if the engine speed is being detected
U71	Calibration attempted while enable switch is off	1) The enable switch is in the off position 2) The enable switch is in the on position at start up but needs to be cycled through off then on to enable the system
U72	Proximity sensor input is out of range – open	1) Incorrect position of steering wheel 2) Faulty proximity sensor 3) Check the proximity sensor connection
U73	Proximity sensor input is out of range – closed	1) Incorrect position of steering wheel 2) Faulty proximity sensor 3) Check the proximity sensor connection
U74	LVDT calibration has been unsuccessful (out of range after 4th attempt)	1) Faulty LVDT sensor 2) Faulty steering hydraulic valve 3) Incorrect assembly of hydraulic valve 4) Check the LVDT sensor connection

EPL Calibration 'U' Error Codes

Code	Description	Possible Failure
U114	Hand brake applied	1) Blue cable (on the handbrake switch connector) cut off 2) Mismatch between the handbrake switch status hardwired to the EPL and the VCU_HB_SWITCH parameter in the VCU2EPL CAN message
U115	Shuttle lever not in the park position	1) Pins A4 or C7 of the EPL module short to ground 2) Pins A4 or C7 of the EPL module cut off 3) Pins A4 or C7 of the EPL module short to supply voltage 4) Shuttle lever damaged
U116	APP position too high	1) Wrong mechanical adjustment of the EPL transmission lever 2) Possible wear in the braking pads
U117	APP position too low	1) Stiffness of the system is too high – possible mechanical interferences 2) Wrong mechanical installation of the EPL
U118	Error codes active preventing completion of initialization procedure	1) High recovery level error code is being activated
U119	Bowden cable not connected	1) Bowden cable not connected
U120	Inclinometer self test failed	1) Inclinometer broken
U121	Inclinometer calibration procedure not OK	–
U122	Inclinometer offset out of range	1) Check the inclinometer installation 2) Vehicle not on flat ground 3) Remove any rear attachment 4) Incorrect wheels could be installed

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Code	Description	Possible Failure
U123	Vehicle moving	1) Vehicle not stationary 2) Vehicle speed sensor failed

Electronic Draft Control (EDC) – Error Codes

Code	Description
1002	Radar disconnected
1003	Speed sensor error
1004	Wheel speed sensor – signal too high
1008	Raise / work switch failure (command arm)
1009	Both external switches operated at the same time
1014	R/H load sensing pin – signal too low
1015	R/H load sensing pin – signal too high
1016	L/H load sensing pin – signal too low
1017	L/H load sensing pin – signal too high
1018	Both load sensing pins disconnected
1019	Load sensing pin 8V reference – voltage too low
1020	Load sensing pin 8V reference – voltage too high
1024	Perform the hydraulic lift calibration
1027	Lift arm position sensor – voltage too low
1028	Lift arm position sensor – voltage too high
1029	Hydraulic control valve disconnected
1030	Signal ground open circuit
1031	Chassis harness disconnected
1049	Hydro in speed sensor open circuit
1053	5 Volt reference – short to +12v
1054	5 Volt reference – short to ground
1059	8 Volt reference error (draft load pins)
1063	Hydraulic valve lower solenoid – open circuit
1064	Hydraulic valve raise solenoid – open circuit
1065	Hydraulic valve lower solenoid – short circuit
1066	Hydraulic valve raise solenoid – short circuit
1067	Hydraulic valve supply voltage – voltage too low
1068	Height limit control not set to maximum during calibration
1070	Hydraulic ram configuration not set

Transmission – Error Codes

Code	Description
2007	Low power 5V reference – voltage too low
2008	Low power 5V reference – voltage too high
2009	Seat switch input – voltage too low
2010	Seat switch input – voltage too high
2011	Clutch pedal potentiometer – voltage too low
2012	Clutch pedal potentiometer – voltage too high
2021	Transmission harness disconnected
2024	All clutches not calibrated
2026	Engine speed – too high
2027	Engine speed – no signal
2035	Dump solenoid – short to 12V
2036	Dump solenoid – short to ground or open circuit
2037	Clutch pedal disconnect switch – open circuit
2046	Fuse sense input – open circuit
2047	Clutch pedal disconnect switch set too high
2048	Clutch pedal disconnect switch set too low
2049	Wheel speed (transmission output speed) sensor – short to ground or open circuit

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Code	Description
2050	Wheel speed (transmission output speed) sensor – short to 12V
2051	Oil temperature sensor – open circuit
2052	Oil temperature sensor – short circuit
2053	5V reference voltage – too high
2054	5V reference voltage – too low
2055	Wheel speed (transmission output speed) sensor – no signal
2059	Shuttle lever switch disagreement
2070	Shuttle lever forward switch – voltage too high
2071	Shuttle lever forward switch – voltage too low
2072	Shuttle lever reverse switch – voltage too high
2073	Shuttle lever reverse switch – voltage too low
2075	Flywheel speed sensor signal error
2076	Flywheel speed sensor – open circuit
2077	Flywheel speed sensor – short circuit
2079	Flywheel speed sensor – no signal
2124	Flywheel speed sensor not calibrated
2303	Damper calibration – low error
2304	Damper calibration – high error
2331	Clutch slipping fault (CP displayed)
2342	Clutch A solenoid – open circuit or short circuit to ground
2343	Clutch B solenoid – open circuit or short circuit to ground
2352	Clutch A solenoid – voltage too high
2353	Clutch B solenoid – voltage too high
2362	Clutch A not calibrated
2363	Clutch B not calibrated
2380	Parklock – unable to reach desired position
2381	Parklock – bus off
2382	Parklock – bus integrity error
2501	Oil pressure sensor – open circuit or short circuit to ground
2502	Oil pressure sensor – short circuit to +5V
2503	Clutch A solenoid – in use, an open circuit or short circuit to ground
2504	Clutch B solenoid – in use, an open circuit or short circuit to ground
2505	Clutch A pressure not plausible
2506	Clutch B pressure not plausible
2507	F1/F3 synchro potentiometer – signal too high
2508	F1/F3 synchro potentiometer – signal too low
2509	Synchro not moving towards F1
2510	Synchro not moving towards F3
2511	F1 solenoid - open circuit or short circuit to ground
2512	F3 solenoid - open circuit or short circuit to ground
2513	F1 solenoid - circuit fault
2514	F3 solenoid - circuit fault
2517	F2/R1 synchro potentiometer – signal too high
2518	F2/R1 synchro potentiometer – signal too low
2519	Synchro not moving towards F2
2520	Synchro not moving towards R1
2521	F2 solenoid - open circuit or short circuit to ground
2522	R1 solenoid - open circuit or short circuit to ground
2523	F2 solenoid - circuit fault
2524	R1 solenoid - circuit fault
2527	F4/R2 synchro potentiometer – signal too high
2528	F4/R2 synchro potentiometer – signal too low
2529	Synchro not moving towards F4
2530	Synchro not moving towards R2
2531	F4 solenoid - open circuit or short circuit to ground

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Code	Description
2532	R2 solenoid - open circuit or short circuit to ground
2533	F4 solenoid - circuit fault
2534	R2 solenoid - circuit fault
2536	Hydro in sensor – open circuit or short circuit to ground
2537	Hydro in sensor – short to 12V
2538	Ring speed sensor – open circuit or short circuit to ground
2539	Ring speed sensor – short to 12V
2540	A clutch pressure transducer – open circuit or short circuit to ground
2541	B clutch pressure transducer – open circuit or short circuit to ground
2542	A clutch pressure transducer – short circuit to 5V
2543	B clutch pressure transducer – short circuit to 5V
2544	Ring speed sensor critical air gap
2545	ORPM sensor critical air gap
2546	Hydro in sensor – no signal
2547	Ring speed sensor – no signal
2548	Brake pressure transducer – open circuit or short circuit to ground
2549	Brake pressure transducer – short to 12V
2552	Transmission oil pressure too high
2553	Transmission oil pressure too low
2557	Hydro 1 solenoid – open circuit or short circuit to ground
2558	Hydro 1 solenoid – short circuit to 12V
2559	ORPM and Ring sensor fault

Engine – Error Codes

Code	Description
3001	Foot throttle sensor – signal not plausible
3002	Foot throttle sensor – signal above range maximum
3003	Foot throttle sensor – signal below range minimum
3006	Coolant temperature signal – signal not plausible
3007	Coolant temperature signal – signal above range maximum
3008	Coolant temperature signal – signal below range minimum
3010	Air intake temperature sensor – signal above range maximum
3011	Air intake temperature sensor – signal below range minimum
3015	Fuel temperature sensor – signal above range maximum
3016	Fuel temperature sensor – signal below range minimum
3019	Boost pressure sensor – signal above range maximum
3022	Boost pressure sensor – signal not plausible
3023	Atmospheric pressure sensor – signal not plausible
3024	Atmospheric pressure sensor – signal above range maximum
3025	Atmospheric pressure sensor – signal below range minimum
3028	Oil pressure too low
3029	Oil pressure sensor – short circuit to battery
3030	Oil pressure sensor – short circuit to ground
3032	Oil pressure sensor – value too high
3033	Oil temperature sensor – signal not plausible
3034	Oil temperature sensor – signal above range maximum
3035	Oil temperature sensor – signal below range minimum
3037	Boost pressure sensor – signal low
3038	Constant engine RPM activate / select switch – short circuit to battery
3047	High pressure pump relay – short circuit to battery
3048	High pressure pump relay – short circuit to ground
3051	Battery voltage to ECM – voltage too high
3052	Battery voltage to ECM – voltage too low
3060	Cylinder 1 – unclassifiable error in injector
3061	Cylinder 1 – injector cable short circuit (low side to battery)

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Code	Description
3063	Cylinder 1 – injector cable short circuit (high side to ground)
3064	Cylinder 5 – unclassifiable error in injector
3065	Cylinder 5 – injector cable short circuit (low side to battery)
3067	Cylinder 5 – injector cable short circuit (high side to ground)
3068	Cylinder 3 – unclassifiable error in injector
3069	Cylinder 3 – injector cable short circuit (low side to battery)
3071	Cylinder 3 – injector cable short circuit (high side to ground)
3072	Cylinder 6 – unclassifiable error in injector
3073	Cylinder 6 – injector cable short circuit (low side to battery)
3075	Cylinder 6 – injector cable short circuit (high side to ground)
3076	Cylinder 2 – unclassifiable error in injector
3077	Cylinder 2 – injector cable short circuit (low side to battery)
3079	Cylinder 2 – injector cable short circuit (high side to ground)
3080	Cylinder 4 – unclassifiable error in injector
3081	Cylinder 4 – injector cable short circuit (low side to battery)
3083	Cylinder 4 – injector cable short circuit (high side to ground)
3088	Crankshaft sensor – no signal
3089	Crankshaft sensor – invalid signal
3090	Camshaft sensor – no signal
3091	Camshaft sensor – invalid signal
3093	Offset between camshaft and crankshaft – outside boundaries
3095	Operating with camshaft sensor only – backup mode
3096	ECM busoff on CAN A
3102	Rail pressure sensor CP3 – signal below range minimum
3104	Rail pressure relief valve – open
3105	Rail pressure relief valve – pressure shock requested
3106	Rail pressure relief valve – did not open after pressure shock
3107	Metering unit – short circuit to battery
3108	Metering unit – short circuit to ground
3110	Rail pressure sensor monitoring – signal below range minimum
3111	Rail pressure sensor monitoring – signal above range maximum
3112	Rail pressure sensor CP3 – signal above maximum range
3120	PTO twist sensor – not plausible
3121	PTO twist sensor – open circuit
3122	PTO twist sensor – short circuit to ground
3123	PTO twist sensor – not calibrated
3124	Hand throttle – channel 2 signal above range maximum
3125	Hand throttle – channel 2 signal below range minimum
3126	Hand throttle – channel 1 signal above range maximum
3127	Hand throttle – channel 1 signal below range minimum
3128	Hand throttle – channel difference error
3129	Hand throttle – idle switch closed circuit
3130	Hand throttle – idle switch open circuit
3131	Grid heater always switched on
3137	Metering unit – open load
3138	Metering unit – temperature too high
3141	Fuel flow setpoint too low
3142	High pressure test – test active
3145	Terminal 15 – no signal
3147	Oil temperature too high
3148	Coolant temperature sensor dynamic test – failure
3154	Grid heater relay – short circuit to battery
3155	Grid heater relay – short circuit to ground
3156	Grid heater relay – no load
3157	ECM not detected on CAN bus

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Code	Description
3158	Invalid ECM checksum
3159	Invalid engine reference torque
3160	Fan actuator – short circuit to battery
3161	Fan actuator – short circuit to ground
3162	Fan actuator – temperature too high
3163	Fan actuator – no load
3176	Setpoint of metering unit not plausible in overrun
3177	Engine overspeed detected
3179	Timeout of CAN message BC2EDC2
3180	Timeout of CAN message VM2EDC
3182	Timeout of CAN message RxCCVS
3185	Timeout of CAN message TF
3188	Cylinder 1 warning – open load
3192	Cylinder 2 warning – open load
3196	Cylinder 3 warning – open load
3200	Cylinder 4 warning – open load
3204	Cylinder 5 warning – open load
3208	Cylinder 6 warning – open load
3210	Bank 1 – general short circuit to injection cable
3211	Bank 1 – injection cable short circuit low side to ground
3213	Bank 1 – unclassifiable error
3218	Bank 2 – general short circuit to injection cable
3219	Bank 2 – injection cable short circuit low side to ground
3221	Bank 2 – unclassifiable error
3227	Injection processor (CY33X) error – internal reset / clock loss / voltage too low
3228	Injection processor (CY33X) error – unlocked / initialisation failure
3229	Injection processor (CY33X) error – injections limited by software
3230	Injection processor (CY33X) error – SPI communication failure
3231	Injection processor error – internal reset / clock loss / voltage too low
3232	Injection processor error – unlocked / initialisation failure
3233	Injection processor error – test mode
3234	Injection processor error – SPI communication failure
3238	ECM internal SPI communications error – CJ940
3239	ECM EEPROM – read operation failure
3240	ECM EEPROM – write operation failure
3241	ECM EEPROM – default value used
3242	ECM (locked) recovery occurred
3243	ECM recovery (suppressed) – recovery occurred
3244	ECM recovery (visible) – recovery occurred
3245	ECM processor – watchdog not plausible
3246	Shutoff paths during initialisation – watchdog
3247	Shutoff paths during initialisation – supply voltage too high
3248	Shutoff paths during initialisation – supply voltage too low
3249	TPU monitoring – time deviation between TPU and system not plausible
3250	Dataset – variant defect
3251	Dataset – requested variant could not be set
3252	Controller watchdog – SPI communication failure
3253	ADC monitoring – reference voltage too low
3254	ADC monitoring – reference voltage too high
3255	ADC monitoring – test impulse error
3256	ADC monitoring – queue error
3263	ECM BusOff on CAN C
3265	Overrun monitoring
3266	Redundant engine speed in overrun monitoring
3278	ECM internal supply voltage too high

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Code	Description
3279	ECM internal supply voltage too low
3280	Sensor supply voltage 1 high
3281	Sensor supply voltage 1 low
3283	Sensor supply voltage 2 high
3284	Sensor supply voltage 2 low
3285	Sensor supply voltage 3 high
3286	Sensor supply voltage 3 low
3297	Rail pressure positive deviation high and high fuel flow setpoint value
3301	Rail pressure negative deviation too high on minimum metering
3305	Rail pressure below minimum limit in controller mode
3309	Rail pressure above maximum limit in controlled mode
3313	Rail pressure drop rate too high
3316	Minimum number of injections not reached – stop engine
3334	Timeout of CAN message TSC1–PE Torque (when active)
3335	Timeout of CAN message TSC1–PE Torque (when inactive)
3338	Timeout of CAN message TSC1–VE Speed (when inactive)
3339	Timeout of CAN message TSC1–VE Speed (when active)
3345	Total throttle failure
3367	Coolant temperature test failure
3368	INFO: Torque limitation due to OBD Performance Limiter by legislation
3369	INFO: Torque reduction due to smoke reduction
3370	INFO: Torque limitation due to Engine Protection (against excessive torque, engine overspeed and overheat)
3371	INFO: Torque limitation due to Fuel Quantity Limitation because of injector system errors
3375	Constant engine RPM increase / decrease switch – short circuit to battery
3999	Unknown ECM SPN Error Code

Rear Electronic Hydraulic Remote Valves – Error Codes

Code	Description
4100	Rear remote no.1 – no control message received
4101	Rear remote no.1 – control message not plausible
4102	Rear remote no.1 – EEPROM error
4103	Rear remote no.1 – switched to failsafe
4104	Rear remote no.1 – under voltage
4105	Rear remote no.1 – over voltage
4106	Rear remote no.1 – spool movement too low
4107	Rear remote no.1 – spool movement too high
4108	Rear remote no.1 – float position not reached
4109	Rear remote no.1 – manually operated
4110	Rear remote no.1 – driver faulty
4111	Rear remote no.1 – potentiometer faulty
4112	Rear remote no.1 – unable to reach neutral
4113	Rear remote no.1 – spool not in neutral at key on
4114	Rear remote no.2 – no control message received
4115	Rear remote no.2 – control message not plausible
4116	Rear remote no.2 – EEPROM error
4117	Rear remote no.2 – switched to failsafe
4118	Rear remote no.2 – under voltage
4119	Rear remote no.2 – over voltage
4120	Rear remote no.2 – spool movement too low
4121	Rear remote no.2 – spool movement too high
4122	Rear remote no.2 – float position not reached
4123	Rear remote no.2 – manually operated
4124	Rear remote no.2 – driver faulty
4125	Rear remote no.2 – potentiometer faulty

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Code	Description
4126	Rear remote no.2 – unable to reach neutral
4127	Rear remote no.2 – spool not in neutral at key on
4128	Rear remote no.3 – no control message received
4129	Rear remote no.3 – control message not plausible
4130	Rear remote no.3 – EEPROM error
4131	Rear remote no.3 – switched to failsafe
4132	Rear remote no.3 – under voltage
4133	Rear remote no.3 – over voltage
4134	Rear remote no.3 – spool movement too low
4135	Rear remote no.3 – spool movement too high
4136	Rear remote no.3 – float position not reached
4137	Rear remote no.3 – manually operated
4138	Rear remote no.3 – driver faulty
4139	Rear remote no.3 – potentiometer faulty
4140	Rear remote no.3 – unable to reach neutral
4141	Rear remote no.3 – spool not in neutral at key on
4142	Rear remote no.4 – no control message received
4143	Rear remote no.4 – control message not plausible
4144	Rear remote no.4 – EEPROM error
4145	Rear remote no.4 – switched to failsafe
4146	Rear remote no.4 – under voltage
4147	Rear remote no.4 – over voltage
4148	Rear remote no.4 – spool movement too low
4149	Rear remote no.4 – spool movement too high
4150	Rear remote no.4 – float position not reached
4151	Rear remote no.4 – manually operated
4152	Rear remote no.4 – driver faulty
4153	Rear remote no.4 – potentiometer faulty
4154	Rear remote no.4 – unable to reach neutral
4155	Rear remote no.4 – spool not in neutral at key on
4156	Rear remote no.5 – no control message received
4157	Rear remote no.5 – control message not plausible
4158	Rear remote no.5 – EEPROM error
4159	Rear remote no.5 – switched to failsafe
4160	Rear remote no.5 – under voltage
4161	Rear remote no.5 – over voltage
4162	Rear remote no.5 – spool movement too low
4163	Rear remote no.5 – spool movement too high
4164	Rear remote no.5 – float position not reached
4165	Rear remote no.5 – manually operated
4166	Rear remote no.5 – driver faulty
4167	Rear remote no.5 – potentiometer faulty
4168	Rear remote no.5 – unable to reach neutral
4169	Rear remote no.5 – spool not in neutral at key on
4170	Rear EHR control No.1 – not calibrated
4173	Rear EHR control No.2 – not calibrated
4177	Rear EHR control no.3 – not calibrated
4180	Rear EHR control no.4 – not calibrated
4190	Rear remote no.1 – no communications
4191	Rear remote no.2 – no communications
4192	Rear remote no.3 – no communications
4193	Rear remote no.4 – no communications
4198	Rear remote no.5 – no communications
4216	Rear remote no.1 – spool not calibrated
4217	Rear remote no.2 – spool not calibrated

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Code	Description
4218	Rear remote no.3 – spool not calibrated
4219	Rear remote no.4 – spool not calibrated
4220	Rear remote no.5 – spool not calibrated

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Front Electronic Hydraulic Remote Valves – Error Codes

Code	Description
4500	Front remote no.1 – no control message received
4501	Front remote no.1 – control message not plausible
4502	Front remote no.1 – EEPROM error
4503	Front remote no.1 – switched to failsafe
4504	Front remote no.1 – under voltage
4505	Front remote no.1 – over voltage
4506	Front remote no.1 – spool movement too low
4507	Front remote no.1 – spool movement too high
4508	Front remote no.1 – float position not reached
4509	Front remote no.1 – manually operated
4510	Front remote no.1 – driver faulty
4511	Front remote no.1 – potentiometer faulty
4512	Front remote no.1 – unable to reach neutral
4513	Front remote no.1 – spool not in neutral at key on
4514	Front remote no.2 – no control message received
4515	Front remote no.2 – control message not plausible
4516	Front remote no.2 – EEPROM error
4517	Front remote no.2 – switched to failsafe
4518	Front remote no.2 – under voltage
4519	Front remote no.2 – over voltage
4520	Front remote no.2 – spool movement too low
4521	Front remote no.2 – spool movement too high
4522	Front remote no.2 – float position not reached
4523	Front remote no.2 – manually operated
4524	Front remote no.2 – driver faulty
4525	Front remote no.2 – potentiometer faulty
4526	Front remote no.2 – unable to reach neutral
4527	Front remote no.2 – spool not in neutral at key on
4528	Front remote no.3 – no control message received
4529	Front remote no.3 – control message not plausible
4530	Front remote no.3 – EEPROM error
4531	Front remote no.3 – switched to failsafe
4532	Front remote no.3 – under voltage
4533	Front remote no.3 – over voltage
4534	Front remote no.3 – spool movement too low
4535	Front remote no.3 – spool movement too high
4536	Front remote no.3 – float position not reached
4537	Front remote no.3 – manually operated
4538	Front remote no.3 – driver faulty
4539	Front remote no.3 – potentiometer faulty
4540	Front remote no.3 – unable to reach neutral
4541	Front remote no.3 – spool not in neutral at key on
4542	Front remote no.4 – no control message received
4543	Front remote no.4 – control message not plausible
4544	Front remote no.4 – EEPROM error
4545	Front remote no.4 – switched to failsafe
4546	Front remote no.4 – under voltage
4547	Front remote no.4 – over voltage
4548	Front remote no.4 – spool movement too low
4549	Front remote no.4 – spool movement too high
4550	Front remote no.4 – float position not reached
4551	Front remote no.4 – manually operated
4552	Front remote no.4 – driver faulty
4553	Front remote no.4 – potentiometer faulty

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Code	Description
4554	Front remote no.4 – unable to reach neutral
4555	Front remote no.4 – spool not in neutral at key on
4560	Front remote no.1 – no communications
4561	Front remote no.2 – no communications
4562	Front remote no.3 – no communications
4563	Front remote no.4 – no communications
4565	High flow pump connection error
4566	High flow pump configuration error

Rear PTO – Error Codes

Code	Description
5003	Rear PTO brake output – open circuit
5005	Rear PTO brake switch – open circuit
5007	Rear PTO solenoid – stuck off
5008	Rear PTO solenoid – open circuit
5010	Rear PTO shift motor – open circuit
5011	Rear PTO shift motor – short circuit
5012	Rear PTO shift sensor error
5013	Rear PTO shift switch – open circuit
5014	Rear PTO shift switch – short circuit
5027	Rear PTO speed sensor – open circuit
5033	Rear PTO cab normally closed switch – open circuit
5034	Rear PTO fender switch – open circuit / short to ground
5035	Rear PTO fender switch – input shorted to 12V
5037	Rear PTO cab normally open switch – stuck closed
5042	Rear PTO management switch – stuck closed
5043	Rear PTO fender switch stuck on
5044	Rear PTO speed sensor – short to ground
5098	Rear PTO fender switch option not enabled

Four Wheel Drive – Error Codes

Code	Description
6023	FWD solenoid – open circuit

Difflock – Error Codes

Code	Description
7017	Difflock solenoid – open circuit
7024	Steering angle sensor not calibrated
7032	Steering angle sensor – signal too low

Front PTO – Error Codes

Code	Description
8007	Front PTO solenoid – stuck on
8008	Front PTO solenoid – open circuit
8033	Front PTO cab normally closed switch – open circuit
8037	Front PTO cab normally open switch – stuck closed
8099	Front PTO option not enabled

Front Hitch – Error Codes

Code	Description
9001	Front hitch position sensor – short circuit to 12V
9002	Front hitch position sensor – open circuit / short circuit to 0V
9003	Front hitch fender up switch error
9004	Front hitch fender down switch error
9005	Front hitch fender common switch error

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Code	Description
9006	Front hitch position potentiometer – not calibrated

Suspended Front Axle – Error Codes

Code	Description
10001	Upper lockout solenoid error
10002	Raise solenoid error
10003	Lower solenoid error
10004	Front axle position sensor – threshold higher than set limit
10005	Front axle position sensor – threshold lower than set limit
10008	Go down error – suspension unable to return to set point
10009	Lower lockout solenoid error
10010	Chassis accelerometer – voltage too low (short circuit to ground / open circuit)
10011	Chassis accelerometer – voltage too high (short circuit to 5V)
10024	Front suspension not calibrated

Electronic Park Lock – Error Codes

Code	Description
12011	Power stage – over voltage protection
12012	Power stage – PH_A open circuit or PH_B open circuit, motor open
12013	Power stage – PH_A or PH_B short circuit to ground
12014	Power stage – PH_A or PH_B short circuit to Vbatt
12017	Power stage – internal service voltage (Vr)not viable
12018	Power stage – current over absolute range / motor short
12019	Power stage – current over dynamic set point
12020	Power stage – unexpected current
12024	Ignition key – key hardware Vs CAN signals coherence check
12032	Encoder – hardware fault on power supply
12033	Encoder virtual peripheral failure (XGATE) wrong sequence, interrupt failure
12034	Encoder function not available (A or B signal not available)
12043	Inclinometer – self test
12052	Battery – lower than 9V
12053	Battery – Higher than 16V
12054	Battery – out of range / spike diagnosis
12066	Trailer relay – open wire / load and output to 12V
12068	Trailer relay – output short circuit to ground
12073	Output status – output incongruence Vs Input
12132	CAN – bus off
12133	CAN – mute
12142	CAN – VCU_TRAIL_BRAKE-INH error / not available
12143	CAN – VCU_VEH_DIRECTION error / not available
12144	CAN – VCU_SPEED error / not available
12145	CAN – VCU_CMD error / not available
12146	CAN – VCU_KEY_OFF_AA_INH error / not available
12147	CAN – engine RMP error / not available
12148	CAN – VCU_KEY error / not available
12150	CAN – VCU_HB_SWITCH error / not available
12151	Logic core – second microprocessor not present
12160	Logic core – EEPROM check
12162	ACU temperature – out of range / spike diagnosis
12163	ACU temperature – power stage over temperature
12172	Actuator – cable disconnection
12183	Actuator – actuator moving without command
12184	Actuator – actuator end stop zone reached
12185	Actuator – actuation timeout (energy) expired
12188	Actuator – excess pad wear

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Code	Description
12192	Shuttle park – shuttle park invalid status
12202	Handbrake switch – handbrake switch incongruence
12212	Factory – accelerometer not calibrated
12213	Factory – actuator not initialised
12214	Factory – disable actuation
12215	Factory – trailer relay present but not configured

Cluster – Error Codes

Code	Description
14013	Steering angle sensor – short circuit to Vcc
14014	Steering angle sensor – short circuit to ground or open circuit
14015	5V supply voltage – too high
14016	5V supply voltage – too low
14021	Cranking line – shorted to 12V
14022	Cranking line – shorted to ground
14051	Fuel level sensor – short circuit to Vcc or open circuit
14052	Fuel level sensor – short circuit to ground
14061	Air brake pressure sensor – short circuit to VCC or option set but sensor not connected
14095	Vane pump – short circuit to ground
14096	Vane pump – short circuit to VCC or open circuit
14100	Air brake pressure – not configured
14102	SWCD – present but not configured
14104	EFH – present but not configured
14105	Electronic park lock – not configured
14106	Steering sensor – present but not configured
14300	Electronic park lock– mismatch between CAN and direct frequency input value
14301	Electronic park lock– direct frequency input shorted to Vcc or open circuit
14304	Electronic park lock– status not validated
14900	Transmission controller missing (RE/RN)
14901	Engine controller missing (EDC16)
14902	Auxiliary controller missing (RW/RN)
14904	Armrest controller missing (LC)
14905	Keypad missing (JA)(ADIC only)
14906	Steering controller missing (KA)
14908	TECU missing (OA)
14909	SWCD missing (VA)
14910	Climate controller missing
14914	Electronic park lock controller missing
14920	Configuration error (ADIC only)

Steering Controller – Error Codes

Code	Description
15002	Steering wheel control proximity sensor – open circuit
15003	Steering wheel control proximity sensor – short circuit
15006	Split valve LVDT – open circuit
15007	Split valve LVDT – short circuit
15008	Change valve solenoid – open circuit
15009	Change valve solenoid – short circuit across
15010	Safety switch fail
15011	Maximum engagement time elapsed (5 minutes)
15012	Split valve spool – stuck open
15013	Change valve or split valve spools – stuck closed
15014	Split valve spool stuck in transition zone – can’t identify which steering mode the tractor is definitely in.
15024	System not calibrated

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Air Conditioning Controller – Error Codes

Code	Description
16111	Cab temperature sensor open or shorted to power
16112	Cab temperature sensor shorted to ground
16113	Outlet temperature sensor open or shorted to power
16114	Outlet temperature sensor shorted to ground
16115	Evaporator temperature sensor open or shorted to power
16116	Evaporator temperature sensor shorted to ground
16117	Outside air temperature sensor open or shorted to power
16118	Outside air temperature sensor shorted to ground
16120	Blower speed select potentiometer open or shorted to power
16121	Temperature select potentiometer open or shorted to power
16122	Mode select potentiometer open or shorted to power
16125	High pressure– low pressure switch (+) input shorted to power
16126	High pressure– low pressure switch (+) input shorted to ground
16127	High pressure– low pressure switch (–) input shorted to power
16128	High pressure– low pressure switch (–) input shorted to ground
16129	High pressure cycling error (2 in 1 minute)
16130	Low pressure switch (+) input shorted to power
16131	Low pressure switch (+) input shorted to ground
16132	Low pressure switch (–) input shorted to power
16133	Low pressure switch (–) input shorted to ground
16134	Low pressure switch open for greater than 1 minute

Armrest – Error Codes

Code	Description
18001	Hand throttle number 1 – voltage too low
18002	Hand throttle number 1 – voltage too high
18003	Hand throttle number 2 – voltage too low
18004	Hand throttle number 2 – voltage too high
18007	Multi-function handle – switch error
18008	Multi-function handle – voltage too low
18009	Multi-function handle – voltage too high
18010	Powershift throttle – voltage too low
18011	Powershift throttle – voltage too high
18012	CVT mode switch error
18013	Multi-function handle – encoder position error
18014	Rear hitch position control potentiometer – voltage too low
18015	Rear hitch position control potentiometer – voltage too high
18016	Rear hitch draft control potentiometer – voltage too low
18017	Rear hitch draft control potentiometer – voltage too high
18018	Rear hitch height limit potentiometer – voltage too low
18019	Rear hitch height limit potentiometer – voltage too high
18020	Rear hitch drop rate potentiometer – voltage too low
18021	Rear hitch drop rate potentiometer – voltage too high
18022	Rear hitch sensitivity control potentiometer – voltage too low
18023	Rear hitch sensitivity control potentiometer – voltage too high
18024	EHR flow encoder position error
18025	Rear hitch slip control potentiometer – voltage too low
18026	Rear hitch slip control potentiometer – voltage too high
18027	EHR 5 lever position – voltage too low
18028	EHR 5 lever position – voltage too high
18029	EHR 6 lever position – voltage too low
18030	EHR 6 lever position – voltage too high
18031	Front hitch position / pressure control potentiometer – voltage too low

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Code	Description
18032	Front hitch position / pressure control potentiometer – voltage too high
18033	Front hitch position / pressure mix potentiometer – voltage too low
18034	Front hitch position / pressure mix potentiometer – voltage too high
18035	Front hitch position height limit potentiometer – voltage too low
18036	Front hitch position height limit potentiometer – voltage too high
18037	Front hitch height limit enable switch error
18038	Front hitch position drop rate potentiometer – voltage too low
18039	Front hitch position drop rate potentiometer – voltage too high
18040	EHR 1 lever position – voltage too low
18041	EHR 1 lever position – voltage too high
18042	EHR 2 lever position – voltage too low
18043	EHR 2 lever position – voltage too high
18044	EHR 3 lever position – voltage too low
18045	EHR 3 lever position – voltage too high
18046	EHR float control switch error
18047	EHR 4 lever position – voltage too low
18048	EHR 4 lever position – voltage too high
18049	Joystick 1 X-axis position – voltage too low
18050	Joystick 1 X-axis position – voltage too high
18051	Joystick 1 Y-axis position – voltage too low
18052	Joystick 1 Y-axis position – voltage too high
18053	Joystick 1 proportional rocker switch – voltage too low
18054	Joystick 1 proportional rocker switch – voltage too high
18055	Joystick 2 X-axis position – voltage too low
18056	Joystick 2 X-axis position – voltage too high
18057	Joystick 2 Y-axis position – voltage too low
18058	Joystick 2 Y-axis position – voltage too high
18059	Joystick 2 proportional rocker switch – voltage too low
18060	Joystick 2 proportional rocker switch – voltage too high
18061	Reference voltage – short circuit to ground
18062	Reference voltage – short circuit to 12V
18063	EEEPROM error
18064	MFH communication error
18065	MFH basic assurance test error
18066	EHR 1 lever implausibility error
18067	EHR 2 lever implausibility error
18068	EHR 3 lever implausibility error
18069	EHR 4 lever implausibility error

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ELECTRONIC SYSTEM - Calibrate ’U’ Code Listing

Continuously Variable Transmission (CVT) Calibration ’U’ Error Codes

Code	Description	Possible Failure
U16	ERPM dropped too soon during clutch calibration	1) Engine lugged down too soon. Possible PWM valve faulty or a mechanical fault within the transmission
U17	Seat switch not activated	1) Operator not in seat 2) Open circuit for the seat switch input to the transmission module 3) Faulty seat switch 4) Switched 12v supply fuse blown Note: Use the H5 switch diagnostics to detect if the seat switch is connected
U19	Oil temperature below **10 °C**	1) Open circuit for the temperature sensor input to module 2) Faulty temperature sensor 3) Incorrect temperature sensor type set in transmission, H3, channel 7 Note: Use the H9 in the transmission module to see if the temperature sensor input is OK
U20	Handbrake is not set	1) Open circuit for the handbrake feed into the transmission module 2) Faulty handbrake switch 3) Switched 12v supply fuse blown Note: Use the H5 switch diagnostics to detect if the handbrake is connected
U21	ERPM is below 1100, increase throttle	1) Operator has not set the correct engine speed 2) Instrument cluster is not powered 3) Broken CAN Note: Use the H9 in the transmission module to see if the engine speed is being detected
U22	ERPM is above 1300, reduce throttle	1) Operator has not set the correct engine speed
U23	Shuttle lever is in neutral, shift it to forward	1) Operator has not selected forward on the shuttle lever 2) Open circuit between the shuttle lever and the transmission module 3) Switched 12v supply fuse blown Note: Use the H5 switch diagnostics to detect if the switch is connected
U26	Clutch pedal is not up, release clutch pedal	1) Operator has not released the clutch pedal 2) The clutch potentiometer / linkage is sticking or broken Note: Use the H9 in the transmission module to see if the clutch input is OK
U31	Wheel speed sensed - tractor moving	1) Handbrake not applied 2) Brakes not working Note: If the brakes are OK move the vehicle forward slightly and repeat calibration
U36	Max allowed clutch calibration value exceeded	1) Current value exceeded without lugging the engine down. Possible PWM valve faulty or a low hydraulic pressure fault
U51	Engine speed error	1) Engine speed must be between 850 and 950 rpm 2) CAN bus error
U55	PTO started	1) The PTO was started during the PTO twist sensor calibration, ensure the PTO is turned off
U58	PTO sensor open circuit	Wiring or connectors to PTO twist sensor
U59	PTO sensor short circuit to ground	Wiring or connectors to PTO twist sensor
U70	PTO twist sensor not calibrated	Calibration value was too high or too low
U75	Quick fill calibration value too high	1) Wiring problem (on clutch solenoid) 2) Clutch solenoid damaged 3) Clutch mechanical problem
U76	Quick fill calibration value too low	1) Wiring problem (on clutch solenoid) 2) Clutch solenoid damaged 3) Clutch mechanical problem

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Code	Description	Possible Failure
U77	Damper calibration value too high	1) Wiring problem 2) Sensor damaged 3) Wrong damper installation 4) Mechanical problem on driveline
U78	Damper calibration value too low	1) Wiring problem 2) Sensor damaged 3) Wrong damper installation 4) Mechanical problem on driveline
U79	PTO twist sensor not plausible	1) Sensor damaged or incorrectly installed
U91	Syncro potentiometer signal is out of range for F1 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U92	Syncro potentiometer signal is out of range for F3 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U93	F1 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch A or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline
U94	F3 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch A or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline
U95	Syncro potentiometer signal is out of range for F2 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U96	Syncro potentiometer signal is out of range for R1 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U97	F2 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch B or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline
U98	R1 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch B or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline
U99	Syncro potentiometer signal is out of range for R2 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U100	Syncro potentiometer signal is out of range for F4 position	1) Wiring problem on synchronizer solenoids or potentiometer 2) Potentiometer damaged 3) Mechanical problem on driveline
U101	R2 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch A or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline
U102	F4 did not engage properly	1) Wiring problem on synchronizer potentiometer 2) Synchronizer potentiometer damaged 3) Clutch B or dump valve problem (electrical, hydraulic or mechanical) 4) Mechanical problem on driveline

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Code	Description	Possible Failure
U103	F1/F3 wrong neutral position	1) Wiring problem 2) Potentiometer damaged 3) Mechanical problem on driveline
U104	F2/R1 wrong neutral position	1) Wiring problem 2) Potentiometer damaged 3) Mechanical problem on driveline
U105	F4/R2 wrong neutral position	1) Wiring problem 2) Potentiometer damaged 3) Mechanical problem on driveline
U107	Clutch not working	1) Wiring problem 2) Potentiometer damaged 3) Mechanical problem on driveline
U108	Damper torque not readable	1) Wiring problem 2) Sensor damaged 3) Wrong damper installation 4) Damper not calibrated
U109	Hydro not in position	1) Wiring problem (on hydro–in or hydro–out sensors) 2) Sensor damaged (hydro–in or hydro–out) 3) Low pressure on hydraulic circuit 4) Mechanical problem

Electronic Draft Control Calibration 'U' Error Codes

Code	Description	Possible Failure
Note: There are no 'U' error codes defined for the electronic draft control calibration procedure. However the following error codes may be displayed during the procedure.		
1068	Height limit control not fully clockwise	1) The height limit control is not turned fully clockwise 2) The height limit control is faulty
1070	EDC hydraulic ram size not configured	Ram size not configured on a new controller or following H8 procedure Note: Use EDC H3, channel 1 to configure

Shiftable PTO Calibration 'U' Error Codes

Code	Description	Possible Failure
U112	PTO speed select cable stalled while extending	1) Cable not connected correctly in neutral position 2) Cable jammed 3) Sensor not connected
U113	PTO speed select cable stalled while retracting	1) Cable not connected correctly in neutral position 2) Cable jammed 3) Sensor not connected
U124	PTO speed select switch in optional speed position	1) Speed select switch is in the wrong position – selector switch set to 1000 or N position instead of optional speed position 2) Selector switch wiring incorrect 3) Speed selector switch faulty
U125	Incorrect optional speed calculation	1) PTO speed RPM inaccurate 2) PTO speed select cable not set up correctly
U126	No movement from position sensor	1) -

Front Suspension Calibration 'U' Error Codes

Code	Description	Possible Failure
U01	Front axle potentiometer open circuit – ACP will not work	1) Check the wiring harness 2) Check the displayed potentiometer reading during calibration. If less than 10 then replace the potentiometer
U02	Front axle potentiometer threshold is higher than set limit	1) Check the potentiometer installation 2) Check the displayed potentiometer reading during calibration. If greater than 972 then change the potentiometer 3) Check the wiring harness

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Code	Description	Possible Failure
U03	Front axle potentiometer short circuit – ACP will not work	1) Check the wiring harness 2) Check if signal ground on potentiometer is open circuit 3) Change the potentiometer
U04	Front axle potentiometer threshold is lower than set limit	1) Change the potentiometer
U05	Suspension is not reaching its minimum / maximum position during ACP procedure	1) Check the range of the potentiometer, calibration will not work if the range of the potentiometer is less than 150 2) Check the suspension mechanics 3) Check the potentiometer linkage
U07	Suspension is stationary during the raise command in the ACP procedure	1) Check the raise solenoid harness 2) Check the suspension mechanics 3) Check the potentiometer linkage 4) Check the pressure of the accumulators 5) Check the hydraulic pressure 6) Disconnect implement
U08	Suspension unable to reach maximum height within 20 seconds	1) Check the raise valve installation 2) Check the unload solenoid installation 3) Check the suspension mechanics 4) Check the hydraulic pressure 5) Disconnect implement
U09	Suspension is stationary during the lowering command in the ACP procedure	1) Check the unload solenoid harness 2) Check the suspension mechanics 3) Check the potentiometer linkage 4) Check the hydraulic pressure 5) Disconnect implement
U10	Suspension unable to reach minimum height within 25 seconds	1) Check unload solenoid installation 2) Check the hydraulic pressure 3) Disconnect implement
U11	Unable to calibrate suspension	1) The lockout switch was pressed more than 3 times to initiate calibration 2) Check the suspension mechanics 3) Check the hydraulic pressure
U12	ACP stopped, vehicle not stationary	1) Handbrake not applied 2) Rear axle speed sensor faulty
U13	Valve 30 (upper lockout) solenoid open circuit	1) Check the wiring harness
U14	Valve 31 (lower lockout) solenoid open circuit	1) Check the wiring harness
U15	Valve 30 (upper lockout) and Valve 31 (lower lockout) solenoid connectors swapped	1) Check the wiring harness
U16	Valve 30 (upper lockout) and Valve 31 (lower lockout) current sense inputs swapped	1) Check the wiring harness
U17	Front suspension pressure switch open circuit	1) Check the wiring harness
U18	Front suspension pressure switch short circuit	1) Check the wiring harness

Rear Electronic Hydraulic Remote Valves Calibration 'U' Error Codes

Code	Description	Possible Failure
U61	Lever No.1 not in neutral	–
U62	Lever No.2 not in neutral	–
U63	Lever No.3 not in neutral	–
U64	Lever No.4 not in neutral	–

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Front Hitch Calibration 'U' Error Codes

Code	Description	Possible Failure
U110	Position potentiometer value too low or the hitch is not raised	Hitch was not raised before height limit control was changed from ON to OFF position

Steering Calibration 'U' Error Codes

Code	Description	Possible Failure
U19	Oil temperature below **5 °C**	1) Open circuit for the temperature sensor input to the transmission module 2) Faulty temperature sensor Note: Use the H9 menu in the transmission module to see if the temperature sensor input is okay
U21	ERPM is below 1300, increase throttle	1) Operator has not set the correct engine speed 2) Open circuit for the engine speed sensor going to the cluster – mechanical engines only 3) Instrument cluster is not powered 4) Broken CAN bus Note: Use the HE menu to see if the engine speed is being detected
U71	Calibration attempted while enable switch is off	1) The enable switch is in the off position 2) The enable switch is in the on position at start up but needs to be cycled through off then on to enable the system
U72	Proximity sensor input is out of range – open	1) Incorrect position of steering wheel 2) Faulty proximity sensor 3) Check the proximity sensor connection
U73	Proximity sensor input is out of range – closed	1) Incorrect position of steering wheel 2) Faulty proximity sensor 3) Check the proximity sensor connection
U74	LVDT calibration has been unsuccessful (out of range after 4th attempt)	1) Faulty LVDT sensor 2) Faulty steering hydraulic valve 3) Incorrect assembly of hydraulic valve 4) Check the LVDT sensor connection

EPL Calibration 'U' Error Codes

Code	Description	Possible Failure
U114	Hand brake applied	1) Blue cable (on the handbrake switch connector) cut off 2) Mismatch between the handbrake switch status hardwired to the EPL and the VCU_HB_SWITCH parameter in the VCU2EPL CAN message
U115	Shuttle lever not in the park position	1) Pins A4 or C7 of the EPL module short to ground 2) Pins A4 or C7 of the EPL module cut off 3) Pins A4 or C7 of the EPL module short to supply voltage 4) Shuttle lever damaged
U116	APP position too high	1) Wrong mechanical adjustment of the EPL transmission lever 2) Possible wear in the braking pads
U117	APP position too low	1) Stiffness of the system is too high – possible mechanical interferences 2) Wrong mechanical installation of the EPL
U118	Error codes active preventing completion of initialization procedure	1) High recovery level error code is being activated
U119	Bowden cable not connected	1) Bowden cable not connected
U120	Inclinometer self test failed	1) Inclinometer broken
U121	Inclinometer calibration procedure not OK	–
U122	Inclinometer offset out of range	1) Check the inclinometer installation 2) Vehicle not on flat ground 3) Remove any rear attachment 4) Incorrect wheels could be installed

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Code	Description	Possible Failure
U123	Vehicle moving	1) Vehicle not stationary 2) Vehicle speed sensor failed

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10001	Upper Lockout Solenoid Error	
10002	Raise Solenoid Error	
10003	Lower Solenoid Error	
10004	Front Axle Position Sensor Threshold Higher Than Set Limit	
10005	Front Axle Position Sensor Threshold Lower Than Set Limit	
10008	Go Down Error - Suspension Unable to Return to Set Point	
10009	Lower Lockout Solenoid Error	
10010	Chassis Accelerometer - Voltage too Low (Short to Ground or Open Circuit)	
10011	Chassis Accelerometer - Voltage Too High (Short Circuit to 5V)	
10024	Front Suspension Not Calibrated	
1002	Radar Disconnected	
1003	Speed Sensor Error	
1004	Wheel Speed Sensor Signal Too High	
1008	Raise / Work Switch Failure (Command Arm)	
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1014	Right Hand Load Sensing Pin Signal Too Low	
1015	Right Hand Load Sensing Pin Signal Too High	
1016	Left Hand Load Sensing Pin Signal Too Low	
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1018	Both Load Sensing Pins Disconnected	
1019	Load Sensing Pin 8V Reference Voltage Too Low	
1020	Load Sensing Pin 8V Reference Voltage Too High	
1024	Perform The Hydraulic Lift Calibration	
1027	Lift Arm Position Sensing Control Voltage Too Low	
1028	Lift Arm Position Sensing Control Voltage Too High	
1029	Hydraulic Control Valve Disconnected	
1030	Signal Ground Open Circuit	
1031	Chassis Harness Disconnected	
1049	Hydro In Sensor Open Circuit Or Short Circuit To Ground	
1053	5 Volt Reference Short to +12V	
1054	5 Volt Reference Short To Ground	
1059	8 Volt Reference Error (Draft Load Pins)	
1063	EDC Hydraulic Valve Lower Solenoid Open Circuit	
1064	EDC Hydraulic Valve Raise Solenoid Open Circuit	

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Reference	Description	Controller
1065	EDC Hydraulic Valve Lower Solenoid Short Circuit	
1066	EDC Hydraulic Valve Raise Solenoid Short Circuit	
1067	Hydraulic Valve Supply Voltage Voltage Too Low	
1068	Height Limit Control Not Set To Maximum During Calibration	
1070	Hydraulic Ram Configuration Not Set	
12011	Power Stage - Overvoltage Protection	
12012	Power Stage - PH_A Open Circuit Or PH_B Open Circuit, Motor Open	
12013	Power Stage - PH_A Or PH_B Short To Ground	
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12017	Power Stage - Internal Service Voltage (Vr) Not Viable	
12018	Power Stage - Current Over Absolute Range / Motor Short	
12019	Power Stage - Current Over Dynamic Set Point	
12020	Power Stage - Unexpected Current	
12024	Ignition Key - Key Hardware Vs CAN Signals Coherence Check	
12032	Encoder - Hardware Fault On Power Supply	
12033	Encoder Virtual Peripheral Failure (XGATE) Wrong Sequence, Interrupt	
12034	Encoder Function Not Available (A Or B Signal Not Available)	
12043	Inclinometer - Self Test	
12052	Battery Lower Than 9V	
12053	Battery - Higher Than 16V	
12054	Battery - Out Of Range / Spike Diagnosis	
12066	Trailer Relay - Open Wire / Load And Output Short To Vbatt	
12068	Trailer Relay - Output Short To Ground	
12073	Output Status - Output Incongruence Vs Input (DIO And Frequency) & Protection	
12132	CAN - Bus OFF	
12133	CAN - Mute	
12142	CAN - VCU_TRAIL_BRAKE_INH Error / Not Available	
12143	CAN - VCU_VEH_DIRECTION Error / Not Available	
12144	CAN - VEH_SPEED Error / Not Available	
12145	CAN - VCU_CMD Error / Not Available	
12146	CAN- VCU_KEY_OFF_AA_INH Error / Not Available	
12147	CAN - ENGINE _RPM Error / Not Available	
12148	CAN - VCU_KEY Error / Not Available	

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Reference	Description	Controller
12150	CAN - VCU_HB_SWITCH Error / Not Available	
12151	Logic Core - Second Microprocessor Not Present	
12160	Logic Core - EEPROM Check	
12162	ACU Temperature - Out Of Range / Spike Diagnosis	
12163	ACU Temperature - Power Stage Over Temperature	
12172	Actuator - Cable Disconnection	
12183	Actuator Moving Without Command	
12184	Actuator Endstop Zone Reached	
12185	Actuator - Actuation Timeout (Energy) Expired	
12188	Actuator - Excess Pad Wear	
12192	Shuttle Park Invalid Status	
12202	Hand Brake Switch Incongruence	
12212	Factory - Accelerometer Not Calibrated	
12213	Factory - Actuator Not Initialised	
12214	Factory - Disable Actuation	
12215	Factory - Trailer Relay Present, But Not Configured	
14013	Steering Angle Sensor - Short Circuit to VCC	
14014	Steering Angle Sensor - Short Circuit to Ground or Open Circuit	
14015	5V Supply Voltage - Too High	
14016	5V Supply Voltage - Too Low	
14021	Cranking Line - Shorted to +12V	
14022	Cranking Line - Shorted to Ground	
14051	Fuel Level Sensor Open Circuit Or Short To High Voltage	
14052	Fuel Level Sensor Short To Ground	
14061	Air Brake Pressure Sensor - Short Circuit to VCC or Option Set But Sensor Not Connected	
14095	Vane Pump Pressure Transducer - Short Circuit To Ground	
14096	Vane Pump Pressure Transducer - Short Circuit To VCC Or Open Circuit	
14100	Air Brake Option Needs To Be Set	
14102	SWCD - Present But Not Configured	
14104	Electronic Front Hitch Present But Not Configured	
14105	Electronic Park Lock (EPL) Present But Not Configured	
14106	Steering Sensor Present But Not Configured	
14300	Electronic Park Lock - Mismatch Between CAN and Direct Frequency Input Info	
14301	Electronic Park Lock - Direct Frequency Input Shorted To VCC Or Open Circuit	
14304	Electronic Park Lock - Status Not Validated	

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Reference	Description	Controller
14900	Transmission Controller Missing (RE/RN)	
14901	Engine Controller Missing (EDC16)	
14902	Auxiliary Controller Missing (RW/RN)	
14904	Armrest Controller Missing (LC)	
14905	Keypad Missing (JA)	
14906	Steering Controller Missing (KA)	
14908	TECU Missing (OA)	
14909	SWCD Missing (VA)	
14910	Climate Controller Missing	
14914	Electronic Park Lock (EPL) Controller Missing	
14920	Configuration Error	
15002	Steering Wheel Control Proximity Sensor Open Circuit.	
15003	Steering Wheel Control Proximity Sensor - Short Circuit	
15006	Split Valve LVDT - Open Circuit	
15007	Split Valve LVDT - Short Circuit	
15008	Change Valve Solenoid - Open Circuit	
15009	Change Valve Solenoid - Short Circuit Across	
15010	Safety Switch Fail	
15011	Maximum Engagement Time Elapsed (5 Minutes)	
15012	Split Valve Spool - Stuck Open	
15013	Change Valve Or Split Valve Spools - Stuck Closed	
15014	Split Valve Spool Stuck in Transition Zone - Unable to Identify Steering Mode	
15024	System Not Calibrated	
16111	Cab Sensor Open Or Shorted To Power	
16112	Cab Sensor Shorted To Ground	
16113	Outlet Sensor Open Or Shorted To Power	
16114	Outlet Sensor Open Or Shorted To Ground	
16115	Evaporator Sensor Open Or Shorted To Power	
16116	Evaporator Sensor Shorted To Ground	
16117	Outside Air Sensor Open Or Shorted To Power	
16118	Outside Air Sensor Shorted To Ground	
16120	Blower Speed Select Potentiometer Open Or Shorted To Power	
16121	Temperature Select Potentiometer Open Or Shorted To Power	
16122	Mode Select Potentiometer Open Or Shorted To Power	
16125	High Pressure Switch (+) Input Shorted To Power	
16126	High Pressure Switch (+) Input Shorted To Ground	

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Reference	Description	Controller
16127	High Pressure Switch (-) Input Shorted To Power	
16128	High Pressure Switch (-) Input Shorted To Ground	
16129	High Pressure Cycling Error (2 in 1 Minute)	
16130	Low Pressure Switch (+) Input Shorted To Power	
16131	Low Pressure Switch (+) Input Shorted To Ground	
16132	Low Pressure Switch (-) Input Shorted To Power	
16133	Low Pressure Switch (-) Input Shorted To Ground	
16134	Low Pressure Switch Open For Greater Than 1 Minute	
18001	Hand Throttle Number 1 - Voltage Too Low	
18002	Hand Throttle Number 1 - Voltage Too High	
18003	Hand Throttle Number 2 - Voltage Too Low	
18004	Hand Throttle Number 2 - Voltage Too High	
18007	Multi-function Handle - Switch Error	
18008	Multi-function Handle - Voltage Too Low	
18009	Multi-function Handle - Voltage Too High	
18010	Powershift Throttle - Voltage Too Low	
18011	Powershift Throttle - Voltage Too High	
18012	CVT Mode Switch Error	
18013	Multi-function Handle - Encoder Position Error	
18014	Rear Hitch Position Control Potentiometer - Voltage Too Low	
18015	Rear Hitch Position Control Potentiometer - Voltage Too High	
18016	Rear Hitch Draft Control Potentiometer - Voltage Too Low	
18017	Rear Hitch Draft Control Potentiometer - Voltage Too High	
18018	Rear Hitch Height Limit Potentiometer - Voltage Too Low	
18019	Rear Hitch Height Limit Potentiometer - Voltage Too High	
18020	Rear Hitch Drop Rate Potentiometer - Voltage Too Low	
18021	Rear Hitch Drop Rate Potentiometer - Voltage Too High	
18022	Rear Hitch Sensitivity Control Potentiometer - Voltage Too Low	
18023	Rear Hitch Sensitivity Control Potentiometer - Voltage Too High	
18024	EHR Flow Encoder Position Error	
18025	Rear Hitch Slip Control Potentiometer - Voltage Too Low	

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Reference	Description	Controller
18026	Rear Hitch Slip Control Potentiometer - Voltage Too High	
18027	EHR 5 Lever Position - Voltage Too Low	
18028	EHR 5 Lever Position - Voltage Too High	
18029	EHR 6 Lever Position - Voltage Too Low	
18030	EHR 6 Lever Position - Voltage Too High	
18031	Front Hitch Position / Pressure Control Potentiometer - Voltage Too High	
18032	Front Hitch Position / Pressure Control Potentiometer - Voltage Too Low	
18033	Front Hitch Position / Pressure Mix Potentiometer - Voltage Too High	
18034	Front Hitch Position / Pressure Mix Potentiometer - Voltage Too Low	
18035	Front Hitch Position Height Limit Potentiometer - Voltage Too High	
18036	Front Hitch Height Limit Potentiometer - Voltage Too Low	
18037	Front Hitch Height Limit Enable Switch Error	
18038	Front Hitch Position Drop Rate Potentiometer - Voltage Too High	
18039	Front Hitch Position Drop Rate Potentiometer - Voltage Too Low	
18040	EHR 1 Lever Position - Voltage Too Low	
18041	EHR 1 Lever Position - Voltage Too High	
18042	EHR 2 Lever Position - Voltage Too Low	
18043	EHR 2 Lever Position - Voltage Too High	
18044	EHR 3 Lever Position - Voltage Too Low	
18045	EHR 3 Lever Position - Voltage Too High	
18046	EHR Float Control Switch Error	
18047	EHR 4 Lever Position - Voltage Too Low	
18048	EHR 4 Lever Position - Voltage Too High	
18049	Joystick 1 X-Axis Position - Voltage Too Low	
18050	Joystick 1 X-Axis Position - Voltage Too High	
18051	Joystick 1 Y-Axis Position - Voltage Too Low	
18052	Joystick 1 Y-Axis Position - Voltage Too High	
18053	Joystick 1 Proportional Rocker Switch - Voltage Too Low	

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Reference	Description	Controller
18054	Joystick Proportional Rocker Switch - Voltage Too High	
18055	Joystick 2 X-Axis Position - Voltage Too Low	
18056	Joystick 2 X-Axis Position - Voltage Too High	
18057	Joystick 2 Y-Axis Position - Voltage Too Low	
18058	Joystick 2 Y-Axis Position - Voltage Too High	
18059	Joystick 2 Proportional Rocker Switch - Voltage Too Low	
18060	Joystick 2 Proportional Rocker Switch - Voltage Too High	
18061	Reference Voltage - Short Circuit To Ground	
18062	Reference Voltage - Short Circuit To 12V	
18063	EEEPROM Error	
18064	Multi-function Handle Communication Error	
18065	Multi-function Handle Basic Assurance Test Error	
18066	EHR 1 Lever Implausibility Error	
18067	EHR 2 Lever Implausibility Error	
18068	EHR 3 Lever Implausibility Error	
18069	EHR 4 Lever Implausibility Error	
2007	Low Power 5V Reference - Voltage Too Low	
2008	Low Power 5V Reference - Voltage Too High	
2009	Seat Switch Input - Voltage Too Low	
2010	Seat Switch Input - Voltage Too High	
2011	Clutch Pedal Potentiometer - Voltage Too Low	
2012	Clutch Pedal Potentiometer - Voltage Too High	
2021	Transmission Harness Disconnected	
2024	All Clutches Not Calibrated	
2025	Synchronizers Not Calibrated	
2026	Engine Speed Too High	
2027	Engine Speed Too Low / No Signal	
2035	Dump Solenoid - Short To 12V	
2036	Dump Solenoid - Short To Ground Or Open Circuit	
2037	Clutch Pedal Disconnect Switch - Open Circuit	
2046	Fuse Sense Input - Open Circuit	
2047	Clutch Pedal Disconnect Switch Set Too High	
2048	Clutch Pedal Disconnect Switch Set Too Low	
2049	Wheel Speed (Transmission Output Speed) Sensor - Short To Ground Or Open Circuit	
2050	Wheel Speed (Transmission Output Speed) Sensor - Short To 12V	

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Reference	Description	Controller
2051	Oil Temperature Sensor Open Circuit	
2052	Oil Temperature Sensor - Short Circuit	
2053	5 Volt Reference Voltage Too High	
2054	5 Volt Reference Voltage Too Low	
2055	Wheel Speed (Transmission Output Speed) Sensor - No Signal	
2059	Shuttle Lever Switch Disagreement	
2070	Shuttle Lever Forward Switch Voltage Too High	
2071	Shuttle Lever Forward Switch Voltage Too Low	
2072	Shuttle Lever Reverse Switch Voltage Too High	
2073	Shuttle Lever Reverse Switch Voltage Too Low	
2075	Flywheel Speed Sensor Signal Error	
2076	Flywheel Speed Sensor Open Circuit	
2077	Flywheel Speed Sensor - Short Circuit	
2079	Flywheel Speed Sensor - No Signal	
2124	Flywheel Speed Sensor Not Calibrated	
2303	Damper Calibration - Low Error	
2304	Damper Calibration - High Error	
2331	Clutch Slipping fault	
2342	Clutch A Solenoid - Open Circuit Or Short Circuit To Ground	
2343	Clutch B Solenoid - Open Circuit Or Short Circuit To Ground	
2352	Clutch A Solenoid - Voltage Too High	
2353	Clutch B Solenoid - Voltage Too High	
2362	Clutch A Not Calibrated	
2363	Clutch B Not Calibrated	
2380	Parklock - Unable To Reach Desired Position	
2381	Parklock - Bus Off	
2382	Parklock - Bus Integrity Error	
2501	Oil Pressure Sensor - Open Circuit Or Short Circuit To Ground	
2502	Oil Pressure Sensor - Short Circuit To +5V	
2503	Clutch A Solenoid - In Use An Open Circuit Or Short Circuit To Ground	
2504	Clutch B Solenoid - In Use An Open Circuit Or Short Circuit To Ground	
2505	Clutch A Pressure Not Plausible	
2506	Clutch B Pressure Not Plausible	
2507	F1/F3 Synchro Potentiometer - Signal Too High	
2508	F1/F3 Synchro Potentiometer - Signal Too Low	
2509	Synchro Not Moving Towards F1	
2510	Synchro Not Moving Towards F3	
2511	F1 Solenoid Open Circuit Or Short Circuit To Ground	

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Reference	Description	Controller
2512	F3 Solenoid Open Circuit Or Short Circuit To Ground	
2513	F1 Solenoid Circuit Fault	
2514	F3 Solenoid Circuit Fault	
2517	F2/R1 Synchro Potentiometer - Signal Too High	
2519	Synchro Not Moving Towards F2	
2520	Synchro Not Moving Towards R1	
2521	F2 Solenoid Open Circuit Or Short Circuit To Ground	
2522	R1 Solenoid Open Circuit Or Short Circuit To Ground	
2523	F2 Solenoid Circuit Fault	
2524	R1 Solenoid Circuit Fault	
2527	F4/R2 Synchro Potentiometer - Signal Too High	
2528	F4/R2 Synchro Potentiometer - Signal Too Low	
2529	Synchro Not Moving Towards F4	
2530	Synchro Not Moving Towards R2	
2531	F4 Solenoid Open Circuit Or Short Circuit To Ground	
2532	R2 Solenoid Open Circuit Or Short Circuit To Ground	
2533	F4 Solenoid Circuit Fault	
2534	R2 Solenoid Circuit Fault	
2536	Hydro In Sensor - Open Circuit Or Short Circuit To Ground	
2537	Hydro In Sensor - Short To 12V	
2538	Ring Speed Sensor - Short To Ground Or Open Circuit	
2539	Ring Speed Sensor - Short To 12V	
2540	A Clutch Pressure Transducer - Open Circuit Or Short To Ground	
2541	B Clutch Pressure Transducer - Open Circuit Or Short To Ground	
2542	A Clutch Pressure Transducer - Short Circuit To 5V	
2543	B Clutch Pressure Transducer - Short Circuit To 5V	
2544	Ring Speed Sensor Critical Air Gap	
2545	ORPM Sensor Critical Air Gap	
2546	No Signal From Hydro In Sensor	
2547	No Signal From Ring Sensor	
2548	Brake Pressure Transducer - Open Circuit Or Short To Ground	
2549	Brake Pressure Transducer - Short To 5V	
2552	Transmission Oil Pressure Too High	
2553	Transmission Oil Pressure Too Low	
2557	Hydro 1 Solenoid - Open Circuit Or Short Circuit To Ground	
2558	Hydro 1 Solenoid - Short Circuit To 12V	
2559	ORPM And Ring Fault	
3001	Foot Throttle Sensor - Signal Not Plausible	

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Reference	Description	Controller
3002	Foot Throttle Sensor - Signal Above Range Maximum	
3003	Foot Throttle Sensor - Signal Below Range Minimum	
3010	Air Intake Temperature Sensor - Signal Above Range Maximum	
3011	Air Intake Temperature Sensor - Signal Below Range Minimum	
3028	Oil Pressure Too Low	
3038	Constant Engine RPM Activate/Select Switch - Short Circuit to Battery	
3047	Main Relay Failure - Short Circuit To Battery	
3048	Main Relay Failure - Short Circuit to Ground	
3088	Crankshaft Sensor - No Signal	
3090	Camshaft Sensor - No Signal	
3091	Camshaft Sensor - Invalid Signal	
3096	CAN A LINE NO SIGNAL	
3107	Fuel Metering Unit - Short Circuit To Battery	
3108	Fuel Metering Unit - Short Circuit To Ground	
3111	Rail Pressure Sensor Monitoring - Signal Above Range Maximum	
3120	PTO Twist Sensor - Not Plausible	
3121	PTO Twist Sensor - Open Circuit	
3122	PTO Twist Sensor - Short Circuit To Ground	
3123	PTO Twist Sensor - Not Calibrated	
3124	Hand Throttle - Signal Above Range Maximum	
3125	Hand Throttle - Channel 2 Signal Below Range Minimum	
3126	Hand Throttle - Channel 1 Signal Above Range Maximum	
3127	Hand Throttle - Channel 1 Signal Below Range Minimum	
3128	Hand Throttle - Channel Difference Error	
3129	Hand Throttle - Idle Switch Closed Circuit	
3130	Hand Throttle - Idle Switch Open Circuit	
3138	Metering Unit - Temperature Too High	
3141	Fuel Flow Setpoint Too Low	
3142	High Pressure Test - Test Active	
3145	Terminal 15 - No Signal	
3148	Coolant Temperature Sensor Dynamic Test - Failure	
3157	ECM Not Detected On CAN Bus	
3158	Invalid ECM Checksum	
3159	Invalid Engine Reference Torque	
3160	Fan Actuator - Short Circuit to Battery	
3162	Fan Actuator - Open Load	
3163	Fan Actuator - No Load	

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Reference	Description	Controller
3176	Setpoint Of Metering Unit Not Plausible In Overrun	
3177	Engine Overspeed Detected	
3182	Timeout Of CAN Message RxCCVS	
3185	Timeout Of CAN Message TF	
3238	Engine Controller Internal SPI Communication Error	
3239	Engine Controller EEPROM - Read Operation Error	
3240	Engine Controller EEPROM - Write Operation Failure	
3241	Engine Controller EEPROM - Default Value Used	
3249	TPU Monitoring - Time Deviation Between TPU And System Not Plausible	
3250	Dataset - Variant Defect	
3251	Dataset - Requested Variant Could Not Be Set	
3252	Controller Watchdog - SPI Comunication Failure	
3263	CAN C Line No Signal	
3265	Overrun Monitoring	
3266	Redundant Engine Speed in Overrun Monitoring	
3297	Rail Pressure Positive Deviation High And High Fuel Flow Setpoint Value	
3301	Rail Pressure Negative Deviation Too High On Minimum Metering	
3305	Rail Pressure Below Minimum Limit In Controller Mode	
3309	Rail Pressure Above Maximum Limit In Controlled Mode	
3313	Rail Pressure Drop Rate Too High	
3316	Minimum Number Of Injections Not Reached - Stop Engine	
3334	Timeout Of CAN Message TCS1-PE Torque - When Active	
3335	Timeout Of CAN Message TSC1-PE Torque - When Inactive	
3338	Timeout Of CAN Message TSC1-VE Speed - When Inactive	
3339	Timeout Of CAN Message TSC1-VE Speed - When Active	
3345	Total Throttle Failure	
3367	Coolant Temperature Test Failure	
3368	Torque Limitation Due To OBD Performance Limiter By Legislation	
3369	Torque Reduction Due To Smoke Reduction	
3370	Torque Limitation Due To Engine Protection (Against Excessive Torque, Engine Overspeed And Overheat)	
3375	Constant Engine RPM Increase / Decrease Switch - Open Circuit	
3999	Unknown ECM SPN Error Code	

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Reference	Description	Controller
4100	Rear Remote No.1 No Control Message Received	
4101	Rear Remote No.1 Control Message Not Plausible	
4102	Rear Remote No.1 EEPROM Error	
4103	Rear Remote No.1 Switched To Failsafe	
4104	Rear Remote No.1 Under Voltage	
4105	Rear Remote No.1 Over Voltage	
4107	Rear Remote No.1 Spool Movement Too High	
4107	Rear Remote No.1 Spool Movement Too High	
4108	Rear Remote No.1 Float Position Not Reached	
4109	Rear Remote No.1 Manually Operated	
4110	Rear Remote No.1 Driver Faulty	
4111	Rear Remote No.1 Potentiometer Faulty	
4112	Rear Remote No.1 Unable To Reach Neutral	
4113	Rear Remote No.1 Spool Not In Neutral At Key On	
4114	Rear Remote No.2 No Control Message Received	
4115	Rear Remote No.2 Control Message Not Plausible	
4116	Rear Remote No.2 EEPROM Error	
4117	Rear Remote No.2 Switched To Failsafe	
4118	Rear Remote No.2 Under Voltage	
4119	Rear Remote No.2 Over Voltage	
4120	Rear Remote No.2 Spool Movement Too Low	
4121	Rear Remote No.2 Spool Movement Too High	
4122	Rear Remote No.2 Float Position Not Reached	
4123	Rear Remote No.2 Manually Operated	
4124	Rear Remote No.2 Driver Faulty	
4125	Rear Remote No.2 Potentiometer Faulty	
4126	Rear Remote No.2 Unable To Reach Neutral	
4127	Rear Remote No.2 Spool Not In Neutral At Key On.	
4128	Rear Remote No.3 No Control Message Received	
4129	Rear Remote No.3 Control Message Not Plausible	
4130	Rear Remote No.3 EEPROM Error	
4131	Rear Remote No.3 Switched To Failsafe	
4132	Rear Remote No.3 Under Voltage	
4133	Rear Remote No.3 Over Voltage	

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Reference	Description	Controller
4134	Rear Remote No.3 Spool Movement Too Low	
4135	Rear Remote No.3 Spool Movement Too High	
4136	Rear Remote No.3 Float Position Not Reached	
4137	Rear Remote No.3 Manually Operated	
4138	Rear Remote No.3 Driver Faulty	
4139	Rear Remote No.3 Potentiometer Faulty	
4140	Rear Remote No.3 Unable To Reach Neutral	
4141	Rear Remote No.3 Spool Not In Neutral At Key On	
4142	Rear Remote No.4 No Control Message Received	
4143	Rear Remote No.4 Control Message Not Plausible	
4144	Rear Remote No.4 EEPROM Error	
4145	Rear Remote No.4 Switched To Failsafe	
4146	Rear Remote No.4 Under Voltage	
4147	Rear Remote No.4 Over Voltage	
4148	Rear Remote No.4 Spool Movement Too Low	
4149	Rear Remote No.4 Spool Movement Too High	
4150	Rear Remote No.4 Float Position Not Reached	
4151	Rear Remote No.4 Manually Operated	
4152	Rear Remote No.4 Driver Faulty	
4153	Rear Remote No.4 Potentiometer Faulty	
4154	Rear Remote No.4 Unable To Reach Neutral	
4155	Rear Remote No.4 Spool Not In Neutral At Key On	
4156	Rear Remote No.5 No Control Message received	
4157	Rear Remote No.5 Control Message Not Plausible	
4158	Rear Remote No.5 EEPROM Error	
4159	Rear Remote No.5 Switched To Failsafe	
4160	Rear Remote No.5 Under Voltage	
4161	Rear Remote No.5 Over Voltage	
4162	Rear Remote No.5 Spool Movement Too Low	
4163	Rear Remote No.5 Spool Movement Too High	
4164	Rear Remote No.5 Float Position Not Reached	
4165	Rear Remote No.5 Manually Operated	
4166	Rear Remote No.5 Driver Faulty	

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Reference	Description	Controller
4167	Rear Remote No.5 Potentiometer Faulty	
4168	Rear Remote No.5 Unable To Reach Neutral	
4169	Rear Remote No.5 Spool Not In Neutral At Key On	
4170	Rear EHR Control No.1 Not Calibrated	
4173	Rear EHR Control No.2 Not Calibrated	
4177	Rear EHR Control No.3 Not Calibrated	
4180	Rear EHR Control No.4 Not Calibrated	
4190	Rear Remote No.1 No Communications	
4191	Rear Remote No.2 No Communications	
4192	Rear Remote No.3 No Communications	
4193	Rear Remote No.4 No Communications	
4198	Rear Remote No.5 No Communications	
4216	Rear Remote No.1 - Spool Not Calibrated	
4217	Rear Remote No.2 - Spool Not Calibrated	
4218	Rear Remote No.3 - Spool Not Calibrated	
4219	Rear Remote No.4 - Spool Not Calibrated	
4220	Rear Remote No.5 - Spool Not Calibrated	
4500	Front Remote No.1 - No Control Message Received	
4501	Front Remote No.1 Control Message Not Plausible	
4502	Front Remote No.1 EEPROM Error	
4503	Front Remote No.1 Switched To Failsafe	
4504	Front Remote No.1 Under Voltage	
4505	Front Remote No.1 Over Voltage	
4506	Front Remote No.1 Spool Movement Too Low	
4507	Front Remote No.1 Spool Movement Too High	
4508	Front Remote No.1 Float Position Not Reached	
4509	Front Remote No.1 Manually Operated	
4510	Front Remote No.1 Driver Faulty	
4511	Front Remote No.1 Potentiometer Faulty	
4512	Front Remote No.1 Unable To Reach Neutral	
4513	Front Remote No.1 Spool Not In Neutral At Key On	

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Reference	Description	Controller
4514	Front Remote No.2 No Control Message Received	
4515	Front Remote no.2 Control Message Not Plausible	
4516	Front Remote No.2 EEPROM Error	
4517	Front Remote No.2 Switched To Failsafe	
4518	Front Remote No.2 Under Voltage	
4519	Front Remote No.2 Over Voltage	
4520	Front Remote No.2 Spool Movement Too Low	
4521	Front Remote No.2 Spool Movement Too High	
4522	Front Remote No.2 Float Position Not Reached	
4523	Front Remote No.2 Manually Operated	
4524	Front Remote No.2 Driver Faulty	
4525	Front Remote No.2 Potentiometer Faulty	
4526	Front Remote No.2 Unable To Reach Neutral	
4527	Front Remote No.2 Spool Not In Neutral At Key On	
4528	Front Remote No.3 No Control Message Received	
4529	Front Remote No.3 Control Message Not Plausible	
4530	Front Remote No.3 EEPROM Error	
4531	Front Remote No.3 Switched To Failsafe	
4532	Front Remote No.3 Under Voltage	
4533	Front Remote No.3 Over Voltage	
4534	Front Remote No.3 Spool Movement Too Low	
4535	Front Remote No.3 Spool Movement Too High	
4536	Front Remote No.3 Float Position Not Reached	
4537	Front Remote No.3 Manually Operated	
4538	Front Remote No.3 Driver Faulty	
4539	Front Remote No.3 Potentiometer Faulty	
4540	Front Remote No.3 Unable To Reach Neutral	
4541	Front Remote No.3 Spool Not In Neutral At Key On	
4542	Front Remote No.4 No Control Message Received	
4543	Front Remote No.4 Control Message Not Plausible	
4544	Front Remote No.4 EEPROM Error	
4545	Front Remote No.4 Switched To Failsafe	
4546	Front Remote No.4 Under Voltage	
4547	Front Remote No.4 Over Voltage	

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Reference	Description	Controller
4548	Front Remote No.4 Spool Movement Too Low	
4549	Front Remote No.4 Spool Movement Too High	
4550	Front Remote No.4 Float Position Not Reached	
4551	Front Remote No.4 Manually Operated	
4552	Front Remote No.4 Driver Faulty	
4553	Front Remote No.4 Potentiometer Faulty	
4554	Front Remote No.4 Unable To Reach Neutral	
4555	Front Remote No.4 Spool Not In Neutral At Key On	
4560	Front RemoteNo.1 No Communications	
4561	Front Remote No.2 No Communications	
4562	Front Remote No.3 No Communications	
4563	Front Remote No.4 No Communications	
4565	High Flow Pump Connection Error	
4566	High Flow Pump Configuration Error	
5003	Rear PTO Brake Solenoid Output Open Circuit	
5005	Rear PTO Brake Switch Open Circuit	
5007	Rear PTO Solenoid Stuck Off	
5008	Rear PTO Solenoid - Open Circuit	
5010	PTO Shift Motor - Open Circuit	
5011	PTO Shift Motor - Short Circuit	
5012	PTO Shift - Sensor Error	
5013	PTO Shift Switch - Open Circuit	
5014	PTO Shift Switch - Short Circuit	
5027	Rear PTO Speed Sensor - Open Circuit	
5033	Rear PTO Cab Normally Closed Switch Open Circuit	
5034	Rear PTO Fender Switch Open Circuit / Short To Ground	
5035	Rear PTO Fender Switch Input Short To 12V+	
5037	Rear PTO Cab Normally Open Switch - Stuck Closed	
5042	PTO Management Switch - Stuck Closed	
5043	Rear PTO Fender Switch Stuck On	
5044	Rear PTO Speed Sensor - Short To Ground	
5098	Rear PTO Fender Switch Option Not Enabled	
6023	Four Wheel Drive Solenoid Open Circuit	
7017	Differential Lock Solenoid - Open Circuit	
7024	Steering Angle Sensor Not Calibrated	

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Reference	Description	Controller
7032	Steering Angle Sensor - Signal Too Low	
8007	Front PTO Solenoid - Stuck On	
8008	Front PTO Solenoid - Open Circuit	
8033	Front PTO Switch In Cab Normally Closed Open Circuit	
8037	Front PTO Cab Normally Open Switch Stuck Closed	
8099	Front PTO Option Not Enabled	
9001	Front Hitch Position Sensor - Short Circuit To 12V	
9002	Front Hitch Position Sensor - Open Circuit Or Short To Ground	
9003	Front Hitch Fender Up Switch Error	
9004	Front Hitch Fender Down Switch Error	
9005	Front Hitch Fender Common Switch Error	
9006	Front Hitch Position Potentiometer - Not Calibrated	
3006	Coolant Temperature Sensor - Signal Not Plausible	EDC
3007	Coolant Temperature Sensor - Signal Above Range	EDC
3008	Coolant Temperature Sensor - Signal Below Range Minimum	EDC
3015	Fuel Temperature Sensor - Signal Above Maximum	EDC
3019	Boost Pressure Sensor - Signal Above Range Maximum	EDC
3022	Boost Pressure Sensor - Signal Not Plausible	EDC
3023	Atmospheric Pressure Sensor - Signal Not Plausible	EDC
3024	Atmospheric Pressure Sensor - Signal Above Range Maximum	EDC
3025	Atmospheric Pressure Sensor - Signal Below Range Minimum	EDC
3029	Oil Pressure Sensor - Short Circuit To Battery	EDC
3030	Oil Pressure Sensor - Short Circuit To Ground	EDC
3032	Oil Pressure Sensor - Value Too High	EDC
3033	Oil Temperature Sensor - Signal Not Plausible (Compared With Coolant Temperature)	EDC
3034	Oil Temperature Sensor - Signal Above Range Maximum	EDC
3035	Oil Temperature Sensor - Signal Below Range Minimum	EDC
3037	Boost Pressure Sensor - Signal Low	EDC
3051	Battery Voltage To Engine Controller - Voltage Too High	EDC
3052	Battery Voltage To Engine Controller - Voltage Too Low	EDC
3060	Cylinder 1 - Unclassifiable Error In Injector	EDC

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Reference	Description	Controller
3061	Cylinder 1 - Injector Cable Short Circuit (Low Side To Battery)	EDC
3063	Cylinder 1 - Injector Cable Short Circuit (High Side To Ground)	EDC
3064	Cylinder 5 - Unclassifiable Error in Injector	EDC
3065	Cylinder 5 - Injector Cable Short Circuit (Low Side To Battery)	EDC
3067	Cylinder 5 - Injector Cable Short Circuit (High Side To Ground)	EDC
3068	Cylinder 3 - Unclassifiable Error In Injector	EDC
3069	Cylinder 3 - Injector Cable Short Circuit (Low Side To Battery)	EDC
3071	Cylinder 3 - Injector Cable Short Circuit (High Side To Ground)	EDC
3072	Cylinder 6 - Unclassifiable Error In Injector	EDC
3073	Cylinder 6 - Injector Cable Short Circuit (Low Side To Battery)	EDC
3075	Cylinder 6 - Injector Cable Short Circuit (High Side To Ground)	EDC
3076	Cylinder 2 - Unclassifiable Error In Injector	EDC
3077	Cylinder 2 - Injector Cable Short Circuit (Low Side To Battery)	EDC
3079	Cylinder 2 - Injector Cable Short Circuit (High Side To Ground)	EDC
3080	Cylinder 4 - Unclassifiable Error In Injector	EDC
3081	Cylinder 4 - Injector Cable Short Circuit (Low Side To Battery)	EDC
3083	Cylinder 4 - Injector Cable Short Circuit (High Side To Ground)	EDC
3089	Crankshaft Sensor - Invalid Signal	EDC
3093	Offset Between Camshaft And Crankshaft - Outside Boundaries	EDC
3095	Operating With Camshaft Sensor Only - Backup Mode	EDC
3102	Rail Pressure Sensor CP3 - Signal Below Range Minimum	EDC
3104	Rail Pressure Relief Valve - Open	EDC
3105	Rail Pressure Relief Valve - Pressure Shock Requested	EDC
3106	Rail Pressure Relief Valve - Did Not Open After Pressure Shock	EDC
3110	Rail Pressure Sensor Monitoring - Signal Above Range Maximum	EDC
3112	Rail Pressure Sensor CP3 - Signal Above Maximum Range	EDC
3131	Grid Heater Always Switched On	EDC
3137	Metering Unit - Open Load	EDC
3147	Oil Temperature Too High	EDC
3154	Grid Heater Relay - Short Circuit To Battery	EDC
3155	Grid Heater Relay - Short Circuit To Ground	EDC

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Reference	Description	Controller
3156	Grid Heater Relay - No Load	EDC
3161	Fan Actuator - Short Circuit to Ground	EDC
3179	Time-out Of CAN Message BC2EDC2	EDC
3180	Time-out of CAN Message VM2EDC	EDC
3188	Cylinder 1 Warning - Open Load	EDC
3192	Cylinder 2 warning - Open Load	EDC
3196	Cylinder 3 Warning - Open Load	EDC
3200	Cylinder 4 Warning - Open Load	EDC
3204	Cylinder 5 Warning - Open Load	EDC
3208	Cylinder 6 Warning - Open Load	EDC
3210	Bank 1 - General Short Circuit To Injector Cable	EDC
3211	Bank 1 - Injector cable Short Circuit Low Side To Ground	EDC
3213	Bank 1 - Unclassifiable Error	EDC
3218	Bank 2 - General Short Circuit On Injector Cable	EDC
3219	Bank 2 - Injector Cable Short Circuit Low Side To Ground	EDC
3221	Bank 2 - Unclassifiable Error	EDC
3227	Injection Processor Error - Internal Reset/Clock Loss/Voltage Too Low	EDC
3228	Injection Processor Error - Unlocked/Initialization Error	EDC
3229	Injection Processor Error - Injections Limited By Software	EDC
3230	Injection Processor Error - SPI Communication Failure	EDC
3231	Injection Processor Error - Internal Reset/Clock Loss/Voltage Too Low	EDC
3232	Injection Processor Error - Unlocked/Initialization Failure	EDC
3233	Injection Processor Error - Test Mode	EDC
3234	Injection Processor Error - SPI Communication Failure	EDC
3242	Engine Controller (Locked) Recovery Occurred	EDC
3243	Engine Controller Recovery (Suppressed) - Recovery Occurred	EDC
3244	Engine Controller Recovery (Visible) - Recovery Occurred	EDC
3245	Engine Controller - Watchdog Not Plausible	EDC
3246	Shutoff Paths During Initialization - Watchdog	EDC
3247	Shutoff Paths Failed During Initialization - Supply Voltage Too High	EDC
3248	Shutoff Paths During Initialization - Supply Voltage Too Low	EDC
3253	ADC Monitoring - Reference Voltage Too Low	EDC
3254	ADC Monitoring - Reference Voltage Too High	EDC
3255	ADC Monitoring Test Impulse Error	EDC
3256	ADC Monitoring Queue Error	EDC

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Reference	Description	Controller
3278	Engine Controller Supply Voltage Too High	EDC
3279	Engine Controller Internal Supply Voltage Too Low	EDC
3280	Sensor Supply Voltage 1 - High	EDC
3281	Sensor Supply Voltage 1 - Low	EDC
3283	Sensor Supply Voltage 2 - High	EDC
3284	Sensor Supply Voltage 2 - Low	EDC
3285	Sensor Supply Voltage 3 - High	EDC
3286	Sensor Supply Voltage 3 - Low	EDC
3371	Torque Limitation Due To Fuel Quantity Limitation Because Of Injector System Errors	EDC

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DISTRIBUTION SYSTEMS - A

PNEUMATIC SYSTEM - 20.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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SERVICE

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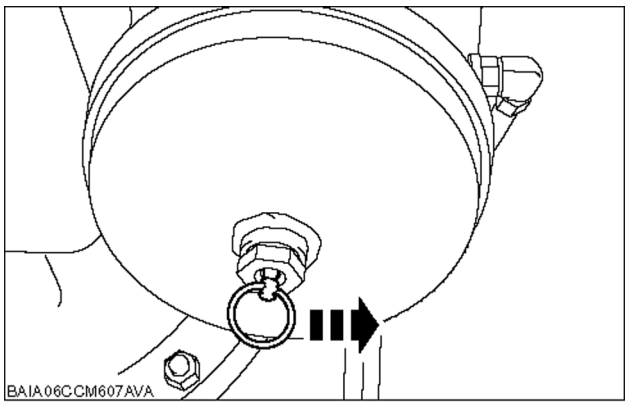
Relief valve - Remove

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

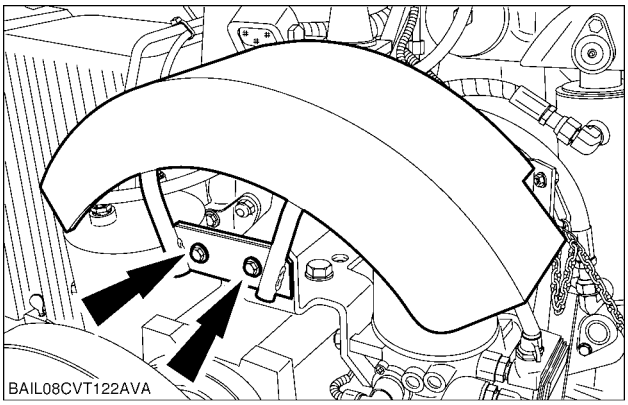
B026

1. Release the trailer brake system pressure from the trailer brake air tanks.



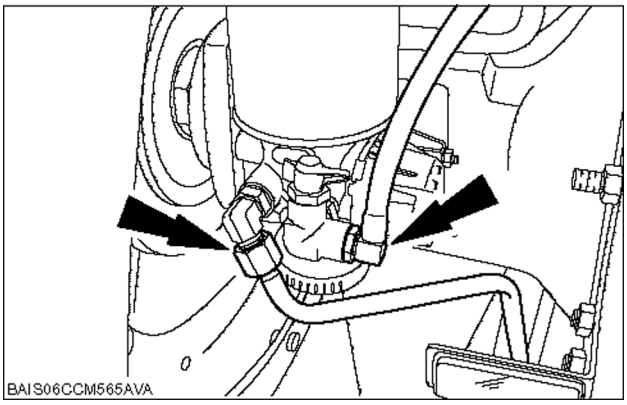
BAIS06CCM607AVA 1

2. Remove the relief valve guard.



BAIL08CVT122AVA 2

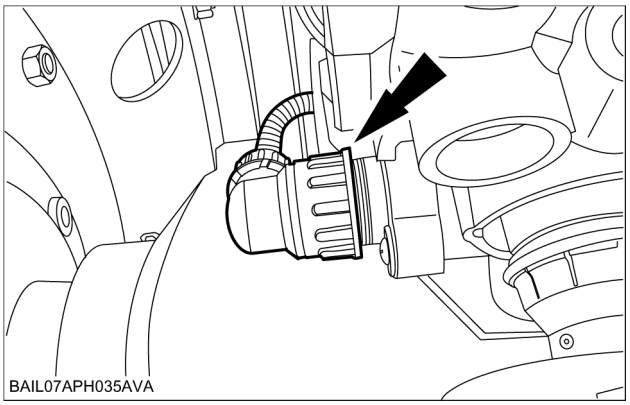
3. Disconnect the pressure feed tube from the compressor and the outlet hose to the air tank.



BAIS06CCM565AVA 3

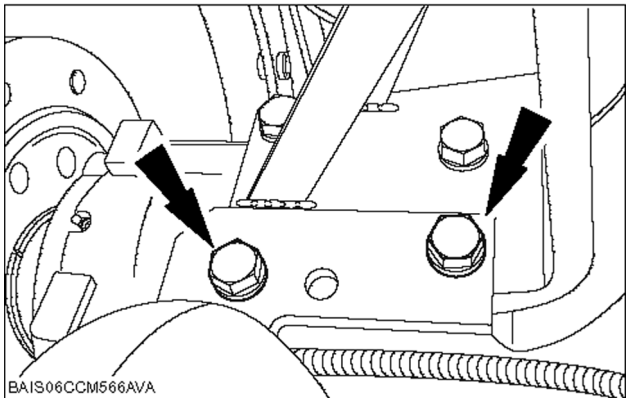
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4. Disconnect the electrical connector.



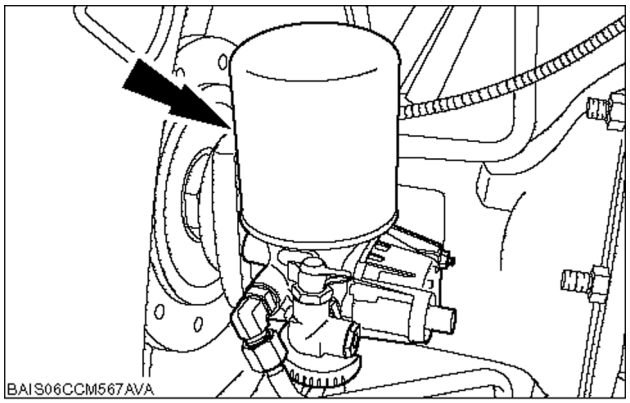
BAIL07APH035AVA 4

5. Remove the relief valve bracket retaining bolts.



BAIS06CCM566AVA 5

6. Remove the relief valve.



BAIS06CCM567AVA 6

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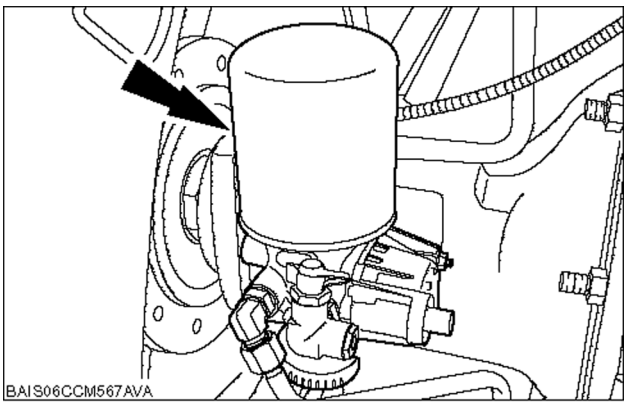
Relief valve - Install

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

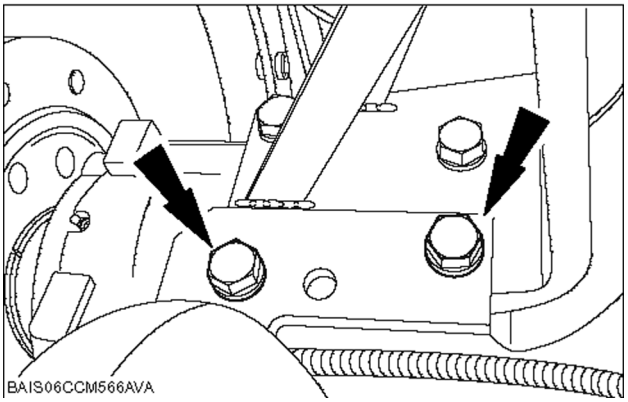
B026

1. Install the relief valve.



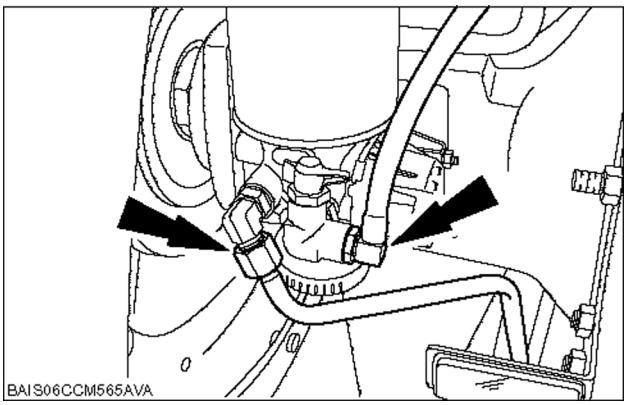
BAIS06CCM567AVA 1

2. Install the relief valve bracket retaining bolts. Tighten to **300 Nm** (**221 lb ft**)



BAIS06CCM566AVA 2

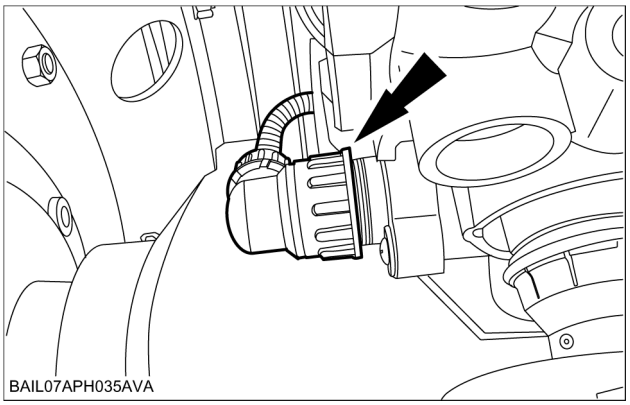
3. Connect the compressor feed tube and the air outlet hose to the relief valve.



BAIS06CCM565AVA 3

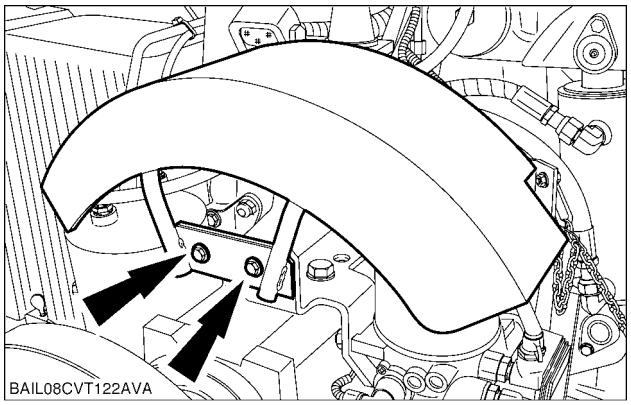
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4. Connect the electrical connector.



BAIL07APH035AVA 4

5. Install the relief valve guard.



BAIL08CVT122AVA 5

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Air tank - Remove

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

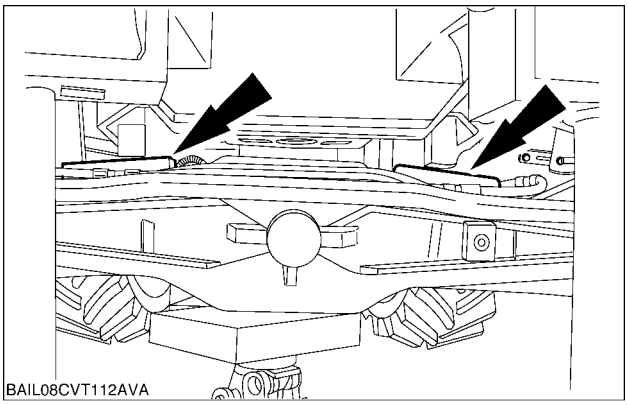
B026

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

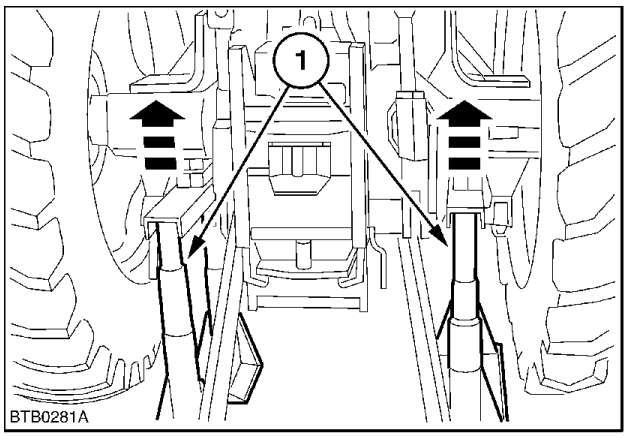
1. Make sure that the vehicle is parked on a level surface.
2. Chock the front wheels using suitable wheels stops.
3. Position wooden wedges between the front axle and front support. These prevent articulation of the front axle.



BAIL08CVT112AVA 1

4. Raise the rear of the vehicle and place two suitable axle stands **(1)** under the final drive cases.

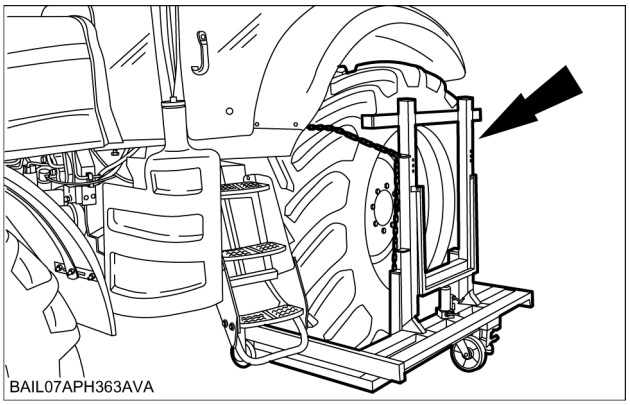
NOTE: *If required, detach the lift rods from the lower links.*



BTB0281A 2

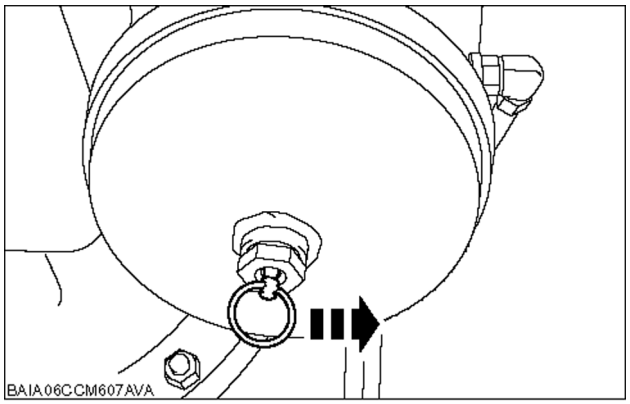
www.truck-freeworkshop.com

5. Remove both rear wheels.



BAIL07APH363AVA 3

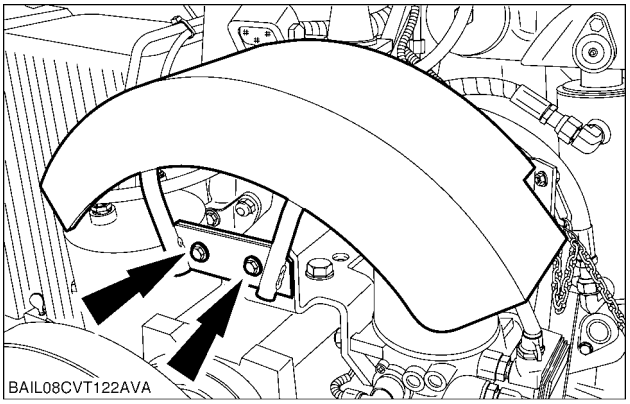
6. Release the trailer brake system pressure from the trailer brake air tanks.



BAIS06CCM607AVA 4

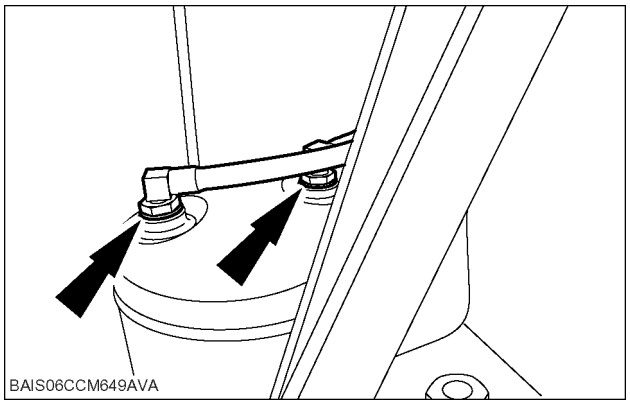
Left-hand air tank

7. Remove the relief valve guard.



BAIL08CVT122AVA 5

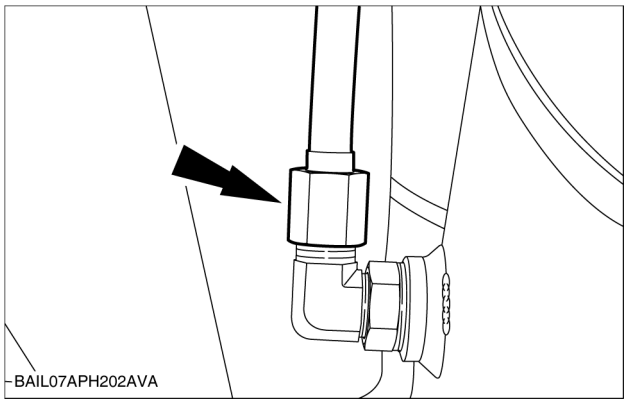
8. Disconnect the air tank supply pipes from the left-hand air tank.



BAIS06CCM649AVA 6

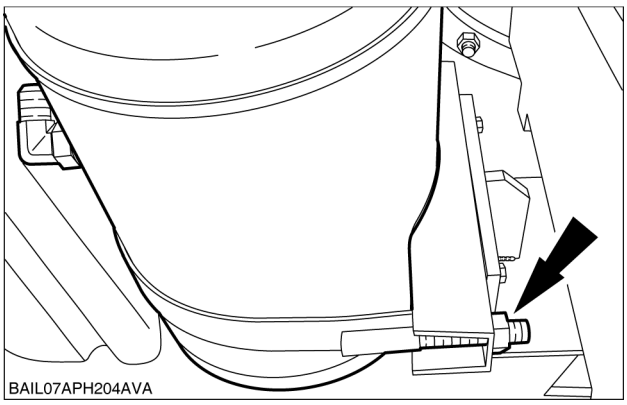
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9. Disconnect the balance pipe from the left-hand air tank.



BAIL07APH202AVA 7

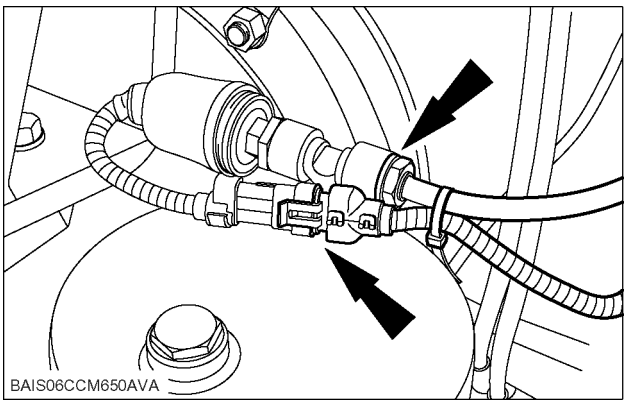
10. Remove the left-hand air tank.



BAIL07APH204AVA 8

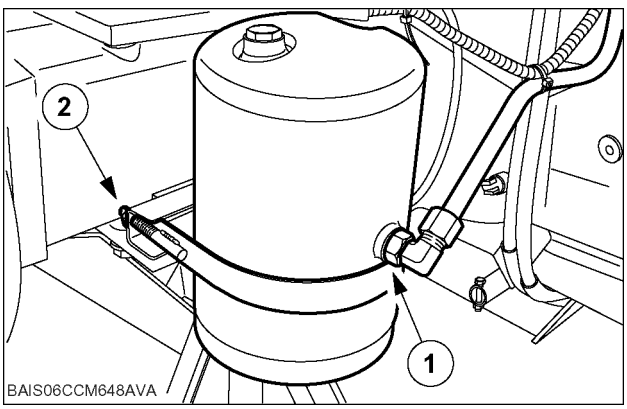
Right-hand air tank

11. Disconnect the electrical connector and the supply pipe.



BAIS06CCM650AVA 9

12. Disconnect the balance pipe from the right-hand air tank **(1)** loosen the air tank retaining nut **(2)** and remove the right-hand air tank.



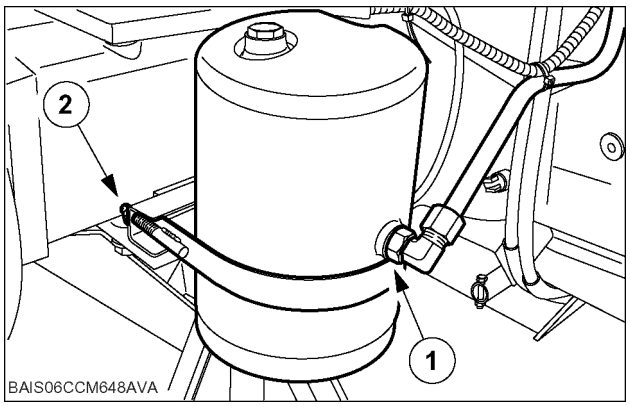
BAIS06CCM648AVA 10

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Air tank - Install

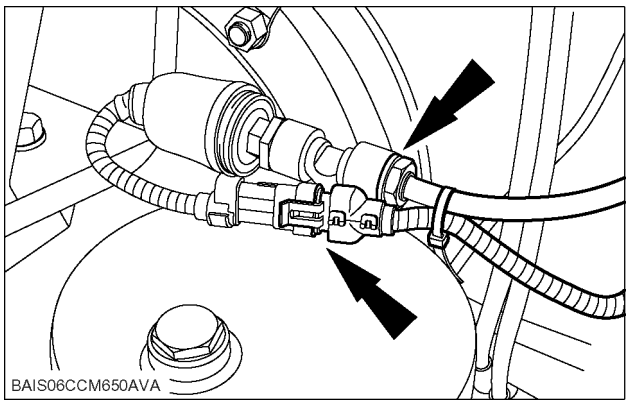
Right-hand air tank

1. Install right-hand the air tank and tighten the retaining nut **(2)**. Connect the balance pipe to the right-hand air tank **(1)**.



BAIS06CCM648AVA 1

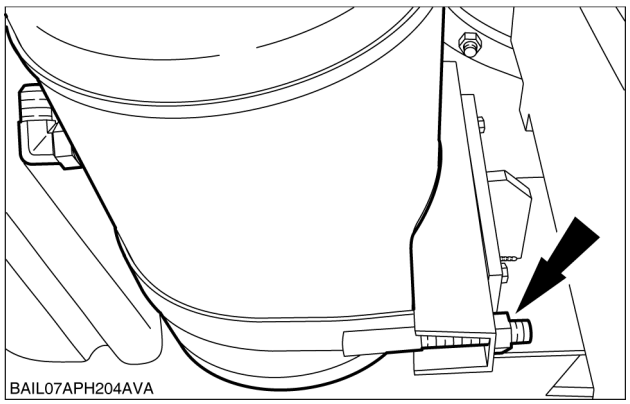
2. Connect the electrical connector and the supply pipe.



BAIS06CCM650AVA 2

Left-hand air tank

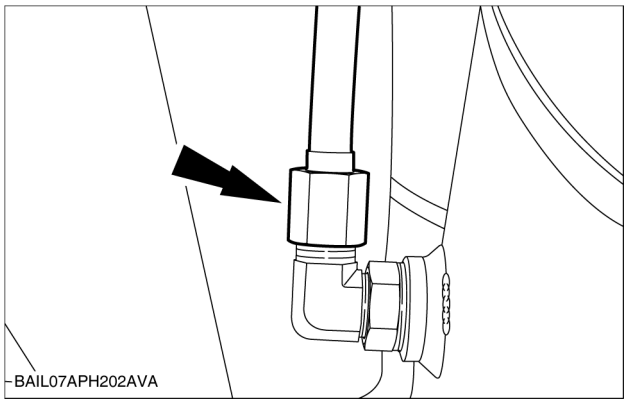
3. Install the left-hand air tank.



BAIL07APH204AVA 3

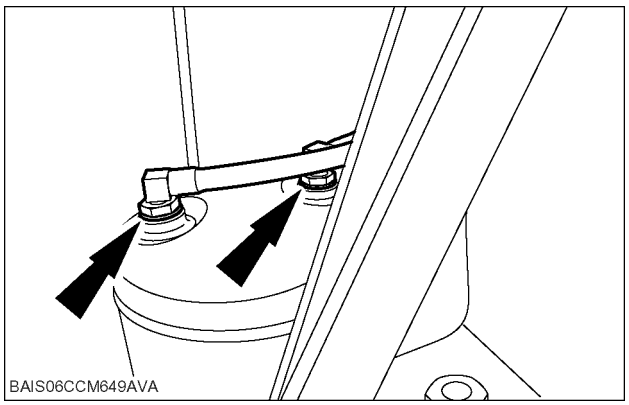
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4. Connect the balance pipe to the left-hand air tank.



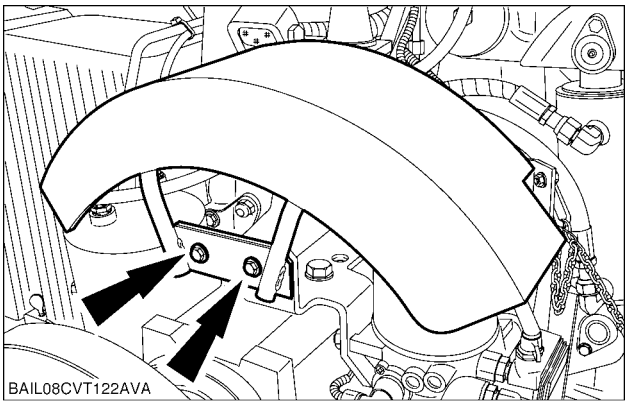
BAIL07APH202AVA 4

5. Connect the supply pipes to the left-hand air tank.



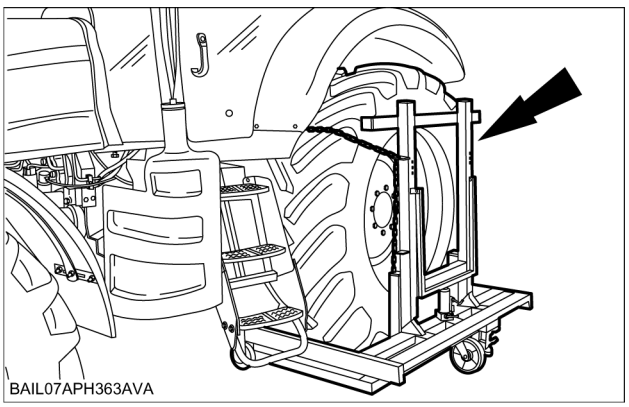
BAIS06CCM649AVA 5

6. Install the relief valve guard.



BAIL08CVT122AVA 6

7. Install both rear wheels and tighten the wheel nuts to the specified torque, for further information refer to **Rear wheel - Torque (D.50.C)**.

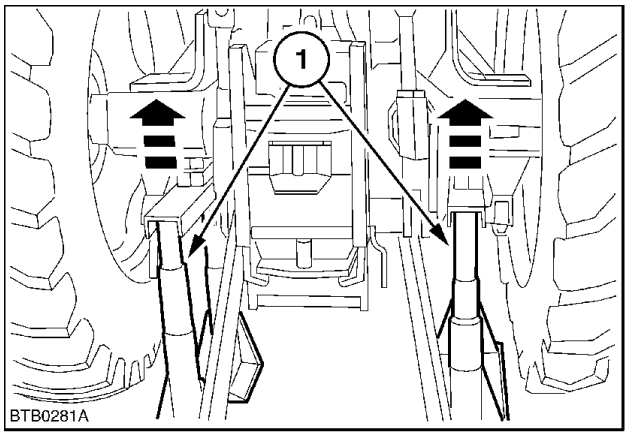


BAIL07APH363AVA 7

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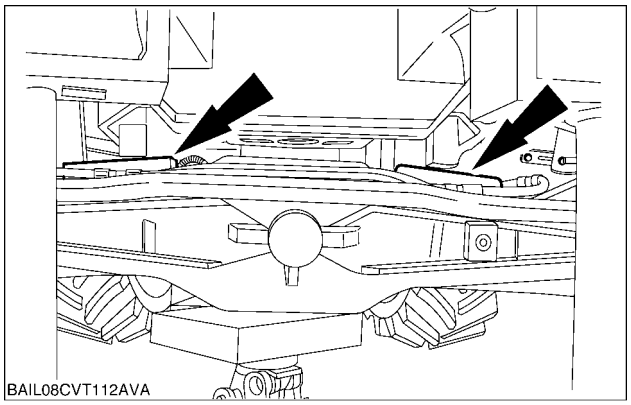
8. Raise the rear of the tractor and remove the axle stands **(1)**.

NOTE: *If applicable, attach the lift rods to the lower links.*



BTB0281A 8

9. Remove the wooden wedges from between the front axle and front support.



BAIL08CVT112AVA 9

10. Remove the front wheels chocks.

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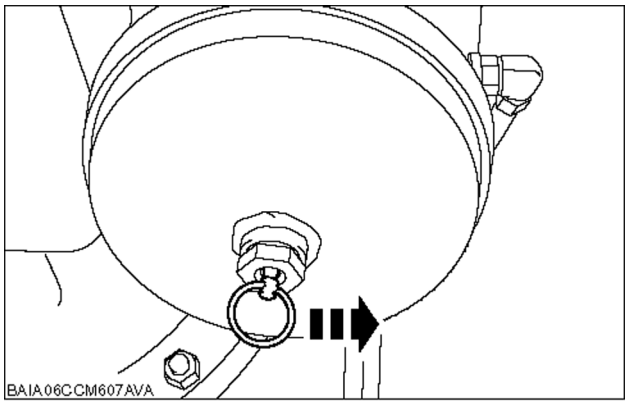
Air compressor - Remove

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

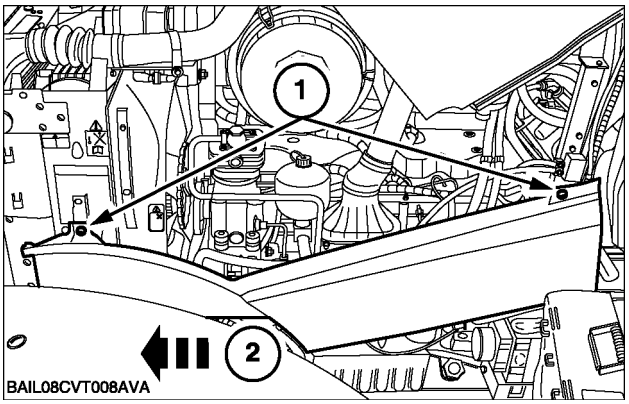
B026

1. Release the trailer brake system pressure from the trailer brake air tanks.



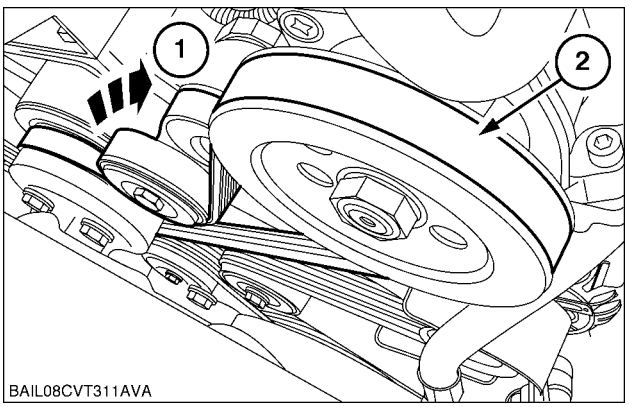
BAIS06CCM607AVA 1

2. Release the left-hand engine panel retaining screws **(1)** and remove the left-hand engine panel **(2)**.



BAIL08CVT008AVA 2

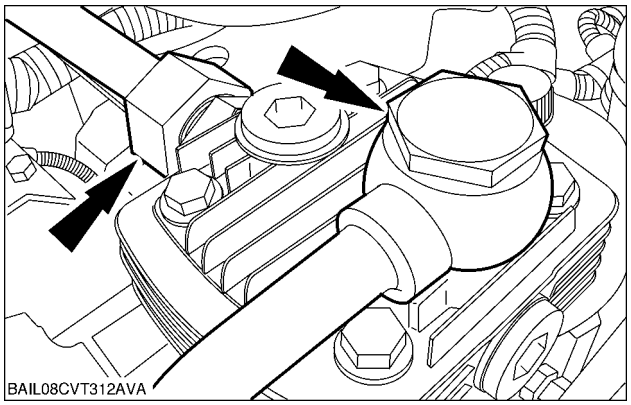
3. Rotate the air compressor drive belt tensioner clockwise **(1)**, and remove the air compressor drive belt **(2)**.



BAIL08CVT311AVA 3

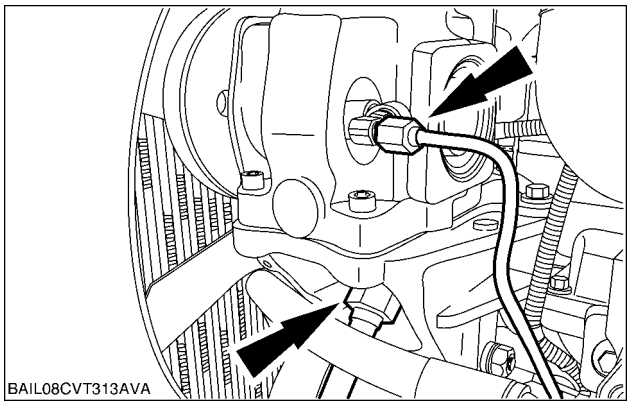
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4. Disconnect air compressor air supply outlet pipes.



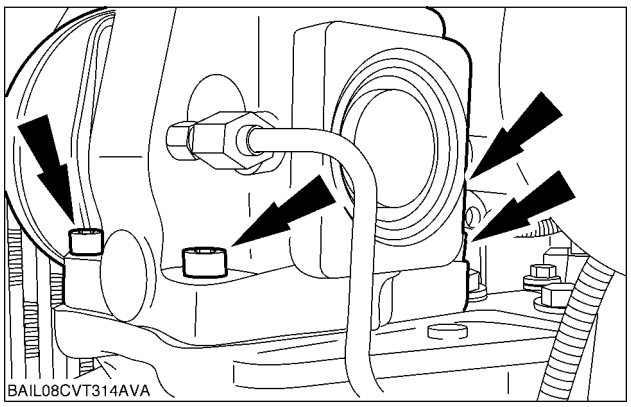
BAIL08CVT312AVA 4

5. Disconnect the air compressor oil supply and outlet pipes.



BAIL08CVT313AVA 5

6. Remove the air compressor.



BAIL08CVT314AVA 6

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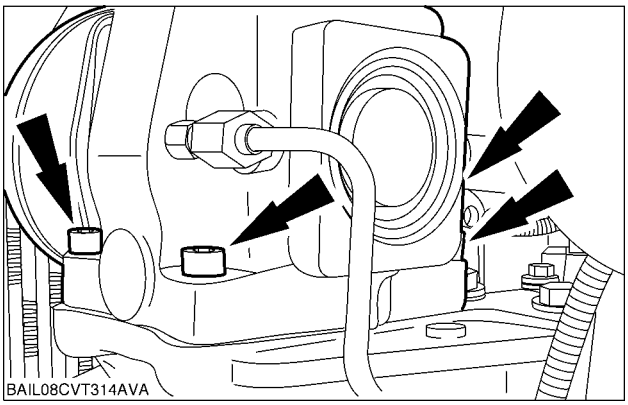
Air compressor - Install

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

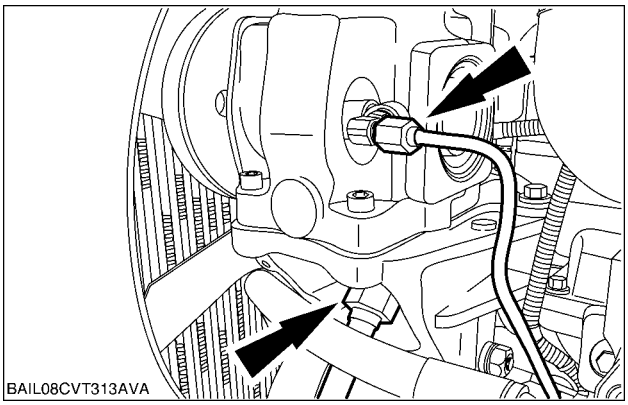
B026

1. Install the air compressor.
   Tighten to **20-25 Nm** (**15-18 lb ft**).



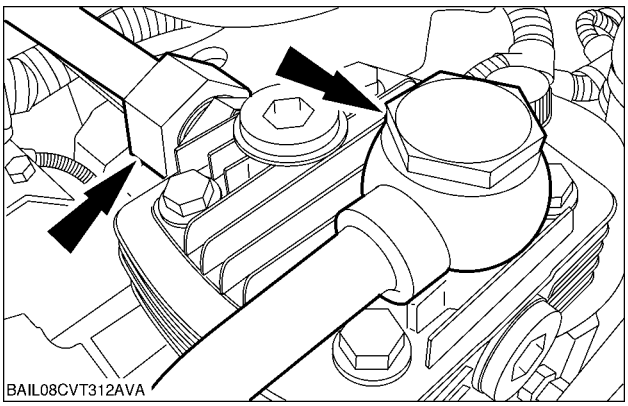
BAIL08CVT314AVA 1

2. Connect the oil supply pipe, tighten to **13-17 Nm** (**10-13 lb ft**).
   Connect the oil outlet pipe, tighten to **42-62 Nm** (**31-46 lb ft**).



BAIL08CVT313AVA 2

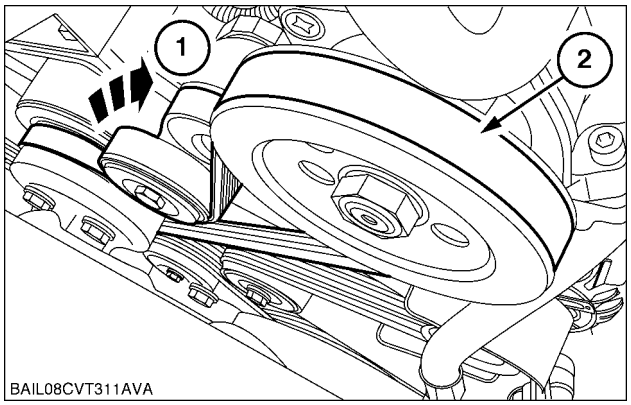
3. Connect the air cleaner to compressor supply pipe and the compressor outlet pipe.
   Tighten compressor outlet pipe to **42-62 Nm** (**31-46 lb ft**).



BAIL08CVT312AVA 3

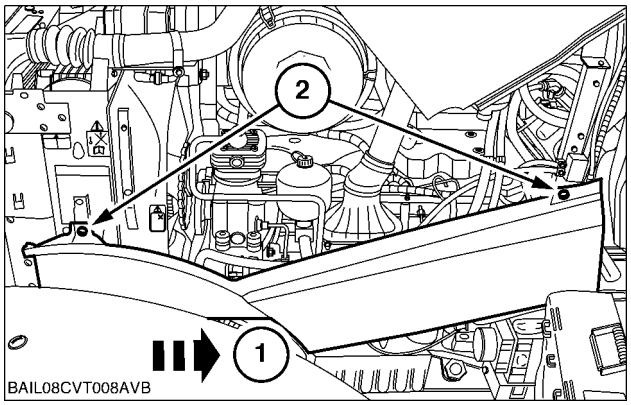
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4. Rotate the air compressor drive belt tensioner clockwise **(1)** and install the air compressor drive belt. **(2)**.



BAIL08CVT311AVA 4

5. Install the left-hand engine shield **(1)** and tighten the left-hand engine panel retaining screws **(2)**.



BAIL08CVT008AVB 5

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SERVICE - Technical Publications & Tools



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CASE IH AGRICULTURE

SERVICE MANUAL

POWER PRODUCTION



Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

84172758A 0 06/02/2009
B

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POWER PRODUCTION - B

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Puma 165 CVX
Puma 180 CVX
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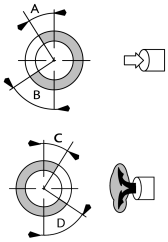
ENGINE - Special tools

TOOL No.	Description
380000979	Puller for engine injection pump union gear
380000665	Tool to extract crankshaft front seal
380000663	Tool to extract crankshaft rear seal
380001099	Injector extractor
380000666	Crankshaft front seal installer
380000664	Crankshaft rear seal installer
380000988	Flywheel locking adaptor plate (to be used with **380000732**)
380000732	Engine turning tool (to be used with **380000988**)
380000667	Drift for camshaft bushing disassembly and reassembly
380000158	Torque screwdriver for injector solenoid valve connector nut setting
380001003	Connecting Rod Check Gauge
380000301	Engine stand (revolving)
380001298	Engine stand to Cylinder block brackets
380001073	Engine lifting brackets
380200013	
380000569	Tractor splitting kit
380140055	Fuel supply/leakage test kit

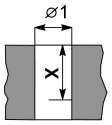
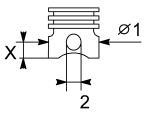
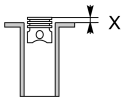
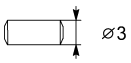
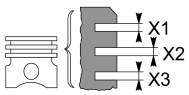
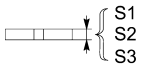
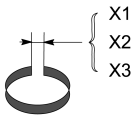
ENGINE - General specification

GENERAL SPECIFICATIONS	PUMA 165	PUMA 180	PUMA 195	PUMA 210	PUMA 225
Engine, type Boosted:	F4DE9684N*J	F4DE9684S*J	F4DE9684L*J	F4DE9684B*J	F4DE9684M*J
Engine, type Un-Boosted:	F4DE9684H*J	F4DE9684E*J	F4DE9684D*J	F4DE9684C*J	F4DE9684
Engine Emission Level (Tier)	Tier 3				
Number of cylinders	6				
Number of valves per cylinder	4				
Bore mm (in.)	**104 mm (4.094 in)**				
Stroke mm (in.)	**132 mm (5.197 in)**				
Total displacement cm3 (in.3)	**6728 cm³ 411 in³**				
Compression ratio	16.5 : 1				
Dynamic Timing (°BDTC)	**3.40 °**	**5.50 °**	**6.30 °**	**6.30 °**	**6.30 °**
Boosted Data Maximum power (Boost Curve) at **2200 RPM**	**150 kW (201 Hp)**	**160 kW (215 Hp)**	**172 kW (231 Hp)**	**175 kW (235 Hp)**	**181 kW (244 Hp)**
Maximum torque @ RPM	**874 Nm@ 1600 RPM**	**938 Nm@ 1600 RPM**	**965 Nm@ 1600 RPM**	**984 Nm@ 1600 RPM**	**1025 Nm @ 1500 RPM**
Unboosted Data Maximum power (Boost Curve) at **2200 RPM**	**123 kW (165 Hp)**	**134 kW (180 Hp)**	**145 kW (194 Hp)**	**157 kW (210 Hp)**	**165 kW (221 Hp)**
Maximum torque @ RPM	**774 Nm@ 1400 RPM**	**844 Nm@ 1400 RPM**	**860 Nm@ 1400 RPM**	**866 Nm@ 1400 RPM**	**950 Nm@ 1400 RPM**
Rated Speed	**2200 RPM**				
Slow idling speed of engine without load	**800 RPM**				
Fast idling speed of engine without load	**2375 RPM**				
Aspiration	Turbocharged and Air to Air Intercooled				
Turbocharger type	HOLSET				
Lubrication	Forced via lobe pump, pressure relief valve, oil filter				
Oil pressure with engine hot	– at slow idling - **0.8 bar (11.60 psi)** – at peak rpm- **3.5 bar (50.75 psi)**				
Cooling system	Fluid–based				

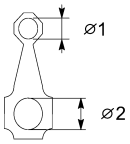
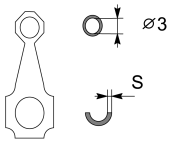
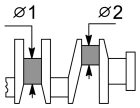
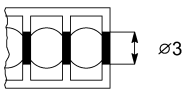
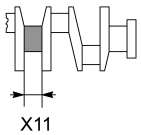
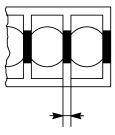
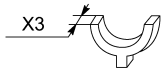
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GENERAL SPECIFICATIONS	PUMA 165	PUMA 180	PUMA 195	PUMA 210	PUMA 225
Coolant pump drive:	Via Poly V Belt				
Thermostat:	Thermostat starts to open at **81 °C** (**178 °F**) and is fully open at **96 °C** (**205 °F**)				
Filling – engine sump – engine sump + filter	**15 l** (**4.0 US gal**)				
Cycle	Diesel, 4–stroke				
Fuel system Fuel injection	Turbocharged with Air to Air intercooler Direct				
Valve Timing  	Start before T.D.C. A = **18.5 °** End after B.D.C. B = **29.5 °** Start before T.D.C. D = **67 °** End after B.D.C C = **35 °**				
Fuel system	Refer to **FUEL AND INJECTION SYSTEM - General specification (B.20.A)**				

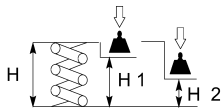
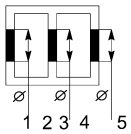
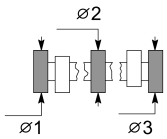
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ASSEMBLY CLEARANCES – DATA		
Engine		F4DE9684
Type		6 cylinders
CRANK GEAR AND CYLINDER ASSEMBLY DATA		
Cylinder linersØ1		**104 - 104.024 mm** (**4.0945 - 4.0954 in**)
Cylinder liners:		
outside diameter	Ø2	–
length	L	–
Cylinder liners – crankcase seats (interference)		–
Outside diameter	Ø2	–
Cylinder liners:		
inside diameter .	Ø2	–
Pistons supplied as spare parts:		–
measurementX		**55.9 mm** (**2.2008 in**)
outside diameter Ø1		**103.73 - 103.748 mm** (**4.0839 - 4.0846 in**)
seat for pin Ø2		**38.010 - 38.016 mm** (**1.4965 - 1.4967 in**)
Piston – cylinder liners		**0.252 - 0.294 mm** (**0.0099 - 0.0116 in**)
Piston diameter	Ø1	**0.5 mm** (**0.0197 in**)
Piston location from crankcase X		**0.28 - 0.42 mm** (**0.0110 - 0.0165 in**)
Piston pin Ø3		**37.994 - 38 mm** (**1.4958 - 1.4961 in**)
Piston pin – pin seat		**0.010 - 0.022 mm** (**0.0004 - 0.0009 in**)
Piston ring grooves X1*		**2.705 - 2.735 mm** (**0.1065 - 0.1077 in**)
X2		**2.44 - 2.46 mm** (**0.0961 - 0.0969 in**)
X3		**4.03 - 4.05 mm** (**0.1587 - 0.1594 in**)
Piston ringsS1*		**2.56 - 2.605 mm** (**0.1008 - 0.1026 in**)
S2		**2.350 - 2.380 mm** (**0.0925 - 0.0937 in**)
S3		**3.970 - 3.990 mm** (**0.1563 - 0.1571 in**)
* measured on Ø of **101 mm** (**3.98 in**)		
Piston rings – grooves1		**0.100 - 0.175 mm** (**0.0039 - 0.0069 in**)
2		**0.040 - 0.900 mm** (**0.0016 - 0.0354 in**)
3		**0.020 - 0.065 mm** (**0.0008 - 0.0026 in**)
Piston rings (oversize)		**0.4 mm** (**0.0157 in**)
Piston ring end opening in cylinder liner:		
X1		**0.3 - 0.4 mm** (**0.0118 - 0.0157 in**)
X2		**0.6 - 0.8 mm** (**0.0236 - 0.0315 in**))
X3		**0.30 - 0.55 mm** (**0.0118 - 0.0217 in**)

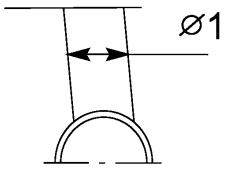
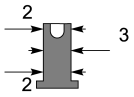
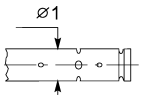
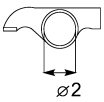
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ASSEMBLY CLEARANCES – DATA		
Connecting Rod Dimensions		
Small end bushing seat Ø1		**40.987 - 41.013 mm (1.6137 - 1.6147 in)**
Connecting rod bearing seat Ø2		**72.987 - 73.013 mm (2.8735 - 2.8745 in)**
Small end bushing diameter:		
outside	Ø3	**43.279 - 43.553 mm (1.7039 - 1.7147 in)**
inside	Ø4	**38.019 - 38.033 mm (1.4968 - 1.4974 in)**
Connecting rod half–bearings supplied as spares	S	**1.955 - 1.968 mm (0.0770 - 0.0775 in)**
Connecting rod bushing – seat		**0.266 - 0.566 mm (0.0105 - 0.0223 in)**
Piston pin – bushing		**0.019 - 0.033 mm (0.0007 - 0.0013 in)**
Connecting rod half bearings		**0.019 - 0.033 mm (0.0007 - 0.0013 in)**
Measurement	X	–
Maximum error on alignment of connecting rod axes	=	–
		
Main journals Ø1		**82.990 - 83.010 mm (3.2673 - 3.2681 in)**
Crankpins Ø2		**68.987 - 69.013 mm (2.7160 - 2.7170 in)**
Main journal half bearings S1		**2.456 - 2.464 mm (0.0967 - 0.0970 in)**
Connecting rod half bearings S2		**1.955 - 1.968 mm (0.0770 - 0.0775 in)**
Main bearings		
no. 1 – 7 Ø3		**87.982 - 88.008 mm (3.4639 - 3.4649 in)**
no. 2 – 3 – 4 - 5 - 6 Ø4		**87.977 - 88.013 mm (3.4637 - 3.4651 in)**
Half bearings – main journals		
no. 1 – 7		**0.041 - 0.119 mm (0.0016 - 0.0047 in)**
no. 2 – 3 – 4 – 5– 6		**0.041 - 0.103 mm (0.0016 - 0.0041 in)**
Half bearings – crankpins		**0.033 - 0.041 mm (0.0013 - 0.0016 in)**
Main journal half bearings		**+ 0.250 mm (0.0098 in)+ 0.500 mm (0.0197 in)**
Connecting rod half bearings		
Main journal for thrust X1		**37.475 - 37.550 mm (1.4754 - 1.4783 in)**
Main bearing for thrust X2		**32.180 - 32.280 mm (1.267 - 1.271 in)**
Semi–circular thrust washersX3		**37.28 - 37.38 mm (1.4677 - 1.4717 in)**
Crankshaft thrust		**0.095 - 0.265 mm (0.004 - 0.010 in)**
CYLINDER HEAD		

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ASSEMBLY CLEARANCES – DATA		
Valve guide bores in the cylinder head	Ø1	**7.042 - 7.062 mm (0.277 - 0.278 in)**
	Ø2	–
Valve guide		
	Ø3	–
Valve guide and bores in head		–
Valve guide		–
Valves:		
	Ø4	**6.970 - 6.999 mm (0.2744 - 0.2756 in)**
	å	**60 ° +/- 0,25**
	Ø4	**6.970 - 6.999 mm (0.2744 - 0.2756 in)**
	å	**45 ° +/- 0,25**
Valve stem and relative guide		**0.052 - 0.092 mm (0.0020 - 0.0036 in)**
Bore in head for valve seat:		
Intake	Ø1	**34.837 - 34.863 mm (1.3715 - 1.3726 in)**
Exhaust	Ø1	**34.837 - 34.863 mm (1.3715 - 1.3726 in)**
Valve seat outside diameter; angle of valve seats in cylinder head		
Intake	Ø2	**34.917 - 34.931 mm (1.3747 - 1.3752 in)**
	å	**60 °**
Exhaust	Ø2	**34.917 - 34.931 mm (1.3747 - 1.3752 in)**
	å	**45 °**
Recessing		
Intake	X	**0.59 - 1.11 mm (0.0232 - 0.0437 in)**
Exhaust	X	**0.96 - 1.48 mm (0.0378 - 0.0583 in)**
Between valve seat and head		
Intake		**0.054 - 0.094 mm (0.0021 - 0.0037 in)**
Exhaust		**0.054 - 0.094 mm (0.0021 - 0.0037 in)**
Valve seats		–
Valve spring height:		–
free spring	H	**47.75 mm (1.8799 in)**
under a load of:		
329 N	H1	**35.33 mm (1.3909 in)**
641 N	H2	**25.2 mm (0.9921 in)**
Injector protrusion	X	–
Seats for camshaft bushings no. 1		**59.222 - 59.248 mm (2.3316 - 2.3326 in)**
Camshaft seats no. 2 – 3 – 4 - 5 - 6 - 7		**54.089 - 54.139 mm (2.1295 - 2.1315 in)**
Camshaft support journals		
1 Þ 5		**53.995 - 54.045 mm (2.1258 - 2.1278 in)**
Camshaft bushing outside diameter:	Ø	**59.222 - 59.248 mm (2.3316 - 2.3326 in))**
Bushing inside diameter:Ø		**54.083 - 54.147 mm (2.1293 - 2.1318 in)**
Bushings and seats in crankcase		–
Bushings and support journals		**0.038 - 0.162 mm (0.0015 - 0.0064 in)**
Useful cam lift:	H - Exhaust	**6.045 mm (0.2380 in)**

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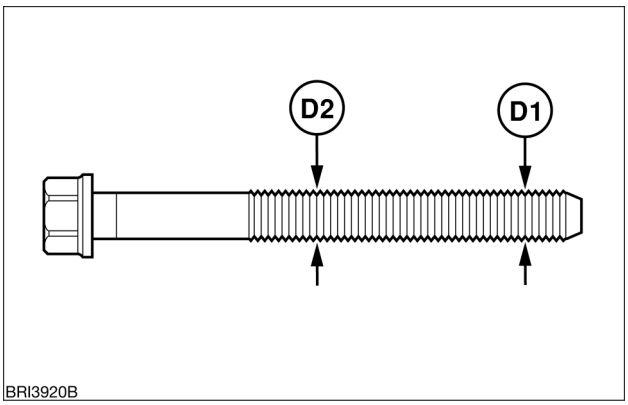
ASSEMBLY CLEARANCES – DATA		
	H - Inlet	**7.582 mm** (**0.2985 in**)
Tappet cap seat in crankcaseØ1		**16.000 - 16.030 mm** (**0.6299 - 0.6311 in**)
Tappet cap outside diameter:		
	Ø2	**15.924 - 15.954 mm** (**0.6269 - 0.6281 in**)
	Ø3	**15.960 - 15.975 mm** (**0.6283 - 0.6289 in**)
Between tappets and seats		**0.025 - 0.070 mm** (**0.0010 - 0.0028 in**)
Tappets		–
Rocker arm shaftØ1		**21.965 - 21.977 mm** (**0.8648 - 0.8652 in**)
Rocker arms:Ø2		**22.001 - 22.027 mm** (**0.8662 - 0.8672 in**)
Between rocker arms and shafts		**0.024 - 0.162 mm** (**0.0009 - 0.0064 in**)

ENGINE - Dimension - Stretch Bolt Check for reuse.

NOTE: *This check is required to be carried out prior to reusing the following stretch bolts:*

Cylinder Head (Refer to ***Cylinder head - Install (B.10.A)****).*
Rocker Post (Refer to ***Rocker assembly Rocker arm - Torque (B.10.A)****).*
Main Bearing (Refer to ***Crankshaft Main bearing - Torque (B.10.A)****).*
Connecting Rod (Refer to ***Connecting rod and piston - Torque (B.10.A)****).*

Before reusing the retaining stretch bolts, make two (2) measurements, using a micrometer, on the tread outer diameter at points D1 and D2. The two points measured should be as close as reasonably possible to the two ends of the bolts threaded section.



bail06ccm024asa 1

If D1-D2< **0,1 mm** (**0.0039 in**), the bolt can be reused.

If D1-D2> **0,1 mm** (**0.0039 in**), the bolt must be renewed.

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ENGINE - Torque

PART	TORQUE Nm (lb ft)
Bolts securing connecting rod caps: Intial Torque Setting Second Torque setting Torque angle bolts	**30 Nm** (**22.13 lb ft**)± **3 Nm** (**2.21 lb ft**) **60 Nm** (**44.25 lb ft**)± **5 Nm** (**3.69 lb ft**) **60 °± 5 °**
Bolts securing pulley and damper:	**110 Nm** (**81.13 lb ft**).± **5 Nm** (**3.69 lb ft**)
Nut securing fuel injection pump drive. gear:	**105 Nm** (**77.44 lb ft**)± **7 Nm** (**5.16 lb ft**)
Nut securing compressor gear:	**125 Nm** (**92.20 lb ft**) ± **19 Nm** (**14.01 lb ft**)
Bolts securing timing gear:	**36 Nm** (**26.55 lb ft**)
Unions securing piston lubrication nozzles:	**15 Nm** (**11.06 lb ft**) ± **3 Nm** (**2.21 lb ft**)
Bolts securing timing system casing M8 1.25 x 40 M10 1.5 x 30	**24 Nm** (**17.70 lb ft**)± **4 Nm** (**2.95 lb ft**) **47 Nm** (**34.67 lb ft**)± **5 Nm** (**3.69 lb ft**)
Bolts securing front cover M10 1.5x30	 **24 Nm** (**17.70 lb ft**) ± **4 Nm** (**2.95 lb ft**)
Bolts securing main bearing caps with angle closed M12 1.50 12.9 Intial Torque Setting Second Torque setting Torque angle bolts	**50 Nm** (**36.88 lb ft**).± **6 Nm** (**4.43 lb ft**) **80 Nm** (**59.00 lb ft**)± **6 Nm** (**4.43 lb ft**) **90 °± 5 °**
Screw fixing Ladder Frame: M10 1.5x25	 **43 Nm** (**31.72 lb ft**) ± **5 Nm** (**3.69 lb ft**)
Bolts securing lifting brackets: M12 1.75x25 M10	 **70 Nm** (**51.63 lb ft**)± **12 Nm** (**8.85 lb ft**) **43 Nm** (**31.72 lb ft**) ± **5 Nm** (**3.69 lb ft**)
Bolts securing cooler M8 x 1,25 x 35 M8 x 1,25 x 100	Refer to **Oil cooler - Torque (B.60.A)** **25 Nm** (**18.44 lb ft**)± **5 Nm** (**3.69 lb ft**) **25 Nm** (**18.44 lb ft**)± **5 Nm** (**3.69 lb ft**)
Bolts securing valve cover	**24 Nm** (**17.70 lb ft**) ± **4 Nm** (**2.95 lb ft**)
Engine Vent Fastener (Ccv) M8 1.25x45 M8 1.25x35	 **24 Nm** (**17.70 lb ft**) ± **4 Nm** (**2.95 lb ft**) **24 Nm** (**17.70 lb ft**) ± **4 Nm** (**2.95 lb ft**)
Bolts securing oil sump ♦ M10 x 1,5 x 45 bolts M10 x 1,5 x 90 bolts M10 x 1,5 x 125 bolts M10 x 1,5 x 190 bolts	Refer to **Oil pan - Torque (B.60.A)** **50 Nm** (**36.88 lb ft**)± **5 Nm** (**3.69 lb ft**) **70 Nm** (**51.63 lb ft**)± **5 Nm** (**3.69 lb ft**) **70 Nm** (**51.63 lb ft**)± **5 Nm** (**3.69 lb ft**) **70 Nm** (**51.63 lb ft**)± **5 Nm** (**3.69 lb ft**)
Bolts / Plugs On Head **1/2 in** Nptf **3/4 in** Nptf **1/4 in** Nptf	 **24 Nm** (**17.70 lb ft**) ± **4 Nm** (**2.95 lb ft**) **36 Nm** (**26.55 lb ft**)± **5 Nm** (**3.69 lb ft**) **12 Nm** (**8.85 lb ft**)± **2 Nm** (**1.48 lb ft**)
Bolts securing cylinder head ♦ M12 x 1.75 x 130 M12 x 1.75 x 150	Refer to **Cylinder head - Tighten (B.10.A)**. **35 Nm** (**25.81 lb ft**)± **5 Nm** (**3.69 lb ft**) **55 Nm** (**40.57 lb ft**)± **5 Nm** (**3.69 lb ft**)
Bolts securing heater grille: M6	 **10 Nm** (**7.38 lb ft**) ± **2 Nm** (**1.48 lb ft**)
Bolts securing intake manifold: M8 1.25x25 M8 1.25x60 Bolts securing exhaust manifold on head M8 1.25x25 M8 1.25x14	 **25 Nm** (**18.44 lb ft**)± **5 Nm** (**3.69 lb ft**) **25 Nm** (**18.44 lb ft**)± **5 Nm** (**3.69 lb ft**) Refer to **Exhaust manifold - Tighten - Sequence. (B.40.A)**. **25 Nm** (**18.44 lb ft**)± **5 Nm** (**3.69 lb ft**) **25 Nm** (**18.44 lb ft**)± **5 Nm** (**3.69 lb ft**)
Bolts securing flywheel M12 M10	Refer to **Flywheel - Torque (B.10.A)**. **85 Nm** (**62.69 lb ft**)± **10 Nm** (**7.38 lb ft**) **49 Nm** (**36.14 lb ft**)± **5 Nm** (**3.69 lb ft**)
Bolts securing camshaft thrust plate:	

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PART	TORQUE Nm (lb ft)
M8	**24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)**
Bolts securing camshaft gear: M8 1.25x20 9.8 Flg	**36 Nm (26.55 lb ft)± 4 Nm (2.95 lb ft)**
Bolts securing rocker arms:	**36 Nm (26.55 lb ft)± 4 Nm (2.95 lb ft).**
Bolts securing rocker arm adjusters: 3/8 24 Unf Hex Nut	**24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)**
Bolts securing rocker arm casing:	**24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)**
Bolts securing phonic wheel: M12 1.25 10.9 Flg Hex	**110 Nm (81.13 lb ft)± 5 Nm (3.69 lb ft)**
Fuel manifold retaining nuts	**50 Nm (36.88 lb ft).± 5 Nm (3.69 lb ft)**
Fuel connector fastener on Common Rail side	**20 Nm (14.75 lb ft)± 2 Nm (1.48 lb ft)**
Common Rail fastener M8 1.25x10 9.8 Flg Hex M8 1.25x50 9.8 Flg Hex M8 1.25x90 9.8 Flg Hex	 **24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)** **24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)** **24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)**
Fastener for high-pressure pipes from Common Rail to cylinder head M14 1.5	**20 Nm (14.75 lb ft)± 2 Nm (1.48 lb ft)**
Fastener for fuel filter mounting on crankcase M12 1.75x25 9.8 Fig Hex	**77 Nm (56.79 lb ft) ± 8 Nm (5.90 lb ft)**
Turbine / exhaust manifold fastener	**25 Nm (18.44 lb ft)± 5 Nm (3.69 lb ft)**
Oil delivery/return pipe fastener M12 1.5	**35 Nm (25.81 lb ft)± 5 Nm (3.69 lb ft)**
Oil dipstick pipe fastener:	**24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)**
Bolts securing oil pump:	**24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)**
Main oil delivery bolts (plugs) M10 — 1 M14 — 1.5	 **6 Nm (4.43 lb ft) ± 1 Nm (0.74 lb ft)** **11 Nm (8.11 lb ft) ± 2 Nm (1.48 lb ft)**
Oil cooler / oil filter assembly fastener:	**24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)**
Coolant pump / crankcase fastener: M8 1.25x25 8.8 Hex 1st phase 2nd phase	 **24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)** **43 Nm (31.72 lb ft) ± 6 Nm (4.43 lb ft)**
Belt Tightener fastener M10 1.5x60 9.8 Fig	-
Fan mounting fastener M10	**33 Nm (24.34 lb ft) ± 5 Nm (3.69 lb ft)**
Fan pulley fastener	-
Fan spacer or accessory pulley fastener (when required) M6 M10 M12	 **10 Nm (7.38 lb ft)± 2 Nm (1.48 lb ft)** **43 Nm (31.72 lb ft) ± 6 Nm (4.43 lb ft)** **77 Nm (56.79 lb ft) ± 12 Nm (8.85 lb ft)**
Alternator fastener M8 1.25x30 9.8 Fig Hex M12 1.75x120 10.9 Fig Hex M12 Nut 1.75 G Fig Hex M10 1.5x25 9.8 Fig Hex M10 1.5x40 9.8 Fig Hex M10 Nut 1.5 9 Fig Hex M16 1.5 Hex	 **24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)** **43 Nm (31.72 lb ft) ± 6 Nm (4.43 lb ft)** **24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)** - - - -
Stud bolts for mounting fuel pump: M8	**12 Nm (8.85 lb ft) ± 2 Nm (1.48 lb ft)**
Bolts securing injection pump: M8 1.5	**24 Nm (17.70 lb ft) ± 4 Nm (2.95 lb ft)**
Tightening nut fixing injection pump gear	

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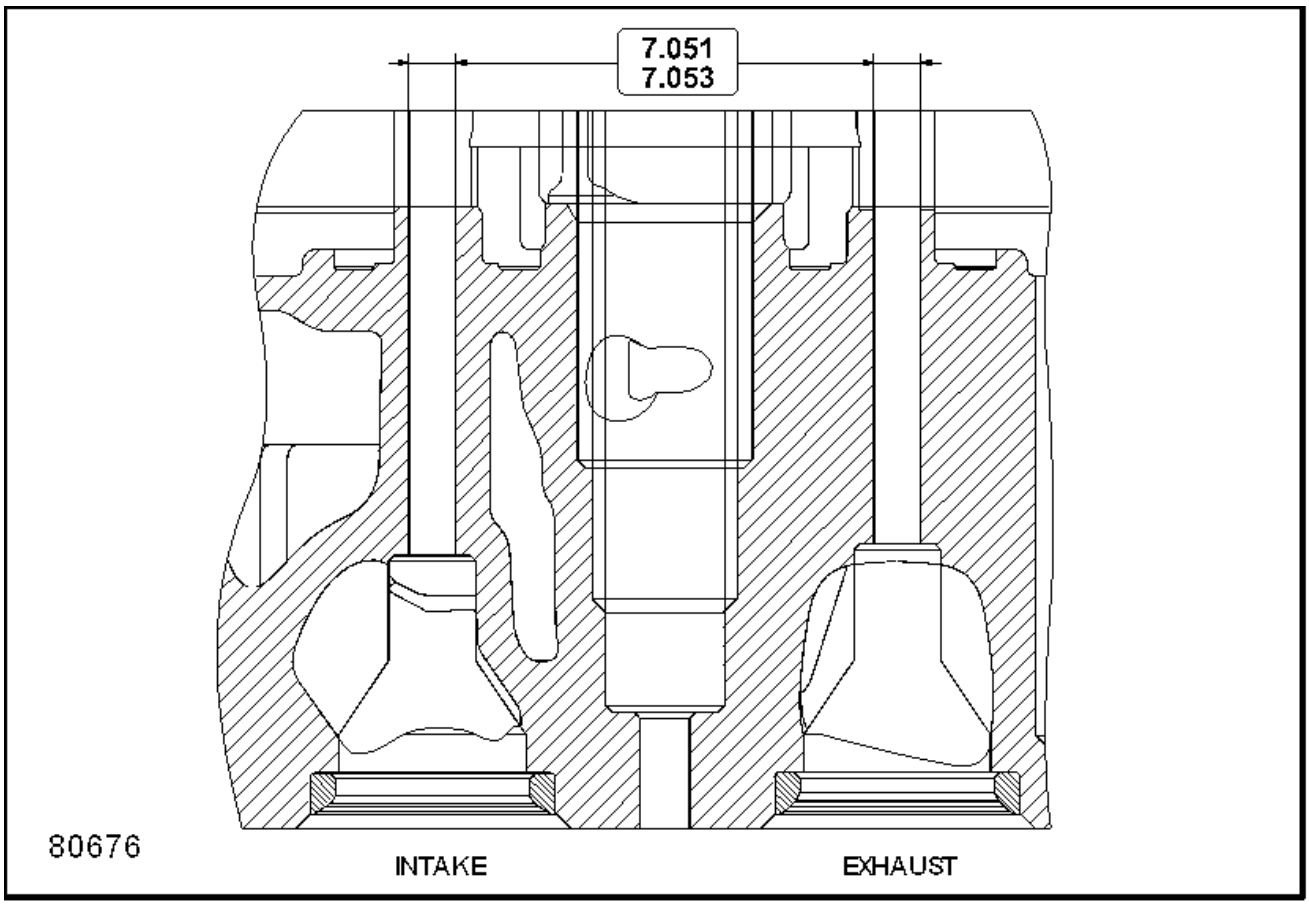
PART	TORQUE Nm (lb ft)
M18 1.5	**105 Nm** (**77.44 lb ft**) ± **5 Nm** (**3.69 lb ft**)
Fastener for fittings from injection pump to Common Rail: M12 1.5	**20 Nm** (**14.75 lb ft**)± **2 Nm** (**1.48 lb ft**)
Bolts securing injectors: Electronic Engine	**3.5 Nm** (**2.58 lb ft**).± **0.35 Nm** (**0.26 lb ft**)
Bolts securing injector connectors:	**1.5 Nm** (**1.11 lb ft**)± **0.25 Nm** (**0.18 lb ft**).
Oil pressure regulator sensor fastener:	**8 Nm** (**5.90 lb ft**) ± **2 Nm** (**1.48 lb ft**)
Camshaft speed sensor fastener in gearbox: M6	**8 Nm** (**5.90 lb ft**) ± **2 Nm** (**1.48 lb ft**)
Crankshaft speed sensor fastener on front cover M6	**8 Nm** (**5.90 lb ft**) ± **2 Nm** (**1.48 lb ft**)
Temperature sensor fastener on cylinder head: M14 1.5x12 Hex	**20 Nm** (**14.75 lb ft**) ± **3 Nm** (**2.21 lb ft**)
Air temperature sensor fastener on intake manifold: M6 1x20	**3 Nm** (**2.21 lb ft**) ± **1 Nm** (**0.74 lb ft**)
Air pressure and temperature sensor fastener on intake manifold: M5	**3 Nm** (**2.21 lb ft**) ± **1 Nm** (**0.74 lb ft**)
Fuel pressure sensor fastener:	**35 Nm** (**25.81 lb ft**) ± **5 Nm** (**3.69 lb ft**)
Fuel temperature sensor fastener: M14 1.5x12 Hex	**20 Nm** (**14.75 lb ft**) ± **3 Nm** (**2.21 lb ft**)
Gear fastener on air compressor: **5/8 in**18 Unf	**125 Nm** (**92.20 lb ft**)± **19 Nm** (**14.01 lb ft**)
Air compressor fastener on crankcase: M12 Nut	**81 Nm** (**59.74 lb ft**) ± **12 Nm** (**8.85 lb ft**)

Table 1

♦ Lubricate with engine oil before assembly

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Valve drive Valve guide - Dimension



80676_98 1

Valve Guide data. (Refer to Valve drive Valve guide - Measure (B.10.A)).

Valve drive Camshaft - Torque Thrust Plate Bolts

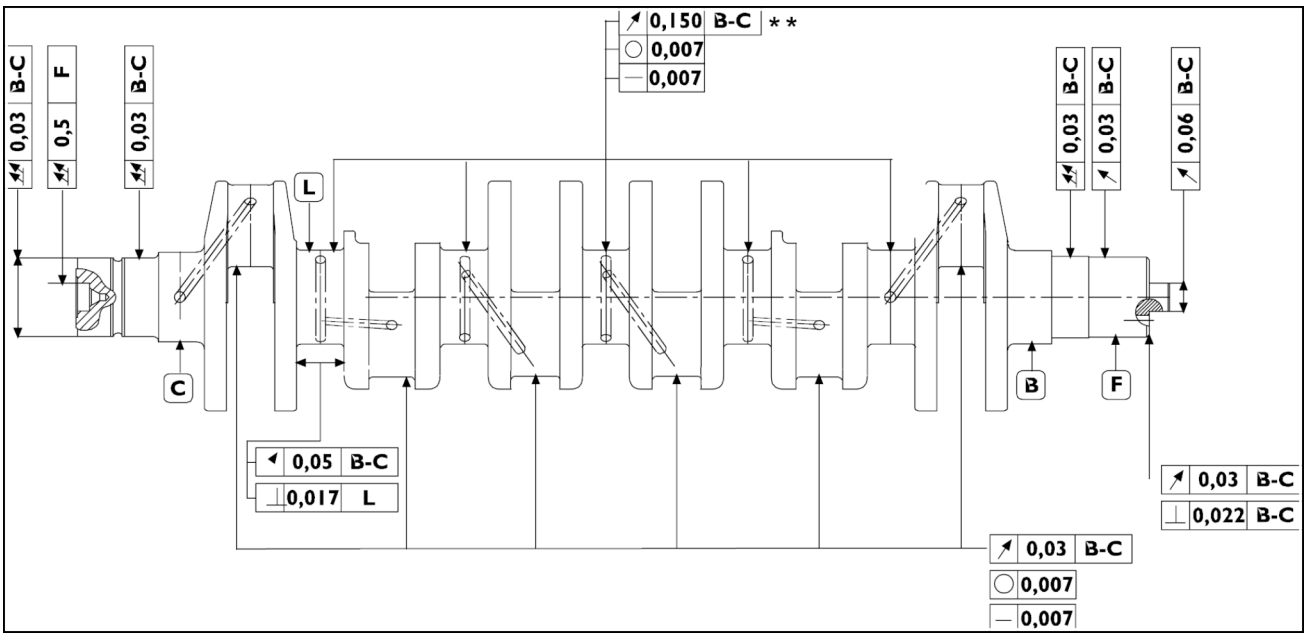
Part	TORQUE Nm (lb ft)
Bolts for securing Camshaft Thrust Plate M8 x 1,25 x 16	**25 Nm +/- 5 Nm** (**18 lb ft +/- 4 lb ft**)

Rocker assembly Rocker arm - Torque

Refer to **ENGINE - Torque (B.10.A)**

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Crankshaft - Dimension



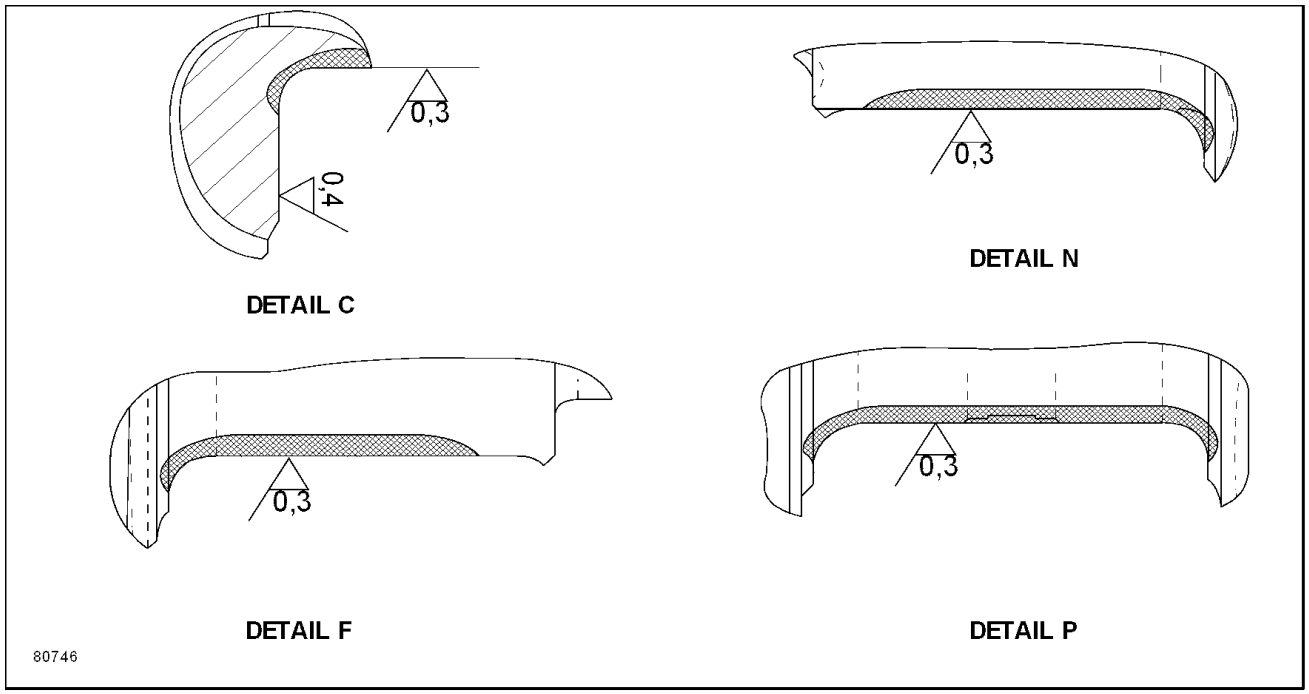
BAIL07APH420FMA 1

MAIN CRANKSHAFT TOLERANCES

TOLERANCES	CHARACTERISTIC SUBJECT OF TOLERANCE	GRAPHIC SYMBOL
SHAPE	Circularity	○
	Cylindricity	/○/
ORIENTATION	Parallelism	//
	Perpendicularity	⊥
	Straightness	—
POSITION	Concentricity or coaxiality	◎
OSCILLATION	Circular oscillation	↗
	Total oscillation	↗↗
	Taper	▷
CLASS OF IMPORTANCE ASSIGNED TO PRODUCT CHARACTERISTICS	GRAPHIC SYMBOL	
CRITICAL	●	
IMPORTANT	◐	

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SECONDARY	△



80746_212 2

Refer to Crankshaft - Measure (B.10.A).

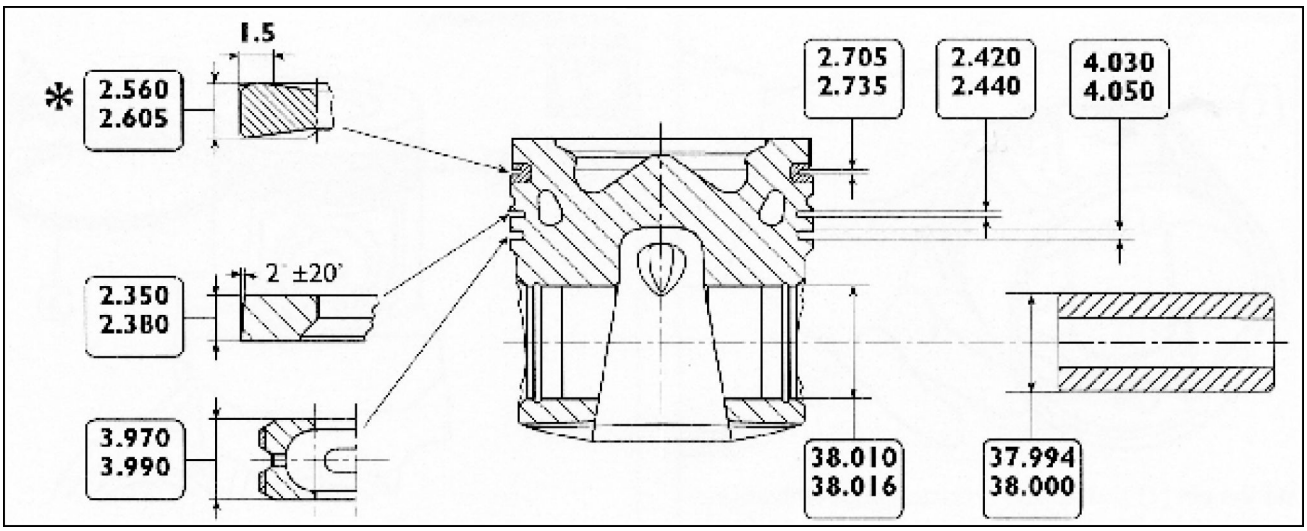
Crankshaft Main bearing - Torque

Refer to **ENGINE - Torque (B.10.A)**

IMPORTANT: *Rotate crankshaft after setting to ensure free rotation.*

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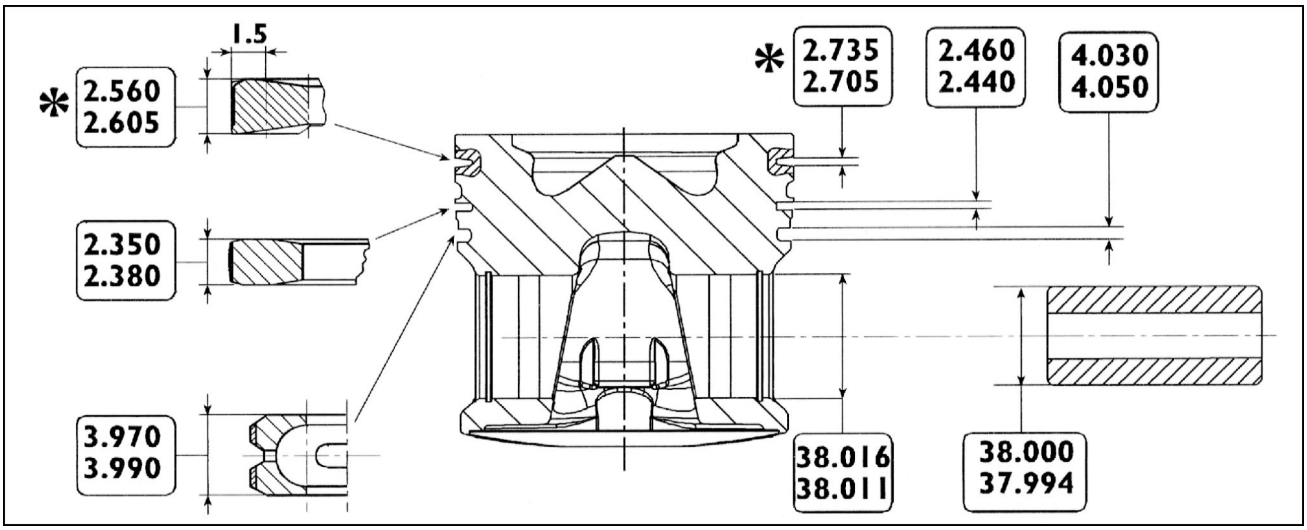
Connecting rod and piston Piston - Dimension



BAIL07APH363ESA 1

Piston with pin tunnel and plastic rings

NOTE: ** Value measured on **101 mm** (**3.98 in**) diameter.*



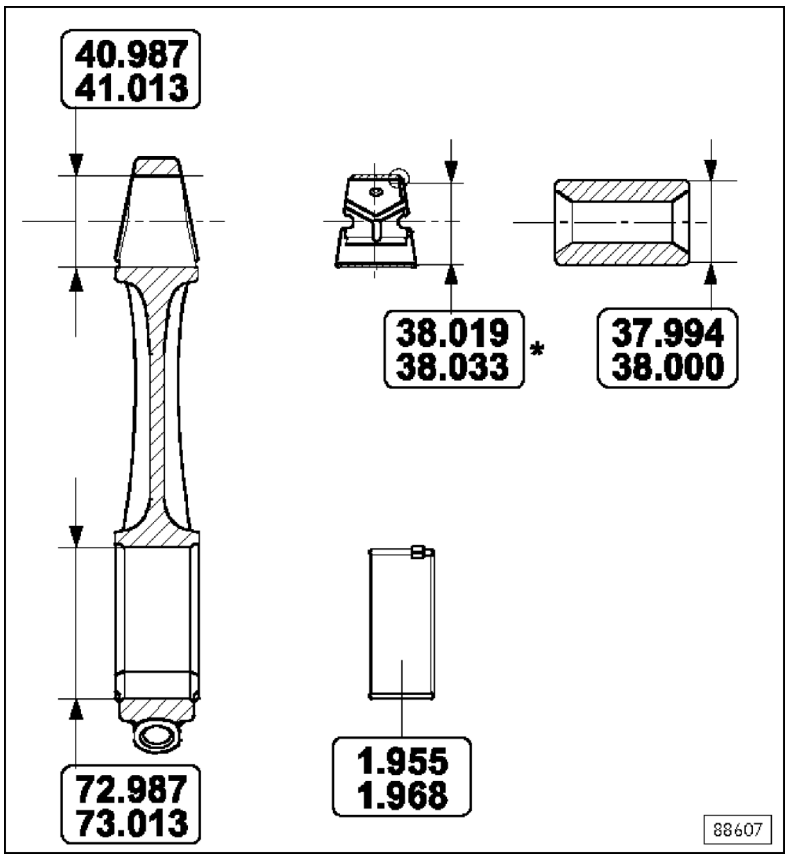
BAIL07APH364ESA 2

Mondial piston ,pins and split rings

NOTE: ** Value measured on **101 mm** (**3.98 in**) diameter.*

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Connecting rod and piston Connecting rod - Dimension



BAILAPH07366BMA 1

CONNECTING ROD, PISTON PIN BUSHING AND HALF BEARING DATA

* Inside diameter to be measured after installing in the small end and regrinding with a reamer.

NOTE: *The connecting rod - connecting rod cap mating surfaces are knurled for a better coupling. It is therefore recommended not to remove the knurling. The rods are manufactured using a fracture breaking technique making each rod and cap unique and having only one way of installation. Refer to* ***Connecting rod and piston - Measure (B.10.A)****.*

Connecting rod and piston - Torque

Part	TORQUE Nm (lb ft)
Bolts securing connecting rod caps M10 x 1,25 x 52	Refer to **Connecting rod and piston - Install (B.10.A)**
Step 1. Tighten bolts to initial torque settings.	**30 Nm +/- 5 Nm** (**22 lb ft +/- 4 lb ft**)
Step 2. Tighten bolts to the torque of	**50 Nm +/- 5 Nm** (**37 lb ft +/- 4 lb ft**)
Step 3. Torque/Angle bolts	**60 ° +/- 5 °**

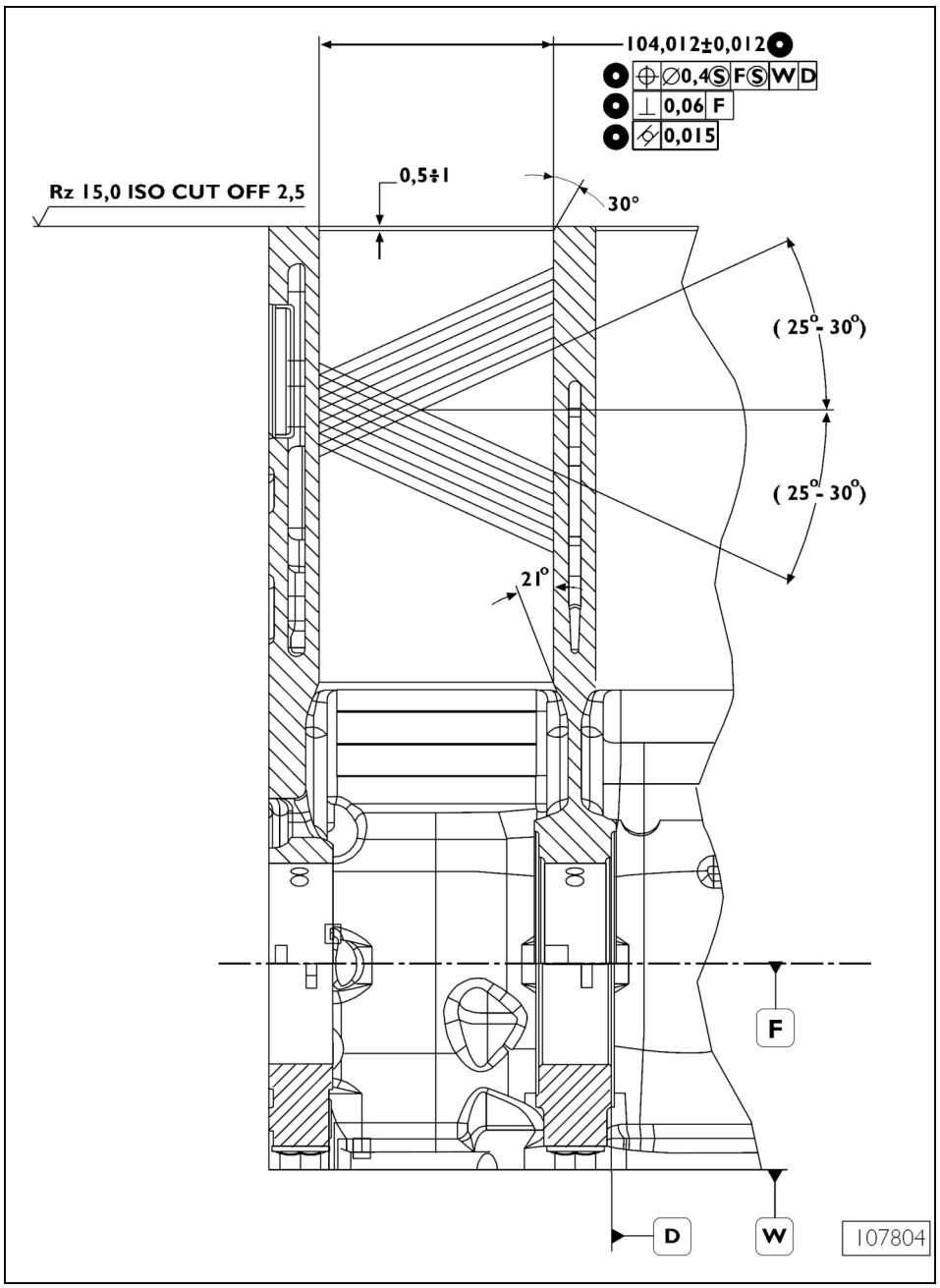
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Flywheel - Torque

PART	TORQUE
Bolts flywheel to crankshaft M12 x 1.25 x 32. 1st Stage. 2nd Stage	**30 Nm +/- 4Nm** (**22 lb ft +/- 3lb ft**) + 60°+/-5°

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Cylinder block - Dimension



BAIL07APH373HMA 1

NOTE: *If the cylinders need regrinding make sure all are bored to the same oversize* ***0.4 mm*** *(****0.0157 in****)*

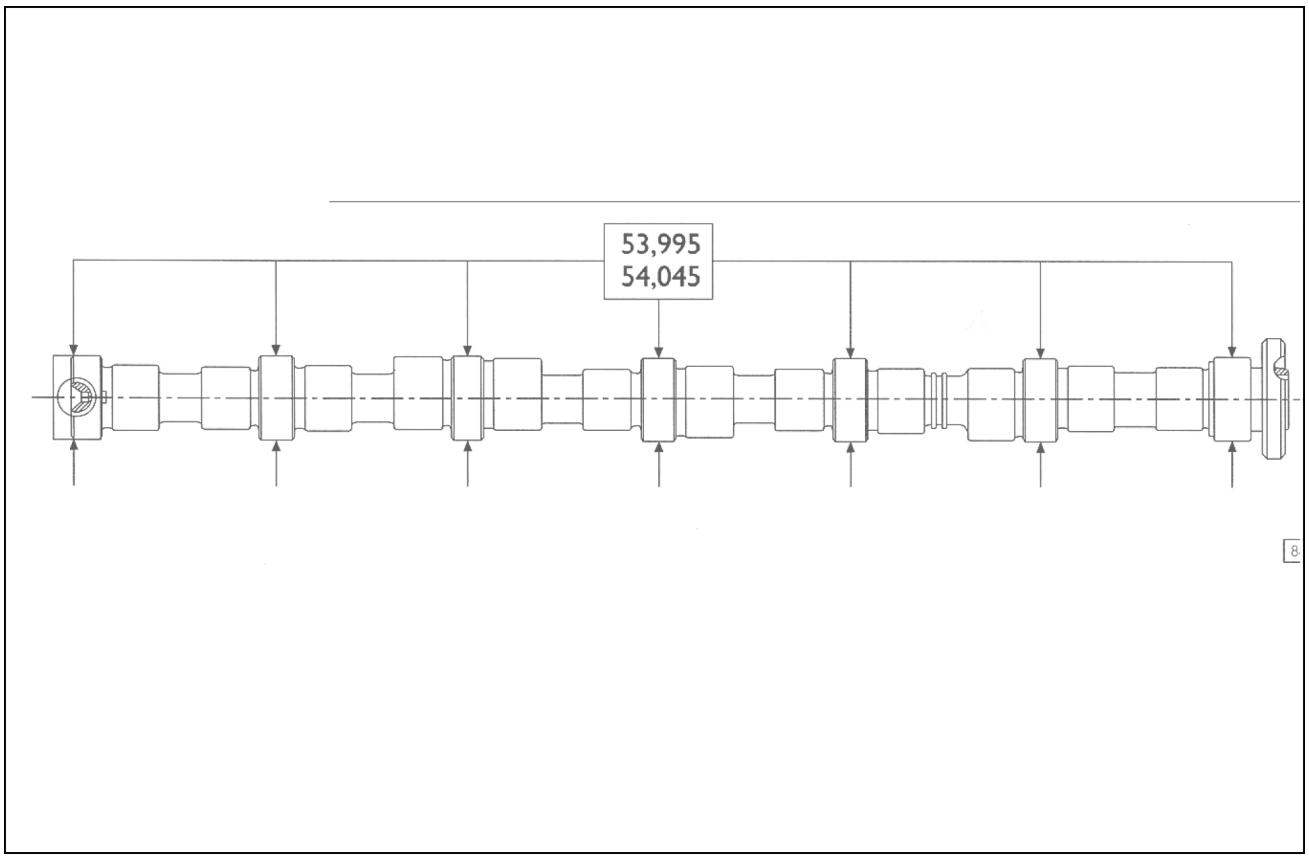
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Cylinder head - Torque

Part	TORQUE Nm (lb ft)
Bolts securing cylinder head. INSTALL LONGER BOLTS (**150 mm**), TO THE MIDDLE TWO (2) ROWS OF BOLT HOLES.	
Step 1. Tighten all bolts to initial torque settings and in the correct tightening sequence. (Refer to **Cylinder head - Tighten (B.10.A)**.	Bolt size M12 x 1,75 x 130 **35 Nm +/- 5 Nm** (**26 lb ft +/- 4 lb ft**) Bolt size M12 x 1,75 x 150 **55 Nm +/- 5 Nm** (**41 lb ft +/- 4 lb ft**)
Step 2.	+ **90 ° +/- 5 °**
Step 3.	+ **90 ° +/- 5 °**

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Valve drive Camshaft - Dimension



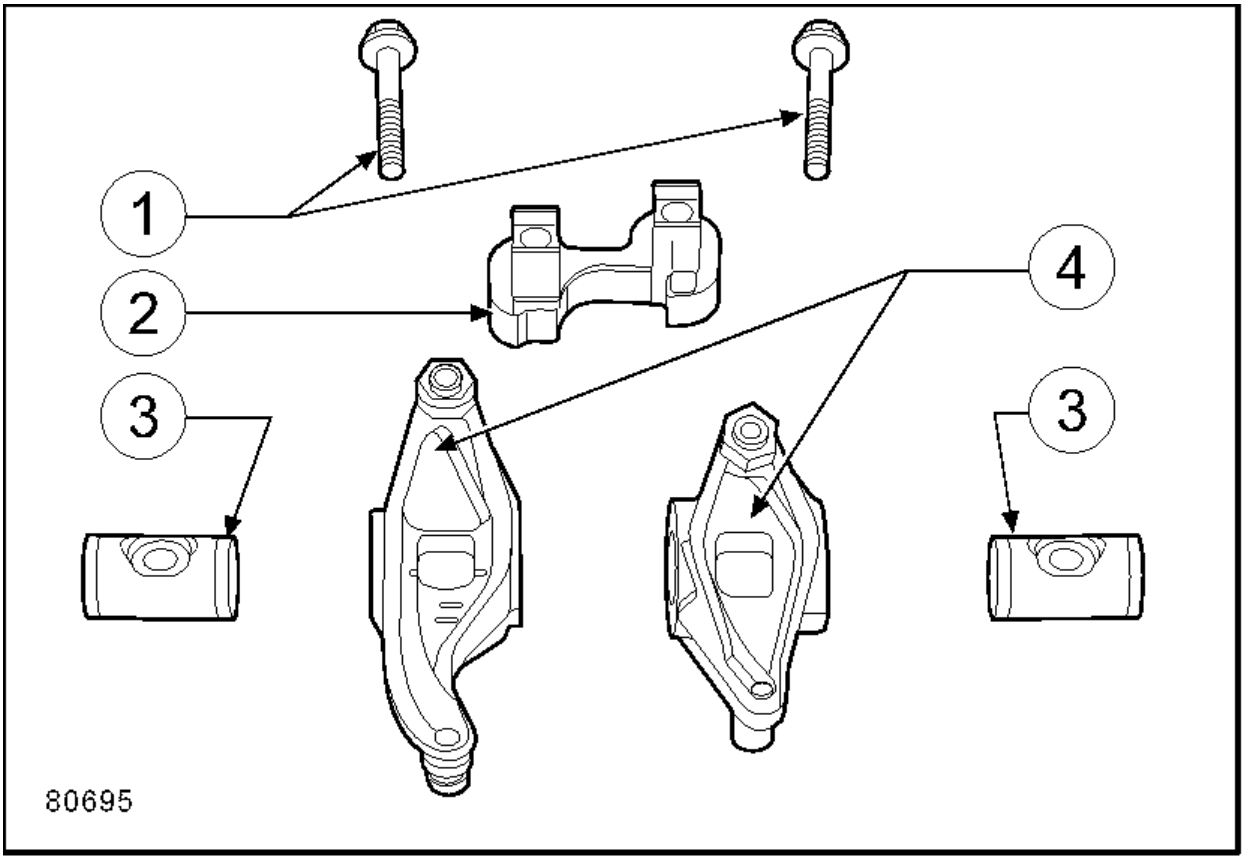
BAIL07APH360FSA 1

The data given refers to the normal pin diameter

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Valve drive Rocker assembly - Component identification

Component Parts of Rocker Arm Assembly

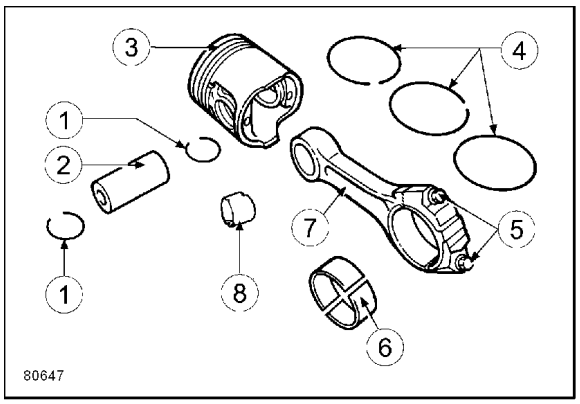


80695 1

1.Bolts
2.Support
3.Spindles (Refer to **Rocker assembly Shaft - Dimension (B.10.A)**).
4.Rocker arms (Refer to **Rocker assembly Shaft - Dimension (B.10.A)**).

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Connecting rod and piston - Exploded view

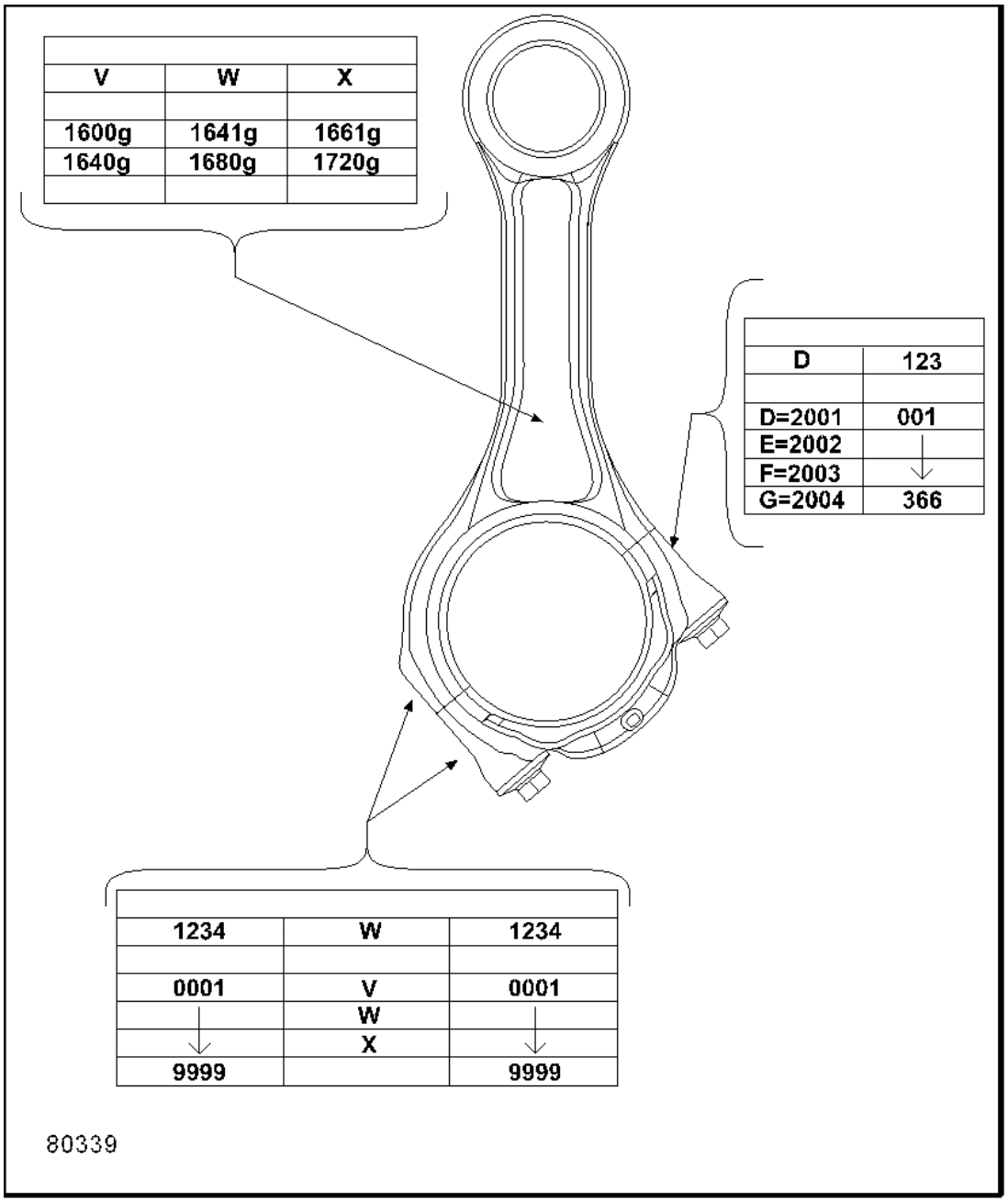


80647 1

1. Retaining rings
2. Pin
3. Piston
4. Piston rings
5. Bolts
6. Half bearings
7. Connecting rod
8. Bushing

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Connecting rod and piston Connecting rod - Component identification

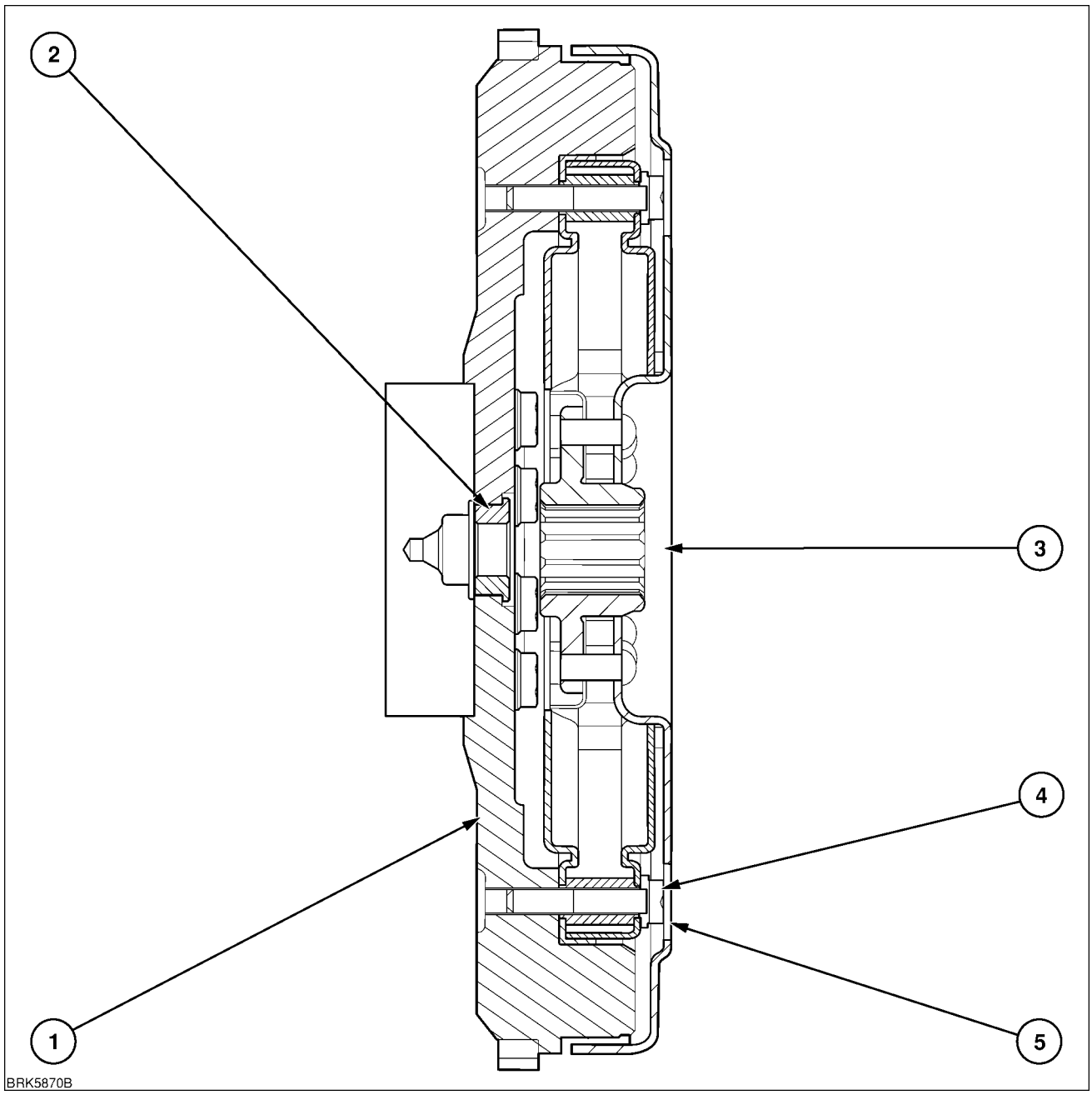


80339 1

Each connecting rod is marked: -
On the body and cap with a number indicating their coupling and the cylinder in which it is mounted. In the event of replacement, number the new rod with the same number as the replaced connecting rod. -
On the body of the connecting rod with a letter indicating the weight class of the connecting rod mounted in production:
V, 1600 to 1640 g (3.5274 to 3.6156 lb) (marked in yellow)
W, 1641 to 1680 g (3.6178 to 3.7038 lb) (marked in green)
X, 1681 to 1720 g (3.7060 to 3.7920 lb) (marked in blue)

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Flywheel - Sectional view



BAIL08CVT141GSA 1

Flywheel and damper assembly

1. Flywheel assembly
2. Flywheel bushing
3. Damper
4. Bolt (Torque **80 Nm** (**59.0 lb ft**))
5. Washer

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ENGINE - Remove

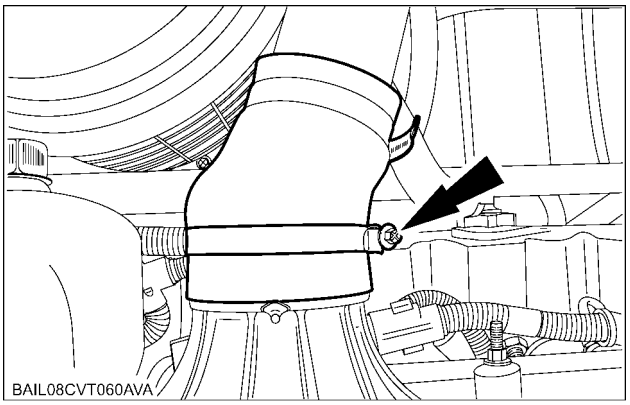
Prior operation:
Disconnect the battery, for further information refer to **Battery - Disconnect (A.30.A)**
Prior operation:
Remove the engine hood, for further information refer to **Engine hood - Remove (E.20.A)**
Prior operation:
Separate the front axle and front support from the engine, for further information refer to **Front - Remove (E.10.B)**

⚠ **DANGER** ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

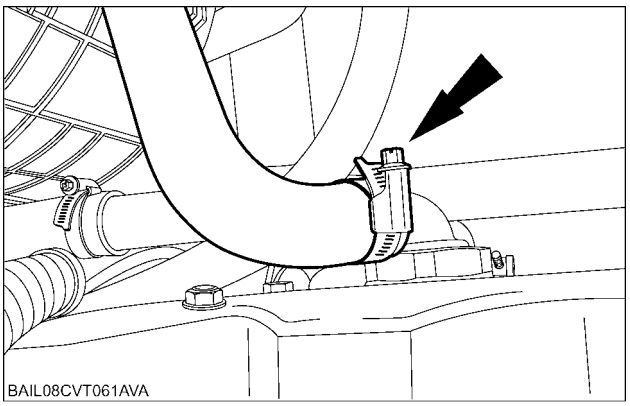
B012

1. Disconnect the charge air cooler outlet pipe from the intake manifold.



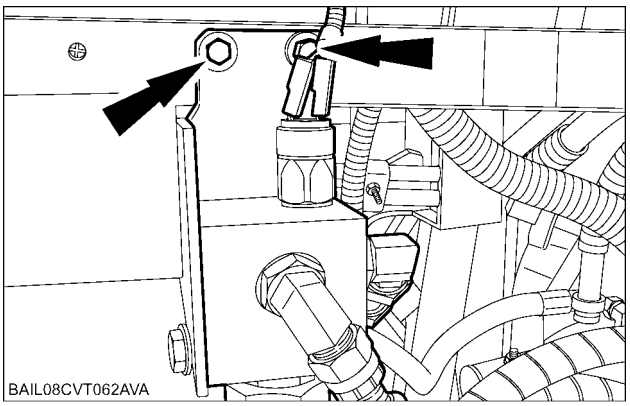
BAIL08CVT060AVA 1

2. Disconnect the cam cover breather pipe.



BAIL08CVT061AVA 2

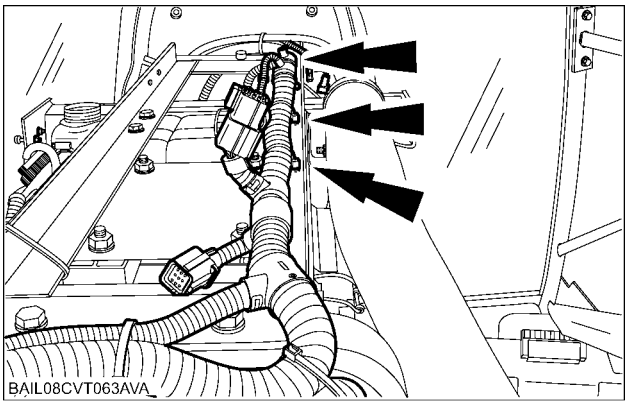
3. Disconnect the electrical connectors and detach the front brake accumulator valve from the air filter frame.



BAIL08CVT062AVA 3

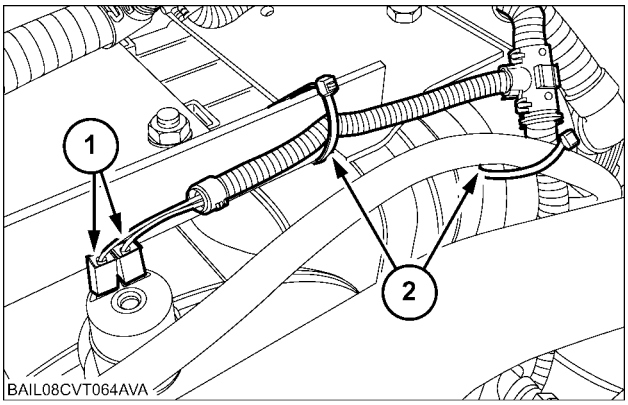
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4. Detach the wiring loom from the left-hand side of the air filter frame.



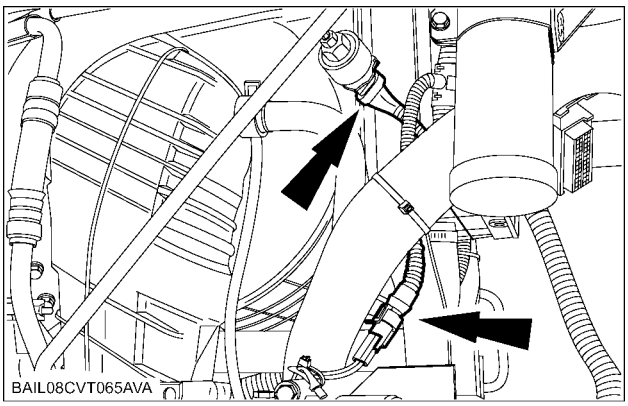
BAIL08CVT063AVA 4

5. Disconnect the air intake vacuum sensor electrical connectors **(1)**.
Cut the cable ties **(2)** to detach the wiring loom from the right-hand side of the air filter frame.



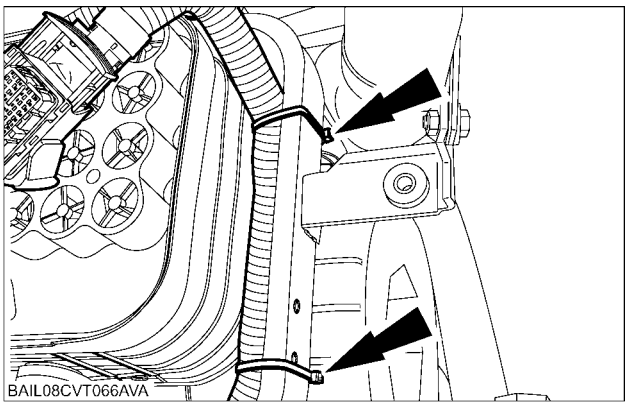
BAIL08CVT064AVA 5

6. Disconnect the air conditioning (A/C) high/low pressure switch and the A/C compressor magnetic clutch electrical connector.



BAIL08CVT065AVA 6

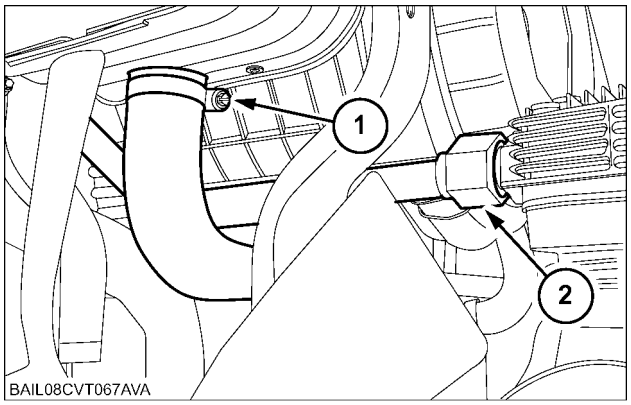
7. Detach the wiring loom from the left-hand front of the air filter frame.



BAIL08CVT066AVA 7

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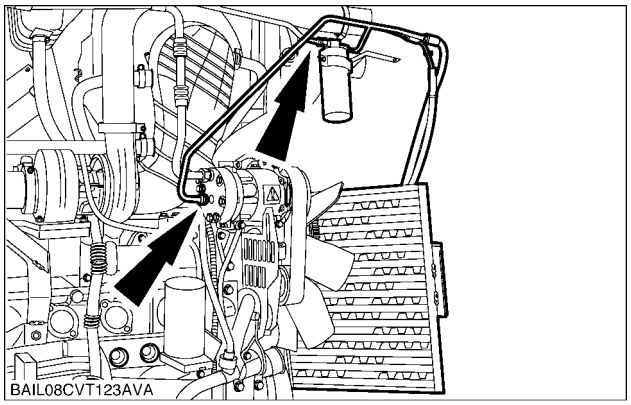
8. Disconnect the aspirator hose from the air filter intake housing **(1)**.
Disconnect the air compressor supply pipe **(2)**.



BAIL08CVT067AVA 8

9. Remove the receiver drier and condenser.

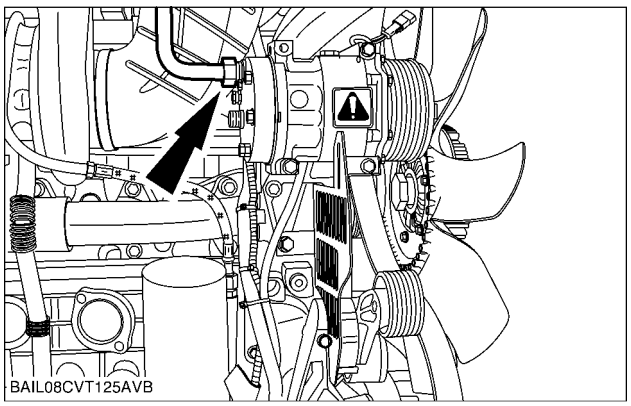
NOTE: *Cap all open connections to prevent contamination of the system.*



BAIL08CVT123AVA 9

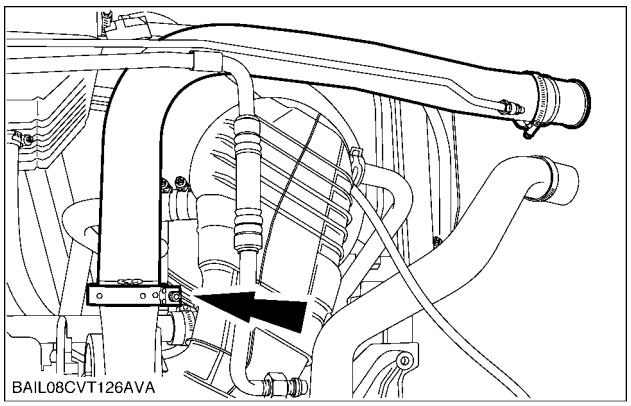
10. Disconnect the A/C compressor low pressure pipe.

NOTE: *Cap all open connections to prevent contamination of the system.*



BAIL08CVT125AVB 10

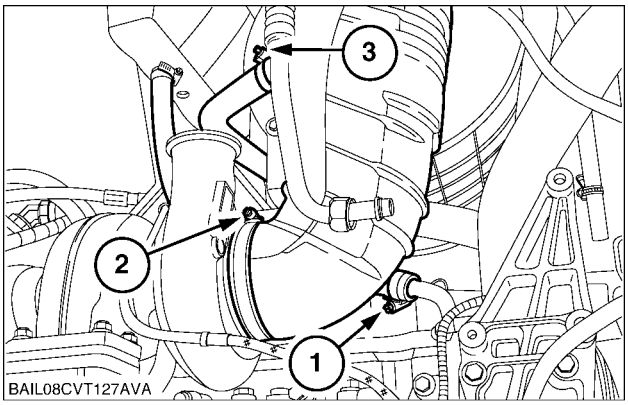
11. Remove the charge air cooler intake pipe.



BAIL08CVT126AVA 11

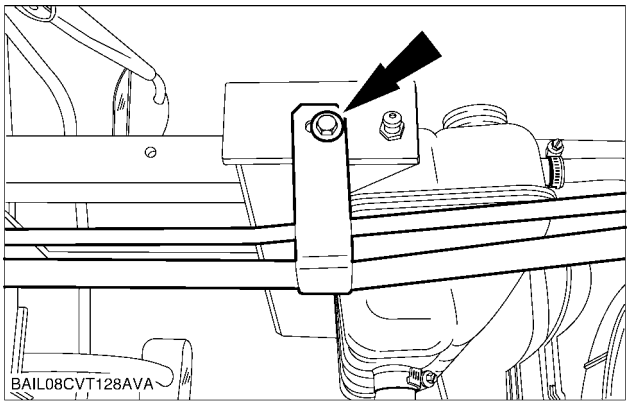
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12. Disconnect the expansion tank hose **(1)**.
Detach the air intake pipe from the turbocharger **(2)**.
Disconnect cam cover breather hose **(3)**.



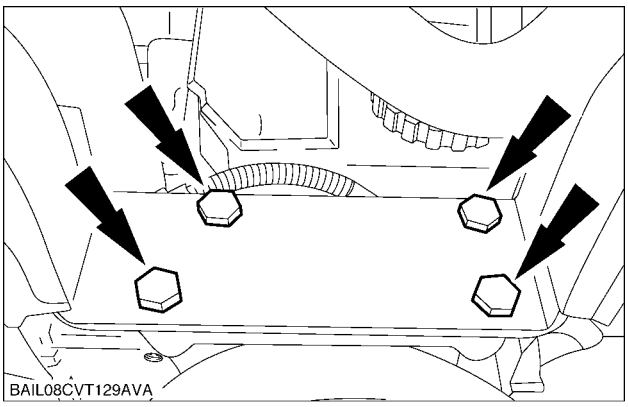
BAIL08CVT127AVA 12

13. Detach the air conditioning pipe bracket from the air filter frame.



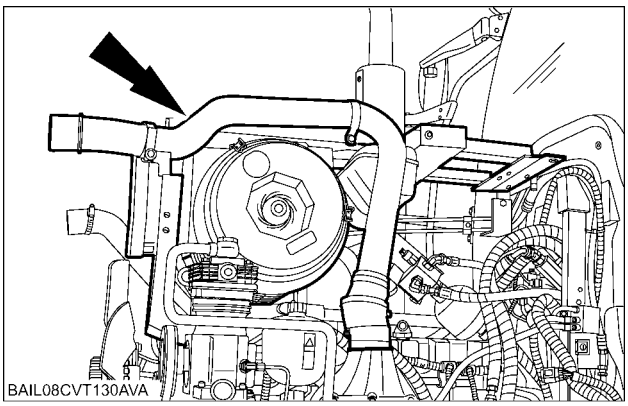
BAIL08CVT128AVA 13

14. Remove the air filter frame front retaining bolts.



BAIL08CVT129AVA 14

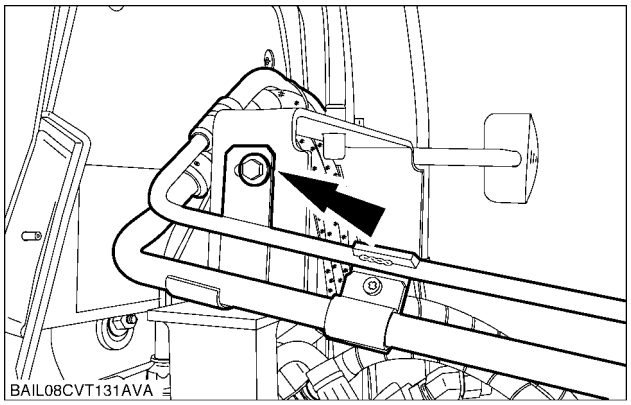
15. Remove the air filter frame, charge air cooler outlet pipe, expansion tank and air filter as an assembly.



BAIL08CVT130AVA 15

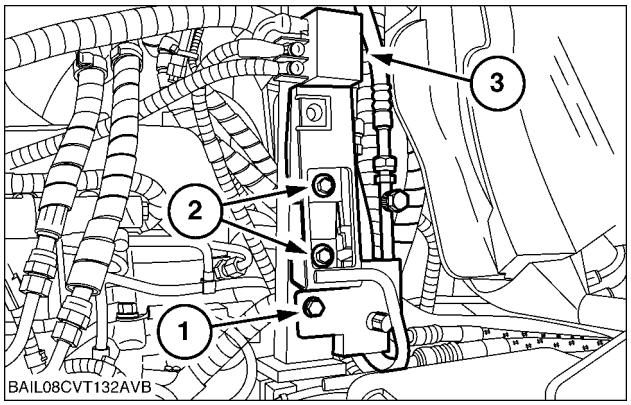
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16. Detach the A/C pipe bracket from the air filter frame support.



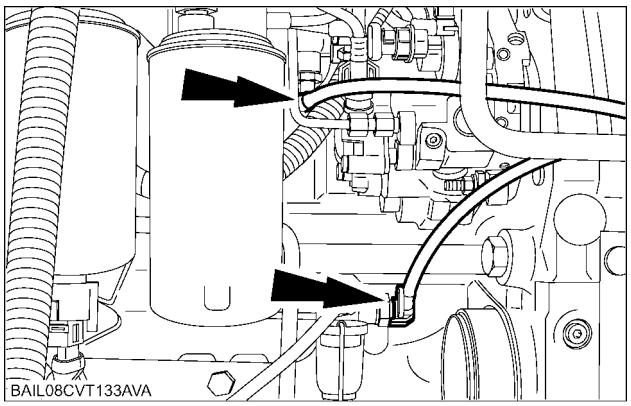
BAIL08CVT131AVA 16

17. Remove the left-hand engine side panel support bracket **(1)**,
Detach the A/C pipe bracket **(2)** and grid heater relay **(3)** from the air filter frame support.



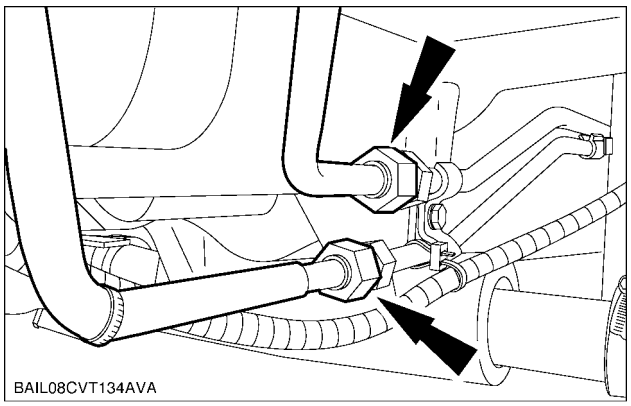
BAIL08CVT132AVB 17

18. Disconnect the fuel supply and return lines.



BAIL08CVT133AVA 18

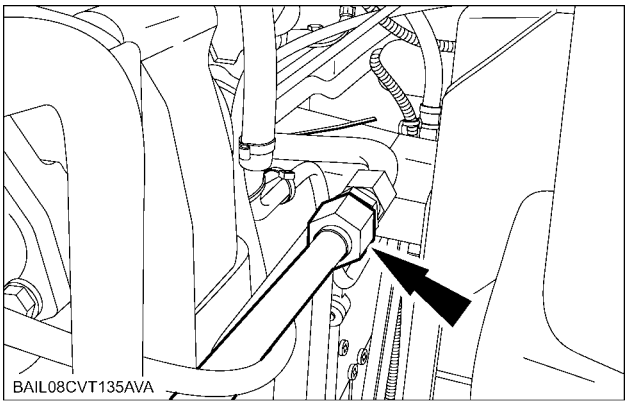
19. Disconnect the diff lock and suspension pipes.



BAIL08CVT134AVA 19

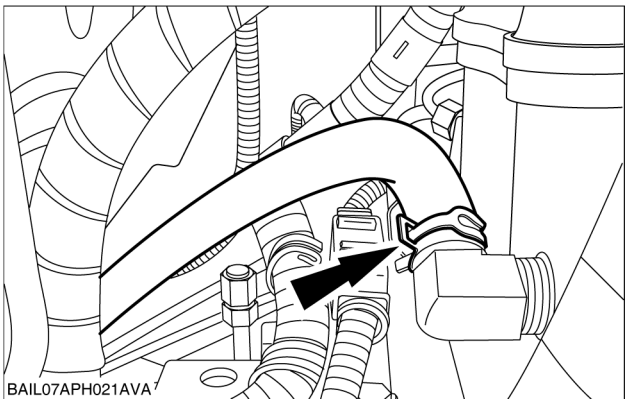
www.truck-freeworkshop.com

20. Disconnect the trailer brake air supply pipe.



BAIL08CVT135AVA 20

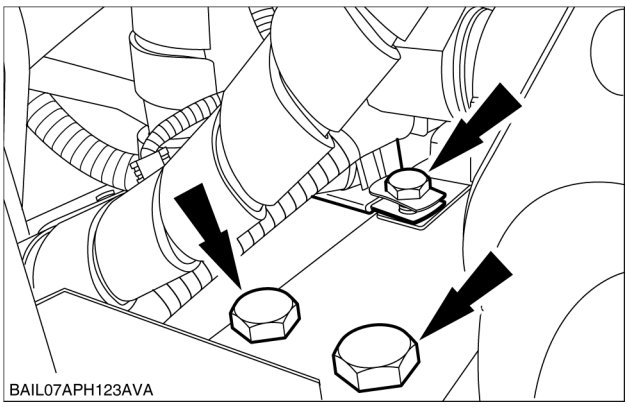
21. Disconnect the heater supply hose from the rear of the engine cylinder head.



BAIL07APH021AVA 21

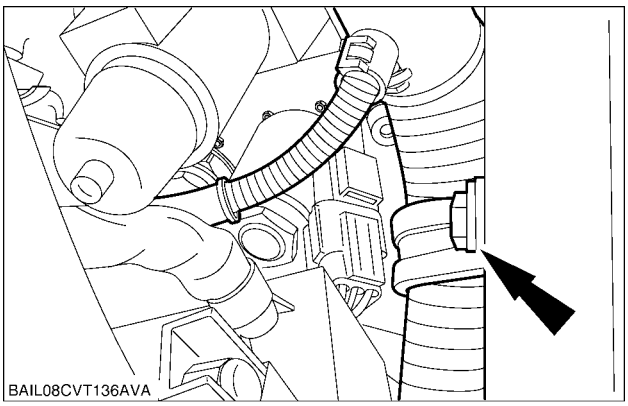
22. Remove the air filter frame support left-hand rear mounting bolts and wiring loom clamp.

NOTE: *Repeat this step for the right-hand side of vehicle.*



BAIL07APH123AVA 22

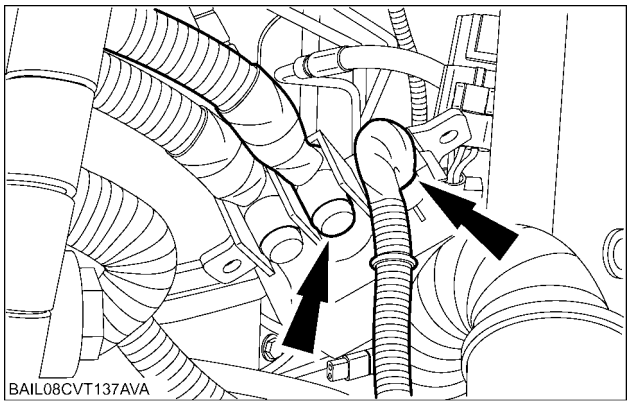
23. Detach the wiring loom from the air filter frame support.



BAIL08CVT136AVA 23

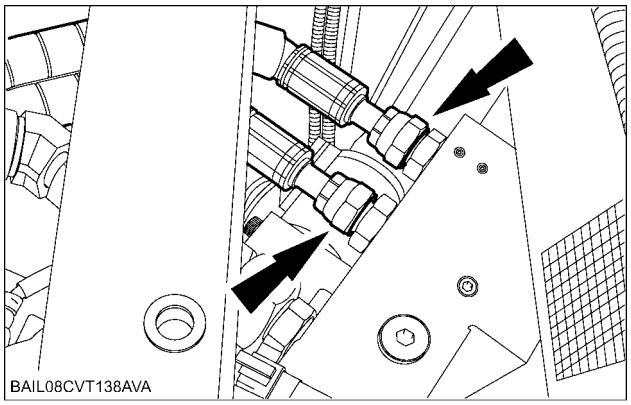
www.truck-freeworkshop.com

24. Disconnect the grid heater relay supply and electrical connector.



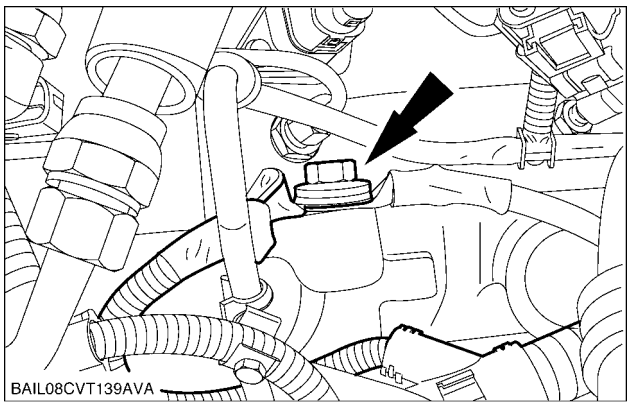
BAIL08CVT137AVA 24

25. Disconnect the steering hoses.



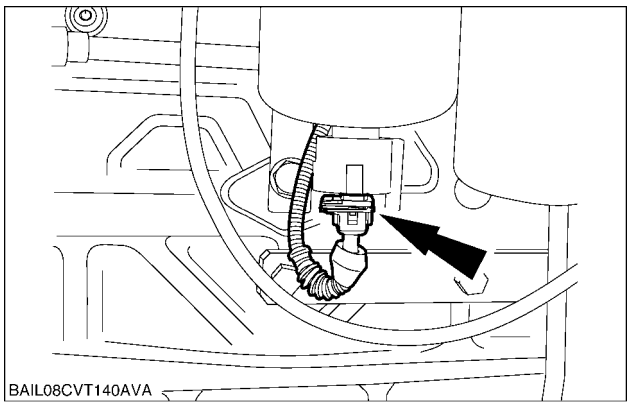
BAIL08CVT138AVA 25

26. Detach the wiring loom from the intake manifold.



BAIL08CVT139AVA 26

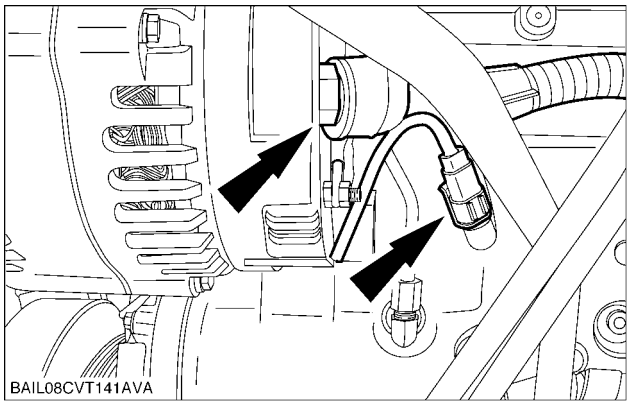
27. Disconnect the water-in-fuel sensor.



BAIL08CVT140AVA 27

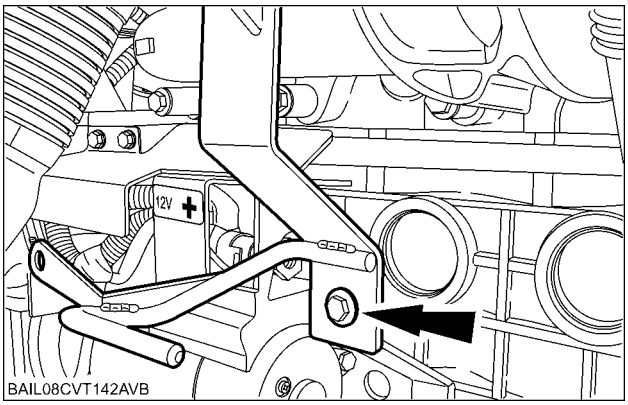
www.truck-freeworkshop.com

28. Disconnect the alternator electrical connectors and feed the loom back along the engine.



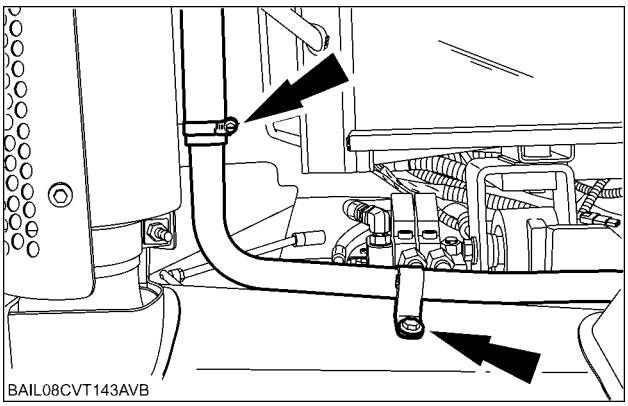
BAIL08CVT141AVA 28

29. Detach the right-hand engine side panel support bracket



BAIL08CVT142AVB 29

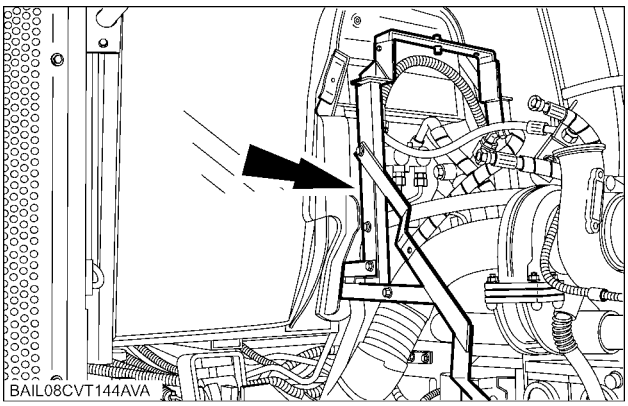
30. Remove the air filter aspirator pipe.



BAIL08CVT143AVB 30

31. Remove the air filter frame support.

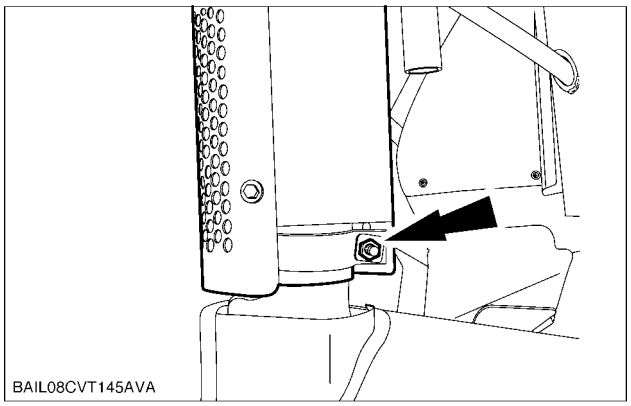
NOTE: *When removing the air filter frame support, take care to pass all hoses and wiring looms through the frame.*



BAIL08CVT144AVA 31

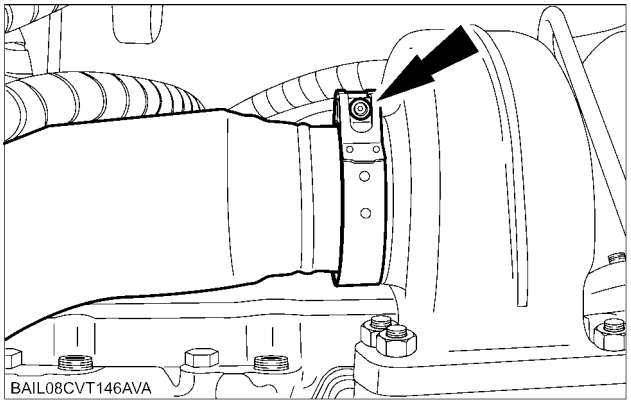
www.truck-freeworkshop.com

32. Remove the muffler.



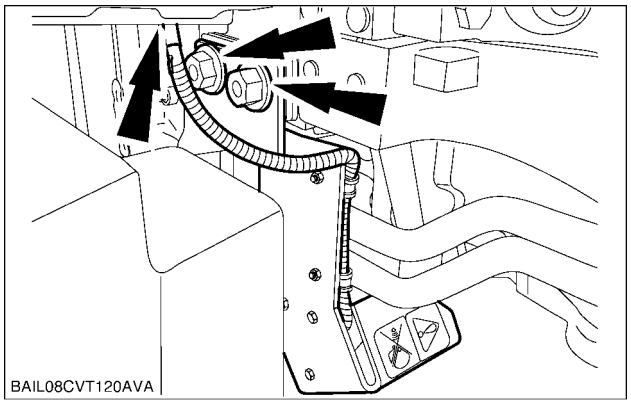
BAIL08CVT145AVA 32

33. Disconnect the turbocharger exhaust outlet.



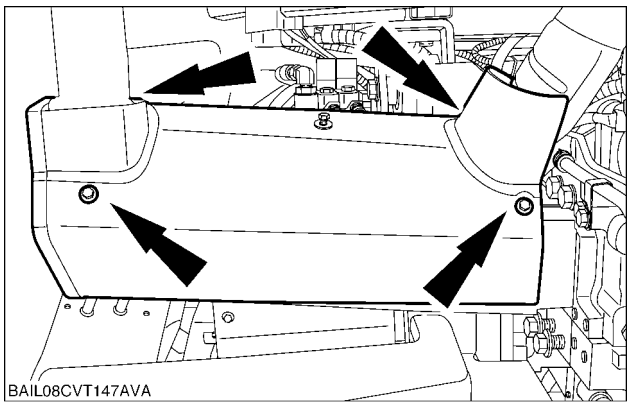
BAIL08CVT146AVA 33

34. Disconnect the electrical connector and remove the radar.



BAIL08CVT120AVA 34

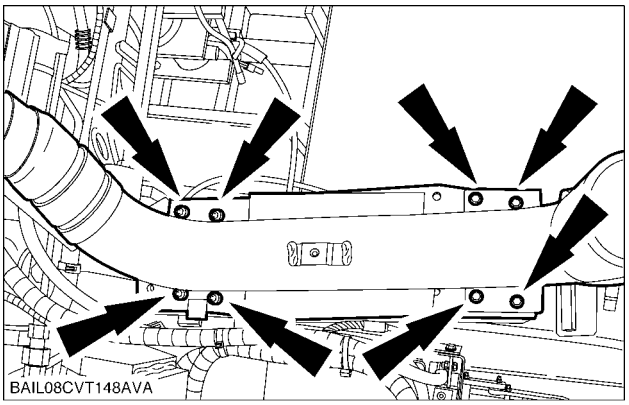
35. Remove the exhaust heat shield.



BAIL08CVT147AVA 35

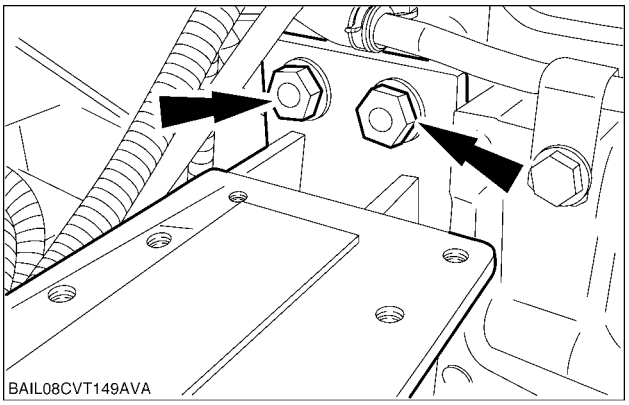
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36. Remove the exhaust.



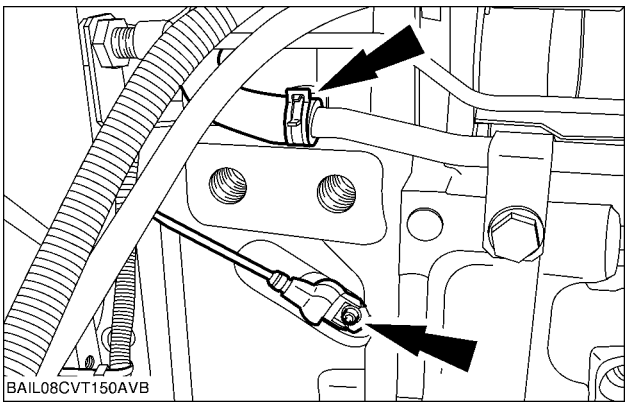
BAIL08CVT148AVA 36

37. Remove the exhaust support.



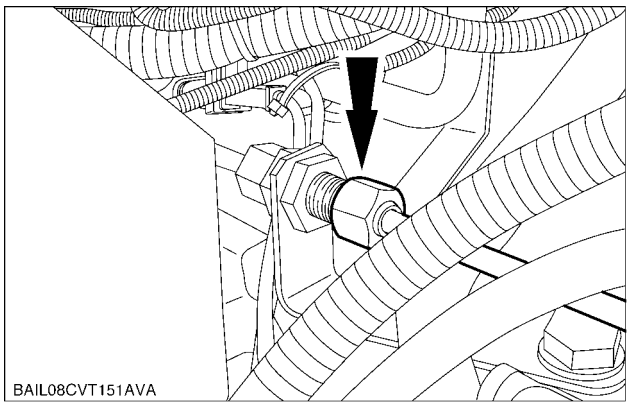
BAIL08CVT149AVA 37

38. Disconnect the flywheel speed sensor and the heater return hose.



BAIL08CVT150AVB 38

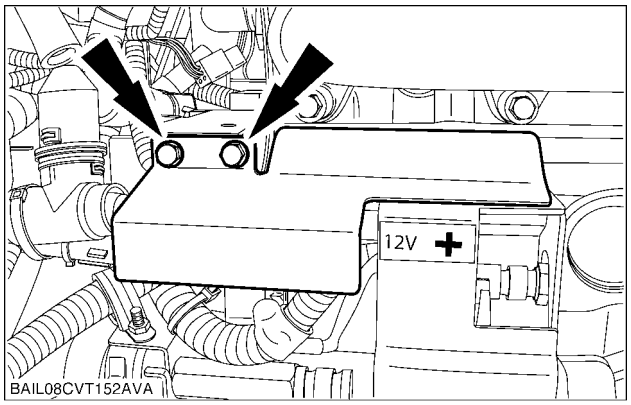
39. Disconnect the brake pipe.



BAIL08CVT151AVA 39

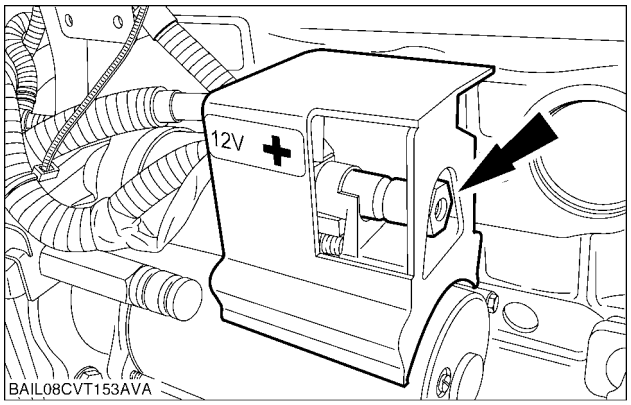
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40. Remove the starter motor shield.



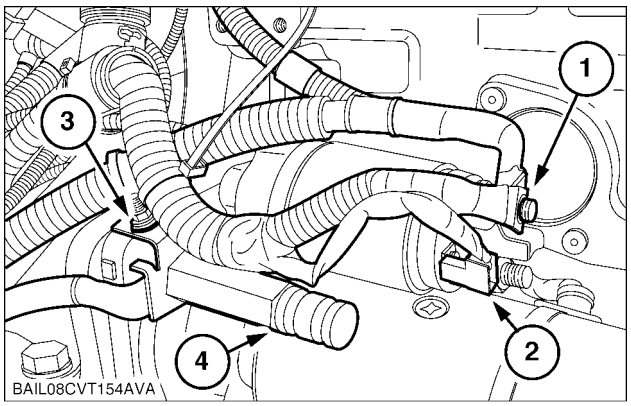
BAIL08CVT152AVA 40

41. Remove the positive jump start terminal cover.



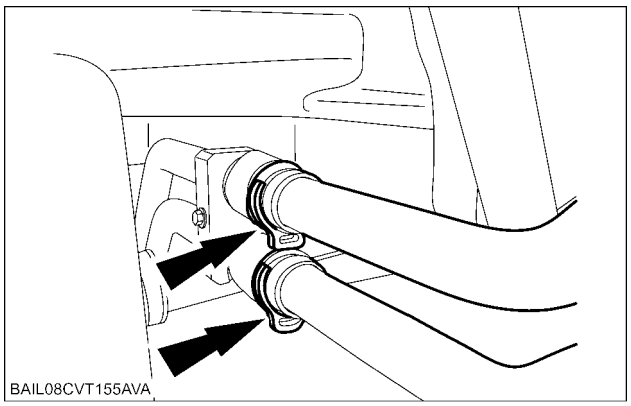
BAIL08CVT153AVA 41

42. Disconnect the three starter motor cables **(1)**.
Disconnect the spade connector **(2)**.
Remove the positive cable retaining bracket **(3)**.
Disconnect the negative jump start terminal **(4)**.



BAIL08CVT154AVA 42

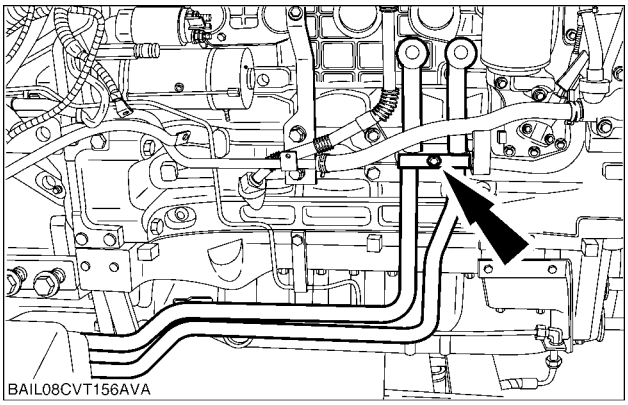
43. Disconnect the oil cooler quick release couplers.



BAIL08CVT155AVA 43

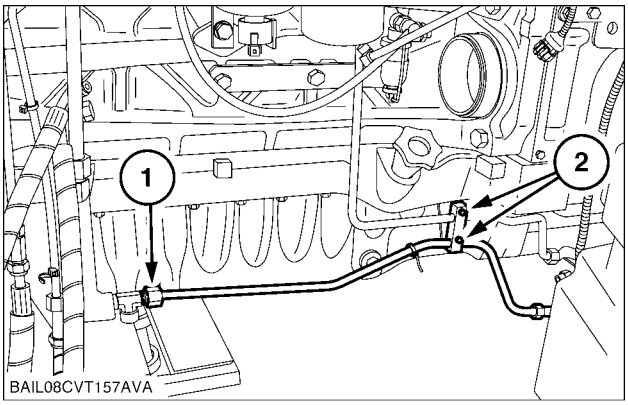
www.truck-freeworkshop.com

44. Remove the retaining bracket and remove the oil cooler pipes.



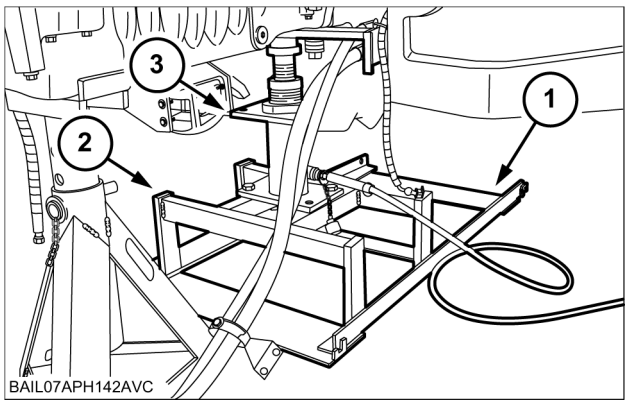
BAIL08CVT156AVA 44

45. Disconnect the diff lock supply pipe **(1)**.
Remove the pipe bracket **(2)** and remove the diff lock pipe.



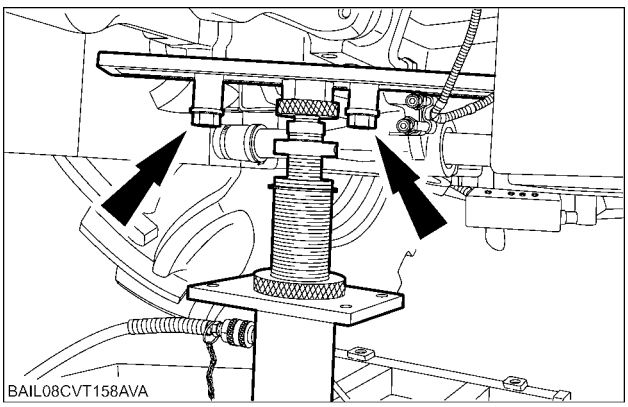
BAIL08CVT157AVA 45

46. Position the splitting gear **(1) MS2700C-1**, **(2) MS2700C-2**, **(3) MS2700C-4** under the transmission.



BAIL07APH142AVC 46

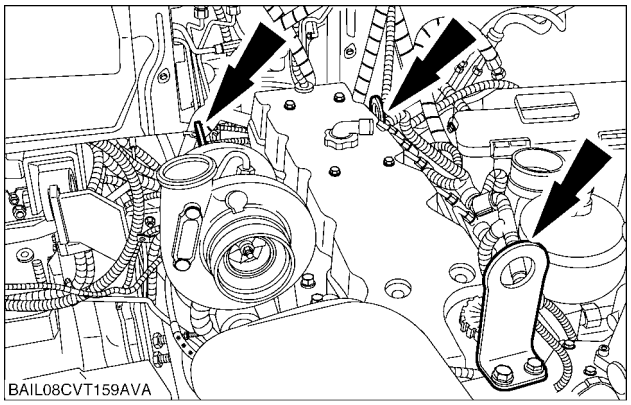
47. Secure the splitting gear to the transmission.



BAIL08CVT158AVA 47

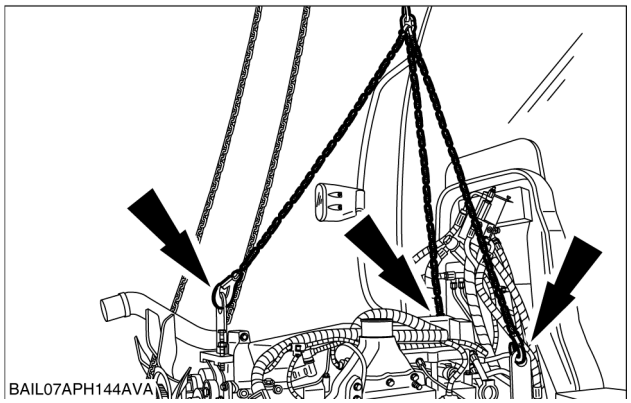
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48. Install the three lifting eyes **380200013** to the engine.



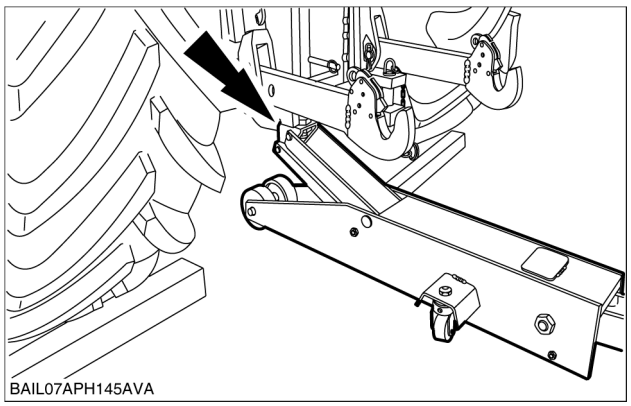
BAIL08CVT159AVA 48

49. Take the weight of the engine using a suitable hoist.



BAIL07APH144AVA 49

50. Support the rear of the vehicle.

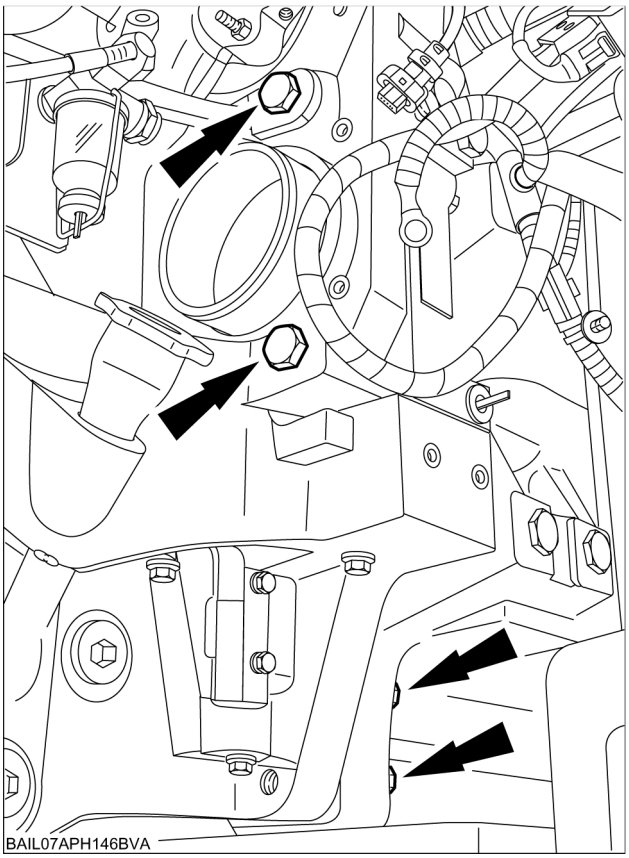


BAIL07APH145AVA 50

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51. Remove the left-hand side engine to transmission securing bolts.

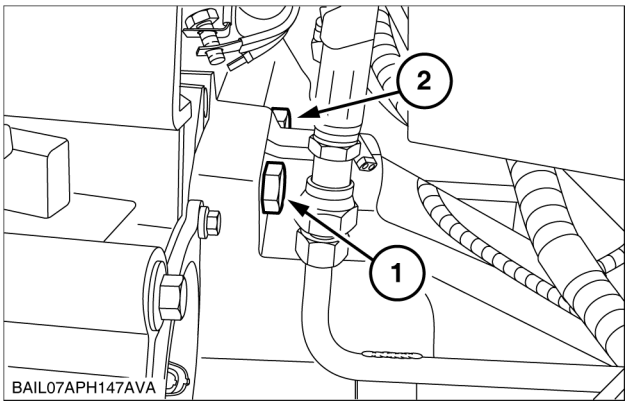
NOTE: *Repeat this step for the right hand side.*



BAIL07APH146BVA 51

52. Remove the engine to transmission centre securing bolt **(2)**. Remove the engine to transmission top left-hand securing bolt **(1)**.

NOTE: *Repeat this step for the right hand side.*



BAIL07APH147AVA 52

53. Separate the engine from the transmission.

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ENGINE - Disconnect (for vehicles with suspended front axle refer to Engine Remove)

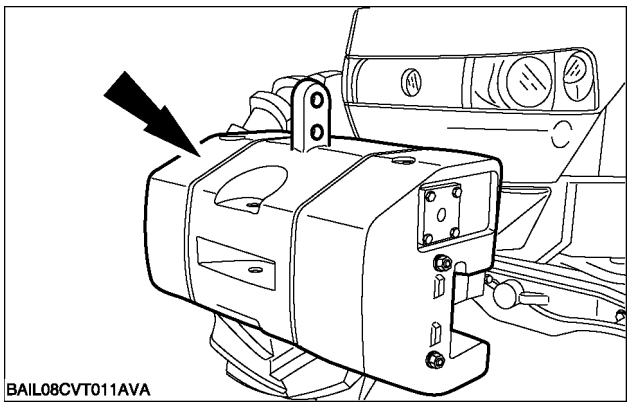
Prior operation:
Disconnect battery, for further information refer to **Battery - Disconnect (A.30.A)**
Prior operation:
Drain the engine coolant, for further information refer to **ENGINE COOLANT SYSTEM - Drain fluid (B.50.A)**
Prior operation:
Discharge the air conditioning system, for further information refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Discharging (E.40.D)**

⚠ **WARNING** ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

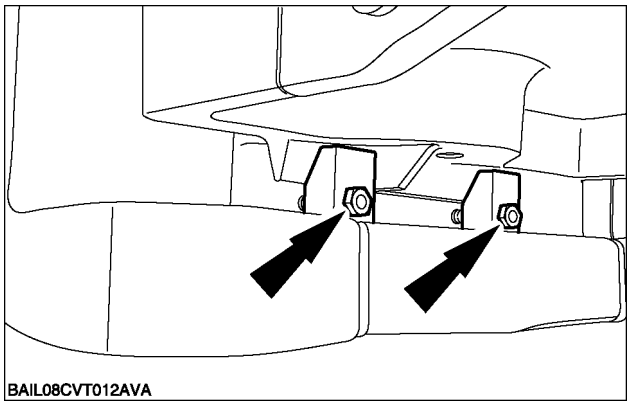
B012

1. Using suitable lifting equipment support the front weights.



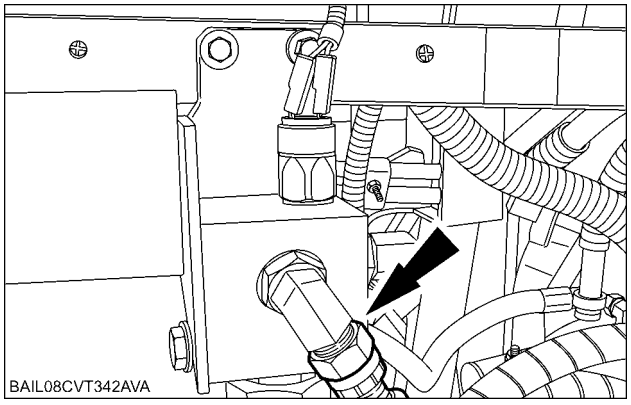
BAIL08CVT011AVA 1

2. Disconnect and remove the front weights from the weight carrier.



BAIL08CVT012AVA 2

3. Disconnect the brake accumulator hose.

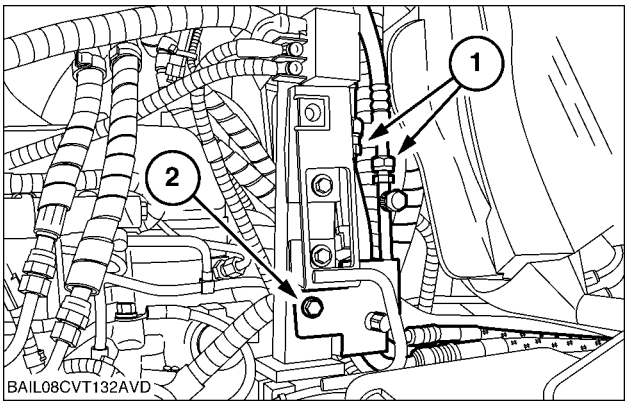


BAIL08CVT342AVA 3

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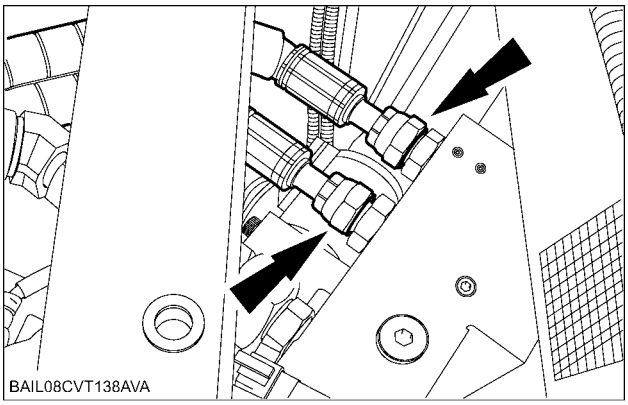
4. Disconnect the air conditioning (A/C) hoses **(1)** and detach the pipe bracket **(2)**.

NOTE: *Cap all open connections to prevent contamination of the system.*



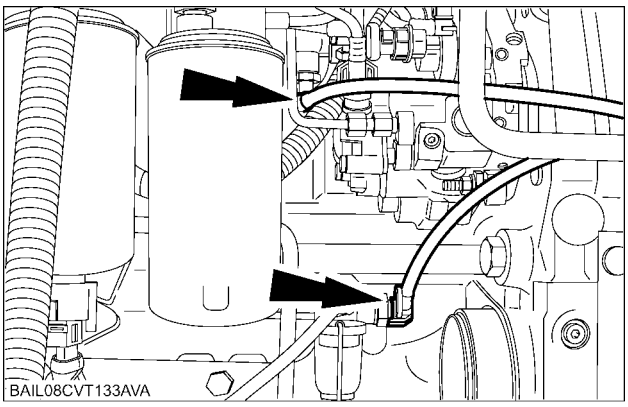
BAIL08CVT132AVD 4

5. Disconnect the steering hoses.



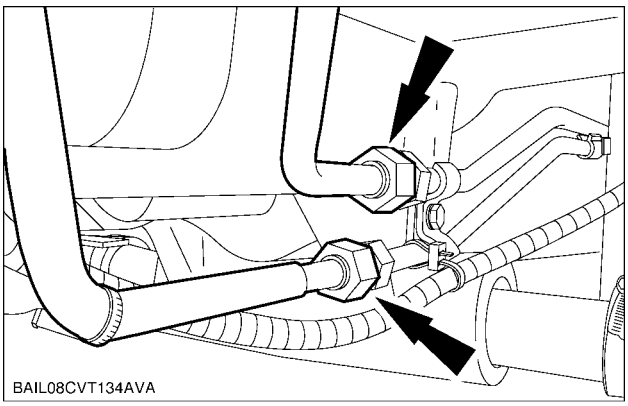
BAIL08CVT138AVA 5

6. Disconnect the fuel supply and return lines.



BAIL08CVT133AVA 6

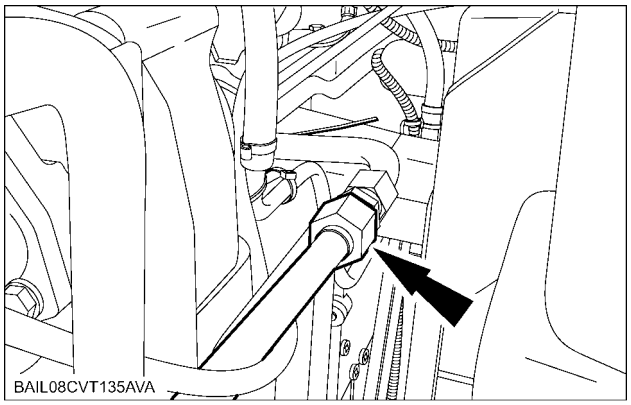
7. Disconnect the diff lock and suspension pipes.



BAIL08CVT134AVA 7

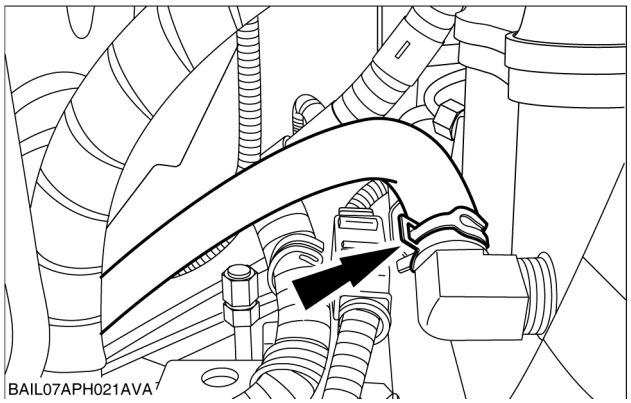
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8. Disconnect the trailer brake air supply pipe.



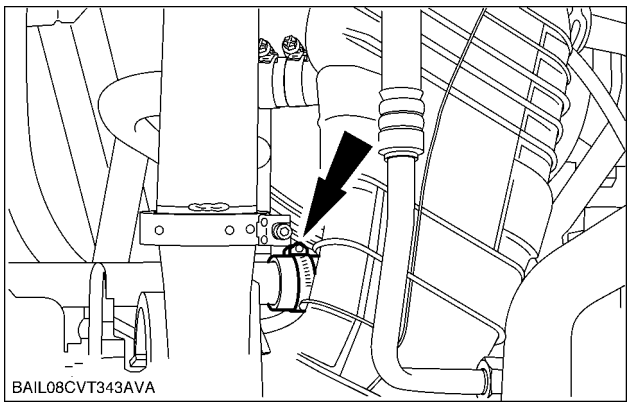
BAIL08CVT135AVA 8

9. Disconnect the heater supply hose from the rear of the engine cylinder head.



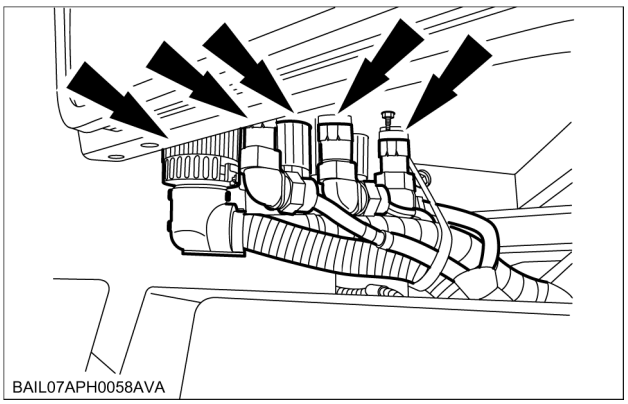
BAIL07APH021AVA 9

10. Disconnect the air filter aspirator hose.



BAIL08CVT343AVA 10

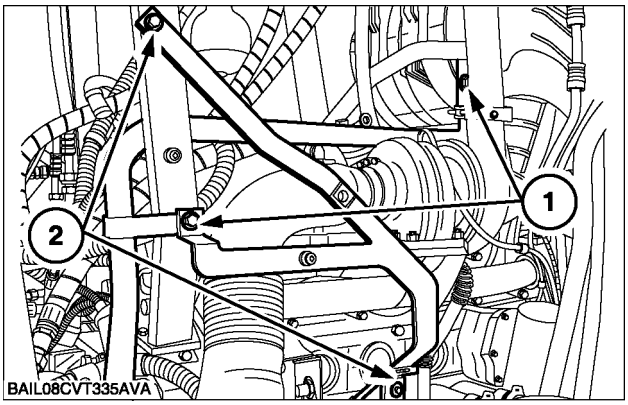
11. Disconnect the engine harness electrical connectors.



BAIL07APH058AVA 11

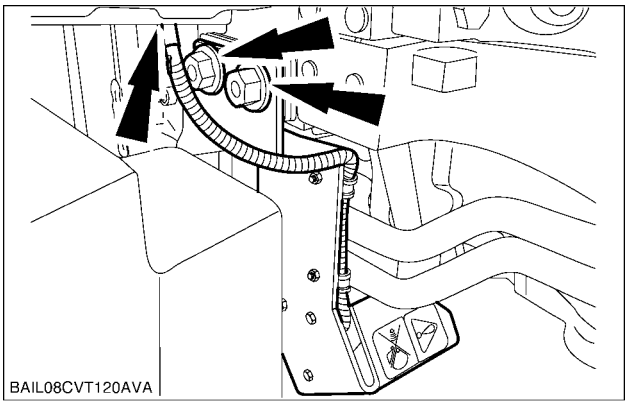
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12. Detach the air filter aspirator pipe brackets **(1)**, and remove the right-hand engine side panel support bracket **(2)**.



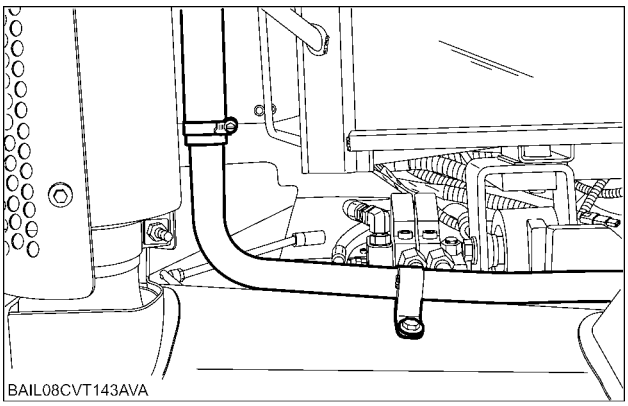
BAIL08CVT335AVA 12

13. Disconnect the electrical connector and remove the radar.



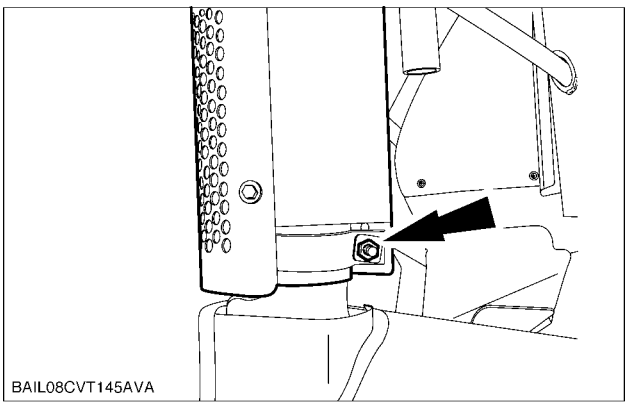
BAIL08CVT120AVA 13

14. Detach the air filter aspirator pipe.



BAIL08CVT143AVA 14

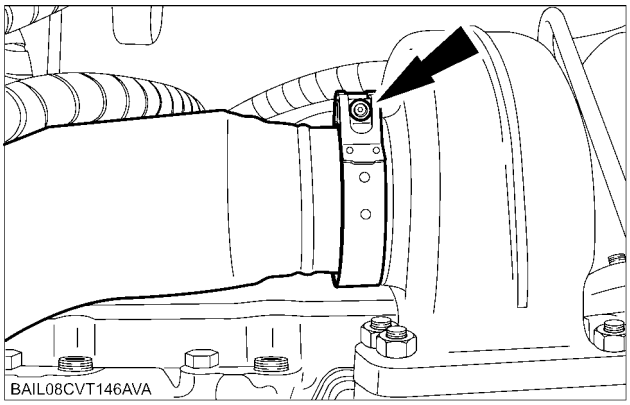
15. Remove the muffler.



BAIL08CVT145AVA 15

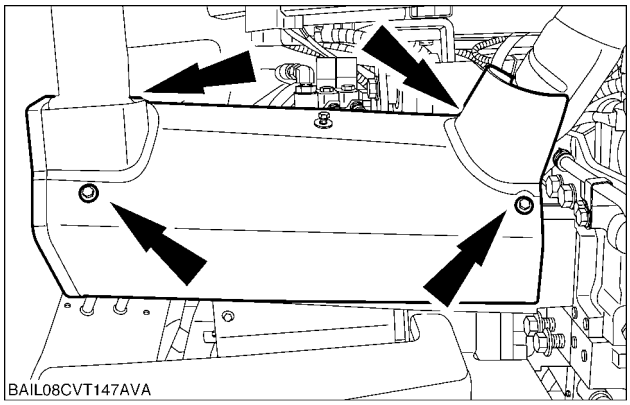
www.truck-freeworkshop.com

16. Disconnect the turbocharger exhaust outlet.



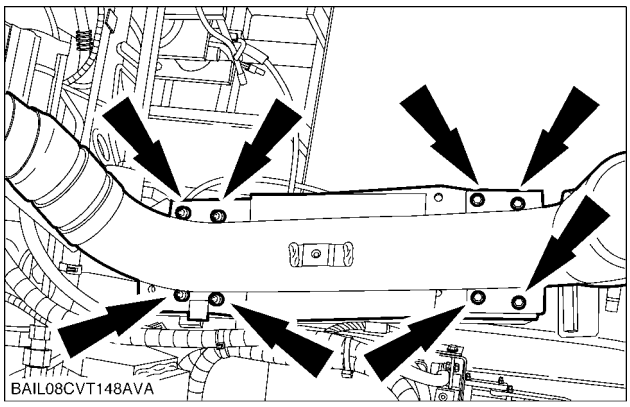
BAIL08CVT146AVA 16

17. Remove the exhaust heat shield.



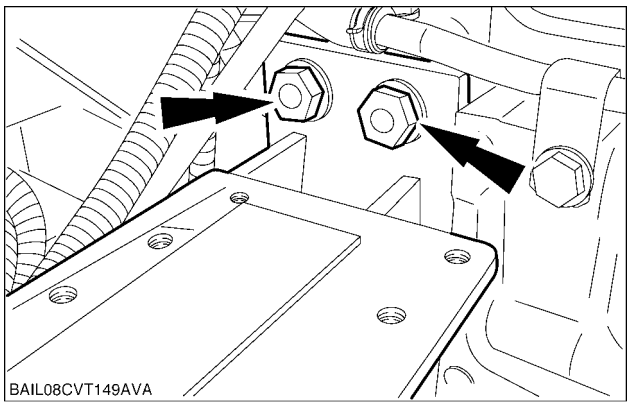
BAIL08CVT147AVA 17

18. Remove the exhaust.



BAIL08CVT148AVA 18

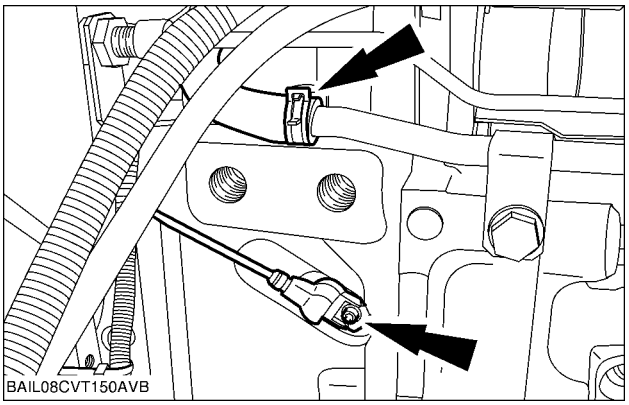
19. Remove the exhaust support.



BAIL08CVT149AVA 19

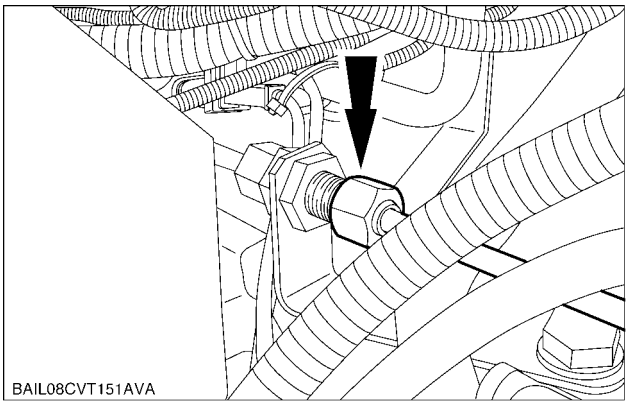
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20. Remove the flywheel speed sensor and disconnect the heater return hose.



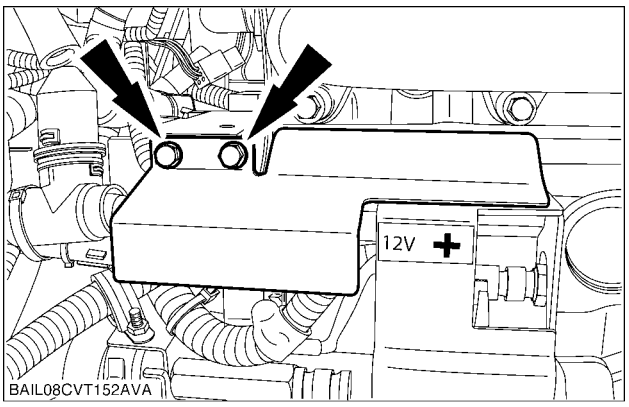
BAIL08CVT150AVB 20

21. Disconnect the brake pipe.



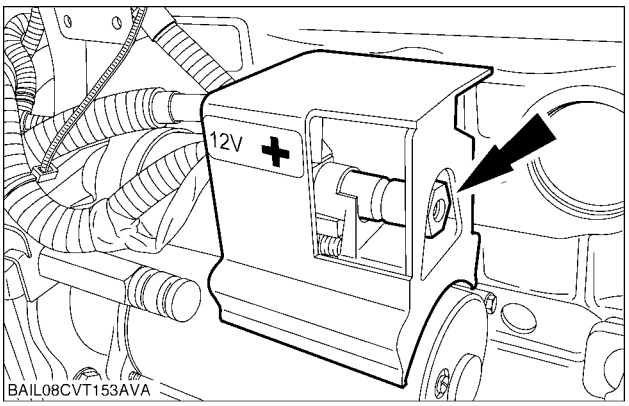
BAIL08CVT151AVA 21

22. Remove the starter motor shield.



BAIL08CVT152AVA 22

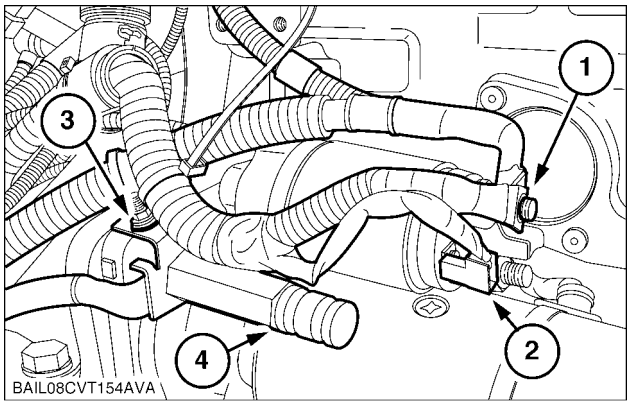
23. Remove the positive jump start terminal cover.



BAIL08CVT153AVA 23

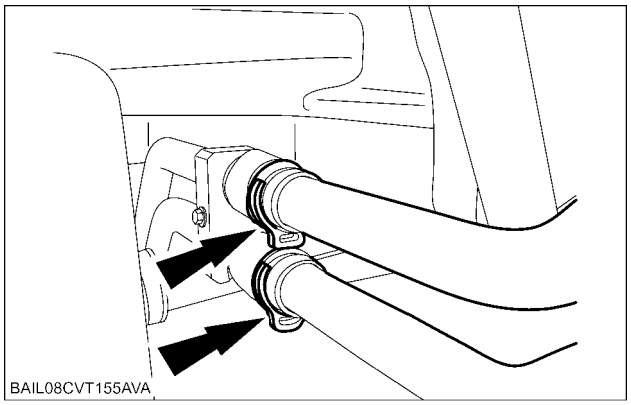
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24. Disconnect the three starter motor cables **(1)**.
Disconnect the spade connector **(2)**.
Remove the positive cable retaining bracket **(3)**.
Disconnect the negative jump start terminal **(4)**.



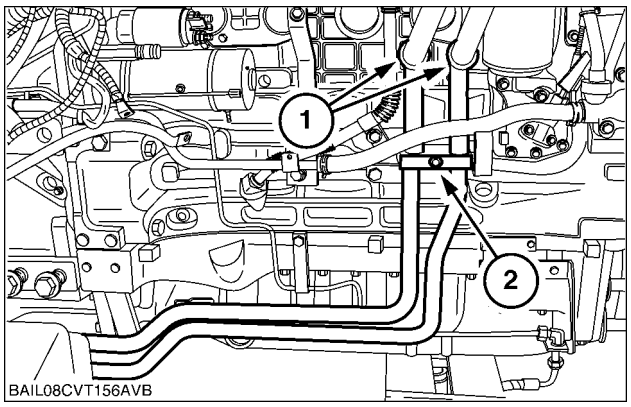
BAIL08CVT154AVA 24

25. Disconnect the oil cooler quick release couplers.



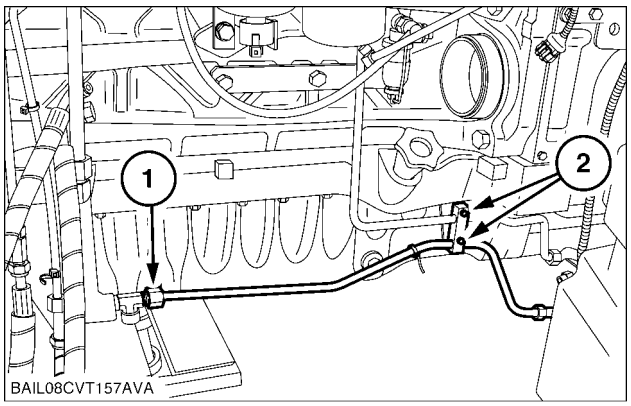
BAIL08CVT155AVA 25

26. Disconnect the quick release couplers **(1)**, remove the pipe bracket **(2)** and remove the oil cooler pipes.



BAIL08CVT156AVB 26

27. Disconnect the diff lock supply pipe **(1)**.
Remove the pipe bracket **(2)** and remove the diff lock pipe.

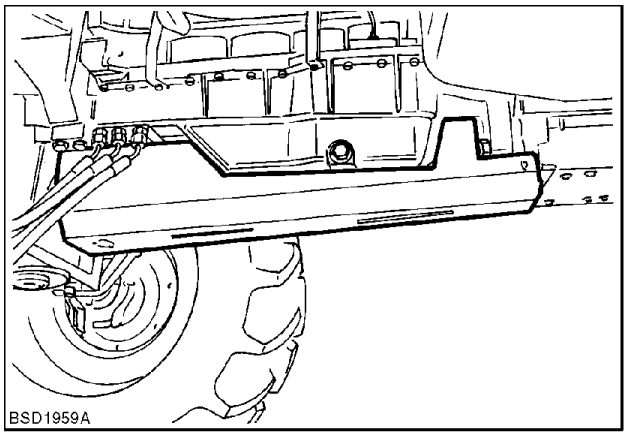


BAIL08CVT157AVA 27

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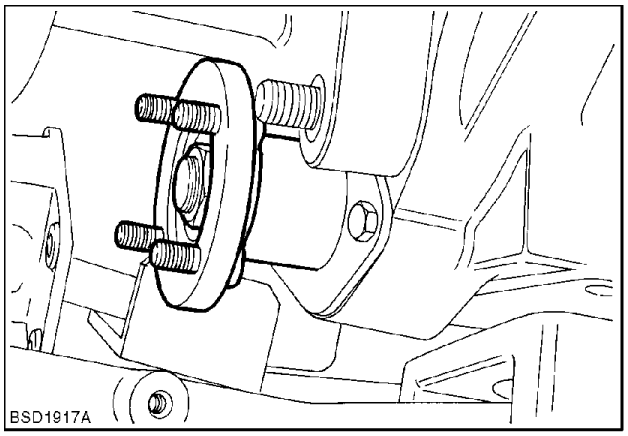
28. Remove the front wheel drive shaft guard and drive shaft.

NOTE: *The type of drive shaft fitted is dependant on type of front axle installed.*



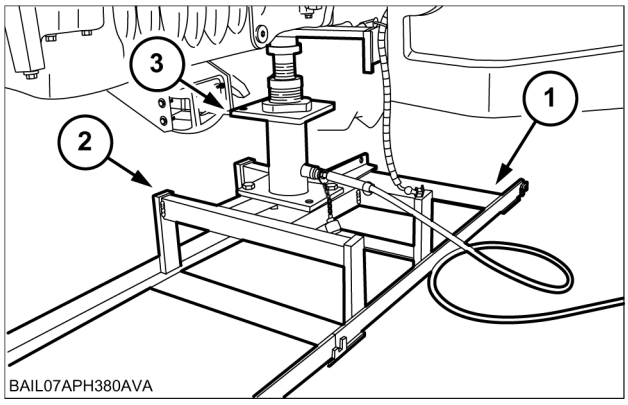
BSD1959A 28

29. Remove the drive shaft flange, where fitted.



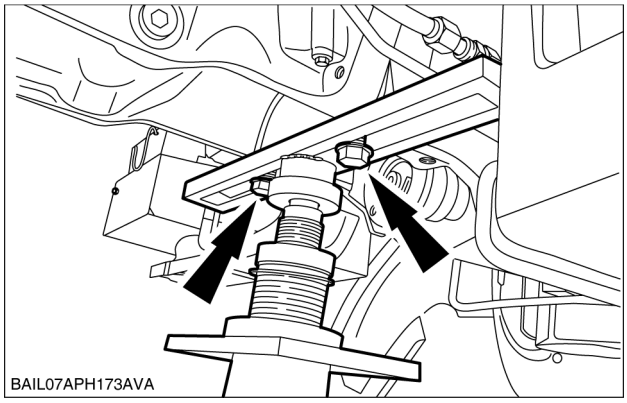
BSD1917A 29

30. Position the splitting gear **(1) MS2700C-1**, **(2) MS2700C-2**, **(3) MS2700C-4** under the transmission.



BAIL07APH380AVA 30

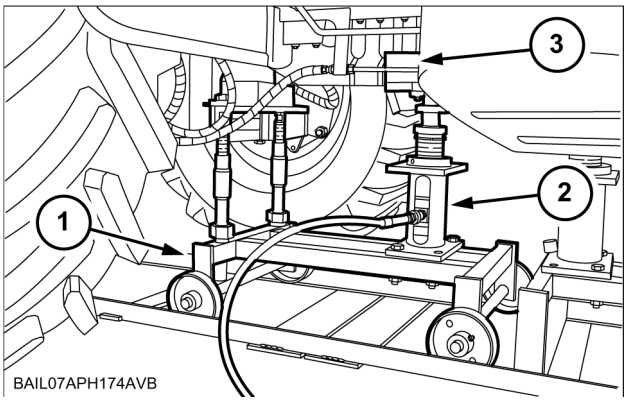
31. Secure the splitting gear to the transmission housing.



BAIL07APH173AVA 31

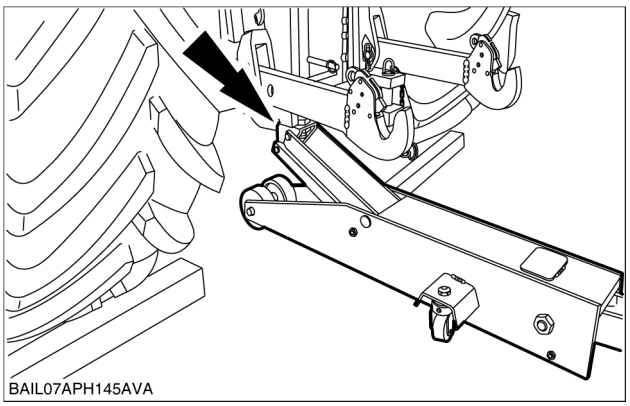
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32. Install the wheeled part of the splitting gear under the engine **(1) MS2700C-3 (2) MS2700C-4 (3) MS2700-3/33**.



BAIL07APH174AVB 32

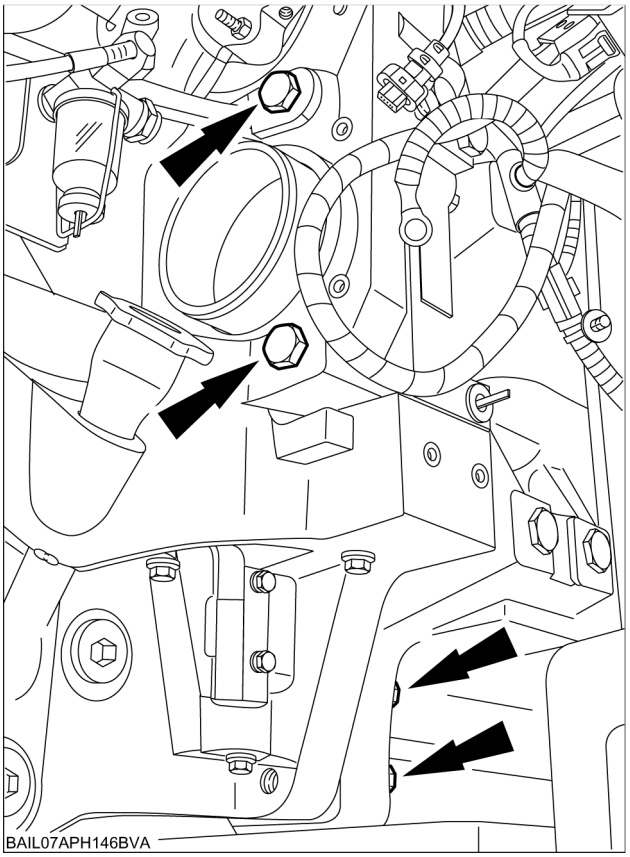
33. Support the rear of the vehicle.



BAIL07APH145AVA 33

34. Remove the left-hand side engine to transmission securing bolts.

NOTE: *Repeat this step for the right-hand side.*

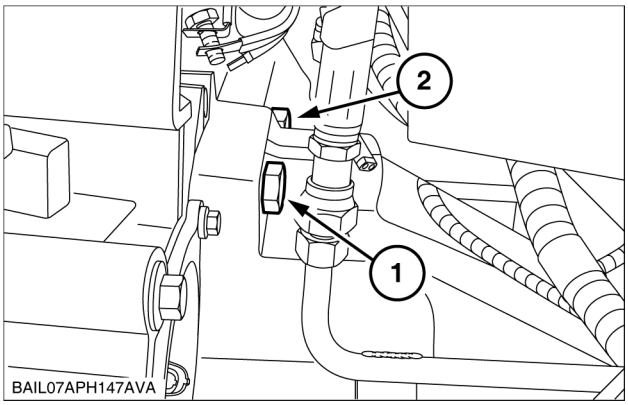


BAIL07APH146BVA 34

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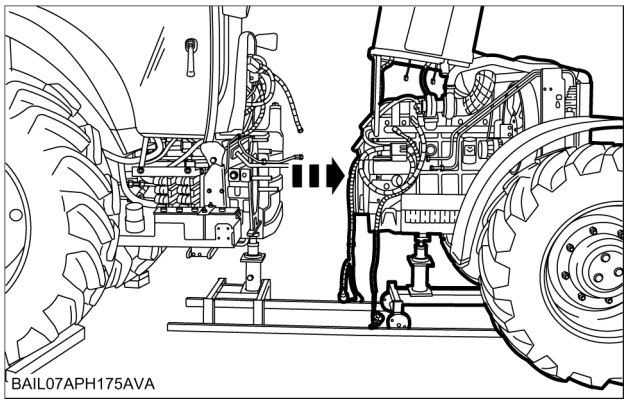
35. Remove the centre engine to transmission securing bolt **(2)**. Remove the top left-hand engine to transmission securing bolt **(1)**.

NOTE: *Repeat this step for the right-hand side.*



BAIL07APH147AVA 35

36. Separate the engine from the transmission.



BAIL07APH175AVA 36

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ENGINE - Install

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

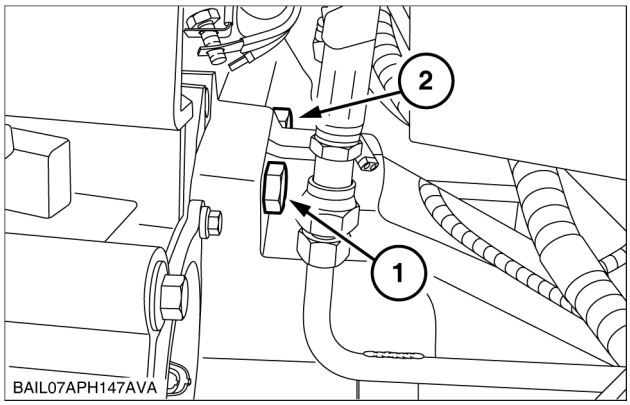
⚠ WARNING ⚠

Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

B020

1. Thoroughly clean the engine to transmission mating surfaces and apply a bead of sealant.
2. Using a suitable chain, connect the engine to a hoist.
3. Align the engine to the transmission and relocate.
4. Install the engine to transmission centre securing bolt **(2)**. Install the engine to transmission top left hand securing bolt **(1)**. Tighten to **285-315 Nm** (**210-232 lb ft**).

NOTE: *Repeat this step for the right-hand side.*

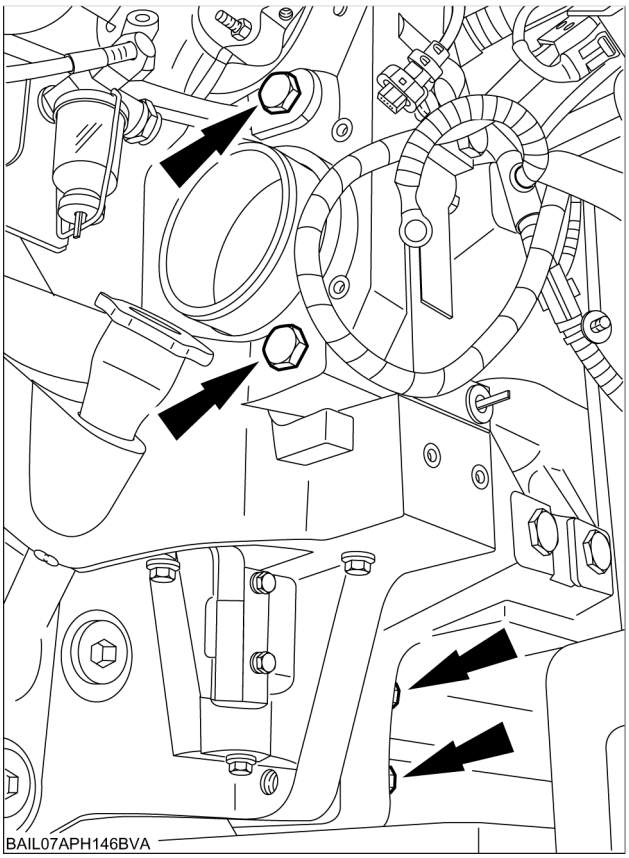


BAIL07APH147AVA 1

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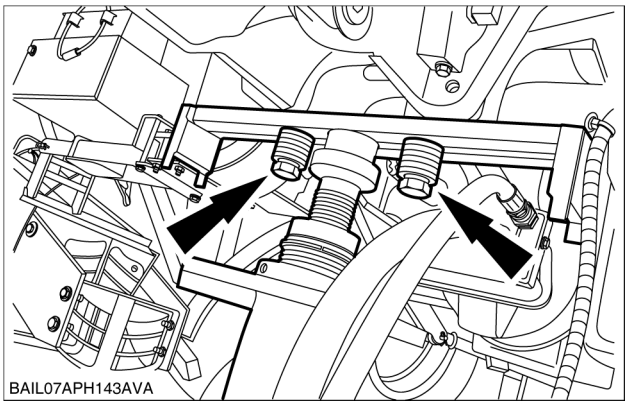
5. Install the left-hand side engine to transmission securing bolts.
   Tighten to **285-315 Nm** (**210-232 lb ft**).

NOTE: *Repeat this step for the right-hand side.*



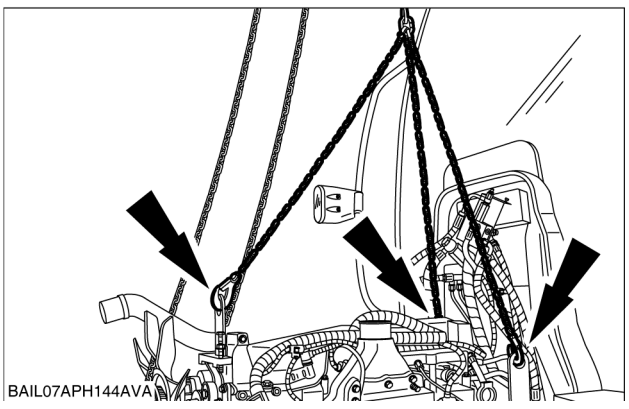
BAIL07APH146BVA 2

6. Disconnect the splitting gear and remove it from under the transmission.



BAIL07APH143AVA 3

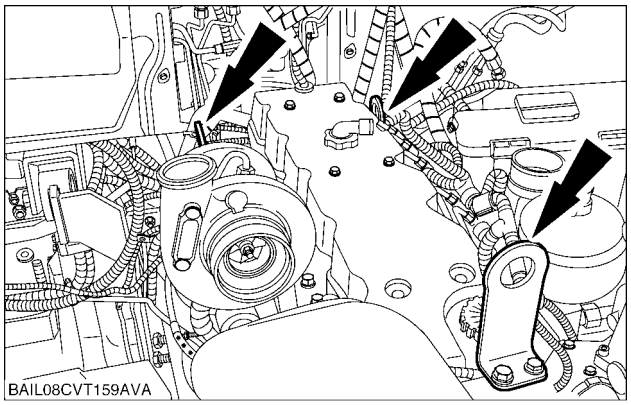
7. Remove the lifting gear from the engine.



BAIL07APH144AVA 4

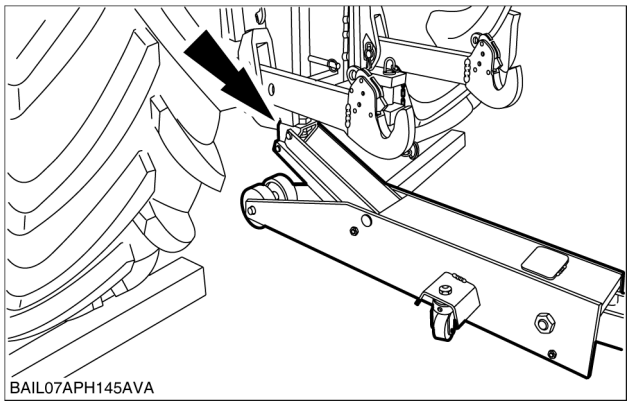
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8. Remove the three lifting eyes **380200013** from the engine.



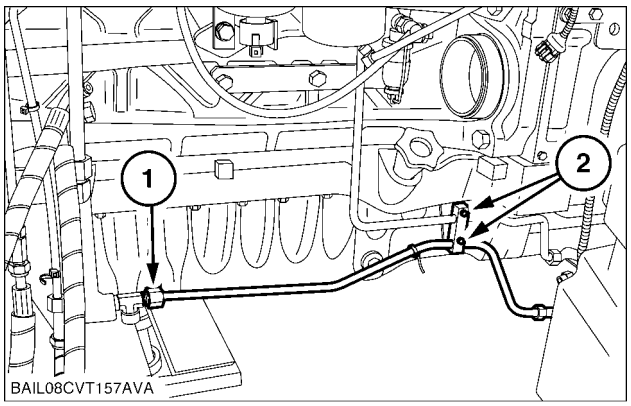
BAIL08CVT159AVA 5

9. Remove the support from the rear of the vehicle.



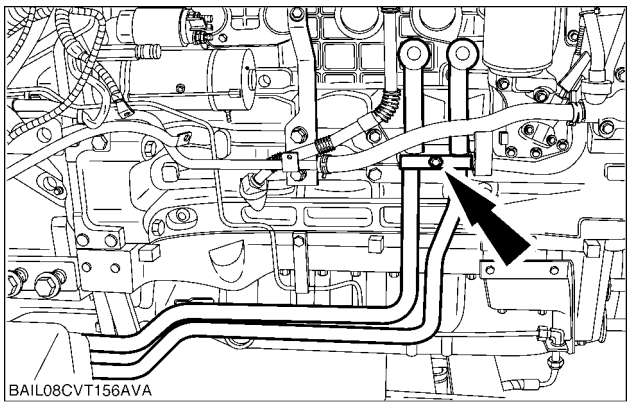
BAIL07APH145AVA 6

10. Install and connect the diff lock supply pipe **(1)**. Install the pipe bracket **(2)**.



BAIL08CVT157AVA 7

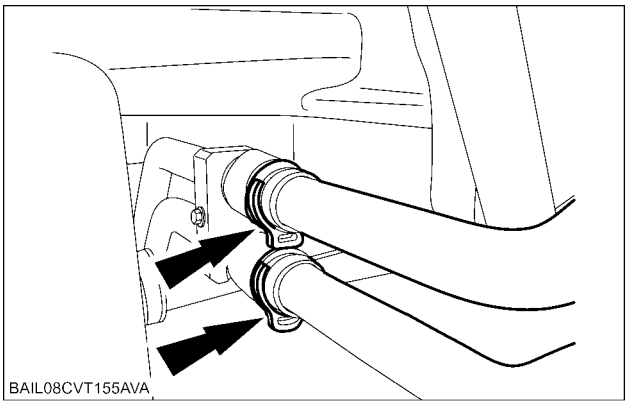
11. Install the oil cooler pipes and the retaining bracket.



BAIL08CVT156AVA 8

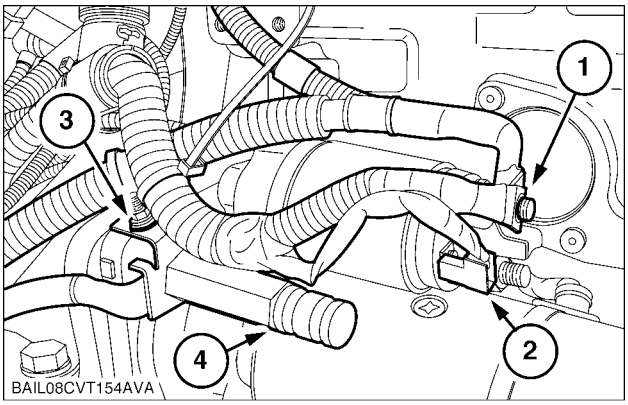
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12. Connect the oil cooler quick release couplers.



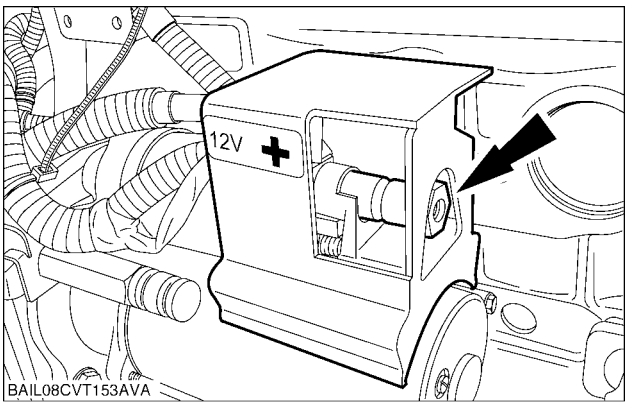
BAIL08CVT155AVA 9

13. Connect the three starter motor cables **(1)**.
Connect the spade connector **(2)**.
Install the positive cable retaining bracket **(3)**.
Connect the negative jump start terminal **(4)**.



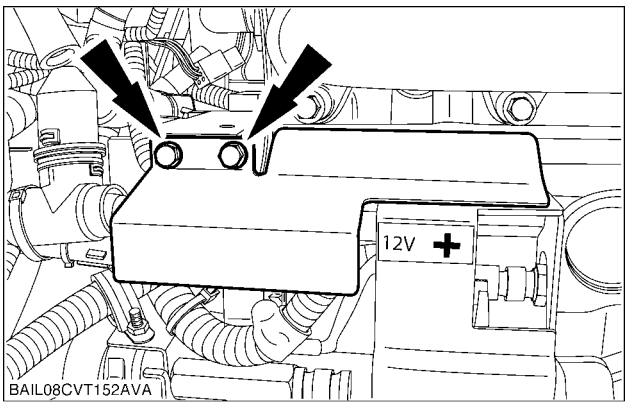
BAIL08CVT154AVA 10

14. Install the positive jump start terminal cover.



BAIL08CVT153AVA 11

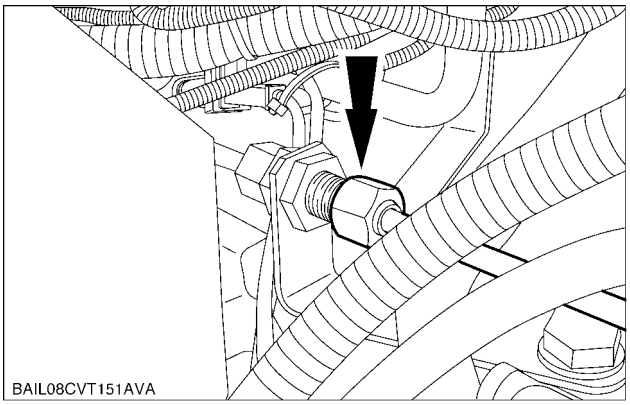
15. Install the starter motor shield.



BAIL08CVT152AVA 12

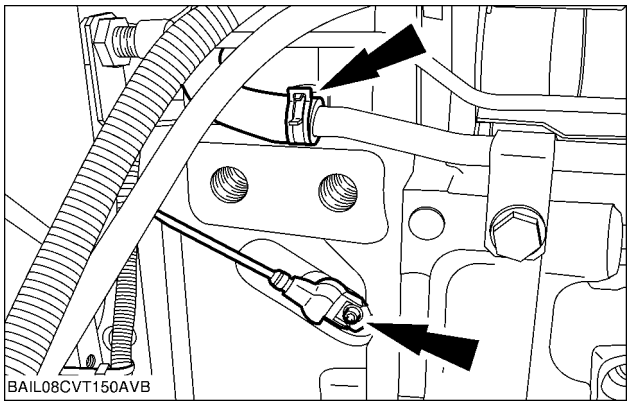
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16. Connect the brake pipe.



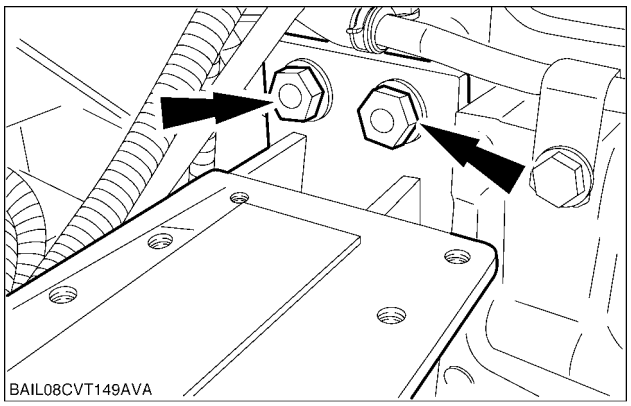
BAIL08CVT151AVA 13

17. Connect the flywheel speed sensor and the heater return hose.



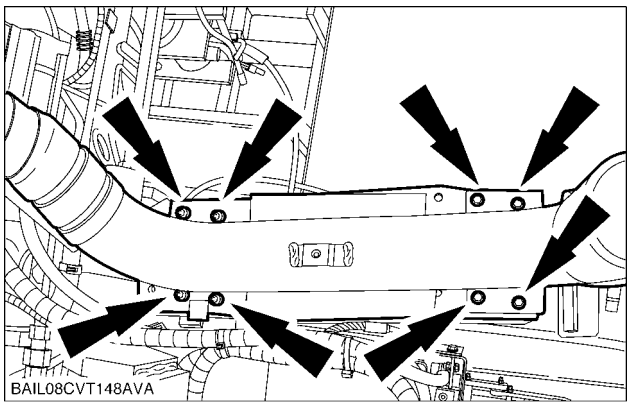
BAIL08CVT150AVB 14

18. Install the exhaust support.



BAIL08CVT149AVA 15

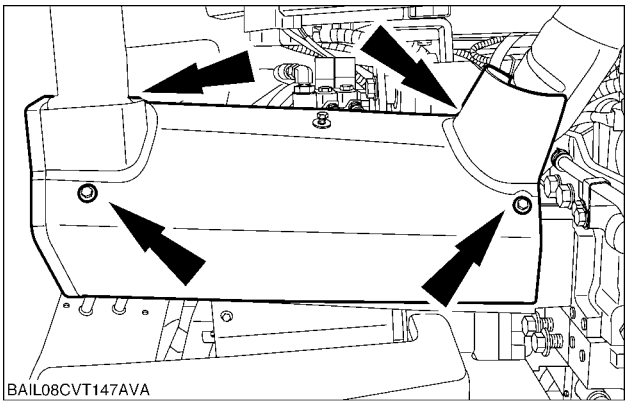
19. Install the exhaust.



BAIL08CVT148AVA 16

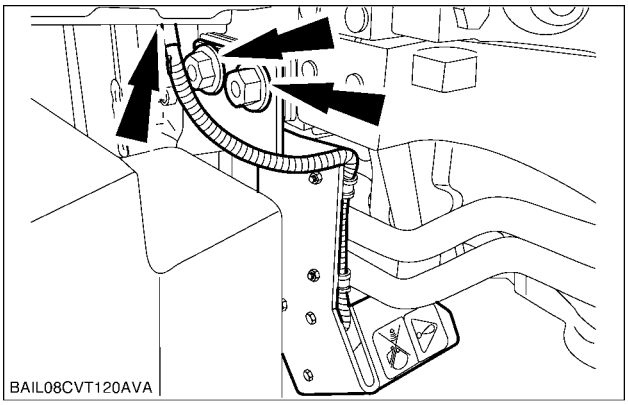
www.truck-freeworkshop.com

20. Install the exhaust heat shield.



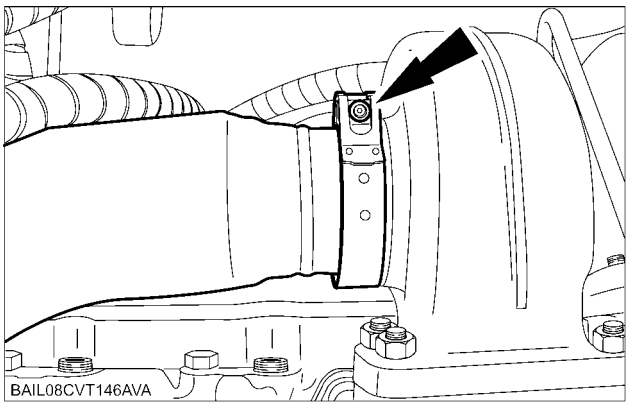
BAIL08CVT147AVA 17

21. Install the radar and connect the electrical connector.



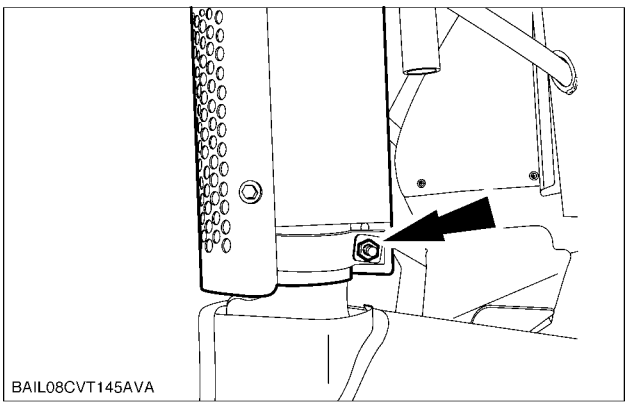
BAIL08CVT120AVA 18

22. Connect the turbocharger exhaust outlet.



BAIL08CVT146AVA 19

23. Install the muffler.

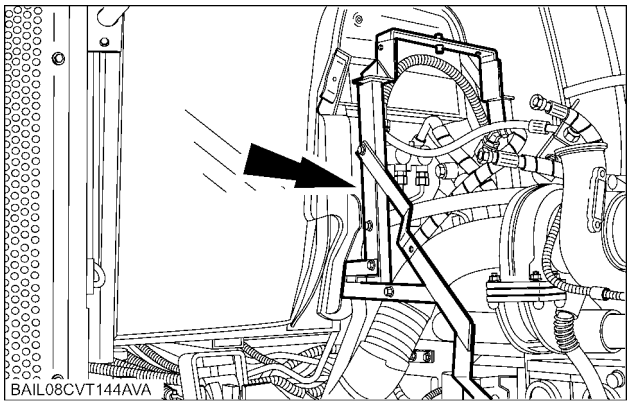


BAIL08CVT145AVA 20

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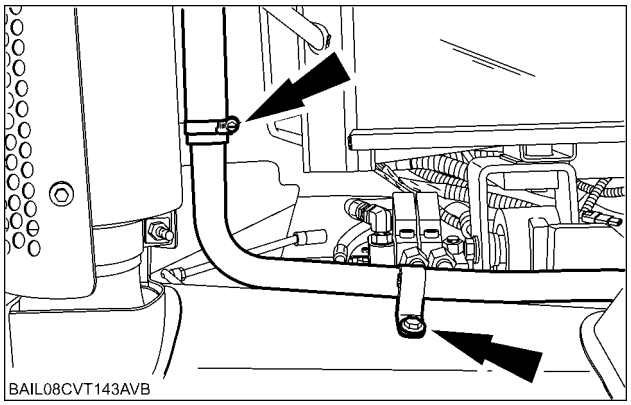
24. Install the air filter frame support.

NOTE: *Take care to pass all hoses and wiring looms through the frame when installing the air filter frame support.*



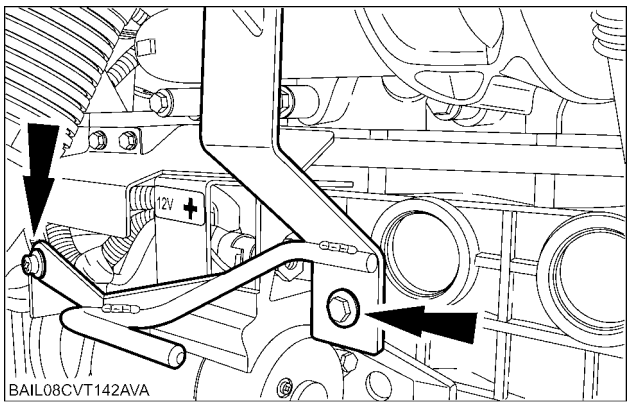
BAIL08CVT144AVA 21

25. Install the air filter aspirator pipe.



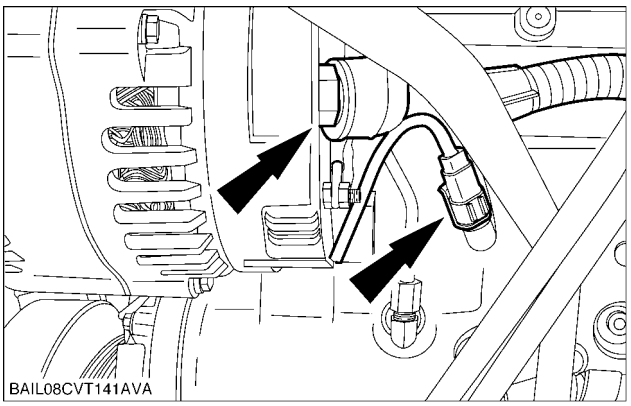
BAIL08CVT143AVB 22

26. Install the right-hand engine side panel support bracket



BAIL08CVT142AVA 23

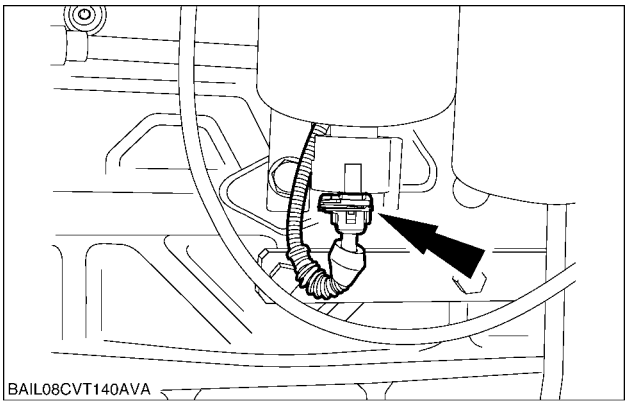
27. Connect the alternator electrical connectors.



BAIL08CVT141AVA 24

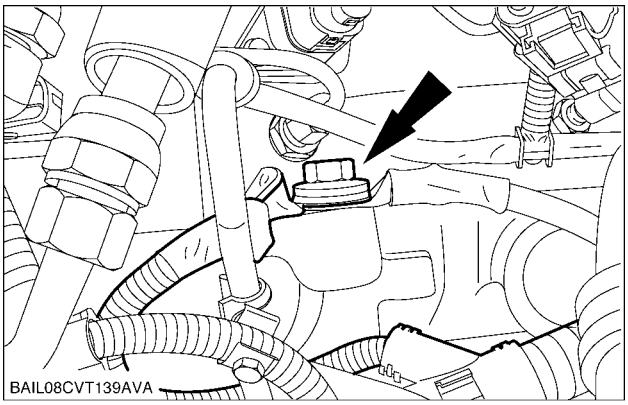
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28. Connect the water-in-fuel sensor.



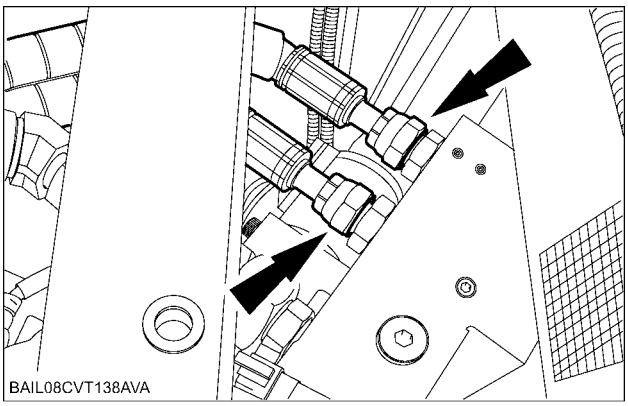
BAIL08CVT140AVA 25

29. Install the wiring loom to the intake manifold.



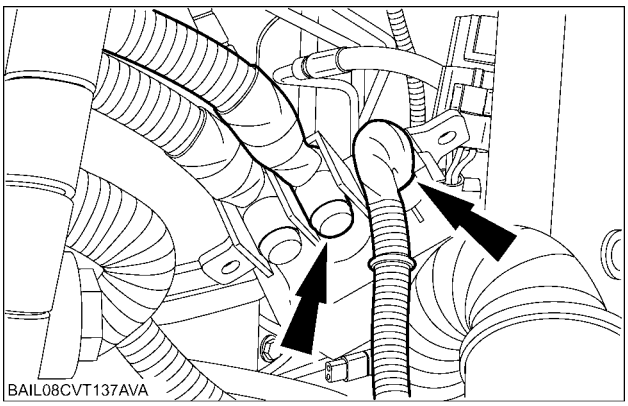
BAIL08CVT139AVA 26

30. Connect the steering hoses.



BAIL08CVT138AVA 27

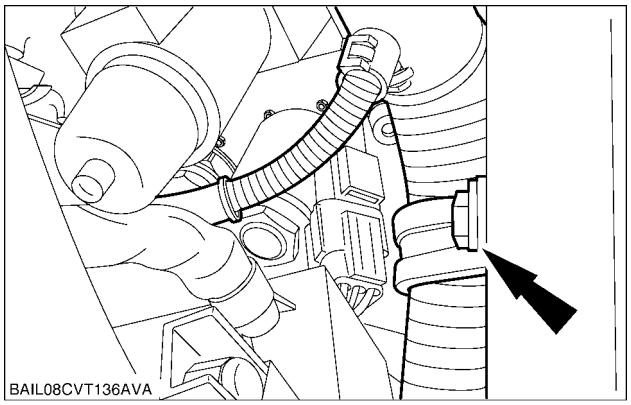
31. Connect the grid heater relay supply and electrical connector.



BAIL08CVT137AVA 28

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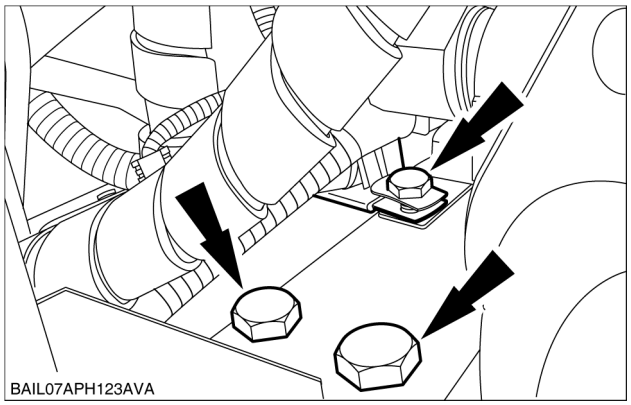
32. Install the wiring loom to the air filter frame support.



BAIL08CVT136AVA 29

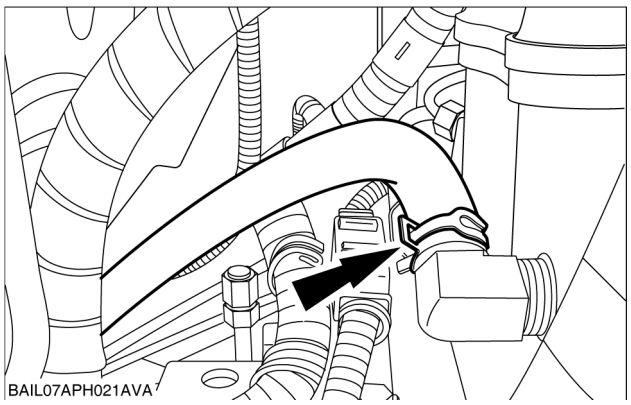
33. Install the air filter frame support left-hand rear mounting bolts and wiring loom clamp.

NOTE: *Repeat this step for the right-hand side of vehicle.*



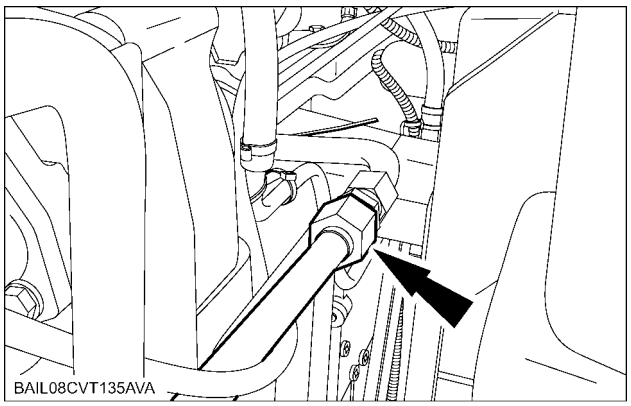
BAIL07APH123AVA 30

34. Connect the heater supply hose to the rear of the engine cylinder head.



BAIL07APH021AVA 31

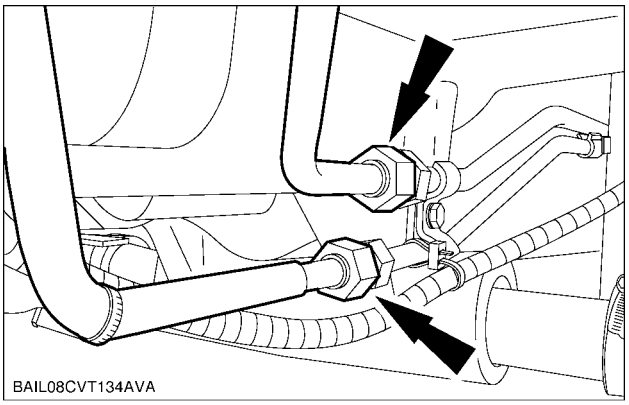
35. Connect the trailer brake air supply pipe.



BAIL08CVT135AVA 32

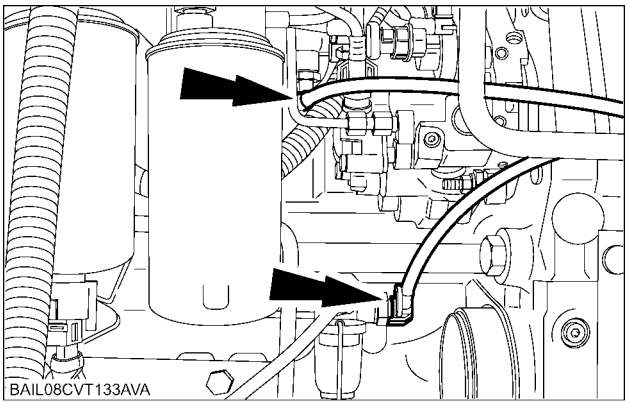
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36. Connect the diff lock and suspension pipes.



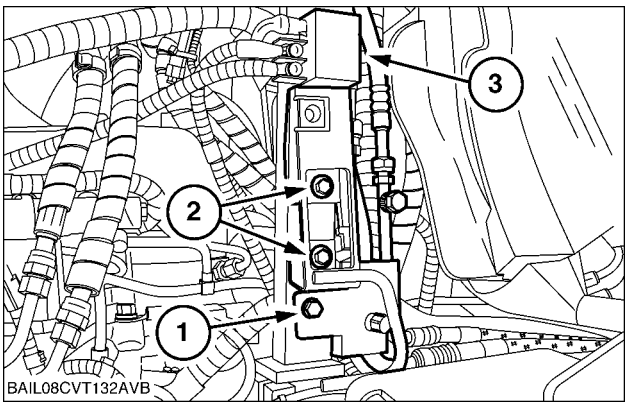
BAIL08CVT134AVA 33

37. Connect the fuel supply and return lines.



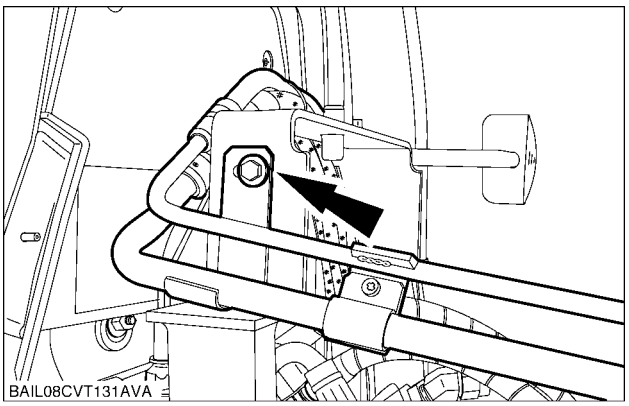
BAIL08CVT133AVA 34

38. Install the left-hand engine side panel support bracket **(1)**,
Install the A/C pipe bracket **(2)** and the grid heater relay **(3)** to the air filter frame support.



BAIL08CVT132AVB 35

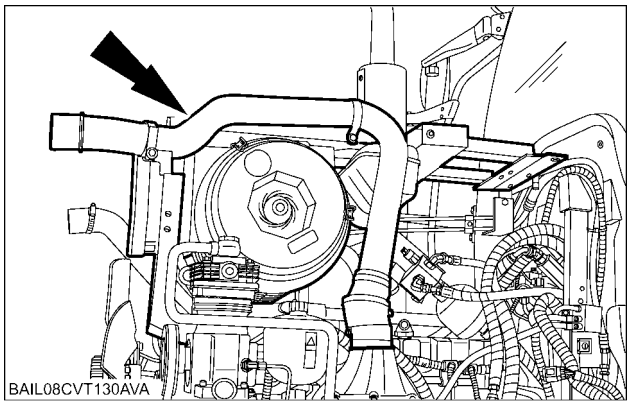
39. Install the A/C pipe bracket to the air filter frame support.



BAIL08CVT131AVA 36

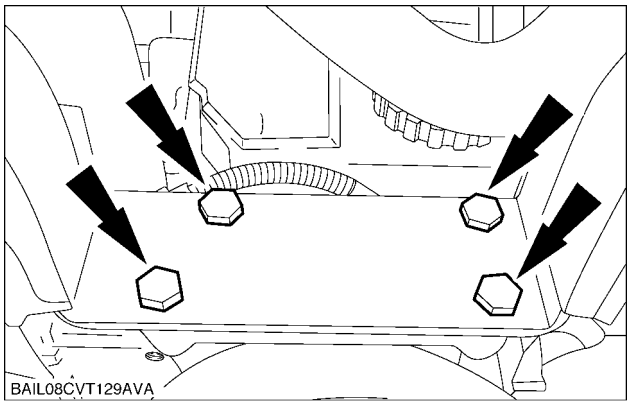
www.truck-freeworkshop.com

40. Install the air filter frame, charge air cooler outlet pipe, expansion tank and air filter as an assembly.



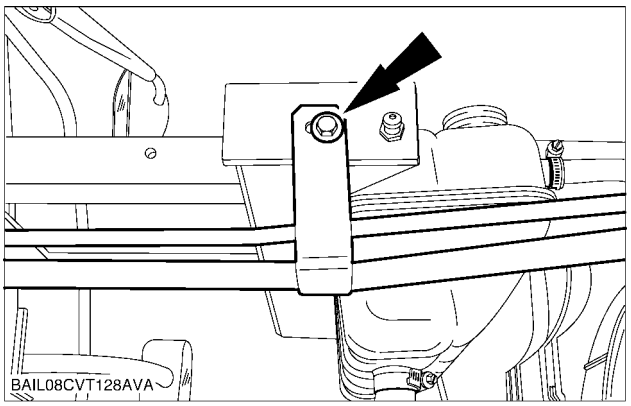
BAIL08CVT130AVA 37

41. Install the air filter frame front retaining bolts.



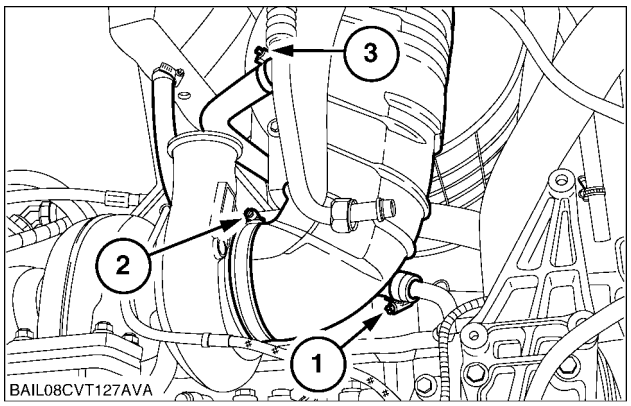
BAIL08CVT129AVA 38

42. Install the air conditioning pipe bracket to the air filter frame.



BAIL08CVT128AVA 39

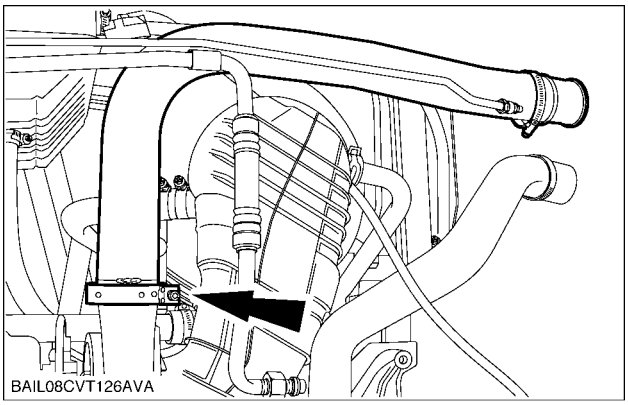
43. Connect the expansion tank hose **(1)**.
Install the air intake pipe to the turbocharger **(2)**.
Connect the air cam cover breather pipe **(3)**.



BAIL08CVT127AVA 40

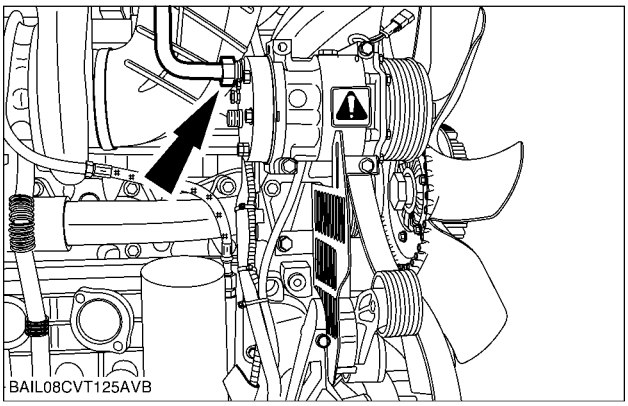
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44. Install the charge air cooler intake pipe.



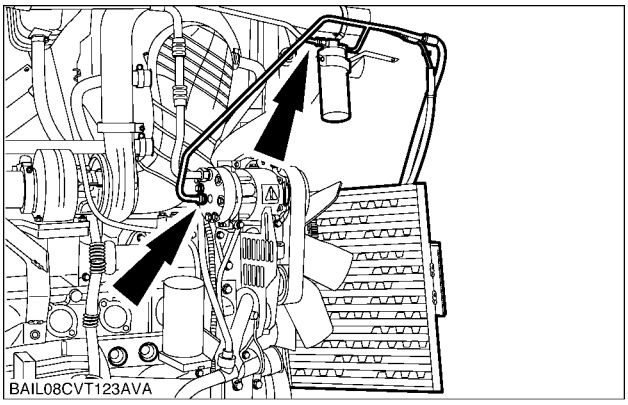
BAIL08CVT126AVA 41

45. Connect the A/C compressor low pressure pipe.



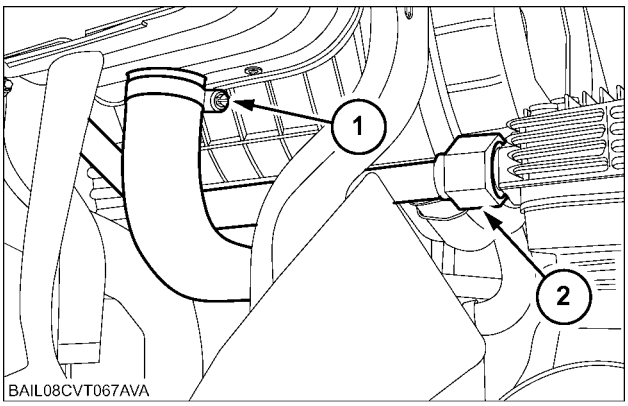
BAIL08CVT125AVB 42

46. Install the receiver drier and condenser.



BAIL08CVT123AVA 43

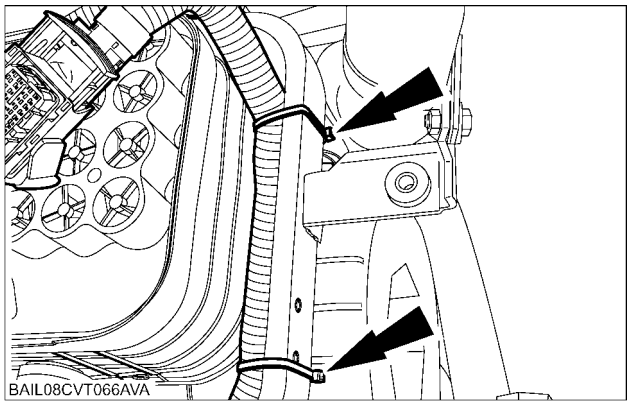
47. Connect the aspirator hose to the air filter intake housing **(1)**.
Connect the air compressor supply pipe **(2)**.



BAIL08CVT067AVA 44

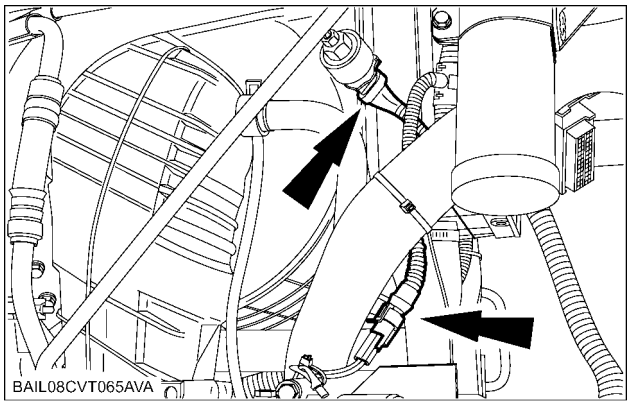
www.truck-freeworkshop.com

48. Install the wiring loom to the left-hand front of the air filter frame.



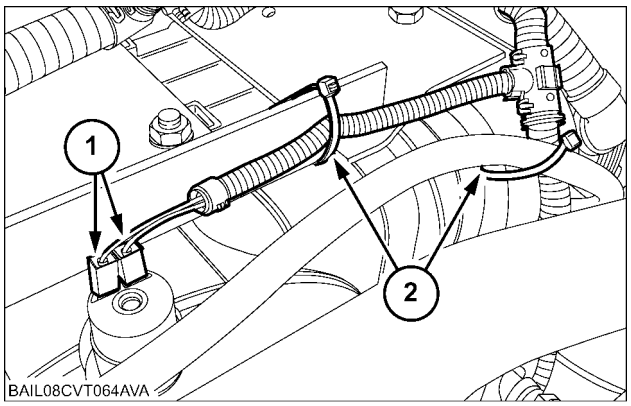
BAIL08CVT066AVA 45

49. Connect the air conditioning (A/C) high/low pressure switch and the A/C compressor magnetic clutch electrical connector.



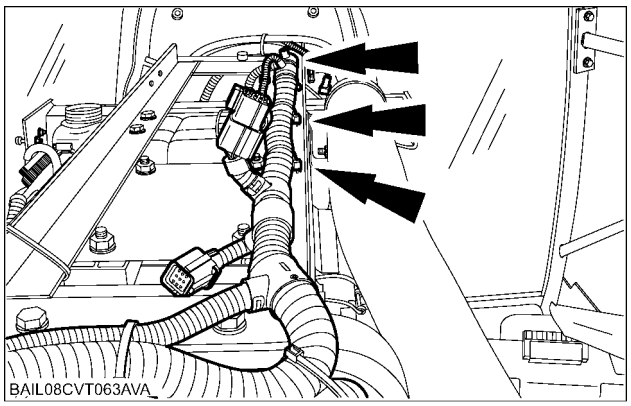
BAIL08CVT065AVA 46

50. Connect the air intake vacuum sensor electrical connectors **(1)**.
Using cable ties **(2)**, install the wiring loom to the right-hand side of the air filter frame.



BAIL08CVT064AVA 47

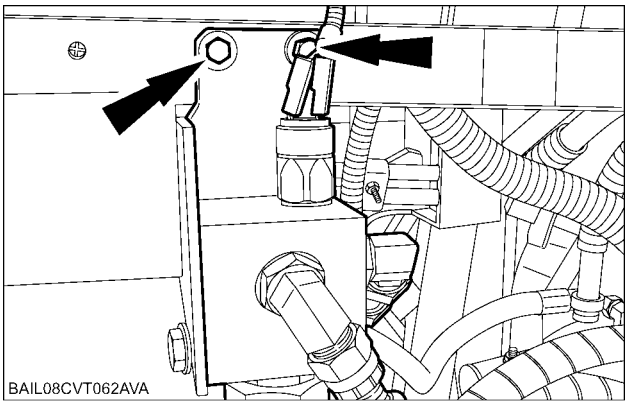
51. Install the wiring loom to the left-hand side of the air filter frame.



BAIL08CVT063AVA 48

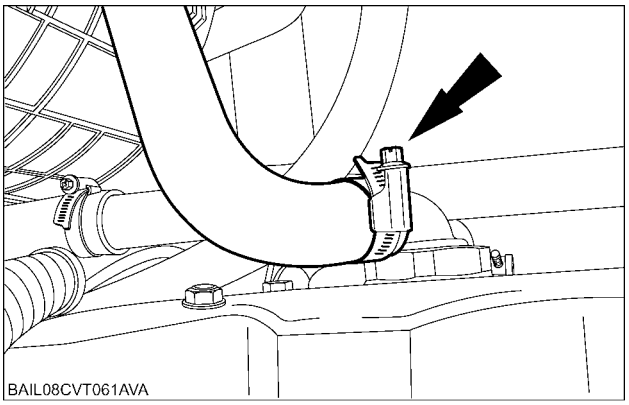
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52. Install the front brake accumulator valve to the air filter frame and connect the electrical connectors.



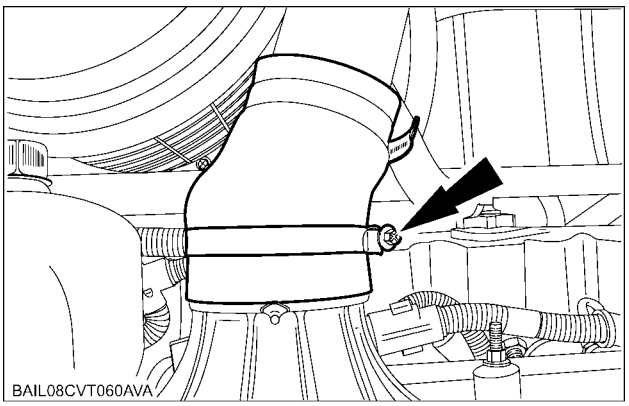
BAIL08CVT062AVA 49

53. Connect the cam cover breather pipe.



BAIL08CVT061AVA 50

54. Connect the charge air cooler outlet pipe to the intake manifold.



BAIL08CVT060AVA 51

Next operation:
Install the front axle and front to the engine, for further information refer to **Front - Install (E.10.B)**.
Next operation:
Install the engine hood, for further information refer to **Engine hood - Install (E.20.A)**
Next operation:
Connect the battery, for further information refer to **Battery - Connect (A.30.A)**

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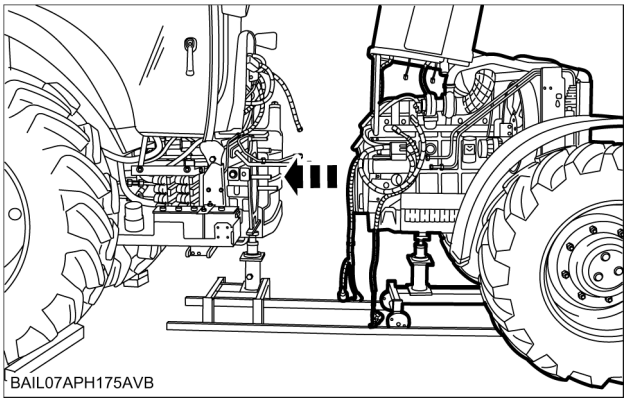
ENGINE - Connect (for vehicles with suspended front axle refer to Engine Install)

⚠ **WARNING** ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

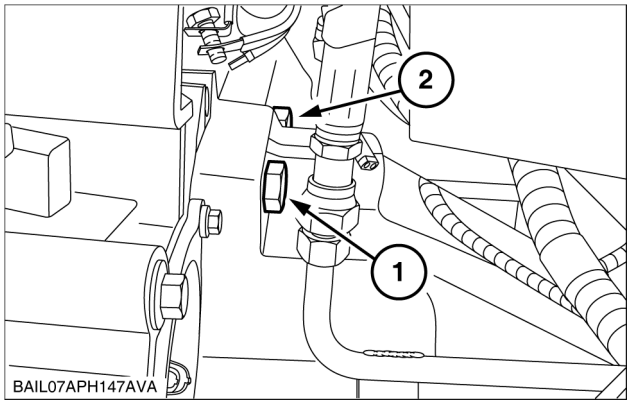
1. Thoroughly clean the engine to transmission mating surfaces.
2. Connect the transmission to the engine.



BAIL07APH175AVB 1

3. Install the engine to transmission centre securing bolt **(2)**. Install the engine to transmission top left-hand securing bolt **(1)**. Tighten to **285-315 Nm** (**210-232 lb ft**).

NOTE: *Repeat this step for the right-hand side.*

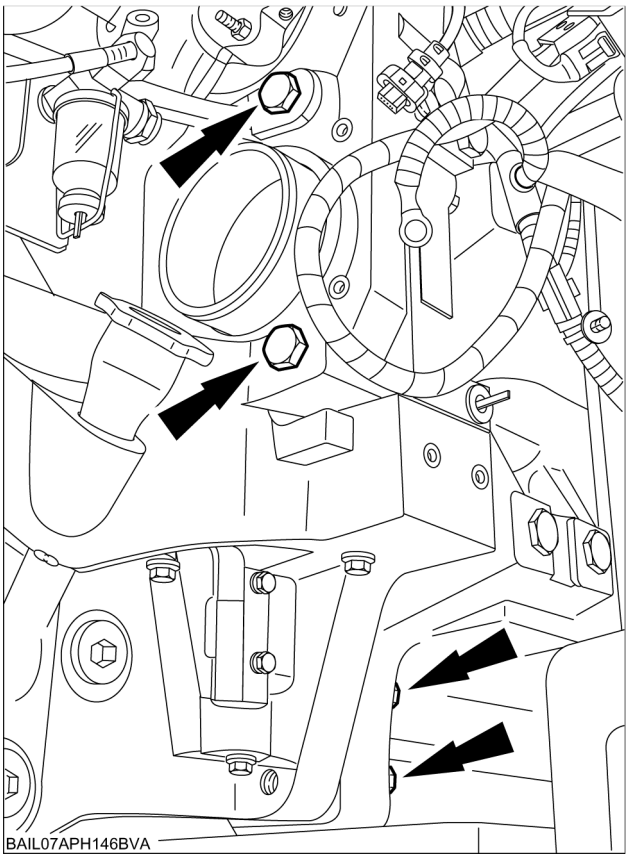


BAIL07APH147AVA 2

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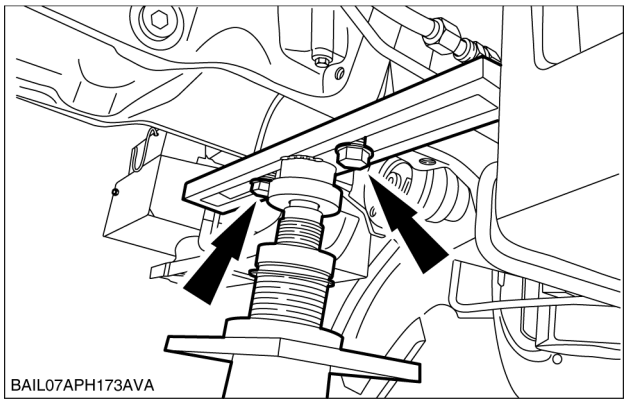
4. Install the left-hand side engine to transmission securing bolts.
   Tighten to **285-315 Nm** (**210-232 lb ft**).

NOTE: *Repeat this step for the right-hand side.*



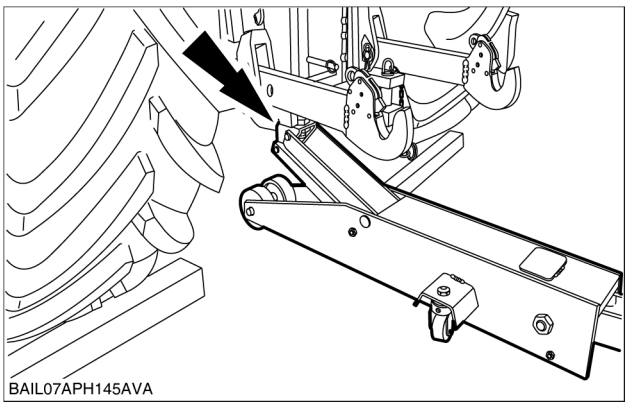
BAIL07APH146BVA 3

5. Disconnect the splitting gear and remove it from under the transmission.



BAIL07APH173AVA 4

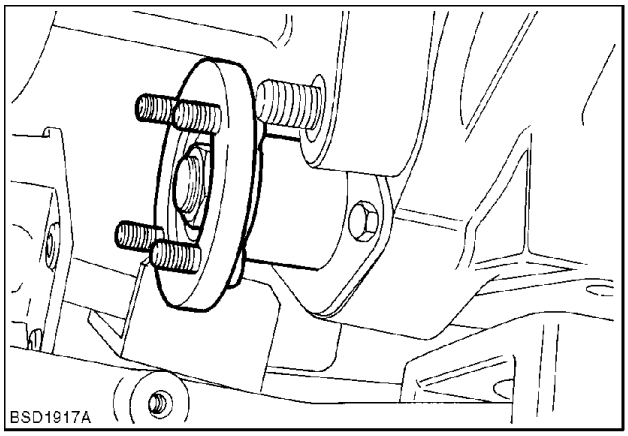
6. Remove the support from the rear of the vehicle.



BAIL07APH145AVA 5

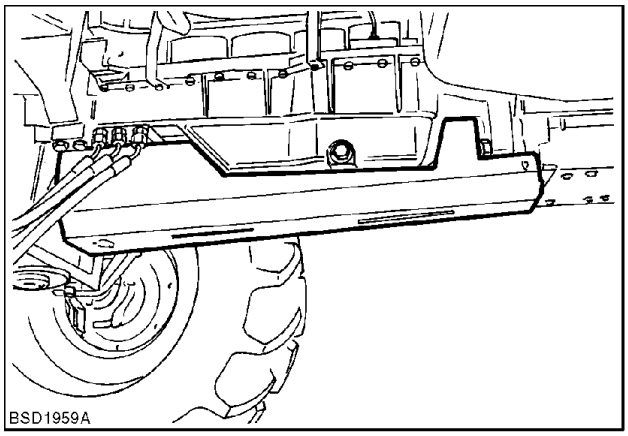
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7. Install the drive shaft flange, (if fitted).



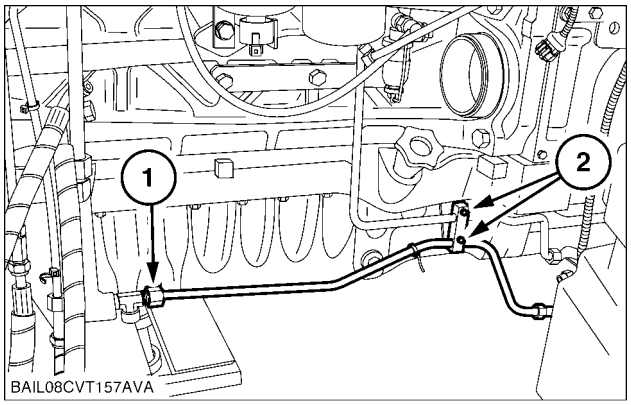
BSD1917A 6

8. Install the front wheel drive shaft and drive shaft guard.



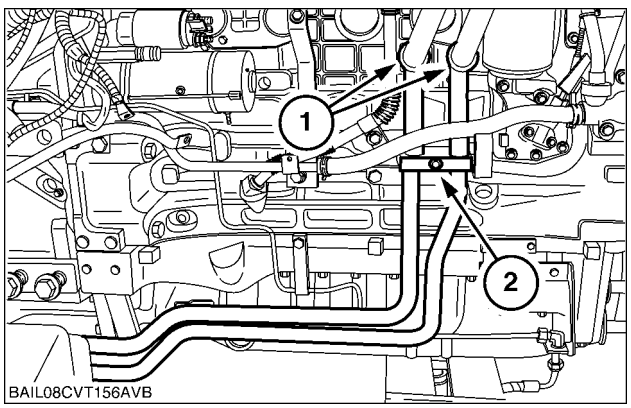
BSD1959A 7

9. Install and connect the diff lock supply pipe **(1)**.
Install the pipe bracket **(2)**.



BAIL08CVT157AVA 8

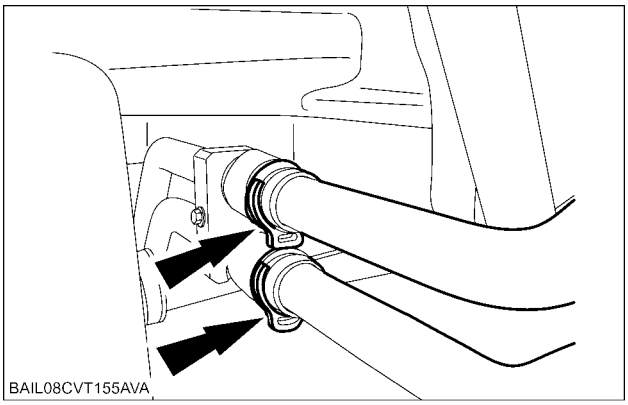
10. Install the oil cooler pipes and connect the quick release couplers **(1)**.
Install the pipe retaining bracket **(2)**.



BAIL08CVT156AVB 9

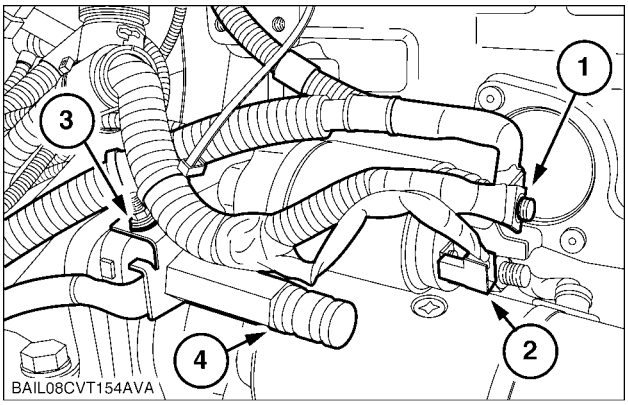
www.truck-freeworkshop.com

11. Connect the oil cooler quick release couplers.



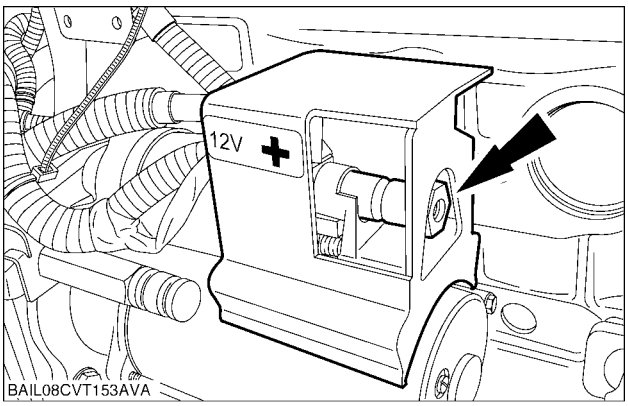
BAIL08CVT155AVA 10

12. Connect the three starter motor cables **(1)**.
Connect the spade connector **(2)**.
Install the positive cable retaining bracket **(3)**.
Connect the negative jump start terminal **(4)**.



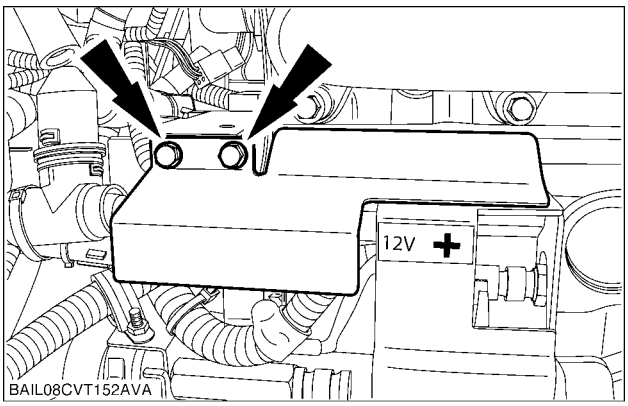
BAIL08CVT154AVA 11

13. Install the positive jump start terminal cover.



BAIL08CVT153AVA 12

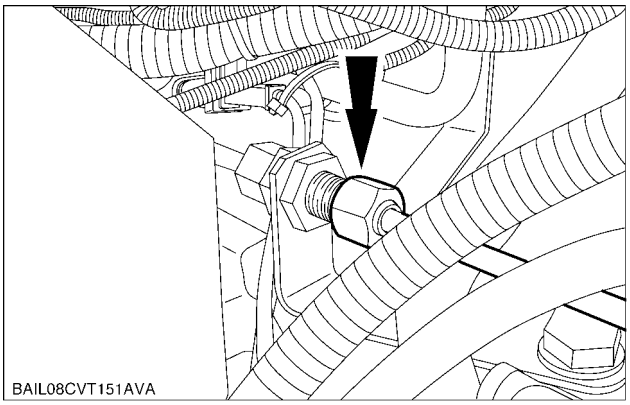
14. Install the starter motor shield.



BAIL08CVT152AVA 13

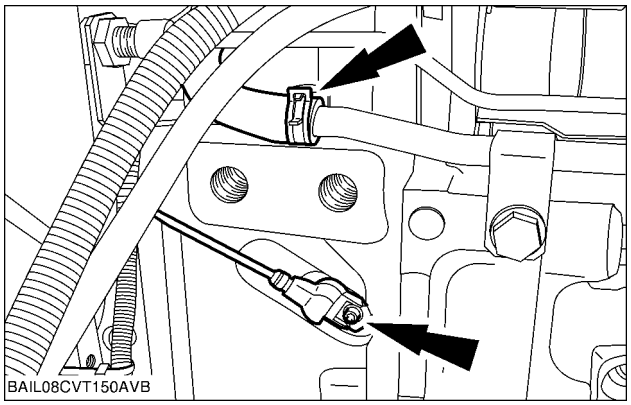
www.truck-freeworkshop.com

15. Connect the brake pipe.



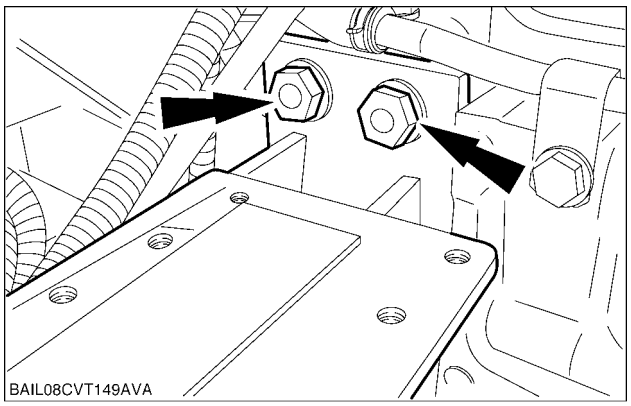
BAIL08CVT151AVA 14

16. Connect the flywheel speed sensor and the heater return hose.



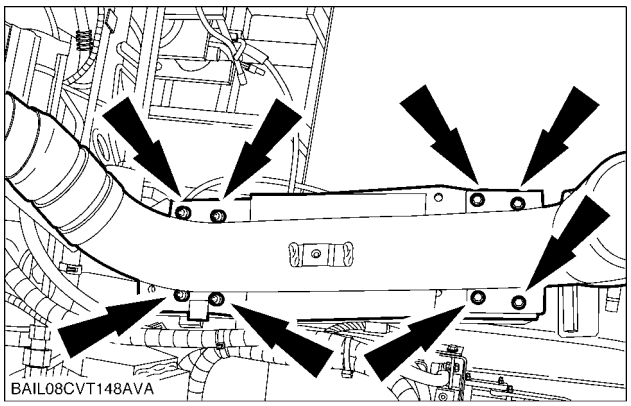
BAIL08CVT150AVB 15

17. Install the exhaust support.



BAIL08CVT149AVA 16

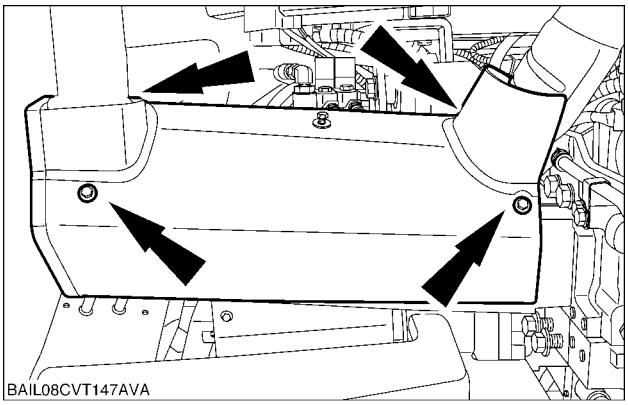
18. Install the exhaust.



BAIL08CVT148AVA 17

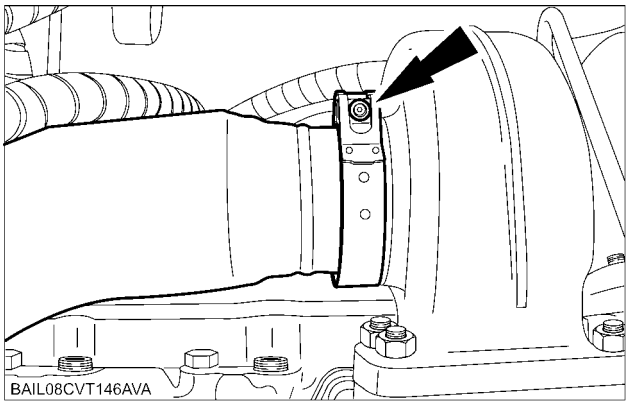
www.truck-freeworkshop.com

19. Install the exhaust heat shield.



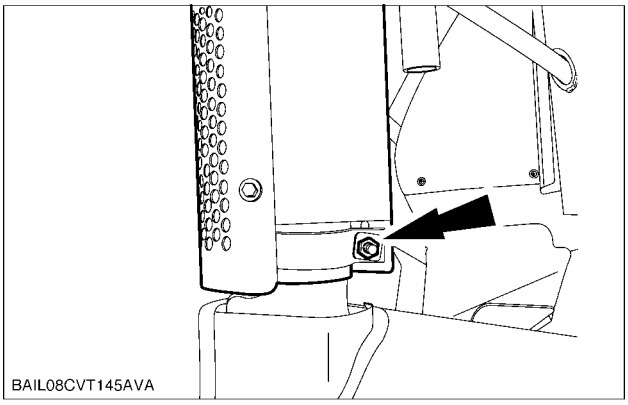
BAIL08CVT147AVA 18

20. Connect the turbocharger exhaust outlet.



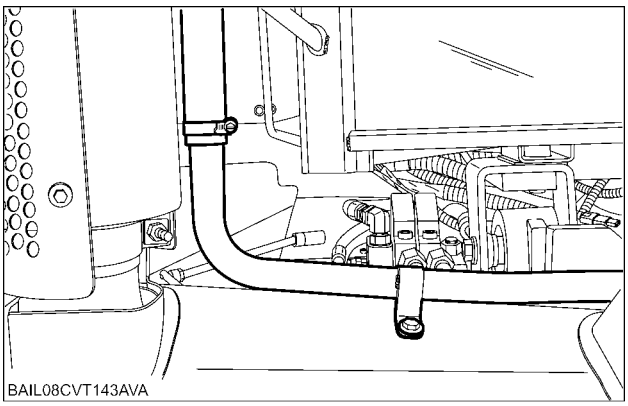
BAIL08CVT146AVA 19

21. Install the muffler.



BAIL08CVT145AVA 20

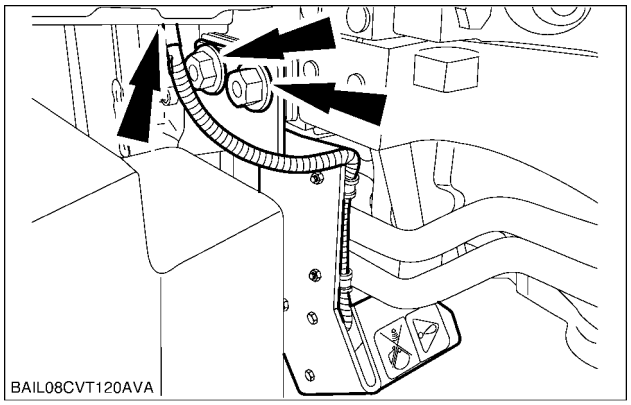
22. Install the air filter aspirator pipe.



BAIL08CVT143AVA 21

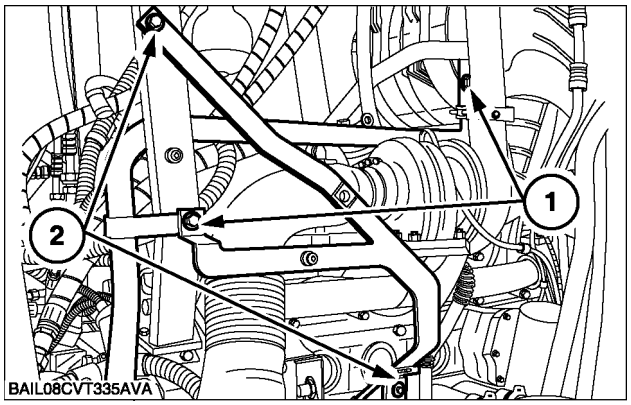
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23. Install the radar and connect the electrical connector.



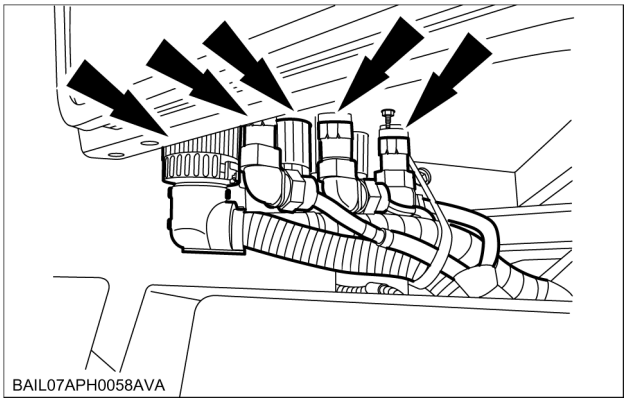
BAIL08CVT120AVA 22

24. Attach the air filter aspirator pipe brackets **(1)**, and install the right-hand engine side panel support bracket **(2)**.



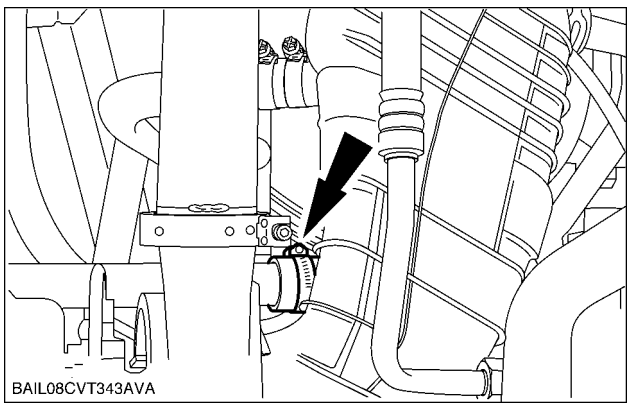
BAIL08CVT335AVA 23

25. Connect the engine harness electrical connectors.



BAIL07APH058AVA 24

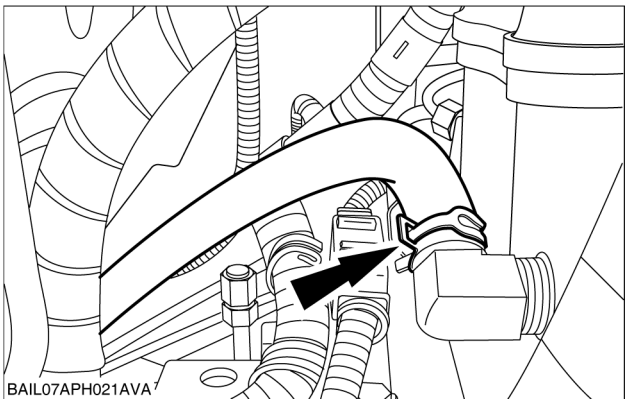
26. Connect the air filter aspirator hose.



BAIL08CVT343AVA 25

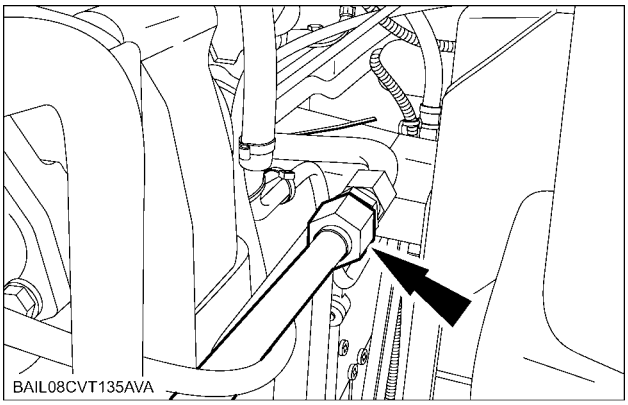
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27. Connect the heater supply hose to the rear of the engine cylinder head.



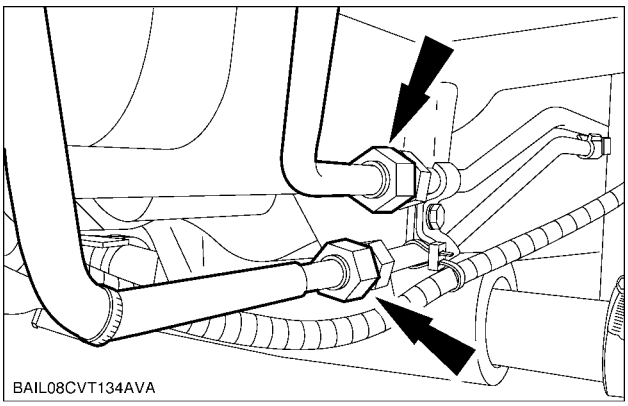
BAIL07APH021AVA 26

28. Connect the trailer brake air supply pipe.



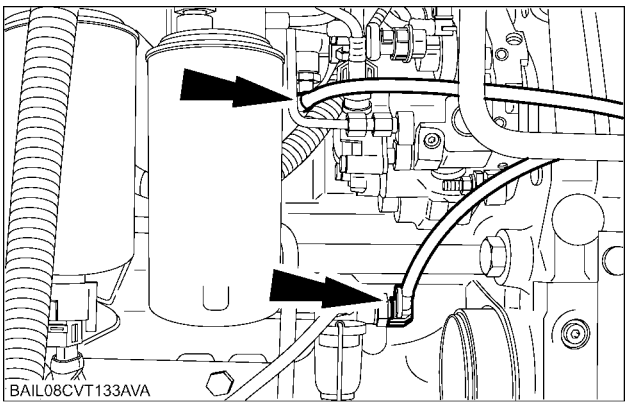
BAIL08CVT135AVA 27

29. Connect the diff lock and suspension pipes.



BAIL08CVT134AVA 28

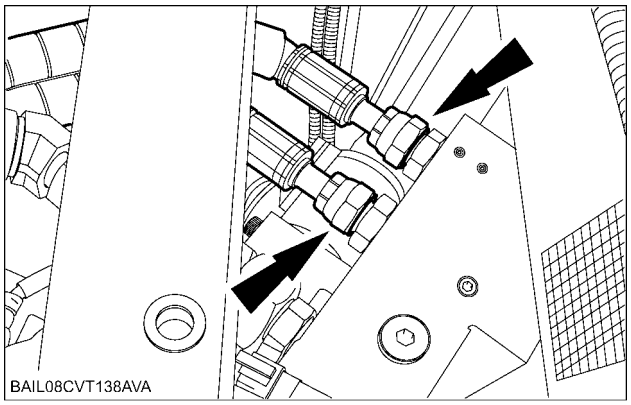
30. Connect the fuel supply and return lines.



BAIL08CVT133AVA 29

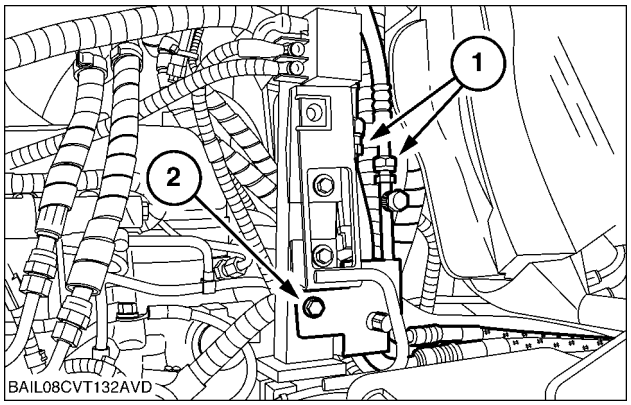
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31. Connect the steering hoses.



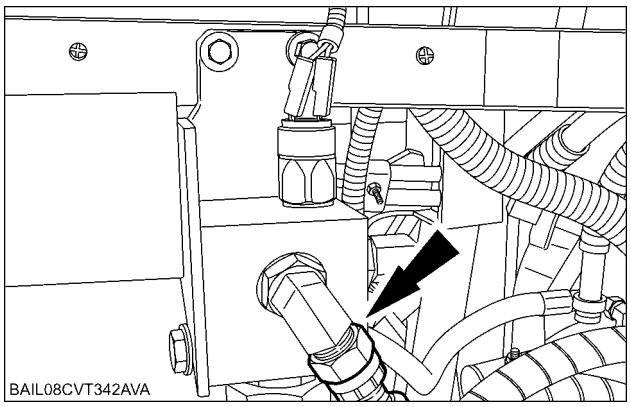
BAIL08CVT138AVA 30

32. Connect the air conditioning (A/C) hoses **(1)** and install the pipe retaining bracket **(2)**.



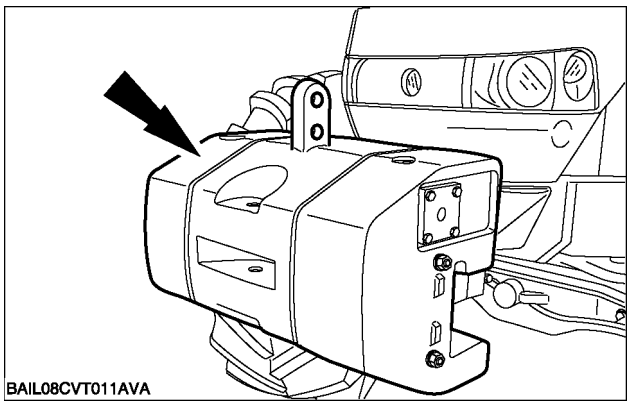
BAIL08CVT132AVD 31

33. Connect the brake accumulator hose.



BAIL08CVT342AVA 32

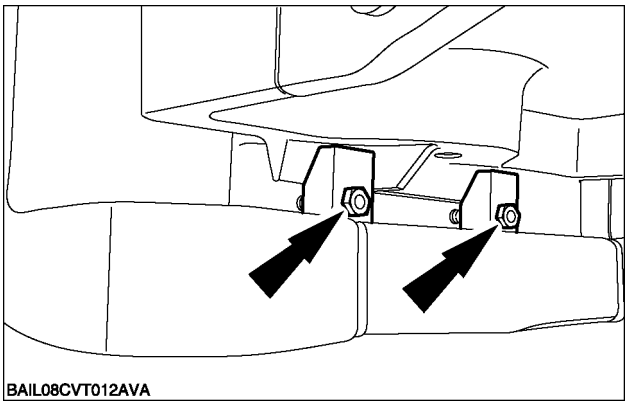
34. Using suitable lifting equipment install the front weights onto the front weight carrier.



BAIL08CVT011AVA 33

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35. Secure the front weights to the front weight carrier.



BAIL08CVT012AVA 34

Next operation:
Fill the engine coolant system, for further information refer to **ENGINE COOLANT SYSTEM - Filling (B.50.A)**
Next operation:
Charge the air conditioning system, for further information refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Charging (E.40.D)**
Next operation:
Connect battery, for further information refer to **Battery - Connect (A.30.A)**

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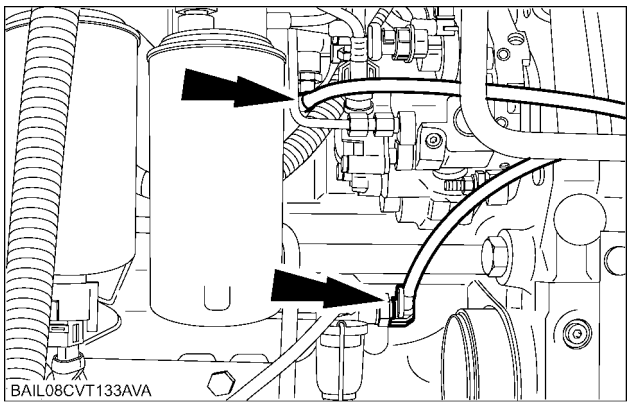
ENGINE - Overhaul External Components

Prior operation:
Battery - Disconnect (A.30.A)

1. Some of the operations described in this section can be carried out directly with the engine fitted on the vehicle, depending on access to the engine bay and on the version.

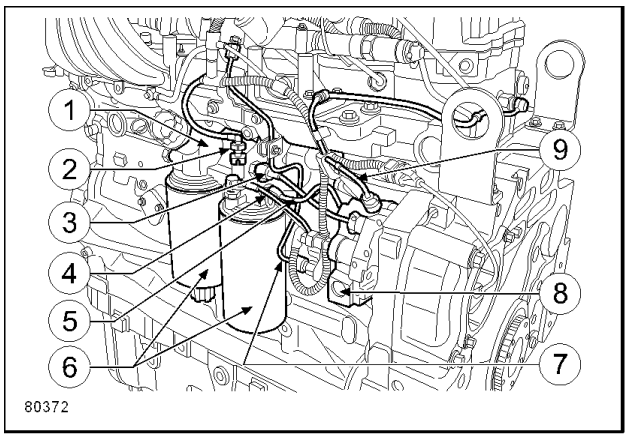
NOTE: *The operations for removing the engine, as those for overhaul, must be performed by skilled personnel using specific tools. Refer to* ***ENGINE - Special tools (B.10.A)***

2. Disconnect the fuel pipes from the pre-filter and the water trap



BAIL08CVT133AVA 1

3. Operations for preparing the engine for assembly on the rotating stand
   To be able to fit the brackets **380001298** (for fixing the engine to the overhaul stand, **380000301** to the crankcase, it is necessary to work from the left–hand side of the engine:
   Remove the fuel filters **(6)** from the mounting **(1)**;
   Disconnect the electrical connection **(2)** from the mounting **(1)** and the one to the heater (again located on the filter mounting);
   Disconnect the fuel pipes **(3)** - **(4)** - **(5)** from the mounting **(1)**;
   Remove the bracket supporting the mounting **(1)** from the crankcase.



80372 2

NOTE: *To disconnect the fuel pipes* ***(3) — (4) — (5)****, Figure* ***2*** *from the relevant fittings, you need to press the clip* ***(1)*** *as shown in Figure* ***(B)****.*
After disconnecting the piping, put the clip ***(1)*** *back in its locking position Figure* ***(A)*** *to prevent it getting buckled.*

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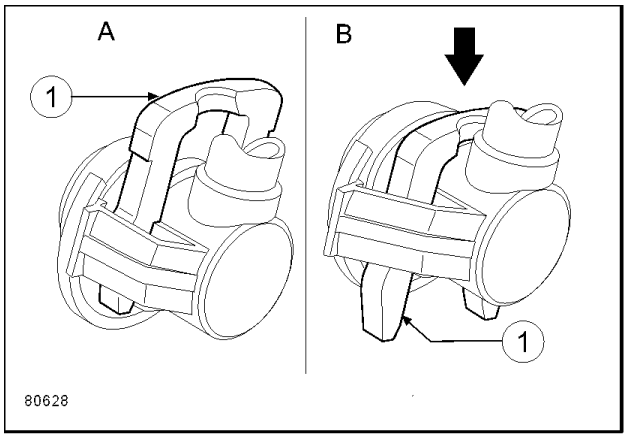
4. Disconnect the high-pressure fuel pipe (**(7)**, Figure **2**) from the rail choke tube and from the high-pressure pump **(8)** and remove it from the crankcase by taking out the bracket.
   Disconnect the pipe **(9)** from the high-pressure pump **(8)**.

NOTE: *Due to the high pressure in the piping from the high-pressure pump to the rail and from here to the electro-injectors, never:*
- disconnect the pipes with the engine running,
- reuse disconnected pipes.

⚠ WARNING ⚠

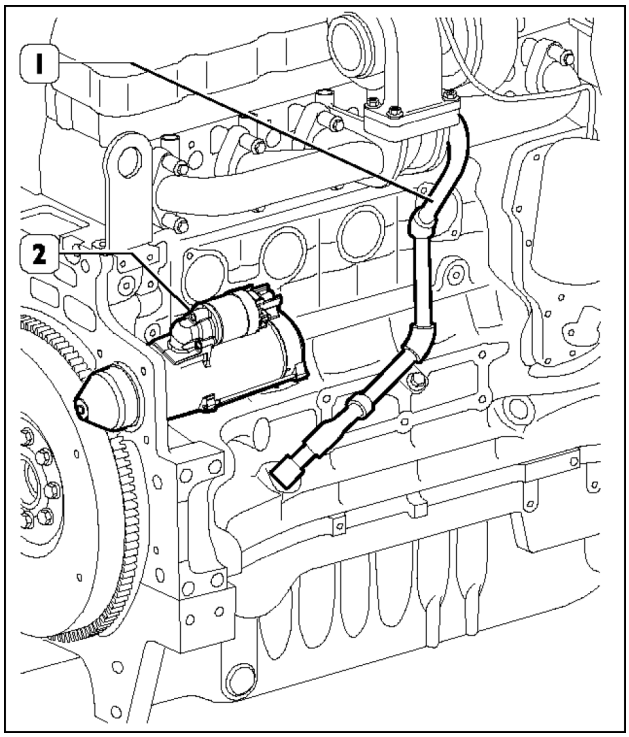
Do NOT loosen or tighten high pressure fuel lines while the engine is running. Failure to comply will result in death or serious injury.

M1042



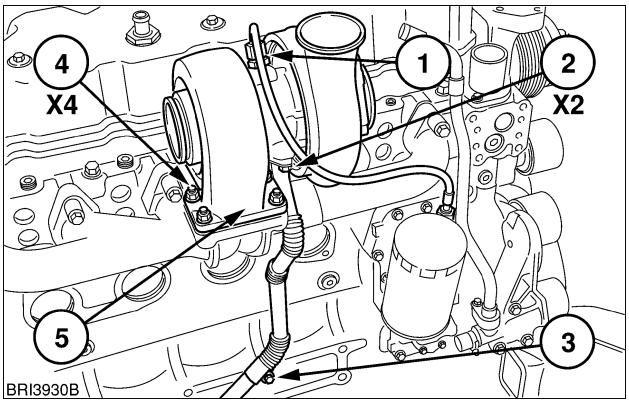
80628 3

5. Unscrew the fixing screws and remove the starter motor **(2)** from its seat.



BAIL07APH375BMA 4

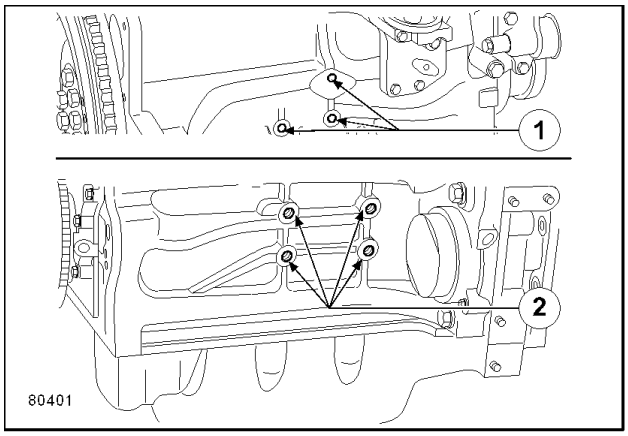
6. Working from the right-hand side of the engine, disconnect the lubricating pipe **(1)** from the top of the cooler to the turbo-blower .
   Remove the thermostat body together with the seal.
7. Unscrew and remove bolt **(3)** retaining lubrication return pipe to crankcase.
8. Unscrew and remove turbocharger to exhaust manifold retaining nuts **(4)** and lubrication pipe securing bolts **(2)**.
9. Supporting the turbocharger, lift from exhaust manifold and remove gasket.



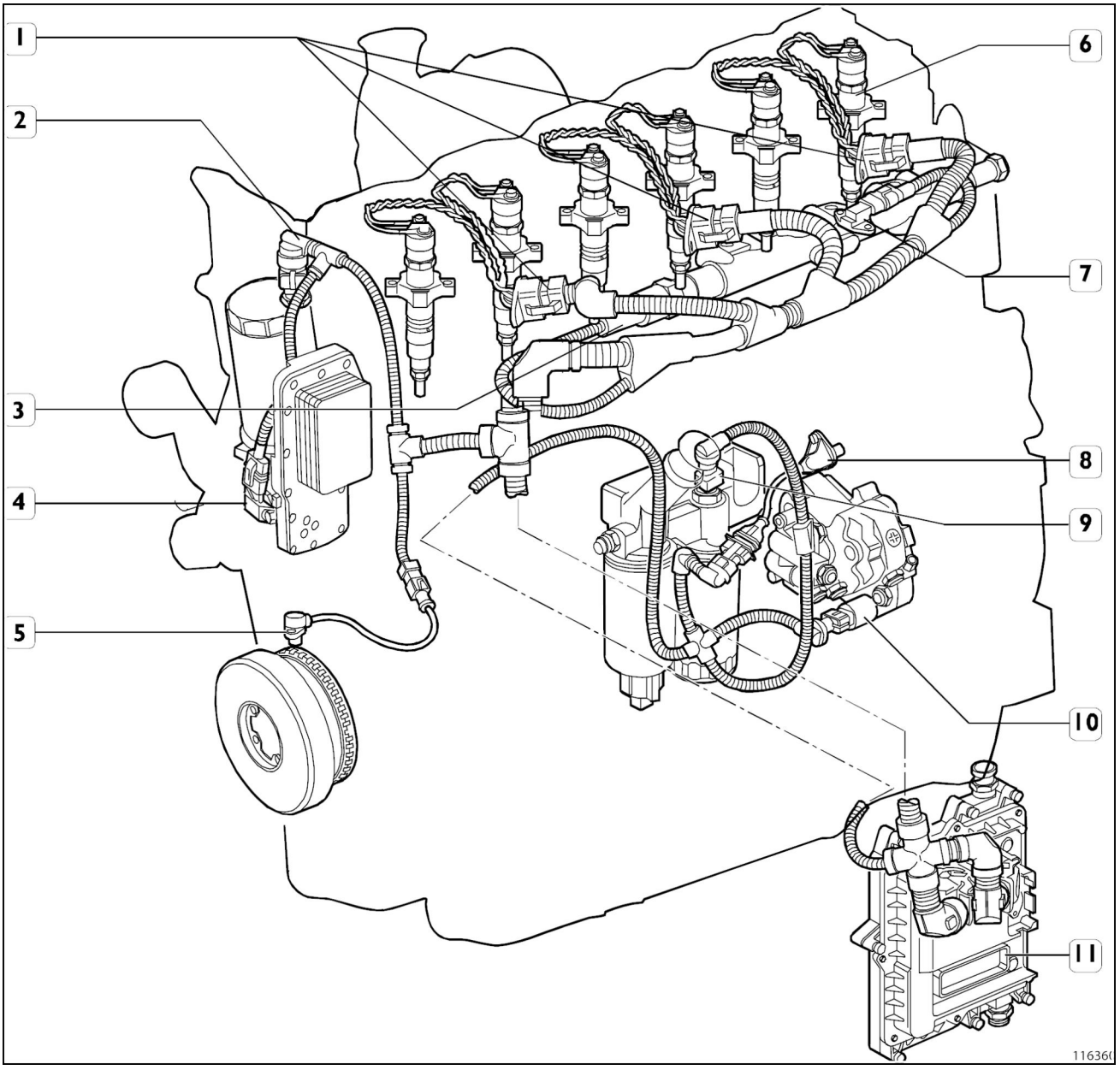
BAIL06CCM058ASA 5

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10. Fit brackets **380001298** into the holes **(1)** and **(2)** in the crankcase on both sides and, using these brackets, secure the engine to the rotating stand **380000301**. Drain off the engine oil into a suitable container by removing the plug from the sump .



80401 6



BAIL07APH407GMA 7

Injection System Components

1 Connection for electro-injectors
2 Engine coolant temperature sensor
3 Fuel pressure sensor cable
4 Engine oil pressure and temperature sensor

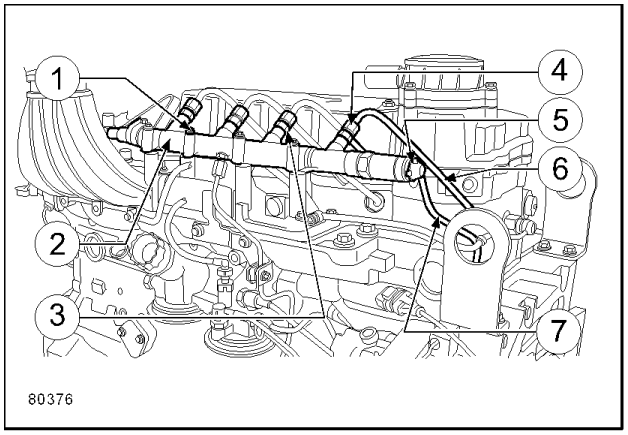
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5 Crankshaft sensor
6 Electro-injector
7 Air pressure temperature sensor
8 Timing system phase sensor
9 Fuel temperature sensor
10 Pressure regulator wiring
11 EDC16 control unit

11. Disconnect the engine cable from the connectors: (**(1)**, figure **7**) electro–injector wiring **(6)**; **(7)** air pressure/temperature sensor; **(3)** fuel pressure sensor; **(11)** control unit; **(10)** high– pressure pump sensor; **(8)** timing system phase sensor; **(2)** engine coolant temperature sensor on thermostat; **(5)** engine speed sensor.
Take off the clamps fastening it to the crankcase and remove it completely.

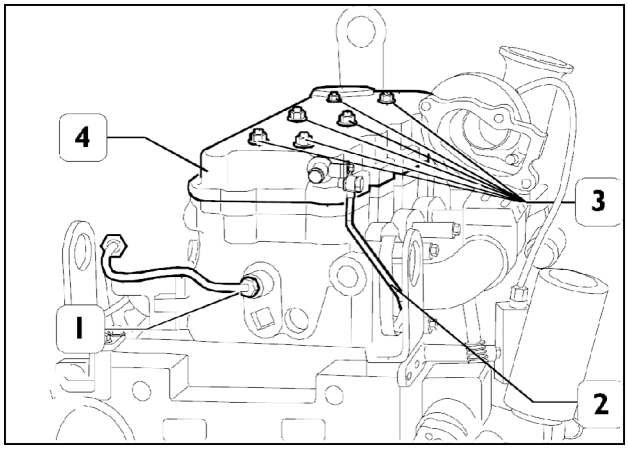
12. Disconnect the following from the rail **(2)**: fuel pipe **(7)** as per the procedures described in **ENGINE - Overhaul (B.10.A)**. Disconnect the fuel pipes **(5)** from the rail **(2)** and from the manifolds **(6)** for the electro-injectors.
Remove the screws **(1)** and detach the rail **(2)**.

NOTE: *When locking the fittings (4) securing the pipes (6) to the rail (2), using an appropriate wrench, you must prevent the flow limiters, if fitted, (3) from turning.*



80376 8

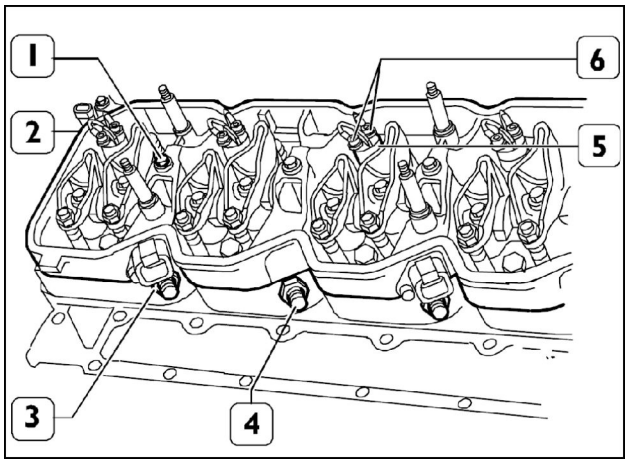
13. Disconnect the piping from the fuel return pressure limiter **(1)**, working on the connections as described in **ENGINE - Overhaul (B.10.A)**.
Undo the nuts **(3)** and take off the tappet cover **(4)**.



BAIL07APH408AMA 9

14. Remove the nuts **(3)** and remove the fuel manifolds **(4)**. Remove the nuts **(6)** and disconnect the electric cables from the electro–injectors **(5)**.
Take out the screws **(1)** and remove the electro–injector wiring mounting **(2)** together with its seal.
.
.

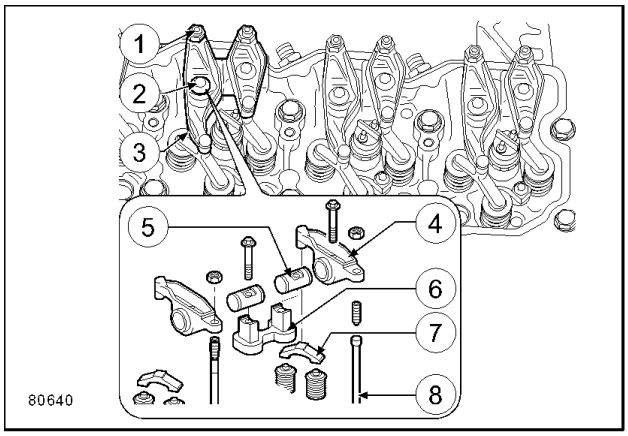
NOTE: *Once removed, the fuel manifolds **(4)** must not be reused; they must be replaced with new ones.*



BAIL07APH414AMA 10

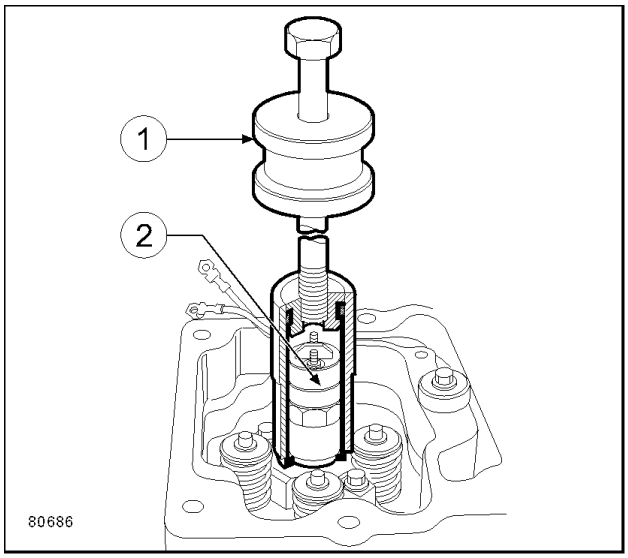
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15. Loosen the tappet adjuster fixing nuts **(1)** and unscrew the adjusters.
Take out the screws **(2)**, remove the rocker-arm assembly **(3)** comprising the mounting **(6)**, rocker arms **(4)** and spindles **(5)** then remove the bridges **(7)** from the valves.
Remove the rods **(8)**.



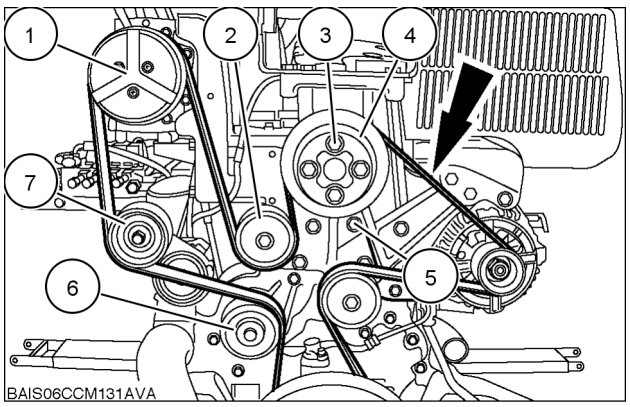
80640 11

16. Take out the screws securing the electro-injectors and, using tool **380001099 (1)**, extract the electro-injectors **(2)** from the cylinder head.



80686 12

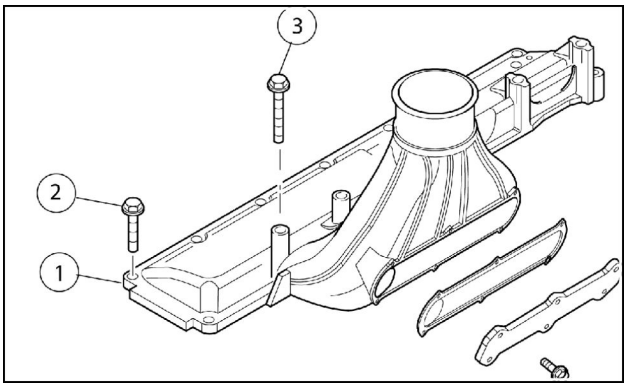
17. Loosen the belt tensioner **(7)**, extract the belt from the pulleys of the alternator, coolant pump and snub pulleys.
Unscrew the bolt retaining the tensioner **(7)** and remove the tensioner;
Remove the snub pulley **(2)**, unscrew the bolts **(3)** and remove the pulley **(4)** from the mounting beneath.
Unscrew the bolts and remove the tightener mounting.
Unscrew the bolts **(5)** and remove the front mounting plate from the crankcase.
Unscrew the bolts and remove the coolant pump **(6)**.
Unscrew the bolt and remove the engine speed sensor



BAIS06CCM131AVA 13

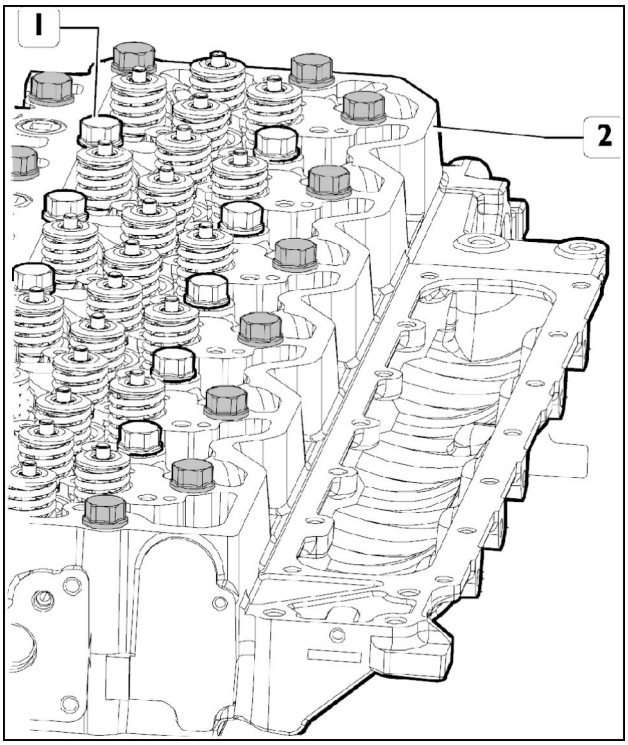
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18. From the opposite side, unscrew the bolts **(2)** and **(3)** securing the intake manifold **(1)** and remove it together with the air heater for cold starts.



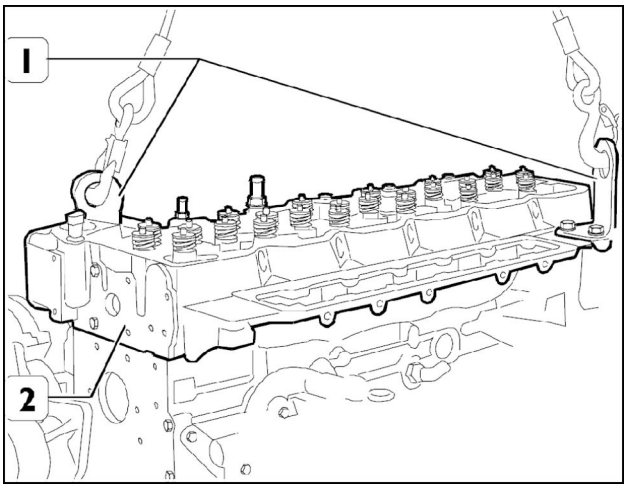
BAIL07APH400AMA 14

19. Remove the bolts **(1)** from the cylinder head **(2)**.



BAIL07APH409BMA 15

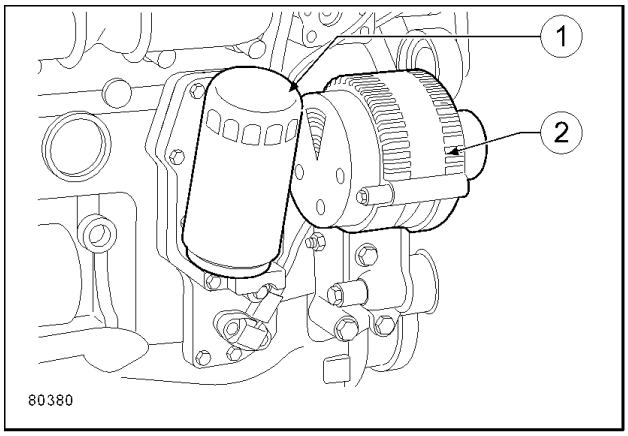
20. Hook up the brackets, **380001073 (1)** with a suitable sling and, using a hoist, remove the cylinder head **(2)** from the crankcase.



BAIL07APH410AMA 16

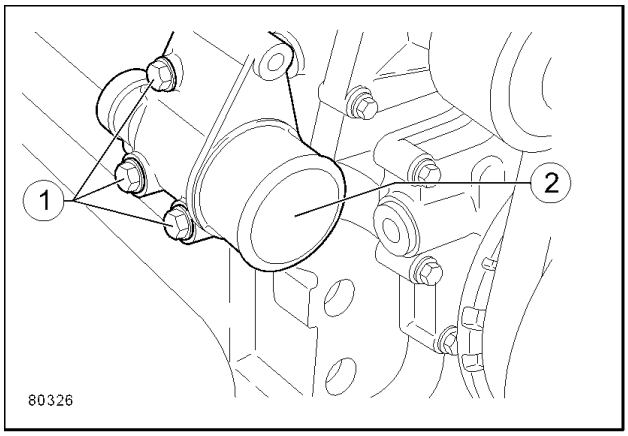
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21. Remove the oil filter **(1)**.
Unscrew the retaining bolts and remove the alternator **(2)**.



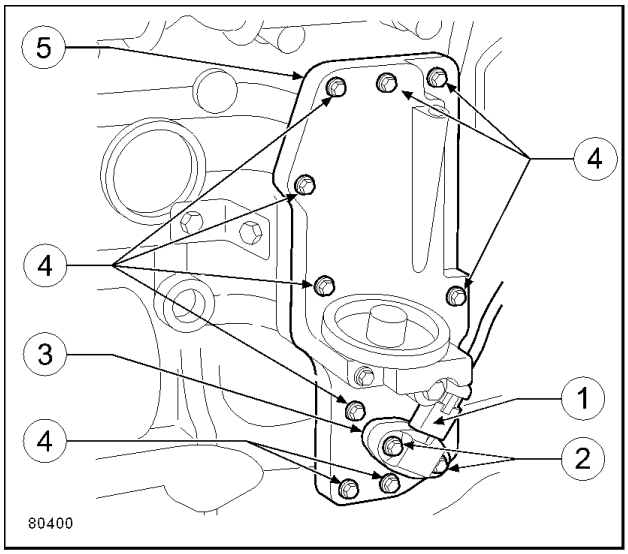
80380 17

22. Unscrew the retaining bolts **(1)** and remove the pipe fitting **(2)**.



80326 18

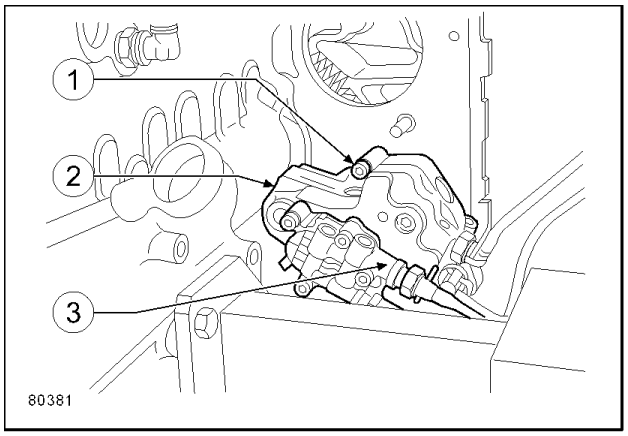
23. Disconnect the connector **(1)** from the oil pressure temperature sensor.
Unscrew the bolts **(2)** and remove the oil pressure temperature sensor **(3)**.
Unscrew the bolts **(4)** and remove the oil filter mounting **(5)** from the crankcase together with its seals.
Remove the cooler from its seat.



80400 19

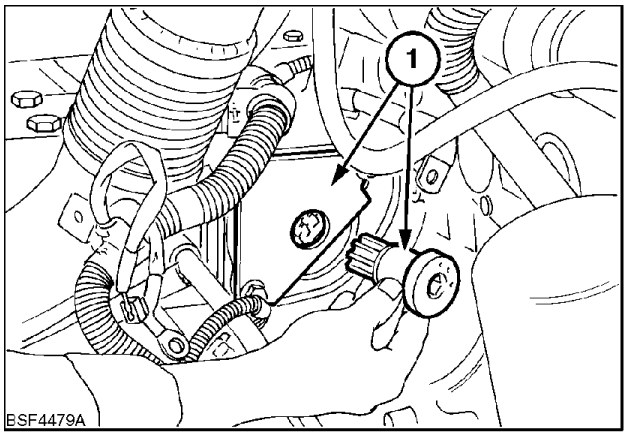
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24. Remove the nuts **(1)** and detach the high-pressure pump **(2)** together with the feed pump **(3)**.



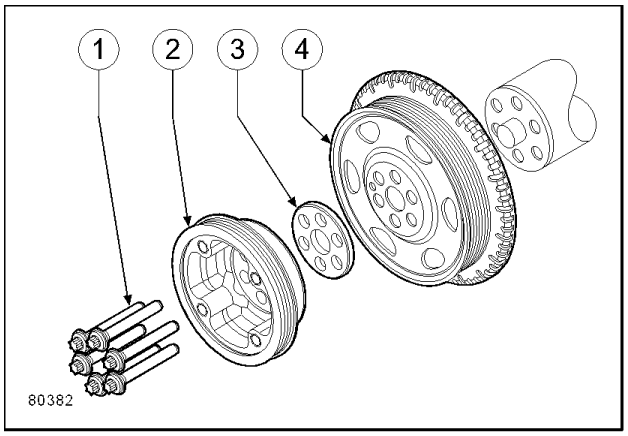
80381 20

25. Install the engine locking tool, **380000988**, **(1)**.
Loosen the screws fixing the flywheel to the crankshaft.



BSF4479A 21

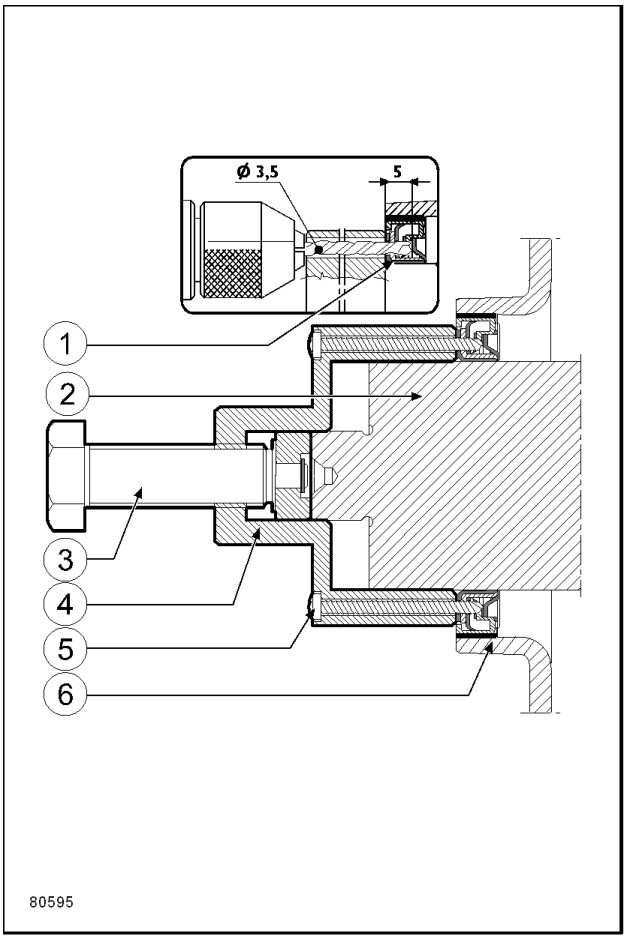
26. Unscrew the bolts **(1)**, remove the pulley **(2)**, spacer **(3)** and pulley **(4)**.
The engine flywheel locking tool can help with disassembly of the damper flywheel **(2)** fitted on the pulley **(4)**.



80382 22

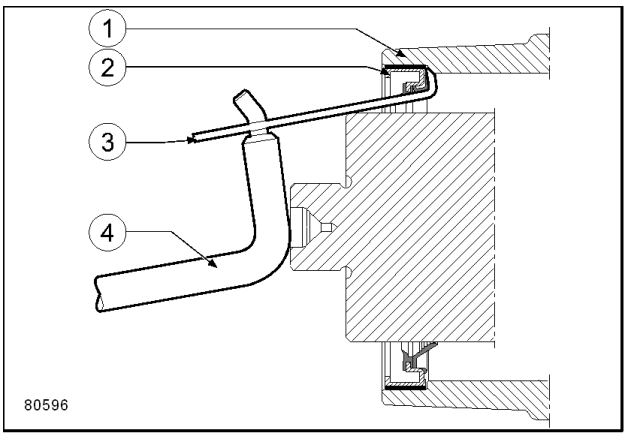
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27. Extract the front cover shaft seal. Apply tool **380000665 (4)** on the front tang **(2)** of the crankshaft. Perforate the inner seal **(1)** with a drill bit (Æ**3.5 mm** (**0.0138 in**.)) through the tool's guide holes, for a depth of **5 mm** (**0.1969 in**.).
Secure the tool to the seal by screwing down the 6 screws supplied. Extract the seal **(1)** by screwing down the screw **(3)**.



80595 23

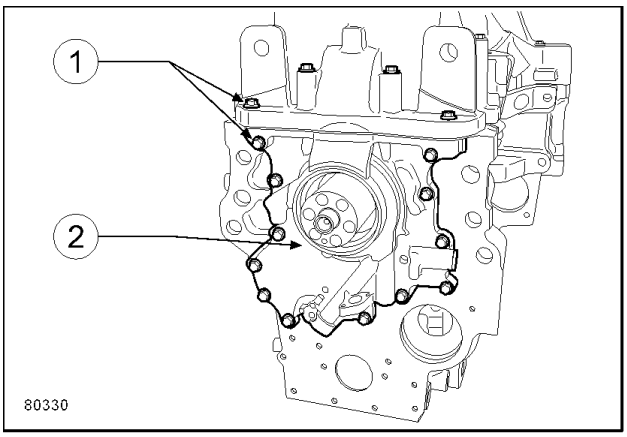
28. Use a suitable hooked device **(3)** with the aid of the lever **(4)** extract the outer seal **(2)** from the front cover **(1)**.



80596 24

29. Take out the screws **(1)** and remove the oil pump **(2)**.

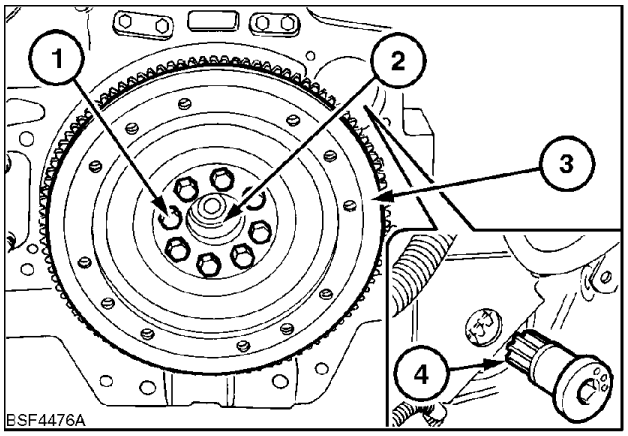
NOTE: *Note down the assembly position of the screws (1) as they have different lengths.*



80330 25

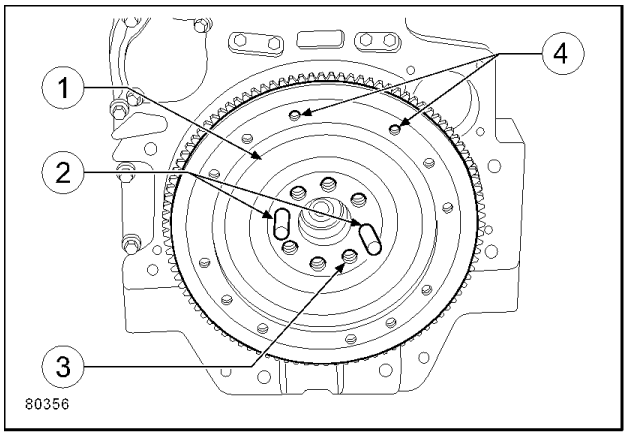
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30. Remove two opposing screws **(1)** where the extraction pins are to go in (see following figure).
Unscrew the remaining screws securing the flywheel **(3)** from the crankshaft **(2)**.
Remove the tool locking the flywheel **(4)**.



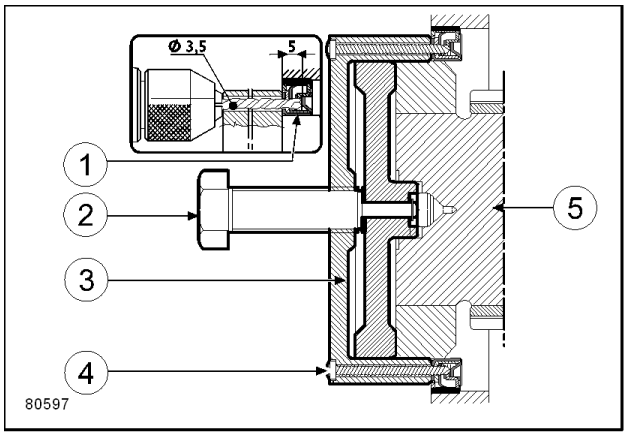
BSF4476A_114 26

31. Screw two screws of suitable length into the holes **(4)** to sling the flywheel with a lift.
Using the two guide pins **(2)** previously screwed into the holes of the crankshaft **(3)**, guide the extraction of the engine flywheel **(1)** with the aid of a lift.



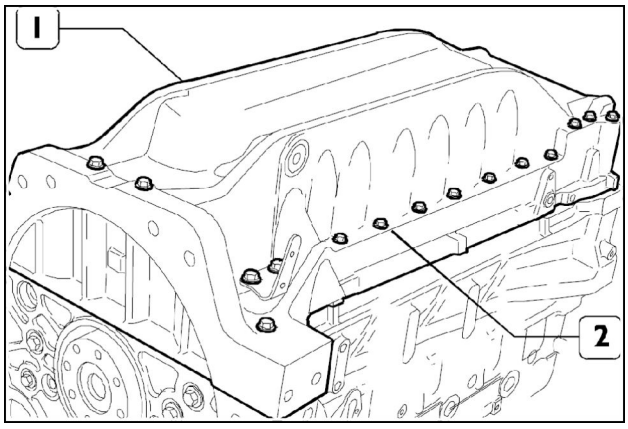
80356_115 27

32. Extract the seal, applying tool **380000663 (3)** onto the rear tang **(5)** of the crankshaft.
Perforate the inner seal with a drill bit (Æ **3.5 mm** (**0.0138 in**.)) through the tool's guide holes, for a depth of **5 mm** (**0.1969 in**.).
Secure the tool 380000663 **(3)** to the seal **(1)** by screwing down the 6 screws supplied **(4)**. Extract the seal **(1)** by screwing down the screw **(2)**.
Use a suitable hooked device with the aid of the lever extract the outer seal from the front cover.



80597 28

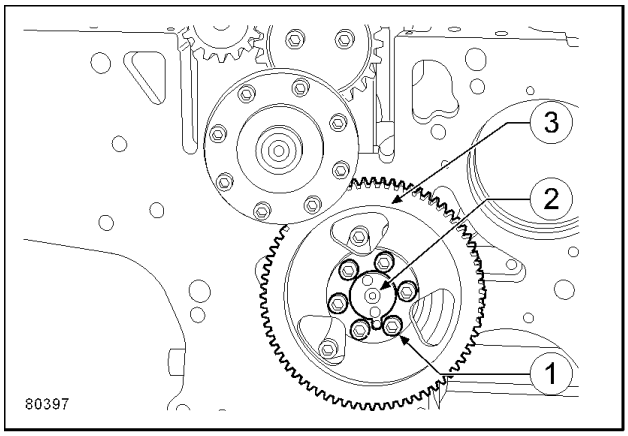
33. Turn the engine over.
Take out the screws **(2)** and remove the oil sump **(1)**.
Disconnect the high–pressure pump phase sensor.
Unscrew the bolt **(3)** and remove the timing gear box **(4)** from the crankcase.



BAIL07APH411AMA 29

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34. Take out the screws **(1)** and remove the gear **(3)** from the camshaft **(2)**.



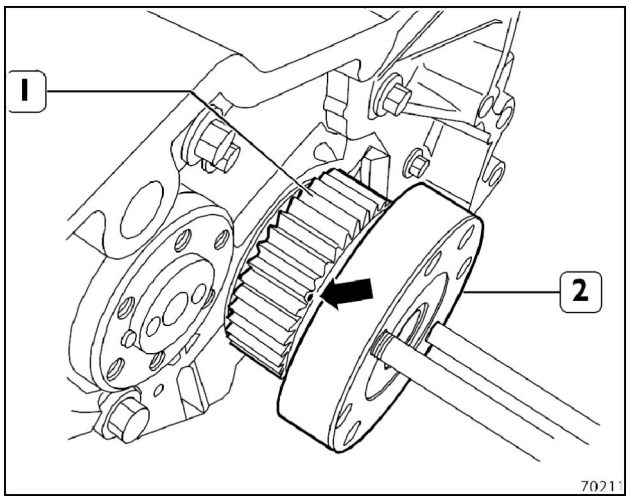
80397 30

NOTE: *For further disassembly of the engine block internal components, crankshaft, pistons, camshaft etc. : Refer to* ***ENGINE - Overhaul Internal components (B.10.A)*** *(Internal Components)*

INSTALLATION

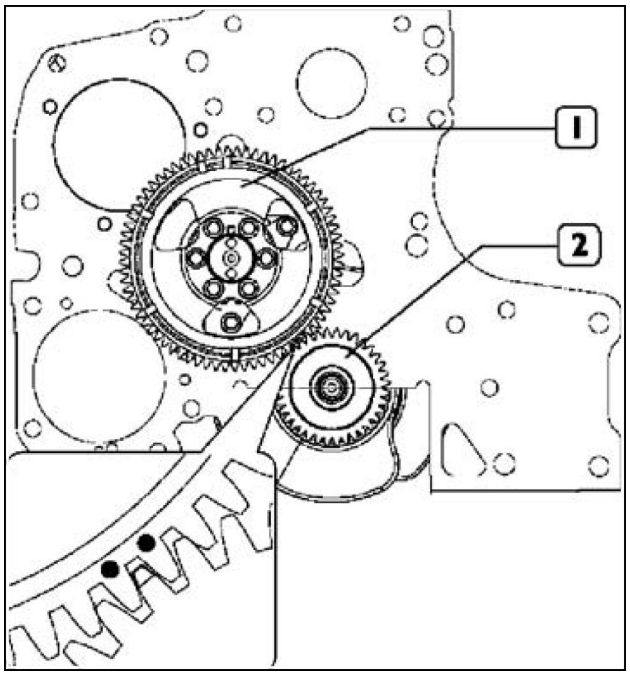
35. Using a felt tip pen mark the gear tooth **(1)** mounted on the engine shaft **(2)** on the upper surface where a groove has been created for the ignition timing.

NOTE: *Screw two pins into the gear as shown to enable shaft rotation.*



BAIL07APH412AMA 31

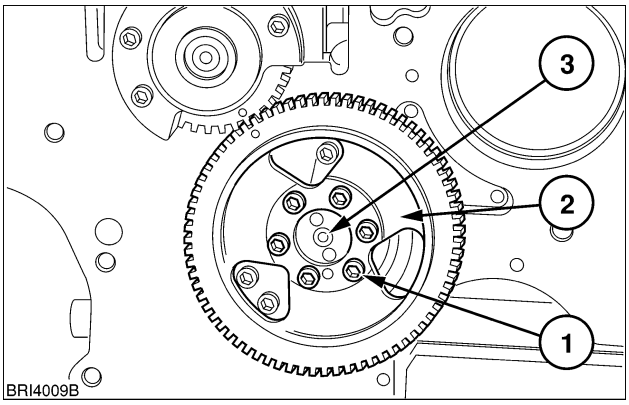
36. Turn the engine shaft and camshaft so that the tooth with the marked gear coincides with the marks on the bevel gear.



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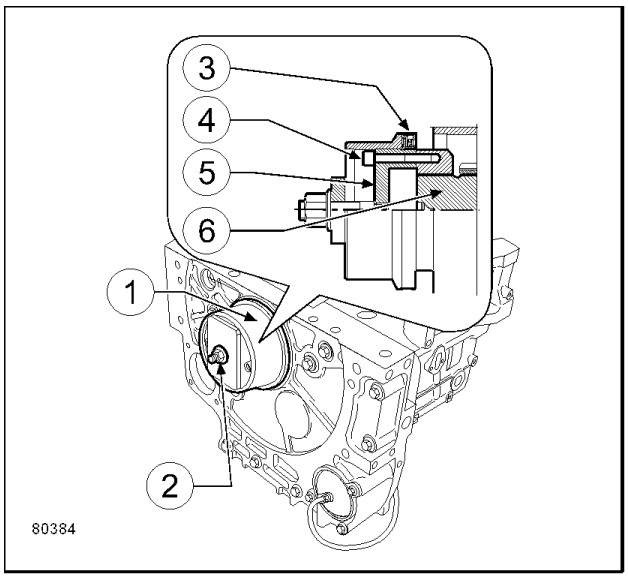
37. Install the bolts **(1)** to fix the gear **(2)** to the camshaft **(3)**. Tighten to **36 Nm** (**26.55 lb ft**).



BAIL06CCM067ASA 33

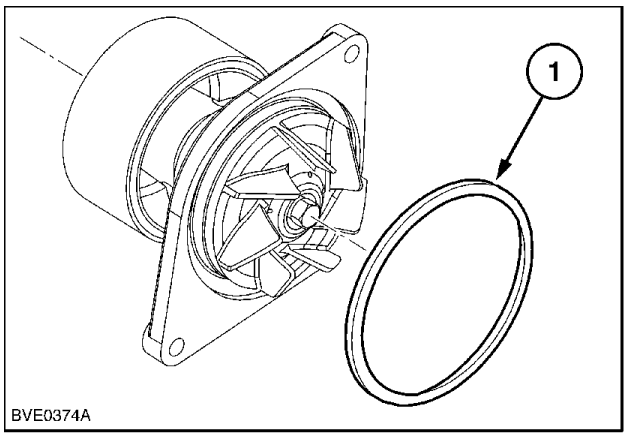
38. Install rear cover . (Refer to **Rear cover - Install (B.10.A)**)

39. Fix tool **380000664 (6)** to the rear output shaft **(5)**. Secure it by bolts **(4)** and fit the new sealing ring **(3)**.Position the outer part of the tool **(1)** onto the shaft **(5)** and screw nut **(2)** until the sealing ring **(3)** is located correctly in the housing.



80384 34

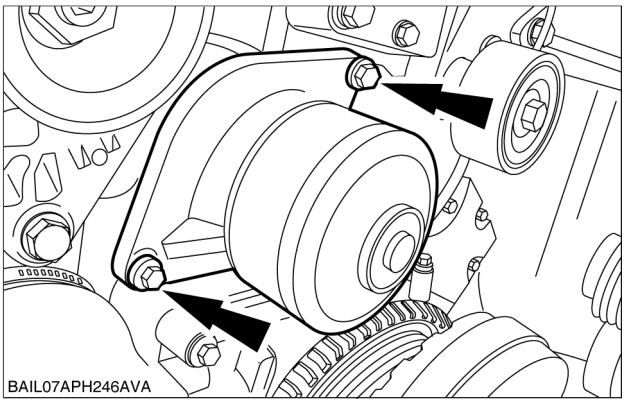
40. Make sure that the mating surfaces are clean. Install a new seal **(1)** and lubricate with clean engine oil. **CASE AKCELA NO. 1 ENGINE OIL SAE 15W-40** .



BVE0374A 35

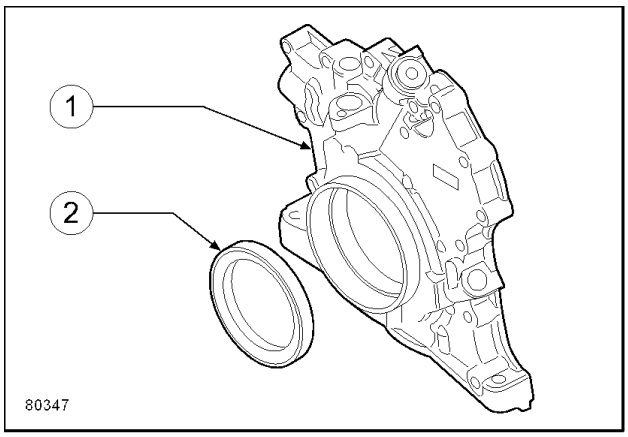
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41. Install the coolant pump. Tighten the retaining bolts to the specified torque value. Refer to **Water pump - Torque (B.50.A)**.



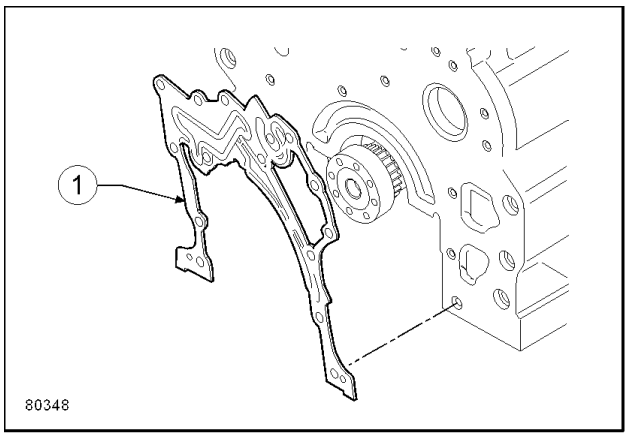
BAIL07APH246AVA 36

42. Remove seal **(2)** from the front cover **(1)**. Clean the surface thoroughly.



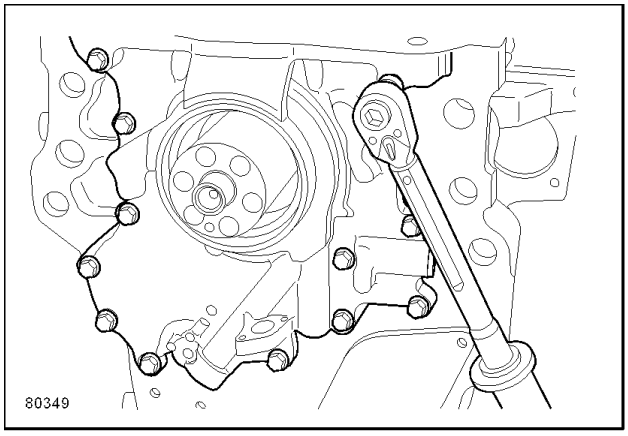
80347_130 37

43. Thoroughly clean the surface on the engine block and position gasket **(1)** on the block.



80348_131 38

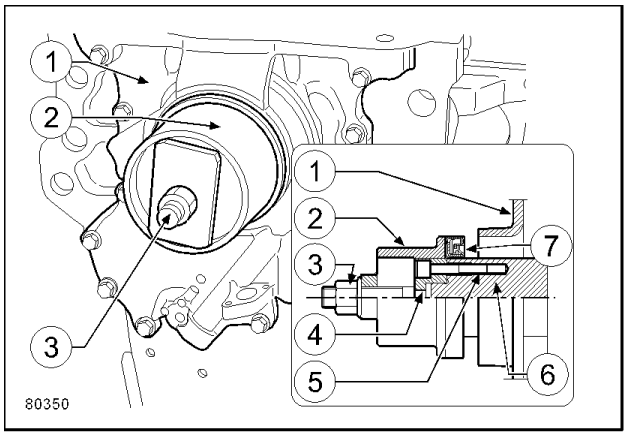
44. Position the oil pump on the block and tighten the bolts to **24 Nm** (**17.70 lb ft**) ± **4 Nm** (**2.95 lb ft**)



80349 39

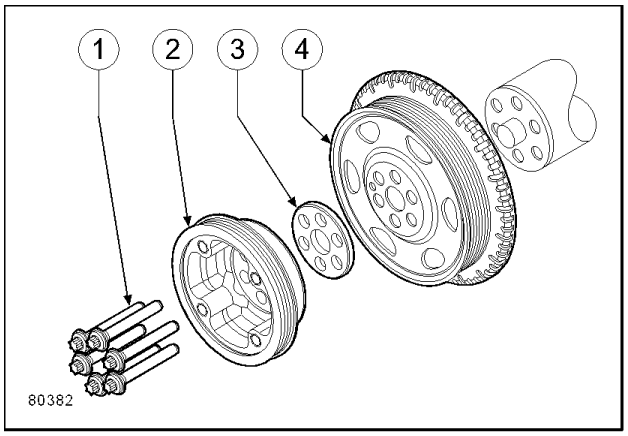
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45. Position tool **380000666 (4)** to the front output shaft **(6)** . Secure it by bolts **(5)** and fit a new seal **(7)**. Position part **(2)** on part **(4)** and screw nut **(3)** until the seal is seated in the front cover **(1)**.



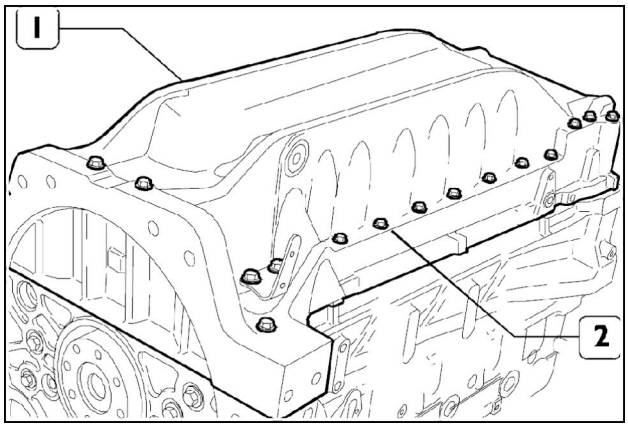
80350_133 40

46. Position the damper and pulley on the shaft Tighten bolts to **110 Nm** (**81.13 lb ft**).± **5 Nm** (**3.69 lb ft**)



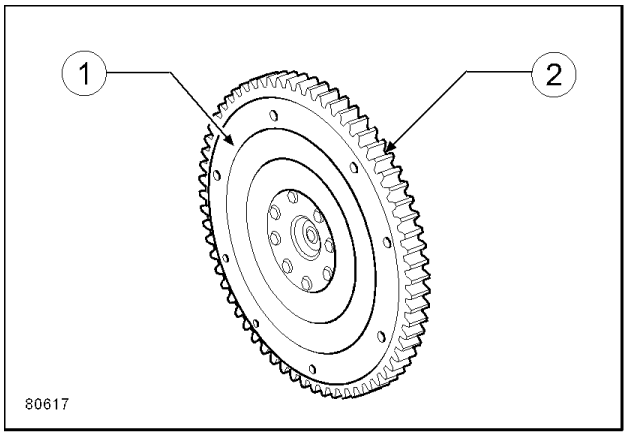
80382 41

47. Fit a new gasket . Position the oil pan **(1)** on the block and tighten the bolts **(2)** to the prescribed torque and sequence. **Oil pan - Torque (B.60.A) Oil pan - Tighten (B.60.A)**



BAIL07APH415AMA 42

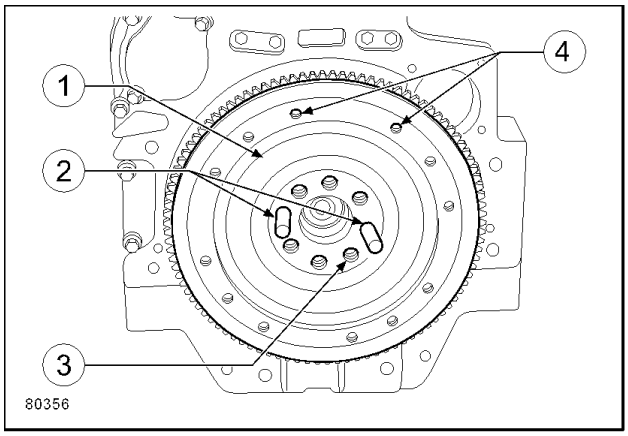
48. Check the contact surface of the clutch plate **(1)**. If scratched, machine the plate accordingly. Check the ring gear teeth **(2)**. If there is any excessive wear or broken teeth, remove ring gear from the flywheel using a suitable hammer. Fit a new ring gear by heating it to **150 °C** (**302.00 °F**) for 15 to 20 minutes. The chamfer on the inside of the ring gear should be facing the flywheel.



80617_134 43

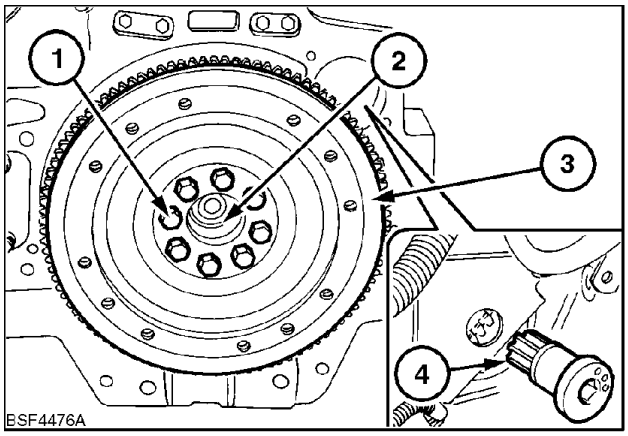
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49. Screw two manoeuvring hooks on to the flywheel using holes **(4)** . Using a suitable hoist bring the flywheel closer to its seat in the flywheel housing. Screw two pins **(2)** of suitable length to fit in holes **(3)** and use them as guides. Place the flywheel in the housing.



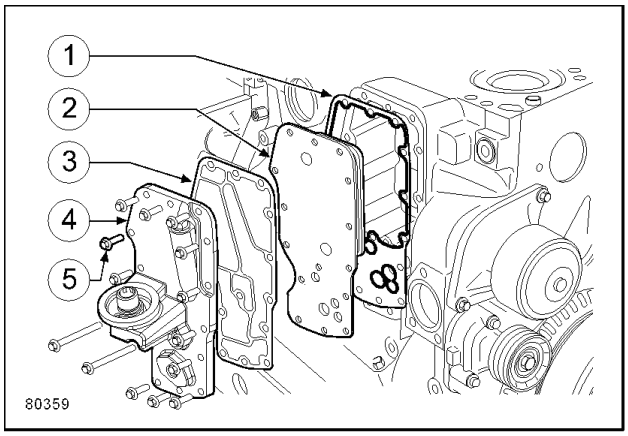
80356_135 44

50. Screw the flywheel fixing screws **(1)** onto the engine shaft **(2)**. Use the engine locking tool **(4)** to prevent the flywheel **(3)** rotating. Tighten M12 bolts to **85 Nm** (**62.69 lb ft**)± **10 Nm** (**7.38 lb ft**) and M10 to **49 Nm** (**36.14 lb ft**)± **5 Nm** (**3.69 lb ft**)



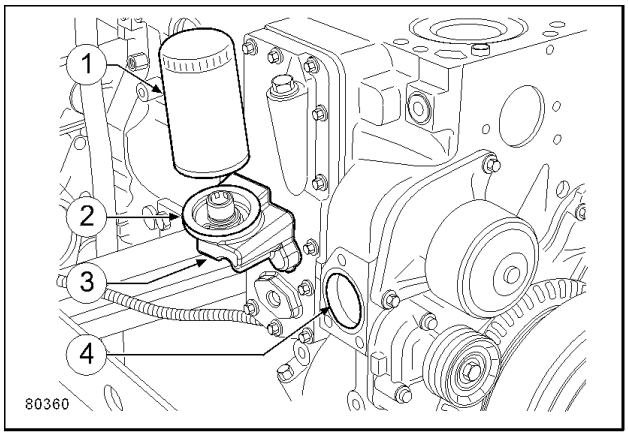
BSF4476A_136 45

51. Fit a new gasket **(1)**, the heat exchanger **(2)**, a gasket **(3)** and the oil filter support **(4)**. Tighten the screws to **24 Nm** (**17.70 lb ft**) ± **4 Nm** (**2.95 lb ft**).



80359_138 46

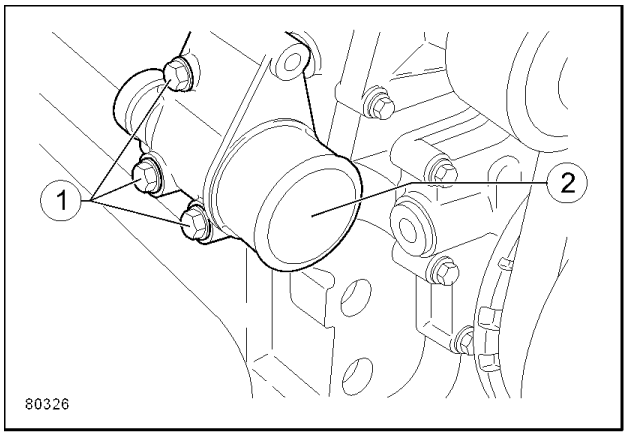
52. Lubricate the sealing ring **(2)** with engine oil and place on the oil filter **(1)**. Screw the oil filter onto the support until the sealing ring makes contact with the housing. Then tighten a further ¾of a turn. Do not overtighten. Fit a new seal on the oil temperature/pressure sensor and fit it on the support.



80360_139 47

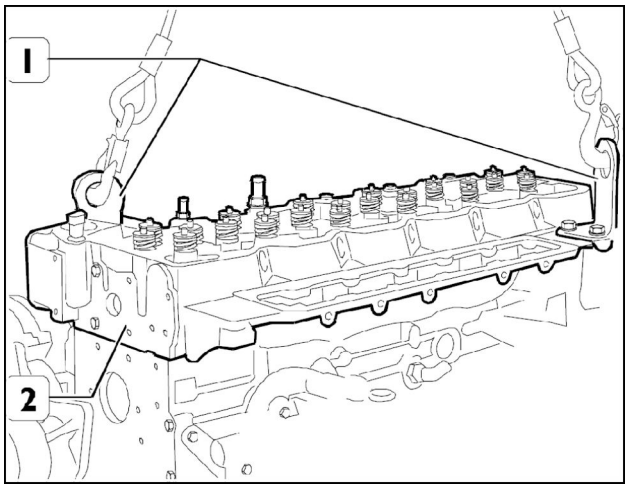
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53. Fit the pipeline union **(2)** to the block and tighten bolts to the prescribed torque.



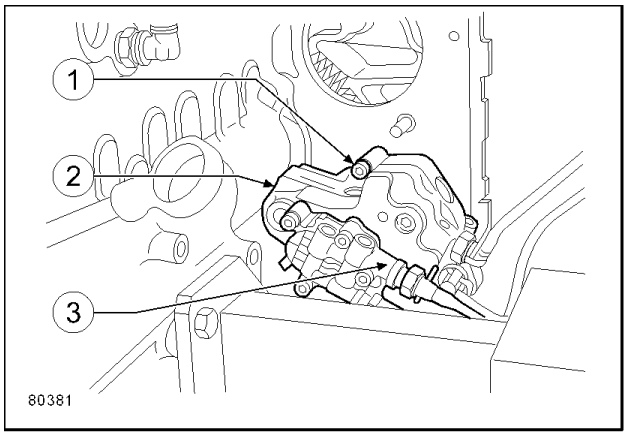
80326_112 48

54. Fit a new gasket to the engine block and position the cylinder head **(2)** on the block.



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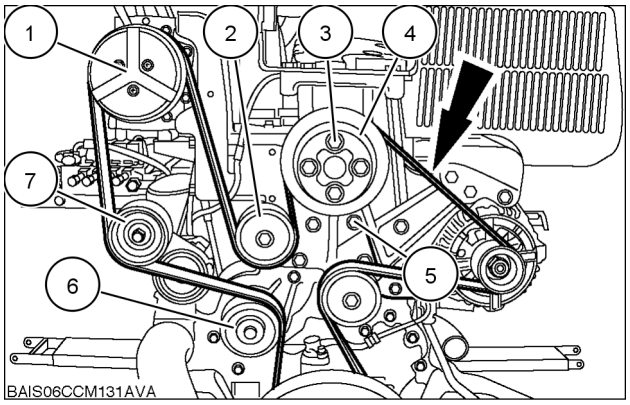
55. Refit the high pressure pump **(2)** and tighten the nuts **(1)** to the specified torque



80381 50

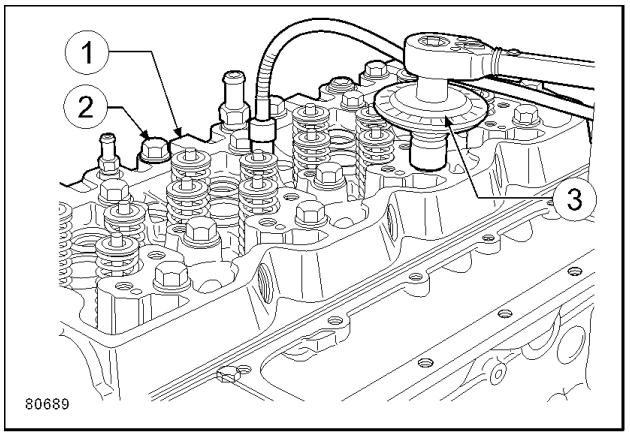
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56. Refit the belt tensioner **(7)** and tighten bolt to the prescribed torque. Refit the mounting **(9)** Refit the idler pulleys .



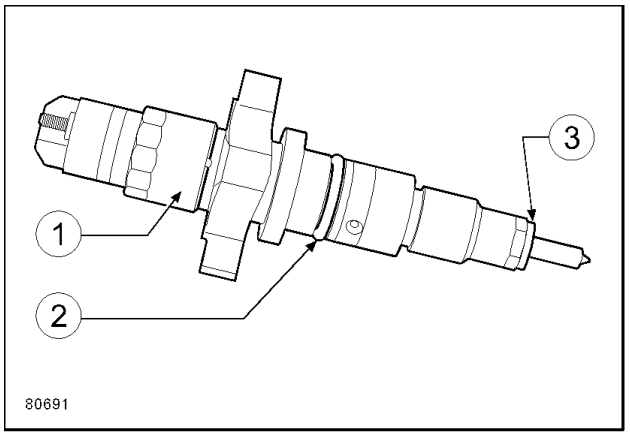
BAIS06CCM131AVA 51

57. Tighten the bolts on the cylinder head. in 3 steps Refer to **Cylinder head - Tighten (B.10.A)** and **ENGINE - Dimension - Stretch Bolt Check for reuse. (B.10.A)** For the required torque settings, refer to **ENGINE - Torque (B.10.A)** .
Step 1 .Tighten to the required torque settings.
Step 2 .Tighten a further **90 °** ± **5 °** using a torque angle tool **(3)**.
Step 3. Tighten again a further **90 °** ± **5 °**.



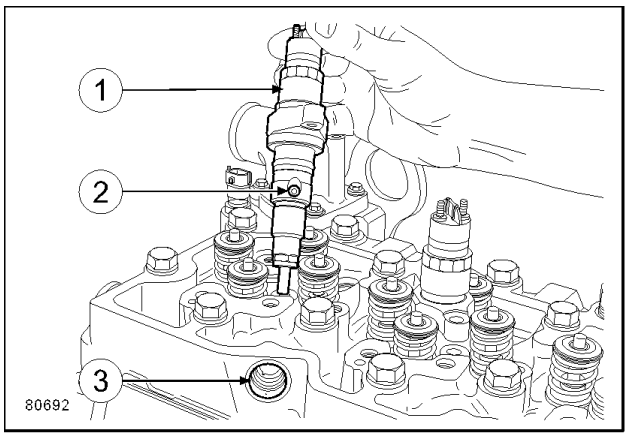
80689_91 52

58. Fit a new seal **(2)** lubricated with petroleum jelly and a new sealing washer **(3)** on the injector **(1)** .



80691 53

59. Fit injectors **(1)** on the cylinder head seats, making sure the fuel inlet hole **(2)** is facing the fuel manifold seat **(3)** side.



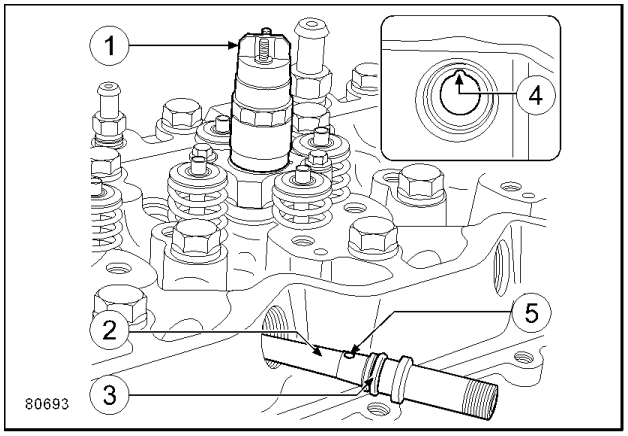
80692 54

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60. Use tool **380001099 (1)** to fit the injector **(2)** to its seat. Screw in the injector bolts without tightening them.

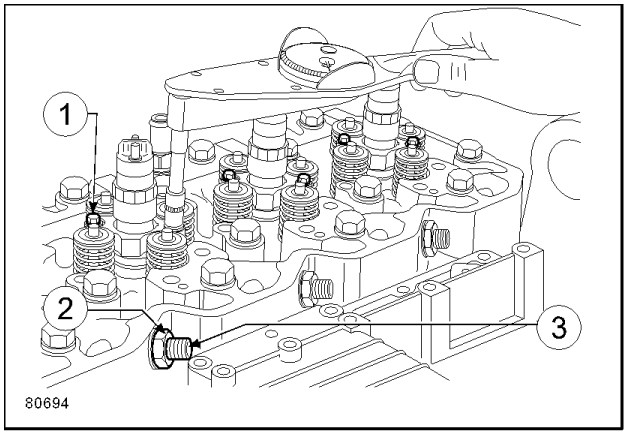
61. Fit a new seal lubricated with petroleum jelly on to the fuel manifold **(2)** and fit it into the cylinder head seat so that the positioning ball **(5)** is in line with the notch on the housing **(4)** .

NOTE: *Disassembled fuel manifolds* ***(2)*** *must not be reused . They should be replaced with new manifolds.*



80693 55

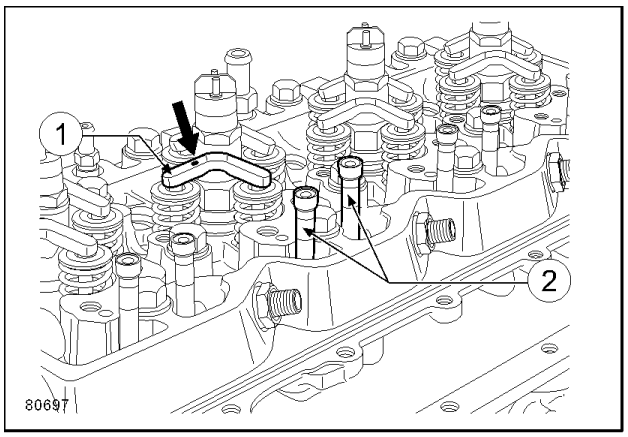
62. Use a torque wrench to gradually and alternately tighten the injector retaining screws **(1)** to a torque of **8.5 Nm** (**6.27 lb ft**) ± **0.8 Nm** (**0.59 lb ft**).
Tighten the fuel manifold **(3)** nuts **(2)** to **50 Nm** (**36.88 lb ft**) .



80694 56

63. Refer to **Valve drive Rocker assembly - Component identification (B.10.A)**, **Rocker assembly Shaft - Dimension (B.10.A)** and **Camshaft Push rod - Visual inspection (B.10.A)**.

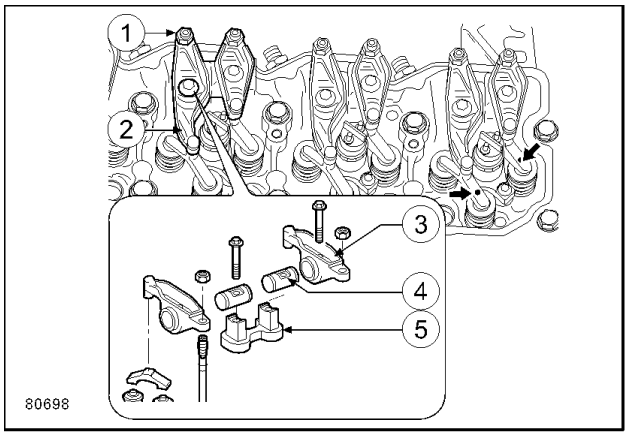
64. Fit rocker control rods **(2)**. Position the bridges **(1)** on valves with marks (→) facing the exhaust manifold.



80697 57

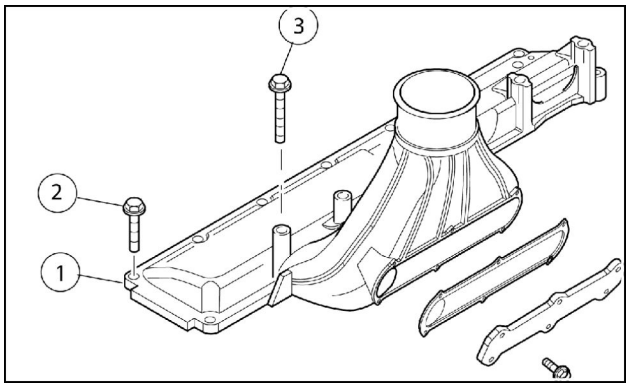
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65. Check that the tappet adjusters **(1)** are loose to prevent them sticking to the rods when refitting the rocker assembly. Fit the rocker assemblies comprising the support **(5)**, rocker arms **(3)**, and spindles **(4)**. Secure them to the cylinder head by tightening the retaining bolts to **36 Nm** (**26.55 lb ft**). To adjust clearance between rockers and valves refer to **Camshaft Tappet - Clearance (B.10.A)**



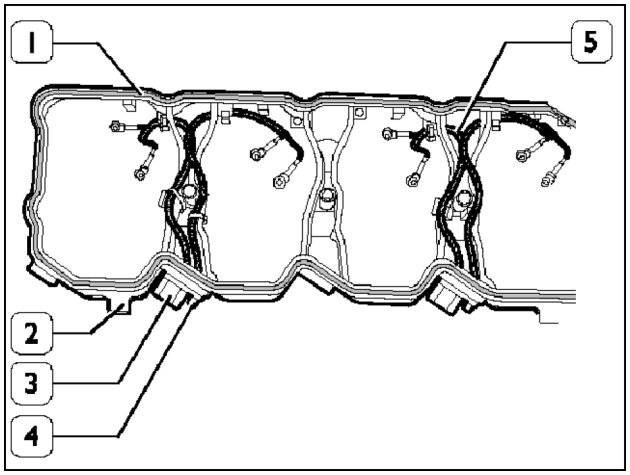
80698 58

66. Apply Loctite 5999 onto the mating surface of the intake manifold **(1)** and tighten the bolts **(2)** and **(3)** to the prescribed torque. Fit temperature and air pressure sensor.



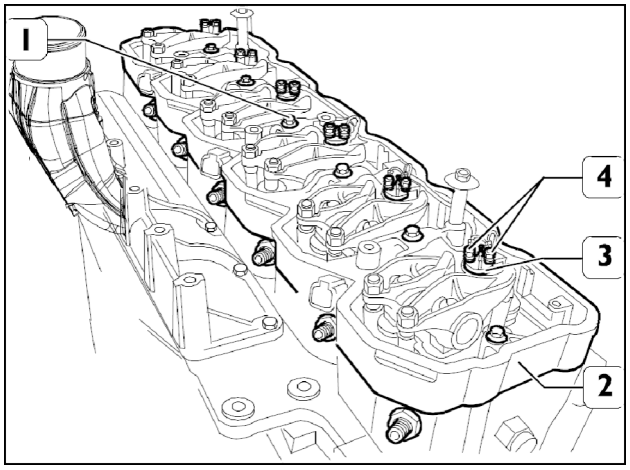
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67. Check electrical cable **(5)** condition and replace if damaged by cutting the support **(2)** clamps and removing the screws **(4)** that secure it to the connections. Fit a new gasket **(1)** on to the support **(2)**.



BAIL07APH403AMA 60

68. Fit the wiring support **(2)** and tighten the screws **(1)** to the specified torque. Connect the electric cables to the electro-injectors **(3)** and using torque wrench **380000158** tighten the retaining nuts to the specified torque.



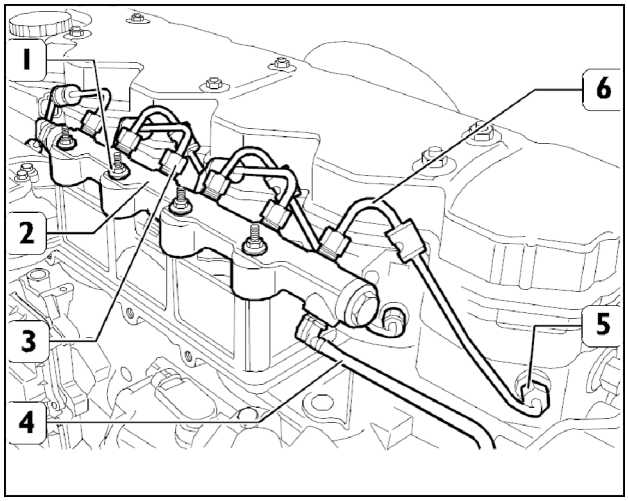
BAIL07APH416AMA 61

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69. Fit the rocker cover. (Refer to **Valve cover - Install (B.10.A)**)

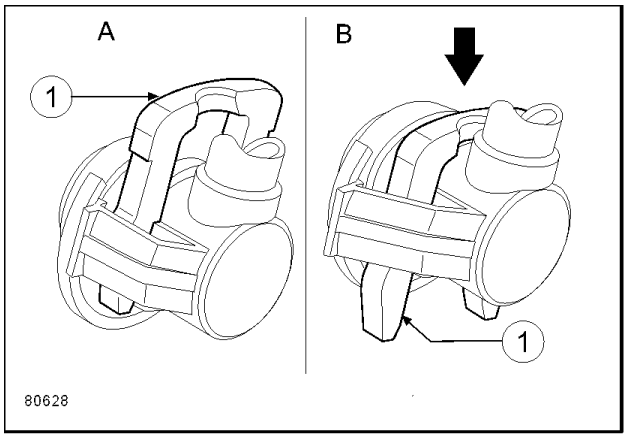
70. Mount the rail **(2)** and tighten the retaining screws **(1)** to the specified torque . Connect new fuel pipes **(6)** to the rail and to the manifold for electro-injectors **(5)**.

NOTE: *The pipe joints **(3)** must be tightened to **20 Nm (14.75 lb ft)** .*



BAIL07APH417AMA 62

71. Press the clamp **(1)** in arrow direction **(B)** and connect the pipe to the rail. Reset the clamp to position **(A)**.

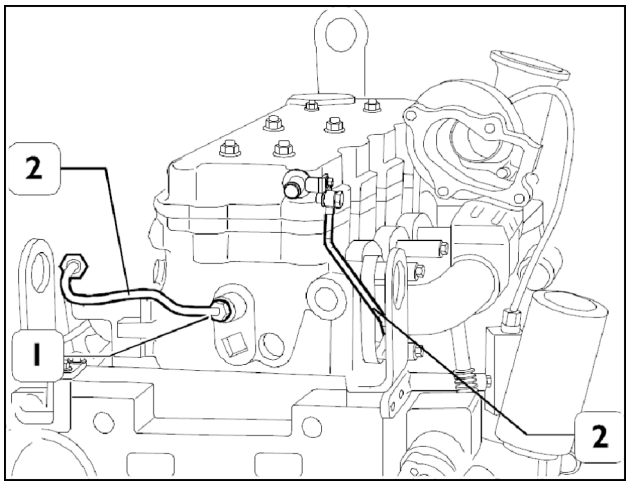


80628 63

72. Refit exhaust manifold. (Refer to **Exhaust manifold - Install (B.40.A)**

73. Install the turbocharger. (Refer to **Turbocharger - Install (B.30.A)**

74. Connect pipe **(2)** to the fuel pressure limiter **(1)** . Connect the external vent pipe **(3)** to the rocker cover and the crankcase.

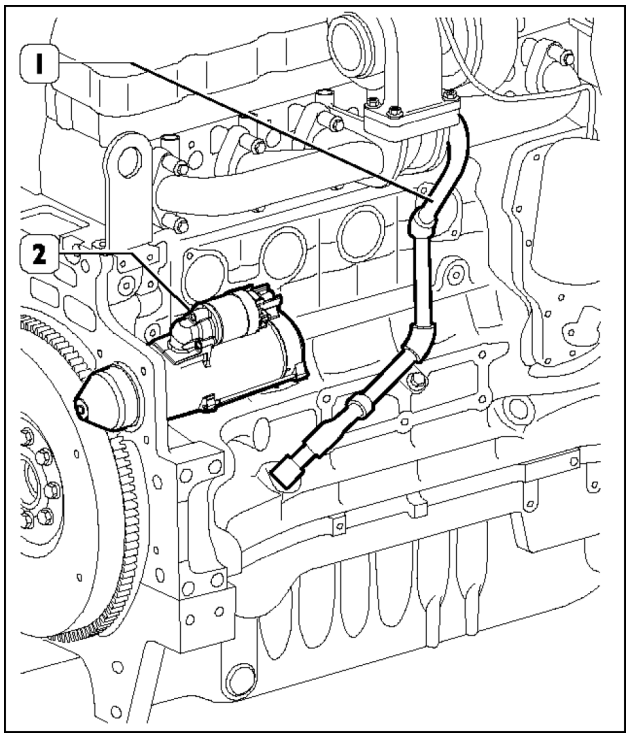


BAIL07APH418AMA 64

75. Remove the engine from the stand using a suitable hoist and place on a suitable support. Remove engine lifting brackets.

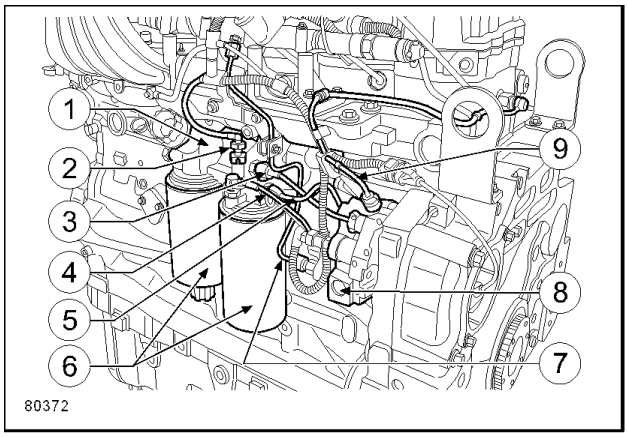
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76. Refit the oil filling pipe **(1)** and the starter motor **(2)**.



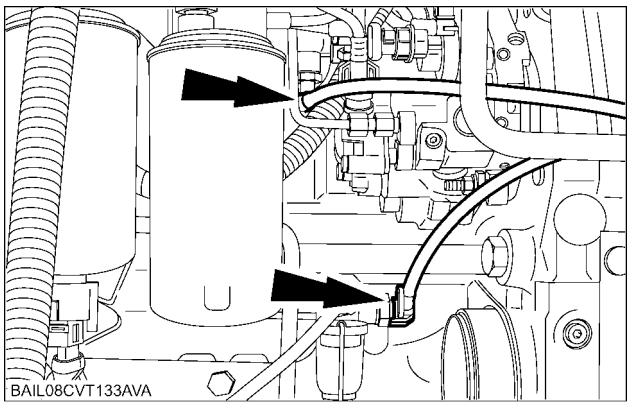
BAIL07APH375BMA 65

77. Assemble the bracket and support **(1)** of the fuel filter **(6)**. Connect the fuel pipes in sequence **(9) (3) (4)** and **(5)**.to the pump **(8)**.



80372 66

78. Refit the fuel pipes to the pre-filter and water trap.



BAIL08CVT133AVA 67

79. Reconnect the engine harness to all sensors, engine control module, and rail diffuser.

IMPORTANT: *Always check connections for leaks before running engine at operating level*

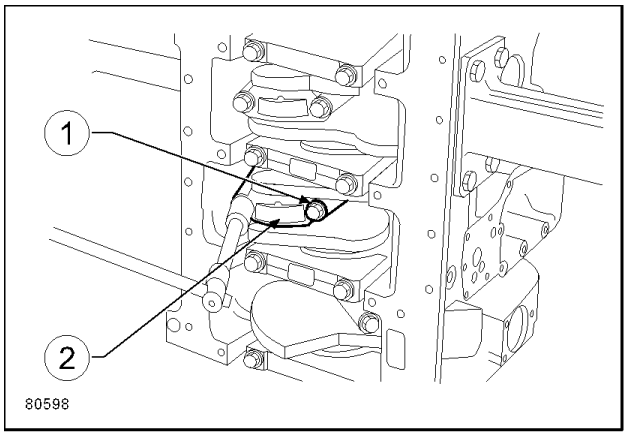
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ENGINE - Overhaul Internal components

Prior operation:
ENGINE - Overhaul External Components (B.10.A) ENGINE - Remove (B.10.A) ENGINE - Disconnect (B.10.A)

1. Take out the screws **(1)** securing the connecting rod caps **(2)** and remove them.

NOTE: *Mark the caps to ensure that they are refitted to the original rod in the original position.*

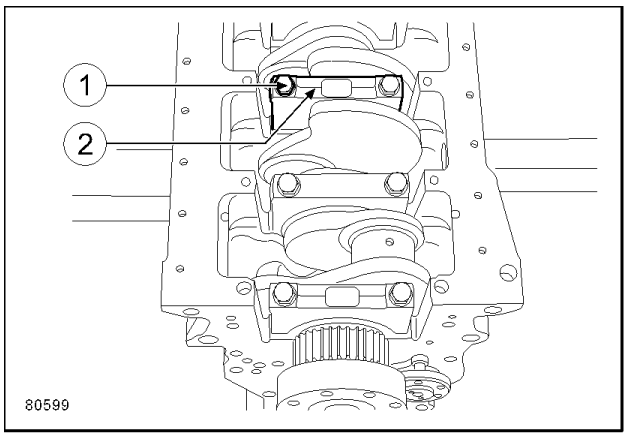


80598 1

2. Extract the pistons together with the connecting rods from the top of the crankcase.

NOTE: *Keep the half bearings in their respective housings since, if they are used, they must be mounted in the position found upon disassembly.*

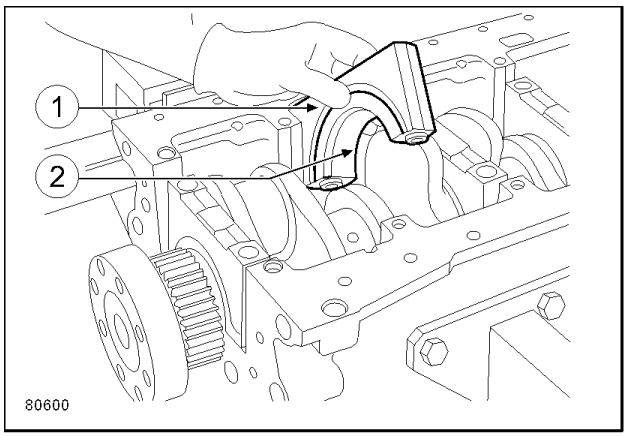
3. Take out the screws **(1)** and remove the main bearing caps **(2)**.



80599 2

4. The penultimate main bearing cap **(1)** and the related mounting have the half bearing **(2)** equipped with a shoulder ring.

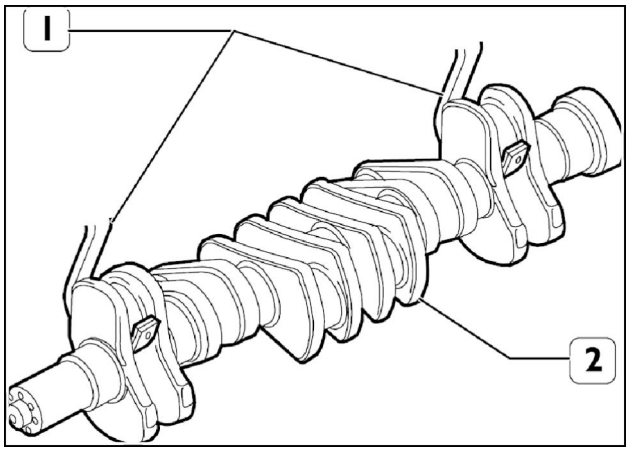
NOTE: *Note down the assembly position of the top and bottom half bearings since, if they are reused, they must be mounted in the position found upon disassembly.*



80600_116 3

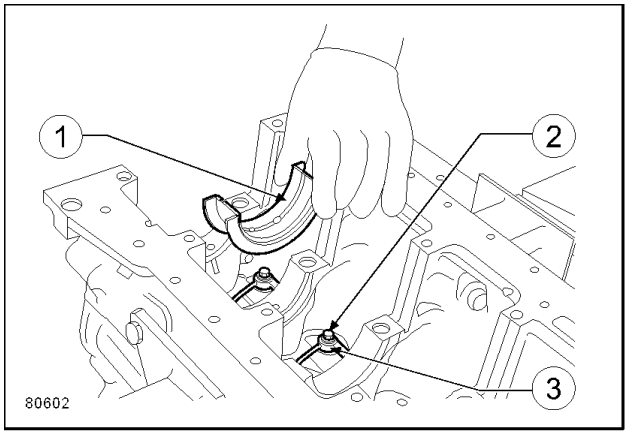
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5. Using suitable lifting hooks **(1)** lift and remove the crankshaft **(2)** from the cylinder block.



BAIL07APH419AMA 4

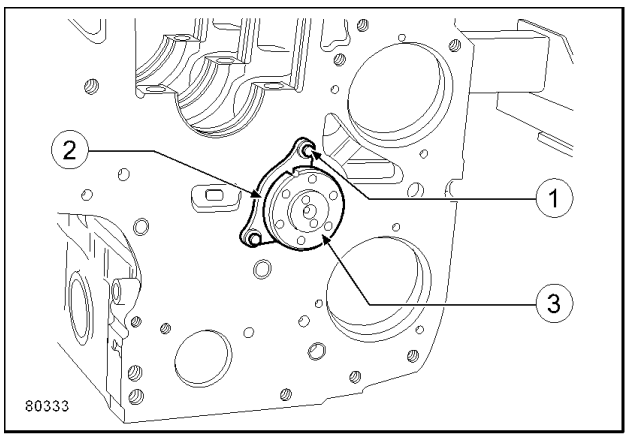
6. Remove the main half bearings **(1)**; take out the screws **(2)** and remove the oil nozzles **(3)**.



80602 5

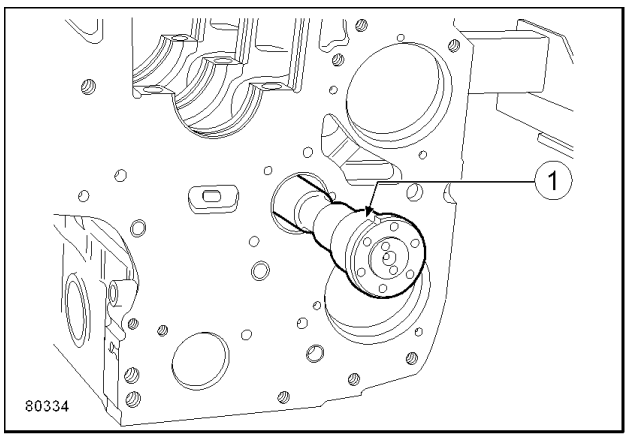
7. Take out the screws **(1)** and remove the plate **(2)** retaining the camshaft **(3)**.

NOTE: *Note down the assembly position of the plate (2).*



80333 6

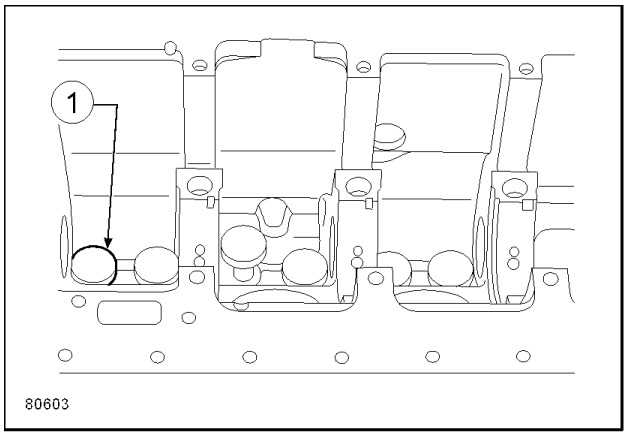
8. Carefully extract the camshaft **(1)** from the crankcase.



80334 7

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9. Extract the tappets **(1)** from the crankcase.

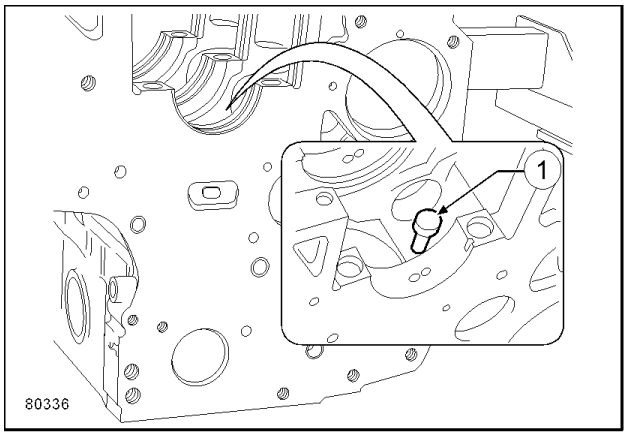


80603 8

10. Inspect and check the cylinder block dimensions, (Refer to **Cylinder block - Overhaul (B.10.A) Cylinder block - Measure (B.10.A)** and **Cylinder block - Dimension (B.10.A)**)

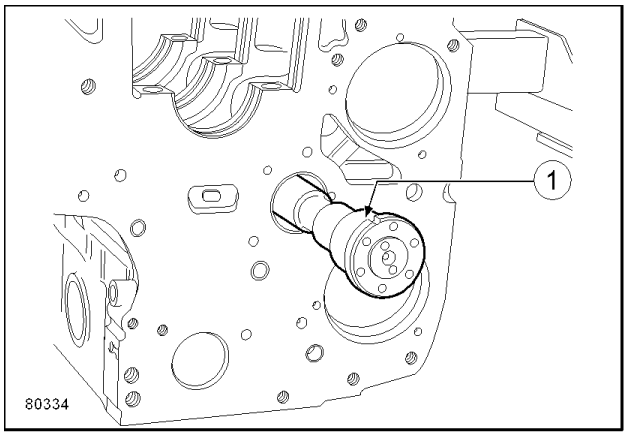
11. Camshaft pin and cam surfaces should be absolutely smooth. If there is any evidence of seizing or scoring replace the camshaft and bushes. Refer to **Valve drive Camshaft - Measure (B.10.A)** and **Cylinder block - Overhaul (B.10.A)**

12. Lubricate the tappets **(1)** and fit them into the relevant housings on the block



80336 9

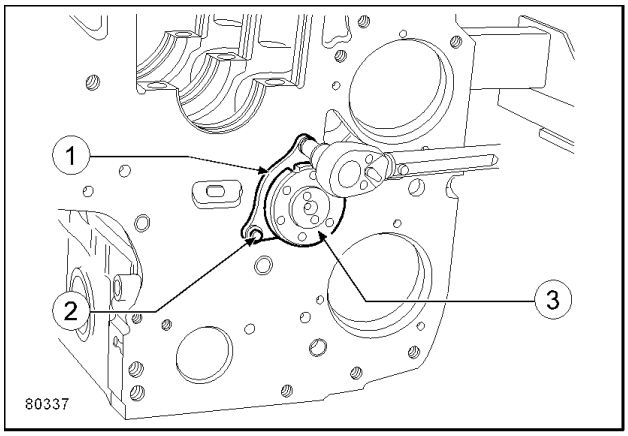
13. Lubricate the camshaft bush and fit the camshaft **(1)** taking care not to damage the bush or the housing.



80334_117 10

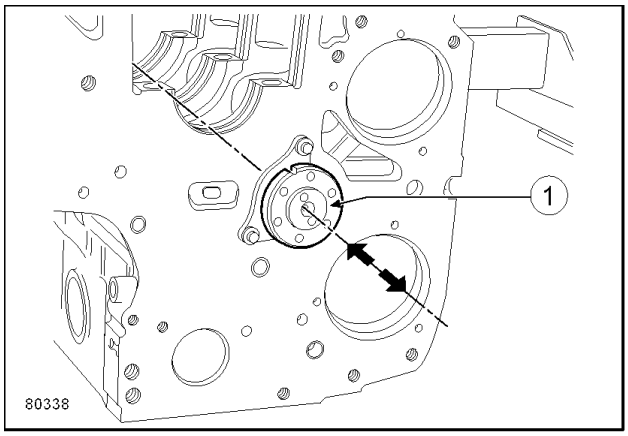
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14. Position the plate **(1)** retaining the camshaft **(3)** with the slot facing towards the top of the crankcase and the punchmark facing the operator. Tighten the screws **(2)** to the prescribed torque, refer to **Valve drive Camshaft - Torque (B.10.A)**.



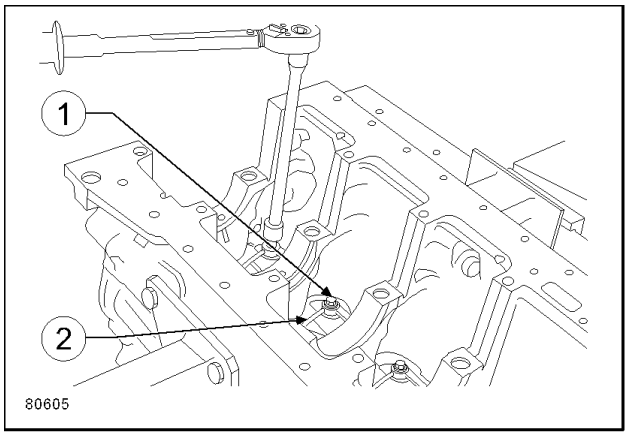
80337 11

15. Using a Dial Test indicator and a suitable lever, check the end float of the camshaft **(1)**.
Locate the dial indicator to the end of the camshaft, using the lever, apply light pressure to move the camshaft one way. Set the dial indicator to "zero", apply light pressure in the opposite direction with the lever. The reading must be **0.23 mm +/- 0.13** (**0.0091 in +/- 0.0051**.).



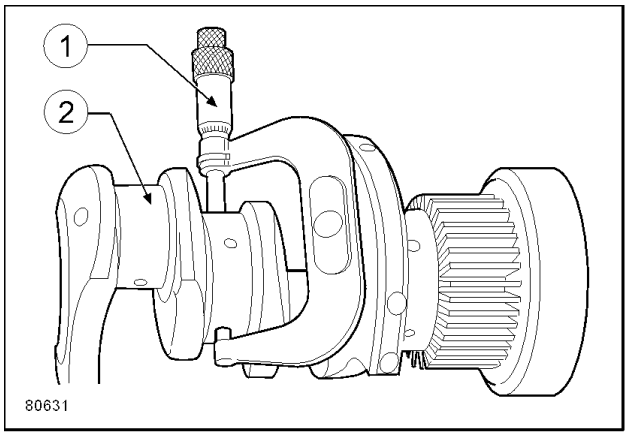
80338 12

16. Fit nozzles **(2)** and tighten the retaining screws **(1)** to the specified torque.



80605 13

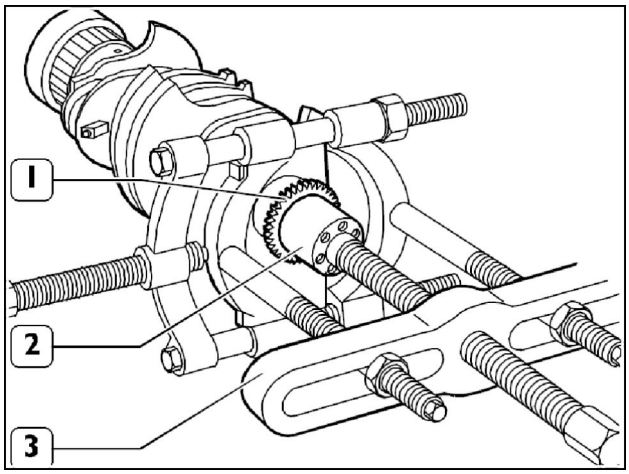
17. Inspect and check the crankshaft . Grind journals and crankpins if seizing ,scoring, or excessive ovalisation is found. Before grinding the pins measure them with a micrometer **(1)**to decide the final diameter by which the pins **(2)** should be reduced. Refer to **Crankshaft - Measure (B.10.A)** and **Crankshaft - Dimension (B.10.A)**



80631 14

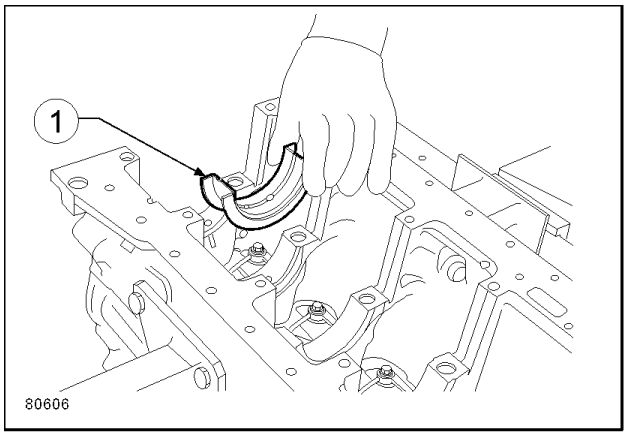
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18. Check that the gear teeth **(1)** on the shaft **(2)** are not damaged or worn. If required remove gear using a suitable puller **(3)**. When fitting a new gear heat it to **180 °C** (**356.00 °F**) for 10 minutes in an oven and then key it to the crankshaft.



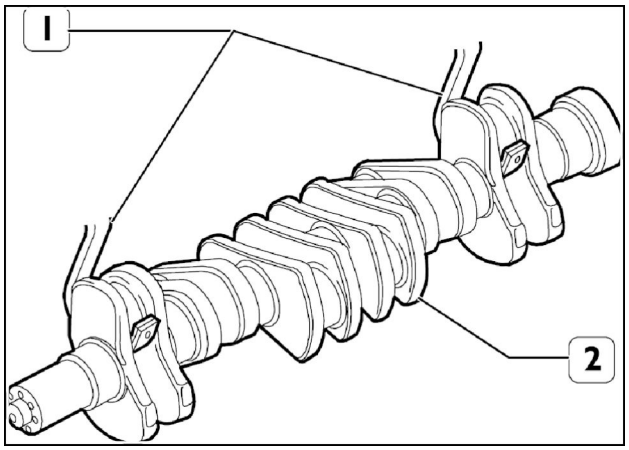
BAIL07APH421AMA 15

19. Refit the main bearings that have not been replaced in the same position they were found at removal. Main bearings are supplied as spares with **0.250 mm** (**0.01 in**) - **0.500 mm** (**0.02 in**) undersize on the internal diameter. Clean the bearings and fit them into the housings. The second to last bearing **(1)** is fitted with shoulder half rings



80606_118 16

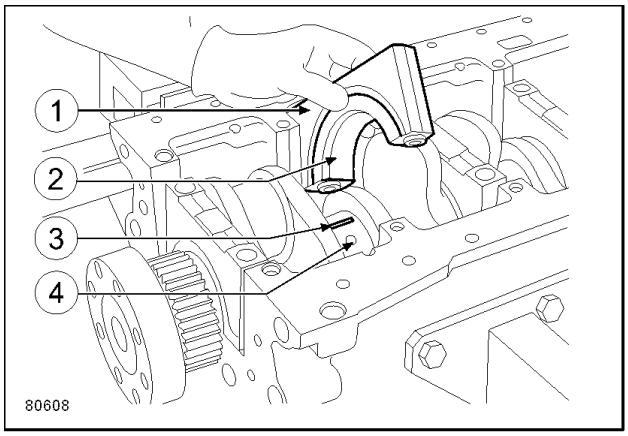
20. Using a suitable tool and hoist refit the crankshaft into the cylinder block.



BAIL07APH419AMA 17

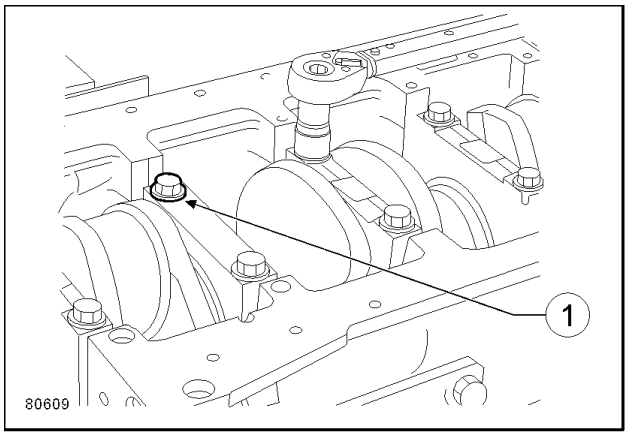
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21. Check the backlash between the crankshaft main journal and the relevant bearings as follows;
Make sure the parts are perfectly clean and remove all traces of oil.
Position a length of calibrated wire **(3)** on the crankshaft journals **(4)** , parallel to the crankshaft centre line
Fit the caps **(1)** complete with half bearings **(2)** on the relevant supports.



80608_159 18

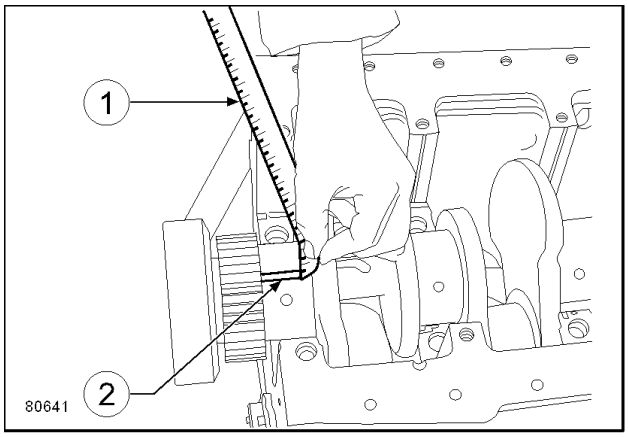
22. Before reusing the retaining bolts refer to **ENGINE - Dimension - Stretch Bolt Check for reuse. (B.10.A)**
Screw in the pre lubricated bolts and tighten them in three successive stages:
1st stage - with a torque wrench tighten to **50 Nm** (**36.878 lb ft**) ± **3 Nm** (**2.213 lb ft**)
2nd stage - tighten to **80 Nm** (**59.005 lb ft**) ± **5 Nm** (**3.688 lb ft**)



80609_121 19

23. 3rd stage - Using a suitable angle gauge tighten the bolts a further **90 ° ± 5 °**

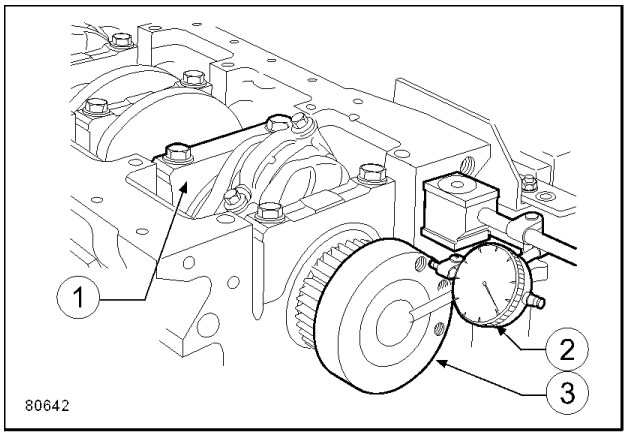
24. Remove the support caps
The clearance between the main bearings and the relevant journals is measured by comparing the width of the calibrated wire **(2)** , at the most narrow point with the graduation of the scale of the scale on the case containing the calibration wire. The numbers on the scale indicate the mating clearance (backlash) in millimetres. If the clearance is found to be other than as prescribed , change the half bearings and repeat the check. Once the correct clearance has been obtained lubricate the bearings and permanently mount the supports. Tighten the retaining bolts as previously described.



80641_162 20

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25. The thrust ring clearance is checked by setting a dial gauge **(2)** with a magnetic base on the crankshaft **(3)** as shown. The normal assembly clearance is **0.068 - 0.41 mm** (**0.003 - 0.016 in**) . If the clearance is found to be greater change the main half bearings of the second from last rear thrust bearing support **(1)** and check the clearance again between the crankshaft journals and main half bearings.

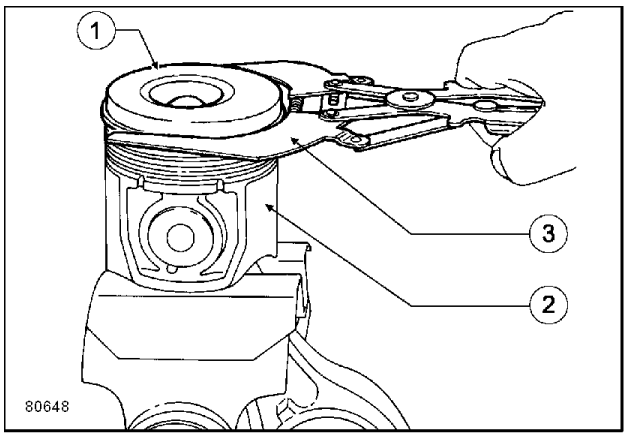


80642_163 21

26. Piston assembly - Refer to **Connecting rod and piston - Exploded view (B.10.A)**

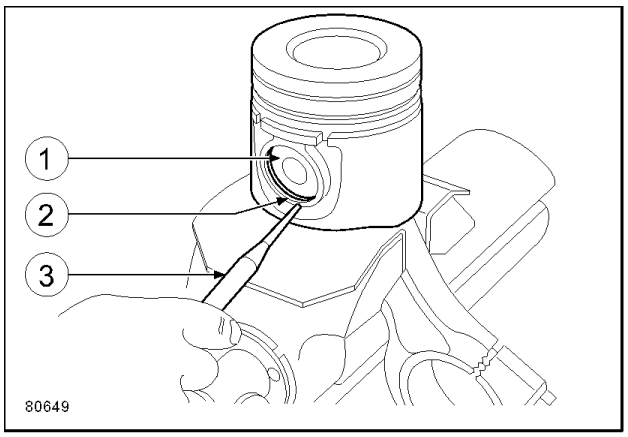
NOTE: *The pistons are supplied as spares with the following sizes: Standard and* ***0.4 mm***

27. Clean all parts carefully before proceeding with the operations described below.
Check that the pistons show no signs of seizure, scoring, cracking or excessive wear; change them if they do.
Removing the rings **(1)** from the piston **(2)** with suitable piston ring pliers **(3)**.



80648 22

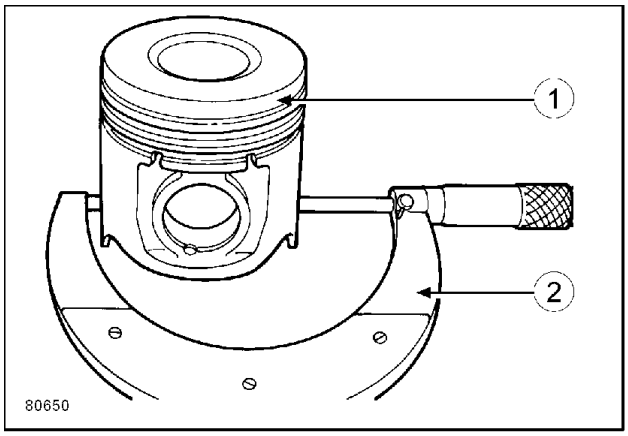
28. The piston pin **(1)** and retaining rings **(2)** should be removed using a marking tool **(3)**.



80649_167 23

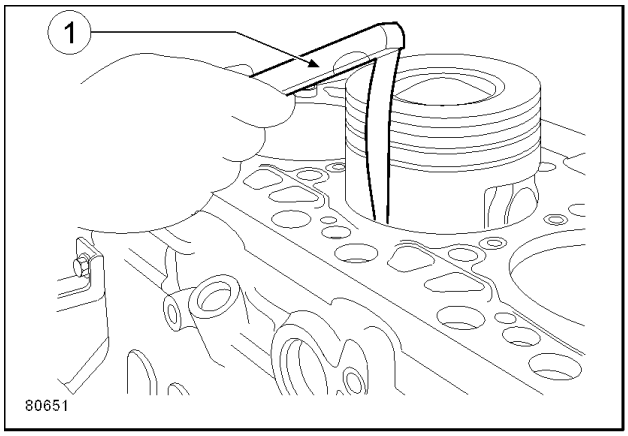
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29. For piston dimensions refer to **Connecting rod and piston Piston - Dimension (B.10.A)** .
Using a micrometer **(2)** measure the diameter of the piston **(1)** to determine the assembly clearance.



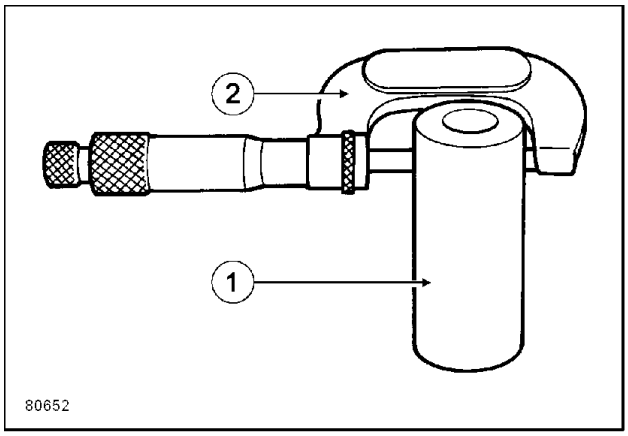
80650_168 24

30. The clearance between the piston and the cylinder barrel can checked using a feeler gauge **(1)**.



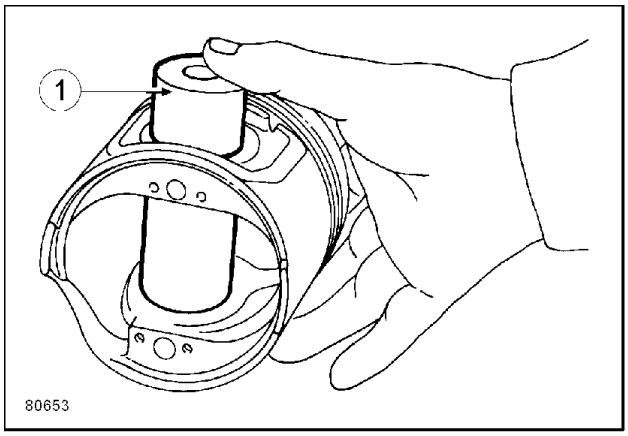
80651_169 25

31. Measure the piston pin **(1)** using a micrometer **(2)**.



80652_170 26

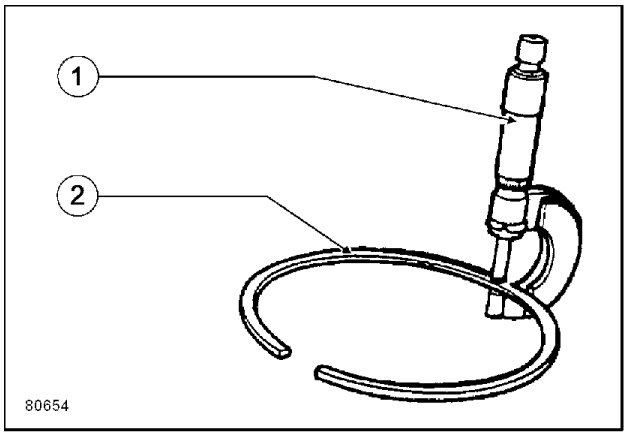
32. Lubricate the pin and the piston pin seat with engine oil . The pin should go into the piston with a light pressure of the fingers and must not drop out.



80653_171 27

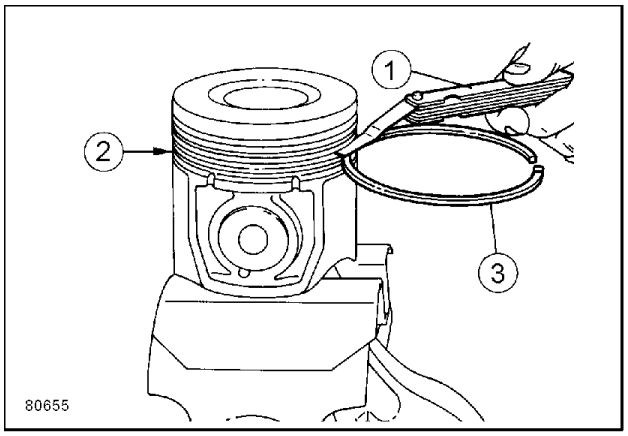
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33. Check the thickness of the rings **(2)** with a micrometer **(1)**.



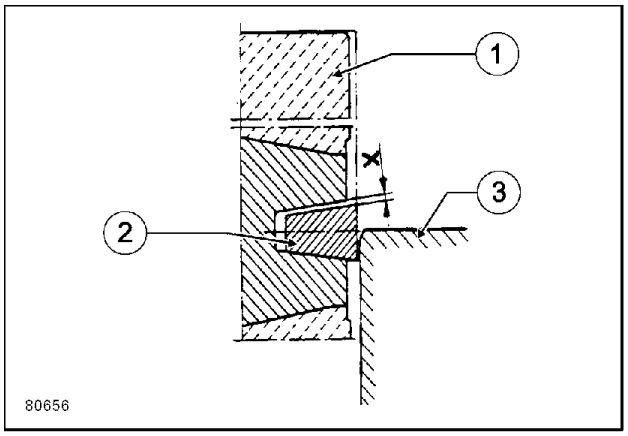
80654_172 28

34. Check the clearance between the rings **(3)** of the second and third slot and the relevant seats in the piston **(2)** with a feeler gauge **(1)**.



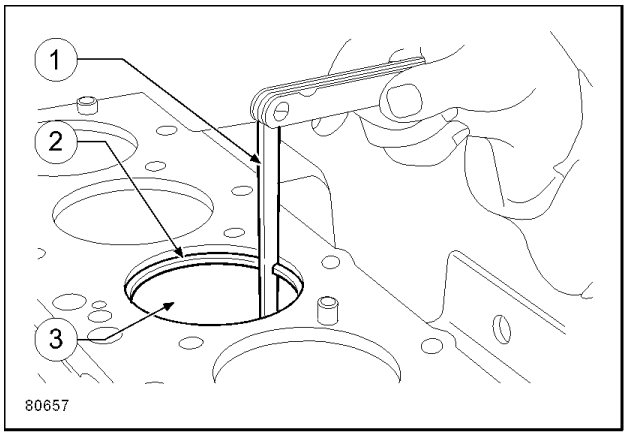
80655_173 29

35. Because the shape of the first ring is trapezoidal , the clearance between the slot and the ring should be measured as follows: Make the piston **(1)** protrude from the engine block so that the ring **(2)** protrudes half way from the cylinder barrel **(3)**. In this position use a feeler gauge to check clearance **(X)** between the ring and the groove. The value should be as specified.



80656_174 30

36. Use a feeler gauge **(1)** to measure the clearance between the ends of the piston rings **(2)** fitted into the cylinder barrel **(3)**.

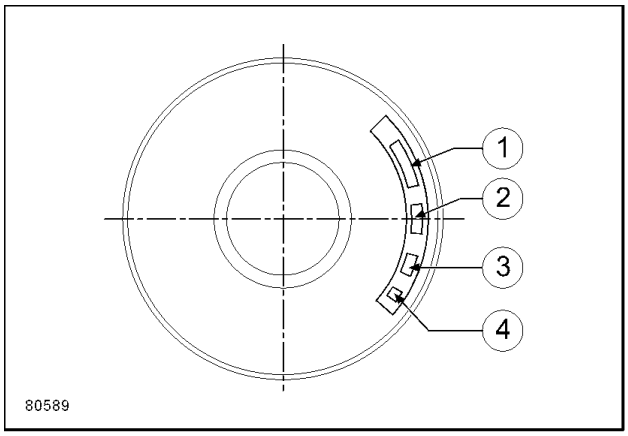


80657_175 31

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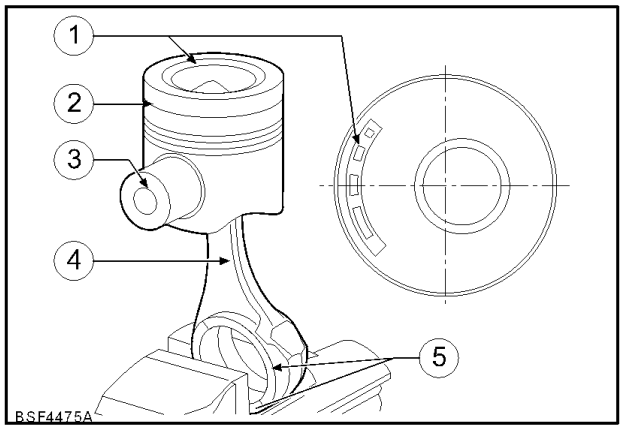
37. Refer to **Connecting rod and piston Connecting rod - Component identification (B.10.A)** and **Connecting rod and piston Connecting rod - Dimension (B.10.A)** to ensure correct usage.

38. The piston crown is marked as follows :
(1) Spare part number and design modification number
(2) Arrow showing direction of assembly of the piston in the cylinder liner, it must face the front of the block.
(3) Date of manufacture
(4) Stamping indicating testing of the first groove insert



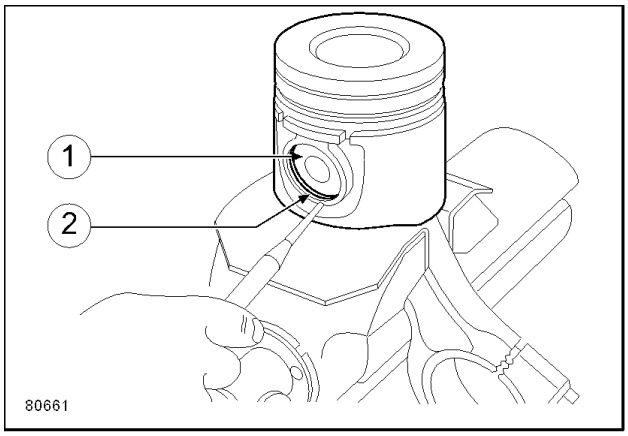
80589 32

39. Using the pin **(3)** connect the piston **(2)** to the connecting rod **(4)** so that the reference arrow **(1)** for fitting the piston **(2)** in the cylinder liner and the numbers **(5)** stamped on the connecting rod **(4)** are observed as in the figure.



BSF4475A 33

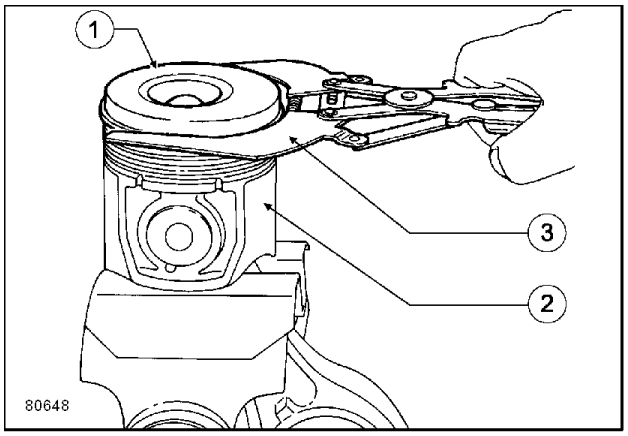
40. Insert the rings **(2)** to retain the piston pin **(1)**.



80661_184 34

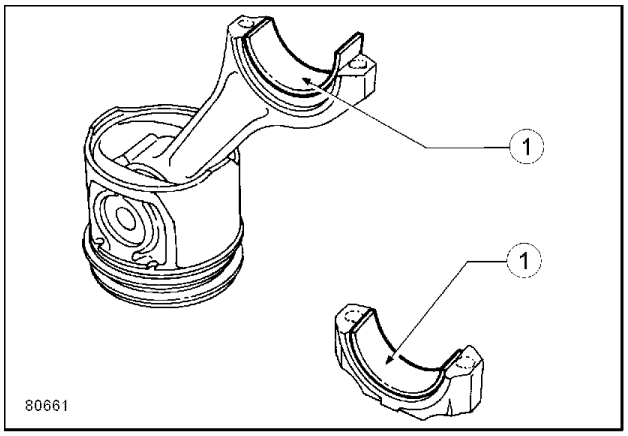
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41. To fit the rings **(1)** on the piston **(2)** use suitable piston ring pliers **(3)**. The rings must be fitted with the word "TOP" facing upwards and their openings staggered from each other by **120 °**.



80648_183 35

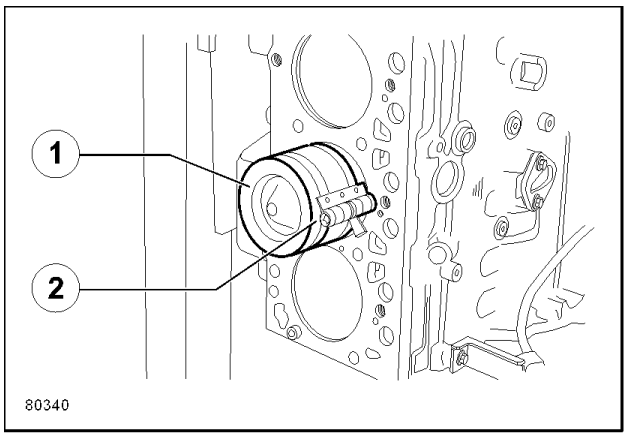
42. Fit the half bearings **(1)** on the connecting rod and cap.



80661_85 36

NOTE: *If it has not been necessary to change the connecting rod bearings they must be fitted in exactly the same position and order as found on disassembly. Do not modify the bearings in any way.*

43. To fit the connecting rod and piston assembly into the cylinder block, lubricate the piston, rings and cylinder barrel. Use a suitable piston ring compressor **(2)** to fit the piston and connecting rod assembly **(1)** into the barrel.

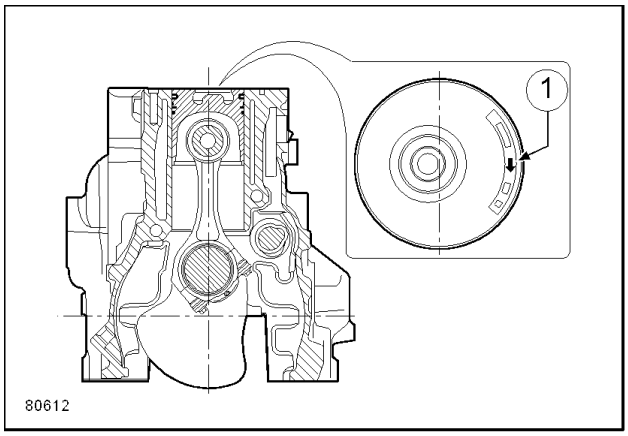


80340_124 37

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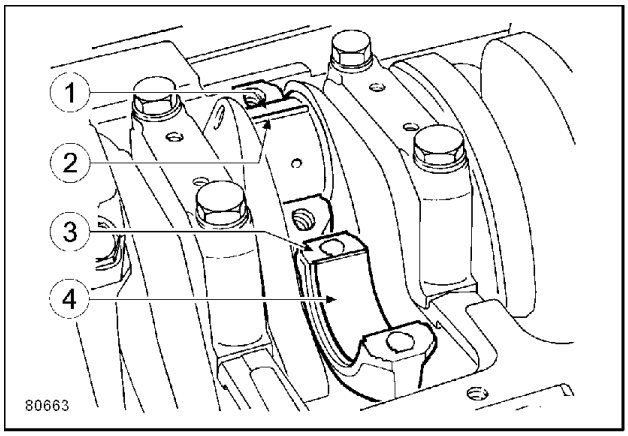
44. The arrow on piston should be facing the front of the cylinder block as shown below.

NOTE: *The pistons should be the same weight.*



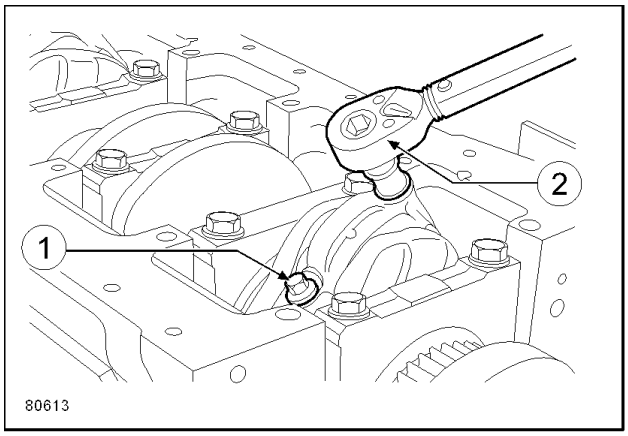
80612_186 38

45. To measure the crankpin clearance proceed as follows:
Clean the parts thoroughly and remove any trace of oil
Position a length of calibrated wire **(2)** on the crankshaft journals **(1)**
Fit the connecting rod caps **(3)** with the relevant half bearings **(4)**



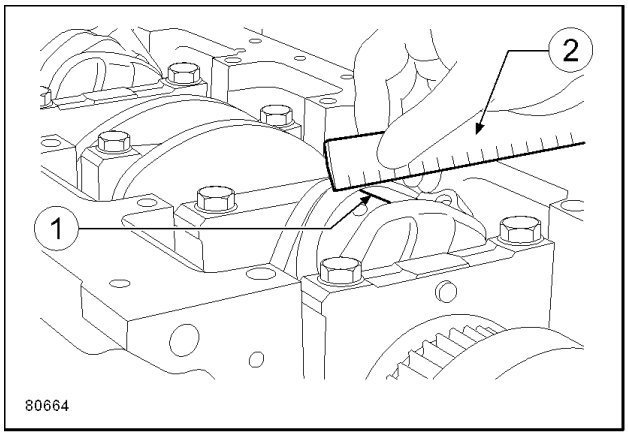
80663_187 39

46. Before reusing the retaining bolts refer to **ENGINE - Dimension - Stretch Bolt Check for reuse. (B.10.A)**.
Lubricate the retaining bolts **(1)** with engine oil and then tighten to the prescribed torque using a torque wrench **(2)**.
1st Stage - **30 Nm** (**22.13 lb ft**)± **3 Nm** (**2.21 lb ft**)
2nd Stage - **60 Nm** (**44.25 lb ft**) ± **5 Nm** (**3.69 lb ft**)
3rd Stage - **60 °**± **5 °**



80613_86 40

47. Remove the cap and determine the clearance by comparing the width of the calibrated wire **(1)** with the scale on the packet **(2)** containing the wire

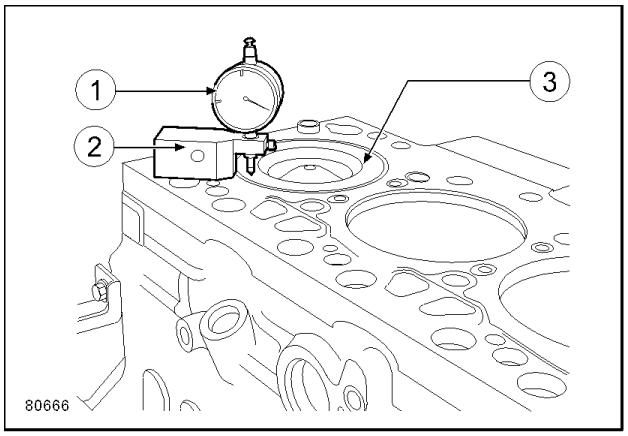


80664_190 41

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48. If the clearance value is different from prescribed value , replace half bearings and check again. Once the specified clearance has been obtained, lubricate the main half bearings and fit them by tightening connecting rod retaining bolts to the prescribed torque. Check by hand that the connecting rods move axially on the crankshaft journals and their end float measured with a feeler gauge **(2)** is **0.10 - 0.33 mm** (**0.0039 - 0.0130 in**).

49. Use a dial gauge to check piston protrusion at Top Dead Centre in relation to the top of the engine block. Protrusion should be **0.28 - 0.52 mm** (**0.0110 - 0.0205 in**).

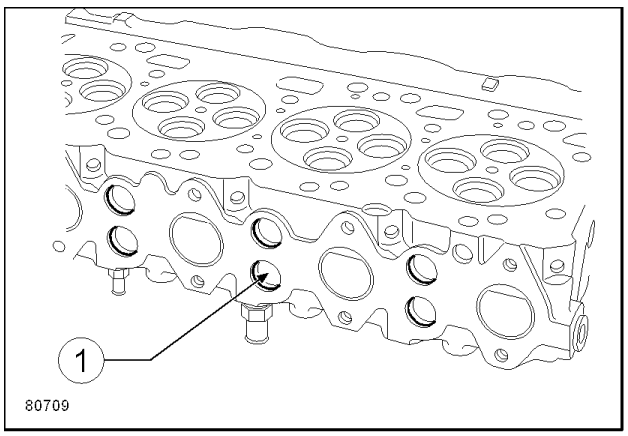


80666_192 42

50. If valve removal is required refer to **Cylinder head - Disassemble (B.10.A)**.

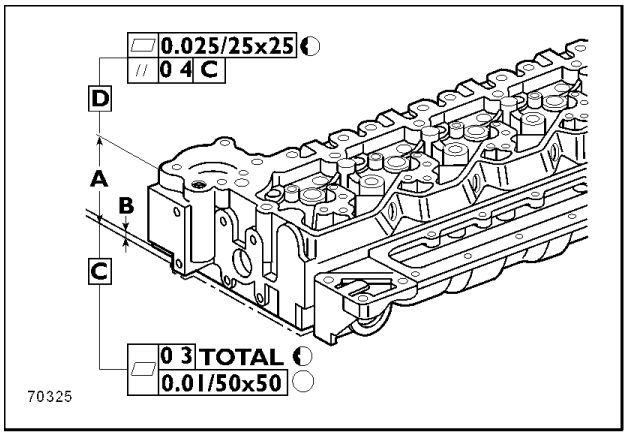
51. Check the hydraulic seal of the cylinder head using the appropriate tools. Use a pump filled with water heated to approximately **90 °C** (**194.00 °F**) and **2 - 3 bar** (**29.00 - 43.50 psi**) pressure.
Check for leaks from the core plugs **(1)** If leaks are found replace plugs using suitable tools.
If there is any leakage from the cylinder head it must be replaced

NOTE: *Before refitting plugs apply a water resistant sealant to the plug surfaces*



80709 43

52. Check the cylinder head surface for distortion using a rule and a feeler gauge. Distortion found along the length of the head should not exceed **0.2 mm** (**0.008 in**). If higher values are found, regrind the cylinder head according to the dimensions shown in figure **44** . The nominal thickness **(A)** is **105 mm** (**4.13 in**) ± **0.25 mm** (**0.01 in**). Maximum metal removal should not exceed thickness **(B)** by **1 mm** (**0.04 in**).



70325_97 44

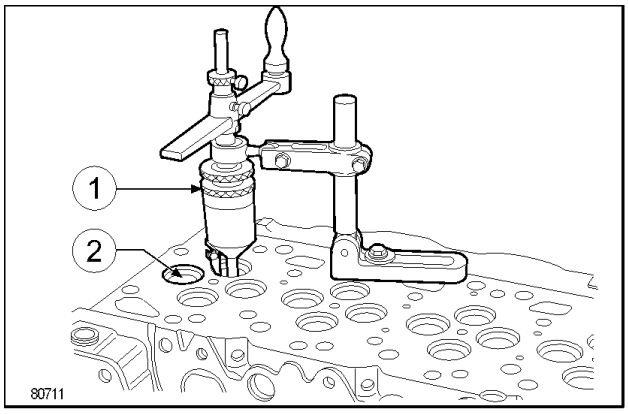
NOTE: *After regrinding check the valve recessing and if necessary regrind the valve seats to obtain the specified value.*

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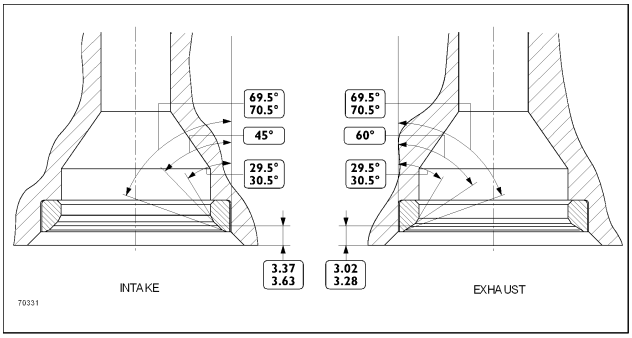
53. Check valve dimensions refer to **Valve assembly Valve - Dimension (B.10.A)**.

54. For checking , grinding and decarbonising procedures refer to **Valve drive Valve assembly - Check Decarbonising and Checking. (B.10.A)**.and for valve guide information refer to **Valve drive Valve guide - Dimension (B.10.A)**

55. Check the valve seats **(2)** . If there is scoring, or signs of burnout, regrind seats using a suitable tool **(1)** according to the angle values shown in figure **46**.

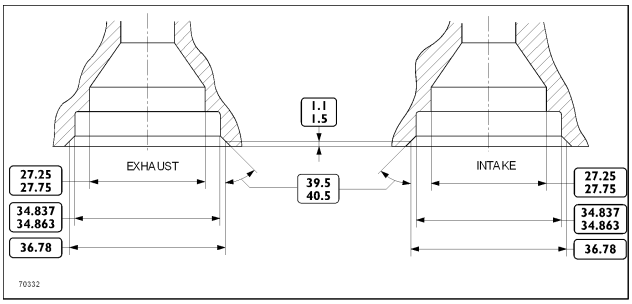


80711_99 45



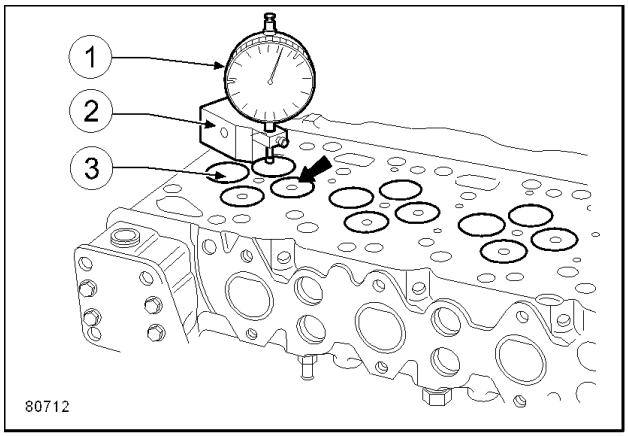
70331_100 46

56. If the valve seats cannot be reconditioned by regrinding, they can be replaced by valve seats supplied as spare parts. Use a suitable tool to remove just enough material to enable the seats to be extracted from the cylinder head using a punch. Heat the cylinder head to **80 - 100 °C** (**176.00 - 212.00 °F**) and using a suitable tool fit new valve seats. Use a suitable tool to regrind the valve seats to value shown in figure **47**



70332_101 47

57. After regrinding check the valve recessing **(3)** is as prescribed using a suitable dial gauge **(1)** with magnetic base. **(2)** .



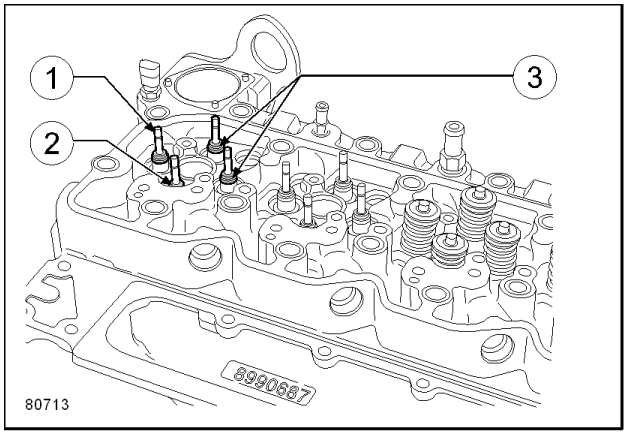
80712 48

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58. Check the valve springs - refer to **Valve assembly Spring - Dimension (B.10.A)**

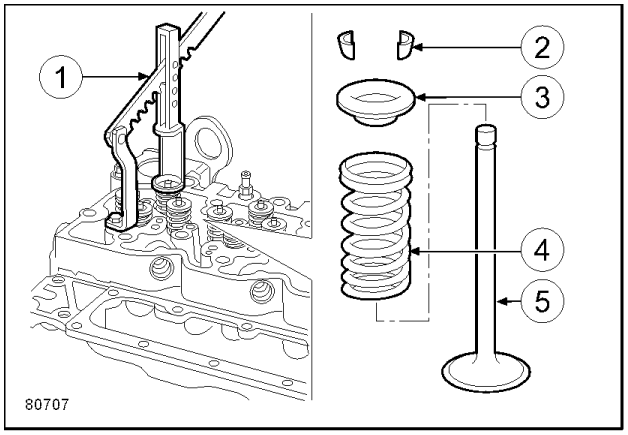
59. Lubricate the valve stems **(1)** and insert them into the relevant valve guides according to the positions marked during disassembly. Fit the seals **(2)** and **(3)** on the valve guide.

NOTE: *The seals **(2)** for intake valves are yellow and the exhaust valve seals **(3)**are green.*



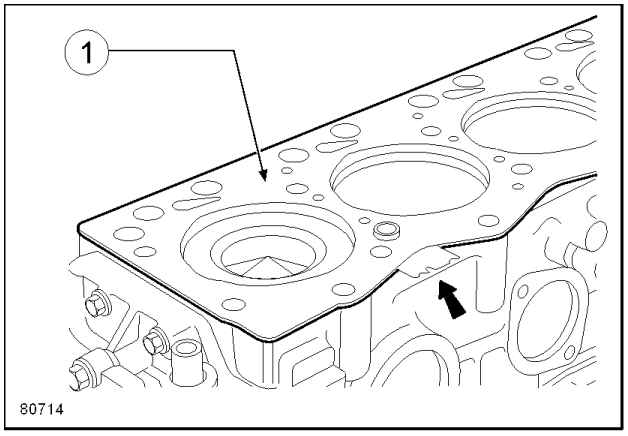
80713 49

60. Position on the cylinder head, the spring **(4)**, and the upper cap, **(3)**. Use the spring compressor tool **(1)** to compress the spring **(4)**, and use the cotters **(2)** lock the parts into position.



80707_88 50

61. Check the mating surfaces of the cylinder head and the engine block are clean. Position the cylinder head gasket with the word "TOP" facing the head on the block. The arrow indicates where the gasket thickness is given.



80714_90 51

62. For cylinder head installation refer to **Cylinder head - Install (B.10.A)**

Next operation:
Refer to **ENGINE - Overhaul External Components (B.10.A)**

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Valve drive Valve guide - Measure

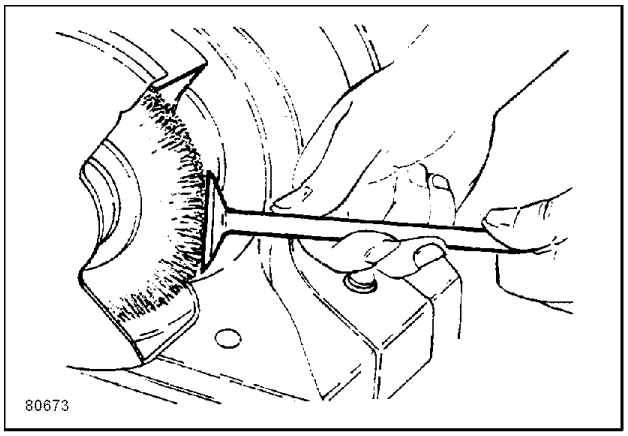
VALVE GUIDES

1. Using a bore gauge, measure the inside diameter of the valve guides; it must be as indicated in the figure **Valve drive Valve guide - Dimension (B.10.A)**).

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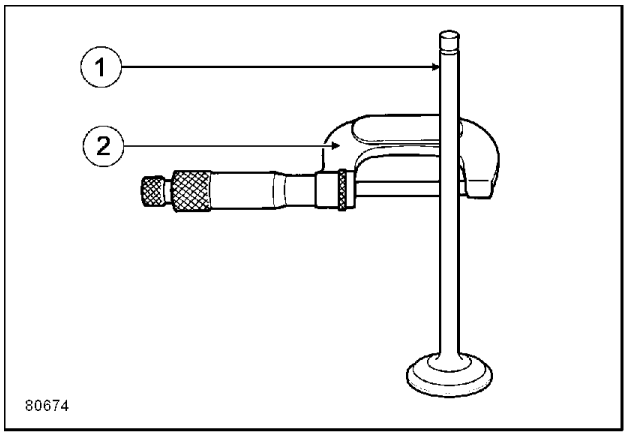
Valve drive Valve assembly - Check Decarbonising and Checking.

1. Decarbonizing, checking and grinding valves
   Remove all carbon deposits from the valves using a wire brush.
   Check that the valves show no signs of seizure, cracking or burning.
   If necessary, regrind the valve seats, removing as little material as possible.



80673 1

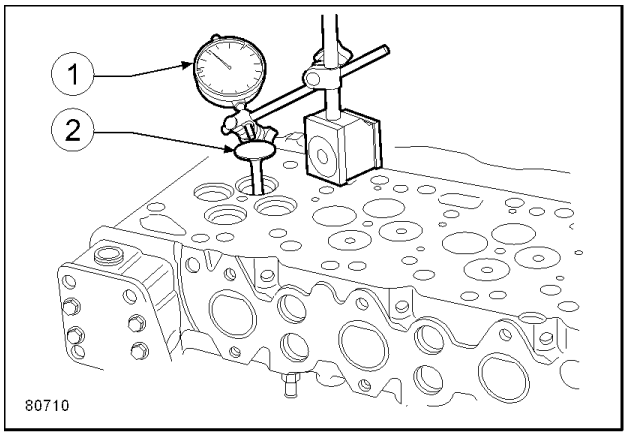
2. Using a micrometer **(2)**, measure the valve stem **(1)**: it must be **6.970 - 6.990 mm** (**0.2744 - 0.2752 in**)). For further dimensions, refer to **Valve assembly Valve - Dimension (B.10.A)**.



80674 2

Checking the clearance between the valve stem, guide and valve centring.

3. The checks are made with a dial gauge **(1)** with a magnetic base, positioned as illustrated. The assembly clearance is **0.052 - 0.092 mm** (**0.0020 - 0.0036 in**.).
   Making the valve **(2)** turn, check that the centring error is no greater than **0.03 mm** (**0.0012 in**).



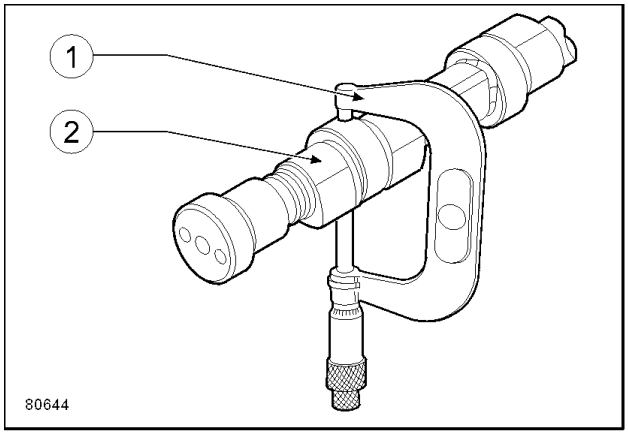
80710 3

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Valve drive Camshaft - Measure

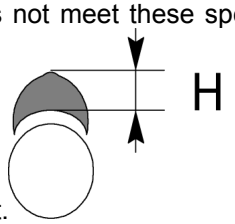
NOTE: *The support journal surfaces on the shaft and cams must be finely honed; if there are any signs of seizing or scoring, replace the camshaft and relevant bushings.*

1. Set the shaft on a support and, using a dial gauge with a **1/100 mm** scale placed on the central support, check that the alignment error is no greater than **0.04 mm** (**0.0016 in**); change the shaft if it is. Check the diameter of the supporting pins of the camshaft **(2)** with the micrometer **(1)** on two perpendicular axis. (Refer to **Valve drive Camshaft - Dimension (B.10.A)**, and **Cylinder block - Overhaul (B.10.A)**.



80644_164 1

2. Check cam lift.
   Exhaust cam = **6.045 mm** (**0.2380 in**)
   Inlet cam = **7.582 mm** (**0.2985 in**)
   If the camshaft does not meet these specifications



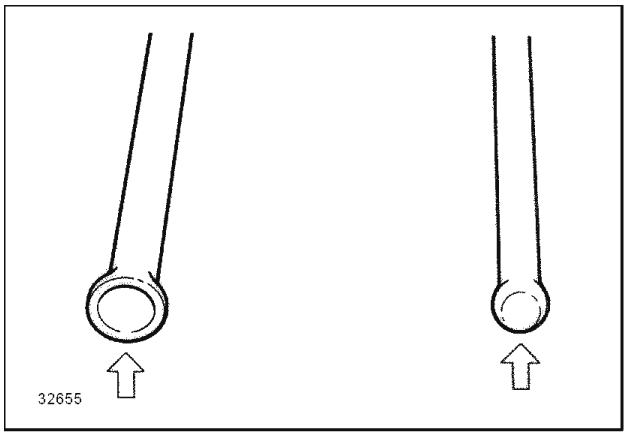
   replace the camshaft.

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Camshaft Push rod - Visual inspection

Prior operation:
Valve drive Rocker assembly - Disassemble (B.10.A)

1. Before assembly, check the rocker-arm control rods: They must have no deformation.
   There should be no signs of seizure or wear on the contact surfaces on the ball seats, rocker arm adjuster screw and tappets (as indicated), if there are, then they require to be renewed.
   The intake and exhaust valve control rods are identical and can therefore be interchanged



32655 1

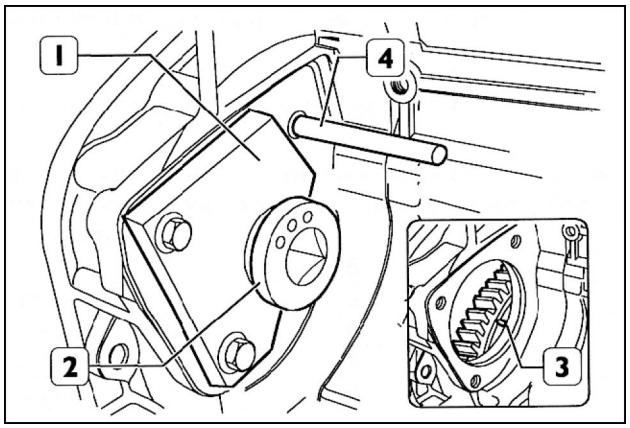
Next operation:
Valve drive Rocker assembly - Install (B.10.A)

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Camshaft Tappet - Clearance

Defining TDC for No. 1 Cylinder

1. Remove the starter (Refer to **Engine starter - Remove (B.80.A)**:
2. Mount **(1)** plate of the tool **380000988** complete with the flywheel rotating spool **(2)** of the tool **380000732**
3. Rotate the engine flywheel in the direction of rotation . Take care to eliminate gear backlash.



BAIL07APH348AMA 1

4. Turn until the pin **(4)** of tool **380000988** is engaged in the socket on the flywheel **(3)**. This indicates that number 1 cylinder is top dead centre (TDC) on the firing stroke.

NOTE: *On the flywheel there are no references to indicate TDC of all the cylinders. Therefore it is important to determine TDC for number one cylinder before calculating the position of TDC on the remaining cylinders.*

Defining TDC of other cylinders (6 Cylinder engine)

5. This operation can be carried out following the table below when the firing order is 1 - 5 - 3 - 6 - 2 - 4. Begin by setting cylinder no. 1 as in the instructions above. Then remove pin.

Flywheel rotational orientation in relation to TDC cylinder numbers 1 to 6 Amount of Degrees in direction of rotation (DOR)				
Cylinder at TDC	Position from No.1 @ TDC	Flywheel Notch	Reference from alignment of notch	Phonic wheel (Visual check only)
1	Reference point **0 °**	Aligned	Reference point **0 °**	0 Reference
5	**120 °** DOR		**120 °** DOR	20 Notches
3	**240 °** DOR		**240 °** DOR	40 Notches
6	**360 °** DOR	Aligned	Reference point **0 °**	0 Reference
2	**480 °** DOR		**120 °** DOR	20 Notches
4	**600 °** DOR		**240 °** DOR	40 Notches

Defining TDC of cylinders (4 cylinder engine)

6. This operation can be carried out using the table below when the firing order is 1 - 3 - 4 - 2. Begin by setting cylinder no. 1 to TDC as already described. Then remove pin **(4)** Figure **1**.

Flywheel rotational orientation in relation to TDC cylinder numbers 1 to 4 Amount of Degrees in direction of rotation (DOR)				
Cylinder at TDC	Position from No.1 @ TDC	Flywheel Notch	Reference from alignment of notch	Phonic wheel (Visual check only)
1	Reference point **0 °**	Aligned	Reference point **0 °**	0 Reference
3	**180 °** DOR		**180 °** DOR	30 Notches
4	**360 °** DOR	Aligned	Reference point **0 °**	0 Reference
2	**540 °** DOR		**180 °** DOR	30 Notches

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NOTE: *In cases where a goniometer, an angular measuring gauge, is not available the procedures below can be used to set TDC of the other cylinders that are not set by the special tool. The TDC of these cylinders can be determined by rotating the flywheel until the exhaust valve is at the final phase of drainage and the inlet valve is at the beginning of suction. At this point the rocker arm should be able to be gently rocked. (Take care that the camshaft follower is not on the EGR lobe.)*

Defining TDC (cylinder by cylinder)

7. When the centralising slot in the flywheel, used in conjunction with pin **(4)** figure **1** is not available to determine TDC of no.1 cylinder it will be necessary to use the method of balanced valves (rocking) as an alternative to find TDC of all cylinders.

Manual Setting Of The Valves (6 Cylinder)

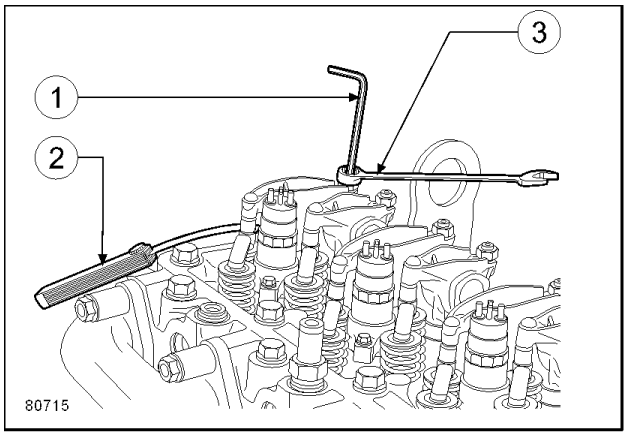
Start Point and Angular Rotation	Phonic wheel (Visual check only)	Adjust the clearance of valves on cylinder no.	Balance the valves of cylinder no.
Cyl. 1-6 TDC	0 Reference	1	6
+ **120 °**	20 notches	5	2
+ **120 °**	40 notches	3	4
+ **120 °**	0 reference	6	1
+ **120 °**	20 notches	2	5
+ **120 °**	40 notches	4	3

Manual Setting Of The Valves (4 Cylinder)

Start Point and Angular Rotation	Phonic wheel (Visual check only)	Adjust the clearance of valves on cylinder no.	Balance the valves of cylinder no.
Cyl. 1-4 TDC	0 Reference	1	4
+ **180 °**	30 notches	3	2
+ **180 °**	0 reference	4	1
+ **180 °**	30 notches	2	3

Valve Lash (clearance) Adjustment

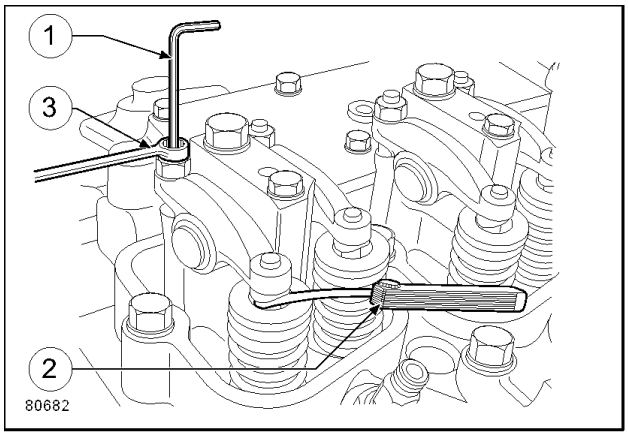
8. To set the clearance between rocker and valves use a key **(1)**, wrench **(3)**, and feeler gauge **(2)** Figure **2** shows 4 valve per cylinder engine.



80715_103 2

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9. To set the clearance between rocker and valves use a key **(1)**, wrench **(3)**, and feeler gauge **(2)** . Figure **3** shows 2 valve per cylinder engine.



80682 3

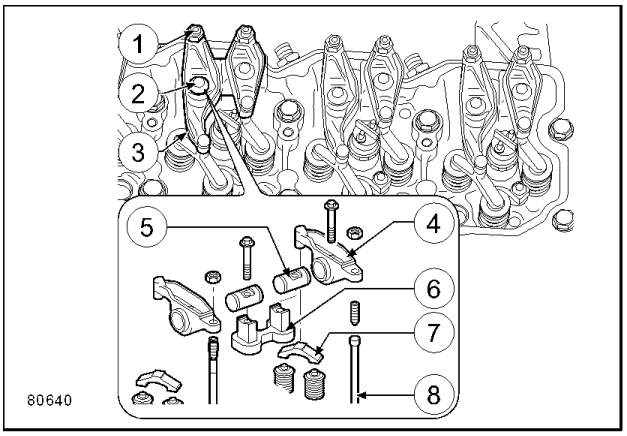
IMPORTANT: *The clearance should be set as follows :*
inlet valve ***0.25 mm*** *(****0.0098 in****)*** ***0.05 mm*** *(****0.0020 in****)*
exhaust valve ***0.50 mm*** *(****0.0197 in****)*** ***0.05 mm*** *(****0.0020 in****)*

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Valve drive Rocker assembly - Disassemble

Prior operation:
Valve cover - Remove (B.10.A)

1. Loosen the tappet adjuster fixing nuts **(1)** and unscrew the adjusters.
   Take out the screws **(2)**, remove the rocker-arm assembly **(3)** comprising the mounting **(6)**, rocker arms **(4)** and spindles **(5)** then remove the bridges **(7)** from the valves.
   Remove the rods **(8)**.



80640 1

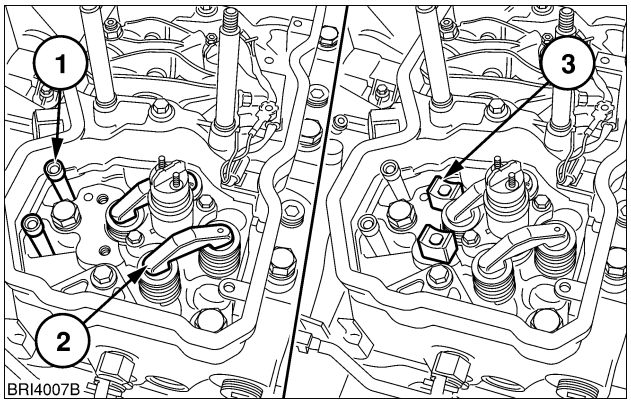
Next operation:
Fuel injector Electro injector - Remove (B.20.A).

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Valve drive Rocker assembly - Install

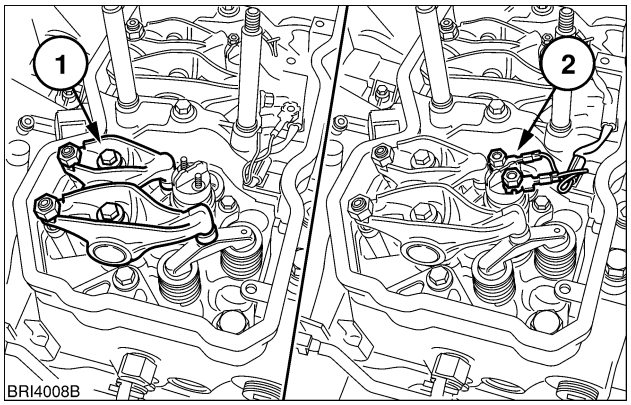
Prior operation:
Camshaft Push rod - Visual inspection (B.10.A).

1. Insert pushrods **(1)** into engine and lubricate the pushrod sockets/cups with new engine oil **CASE AKCELA NO. 1 ENGINE OIL SAE 15W-40** .



BAIL06CCM093ASA 1

2. Position the bridges **(2)** on the valves with the reference marks/dimples facing the exhaust manifold.
3. Position rocker arm supports **(3)**.
4. Ensuring that the tappet adjusters on the rocker arms are unscrewed, mount the rocker arm assemblies, complete with spindles, into the rocker arm supports, securing into position with the retaining bolts **(1)** to the required torque. Refer to **Rocker assembly Rocker arm - Torque (B.10.A)**.



BAIL06CCM094ASA 2

5. Set tappet clearance, refer to **Camshaft Tappet - Clearance (B.10.A)**.
6. Connect the electric cables **(2)** to the electro injectors and using special tool **380000158** tighten the retaining nuts to the required torque. Refer to **Electrical control - Torque (B.20.A)**.

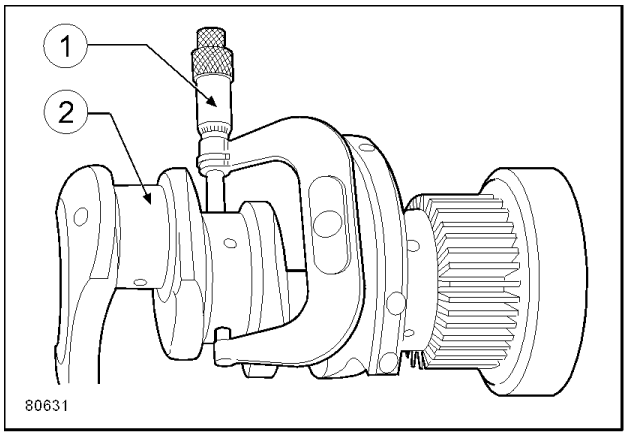
Next operation:
Camshaft Tappet - Clearance (B.10.A).

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Crankshaft - Measure

1. Main and connecting rod journal dimensions
   If any sign of seizure, scoring or ovality is found on the main journals or crankpins, they must be re-ground. Before reconditioning the pins **(2)**, use a micrometer **(1)** to measure the pins of the shaft to define the diameter to which the pins must be reduced.

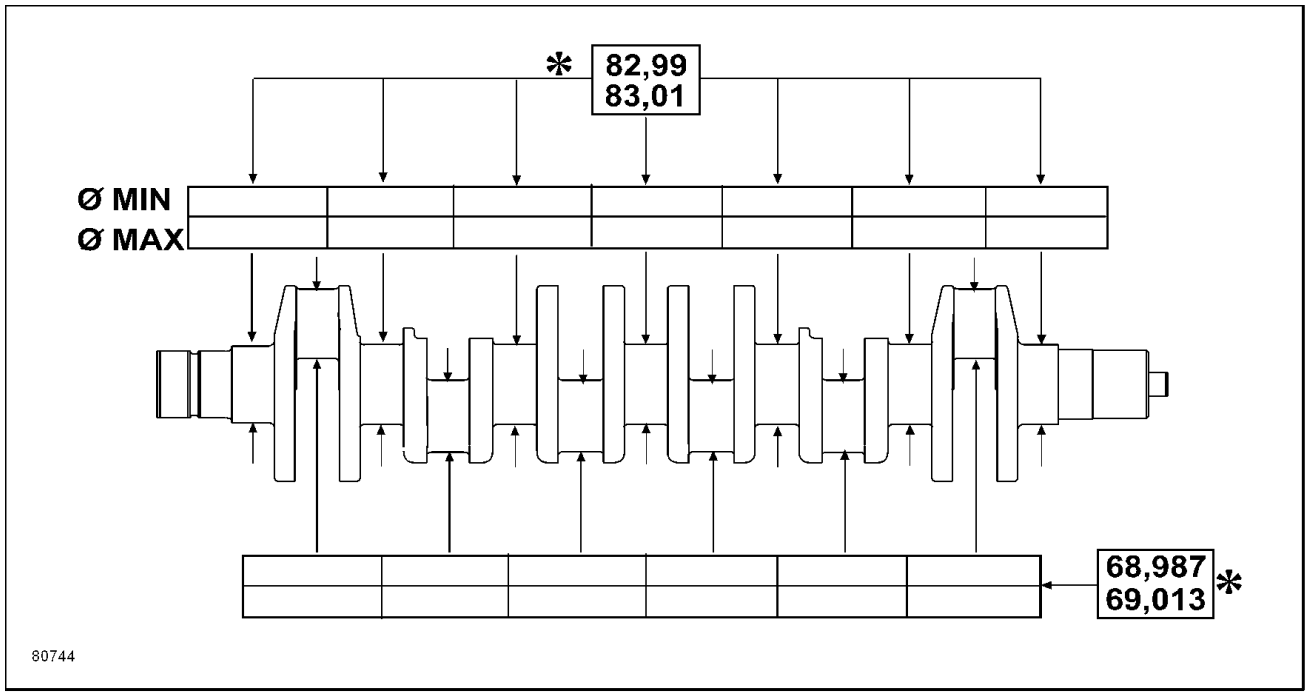
NOTE: *It is advisable to note the values on a chart shown in the following figure.*



80631_209 1

2. The undersize classes are: **0.250 - 0.500 mm** (**0.0098 - 0.0197 in**.)

NOTE: *The main journals and crankpins must always be reconditioned to the same undersize class. After undersizing, mark the main journal and the crankpin with a stamp on the side of the crank No. 1.*
For undersized crankpins letter ***(M)***
For undersized journals letter ***(B)***
For undersized crankpins and journals letters ***(MB)***



80744_210 2

NOTE THE CRANKSHAFT MAIN JOURNAL AND CRANKPIN MEASUREMENTS ON THE TABLE
*** Nominal value**

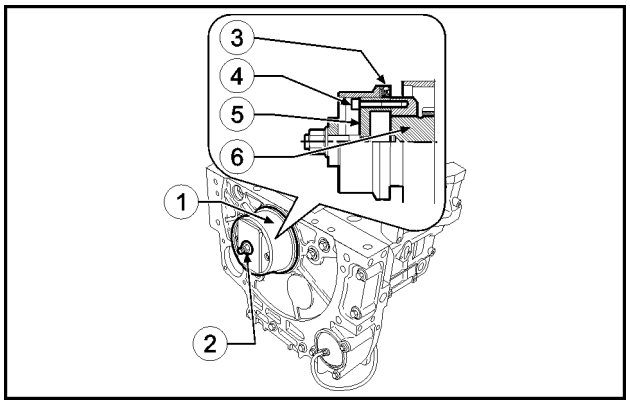
Refer to **Crankshaft - Dimension (B.10.A)**.

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Crankshaft Rear seal - Install

Prior operation:
Rear cover - Install (B.10.A)

1. Fit part **(5)** of tool **380000664** on to the crankshaft **(6)** . Secure it with the screws **(4)** and fit the new seal **(3)** onto it.
   Position part **(1)** on part **(5)**, screw down the nut **(2)** until the seal **(3)** is completely fitted in the housing.



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Timing gear - Adjust

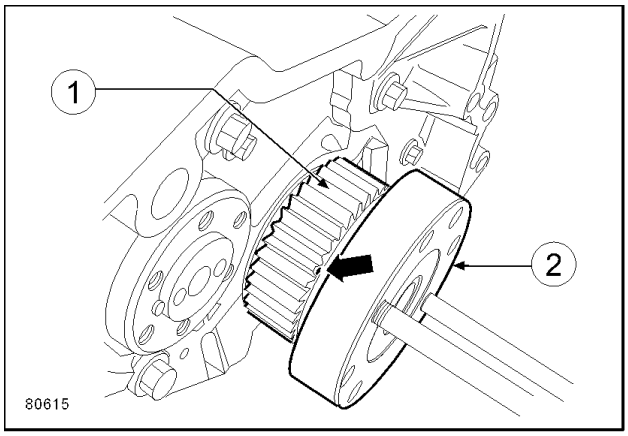
Timing marks:	
The alignment of the timing marks on the gears corresponds to the piston's top dead centre in the 1st cylinder between the compression and operating stroke.	
On the crankshaft gear	2 points on the teeth
On the intermediate gear: - opposite the crankshaft gear - opposite the camshaft gear	 1 point on the tooth 1 point on the tooth
On the camshaft gear	1 point on the tooth gap

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Timing gear - Timing adjust

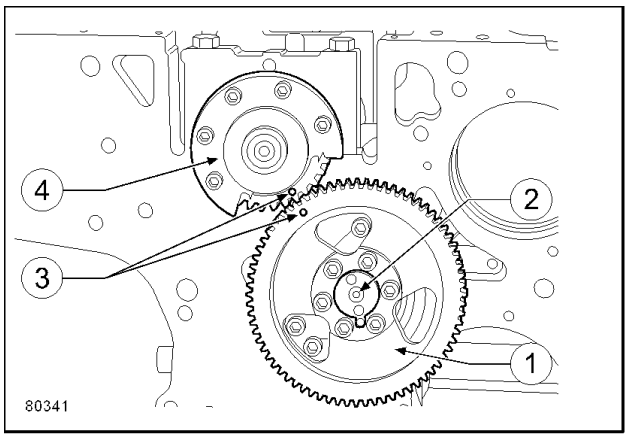
1. Use a marker pen to mark the tooth of the driving gear **(1)** mounted on the crankshaft **(2)** on the side of which the reference mark (→) is stamped for timing.

NOTE: *Screw in two pins to help in the operation of turning the crankshaft.*



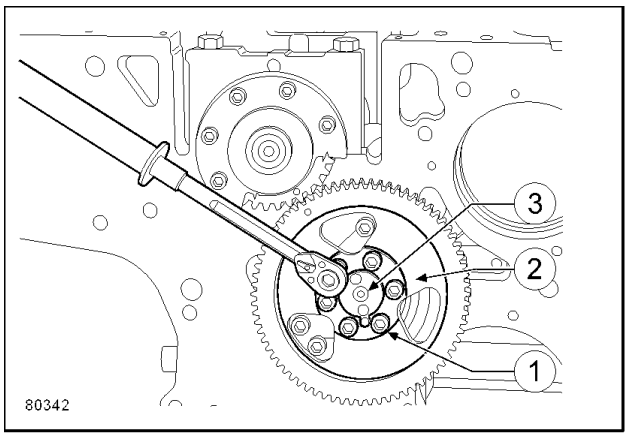
80615 1

2. Rotate the crankshaft **(4)** and camshaft **(2)** so that when mounting the driven gear **(1)** on the camshaft, the marks stamped on the gears **(3)** coincide.



80341 2

3. Screw down the bolts **(1)** securing the gear **(2)** to the camshaft **(3)** and tighten to **36 Nm** (**26.6 lb ft**).



80342 3

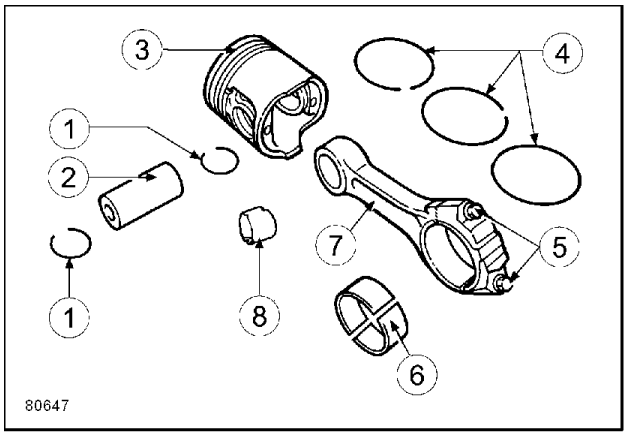
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Connecting rod and piston - Measure

NOTE: *For dimensions of Piston and/or Connecting rod, refer to and* ***Connecting rod and piston Piston - Dimension (B.10.A)*** *and* ***Connecting rod and piston Connecting rod - Dimension (B.10.A)***

NOTE: *The pistons are supplied as spare parts oversized by* ***0.4 mm*** *(****0.0157 in****)*

1. Connecting rod-piston component parts
   1. Retaining rings
   2. Pin
   3. Piston
   4. Piston rings
   5. Screws
   6. Half bearings
   7. Connecting rod
   8. Bushing



80647_217 1

Connecting Rods

2. CONNECTING ROD, PISTON PIN BUSHING AND HALF BEARING DATA
   Inside diameter to be measured after installing in the small end and regrinding with a reamer.
   Refer to **Connecting rod and piston Connecting rod - Dimension (B.10.A)**

NOTE: *The connecting rod - connecting rod cap mating surfaces are knurled for a better coupling. It is therefore recommended not to remove the knurling. The rods are manufactured using a fracture breaking technique making each rod and cap unique and having only one way of installation.*

3. Connecting rods are supplied as spare parts in class W and marked in green*.
   Removing material is not permissible.

NOTE: *Each connecting rod is marked:*
- On the body and cap with a number indicating their coupling and the cylinder in which it is mounted. In the event of replacement, number the new rod with the same number as the replaced connecting rod.
- On the body of the connecting rod with a letter indicating the weight class of the connecting rod mounted in production: (Refer to ***Connecting rod and piston Connecting rod - Component identification (B.10.A)***
-- V, 1600 to 1640 (3.5274 to 3.6156 lb) (marked in yellow);
--V, 1641 to 1680 (3.6178 to 3.7038 lb) (marked in green);
-- V, 1681 to 1720 (3.7060 to 3.7920 lb) (marked in blue);

Bushings

4. Check that the bushing in the small end has not come loose and shows no sign of scoring or seizure. If this is not so, change it.

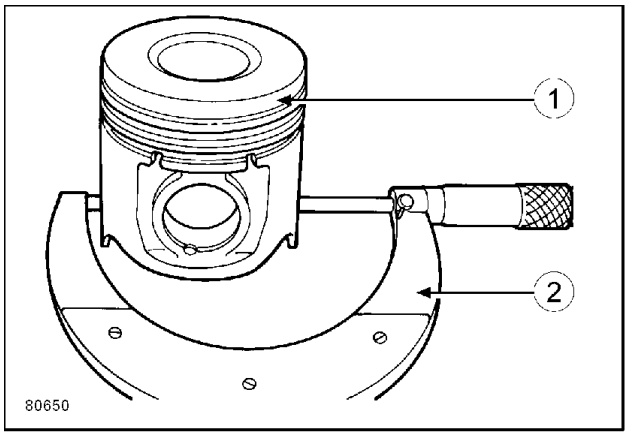
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5. Disassembly and assembly are performed with a suitable drift.
When driving in, make sure that the oilways in the bushing and small end coincide. Using a boring machine, regrind the bushing to obtain the prescribed diameter.

Pistons - Measuring the Piston Diameter

6. Measuring the piston **(1)** diameter using a micrometer **(2)** to determine the assembly clearance.

NOTE: *The diameter must be measured at a distance of* ***12 mm*** *(****0.4724 in****) from the base of the piston skirt.*

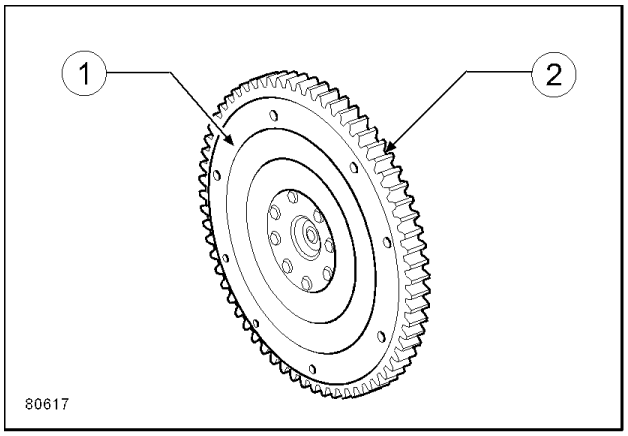


80650 2

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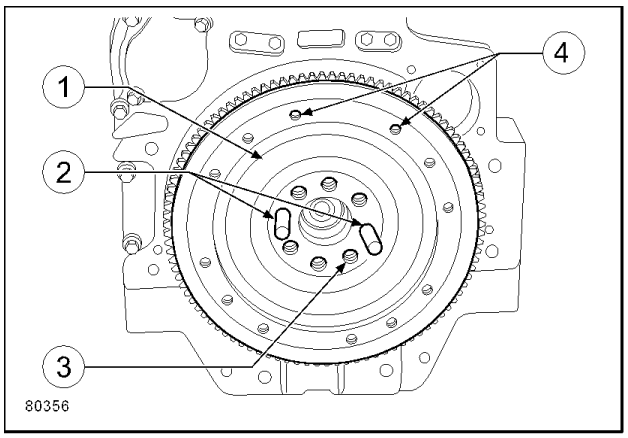
Flywheel - Install

1. Check the condition of the teeth of the ring gear **(2)**. If you find any breakage or excessively worn teeth, remove it from the engine flywheel **(1)** with a general drift and mount the new one, previously heated to a temperature of **150 °C** (**302 °F**) for **15 - 20 min**; the bevel, made on the inside diameter of the ring gear, must face the engine side of the flywheel.



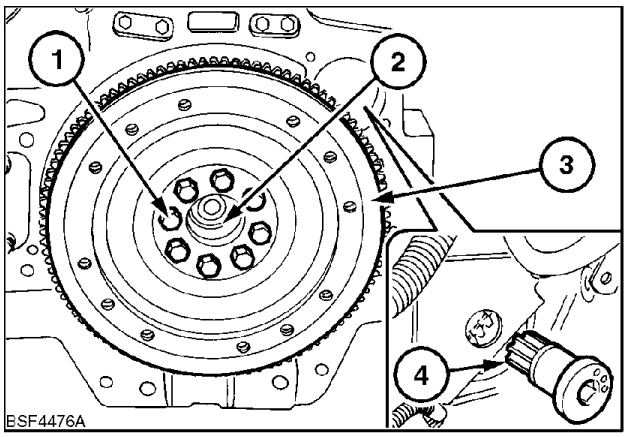
80617 1

2. Screw two hooks or eyebolts onto the flywheel **(1)** using the holes **(4)**.
With the aid of a lift, operate to bring the flywheel near its seat in the flywheel housing.
Screw two pins **(2)** of the appropriate length into the holes in the shaft **(3)** and, using them as a guide, mount the engine flywheel **(1)** suitably housing it in the flywheel housing.



80356 2

3. Screw down the bolts **(1)** securing the engine flywheel **(3)** to the crankshaft. Fit the tool, **380000988 (4)** to lock rotation of the engine flywheel.

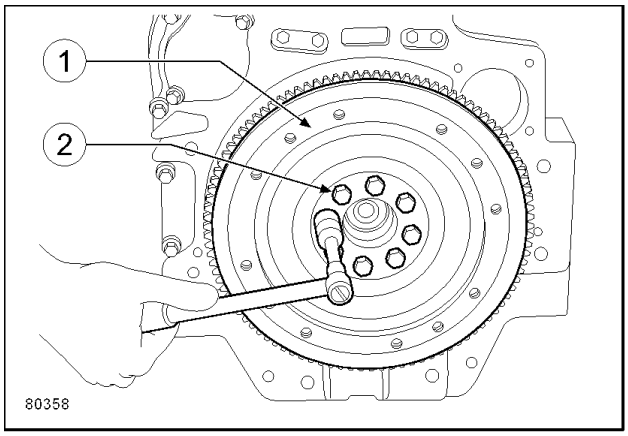


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4. Tighten the bolts **(2)** retaining the engine flywheel **(1)** in a criss cross sequence, to the correct specification. Refer to **Flywheel - Torque (B.10.A)**.

NOTE: *Use a suitable angle gauge to perform final tightening. Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.*

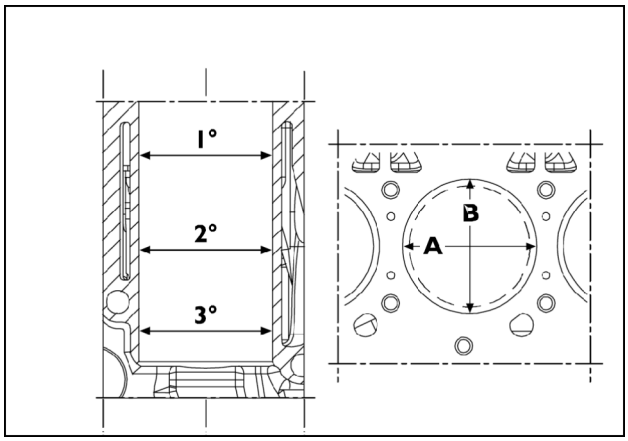


80358 4

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Cylinder block - Measure

1. Measurements should be performed on each cylinder at three different heights in the cylinder and on two planes perpendicular with each other. One parallel to the longitudinal axis of the engine **(A)** , and the other perpendicular **(B)** . Maximum wear is usually found on plane **(B)** .
   If ovality, taper or general wear is noted, bore and recondition the cylinder liners. The cylinder liners must be reground in relation to the diameter of the pistons supplied as spare parts oversized by **0.5 mm** (**0.0197 in**) over the nominal value and to the prescribed assembly clearance. (Refer to **Cylinder block - Dimension (B.10.A)** and **Cylinder block - Overhaul (B.10.A)**

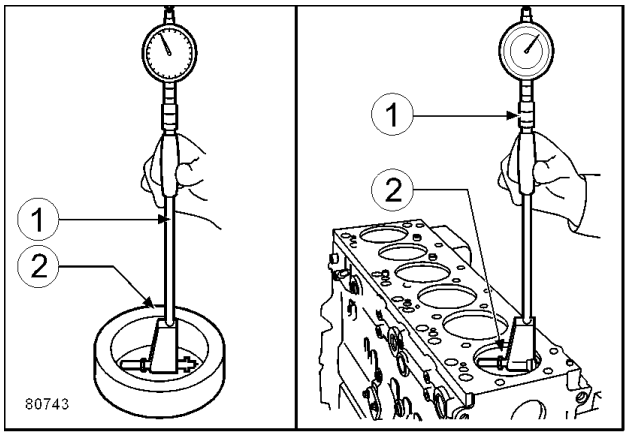


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Cylinder block - Overhaul

1. After disassembling the engine, thoroughly clean the cylinder-crankcase assembly. Use the appropriate rings for transporting the cylinder assembly.
   Carefully check the crankcase is not cracked.
   Check the condition of the plugs. If they are rusty or if there is the slightest doubt about their seal, change them.
   Examine the surfaces of the cylinder liners; they should show no sign of enlargement, scoring, ovality, taper or excessive wear.
   To check the internal diameter of the cylinder liners for ovality, taper and wear, use a bore gauge **(1)**, fitted with a dial gauge zero-set on the ring gauge **(2)** of the diameter of the cylinder liner. (Refer to **Cylinder block - Measure (B.10.A)**).



NOTE: *If regrinding, all the liners must have the same oversize (0.5 mm (0.0197 in.)).*

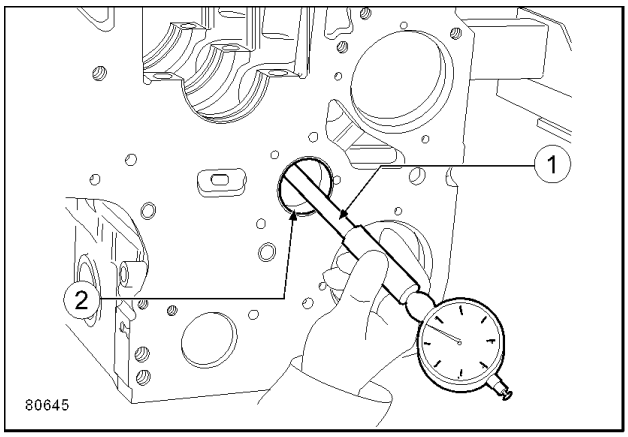
NOTE: *If the ring gauge is not available, use a micrometer.*

2. Check the main bearing seats, proceeding as follows:
   – fit the main bearing caps on the supports without bearings;
   – tighten the retaining bolts to the prescribed torque; (refer to **ENGINE - Torque (B.10.A)**)
   – using an appropriate dial gauge for interiors, check that the diameter of the seats is as prescribed. (refer to **ENGINE - General specification (B.10.A)**)
   If the measurement is any greater, change the crankcase.

   Cylinder head mating surface check
   After having located any deformed areas, level off the mating surface using a grinding machine.
   The flatness error must be no greater than **0.075 mm** (**0.0030 in**). Check the condition of the cylinder block plugs **(1)**; if they are rusty or if there is the slightest doubt about their seal, change them.

BUSHINGS

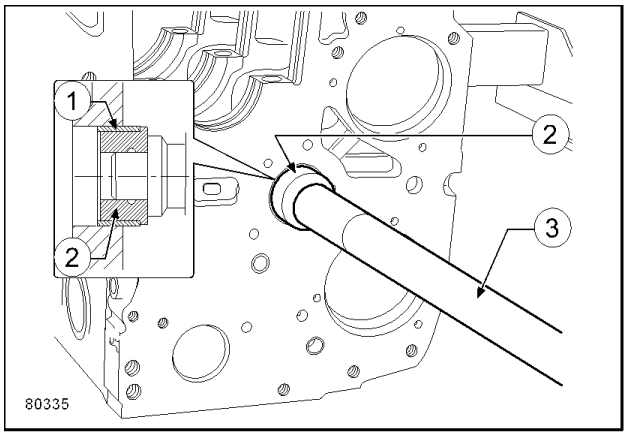
3. The camshaft bushings **(2)** must be forced into their respective seats.
   The internal surfaces must show no sign of seizure or wear.
   Using the bore meter **(1)**, measure the diameter of the front and rear bushings **(2)** and of the intermediate seats for the camshaft. (refer to **Cylinder block - Dimension (B.10.A) Valve drive Camshaft - Measure (B.10.A)** and **ENGINE - General specification (B.10.A)**)
   Measurements must be made at two perpendicular points.



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4. To change the front bushing **(1)**, use **380000667** for disassembly and assembly.

NOTE: *Upon assembly, the bushing (1) must be directed so that the lubrication holes coincide with the holes in the seats in the crankcase.*



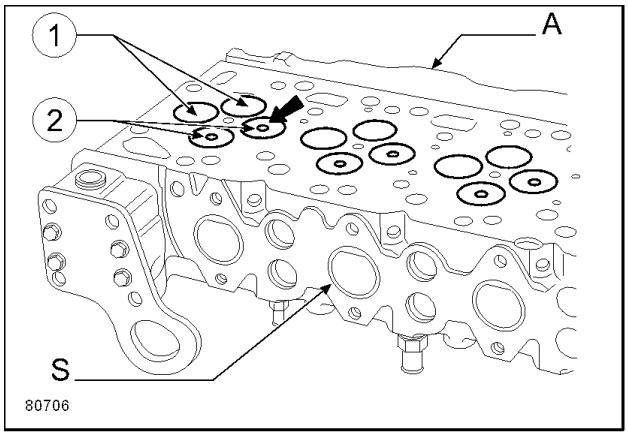
80335 3

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Cylinder head - Disassemble

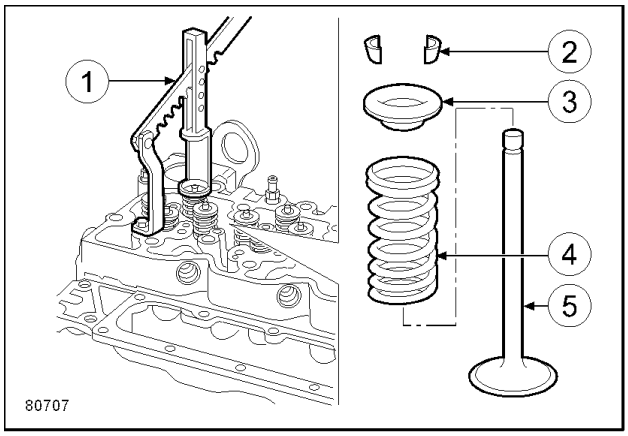
1. Valve disassembly
   The intake **(1)** and exhaust **(2)** valve heads have the same diameter.
   The central recess (→) of the head of the exhaust valve **(2)** distinguishes it from the intake one.

NOTE: *Before removing the valves from the cylinder head, number them so as to fit them back on, if they are not replaced, in the positioned found upon disassembly.*
A = intake side - S = exhaust side



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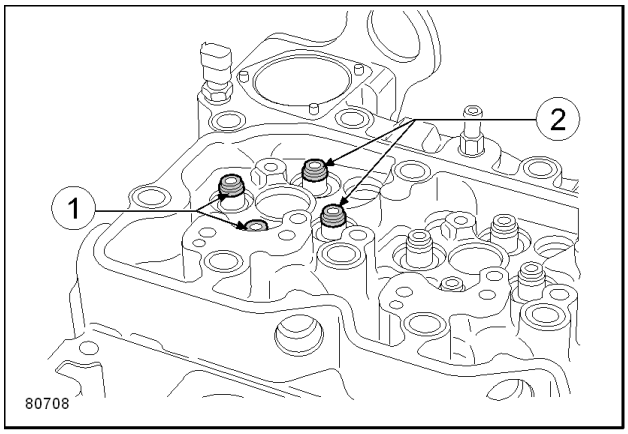
2. Valves are removed using a general valve spring compressor tool, **(1)**, applying pressure on the cap **(3)** so that, by compressing the springs **(4)**, it is possible to remove the cotters **(2)**. Then remove the cap **(3)** and springs **(4)**.
   Repeat this operation on all valves.
   Overturn the cylinder head and extract the valves **(5)**.



80707 2

3. Remove the seals **(1)** and **(2)** from the relevant valve guides.

NOTE: *The seals (1) for the intake valves are yellow. The seals (2) for the exhaust valves are green.*



80708 3

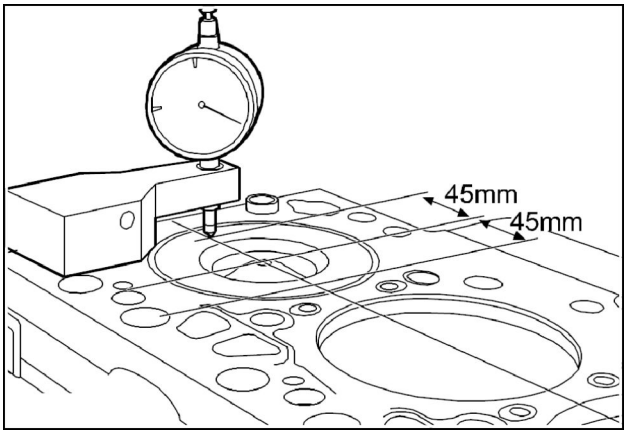
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Cylinder head - Install

NOTE: *Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.*

1. Prior to the fitting of the cylinder head to the crankcase, measurements are required to be taken to determine the correct thickness of head gasket required.
   The gasket is available in 2 thicknesses, **1.25 mm** (**0.049 in**) gasket type A and **1.15 mm** (**0.045 in**) gasket type B, select the correct one depending on the piston protrusion dimension.

NOTE: *Ensure that the mating surfaces of the cylinder head and crankcase are clean.*
It is recommended to keep the gasket in its wrapping until the head is to be fitted on.



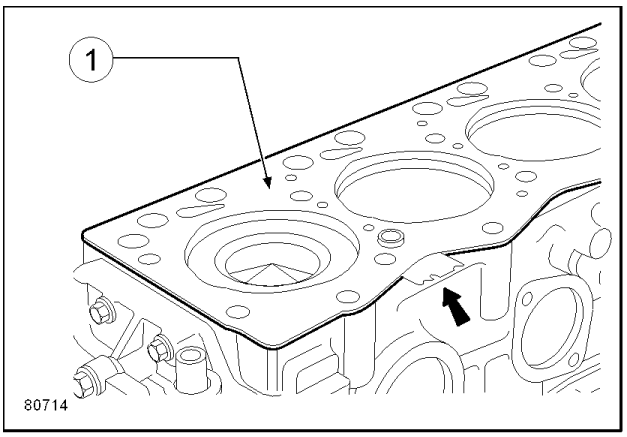
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2. Using the dial gauge, Special Tool number **380000228 (1)**, fitted with base, Special Tool number **380000364 (2)**, check the protrusion of the pistons **(3)**, at T.D.C. from the cylinder block face.

3. For each piston, at a distance of **45 mm** (**1.77 in**) from the centre of the piston, measure the protrusions S1 and S2 from the top face of the crankcase and then calculate the mean:
   S cyl1 = S1+S2 / 2
   Repeat this operation for pistons 2, 3, 4, 5, & 6 and calculate the mean value.
   S = S cyl1 + S cyl2 + S cyl3 + S cyl4 + S cyl5 + S cyl6 / 6
   If S is > **0.40 mm** (**0.015 in**) use the gasket type A.
   If S is < **0.40 mm** (**0.015 in**) use gasket type B.

4. Position the gasket **(1)** on the crankcase, ensuring that the word "TOP" **(1)** is facing the cylinder head.

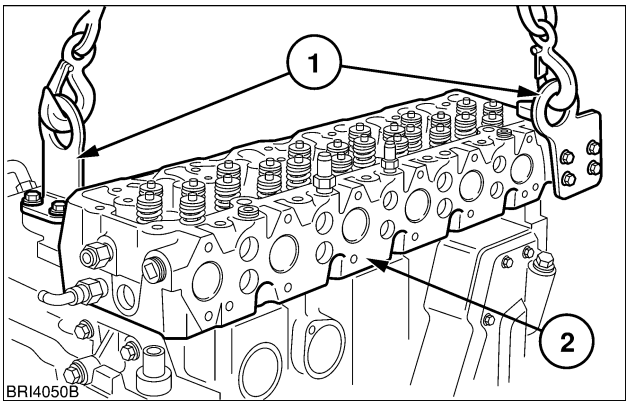
NOTE: *Do not grease the gasket.*



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5. With the head gasket positioned on the crankcase, place the cylinder head **(2)** onto it, slung with the brackets, Special Tool number **380001073 (1)**.



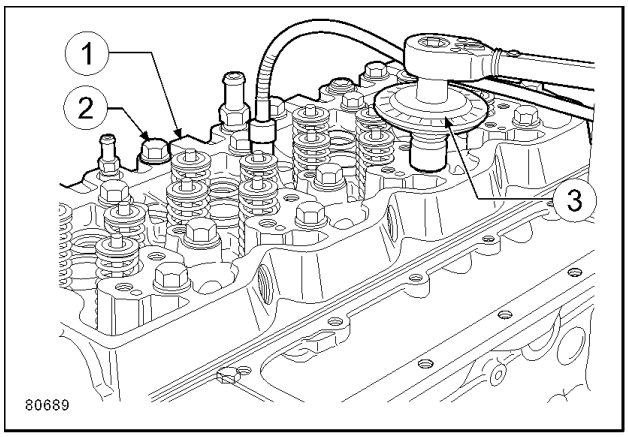
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6. Before reusing cylinder head retaining bolts, refer to **ENGINE - Dimension (B.10.A)**.

7. Insert cylinder head retaining bolt and tighten in sequence to specified torques, refer to **Cylinder head - Torque (B.10.A)** and **Cylinder head - Tighten (B.10.A)**.

NOTE: *Angle closing is performed using a suitable angle gauge on the wrench (3).*

NOTE: *Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.*



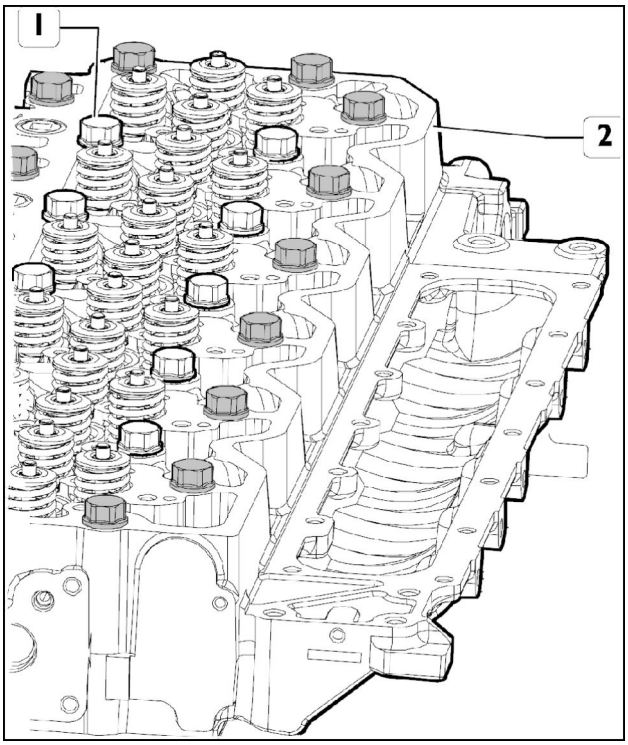
80689_91 4

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Cylinder head - Tighten

1. Place the bolts in the correct location in the cylinder head

NOTE: *Highlighted Bolts are shorter*

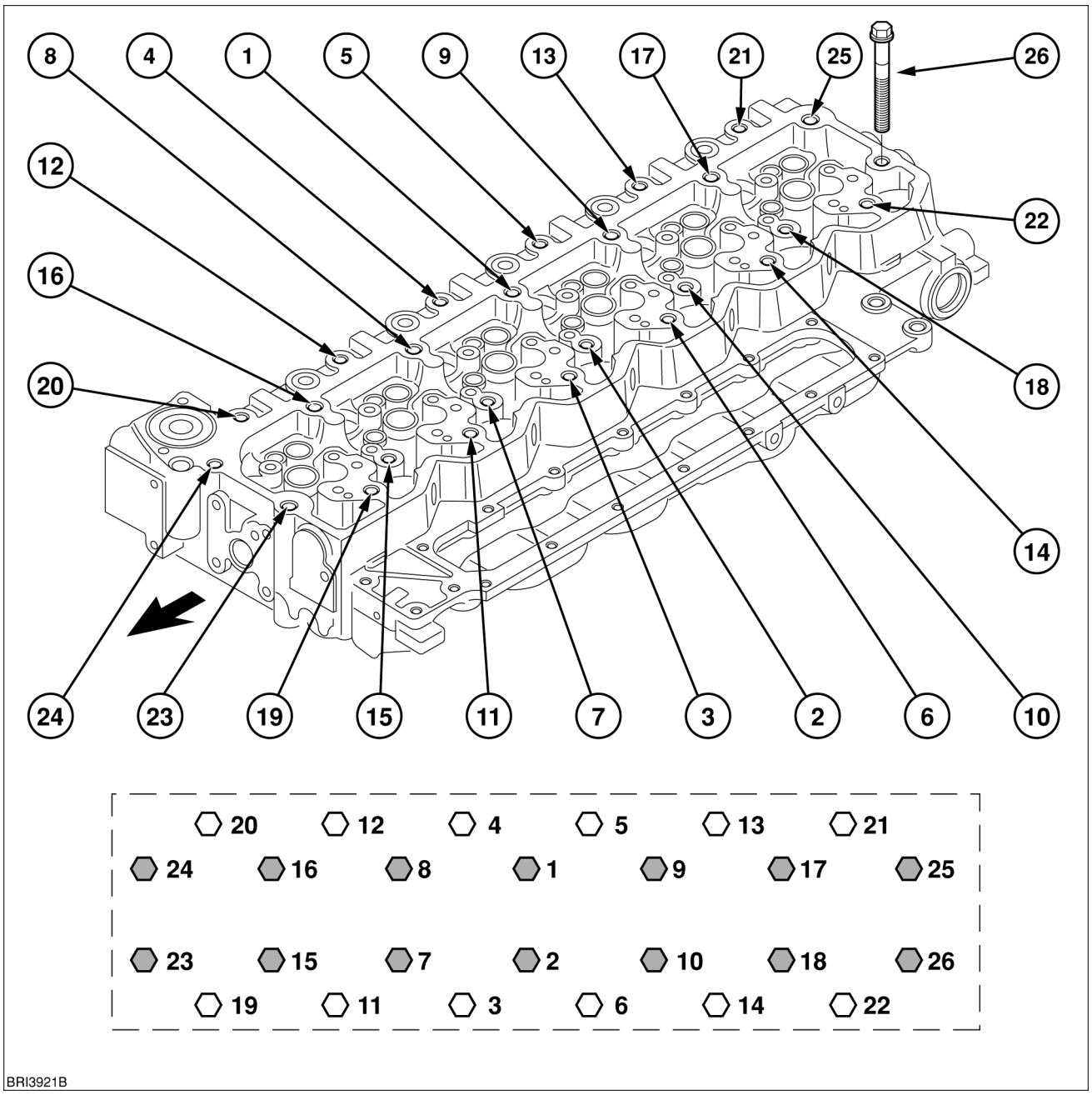


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2. Tightening sequence for cylinder head bolts.

NOTE: *The **150 mm** length cylinder head bolts, are shown below as the shaded bolt locations.*



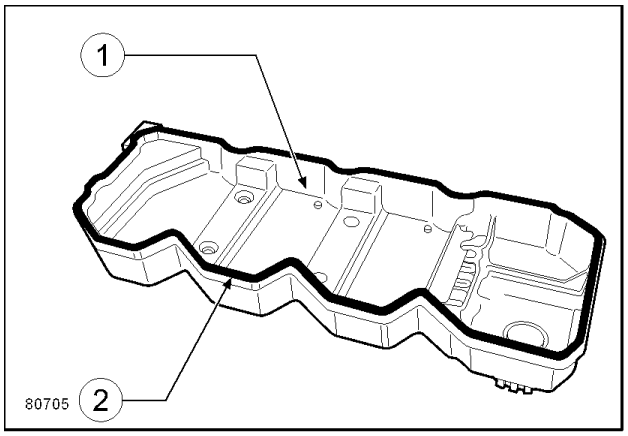
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For the required torque settings, refer to ENGINE - Torque (B.10.A) .

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Valve cover - Install

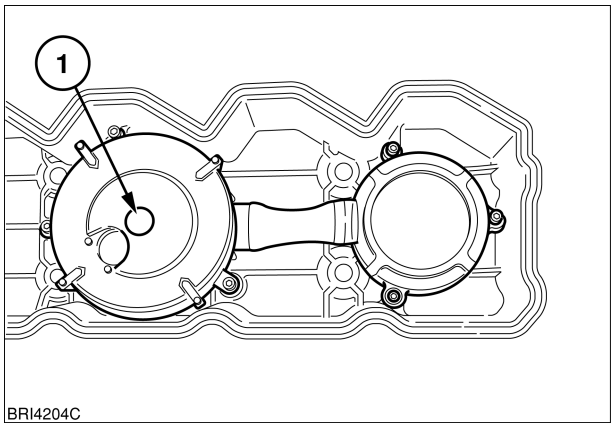
1. Install a new gasket **(2)** on the rocker cover **(1)**. Figure **1** (Shows cover less breather assembly.)



80705 1

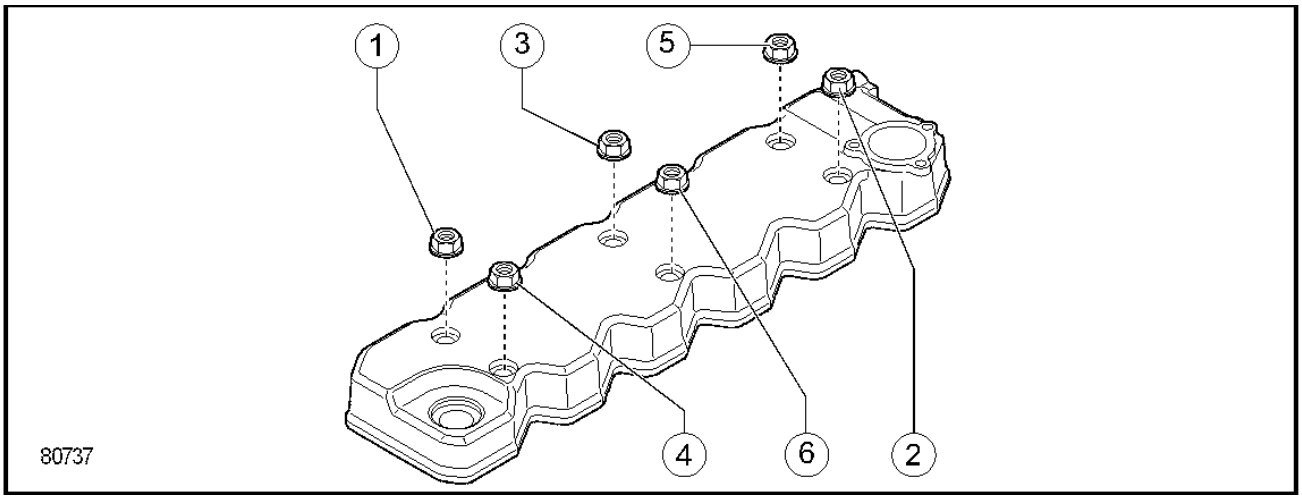
IMPORTANT: *When refitting the valve cover make sure the breather assembly has the breather check valve installed. If this is missing oil consumption and excessive smoke may occur.*

2. The check valve is the orange component **(1)** installed in the centre of the blow-by filter.



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3. Locate the cover over the protruding studs . Screw on the nuts and tighten to **24 Nm** (**17.70 lb ft**) ± **0.4 Nm** (**0.30 lb ft**). Refer to Figure **3** for tightening sequence.

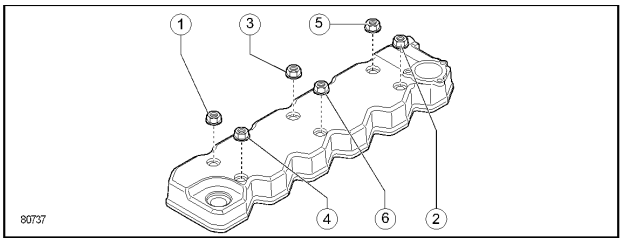


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Valve cover - Remove

1. Undo the retaining nuts and remove valve cover from the housing.



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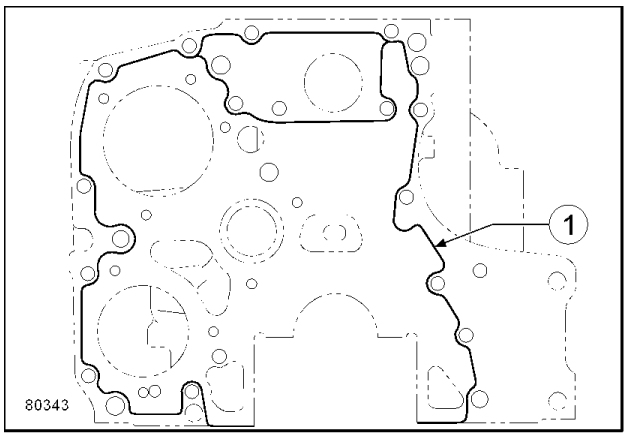
Rear cover - Install

Prior operation:
Timing gear - Timing adjust (B.10.A)

DIAGRAM OF ZONE FOR APPLYING LOCTITE 5205 SEALANT ON THE GEAR COVER

1. Carefully clean the timing gear cover and the crankcase.

NOTE: *Cleaning the surface to seal is both necessary and unavoidable in order to obtain an effective seal.*
Apply LOCTITE 5205 sealant onto the casing to form a bead (1) with a diameter of a few mm.
It must be uniform (no lumps), with no air bubbles, thin areas or breaks.
Any flaws must be corrected in as short a time as possible.
Avoid using excess material to seal the joint. Too much sealant would tend to come out on both sides of the joint and clog the lubricant passageways.
After applying the sealant, the joints require immediate assembly (10 — 20 minutes).

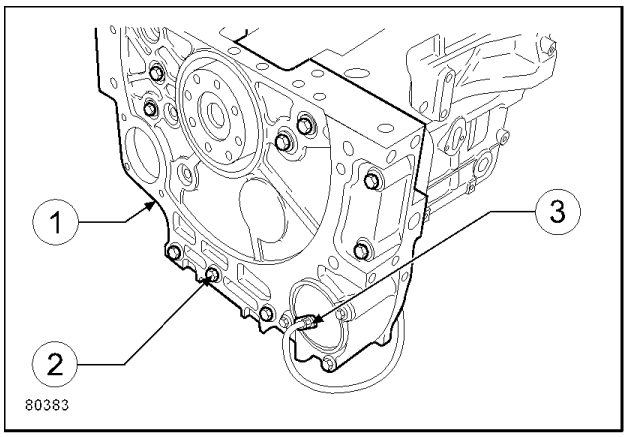


80343 1

TIGHTENING SEQUENCE FOR GEAR COVER BOLTS

2. Refit the cover **(1)** to the crankcase.
Screw down the retaining bolts **(2)** in the position found during disassembly and tighten the bolts to the specified torque wrench settings :
M8: . **24 Nm± 4 Nm**(**17.7015 lbft ± 2.9502 lbft**
M10: **47 Nm± 5 Nm**(**34.6654 lbft ± 3.6878 lbft**
Refit the phase sensor **(3)** of the high-pressure pump.

NOTE: *Before each assembly, always check that the threads of the holes and bolts show no signs of wear or traces of dirt.*



80383 2

Next operation:
Crankshaft Rear seal - Install (B.10.A)

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POWER PRODUCTION - B

FUEL AND INJECTION SYSTEM - 20.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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FUEL AND INJECTION SYSTEM - General specification

Description	
Fuel System	High Pressure, Common Rail
Injection	Bosch Control Unit EDC16 ECU
Nozzles	Electro-Injectors
Injection Firing order	1 - 5 - 3 - 6 - 2 - 4
Injection Pressure	**250 - 1600 bar** (**3625.000 - 23200.000 psi**)

Fuel injection pump - Torque

Description	
Nut retaining fuel pump drive gear	**100 Nm +/- 5** (**73.8 lbft +/- 4**)
Gear backlash	**0.076 - 0.368 mm**

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Fuel injector Electro injector - Torque

Part	TORQUE Nm (lb ft)
Torque electro-injector retaining bolts.	
Tighten both bolts alternately to torque setting.	**3.5 Nm** (**2.6 lb ft**)

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Electrical control - Torque

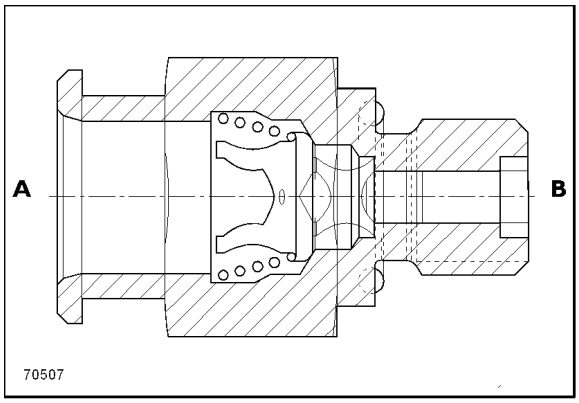
Part	Torque
Screws connecting injector connectors	**1.5 Nm** (**1.11 lb ft**)± **0.25 Nm** (**0.18 lb ft**).

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Regulator valve Injection return - Static description

Fuel Return Pressure Limiter

Housed on the back of the cylinder head, it governs the pressure of the fuel returning from the injectors at a pressure of between **1.3 - 2 bar** (**18.8548 - 29.0074 psi**). By ensuring this pressure for the return fuel, no fuel vapours form in the electro-injectors, optimizing the spray of fuel and its combustion.



70507 1

A. To the tank

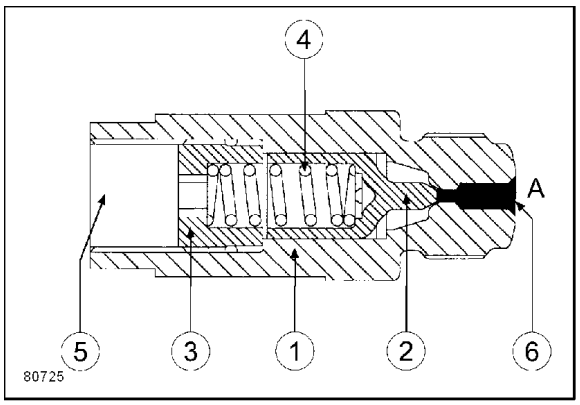
B. From the electro-injectors

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Relief valve - Static description

Pressure Relief Valve on High Pressure Common Rail

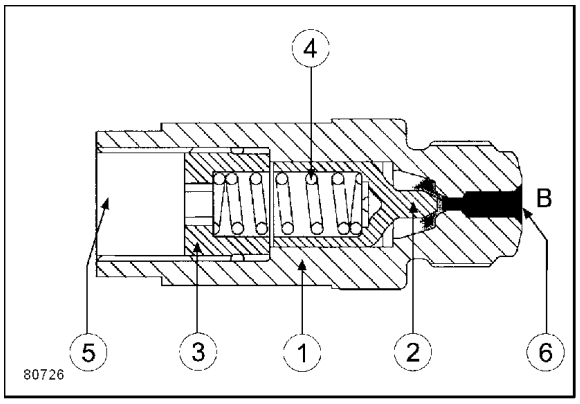
The pressure relief valve on the rail is used to protect the system components if there is too great an increase in the pressure in the high-pressure system.
When the rail pressure reaches **1800 bar** (**26100.00 psi**) , the valve trips to make the fuel flow off and lower the pressure within safe limits. The pressure is mechanically adjusted in the rail to approximately **800 bar** (**11602.9600 psi**).
In this way, the valve lets the engine operate for extended periods at limited performance, preventing the fuel from overheating and protecting the outlet piping.
If this valve trips, the control unit turns off the control of the pressure regulator . The valve will supply the maximum delivery to the rail.



80725 1

(A) Normally, the tapered end of the plunger keeps the outlet to the tank closed.

1. Body
2. Plunger
3. Stop
4. Spring
5. Outlet to tank
6. Seat on rail



80726 2

(B) If the pressure of **1800 bar** (**26100.00 psi**) of the fuel in the rail is exceeded, the plunger is shifted and the excess pressure is discharged into the tank.

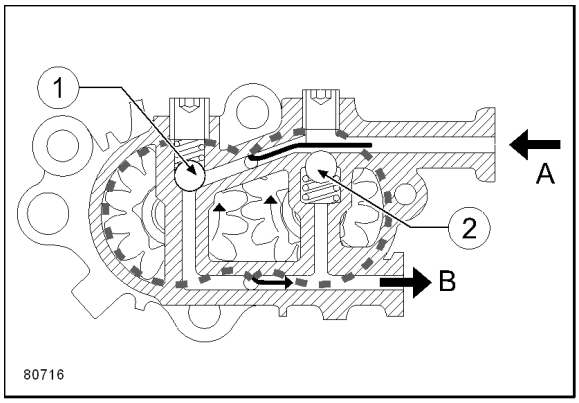
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Fuel injection pump - Dynamic description Fuel Supply Gear Pump.

The gear pump, mounted on the rear of the high-pressure pump, has the function of feeding the pump. It is governed by the shaft of the high-pressure pump.

Normal operating condition (Figure 1)

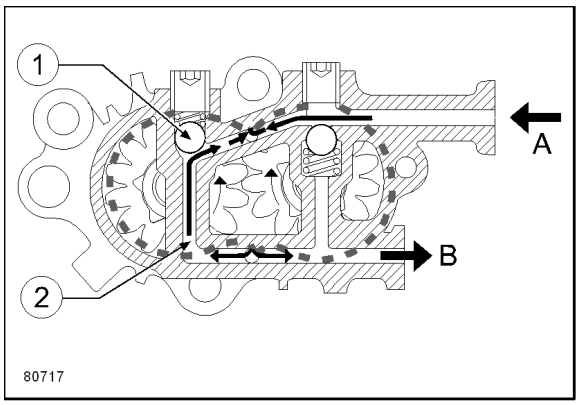
(A) Fuel inlet from the tank, **(B)** fuel outlet to the filter, **(1)** and **(2)**-By-pass valves in closed position.



80716 1

Condition of overpressure at outlet (Figure 2)

The by-pass valve **(1)** trips when overpressure is generated at the outlet **(B)**. The pressure, overcoming the elastic resistance of the spring of the valve **(1)**, sets the outlet in communication with the inlet through the duct **(2)**.



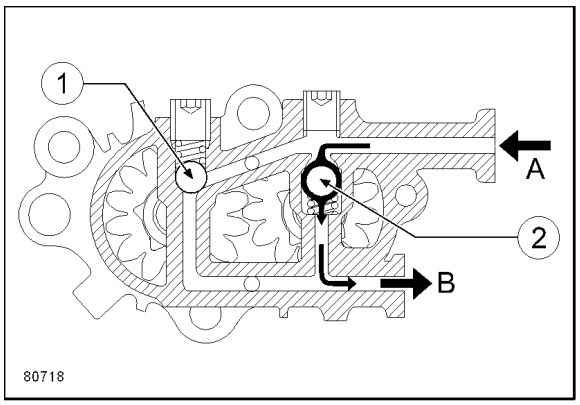
80717 2

Bleed conditions (Figure 3)

The by-pass valve **(2)** trips when, with the engine switched off, you want to fill the feed system through the priming pump. In this situation, the by-pass valve **(1)** stays shut and the by-pass valve **(2)** opens due to the effect of the inlet pressure and the fuel flows out via outlet **(B)** .

NOTE: *The mechanical fuel supply pump cannot be replaced on its own; therefore it must not be removed from the high-pressure pump.*

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80718 3

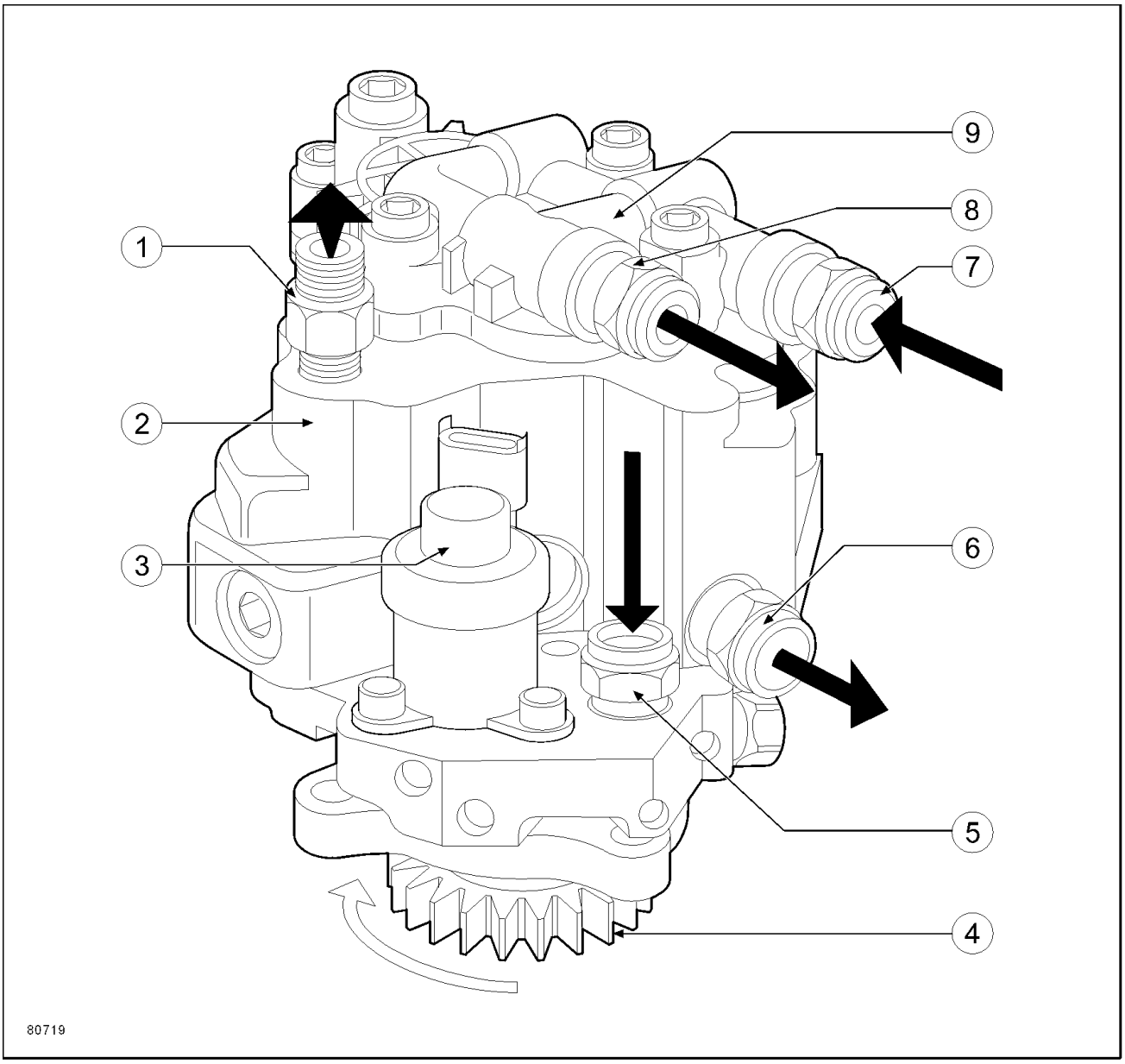
For an overview of the High Pressure Pump CP3, refer to **Fuel injection pump - Overview (B.20.A)**.

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Fuel injection pump - Overview High Pressure Pump CP3

For information on Fuel Supply Gear Pump, refer to **Fuel injection pump - Dynamic description (B.20.A)**. This pump with 3 radial pumping elements governed by the timing gear does not need timing. The mechanical fuel supply pump governed by the shaft of the high-pressure pump is mounted on the back of the pump.

NOTE: *The high-pressure / fuel supply pump assembly cannot be overhauled and therefore it must not be removed and the retaining bolts must not be tampered with. The only permissible action is to change the drive gear.*



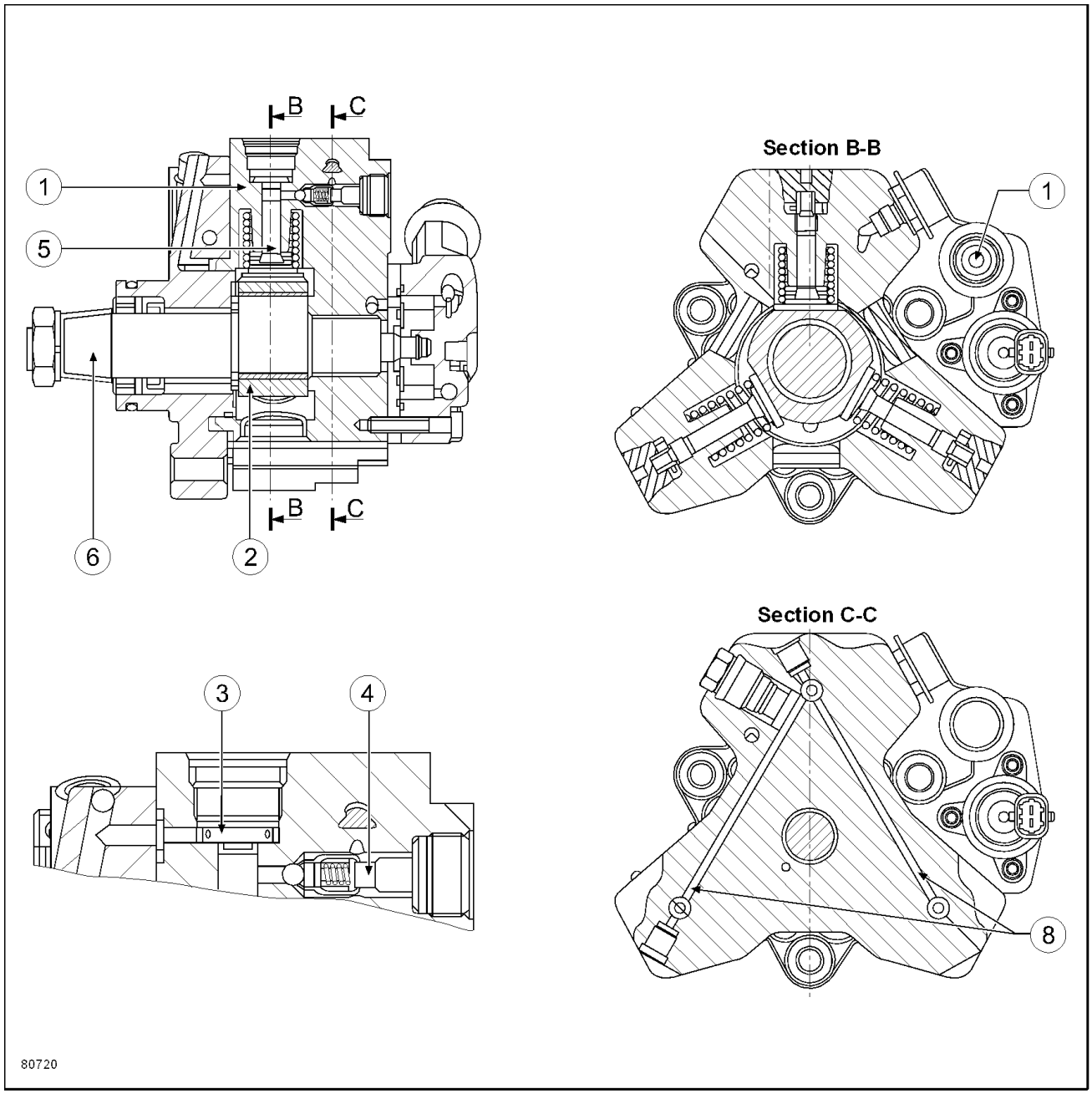
80719 1

1 Fuel outlet fitting to rail
2 High-pressure pump
3 Pressure regulator
4 Drive gear
5 Fuel filter inlet fitting from filter
6 Fuel outlet fitting to filter mounting
7 Fuel inlet fitting from the cooler of the pack
8 Fuel outlet fitting from the mechanical pump to the filter
9 Mechanical supply pump.

NOTE: *For sectional internal structure of High Pressure Pump, refer to* ***Fuel injection pump - Sectional view (B.20.A)****.*

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Fuel injection pump - Sectional view High Pressure Pump Internal Structure



80720 1

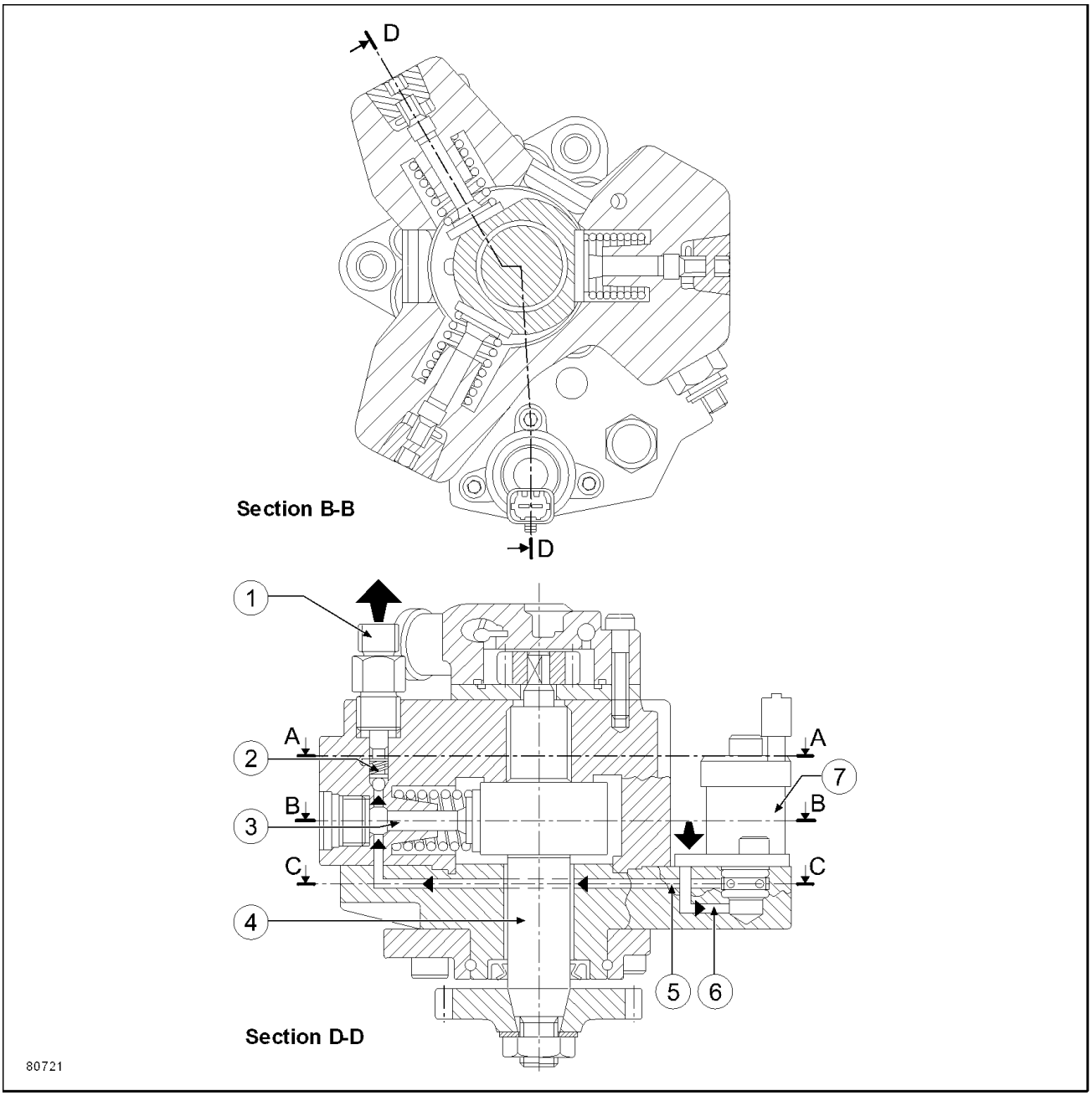
1 Cylinder
2 Three-lobe element
3 Inlet cap valve
4 Delivery ball valve
5 Piston
6 Pump shaft
7 Low pressure fuel inlet
8 Fuel channels to supply pumping elements

Each pumping assembly comprises:

- a piston **(5)** operated by a three-lobe element **(2)** floating on the pump shaft **(6)**. Since the element **(2)** floats on a misaligned portion of the shaft **(6)**, when the shaft rotates it does not turn with it, but is only moved in a circular fashion on a wider radius, with the result of operating the three pumping elements alternately;
- an inlet cap valve **(3)**;
- a delivery ball valve **(4)**.

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Operating principle

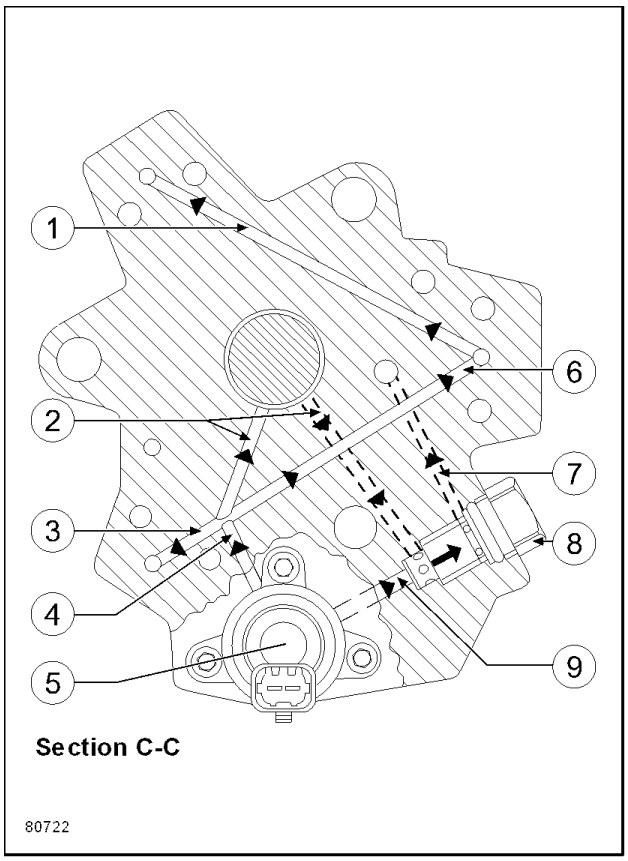


80721 2

1 Fuel outlet fitting to rail
2 Delivery valve to rail
3 Pumping element
4 Pump shaft
5 Pumping element supply pipe
6 Pressure regulator supply pipe
7 Pressure regulator

The pumping element **(3)** is oriented on the cam on the pump shaft **(4)**. In the inlet phase, the pumping element is fed through the supply pipe **(5)**. The amount of fuel to send to the pumping element is established by the pressure regulator **(7)**. The pressure regulator, on the base of the PWM control received from the control unit, chokes the flow of fuel to the pumping element. During the compression phase of the pumping element, the fuel, on reaching such a pressure as to open the delivery valve to the common rail **(2)**, supplies it through the outlet **(1)**.

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80722 3

1. Inlet to the pumping element
2. Pump lubrication pipes
3. Inlet to the pumping element
4. Main pumping element supply pipe
5. Pressure regulator
6. Inlet to the pumping element
7. Regulator outlet pipe
8. **5 bar** (**72.5185 psi**) relief valve
9. Fuel outlet from regulator inlet

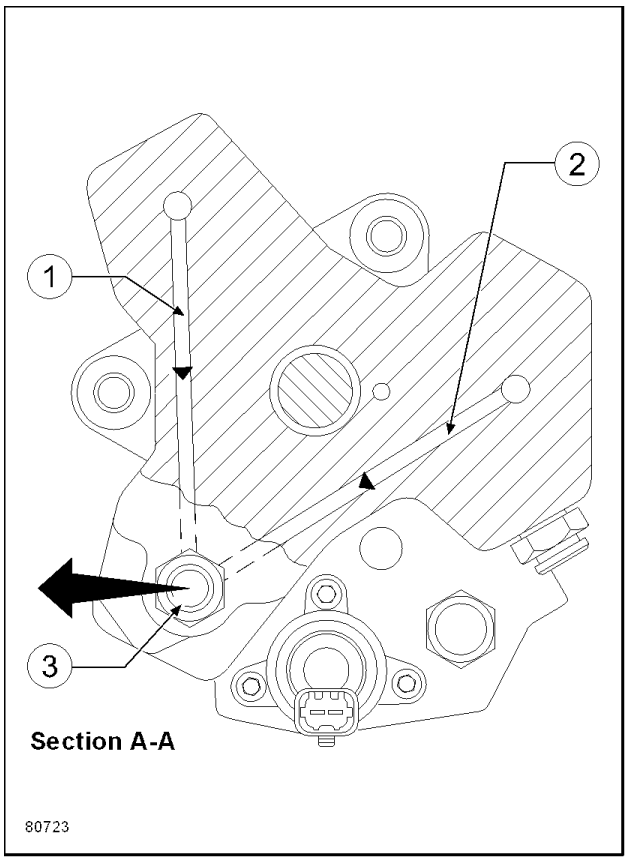
The low-pressure fuel lines in the pump are shown; the main supply pipe of the pumping elements **(4)**, the supply pipes of the pumping elements **(1)** - **(3)**- **(6)**, the pipes used to lubricate the pump **(2)**, the pressure regulator **(5)**, the **5 bar** (**72.5185 psi**) relief valve **(8)** and the fuel outlet **(7)** are shown.

The pump shaft is lubricated by the fuel through the delivery and return pipes **(2)**.

The pressure regulator **(5)** determines the amount of fuel with which to supply the pumping elements; the excess fuel flows out through the pipe **(9)**.

The **5 bar** (**72.5185 psi**) relief valve, besides acting as a manifold for the fuel outlets, has the function of keeping the pressure constant at the regulator inlet at **5 bar**(**72.5185 psi**).

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80723 4

1. Fuel outlet pipe
2. Fuel outlet pipe
3. Fuel outlet from the pump with the high-pressure pipe fitting for the common rail.

The flow of fuel at high pressure through the pumping element outlet pipes is shown.

Operation

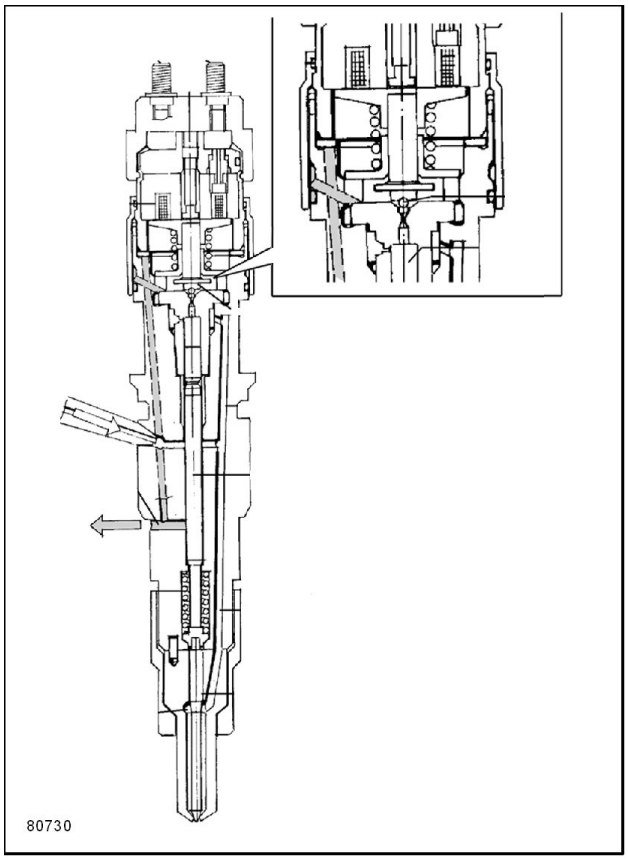
The cylinder is filled through the inlet cap valve only if the supply pressure is able to open the delivery valves on the pumping elements (approximately **2 bar** (**29.0074 psi**)).
The amount of fuel feeding the high-pressure pump is metered by the pressure regulator, located on the low-pressure system. The pressure regulator is governed by the EDC 7 control unit via a PWM signal.
When fuel is sent to the pumping element, the relevant piston is moving downwards (intake stroke). When the piston stroke reverses, the intake valve closes and the fuel left in the pumping element chamber, not being able to get out, is compressed above the level of the supply pressure in the rail.
The pressure generated in this way causes the exhaust valve to open and the compressed fuel reaches the high-pressure circuit.
The pumping element compresses the fuel to reach the top dead centre (delivery stroke). The pressure then decreases until the exhaust valve closes.
The plunger of the pumping element goes back towards the bottom dead centre and the remaining fuel decompresses.
When the pressure in the chamber of the pumping element becomes less than the supply pressure, the intake valve opens again and the cycle is repeated.
The delivery valves must always be free to move, with no debris or oxidation.
The delivery pressure to the rail is modulated between **250 - 1600 bar** (**3625.000 - 23200.000 psi**)) by the electronic control unit via the solenoid valve of the pressure regulator.
The pump is lubricated and cooled by the fuel itself.
The time for removing - installing the radial jet pump on the engine is considerably shorter than for conventional injection pumps as it does not need timing.
If disassembling - reassembling the piping between the fuel filter and the high-pressure pump, make sure your hands and the components are clean.

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Fuel injector Electro injector - Dynamic description

Injection Start

When the coil is energized, it causes the shutter to move upwards. The fuel of the control volume flows out towards the backflow pipe, causing a drop in pressure in the control volume. At the same time, the pressure of the fuel in the pressure chamber causes the needle to rise, with fuel getting injected into the cylinder as a result.



80730 1

Injection End

When the coil is de-energized, the shutter goes back into its closed position to form such a balance of forces as to make the needle go back into its closed position and end injection.

NOTE: *The electro-injector cannot be overhauled and therefore must not be removed.*

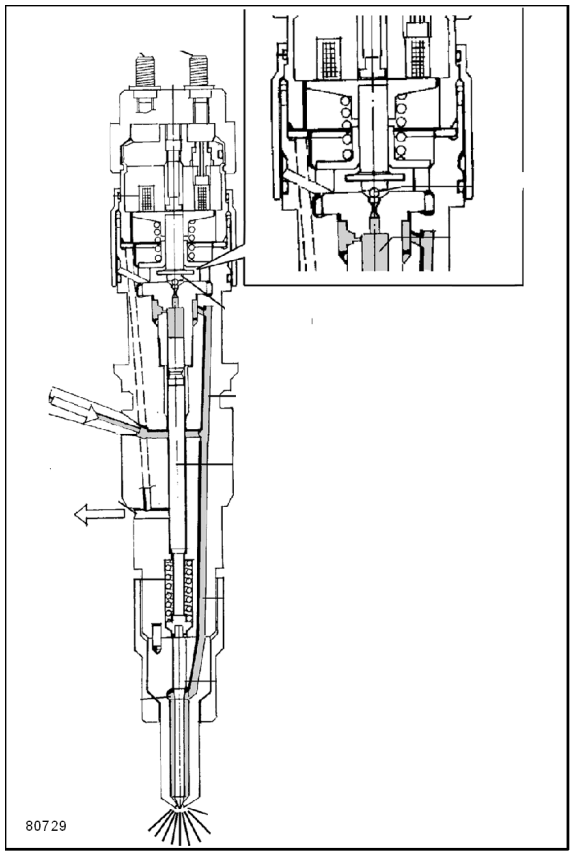
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Fuel injector Electro injector - Sectional view

The construction of the injector is similar to that of conventional ones, except that there are no needle return springs. The electro-injector can be considered to comprise two parts:

- actuator - nozzle composed of a pressure rod, needle and nozzle;
- control solenoid valve composed of coil and pilot valve.

The solenoid valve controls the lift of the needle of the nozzle.



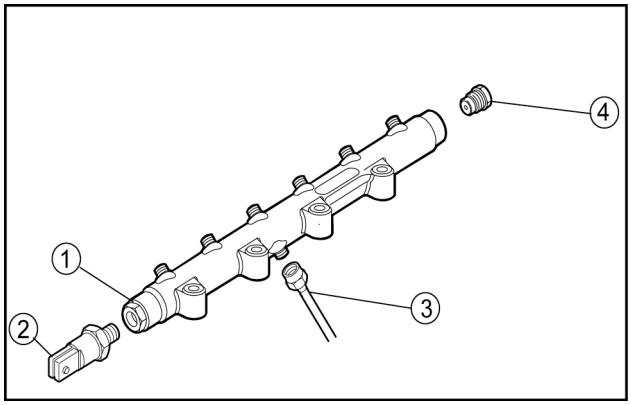
80729 1

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High pressure common rail - Overview

Rail (Pressure Accumulator)

The rail volume is small to permit fast pressurization when starting, at slow idling and when there are high flow rates. However, its volume is sufficient to minimize the fluctuations caused by the injectors opening and closing and the pump working at high pressure. This function is helped further by a calibrated orifice downstream from the high-pressure pump.
Screwed onto the rail there is a fuel pressure sensor **(2)**. The signal sent from this sensor to the electronic control unit is used to control and check the level of pressure in the rail .



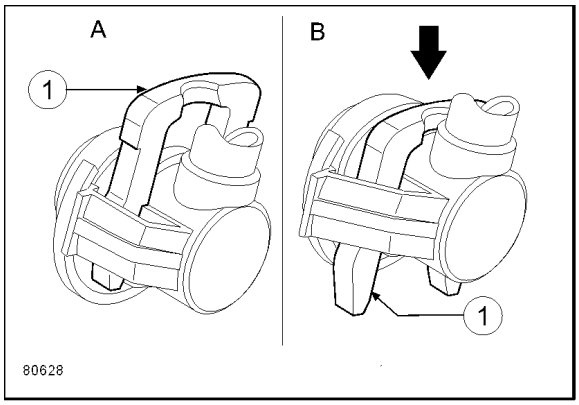
BAIL07APH398AMA 1

1. Rail
2. Pressure sensor
3. Fuel inlet from the high-pressure pump
4. Relief Valve (Refer to **Relief valve - Static description (B.20.A)**

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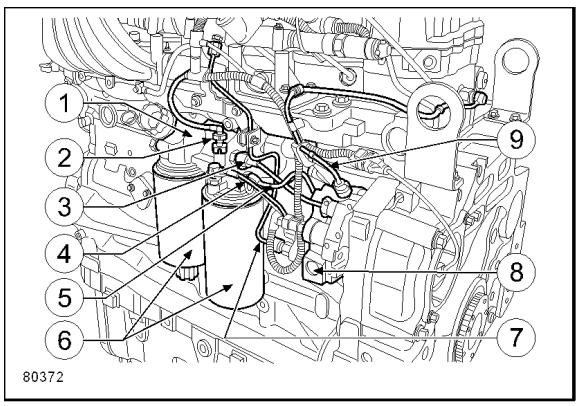
Fuel line - Disconnect

NOTE: *To disconnect the fuel pipes* ***(3)*** *—* ***(4)*** *—* ***(5)****, Figure from the relevant fittings, you need to press the clip* ***(1)*** *as shown in Figure* ***(B)****.*
After disconnecting the piping, put the clip ***(1)*** *back in its locking position Figure* ***(A)*** *to prevent it getting buckled.*



80628 1

1. Disconnect the fuel pipes **(3)** - **(4)** - **(5)** from the mounting **(1)**;
   Remove the bracket supporting the mounting **(1)** from the crankcase.



80372 2

2. Disconnect the high-pressure fuel pipe (**(7)**, Figure) from the rail choke tube and from the high-pressure pump **(8)** and remove it from the crankcase by taking out the bracket.
   Disconnect the pipe **(9)** from the high-pressure pump **(8)**.

NOTE: *Due to high pressure in the piping from the high-pressure pump to the rail, and from the rail to the electro-injectors, never:*
- disconnect the pipes with the engine running,
- reuse disconnected pipes.

⚠ WARNING ⚠

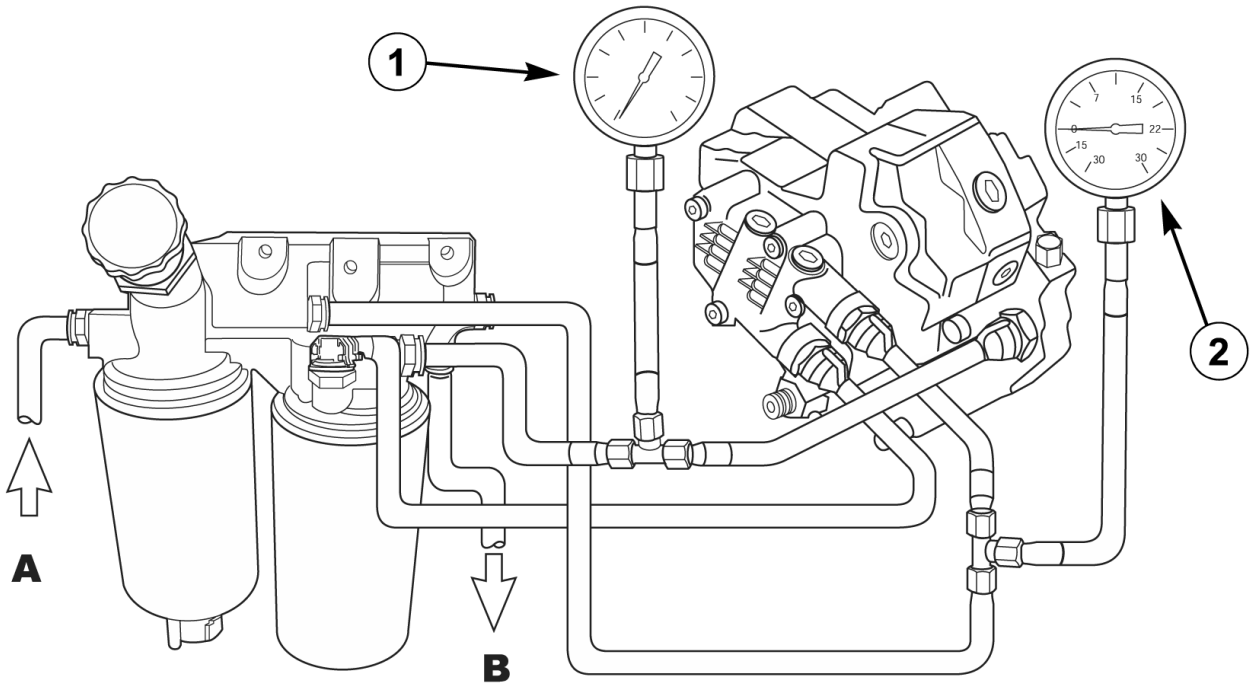
Do not open the high-pressure fuel system or loosen any fittings with the engine running. Engine operation causes high fuel pressure. High-pressure fuel spray can cause serious injury or death.

M1002

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FUEL AND INJECTION SYSTEM - Test

Fuel inlet restriction/air entering system



BAIL08CVT128ASA 1

1. 380100057 **0 - 11 bar** (**0 - 160 psi**) gauge and hose assembly
2. 380100056 0 to 100 kPa/0 to 30" HG, 0 to 200 kPA/0 to 30 PSI Gauge Assembly

(A) From fuel tank

(B) Return to fuel tank

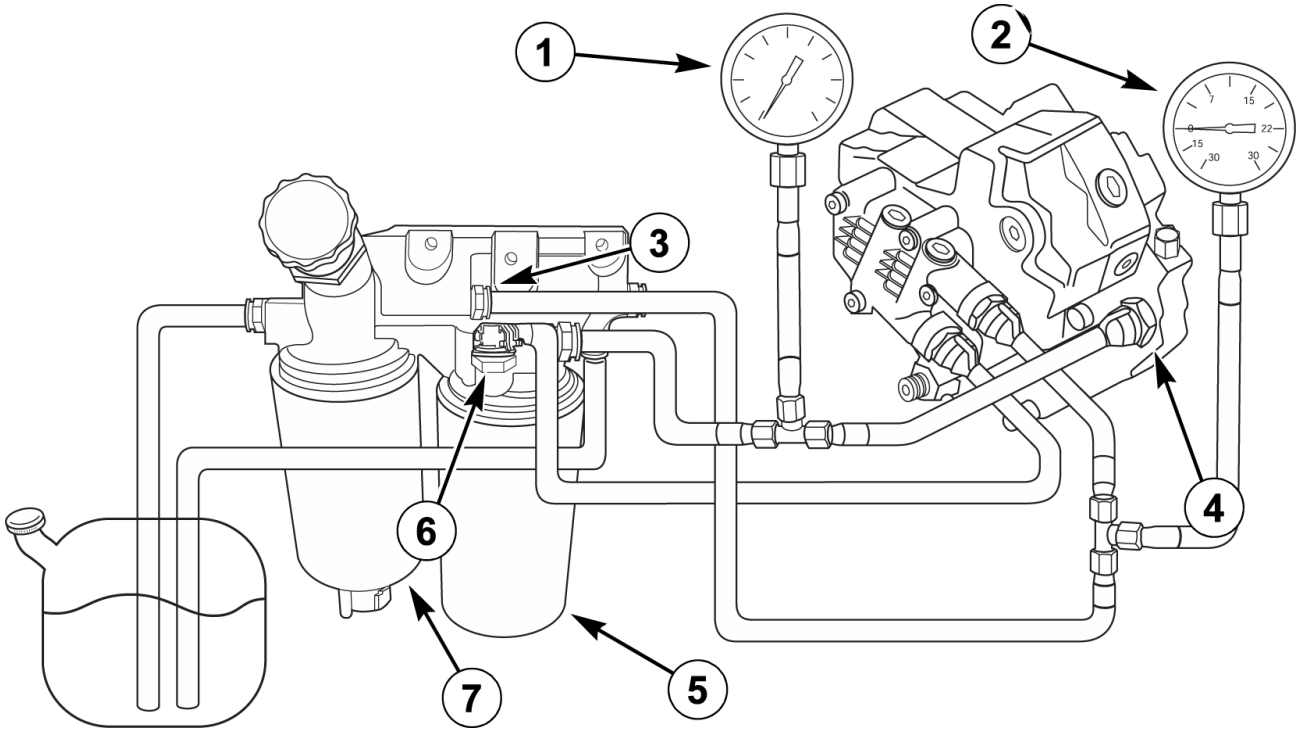
NOTE: *Use the contents of special tool* ***380140055*** *for these tests*

1. Install 380100056 at the inlet of the low pressure pump (after the primary filter).
   • This test line contains a compound gauge . **0 - 762 mm** (**0 - 30 in**) of Hg vacuum and **0 - 2.07 bar** (**0 - 30 psi**) positive pressure. This test line is constructed with clear tubing to allow observation for air in the system.
   Install 380100057 between the outlet of the fuel filter and the inlet of the high pressure pump.
   • This test line contains a pressure gauge . **0 - 11 bar** (**0 - 160 psi**).
   Operate the engine to purge air from the system which entered during gauge installation.

NOTE: *The clear line could be left in place over night to check for a slow air ingress leak.*

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2. When air is no longer visible in the clear test line, measure and record the operating pressure, while continually observing for air in the fuel. Fuel Pressure Specification between Filter and High Pressure Pump: 5 bar (72 psi) minimum. Conditions:
_____Gauge 1 _____ Gauge 2: Low idle; apply no load to the engine.
_____Gauge 1 _____ Gauge 2: **1500 RPM**apply no load to the engine.
_____Gauge 1 _____ Gauge 2: High idle; apply load to the engine using the hydraulics (over relief), hydrostatic stall, converter stall, or dynamometer. Load the engine to its rated rpm.



BAIL08CVT129FSA 2

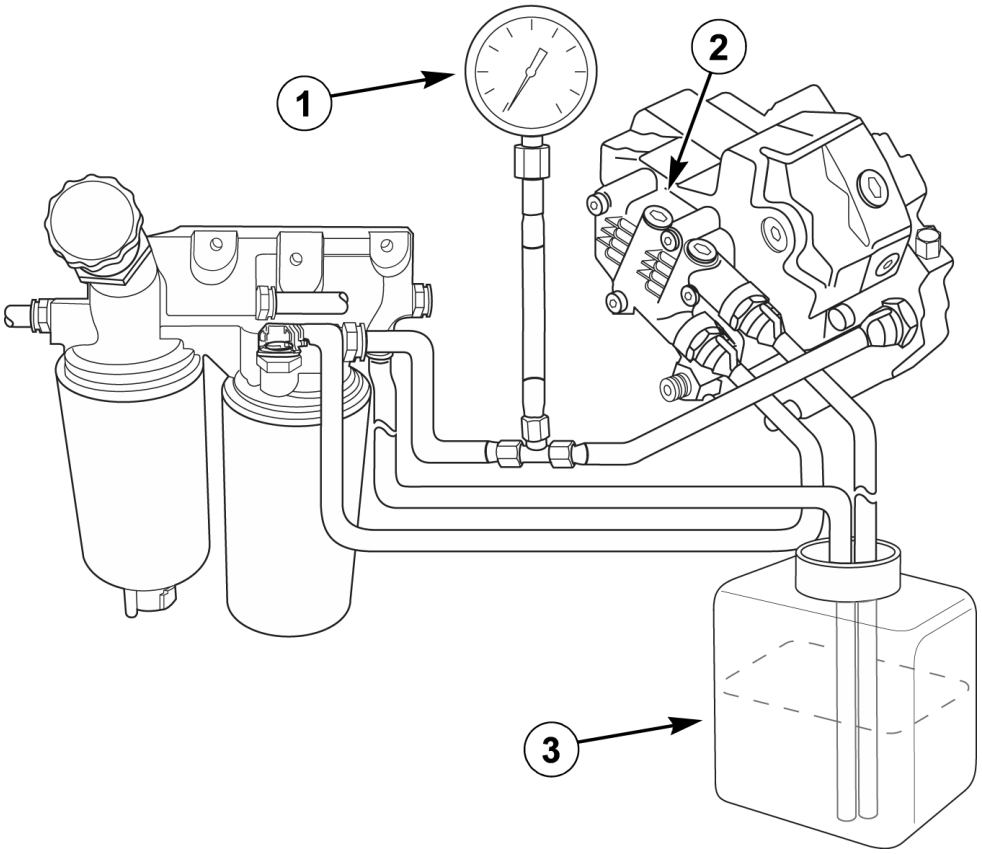
1. 380100057 **0 - 11 bar** (**0 - 160 psi**) gauge and hose assembly
2. 380100056 **0 - 100 kPa 0 - 30 in**/ HG, **0 - 200 kPa** / **0 - 30 in** PSI Gauge Assembly
3. Primary Filter Outlet to Low Pressure Pump Inlet
4. High Pressure Pump Inlet from Fuel Filter Outlet
5. Secondary Fuel Filter (pressurized filter)
6. Secondary Fuel Filter Inlet (pressurized filter)
7. Primary Fuel Filter (suction filter)

3. If the fuel pressure at gauge **(1)** is below **5 bar** (**73 psi**) at any time during the test, check or replace the following as needed:
• Fuel Pre-filter (if equipped). Some applications do not use a fuel pre-filter.
• Primary Fuel Filter
• The lines and connections from the fuel supply pump inlet back to the fuel tank, checking for damaged lines (kinks create restriction; rub marks may allow air to enter) and leakage at the Voss o-ring fittings.
• Fuel tank, clean as required.
• The fuel pick-up tube in the fuel tank. Check for cracks, plugging, or contact with the bottom/sidewalls of the tank.
• The fuel tank cap. Be sure a vacuum is not being formed in the fuel tank. A vacuum at the tank would

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reduce the fuel supply pressure to the injection fuel pump inlet. Vacuum in the fuel tank might not be observable during short-term running.
• Check the valve at the fuel tank outlet (if equipped). Ensure that fuel supplied to and from the valve assembly is properly connected.

Low pressure pump testing



BAIL08CVT130FSA 3

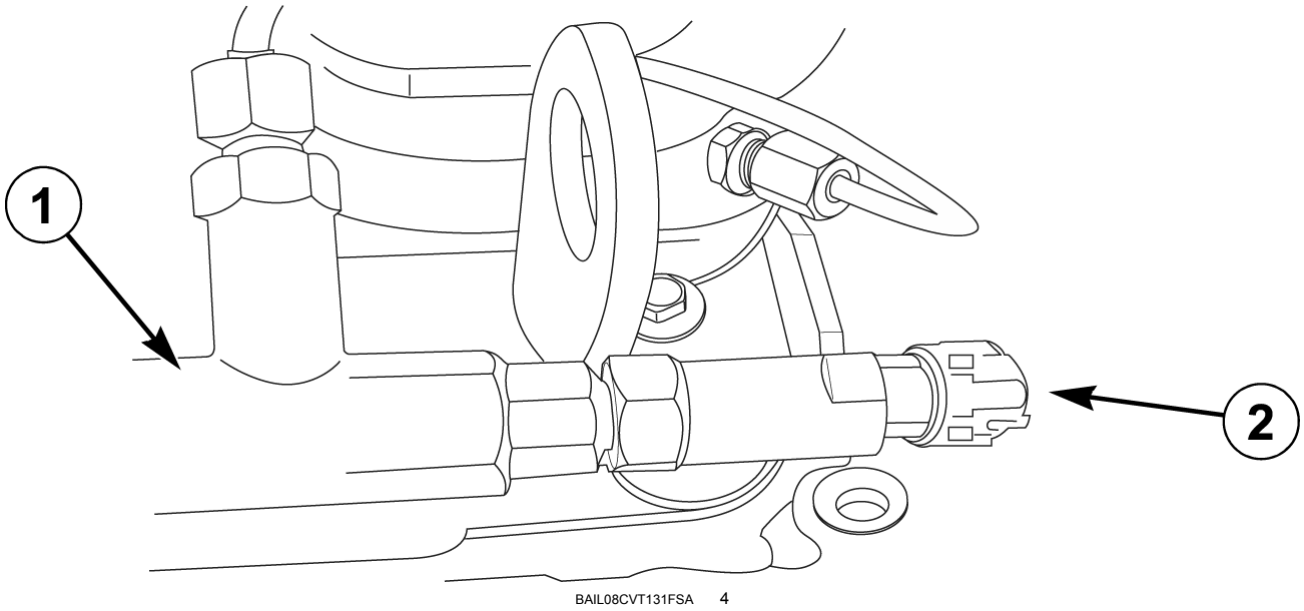
1. 380100057 **0 - 11 bar** (**0 - 160 psi**) gauge and hose assembly
2. Low Pressure Pump
3. 380100058 - Plastic **2000 ml** (4.2 pint) Container located not more than 1m (3.3 ft.)

4. If the pressure is still below - **5 bar** (**73 psi**) minimum, perform the following tests:
Supply fuel from an alternate fuel source (a separate container, 380100058), located not more than 1m (3.3 ft.) below the engine with a known good supply line. This bypasses:
• The Fuel Tank, Inlet Lines and Connections, and Pre-Filter (if equipped)
Connect a pressure gauge assembly (380100057) between the fuel filter outlet and the high pressure pump inlet.

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5. The engine should start (at the first or second attempt) and then draw fuel from the external container. Check the fuel pressure at **1500 RPM**. The reading on the filter outlet pressure gauge should be higher than **5 bar** (**73 psi**). If the pressure is lower than **5 bar** (**73 psi**):
   • Replace the fuel filter(s).
   • Retest. If the pressure is still below **5 bar** (**73 psi**), replace the low pressure pump.
   • Retest. If the pressure is still below **5 bar** (**73 psi**), the pressure regulator (part of the high pressure pump assembly) could be responsible, replace the high pressure pump.

Pressure relief valve testing



1. Fuel rail
2. Pressure Relief Valve Return Line Coupler

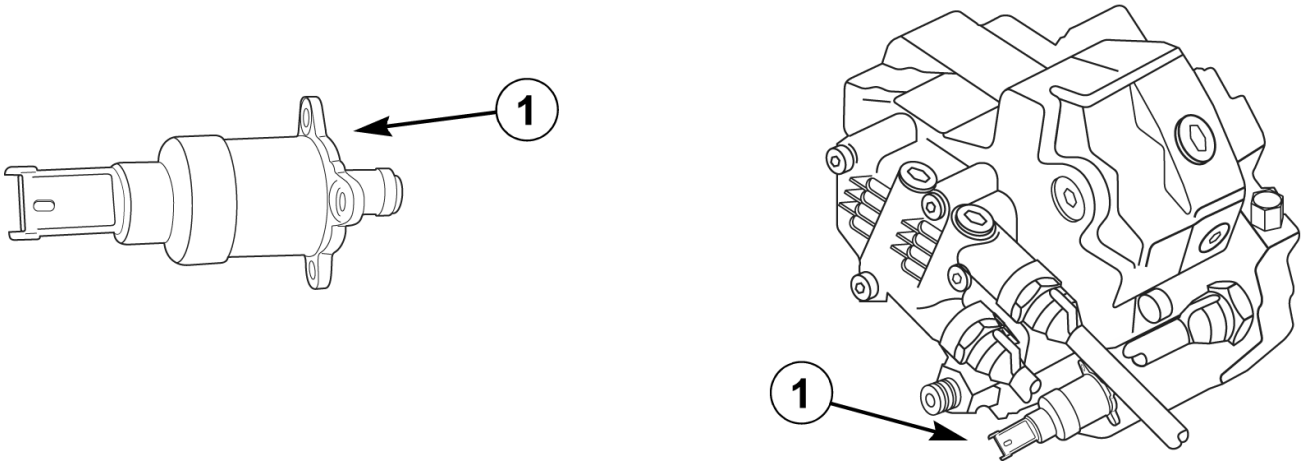
6. The Pressure Relief Valve is located at rear end of the fuel rail. This pressure relief valve protects the fuel system components from excessive pressure if:
   • The Rail Pressure Sensor fails to signal the correct pressure to the ECU (Engine Control Unit).
   • The High Pressure Flow Regulator, located at the pump, allows excessive pressure in the high pressure system.
   Check the ECU for:
   • Fault codes related to over pressurization of the common rail, refer to : High Pressure Flow Regulator Disconnect the pressure relief valve return line and cap the line with 380100060 cap. Install 380100057 gauge and hose assembly on the relief valve to direct any leakage to container 380100062 if the relief valve is leaking.

NOTE: *Under normal circumstances fuel should not come out of the relief valve*

7. If the diagnostic system does not indicate a fault code and fuel is leaking from the pressure relief valve, replace the pressure relief valve.

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High pressure flow regulator



BAIL08CVT132FSA 5

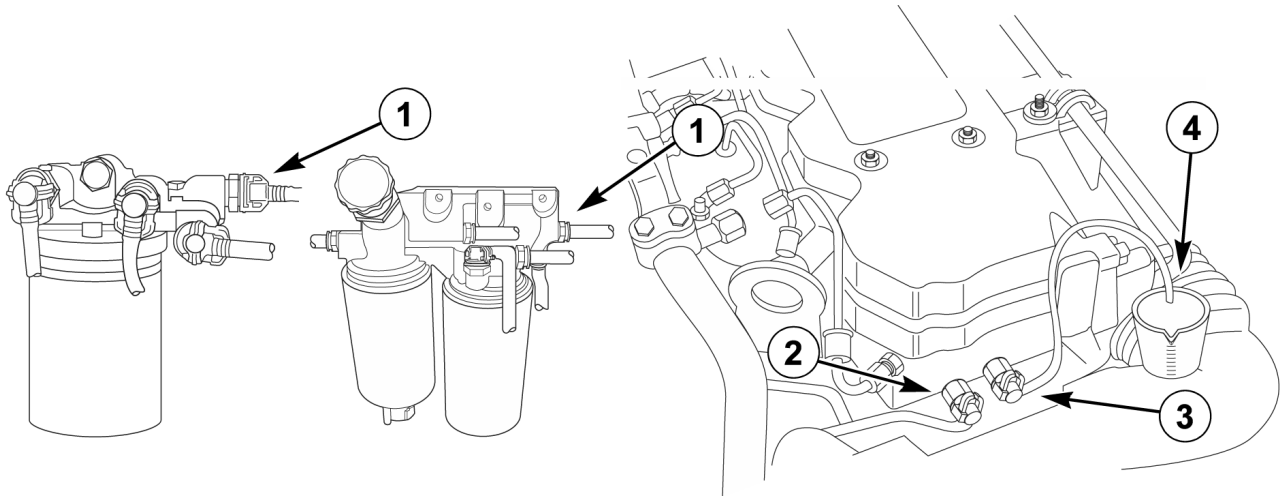
1. High Pressure Flow Regulator (Resistance Specification is **3.2 Ω**)

8. The High Pressure Flow Regulator is an electrical control located at the inlet of the high pressure pump. It regulates the amount of fuel supplied to the high pressure system based on control signals received from the ECU (by modulating the pulses sent to the internal solenoid). This is used to control the pressure within the fuel rail.
   • The high pressure flow regulator is normally open.
   • The high pressure pump is in maximum delivery mode if no control signal is sent by the ECU.
   If the high pressure flow regulator has an open circuit (the flow regulator is disconnected, the harness is broken, etc.) or a short circuit (resistance value is much lower than **3.2 Ω**):
   1. The pump will be in maximum delivery mode and pressure in the rail will exceed **1700 bar** (**24650 psi**) for a very short amount of time.
   2. The High pressure relief valve will open.
   3. The ECU sense the over pressure condition and store fault codes in the ECU memory.
   4. The engine will derate.
   • Check the resistance (on the ECU connector pins). The resistance specification is approximately **3.2 Ω**
   • When in parameter mode on the Electronic Service Tool, the duty cycle reading indicates the position of the regulator.

IMPORTANT: *When all of the system components have been checked, inspect for the following symptoms:*
The duty cycle tends to fluctuate irregularly and the engine idle speed is irregular.
• The engine stalls when idling and no fault is stored in the ECU.
• . Starting is difficult (takes longer than 4 seconds).
Replace the high pressure flow regulator.

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Fuel injectors



BAIL08CVT133FSA 6

1. Return Line at Fuel Filter Base (disconnect and plug using 380100059)
2. Return Line Shown Disconnected and Capped (380100060)
3. Drain Line (use gauge and hose assembly 380100057 as the drain line) Shown connected to fuel return outlet on the cylinder head
4. **100 ml** (**3.4 US fl oz**) Cup (380100062)

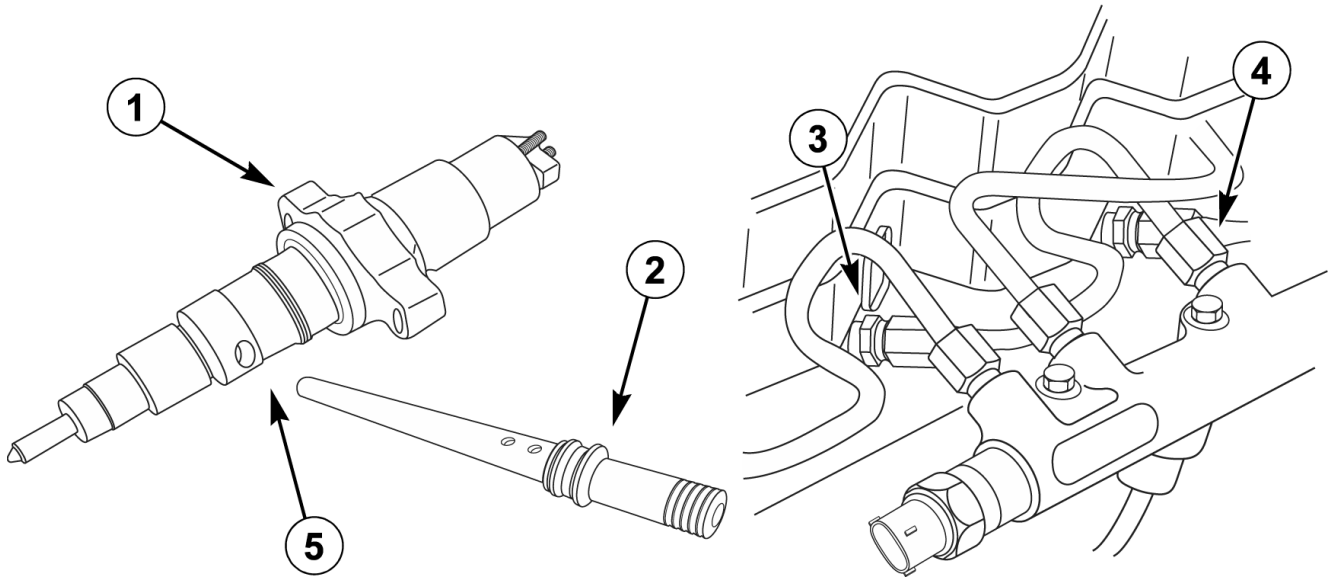
9. Engine load and rpm are controlled by the fuel injectors. The load requested by the operator is controlled by the throttle position and converted into a fuel quantity by the ECU. The ECU controls the amount and timing of the fuel injection (using current fuel rail pressure as a factor).
   Fuel injector mechanical problems:
   1. If the engine is difficult to start (excessive cranking time and no fault codes present):
   • Warm engine to **50 °C** (**122 °F**) minimum. Check for excessive fuel return of the cylinder head injectors (with the engine running at low idle (no load - A/C etc.). Complete **(A)**and/or **(B)** as required. :

NOTE: *Return leakage can be checked at various locations (at the filter base or the cylinder head depending on ease of the connection. If excessive leakage is found, additional testing will be required to determine the exact location(s) of the leakage. Each fuel injector connector and the pressure relief valve could be a source of excessive return flow. More than one component could be responsible for excessive return.*

(A) - Disconnect the return line at the fuel filter base and plug (380100059) the filter port. Drain the fuel return line at the filter head into a **100 ml** (**3.4 US fl oz**) cup (380100062) and measure the amount of fuel that escapes from the drain line in one minute. Leakage should not exceed **80 ml** (**2.7 US fl oz**) per minute with the engine running at low idle. If leakage exceeds **80 ml** (**2.7 US fl oz**) retest as directed in Step **(B)** to determine location of leakage.

(B) - Disconnect the return line on the engine cylinder head and cap (380100060) the line. Connect a drain line (use 380100057 as a drain line) to the fuel return outlet on the cylinder head and measure the amount of fuel that escapes from the cylinder head port in one minute using a **100 ml** (**3.4 US fl oz**) cup (380100062). Leakage should not exceed **80 ml** (**2.7 US fl oz**) per minute with the engine running at low idle.

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BAIL08CVT134FSA 7

1. Injector

2. Injector Connector - Check the fuel injector end of the connector to make sure is not deformed.

3.Injector Connector Cylinder Head Location - Torque Specification is **45 - 55 Nm** (**33 - 41 lb ft**)

4. Fuel Rail Outlet - Cap (380100061) each fuel rail outlet location; one at a time.

5. Interface location between injector and injector connector

10. If leakage from the cylinder head port exceeds **80 ml** (**2.7 US fl oz**) per minute with the engine running at low idle, check the leakage within each injector.
    - Maintain engine temperature, **50 °C** (**122 °F**) minimum. To locate a damaged injector, cap (380100061) each fuel rail outlet location; one at a time. Recheck the total leakage. When the return leakage value drops significantly with a fuel rail outlet capped, a leaking injector has been identified. Replace the damaged injector. Retest total leakage to ensure additional injectors are not leaking excessively.
    - Inspect the injector connector between each fuel injector and the associated fuel rail line. The torque specification is for the injector connector is **45 - 55 Nm** (**33 - 41 lb ft**). Check the fuel injector end of the connector to make sure is not deformed. If the injector end of the connector is deformed, replace the injector connector.
    - If the injector supply tube is not the cause of the leakage, the injector may have internal leakage and require replacement. Injectors could leak excessively at operating temperature and perform correctly cold. Test kits 380040185 and 380040188 can be used to bench test injectors.

NOTE: *Injectors and injector connectors are replaced as pairs.*

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Fuel tank - Remove

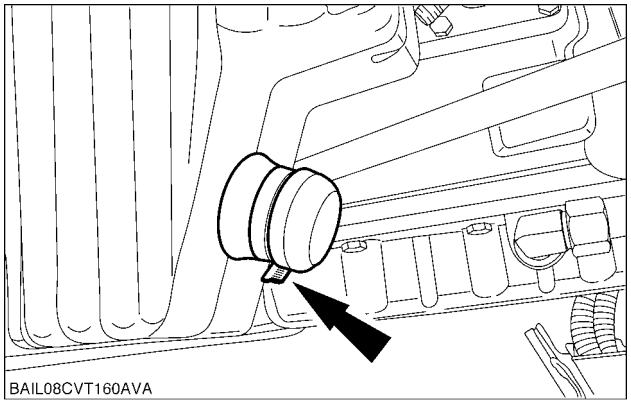
Prior operation:
Disconnect the battery, for further information refer to **Battery - Disconnect (A.30.A)**.

⚠ **DANGER** ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

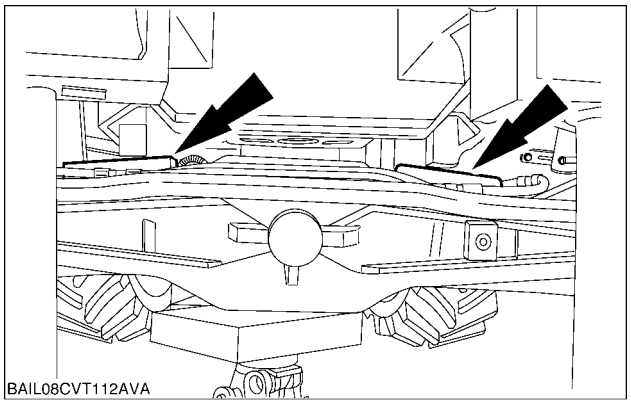
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1. Drain the fuel tank into a suitably sized fuel container. When the fuel is completely drained re-seal the drainage point.



BAIL08CVT160AVA 1

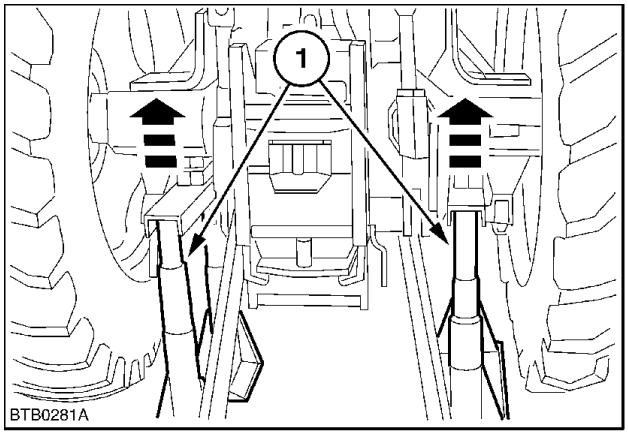
2. Position wooden wedges between the front axle and front support. These prevent articulation of the front axle.



BAIL08CVT112AVA 2

3. Raise the rear of the tractor and place two suitable axle stands **(1)** under the final drive cases.

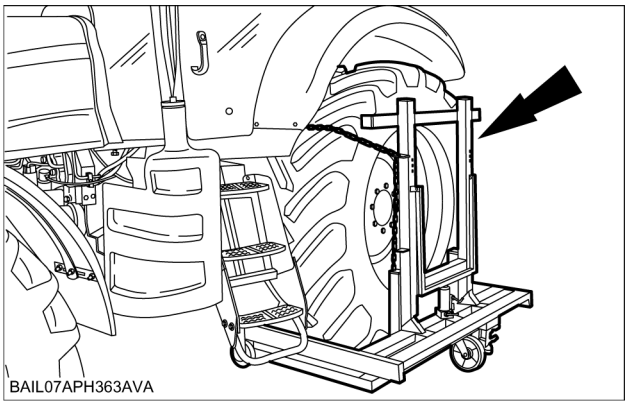
NOTE: *If required, detach the lift rods from the lower links.*



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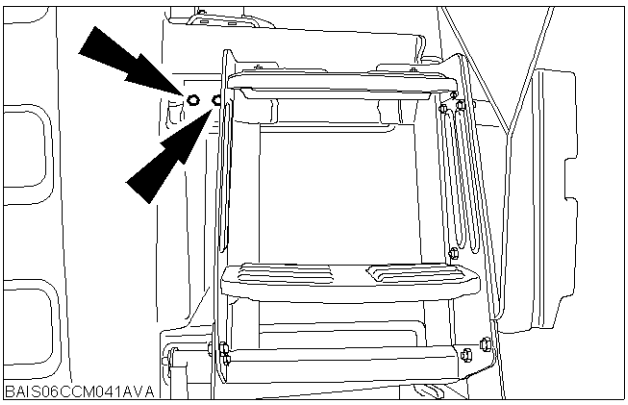
4. Remove both rear wheels.



BAIL07APH363AVA 4

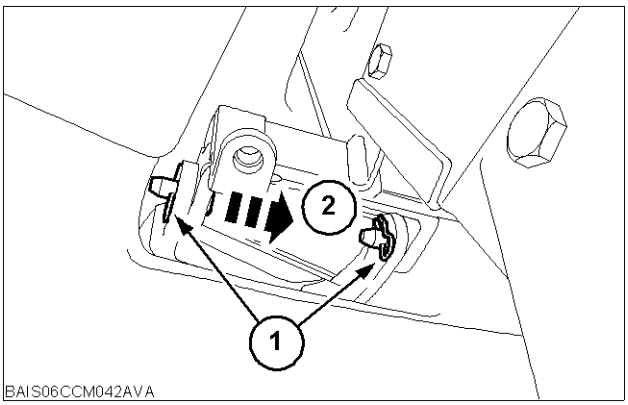
Left-hand Fuel Tank

5. Remove the left-hand side steps upper retaining bolts.



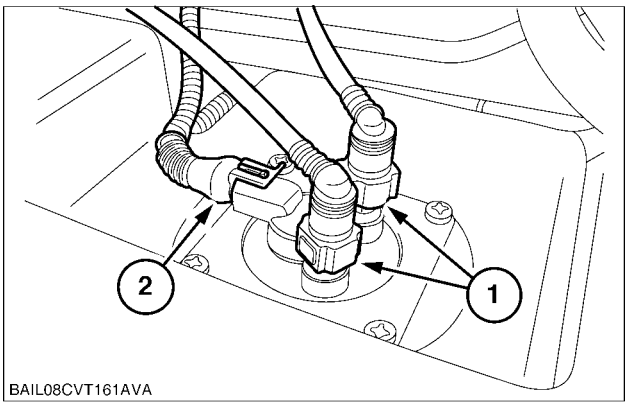
BAIS06CCM041AVA 5

6. Remove the R-clips **(1)** and remove the left-hand side steps **(2)**.



BAIS06CCM042AVA 6

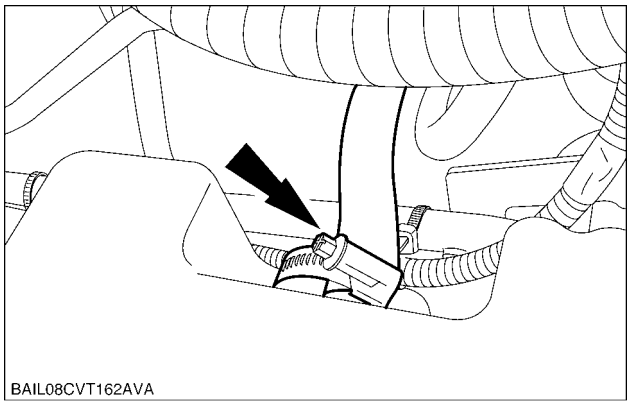
7. Disconnect the fuel tank supply and return lines **(1)**, and the fuel tank sender unit electrical connector **(2)**.



BAIL08CVT161AVA 7

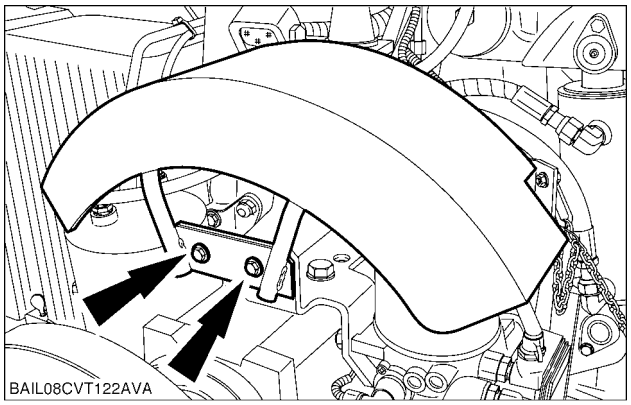
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8. Disconnect the fuel tank breather hose.



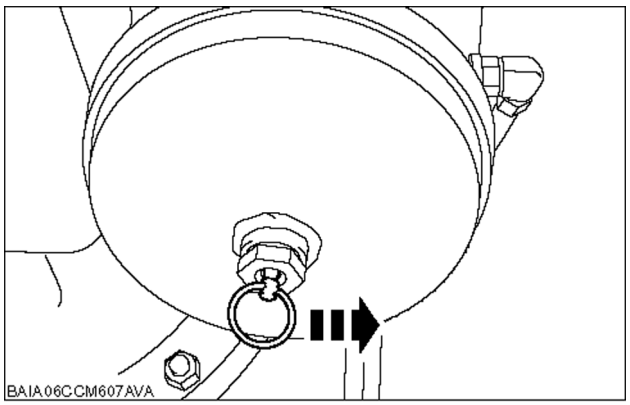
BAIL08CVT162AVA 8

9. Remove the trailer brake relief valve shield.



BAIL08CVT122AVA 9

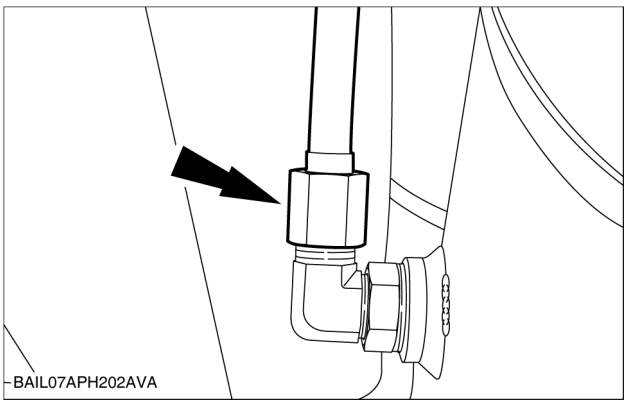
10. Release the trailer brake system pressure from the trailer brake air tanks.



BAIS06CCM607AVA 10

11. Disconnect the balance pipe from the left-hand air tank.

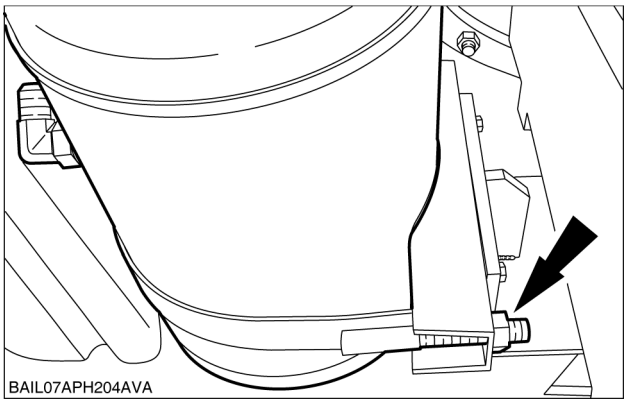
NOTE: *Repeat this step for the right-hand side and position the balance pipe to one side.*



BAIL07APH202AVA 11

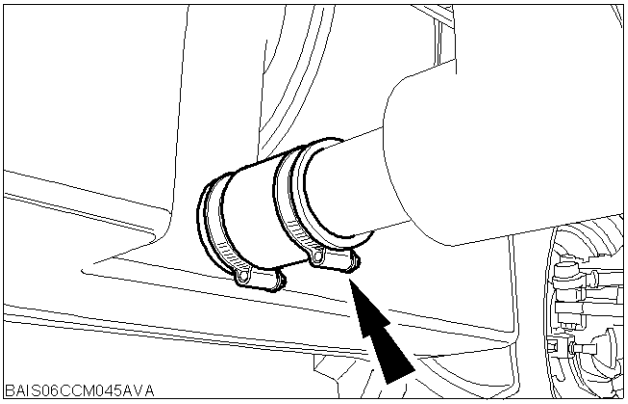
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12. Remove the left-hand air tank retaining clamp and position the tank to one side.



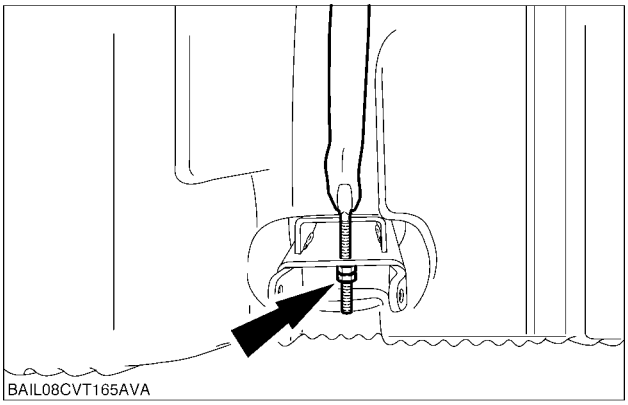
BAIL07APH204AVA 12

13. Disconnect the fuel tank balance pipe



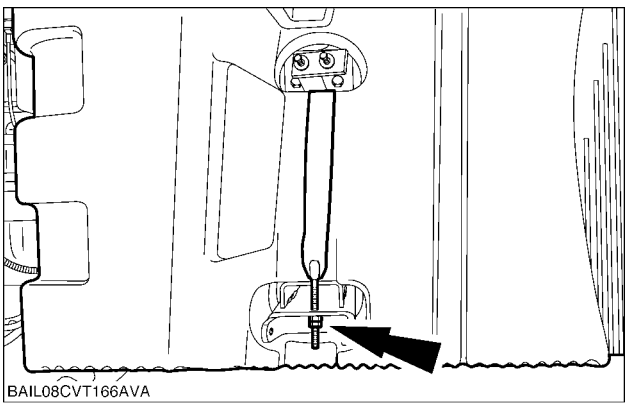
BAIS06CCM045AVA 13

14. Remove the left-hand fuel tank rear retaining strap.



BAIL08CVT165AVA 14

15. Remove the front left-hand fuel tank retaining strap and with the aid of an assistant or trolley jack remove the left-hand fuel tank.

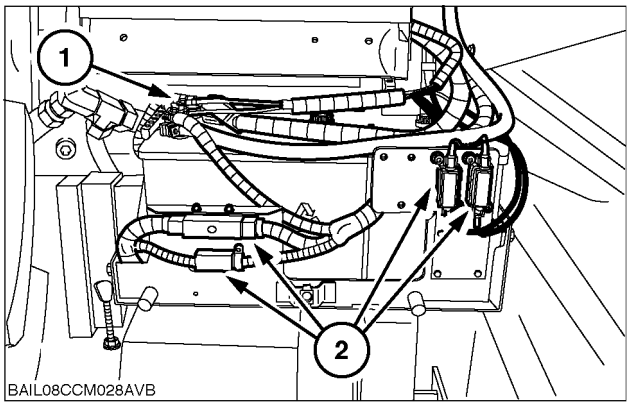


BAIL08CVT166AVA 15

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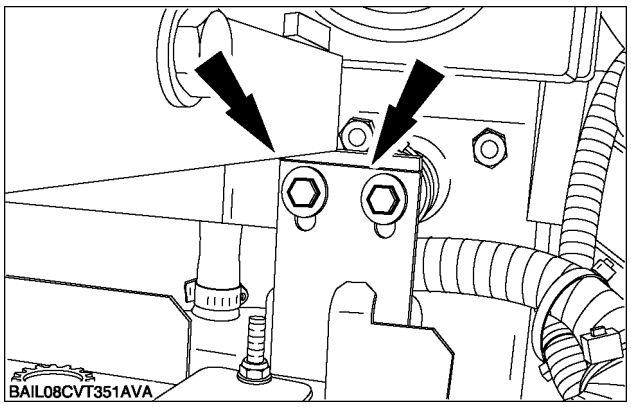
Right-hand Fuel Tank

16. Disconnect the positive battery terminal **(1)**, detach the maxi fuses from the battery tray **(2)** and position the battery wiring harness to one side.



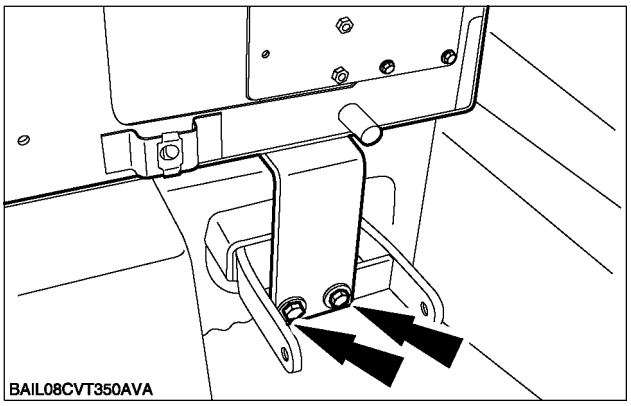
BAIL08CCM028AVB 16

17. Remove the battery tray upper retaining bolts.



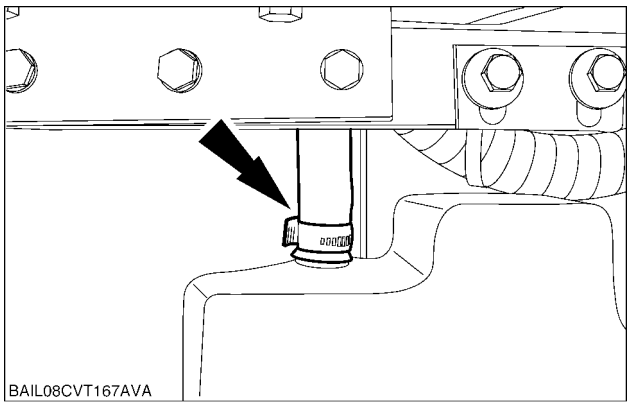
BAIL08CVT351AVA 17

18. Remove the battery tray lower retaining bolts and remove the battery and tray as an assembly.



BAIL08CVT350AVA 18

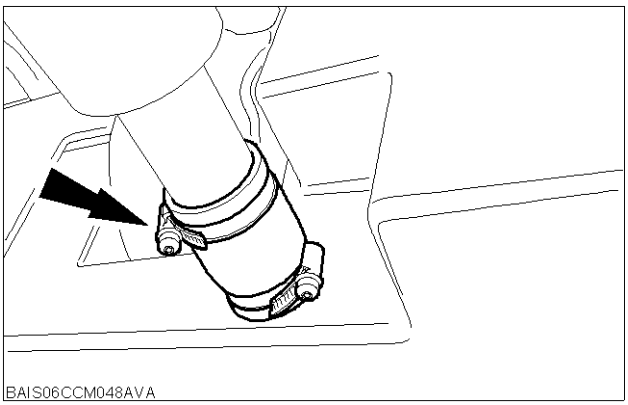
19. Disconnect the fuel tank breather hose.



BAIL08CVT167AVA 19

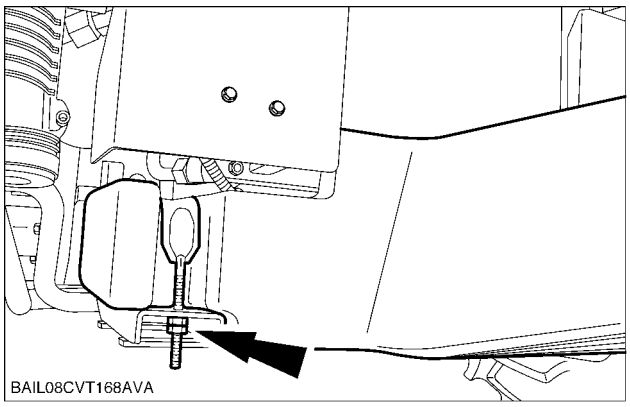
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20. Disconnect the fuel tank balance pipe.



BAIS06CCM048AVA 20

21. Remove the right-hand fuel tank retaining strap and with the aid of an assistant or trolley jack remove the right-hand fuel tank.



BAIL08CVT168AVA 21

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Fuel tank - Install

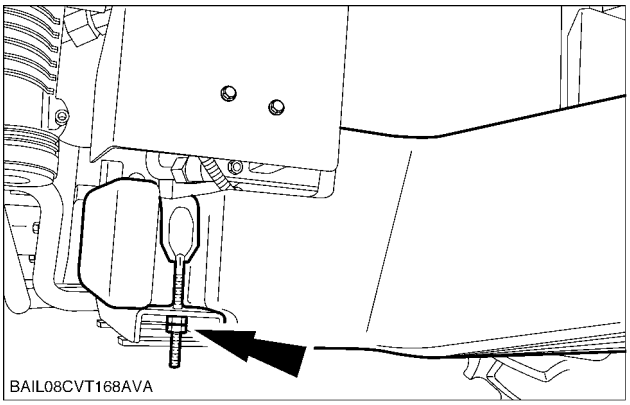
⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

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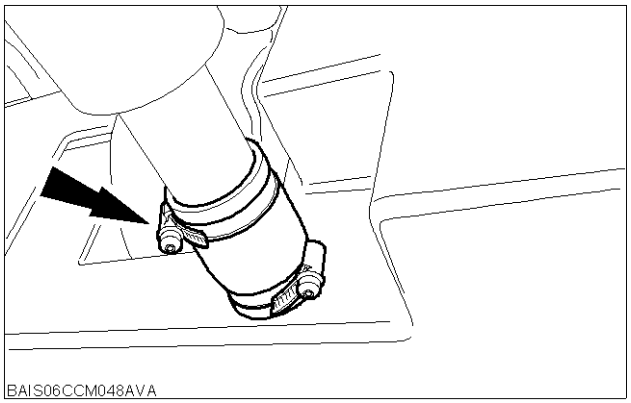
Right-hand Fuel Tank

1. With the aid of an assistant or trolley jack install the right-hand fuel tank and install the fuel tank retaining strap.



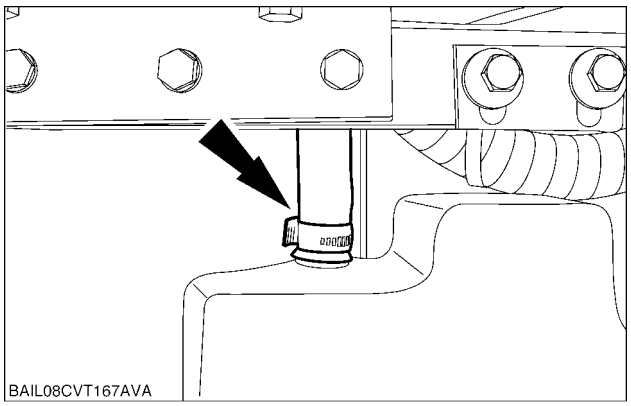
BAIL08CVT168AVA 1

2. Connect the fuel tank balance pipe.



BAIS06CCM048AVA 2

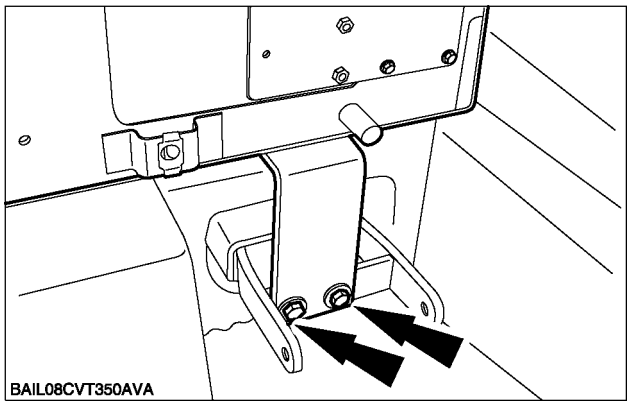
3. Connect the fuel tank breather hose.



BAIL08CVT167AVA 3

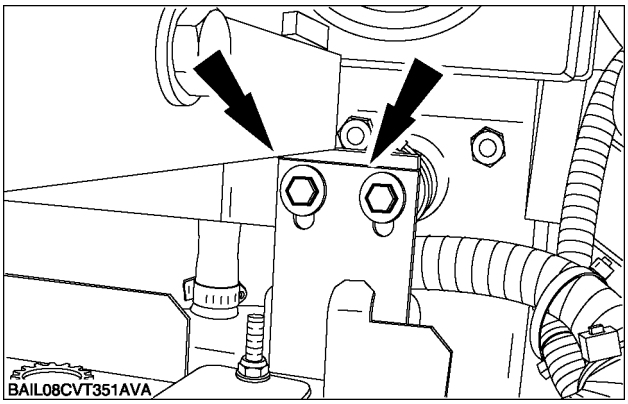
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4. Install the battery and tray as an assembly and install the battery tray lower retaining bolts.



BAIL08CVT350AVA 4

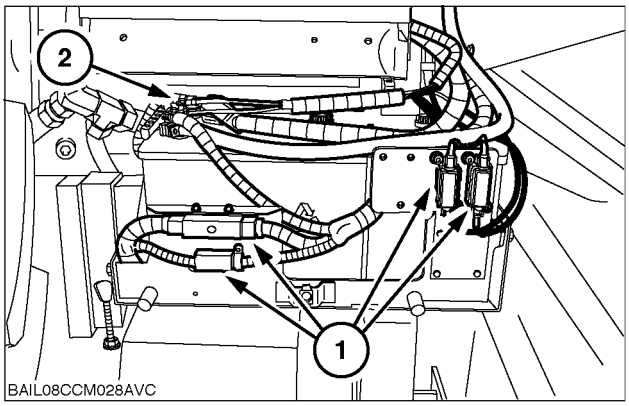
5. Install the battery tray upper retaining bolts.



BAIL08CVT351AVA 5

6. Reposition the battery wiring harness and attach the maxi fuses to the battery tray **(1)**, connect the positive battery terminal **(2)**.

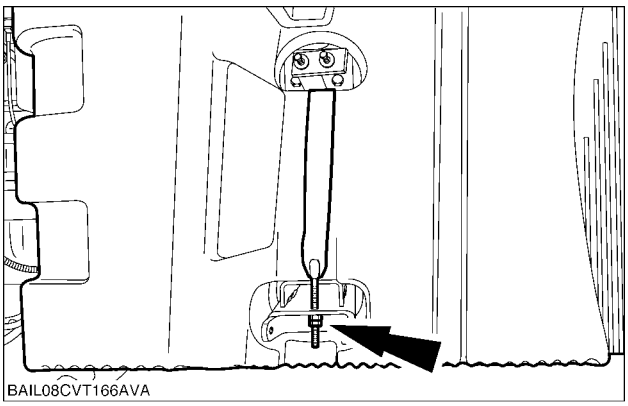
NOTE: *Do not connect the negative terminal at this point.*



BAIL08CCM028AVC 6

Left-hand Fuel Tank

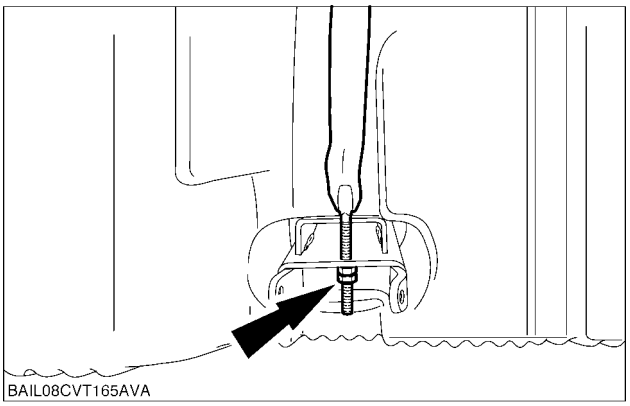
7. With the aid of an assistant or trolley jack install the left-hand fuel tank and install the front left-hand fuel tank retaining strap.



BAIL08CVT166AVA 7

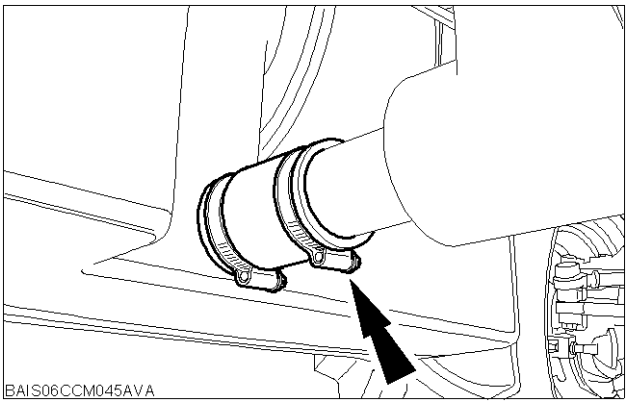
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8. Install the left-hand fuel tank rear retaining strap.



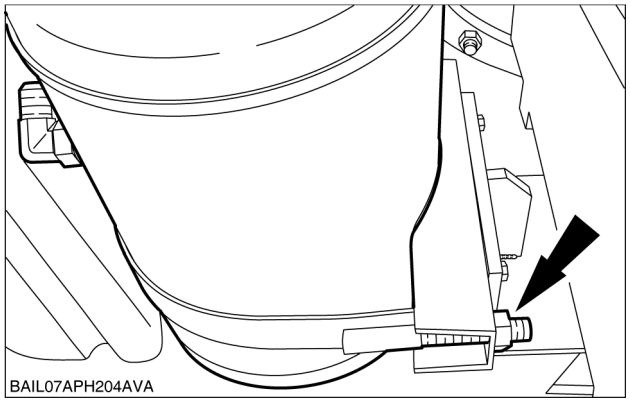
BAIL08CVT165AVA 8

9. Connect the fuel tank balance pipe



BAIS06CCM045AVA 9

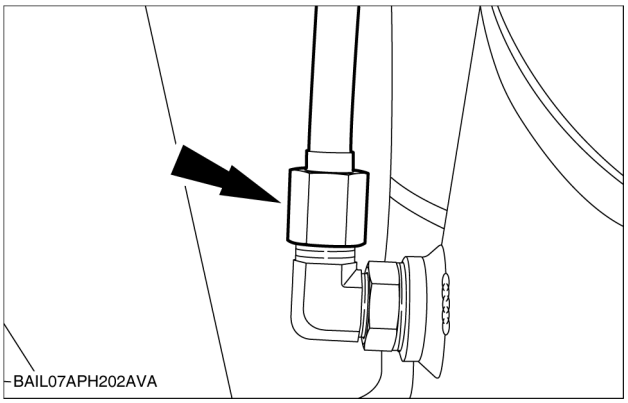
10. Reposition the left-hand air tank and install the retaining clamp.



BAIL07APH204AVA 10

11. Connect the balance pipe to the left-hand air tank.

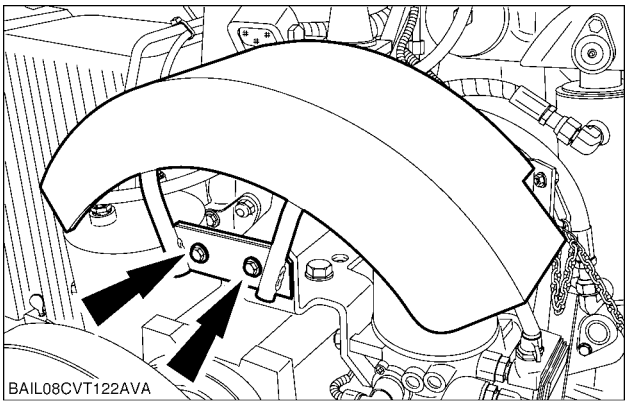
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH202AVA 11

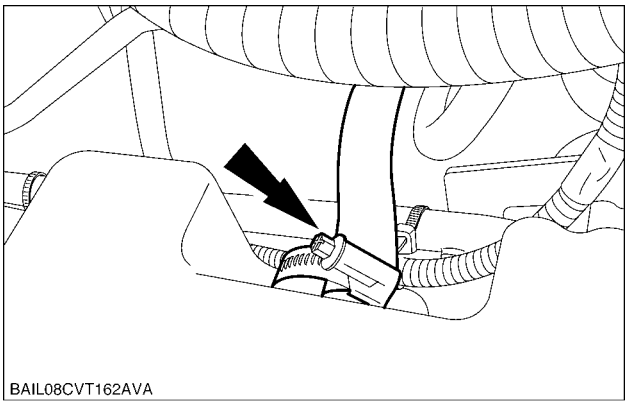
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12. Install the trailer brake relief valve shield.



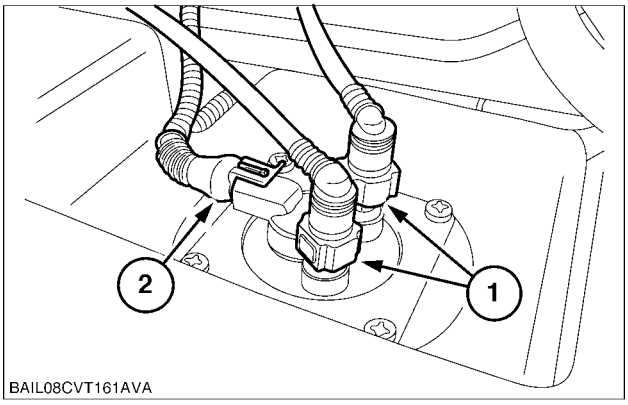
BAIL08CVT122AVA 12

13. Connect the fuel tank breather hose.



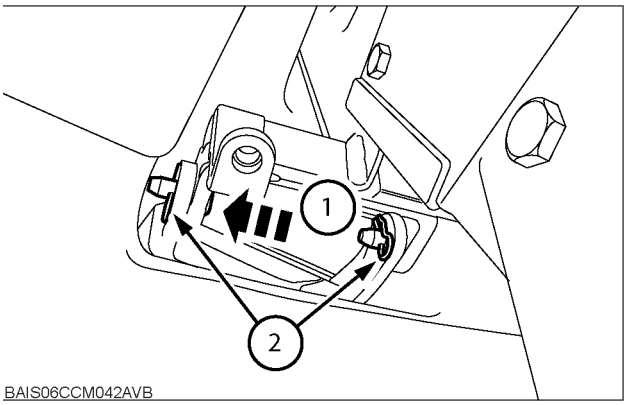
BAIL08CVT162AVA 13

14. Connect the fuel tank supply and return lines **(1)**, and the fuel tank sender unit electrical connector **(2)**.



BAIL08CVT161AVA 14

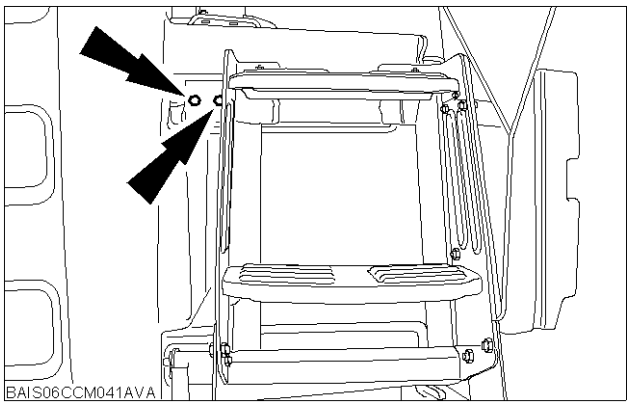
15. Install the left-hand side steps **(1)** and install the R-clips **(2)**.



BAIS06CCM042AVB 15

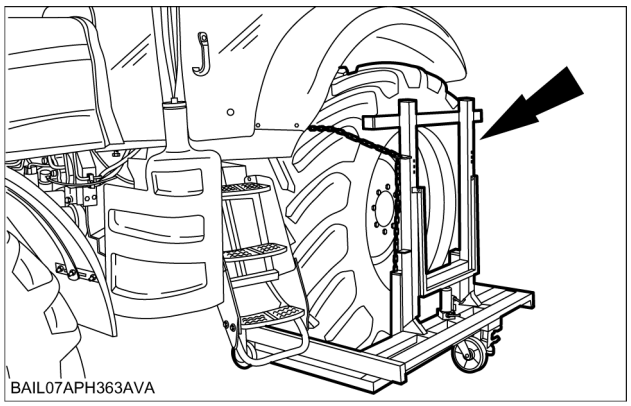
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16. Install the left-hand side steps upper retaining bolts.



BAIS06CCM041AVA 16

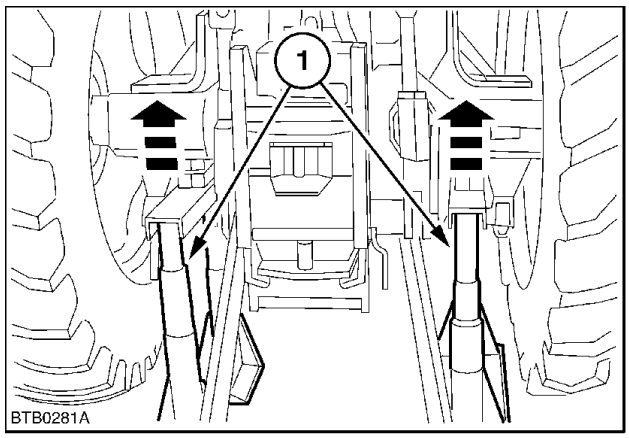
17. Install both rear wheels.
Tighten to the specified torque, for further information refer to **Rear wheel - Torque (D.50.C)**.



BAIL07APH363AVA 17

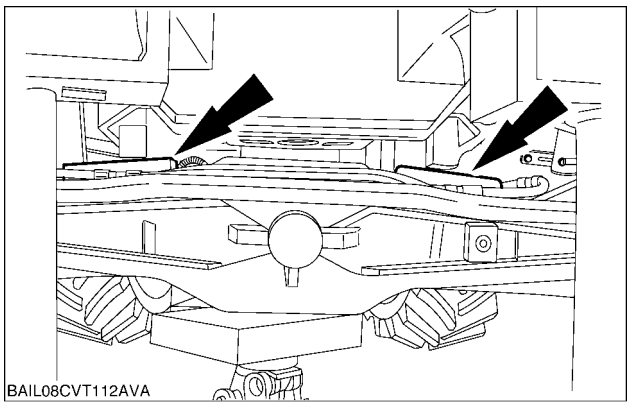
18. Remove the axle stands **(1)** from under the final drive cases.

NOTE: *If required, attach the lift rods to the lower links.*



BTB0281A 18

19. Remove the wooden wedges from between the front axle and front support.



BAIL08CVT112AVA 19

20. Fill the fuel tanks with fuel and check all connections for leaks.

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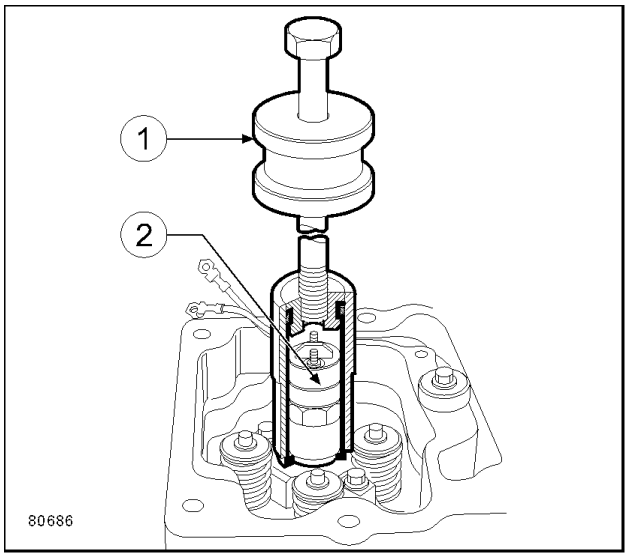
Next operation:
Connect the battery, for further information refer to **Battery - Connect (A.30.A)**

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Fuel injector Electro injector - Remove

Prior operation:
Valve drive Rocker assembly - Disassemble (B.10.A)

1. Remove the screws securing the electro-injectors and using tool **380001099 (1)**, extract the electro-injectors **(2)** from the cylinder head.



80686 1

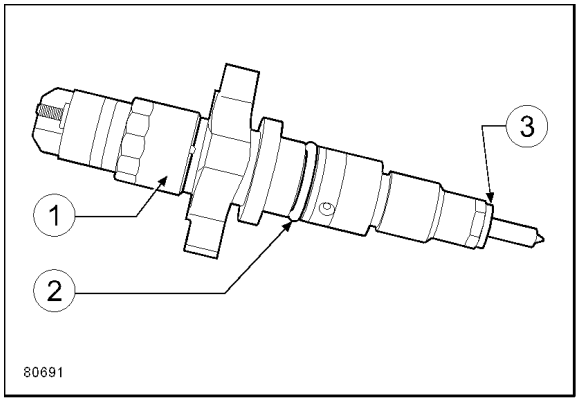
Next operation:
Fuel injector Electro injector - Overhaul (B.20.A)

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Fuel injector Electro injector - Overhaul

Prior operation:
Fuel injector Electro injector - Remove (B.20.A)

1. On the electro-injector **(1)**, mount a new seal **(2)**, lubricated with petroleum jelly and a new washer **(3)**.



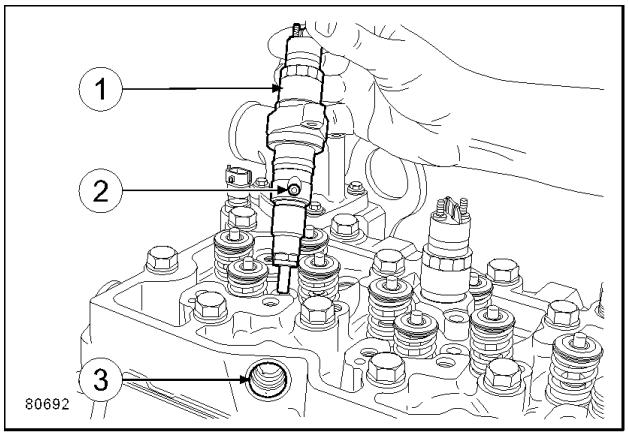
80691 1

Next operation:
Fuel injector Electro injector - Install (B.20.A).

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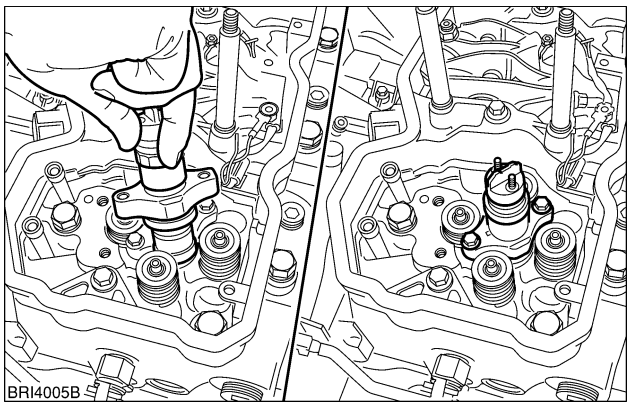
Fuel injector Electro injector - Install

1. Fit the electro-injectors **(1)** in the seats on the cylinder head, directed so that the fuel inlet orifice **(2)** faces the fuel manifold seat side **(3)**.



80692 1

2. Insert electro-injector firmly into the seat of the cylinder head.
   Screw down the electro-injector retaining bolts without tightening them.



BAIL06CCM068ASA 2

Next operation:
Fuel injector Fuel Manifold - Install (B.20.A)

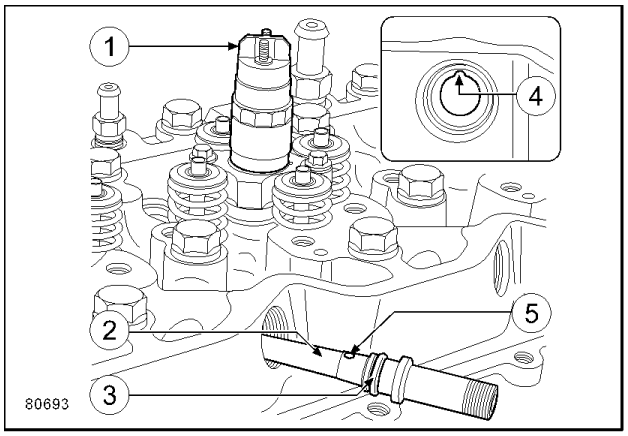
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Fuel injector Fuel Manifold - Install

1. Mount a new seal **(3)**, lubricated with petroleum jelly, on the fuel manifold **(2)** and insert it into the cylinder head seat so that the positioning ball **(5)** coincides with the relevant housing **(4)**.
   Screw down the electro-injector retaining bolts without locking them.

NOTE: *Once removed, the fuel manifolds **(2)** must not be reused; they MUST be replaced with new ones.*

NOTE: *During this operation, manoeuvre the electro-injector **(1)** so that its fuel inlet orifice correctly receives the manifold **(2)**,*

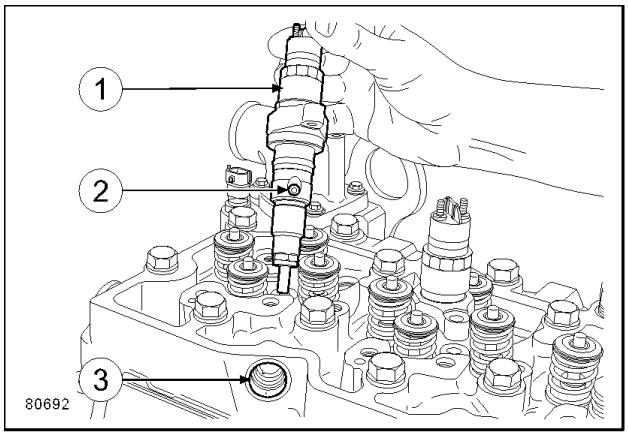


80693 1

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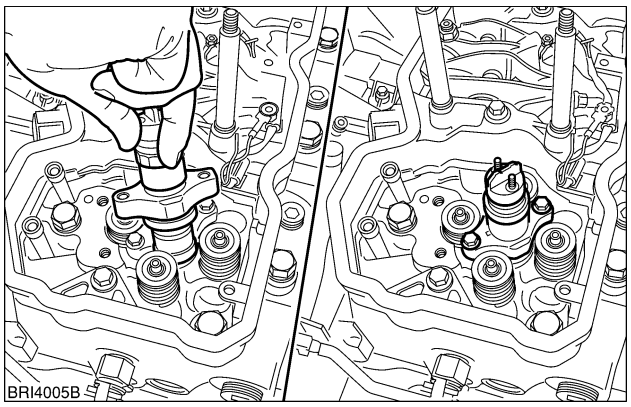
Fuel injector Electro injector - Install

1. Fit the electro-injectors **(1)** in the seats on the cylinder head, directed so that the fuel inlet orifice **(2)** faces the fuel manifold seat side **(3)**.



80692 1

2. Insert electro-injector firmly into the seat of the cylinder head.
   Screw down the electro-injector retaining bolts without tightening them.



BAIL06CCM068ASA 2

Next operation:
Fuel injector Fuel Manifold - Install (B.20.A)

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POWER PRODUCTION - B

AIR INTAKE SYSTEM - 30.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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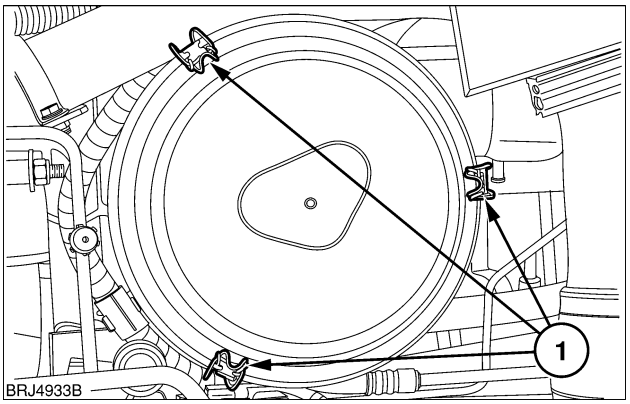
Turbocharger - Torque

Part	TORQUE Nm (lb ft)
Turbocharger/exhaust manifold retaining nuts M8 x 1,25	**20 - 30 Nm** (**14.75 - 22.13 lbft**)

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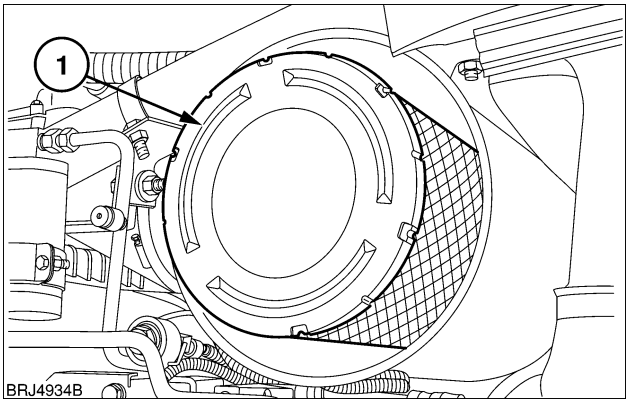
Air cleaner - Remove

1. Raise the engine cover.
2. Undo the retaining clips. **(1)** and remove cover.



BAIL07APH334ASA 1

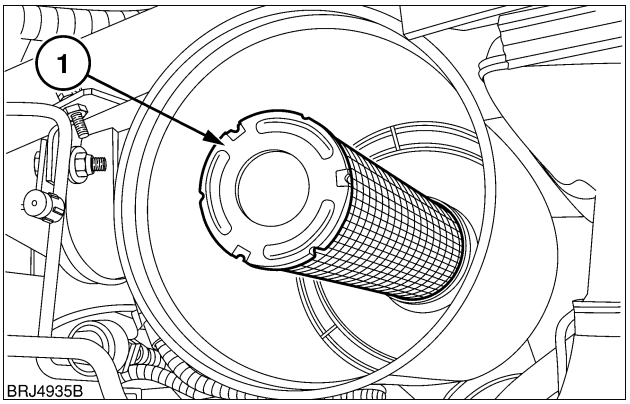
3. Remove outer filter **(1)**.



BAIL07APH335ASA 2

4. Remove inner filter **(1)**.

IMPORTANT: *Do not remove inner element unless it is to be replaced.*



BAIL07APH336ASA 3

Next operation:
Air cleaner - Cleaning (B.30.A)

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Air cleaner - Cleaning

Prior operation:
Air cleaner - Remove (B.30.A)

1. Clean and examine the outer casing and repair or seal any damaged seams.
2. Remove the outer filter from housing. Do not let dirt fall on the inner filter.

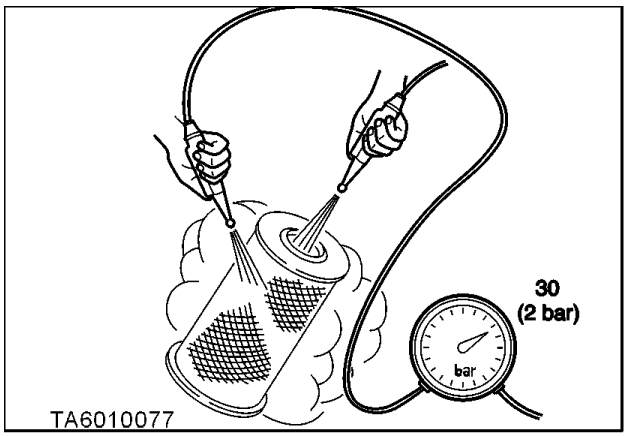
IMPORTANT: *Do not remove inner element unless it is to be replaced.*

3. To clean the element, hold the top and tap it against the palm of the other hand to remove the dust. Never tap it on a hard surface or you can damage the filter.
4. When tapping does not remove the dirt, direct compressed air through the element, from the inside towards the outside.

NOTE: *Never blow compressed air from the outside to the inside of the filter because particles can become embedded or lodged in the filter and later be released into the engine causing damage.*

5. To prevent damage to the element when cleaning with compressed air, take the following precautions: 1) Maximum air pressure should not exceed **2 bar** (**29.00 psi**)2) Move the nozzle up and down when rotating the element. 3) Keep the nozzle at least **25 mm** (**0.98 in**) from the pleated paper.

NOTE: *To keep the interval acceptable it is highly recommended to clean the element with compressed air.*



TA6010077 1

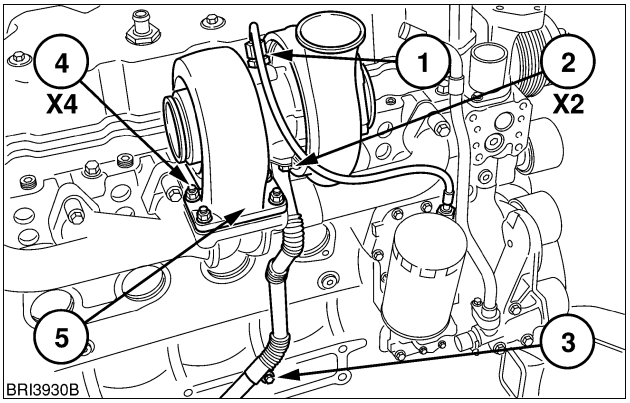
6. Every time the element is cleaned, it should be examined for holes and cracks by holding an electric light bulb inside the element and looking through it. If any damage is noted, discard the element and fit a new one.
7. Replace the element after 3 cleanings or once a year, whichever comes first.
8. When fitting, make sure the element is seated properly and the sealing is in good condition.
9. Inner Element
   The inner element should not be disturbed unless damaged, or contaminated by dirt through failure of the outer element. The element should therefore only be replaced and not cleaned when contaminated.
10. If the inner element is okay leave assembled in the cleaner body, and change only annually, or every **1200 hours** whichever occurs first.

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Turbocharger - Install

Prior operation:
Turbocharger - Remove (B.30.A), **Exhaust manifold - Install (B.40.A)**

1. Prior to installation of turbocharger **(5)** to exhaust manifold, position new turbocharger to exhaust manifold gasket.
2. Connect lubrication oil return pipe to underside of turbocharger, securing into position with bolts (x 2) **(2)**.
3. Position turbocharger and retain with securing nuts **(4)** (x 4) to the specified torque. Refer to **Turbocharger - Torque (B.30.A)** and **Turbocharger - Tighten (B.30.A)**.
4. Connect lubrication oil return pipe into crankcase and retain into position with clamp and bolt **(3)**.
5. Connect the flexible lubrication oil pipe **(1)** from the oil filter/cooler



BAIL06CCM058ASA 1

Next operation:
Silencer - Install (B.40.A)

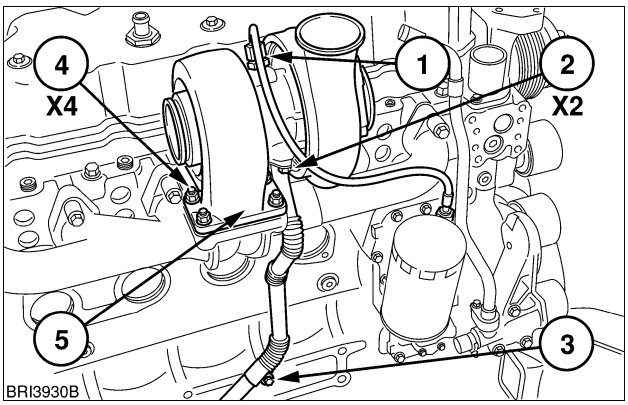
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Turbocharger - Remove

Prior operation:
Battery - Disconnect (A.30.A) Air cleaner - Remove (B.30.A) Silencer - Remove (B.40.A)

Procedure to remove the turbocharger:

1. Unscrew and remove the flexible lubrication piping **(1)** of the turbocharger **(5)** .
2. Unscrew and remove bolt **(3)** retaining lubrication return pipe to crankcase.
3. Unscrew and remove turbocharger to exhaust manifold retaining nuts **(4)** and lubrication pipe securing bolts **(2)**.
4. Supporting the turbocharger, lift from exhaust manifold and remove gasket.



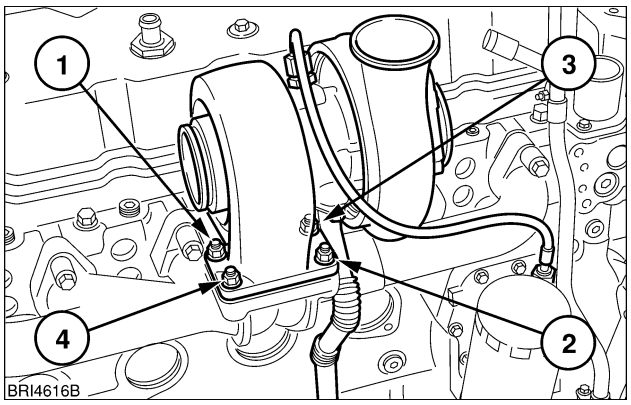
BAIL06CCM058ASA 1

Next operation:
Exhaust manifold - Remove (B.40.A), **Turbocharger - Install (B.30.A)**.

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Turbocharger - Tighten - Sequence.

1. Tightening sequence for turbocharger retaining nuts.



BAIL07CCM261ASA 1

For the required torque settings, refer to Turbocharger - Torque (B.30.A)

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POWER PRODUCTION - B

EXHAUST SYSTEM - 40.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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Exhaust manifold - Torque

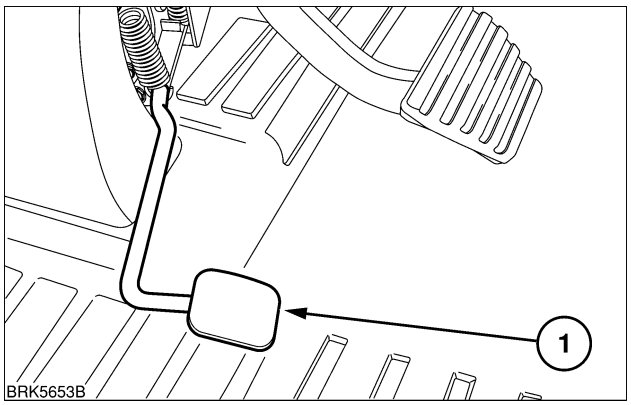
Part	TORQUE Nm (lb ft)
Bolts securing exhaust manifold on head. M10 x 1,50 x 65	**53 Nm +/- 5 Nm** (**39.1 lb ft +/- 4 lb ft**)

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Engine brake - Static description

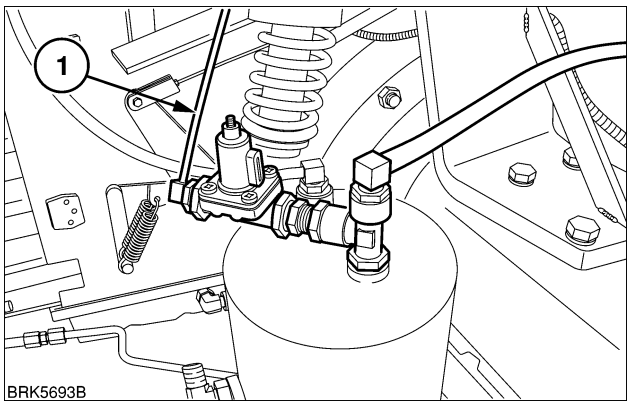
The function of the exhaust brake is to increase the engines natural braking effect. This is achieved by restricting the flow in the exhaust system. An air operated exhaust brake valve closes a butterfly valve which is situated in the exhaust pipe between the engine manifold and the silencer. When the valve is closed the fuel supply to the combustion chamber is also cut off. Pressure builds up as the air is pushed into the closed off manifold. The air pressure increases until it is able to overcome the force of the exhaust valve springs and force its way back into the cylinder. Maximum working pressure is the pressure required to overcome the exhaust valve springs and force its way back into the cylinder. The piston is working against this air pressure on every compression and exhaust stroke. When the system is at working pressure sufficient new air is drawn in through the inlet valve to replenish any air lost through leakage.

The exhaust brake is operated by depressing the pedal **(1)** located on left hand side on the floor of the cab. When the pedal is depressed a brake switch is operated and a **12 V** signal is sent to the engine processor which determines whether conditions are met which will allow the exhaust brake valve to be activated.



BAIL08CVT040ASA 1

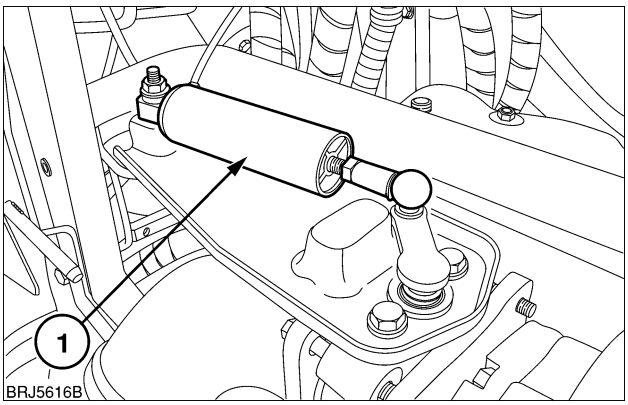
The engine processor determines that the engine speed is is greater than **1000 - 1200 RPM** and then sends a **12 V** signal to the pneumatic directional valve **(1)** and shuts off the fuel to the injectors . The lower speed limit is to prevent the engine stalling.



BAIL08CVT024ASA 2

The compressed air from the air brake reservoir is passed by the directional pneumatic valve to a pneumatic cylinder **(1)** (Figure **3**) on the exhaust brake valve assembly that shuts a butterfly valve which restricts the gas flow from the engine. This is an on/off device, not a proportional system. The valve has a bypass hole in it of 14 mm diameter. This has been developed to limit the pressure developed in the engine to **2 bar** (**29 psi**) at engine maximum speed (high idle). If the operator allows the steepness of the slope and the gear selected to drive the engine above the maximum speed, a visual warning is displayed. There is a pressure protection valve at the start of the supply line at the air brake reservoir. This only allows the air to pass to the exhaust brake system if the brake system has working pressure. This is to prevent the exhaust brake system bleeding all the air out of the air brake system..

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BAIL08CVT015ASA 3

NOTE: *The exhaust brake is cancelled when engine speed goes below* ***1200 RPM*** *and the throttles are inoperable when the exhaust brake pedal is pressed. They only become active again when it is released*

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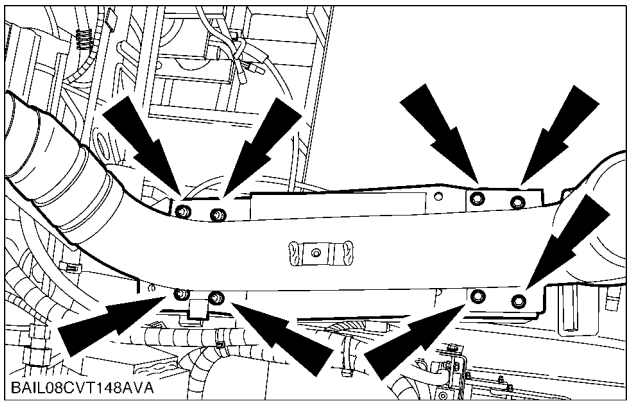
Silencer - Install

1. Attach the exhaust to the support and tighten the retaining bolts.

⚠ WARNING ⚠

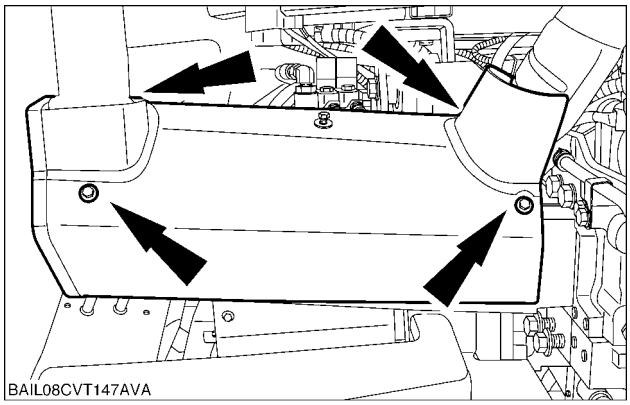
The component is heavy. ALWAYS use a hoist or get assistance to lift the component. Failure to comply could result in serious injury or death.

M944



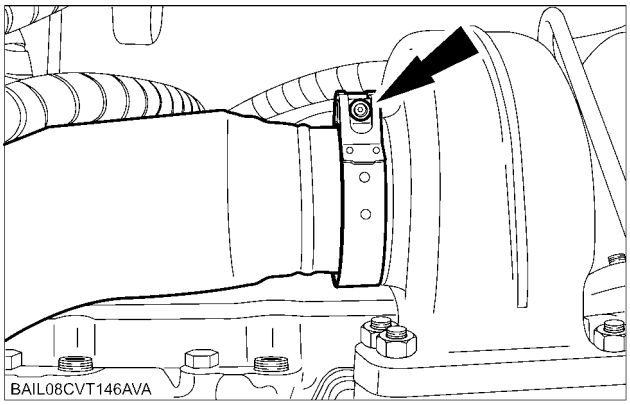
BAIL08CVT148AVA 1

2. Install the exhaust heat shield .



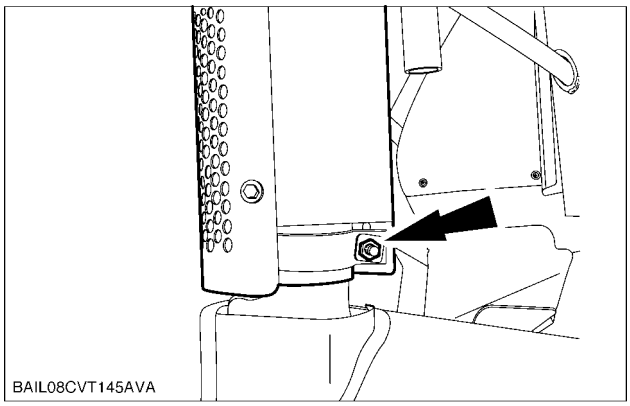
BAIL08CVT147AVA 2

3. Attach the exhaust pipe to the turbocharger and tighten clamp.



BAIL08CVT146AVA 3

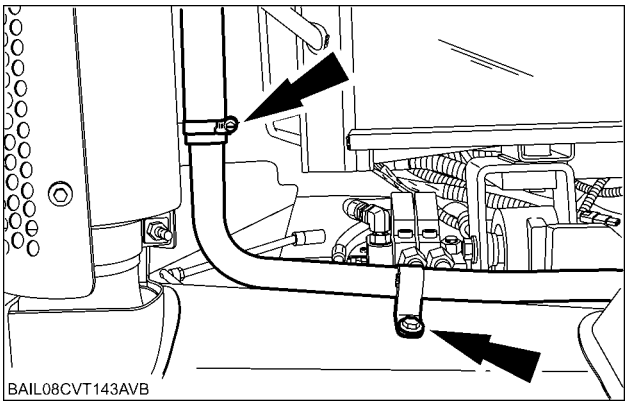
4. Install the muffler pipe and tighten clamp.



BAIL08CVT145AVA 4

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5. Reattach the air filter aspirator pipe.

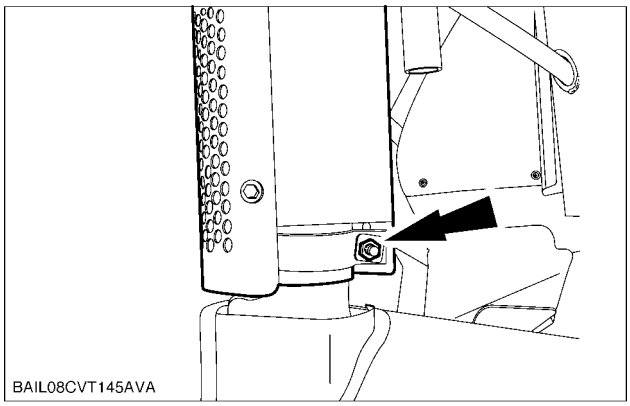


BAIL08CVT143AVB 5

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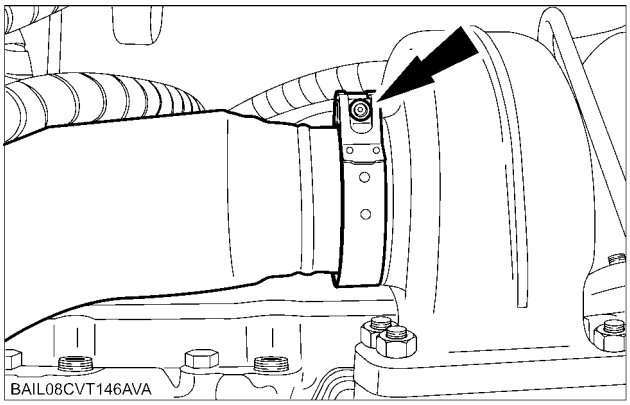
Silencer - Remove

1. Remove the muffler.



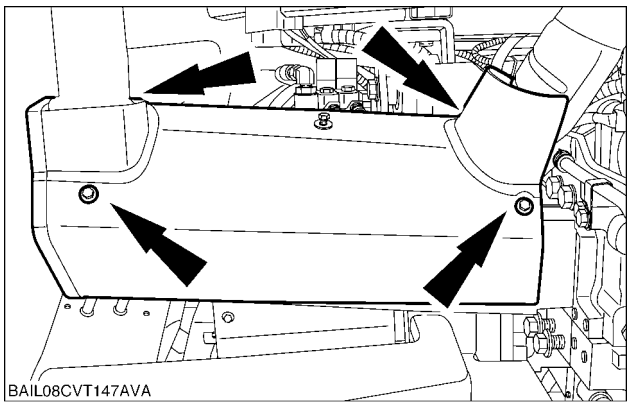
BAIL08CVT145AVA 1

2. Disconnect the turbocharger exhaust outlet.



BAIL08CVT146AVA 2

3. Remove the exhaust heat shield.



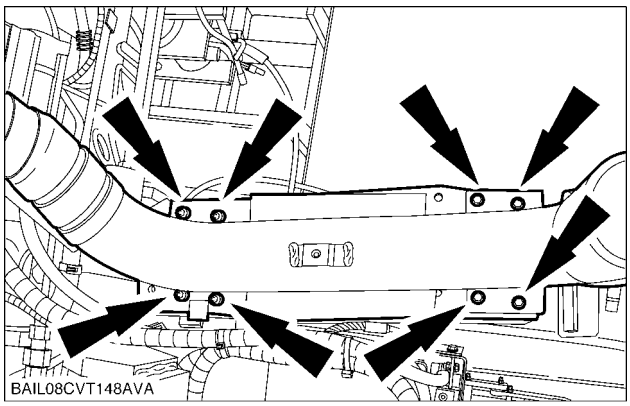
BAIL08CVT147AVA 3

4. Remove the exhaust.

⚠ WARNING ⚠

The component is heavy. ALWAYS use a hoist or get assistance to lift the component. Failure to comply could result in serious injury or death.

M944

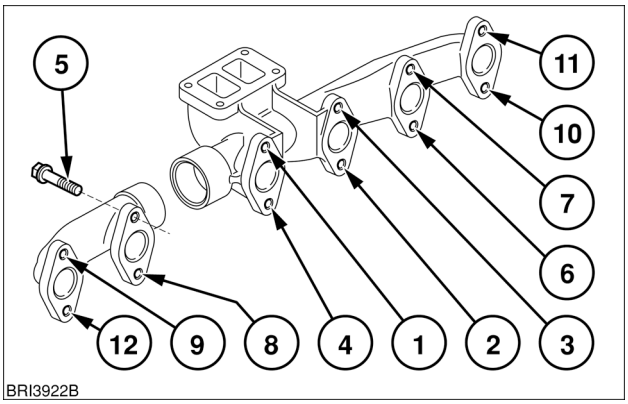


BAIL08CVT148AVA 4

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- Sequence.

1. Tightening sequence for exhaust manifold bolts.
   For the required torque settings, refer to **ENGINE - Torque (B.10.A)**

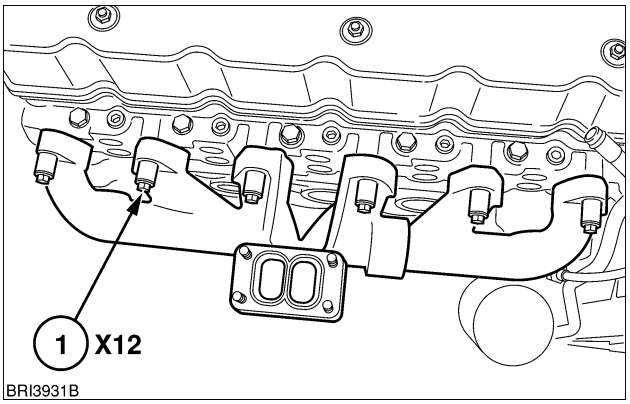


bail06ccm029asa 1

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Exhaust manifold - Install

1. Mount the exhaust manifold, complete with new gasket, tightening the retaining bolts to the specified torque. Refer to **Exhaust manifold - Torque (B.40.A)**.



BAIL06CCM055ASA 1

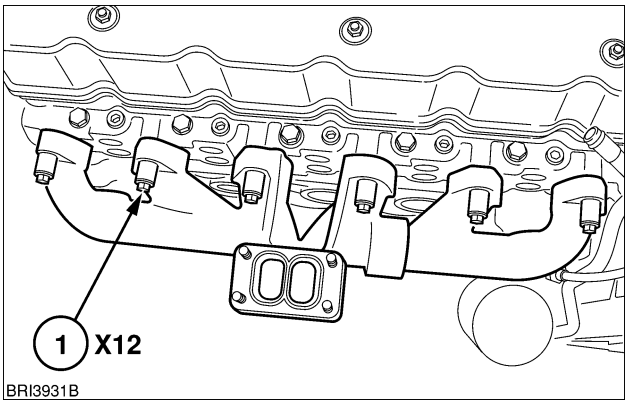
Next operation:
Turbocharger - Install (B.30.A)

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Exhaust manifold - Remove

Prior operation:
Turbocharger - Remove (B.30.A)

1. Unscrew the retaining bolts (x 12) and remove the exhaust manifold .



BAIL06CCM055ASA 1

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POWER PRODUCTION - B

ENGINE COOLANT SYSTEM - 50.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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ENGINE COOLANT SYSTEM - General specification

Description	
Coolant Pump	
Type	Centrifugal
Drive	Multi-Ribbed-Belt
Drive Belt	
Belt Tension	Spring Loaded Automatic Drive Belt Tensioner
Thermostat	
Starts to open at:	**81 °C**
Fully open at:	**96 °C**
Coolant Expansion Tank Cap	
Cap pressure	**1 bar** (**14.5 psi**)

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Water pump - Torque

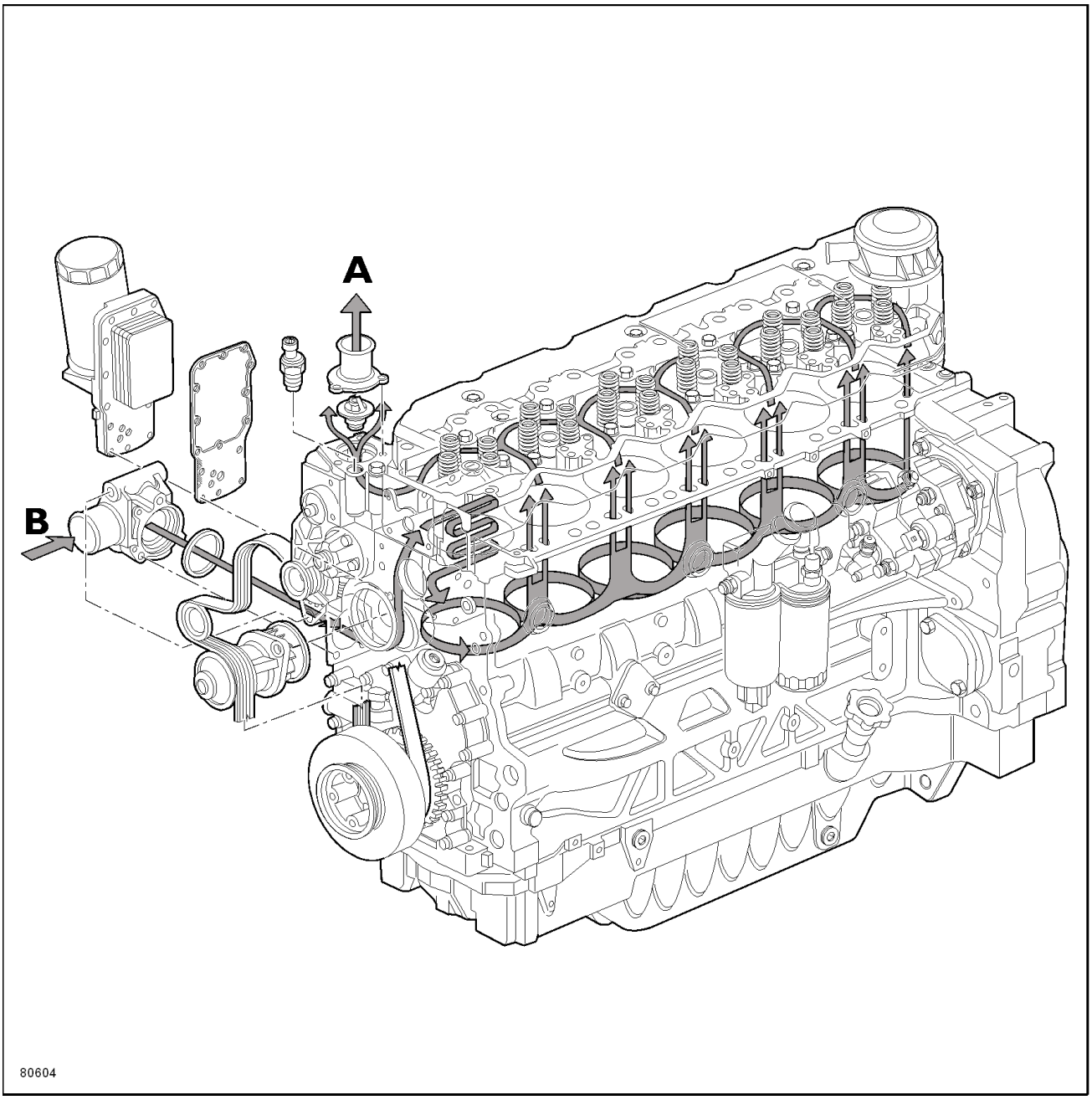
PART	TORQUE
Bolts securing coolant pump M8 x 1.25 x 25	**25 Nm +/- 5 Nm** (**18 lb ft +/- 4 lb.ft**)

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ENGINE COOLANT SYSTEM - Static description

The forced circulation, closed-circuit engine coolant system is composed of the following components:

- Coolant expansion tank: .
- Radiator, which dissipates the heat taken by the coolant from the engine. .
- Viscous fan, which increases the radiator's dissipating capacity:
- Oil cooler.
- A centrifugal coolant pump housed at the front of the crankcase.
- A thermostat governing coolant circulation.
- The circuit may also extend to the air compressor if the version includes it.



80604 1

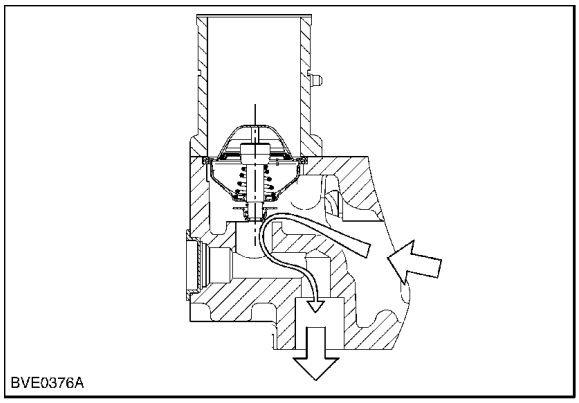
COOLING SYSTEM DIAGRAM

A = TO THE RADIATOR
B = FROM THE RADIATOR

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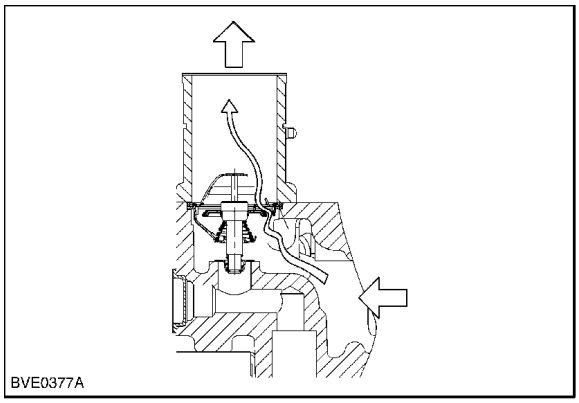
Thermostat - Dynamic description

When the thermostat is closed, a recirculating bypass gallery allows the coolant to recirculate from the cylinder head to the block, to allow faster engine coolant warm-up.



BVE0376A 1

When the coolant has reached normal operating temperature, the thermostat will open and allow coolant to be drawn through the radiator by the coolant pump. Cooled coolant then returns to the engine.

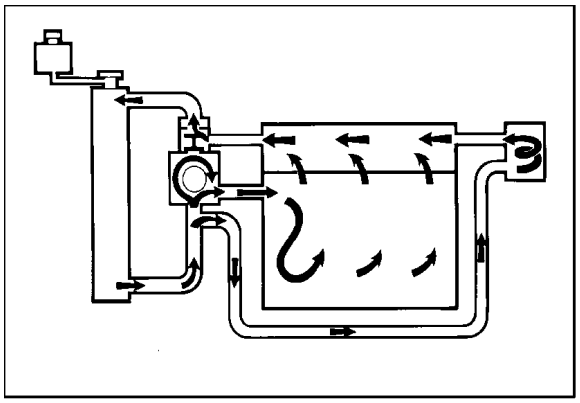


BVE0377A 2

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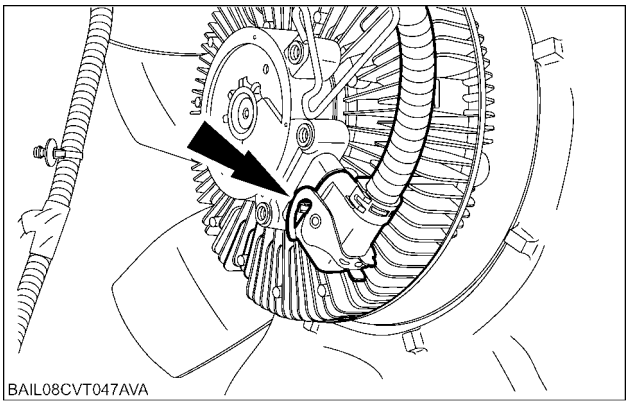
Radiator - Dynamic description

Once the engine has reached its normal operating temperature, the thermostat will open and allow water to be drawn through the radiator by the pump action. Cooled water then returns to the engine system.



1b0o2004105206 1

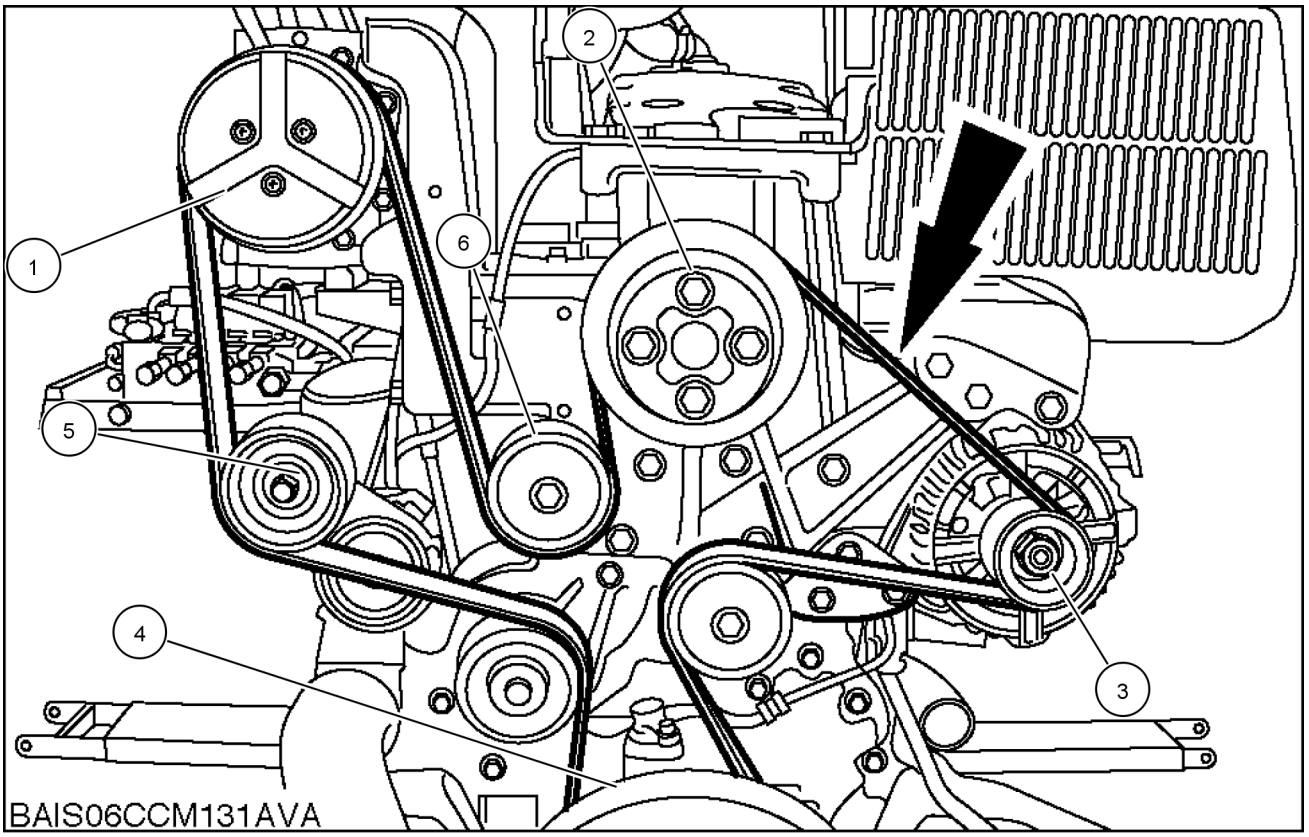
Cooling occurs as the coolant passes down through the radiator cores. Air is drawn through the radiator fins by a viscous fan situated on a pulley mounted between the radiator and the engine block.



BAIL08CVT047AVA 2

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Fan and drive - Static description



BAIS06CCM131AVA 1

1. Air conditioning compressor
2. Fan mounting pulley
3. Alternator
4. Crankshaft pulley
5. Air conditioning belt tensioner
6. Coolant pump

The function of the coolant pump **(6)** mounted at the front of the engine is to maintain a continuous flow of coolant around the coolant system (Refer to **ENGINE COOLANT SYSTEM - Static description (B.50.A)**. This is essential to ensure correct engine coolant temperature. The Coolant pump is driven by the poly-v belt from the crankshaft pulley **(4)** and the tension is maintained by the spring loaded automatic fan belt tensioner **(5)**.

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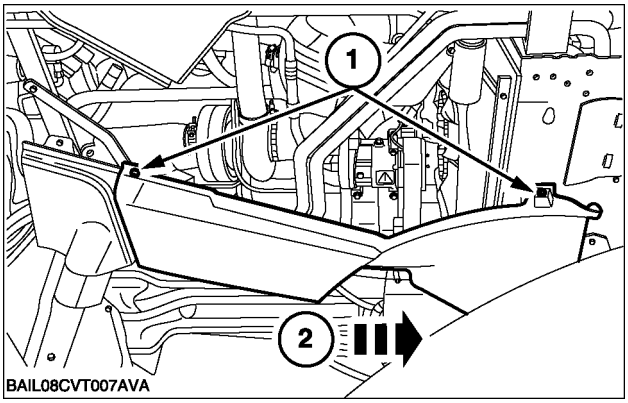
ENGINE COOLANT SYSTEM - Drain fluid

⚠ WARNING ⚠

The engine coolant system operates under pressure which is controlled by the radiator pressure cap. It is dangerous to remove the pressure cap while the system is hot. When cool, use a thick cloth and turn the cap slowly to the first stop and allow the pressure to escape before fully removing the cap. Coolant should be kept off the skin. Adhere to the precautions outlined on the antifreeze and inhibitor containers, where used.

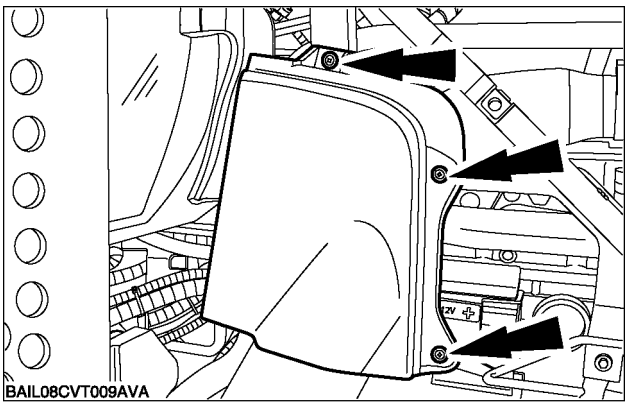
B097

1. Release the right-hand engine side panel retaining screws **(1)** and remove the panel **(2)**.



BAIL08CVT007AVA 1

2. Remove the exhaust panel.



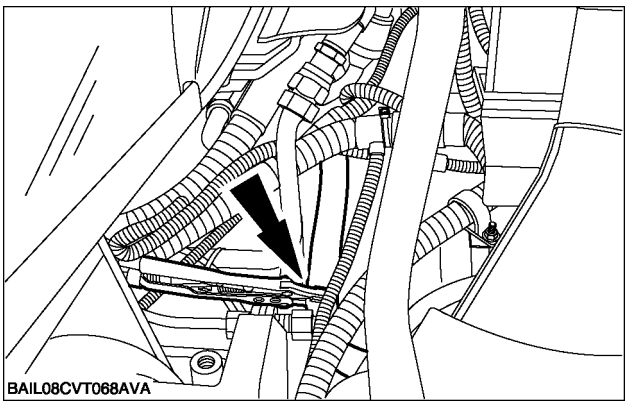
BAIL08CVT009AVA 2

3. Clamp the cab heater hose.

⚠ WARNING ⚠

Do not allow antifreeze to contact skin. Adhere to instructions detailed on antifreeze container.

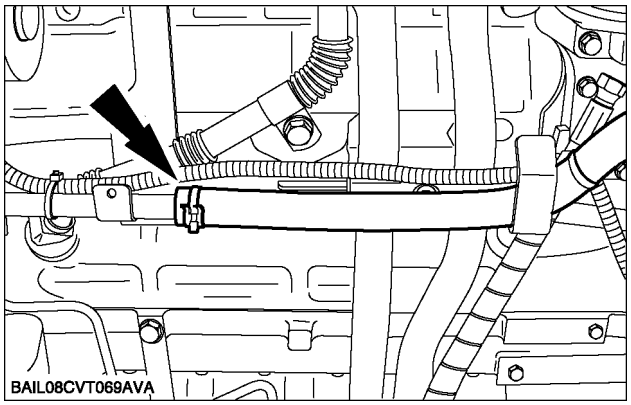
B024



BAIL08CVT068AVA 3

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4. Place a suitable container under the vehicle. Disconnect the cab coolant hose and drain the coolant.



BAIL08CVT069AVA 4

5. Remove the coolant expansion tank cap.
6. Connect the coolant hose when the coolant system has finished draining.
7. Remove the clamp from the cab heater hose.

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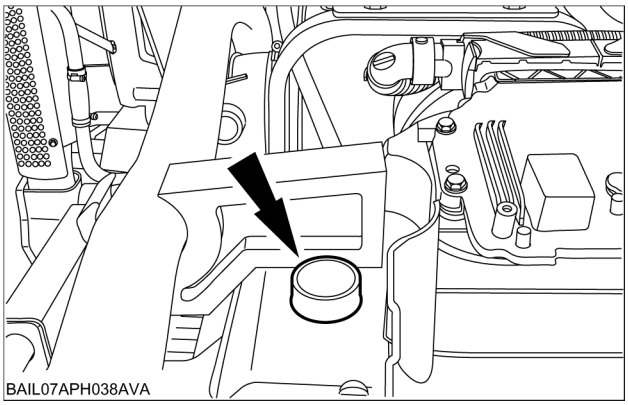
ENGINE COOLANT SYSTEM - Filling

⚠ WARNING ⚠

Do not allow antifreeze to contact skin. Adhere to instructions detailed on antifreeze container.

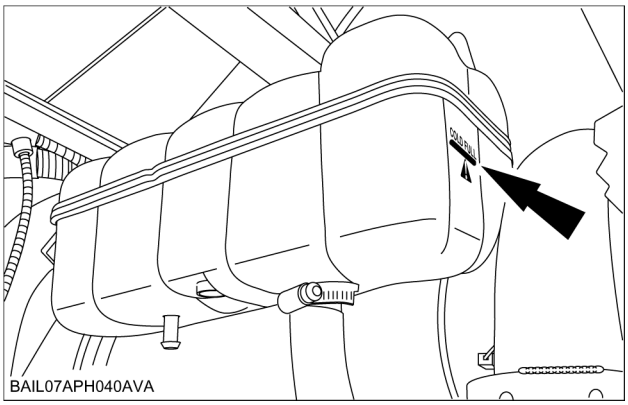
B024

1. Make sure that the correct grade and quantity of antifreeze is added to the water. Recommended coolant mixture is 50% water to 50% antifreeze to specification **CASE AKCELA PREMIUM ANTI-FREEZE (MS 1710) AMBRA AGRIFLU**.
2. Refill the engine coolant system through the radiator cap until completely full and reinstall the radiator cap.



BAIL07APH038AVA 1

3. Refill the coolant expansion tank to the COLD FILL mark.



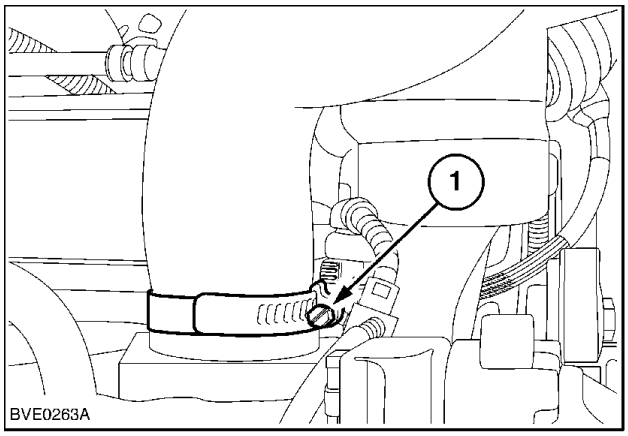
BAIL07APH040AVA 2

4. Start the engine and run until normal operating temperature is reached. Check for leaks, allow to cool and recheck the engine coolant level.

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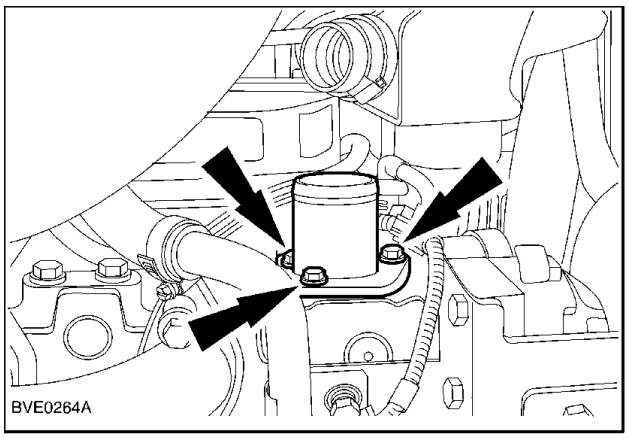
Thermostat - Remove

1. Loosen the hose clamp **(1)** and disconnect the coolant hose from the thermostat housing.



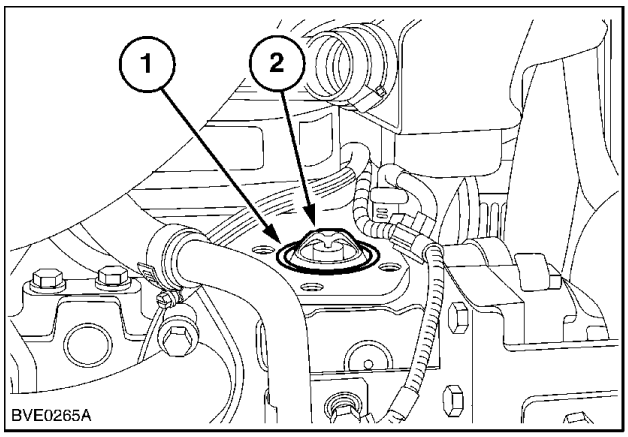
BVE0263A 1

2. Remove the thermostat housing from the cylinder block.



BVE0264A 2

3. Remove the thermostat seal **(1)** and the thermostat **(2)**.



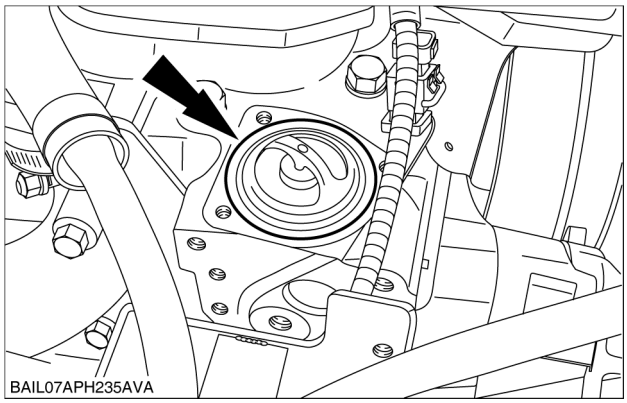
BVE0265A 3

Next operation:
Thermostat - Install (B.50.A)

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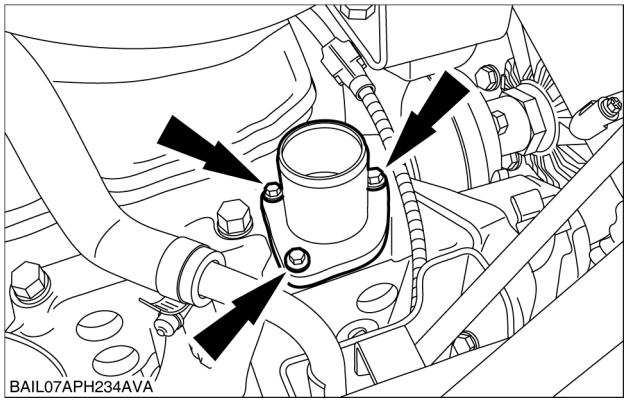
Thermostat - Install

1. Make sure that the mating surfaces are clean. Install the thermostat with a new thermostat seal.



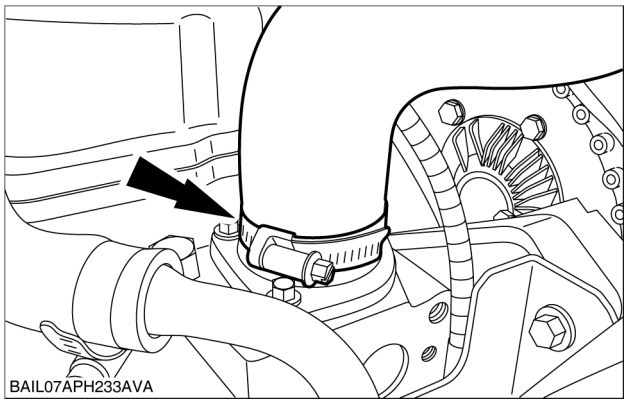
BAIL07APH235AVA 1

2. Install the thermostat housing to the cylinder block. Tighten the retaining bolts to the specified torque value. **10 Nm +/- 2 Nm** (**7.4 lbft +/- 1.5 lbft**) .



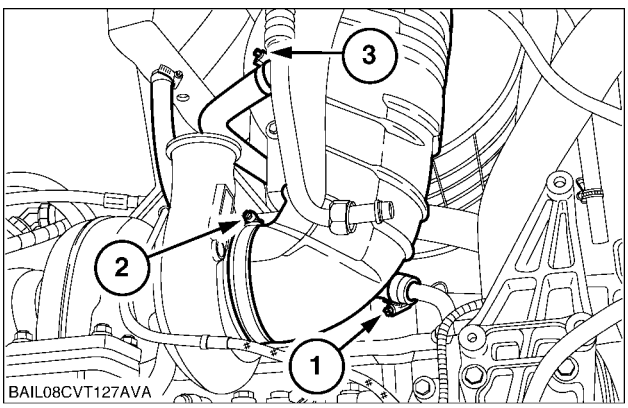
BAIL07APH234AVA 2

3. Connect the coolant hose to the thermostat housing and tighten the hose clamp.



BAIL07APH233AVA 3

4. Install the air intake pipe to the turbocharger **(2)**.



BAIL08CVT127AVA 4

5. Install the guard.

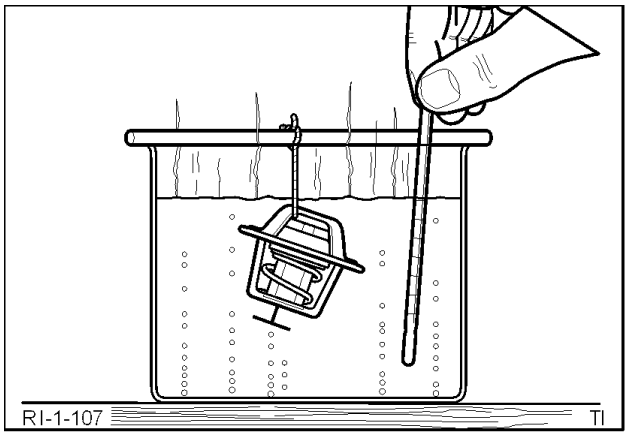
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Thermostat - Test

1. Place the thermostat in a container of water, and raise the temperature to **212 °F** (**100 °C**). If the thermostat fails to open when hot, or fails to close properly when cooled, it must be replaced.

NOTE: *A faulty thermostat may cause the engine to operate at a too hot or too cold operating temperature. If the thermostat is not replaced, this could result in damage to the engine or impaired engine performance.*

IMPORTANT: *Do not operate an engine without a thermostat.*



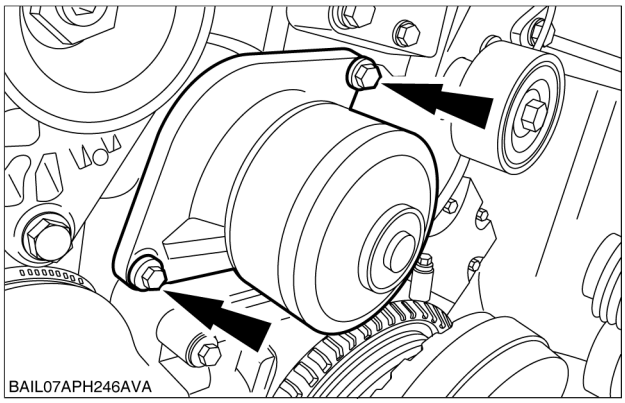
RI-1-107 1

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Water pump - Remove

Prior operation:
Drain the cooling system, for further information refer to **ENGINE COOLANT SYSTEM - Drain fluid (B.50.A)**
Prior operation:
Remove the drive belt, for further information refer to **Fan and drive Belt - Remove (B.50.A)**

1. Remove the coolant pump retaining bolts and remove the coolant pump.



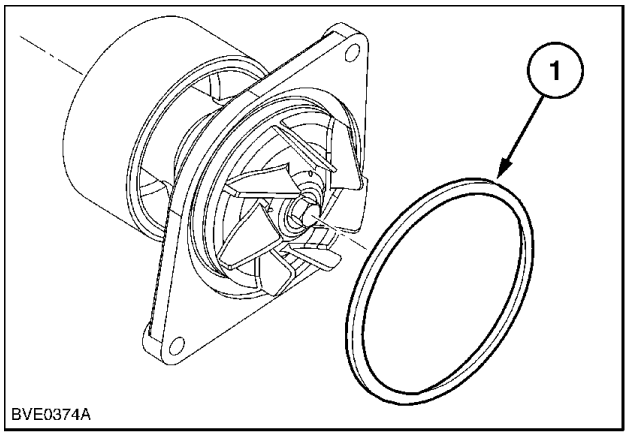
BAIL07APH246AVA 1

Next operation:
Water pump - Install (B.50.A)

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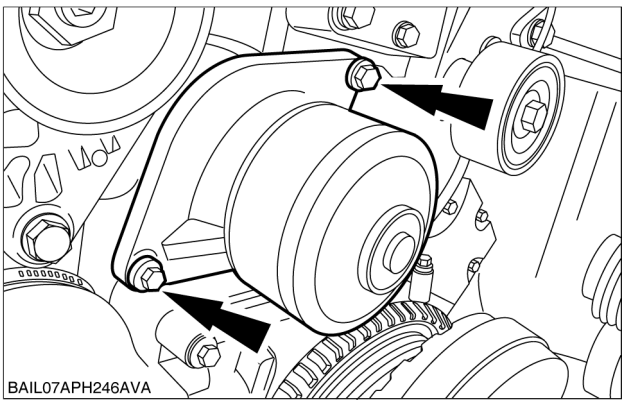
Water pump - Install

1. Make sure that the mating surfaces are clean. Install a new seal **(1)** and lubricate with clean engine oil. **CASE AKCELA NO. 1 ENGINE OIL SAE 15W-40** .



BVE0374A 1

2. Install the coolant pump. Tighten the retaining bolts to the specified torque value. Refer to **Water pump - Torque (B.50.A)**.



BAIL07APH246AVA 2

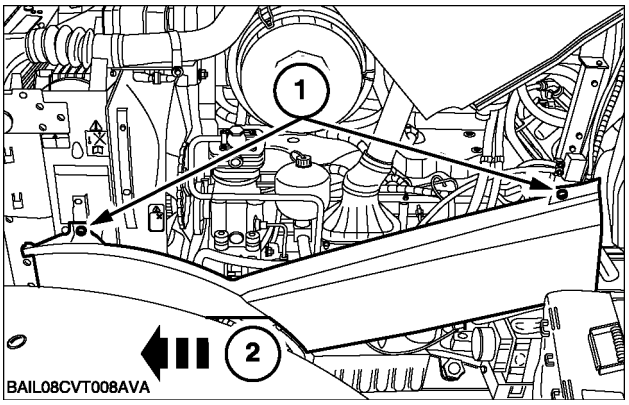
Next operation:
Install the drive belt, for further information refer to **Fan and drive Belt - Install (B.50.A)**
Next operation:
Refill the engine coolant system, for further information **ENGINE COOLANT SYSTEM - Filling (B.50.A)**

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Radiator - Remove

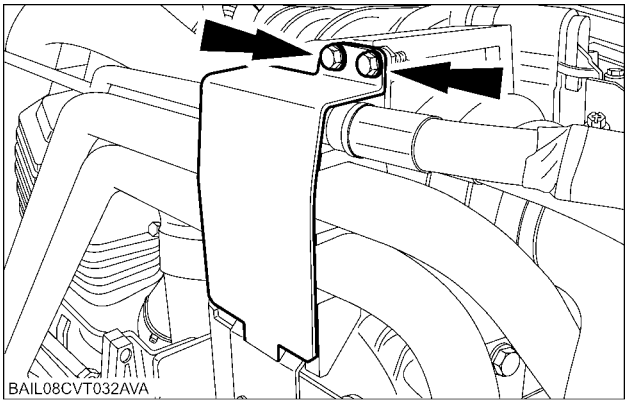
Prior operation:
Drain the engine coolant system, for further information refer to **ENGINE COOLANT SYSTEM - Drain fluid (B.50.A)**.
Prior operation:
Remove the air conditioning condenser, for further information refer to **Condenser - Remove (E.40.D)**.

1. Release the left-hand engine side panel retaining screws **(1)** and remove the panel **(2)**.



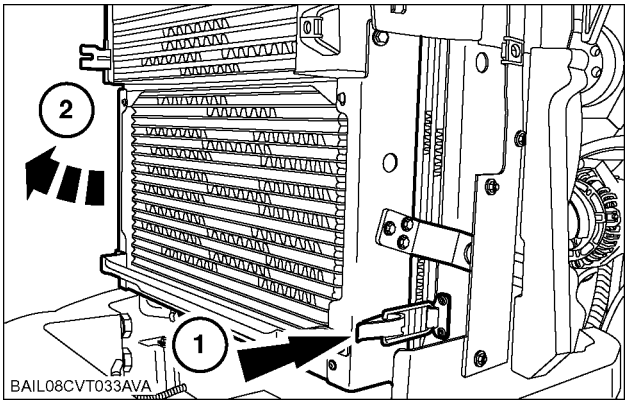
BAIL08CVT008AVA 1

2. Remove the air conditioning and oil cooler pipes retaining bracket.



BAIL08CVT032AVB 2

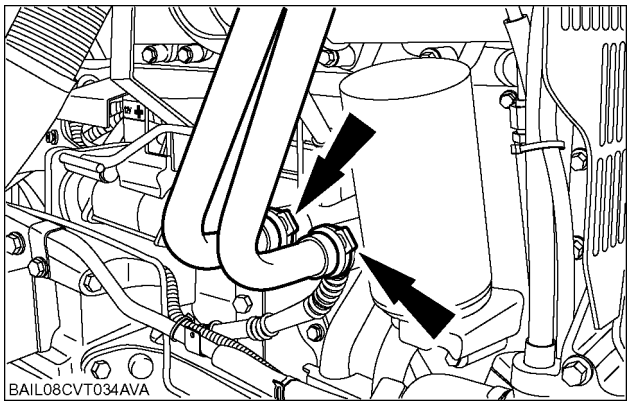
3. Release the charge air cooler/oil cooler assembly **(1)** and pull forward **(2)**.



BAIL08CVT033AVA 3

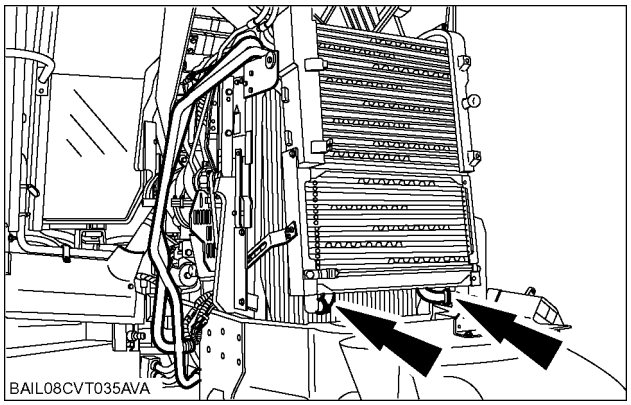
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4. Disconnect the oil cooler supply and return pipes.



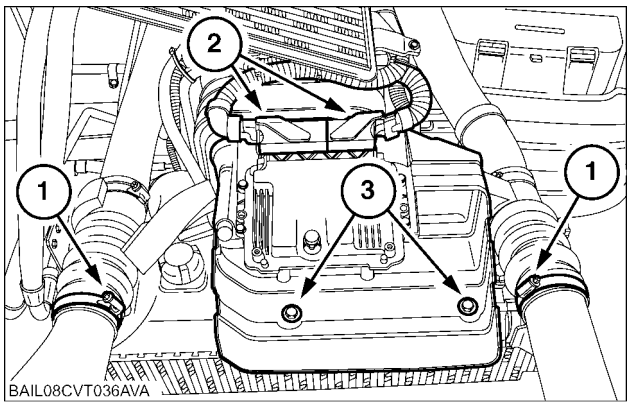
BAIL08CVT034AVA 4

5. Remove the oil cooler supply and return pipes.



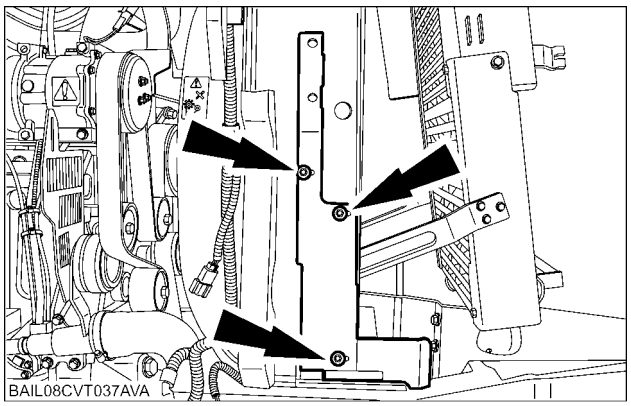
BAIL08CVT035AVA 5

6. Detach the charger air cooler pipes from the charge air cooler **(1)**.
Disconnect the engine control module electrical connectors **(2)**.
Remove the air intake and engine control module **(3)**.



BAIL08CVT036AVA 6

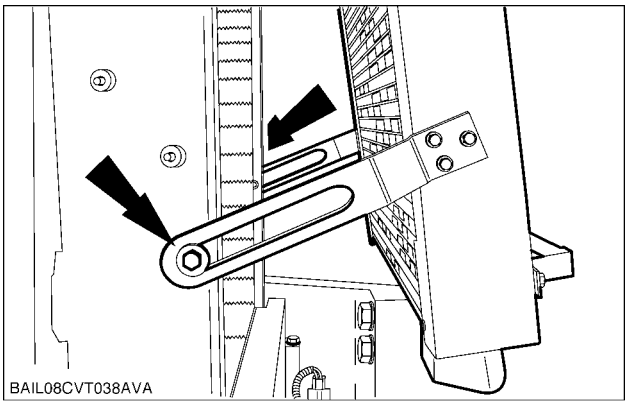
7. Remove the engine right-hand side panel front retaining bracket. Repeat this step for the left-hand side.



BAIL08CVT037AVA 7

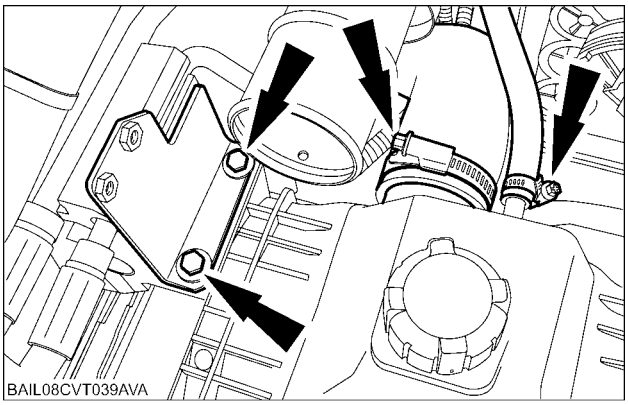
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8. Remove the charge air cooler and oil cooler lower retaining bolts and remove the charge air cooler and oil cooler.



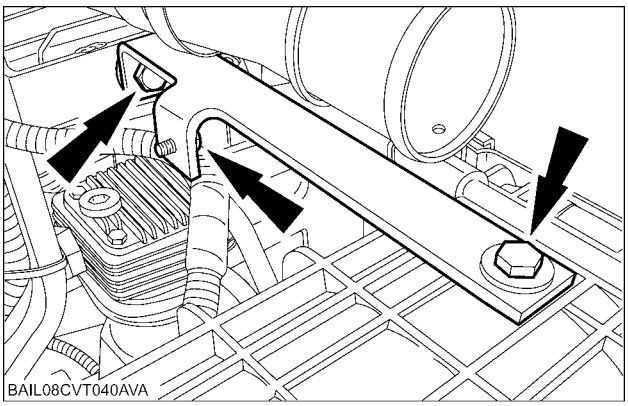
BAIL08CVT038AVA 8

9. Disconnect the receiver dryer retaining bracket, radiator upper coolant hose, and radiator breather hose.



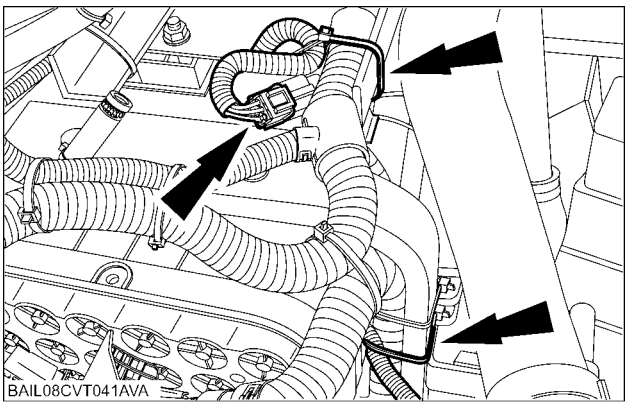
BAIL08CVT039AVA 9

10. Remove the radiator left hand retaining bracket and detach the cooling fan wiring harness.



BAIL08CVT040AVA 10

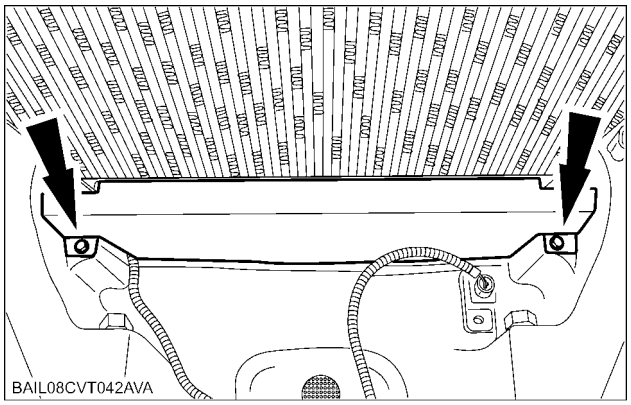
11. Disconnect the cooling fan electrical connector and cut the wiring harness cable ties.



BAIL08CVT041AVA 11

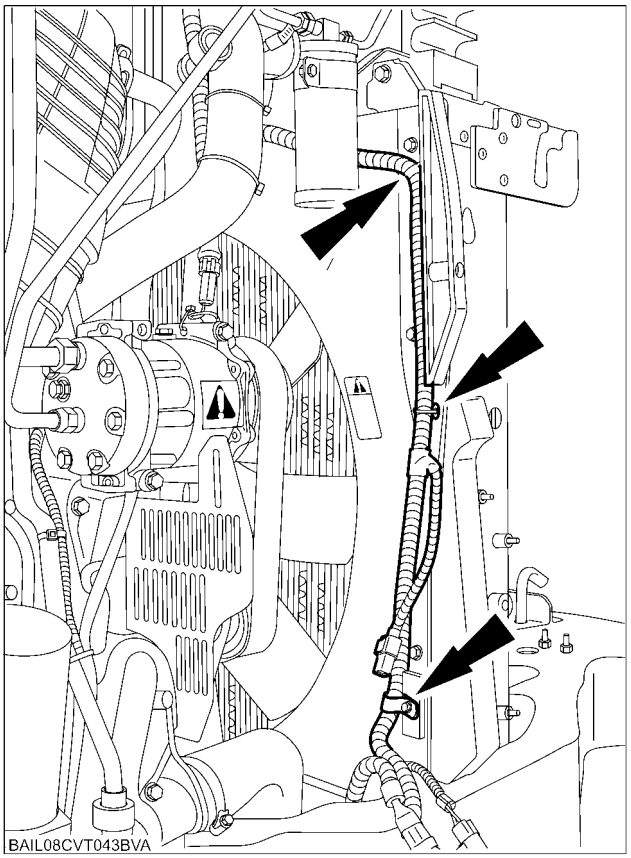
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12. Remove the radiator baffle plate.



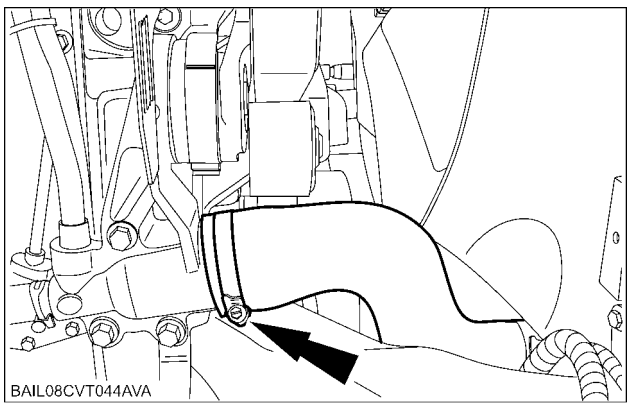
BAIL08CVT042AVA 12

13. Detach the wiring harness from the cooling fan shroud



BAIL08CVT043BVA 13

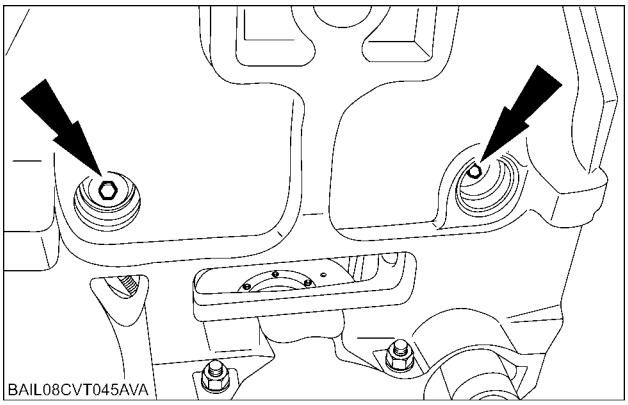
14. Disconnect the radiator lower coolant hose.



BAIL08CVT044AVA 14

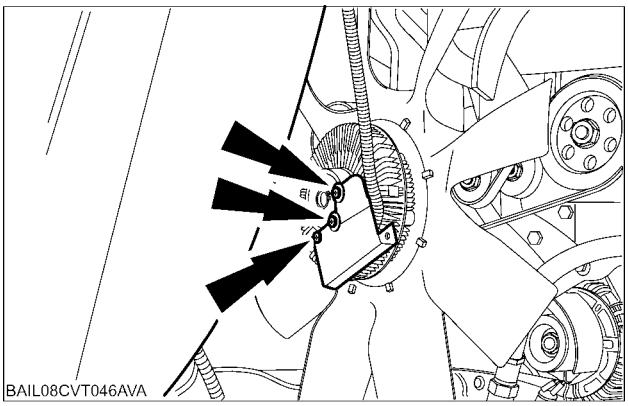
www.truck-freeworkshop.com

15. Remove the radiator lower retaining bolts.



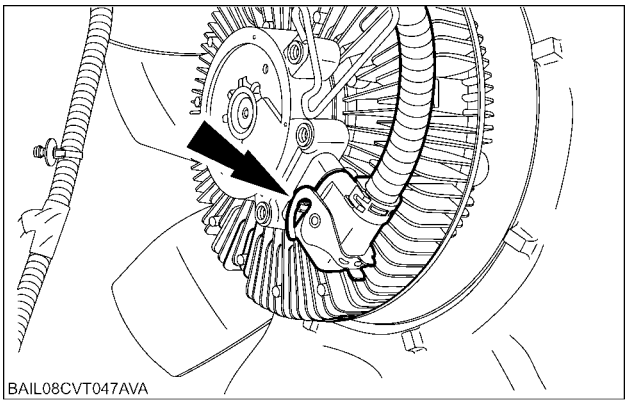
BAIL08CVT045AVA 15

16. Remove the cooling fan clutch electrical connector guard.



BAIL08CVT046AVA 16

17. Disconnect the cooling fan clutch electrical connector.



BAIL08CVT047AVA 17

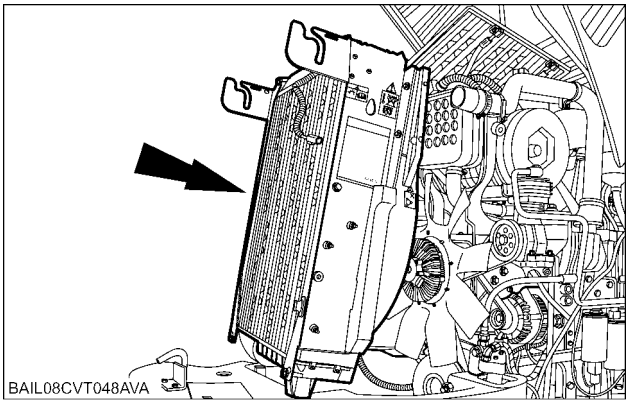
www.truck-freeworkshop.com

⚠ WARNING ⚠

The component is heavy. ALWAYS use a hoist or get assistance to lift the component. Failure to comply could result in serious injury or death.

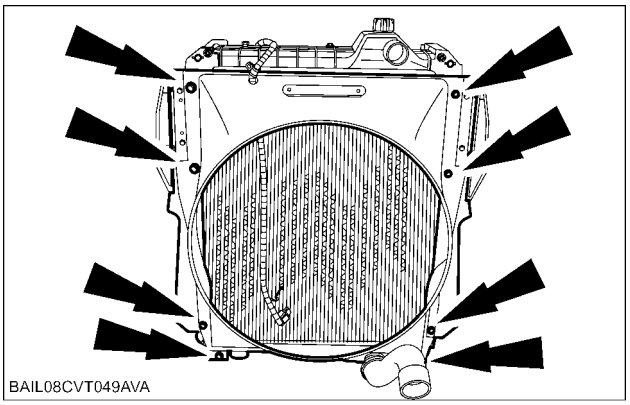
M944

18. Remove the radiator assembly.



BAIL08CVT048AVA 18

19. Remove the cooling fan shroud from the radiator.

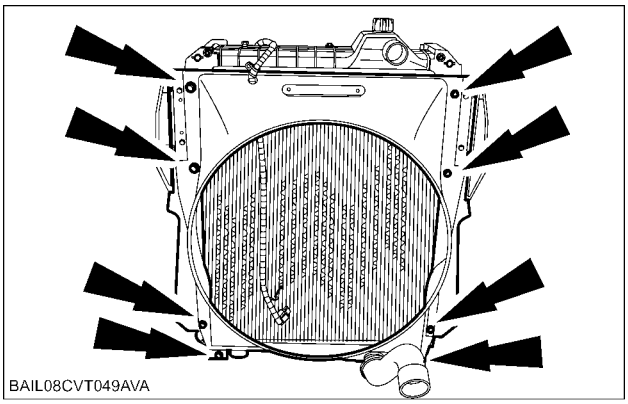


BAIL08CVT049AVA 19

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Radiator - Install

1. Install the cooling fan shroud to the radiator.



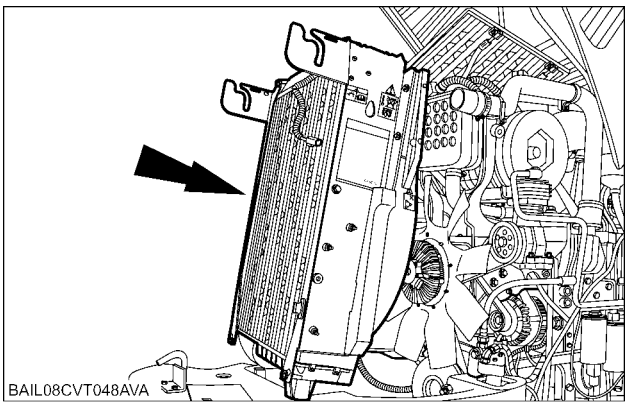
BAIL08CVT049AVA 1

⚠ WARNING ⚠

The component is heavy. ALWAYS use a hoist or get assistance to lift the component. Failure to comply could result in serious injury or death.

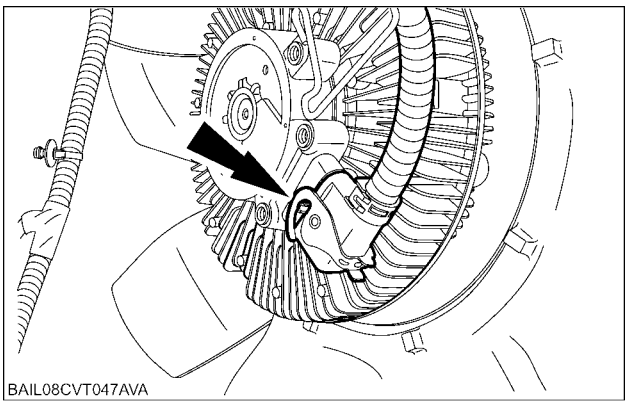
M944

2. Stand the radiator assembly on the front support.



BAIL08CVT048AVA 2

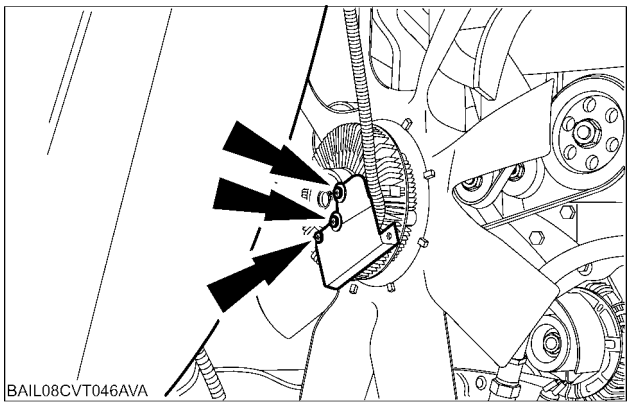
3. Connect the cooling fan clutch electrical connector.



BAIL08CVT047AVA 3

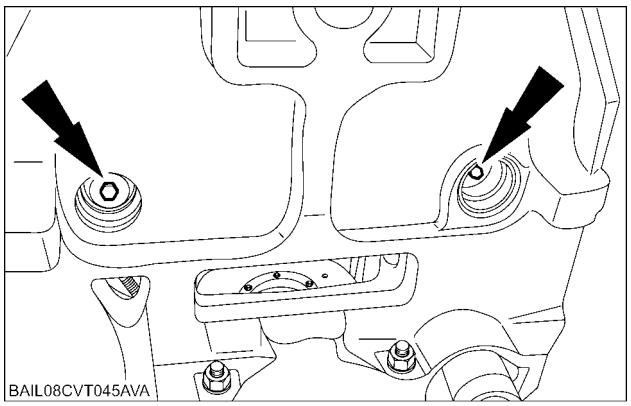
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4. Install the cooling fan clutch electrical connector guard.



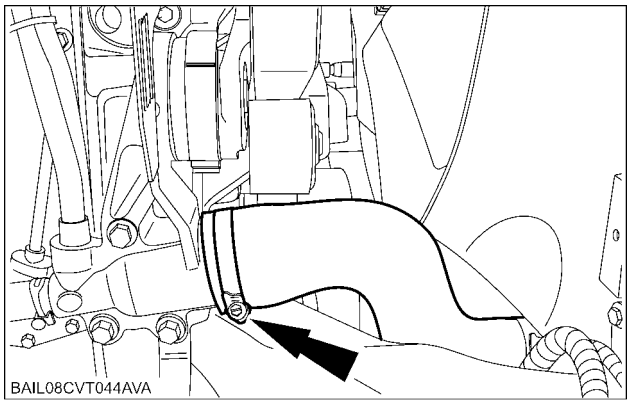
BAIL08CVT046AVA 4

5. Install the radiator lower retaining bolts.



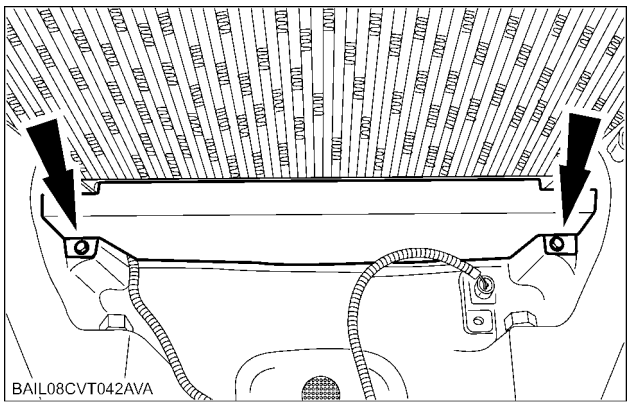
BAIL08CVT045AVA 5

6. Connect the radiator lower coolant hose.



BAIL08CVT044AVA 6

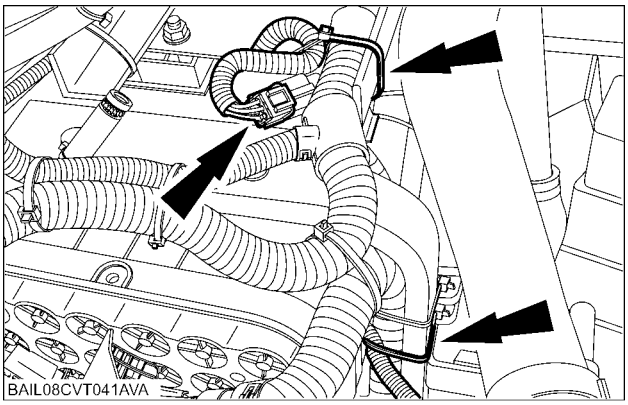
7. Install the radiator baffle plate.



BAIL08CVT042AVA 7

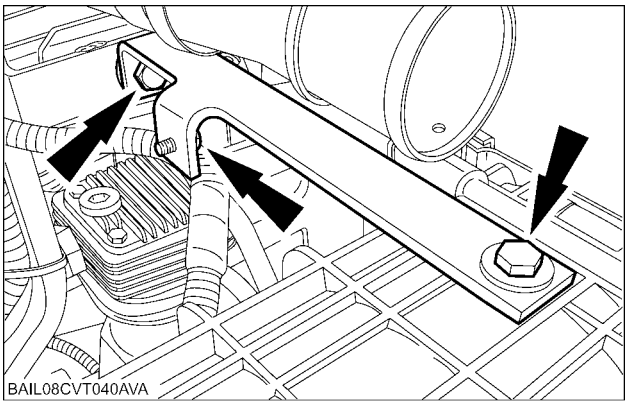
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8. Connect the cooling fan electrical connector and secure with cable ties.



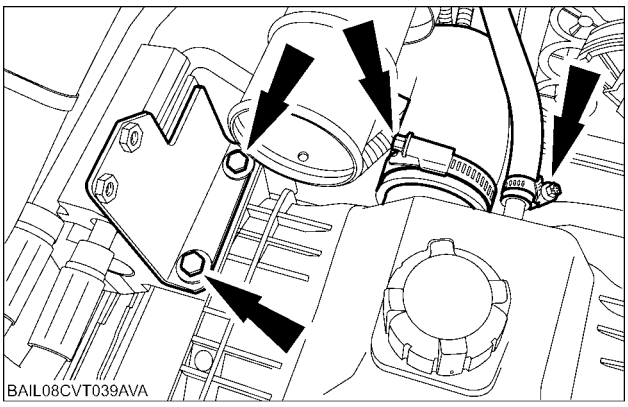
BAIL08CVT041AVA 8

9. Install the radiator left hand retaining bracket and attach the cooling fan wiring harness to the bracket.



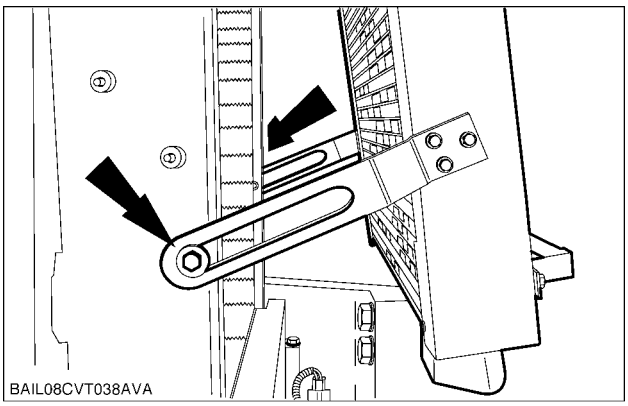
BAIL08CVT040AVA 9

10. Connect the receiver dryer retaining bracket, radiator top coolant hose, and radiator breather hose.



BAIL08CVT039AVA 10

11. Install the charge air cooler and oil cooler. Install the charge air cooler and oil cooler lower retaining bolts.

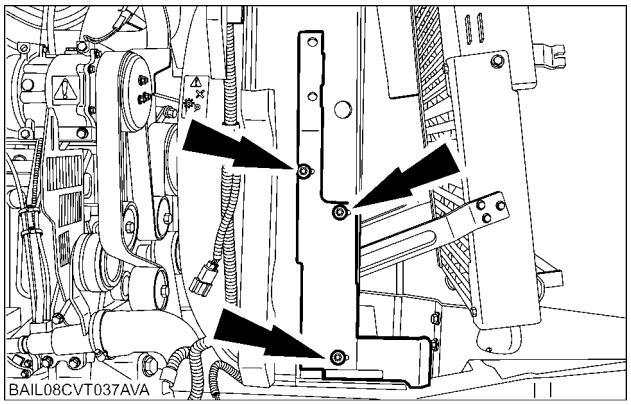


BAIL08CVT038AVA 11

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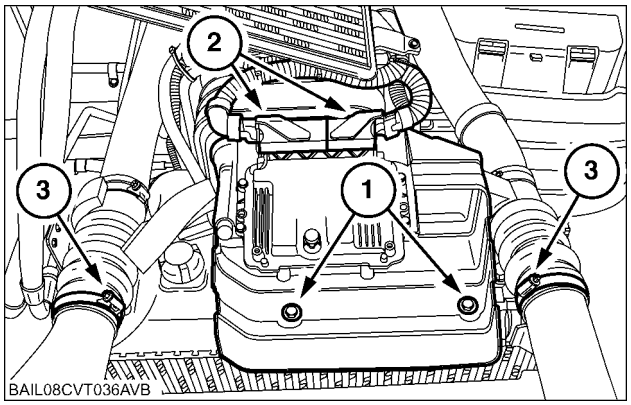
12. Install the engine right-hand side panel front retaining bracket.

NOTE: *Repeat this step for the left-hand side.*



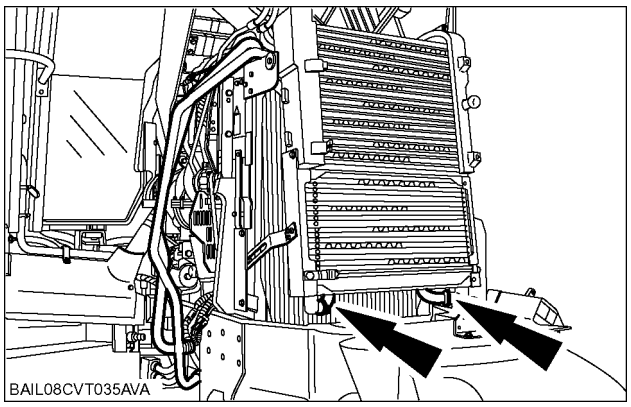
BAIL08CVT037AVA 12

13. Install the air intake and engine control module. **(1)**. Connect the engine control module electrical connectors **(2)**.
Attach the charge air cooler pipes to the charge air cooler **(3)**.



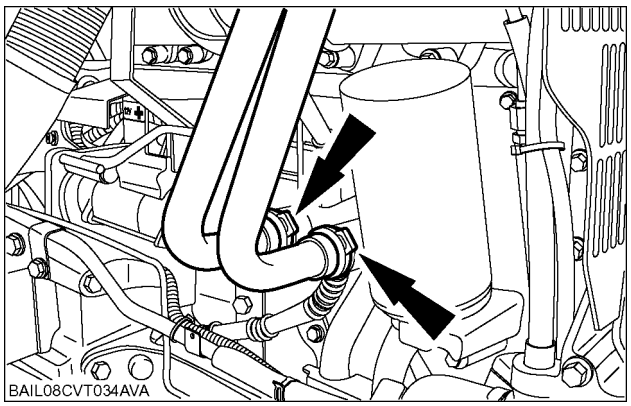
BAIL08CVT036AVB 13

14. Install the oil cooler supply and return pipes, and connect them to the oil cooler.



BAIL08CVT035AVA 14

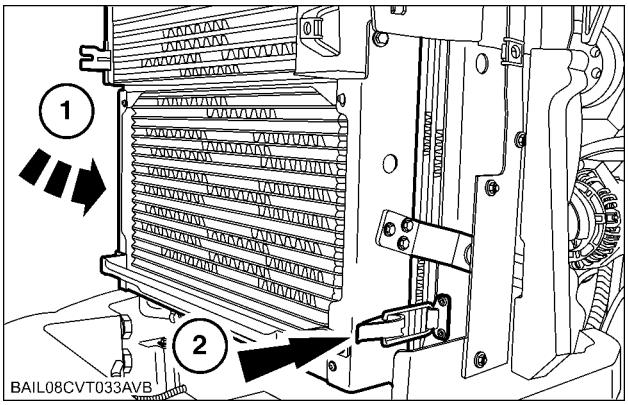
15. Connect the oil cooler supply and return pipes.



BAIL08CVT034AVA 15

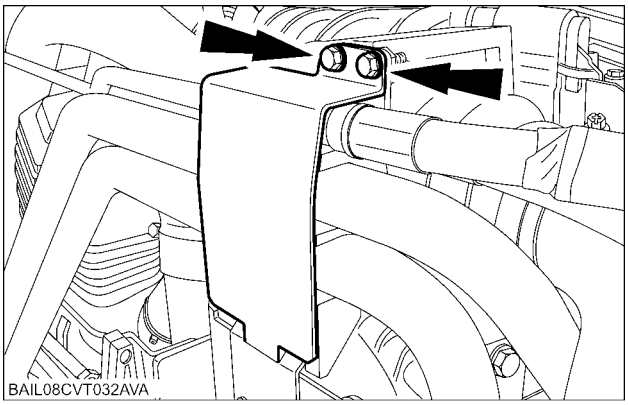
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16. Push the charge air cooler/oil cooler assembly into position **(1)** and secure **(2)**.



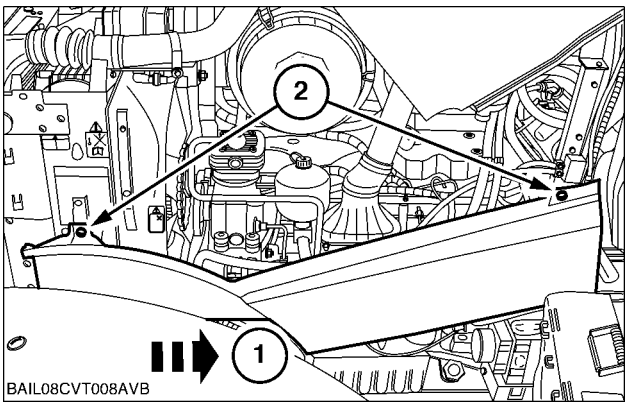
BAIL08CVT033AVB 16

17. Install the air conditioning and oil cooler pipes retaining bracket.



BAIL08CVT032AVB 17

18. Install the left-hand engine side panel **(1)** and tighten left-hand engine side panel retaining screws **(2)**.



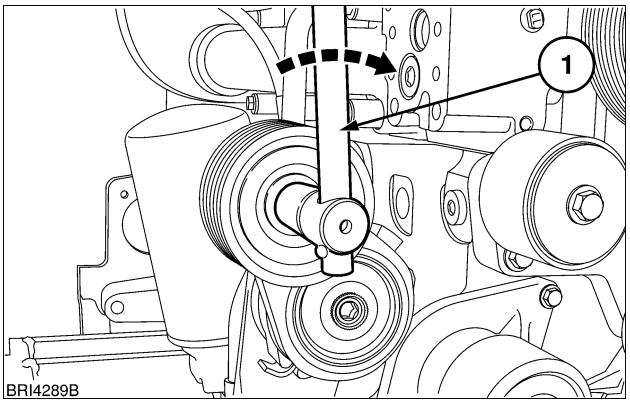
BAIL08CVT008AVB 18

Next operation:
Install the air conditioning condenser, for further information refer to **Condenser - Install (E.40.D)**
Next operation:
Fill the engine coolant system, for further information refer to **ENGINE COOLANT SYSTEM - Filling (B.50.A)**

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Fan and drive Belt - Remove

1. Attach a **15 mm**. socket and bar **(1)** to the automatic drive belt tensioner arm. Rotate clockwise and remove the drive belt from the pulleys.
   Carefully feed the drive belt between the cooling fan and the radiator shroud.

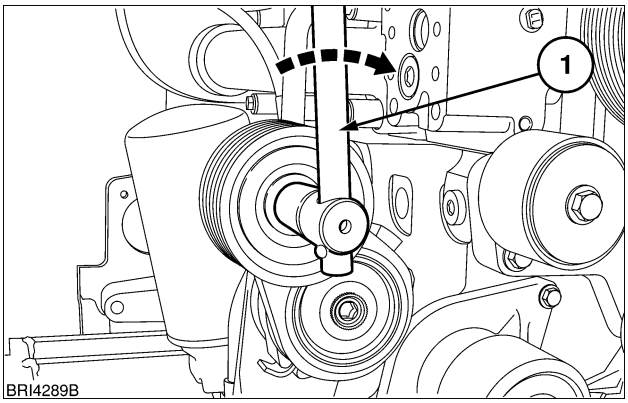


BAIL06CCM247ASA 1

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Fan and drive Belt - Install

1. Carefully feed the drive belt between the cooling fan and the radiator shroud.
   Attach a **15 mm**. socket and bar **(1)** to the automatic drive belt tensioner arm. Rotate clockwise and refit the drive belt onto the pulleys.
   Once the belt is in position, rotate the socket and bar anti clockwise until the tensioner takes up all of the play in the belt and the socket and bar can safely be removed. The belt should now be correctly tensioned.



BAIL06CCM247ASA 1

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POWER PRODUCTION - B

ENGINE COOLANT SYSTEM Fan reversing system - 50.B

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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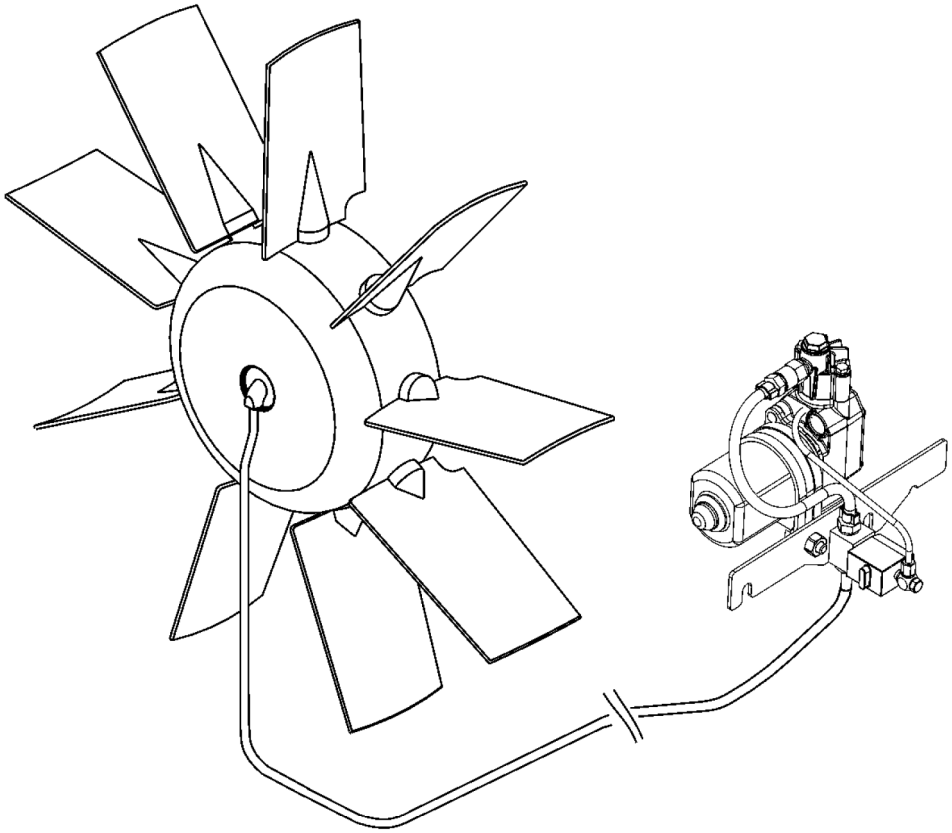
POWER PRODUCTION - B

ENGINE COOLANT SYSTEM Fan reversing system - 50.B

FUNCTIONAL DATA
Fan
Static description Reversible fan 3

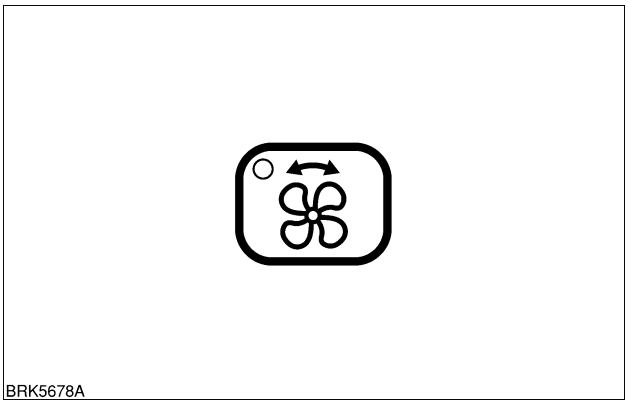
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Fan - Static description Reversible fan



SS05N282 1

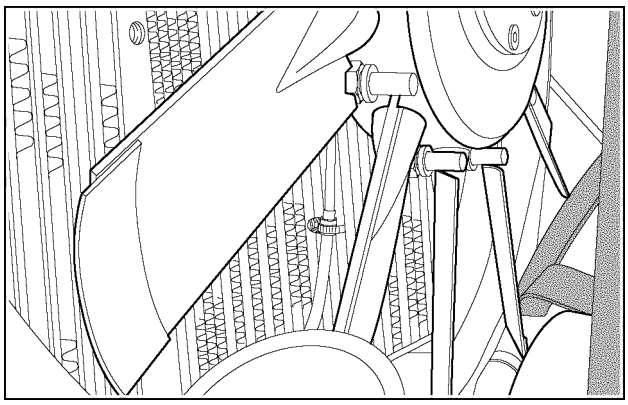
The reversible fan aids clearance of the grille and ensures optimum cooling performance. The fan has 9 blades which are connected to a piston, which in turn is connected to a solenoid. The working of the fan is similar to that of a normal fan until the reversible fan mode is operated by the switch located on the control panel.



BAIL08CVT023ASA 2

In the reversible fan mode, the blades rotate **180 °**. This leads to a change in the direction of flow of air and it starts to blow in the opposite (Outer) direction. The complete cycle takes about 30 seconds to complete (including the five seconds to reverse the blades). The reversible fan can be stopped at any time during the cycle by pressing the switch again, otherwise at end of the cycle the blades return to their original position.

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RCPH07CCH216AAB 3

The fan blades rotate using an eccentric linkage housed within the central fan hub. A set of springs ensures the blades return to the normal operating position.
The fan blades are also automatically adjusted thermostatically by the thermo-elements. These thermo-elements have a piston which expands and contracts depending on the temperature.

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POWER PRODUCTION - B

ENGINE COOLANT SYSTEM Fan reversing system - 50.B

Fan - Static description Reversible fan 3

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POWER PRODUCTION - B

LUBRICATION SYSTEM - 60.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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- Oil pan
  - Tighten Sequence 5
- Oil cooler
  - Tighten - Sequence. 6

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Oil pan - Torque

Part	TORQUE
Bolts securing oil pan.	Refer to **Oil pan - Tighten (B.60.A)**
M10 x 1,5 x 45 bolts	**50 Nm** (**36.88 lb ft**)± **5 Nm** (**3.69 lb ft**)
M10 x 1,5 x 90 bolts	**70 Nm** (**51.63 lb ft**)± **5 Nm** (**3.69 lb ft**)
M10 x 1,5 x 125 bolts	**70 Nm** (**51.63 lb ft**)± **5 Nm** (**3.69 lb ft**)
M10 x 1,5 x 190 bolts	**70 Nm** (**51.63 lb ft**)± **5 Nm** (**3.69 lb ft**)

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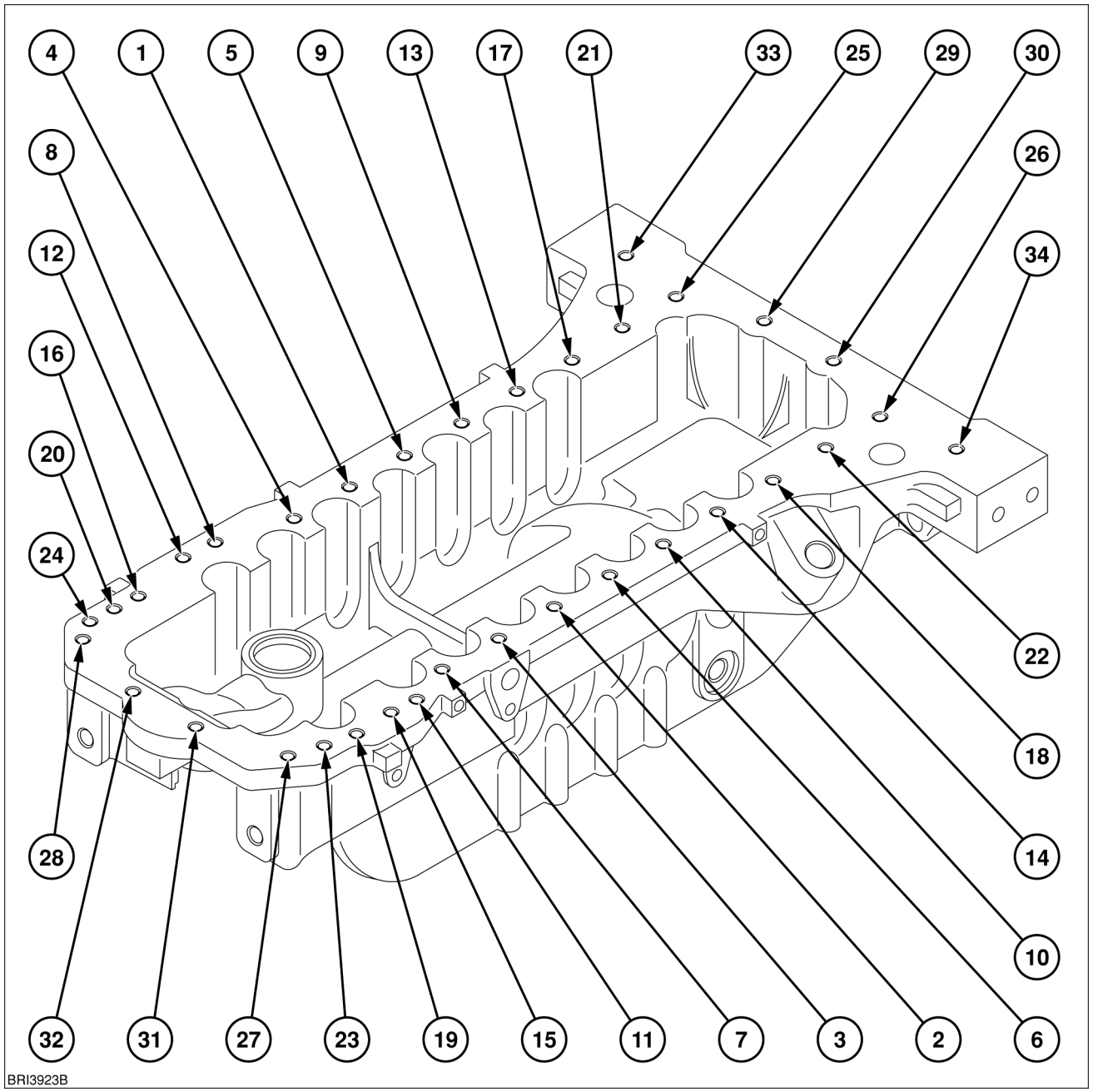
Oil cooler - Torque

Part	TORQUE Nm
Bolts for securing oil cooler to engine block.	Refer to **Oil cooler - Tighten (B.60.A)**
M8 x 1,25 x 35	**25 Nm +/- 5 Nm** (**18 lb ft +/- 4 lb ft**)
M8 x 1,25 x 100	**25 Nm +/- 5 Nm** (**18 lb ft +/- 4 lb ft**)

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Oil pan - Tighten Sequence

1. Tightening sequence for oil pan bolts.



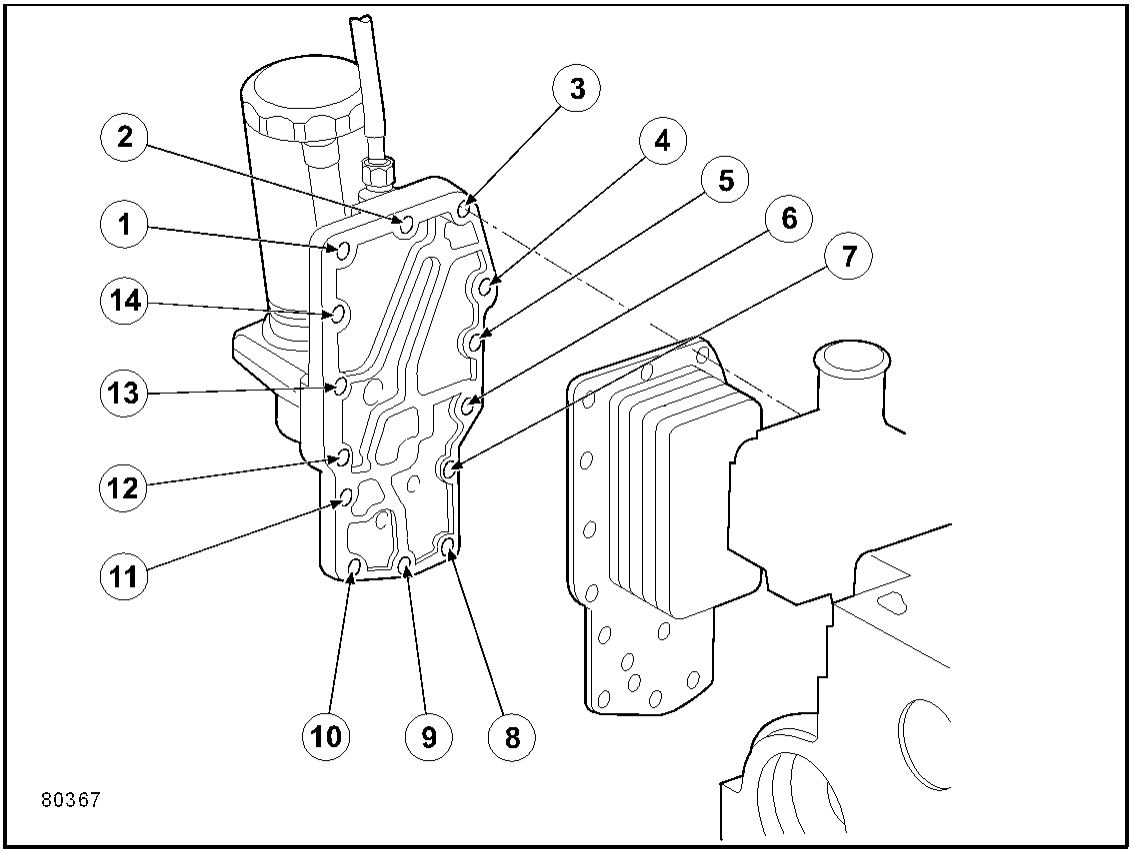
bail06ccm028gsa 1

For required torque settings, refer to Oil pan - Torque (B.60.A).

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Oil cooler - Tighten - Sequence.

1. Tightening sequence for oil cooler bolts.



80367_89 1

For the required torque settings, refer to Oil cooler - Torque (B.60.A).

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POWER PRODUCTION - B

STARTING SYSTEM - 80.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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Engine starter - General specification

	Starter Type - Iskra Gear Starter
Rated Voltage	**12 V**
Rated Power	**4.2 Kw**
Direction of rotation	Clockwise
Maximum No Load Current Draw at **11.5 volts** and **4000 rev/min**.	**120 amps**

Engine starter - Torque

Description	Torque
Starter Motor mounting bolts M10 x 1.50 x 35mm	**43 Nm +/- 5** (**31.7 lbft +/- 4**)

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Engine starter - Test

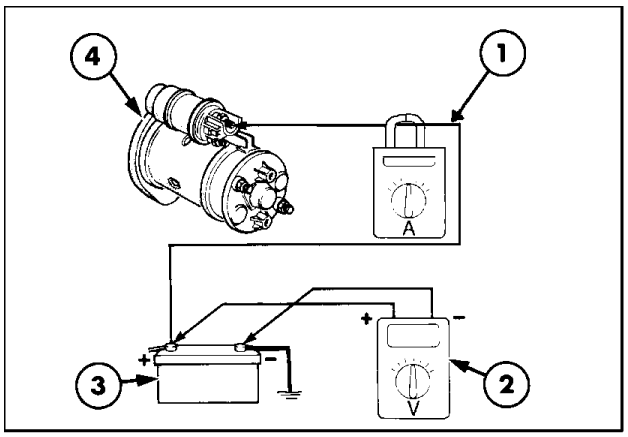
1. For easier and rapid diagnosis and for most conclusive test results, it is recommended that a battery-starter tester (high rate discharge tester) incorporating a **0 - 20 V** voltmeter and a **0 - 1000 A** ammeter be used to diagnose starting system problems.
   When using test equipment follow the manufacturers recommended test procedures. If test equipment is not available the following test procedure, using a standard **0 - 20 V** voltmeter and **0 - 1000 A** ammeter can be used to determine the correct operation of the starter without removing it from the engine.
   Before testing :
   Check that the battery is fully charged.
   Check the complete starting system wiring circuit for frayed or broken wires or loose terminal connections.
   Check the engine is not seized.

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Engine starter - Electrical test Starter Motor Circuit Current Draw

Starter Motor Circuit Current Draw

1. Attach a suitable clamp meter, **(1)**, with a **0 - 1000 A** range, over the battery positive cable.
   Connect the voltmeter **(2)** positive lead to the battery positive terminal and the voltmeter negative lead to the battery negative terminal.
   To prevent engine start up during cranking remove the engine processor fuse, Fuse 33, refer to, **Fuse and relay box - General specification (A.30.A)**.
   Crank the engine while observing the voltmeter and ammeter readings. The voltage should remain steady at around **10 - 12 V** with between **250 - 400 A** being drawn.



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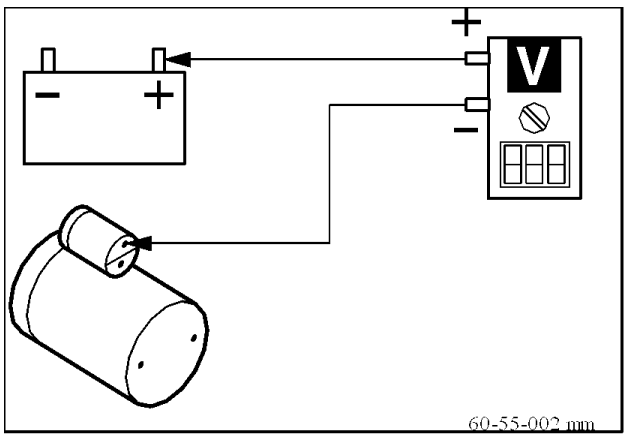
2. If the current draw is within specification the starting motor **(4)** is functioning correctly. If the voltage drops during the test proceed to 'Starting System Circuit Resistance'.
3. If the current draw is greater than specified, check the circuit as outlined below. If the starting system circuit tests are satisfactory the starting motor is defective and must be replaced or renewed.
4. If the current draw is less than specified, the starting motor is defective and must be replaced or renewed..

   If there is an excessive current draw the circuit should be checked by recording voltage drops across the individual components in the circuit

IMPORTANT: *Disconnect the fuel injection pump fuel shut off solenoid wire.*

Battery Positive Cable :

5. Connect the voltmeter positive lead to the battery positive terminal.
   Connect the voltmeter negative lead to the starting motor solenoid battery terminal.
   Crank the engine while observing the voltmeter reading. If the voltage exceeds **0.2 V**, check and tighten the cable connections. Recheck the voltage, if still excessive install a new cable.

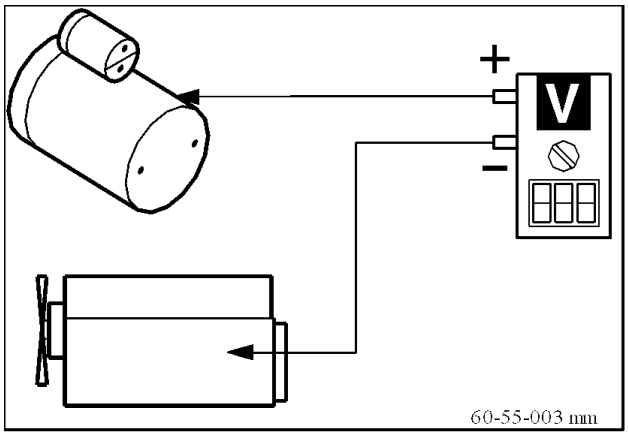


60-55-002 2

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Starting Motor Ground Connections :

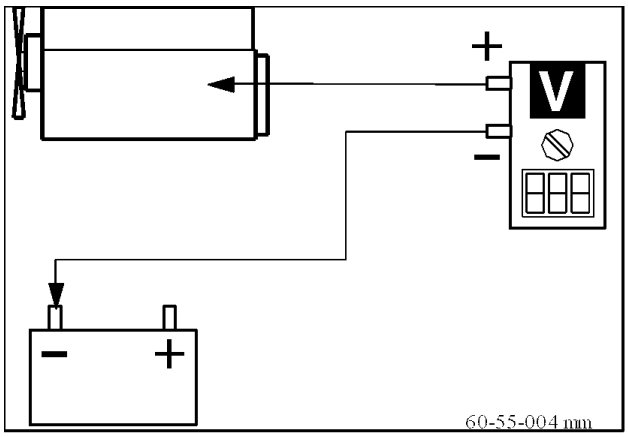
6. Connect the voltmeter positive lead to the starting motor frame.
   Connect the voltmeter negative lead to the engine block.
   Crank the engine while observing the voltmeter reading. If the voltmeter reading exceeds **0.2 V** check the ground connections between the starting motor flange and the rear engine plate.



60-55-003 3

Battery Ground Cable :

7. Connect the voltmeter positive lead to the engine block.
   Connect the voltmeter negative lead to the battery negative terminal.
   Crank the engine while observing the voltmeter reading. If the reading exceeds **0.2 V**, check and tighten the ground cable connections. Recheck the voltage, if it is still excessive install a new ground cable.



60-55-004 4

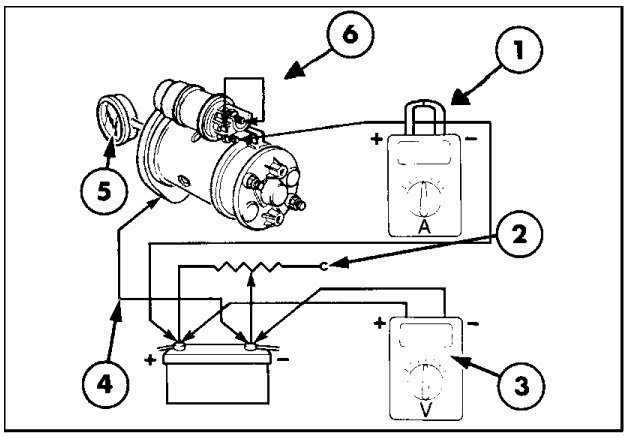
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Engine starter - Electrical test Starter Motor No Load Bench Test.

Prior operation:
Engine starter - Remove (B.80.A).

Starting Motor No-Load Test:

1. Secure the starting motor in a vice equipped with soft jaws.
   Connect the battery negative cable **(4)** to the starting motor mounting flange.
   Connect a voltmeter **(3)** positive lead to the battery positive terminal, the voltmeter negative lead to the battery negative terminal.
   Connect the battery positive cable to the starting motor terminal and attach a suitable clamp meter **(1)**, over the cable.
   Connect a short jumper lead **(6)** between the solenoid battery and solenoid switch terminals.
   Hold a hand tachometer **(5)** on the end of the armature shaft. Set the starting motor by adjusting the carbon pile **(2)** to give **11.7 V**. When the armature rotates above **4000 RPM**. the maximum current draw should not exceed **150 A**.
   If the starting motor does not perform to specification, renew or replace starter motor.



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NOTE: *A fully charged battery and a battery starter tester (high rate discharge tester) with a carbon pile (variable load resistor) should be used to perform this test.*

NOTE: *Connecting the jumper lead will cause the starter to operate.*

Drive Pinion Assembly

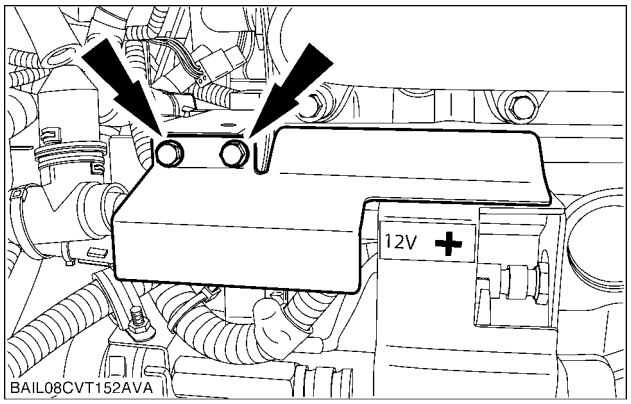
2. Check the operation of the roller clutch. The pinion should rotate clockwise only. If the pinion is stuck or rotates in both directions, or if the pinion teeth are damaged, renew or replace starter motor assembly.
   If damaged pinion teeth are evident, check the flywheel ring gear teeth as described in **Flywheel - Install (B.10.A)**.

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Engine starter - Remove

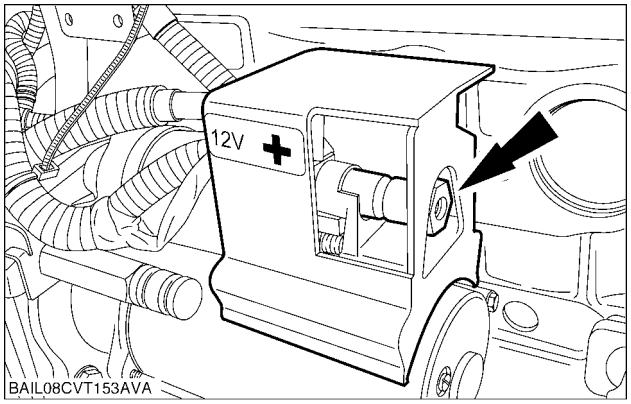
Prior operation:
Battery - Disconnect (A.30.A)

1. Remove the starter motor shield.



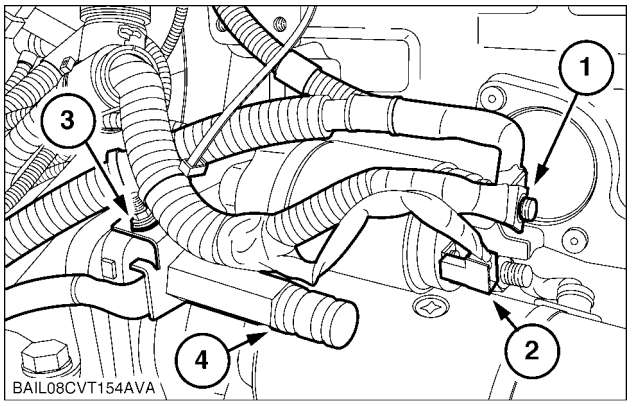
BAIL08CVT152AVA 1

2. Remove the positive jump start terminal cover.



BAIL08CVT153AVA 2

3. Disconnect the three starter motor cables **(1)**.
Disconnect the spade connector **(2)**.
Remove the positive cable retaining bracket **(3)**.
Disconnect the negative jump start terminal **(4)**.
Remove the three starter motor mounting bolts and withdraw the starter motor from the flywheel housing.



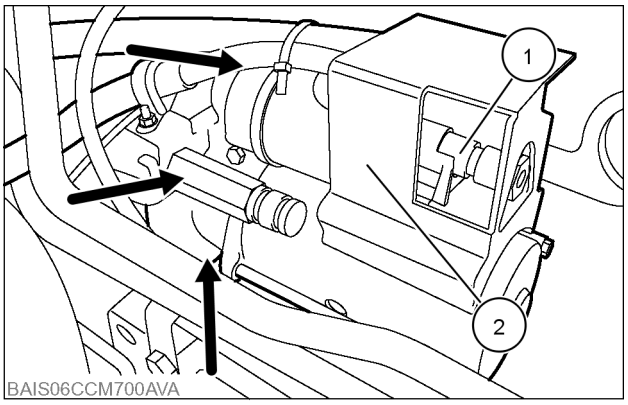
BAIL08CVT154AVA 3

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Engine starter - Install

ATTENTION: *Ensure that the mating faces of the starter motor and starter motor housing are clean and free from debris.*

1. Mount the starter motor into the starter motor housing and secure into position with the starter motor mounting bolts.
2. Torque starter motor mounting bolts to recommended specification. Refer to **Engine starter - Torque (B.80.A)**.
3. Reconnect the solenoid feed wire and solenoid positive supply wire. Refit the protective cover **(2)** and install the 'positve clamp' brass stud **(1)**.



BAIS06CCM700AVA 1

4. Reconnect the battery, refer to **Battery - Connect (A.30.A)**.

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SERVICE MANUAL

POWER TRAIN



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TRANSMISSION Continuously Variable Transmission (CVT) - General specification

TRANSMISSION OPTIONS	**35 km/h** **40 km/h**	**40 km/h** (ECO) **50 km/h**
TRANSMISSION RATIO FOR THE MECHANICAL GEARS		
F1 (forwards)	1 : 1,321	1 : 1,321
F2 (forwards)	1 : 2,333	1 : 2,333
F3 (forwards)	1 : 0,344	1 : 0,429
F4 (forwards) only for **40 km/h** (ECO) and **50 km/h**	—	1 : 0,784
R1 (reverse)	1 : 1,172	1 : 1,172
R2 (reverse) only for **40 km/h** (ECO) and **50 km/h**	—	1 : 1,744
TRANSMISSION SPEEDS		
Nominal input speed	**2200 RPM**	**2200 RPM**
Output shaft speed in forwards	**0 - 5615 RPM**	**0 - 7520 RPM**
Output shaft speed in reverse	**0 - 1650 RPM**	**0 - 3380 RPM**
TRANSMISSION RATIO FOR THE HYDROSTAT		
Input	1 : 0,710	
Output	1 : 2,167	
CLUTCHES		
Construction	wet disc clutch	
Actuation	Electro-hydraulic (proportionally controlled)	
Clutch A (number of discs)	11	
Clutch B (number of discs)	11	
Disc thickness (each)	**2.8 mm** (**0.1 in**)	
Wear limit	**2.4 mm** (**0.1 in**)	
MAXIMUM PERMITTED OPERATING ANGLE		
Tractor tilting rearwards	**32 °**	
Tractor tilting forwards *	**28 °**	
Tractor tilting leftwards	**35 °**	
Tractor tilting rightwards	**35 °**	
SYNCHRONISATION		
Wear limit - synchroniser rings (measured between synchroniser ring and cone)	**1 mm** (**0.04 in**)	
*) Under very difficult working conditions the oil level must be increased from minimum to maximum / extra so that it can be operated at a tilt angle of 35º. (see operating instructions)		

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Hydrostat

HYDROSTAT PUMP	
Construction	Axial piston pump with variable displacements that is able to shift direction
Control	Electro-hydraulic solenoid valve (proportionally controlled)
Maximum displacements	**110 cm³**
Minimum displacements	**0 cm³**
Direction of rotation (as seen when looking at pump shaft)	left
Number of pistons	9
Maximum viscosity of the transmission oil at connection G **	1000 cSt
Minimum viscosity of the transmission oil at connection G **	10 cSt
"Nominal" feed pressure from system pressure pump at connection G **	**22 bar** (**319.0 psi**)
"Minimum" feed pressure from system pressure pump at connection G **	**18 bar** (**261.0 psi**)
"Maximum" feed pressure from system pressure pump at connection G **	**50 bar** (**725.0 psi**)
Maximum oil flow at connection G ** at "nominal" feed pressure, an oil viscosity of 10 cSt, nominal flushing oil volume, maximum flow rate, 1000 rpm pump speed and a high pressure of 450 bar	**34 l/min** (**9.0 US gpm**)
HYDROSTAT, ENGINE	
Construction	Axial piston motor with fixed swash plate (engine operation and pump operation)
Maximum displacements	**90 cm³**
Direction of rotation (as seen when looking at engine shaft)	Left and right
Number of pistons	7
RELIEF VALVE	
Opening pressure	**440 bar** (**6380.0 psi**)
Setting value for pressure relief valve	**110 l/min** (**29.1 US gpm**) at **480 bar** (**6960.0 psi**) (Δp)
FLUSHING VALVE	
Opening pressure	**14 bar** (±1) **203 psi** (±14.5)
Oil flow at connection G ** for flushing at 200 bar	**29 l/min** (±3) **7.7 US gpm** (±0.8)
SOLENOID VALVE, HYDROSTAT	
Nominal (clocked) supply	**12 V** (±20%)
Clock frequency	**1000 Hz**
Resistance of the coil at **20 °C** (**68 °F**)	**5,5 Ω** (±0.4)
Insulating resistance	> **100 k Ω**
Maximum current	**1,35 A**
**) Feed pressure - input	

TRANSMISSION Continuously Variable Transmission (CVT) - Special tools

⚠ CAUTION ⚠

The operations described in this section can only be carried out with the ESSENTIAL tools indicated by an (X). To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

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List of the special tools required for the work steps in this section:

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Tool number	Name / Use
(X) 380200080	Bracket for transmission cover, right (when using assembly dolly 380000013)
380200081	Clevis for uninstalling the hydrostat
380200082	Grab handle for cover of "reverse gear intermediate wheels"
(X) 380200083	Socket wrench for grooved nut (drive shaft)
(X) 380200084	Socket wrench for hexagon nut (sleeve shaft)
(X) 380200085	Installer for fitting the cassette seal ring - drive shaft, front wheel drive
(X) 380200086	Installer for seal ring in cover - summing planetary gears
380200087	Installer for seal ring - sleeve shaft, clutch A/B
380200089	Installer for seal ring - sleeve shaft / PTO shaft
(X) 380000013*	Assembly dolly
380000258	Grab handle for installers
380002552	Installer for seal ring - sleeve shaft
380001750	Installer for seal ring - sleeve shaft
380001744	Installer for seal ring - sun gear
380000015	Assembly bush and supporting pin (for fitting the Belleville spring washers)

*) The assembly dolly 380000013 is required in connection with the bracket 380200080 for removing the hydrostat unit if the transmission has not been uninstalled from the vehicle!

List of commercially available tools that can be obtained from specialized stores:

Name	Use
"Pivotable" assembly block	To dismantle and reassemble the transmission
Socket (key width 70 mm)	For hexagon nut - sleeve shaft
Ring bolt, M10x1.25 (2 units)	For disassembling / assembling the separator plate

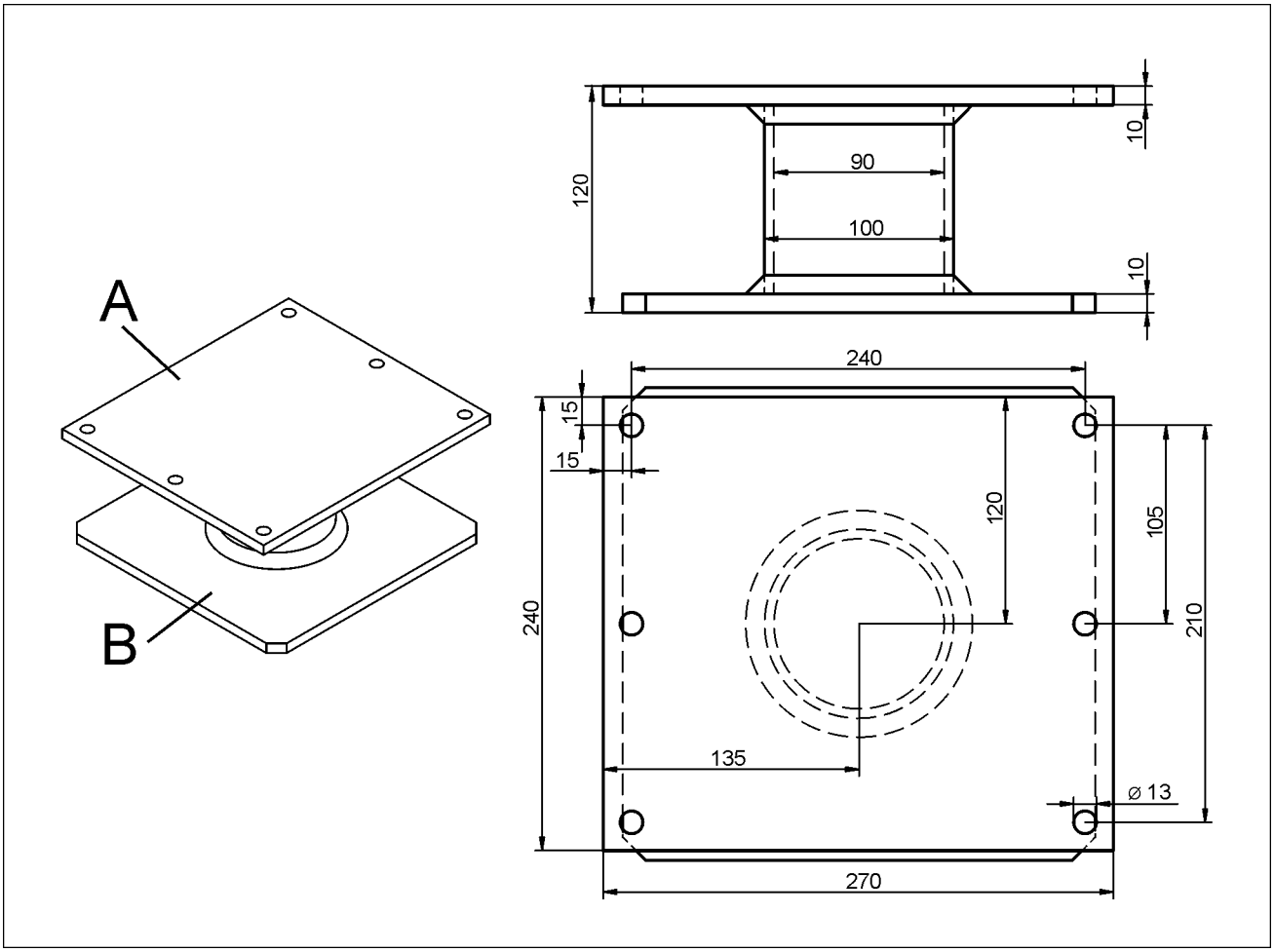
ATTENTION: *The assembly block must be licensed for a minimum bearing load of* ***800 kg*** *(****1764 lb****)!*

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Tools that can be produced in the workshop:

Name	Use
Adapter plate (Figure **1**)	To clamp the transmission onto the assembly block

Adapter plate that can be made by the workshop to clamp the transmission onto a commercially available pivotable assembly block. The hole pattern of the flange surface **(A)** corresponds to the hole pattern on the transmission casing. (cover for reverse gear intermediate wheels) The hole pattern of the flange surface **(B)** is to be taken from the existing assembly block.
Material: S235JR in accordance with DIN 10025

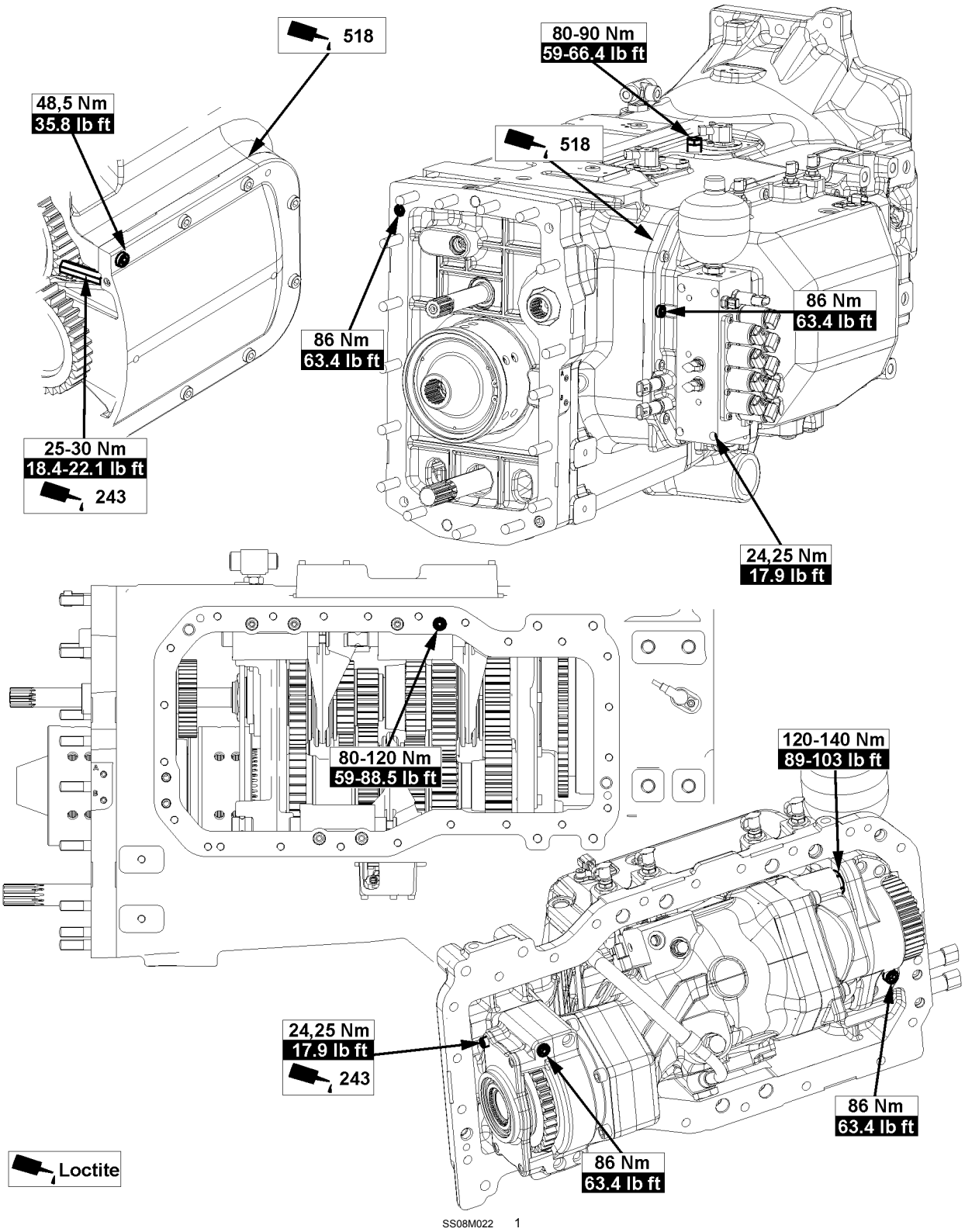


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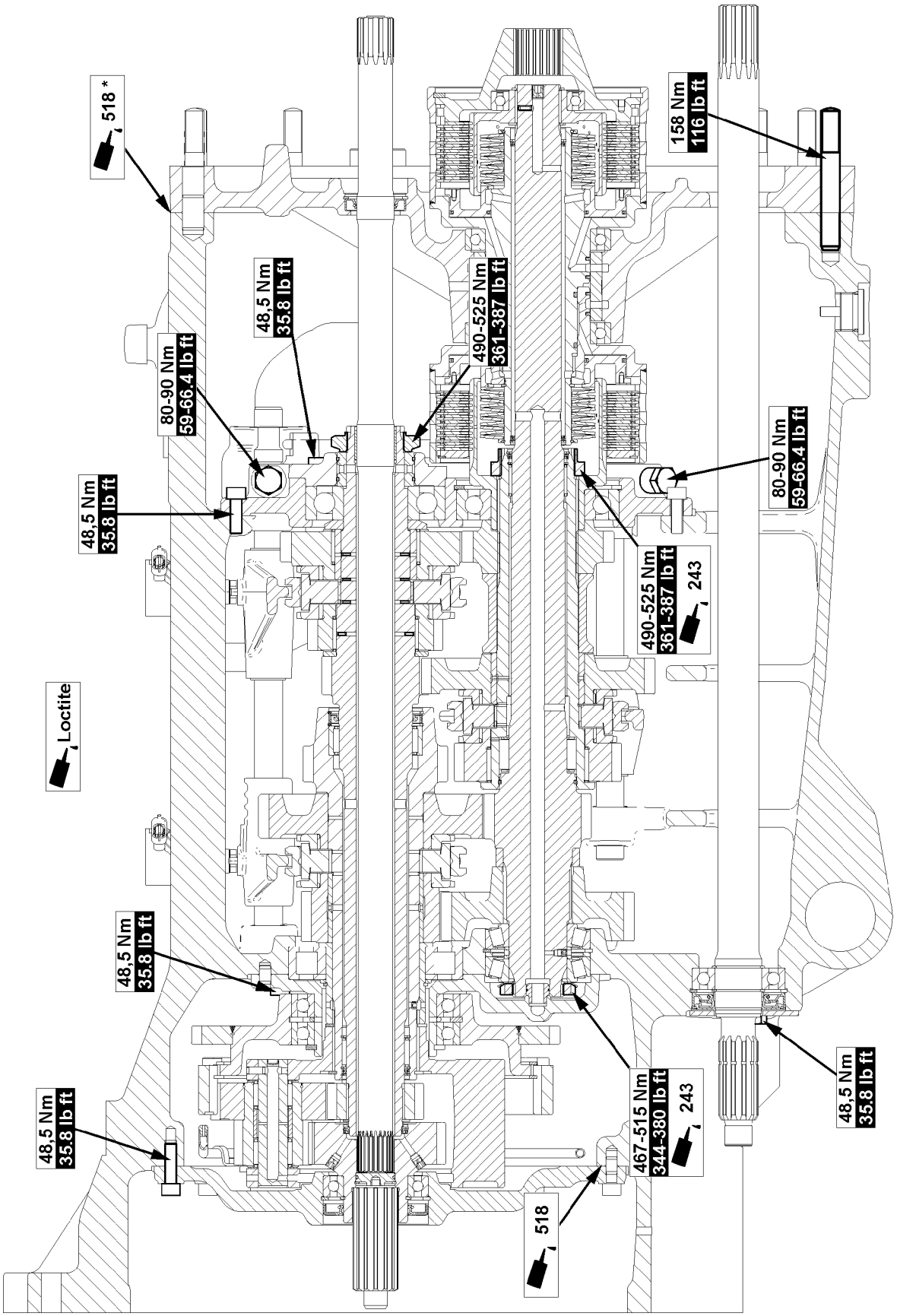
TRANSMISSION Continuously Variable Transmission (CVT) - Torque , Locking and sealing material

Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

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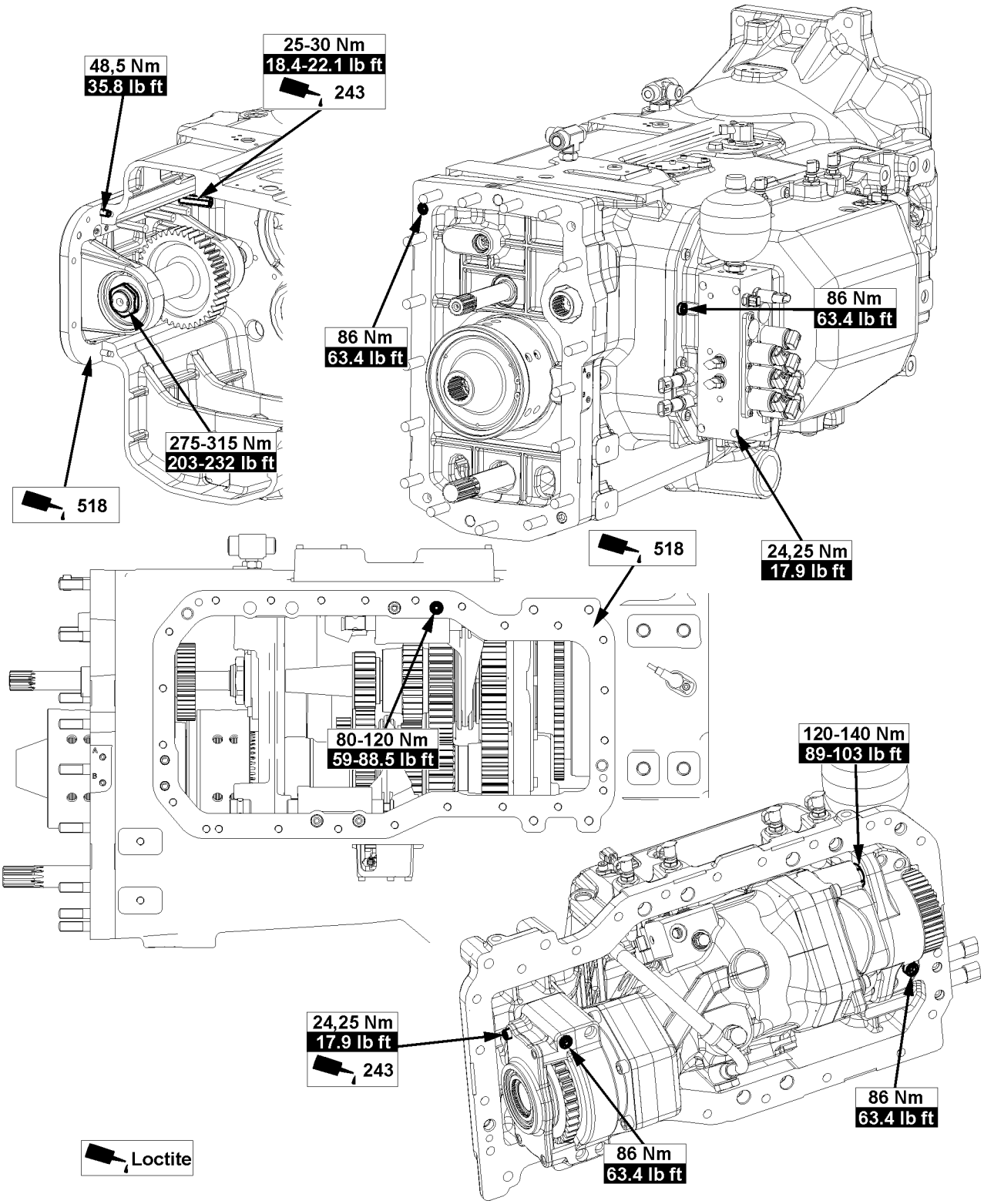
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* Observe the mounting instruction - see **Clutch - Install ("A" and "B") (C.20.G)**.

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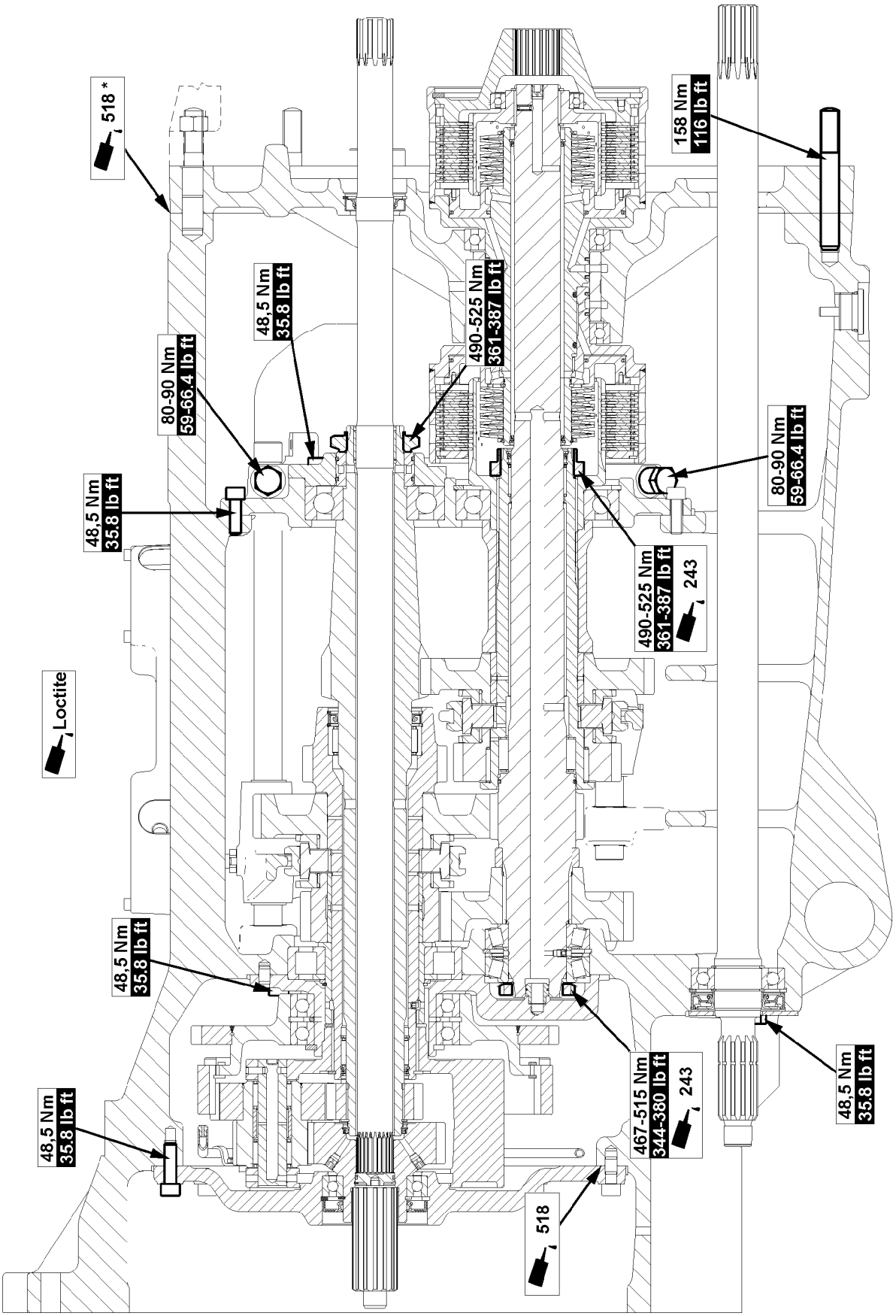
TRANSMISSION Continuously Variable Transmission (CVT) - Torque , Locking and sealing material

Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox



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SS08M023 2

* Observe the mounting instruction - see **Clutch - Install ("A" and "B") (C.20.G)**.

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Hydrostat - General specification

Pump specifications

Displacement	**0 - 110 cm³/rev**
Number of pistons	9
Maximum torque at pump shaft (Maximum 5 seconds)	**840 Nm**
Hydrostatic unit drive ratio	1:4
Hydrostatic pump rotation direction as viewed from (pump) shaft drive end	Counter clockwise
Minimum engine speed	**800 RPM**
Maximum engine speed	**2400 RPM**
Minimum continuous pump speed	**500 RPM**
Maximum continuous pump speed	**3100 RPM**

Control signal specification

Control signal operating range	**400 - 1200 mA**
Maximum current	**1350 mA**
Coil resistance at **25 °C** ambient temperature	**5.5 ±6% Ω**
Base frequency PWM	**1k Hz**

Motor specifications

Displacement	**90 cm³/rev**
Number of pistons	7
Maximum torque at motor shaft (maximum 5 seconds)	**688 Nm**
Maximum continuous motor speed	**3785 RPM**

Boost flow conditions

Nominal pressure	**22 bar** (**319.0 psi**)
Minimum pressure (full function)	**18 bar** (**261.0 psi**)
Maximum pressure	**50 bar** (**725.0 psi**)
Maximum boost flow at nominal boost pressure, oil viscosity 10 cSt. nominal flush flow, maximum pump displacement, pump speed at **1000 RPM** high pressure **450 bar**.	**34 l/min** (**9.0 US gpm**)

Relief valve setting

Relief valve setting	**110 l/min** (**29.1 US gpm**) @ **480 bar** (**6960.0 psi**)
Crack differential pressure	**440 bar** (**6380.0 psi**)
Maximum continuous operating time (valve opened)	5 seconds

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TRANSMISSION Continuously Variable Transmission (CVT) - Static description

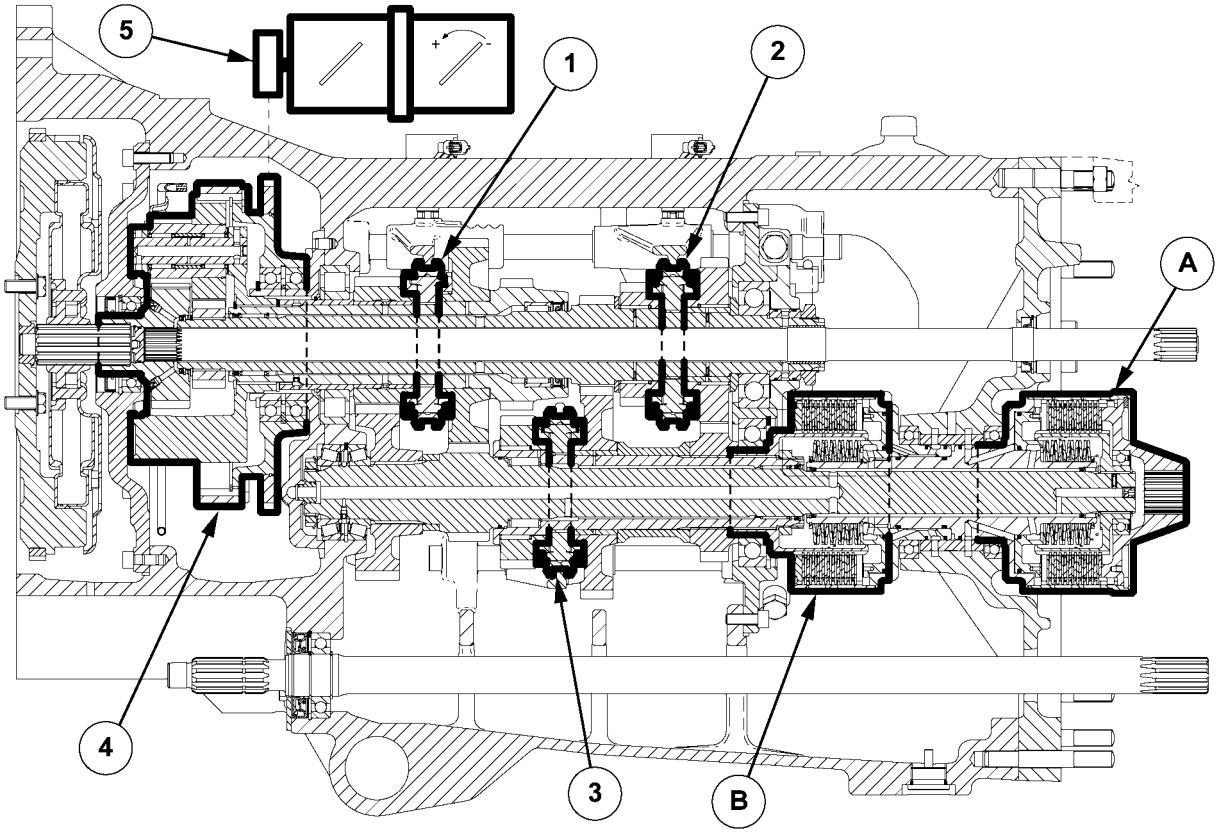
Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

General description of transmission

The CVT transmission is a hydro-mechanical, electronically controlled continuously variable transmission. The transmission consists of 4 forwards and 2 reverse transmission ratio levels that are shifted using the synchroniser units F1/F3 **(1)** F4/R2 **(2)** F2/R1 **(3)**. The transmission input speed is continuously changed in the summing planetary gear **(4)**, that is coupled with a hydrostatic motor **(5)**. The driving power is delivered alternately via clutch **(A)** and clutch **(B)** according to the transmission ratio level.
A **50 km/h** transmission and a **40 km/h** (ECO) transmission are optionally available.

Some of the main advantages of the CVT transmission are:

- Variable power transmission instead of fixed transmission ratios
- Engine speed and vehicle speed are decoupled. This allows the engine and power transmission to work as efficiently as possible according to the current conditions (e.g. with partial loads)
- A stationary control mode ("powered zero") is available



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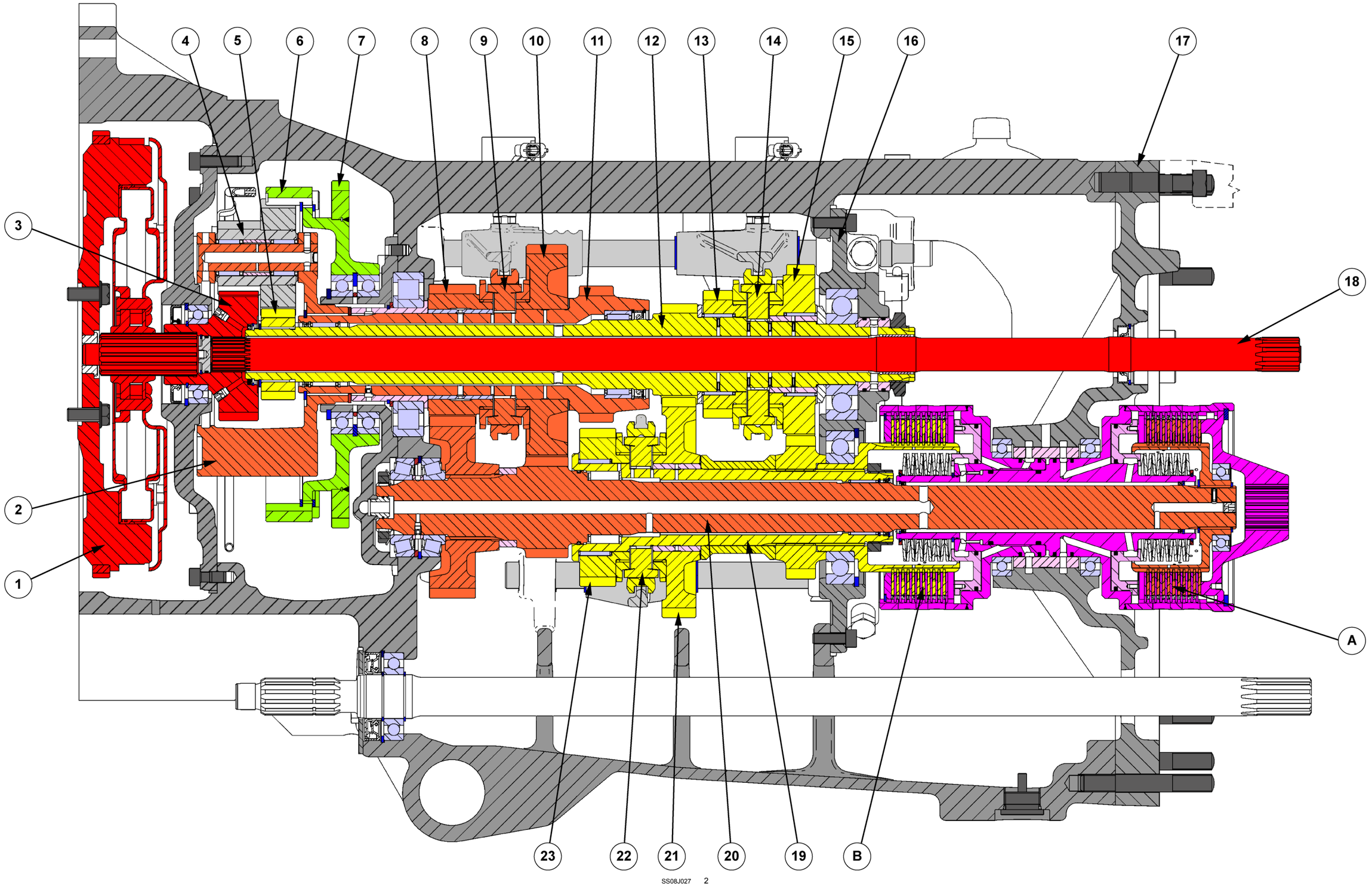
Sectional view of the transmission

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Parts			
A	Clutch A	B	Clutch B
1	Flywheel with hydro-damper	2	Planetary carrier
3	Sun gear	4	Planetary gear
5	Sun gear	6	Ring gear
7	Gear wheel	8	Gear wheel, F1
9	Synchroniser unit F1/F3	10	Gear wheel, F3
11	Input sleeve shaft F1/F3	12	Input sleeve shaft F4/R2
13	Gear wheel, R2	14	Synchroniser unit F4/R2
15	Gear wheel, F4	16	Cover
17	Separator plate	18	PTO shaft
19	Output sleeve shaft F2/R1 (clutch B)	20	Output shaft (clutch A)
21	Gear wheel, F2	22	Synchroniser unit F2/R1
23	Gear wheel, R1		

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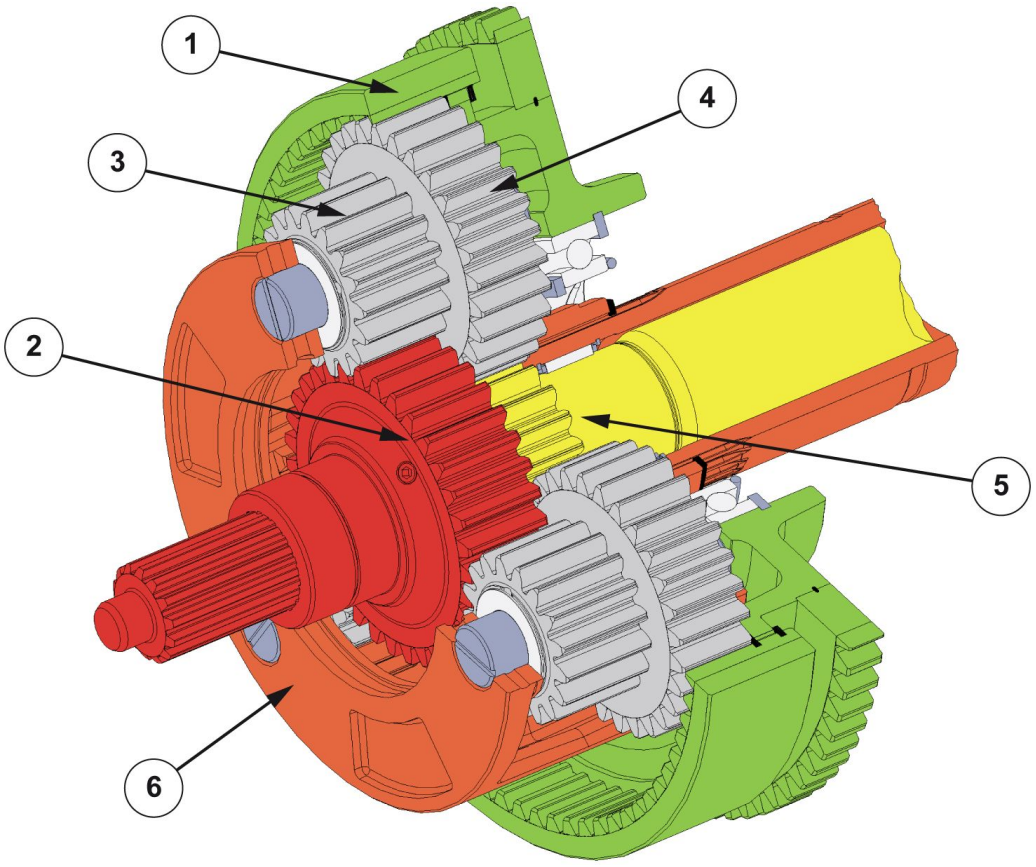
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Summing planetary gear

The summing planetary gear is a "4 shaft planetary transmission" with two input shafts and two output shafts. The sun gear **(2)** and the ring gear **(1)** are in a figurative sense the two input shafts. The planetary carrier **(6)** and the sun gear **(5)** are each permanently connected to an output shaft. The ring gear **(1)** is powered directly by the hydrostatic motor via a spur wheel. The sun gear **(2)** is powered directly by the motor. Via the three twin planetary gears **(3)** the driving power is transferred to the relevant output shaft either via the planetary carrier **(6)** or via the sun gear **(5)**.
Using these two output options at the summing planetary gear, together with the downstream synchronizer units and clutches, the four forwards transmission ratio ranges and the two reverse transmission ratio ranges can be attained continuously variably.
As a result, all of the requirements such as high degree of tractive force, high final speed, the necessary transmission-ratio spread and an excellent degree of efficiency are attained.



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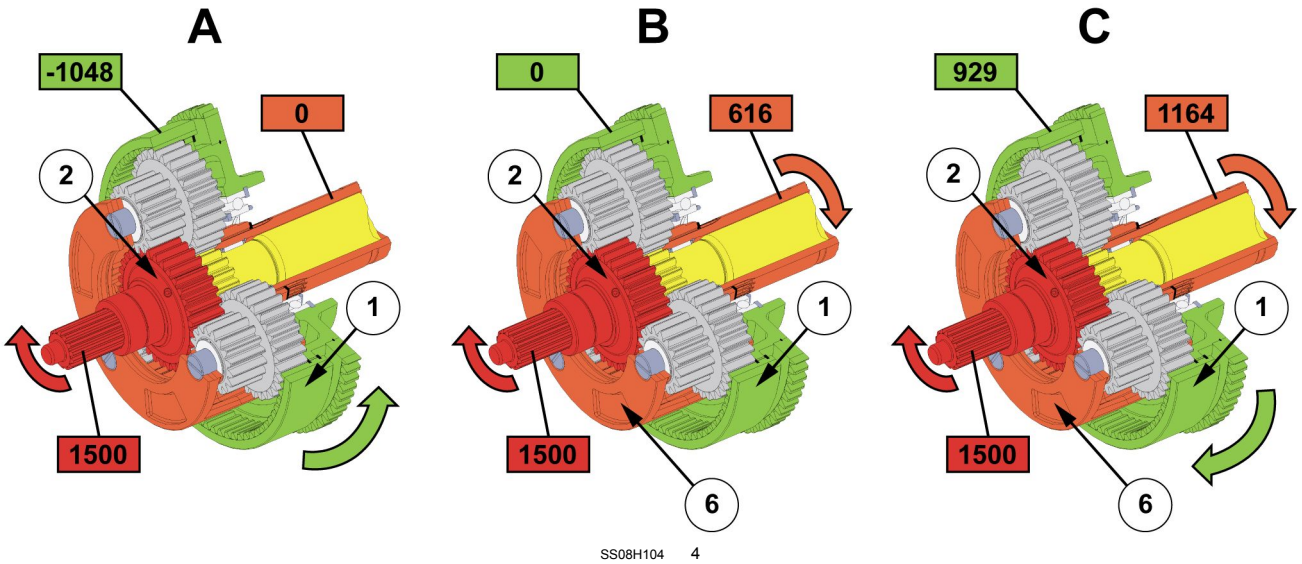
View of summing planetary gear

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Summing planetary gear - functional principle

The following diagrams illustrate the functional principle of the summing planetary gear using three distinctive transmission ratio ranges for driving operation. (Stationary control mode ("powered zero"), driving operation with 0% hydrostatic portion and driving operation with 100% hydrostatic portion) The speeds given correspond to the mechanical shifting position F1 at an engine speed of 1500 rpm.

- Stationary control mode **(A)**
  The speed of the sun gear **(2)** is 1500 rpm. The rotational direction of the ring gear **(1)** is opposite to that of the sun gear and is maintained at 1048 rpm via the hydrostatic motor. In this transmission ratio range the output shafts on the summing planetary gear come to a halt.
- Hydrostatic portion is 0% **(B)**
  The speed of the sun gear **(2)** is 1500 rpm. The adjustment angle of the swash plate in the hydrostatic pump is 0°, which causes the ring gear **(1)** to come to a halt. In this transmission ratio range there is a speed of 616 rpm at the planetary carrier **(6)**.
- Hydrostatic portion is 100% **(C)**
  The speed of the sun gear **(2)** is 1500 rpm. The rotational direction of the ring gear **(1)** is the same as that of the sun gear and is maintained at 929 rpm via the hydrostatic motor. In this transmission ratio range there is a speed of 1164 rpm at the planetary carrier **(6)**.



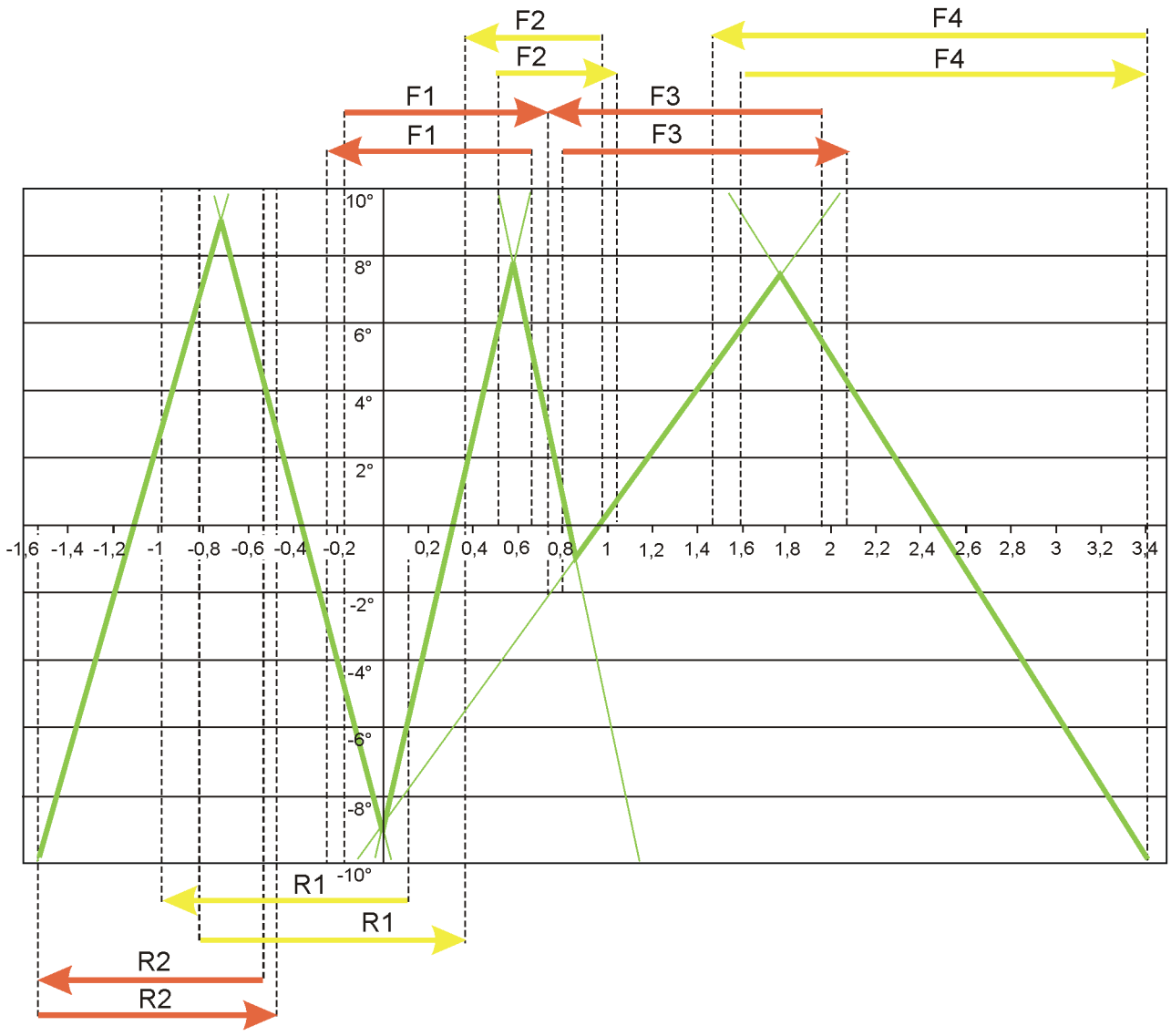
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Summing planetary gear - functional principle

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Hydrostat swing angle diagrams

The following two diagrams illustrate the relationship between the swing angle of the swash plate in the hydrostat and the transmission ratio/travelling speed at the rated engine speed.



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Diagram showing swing angle - transmission ratio

Clutch "A"
Clutch "B"
Swing angle

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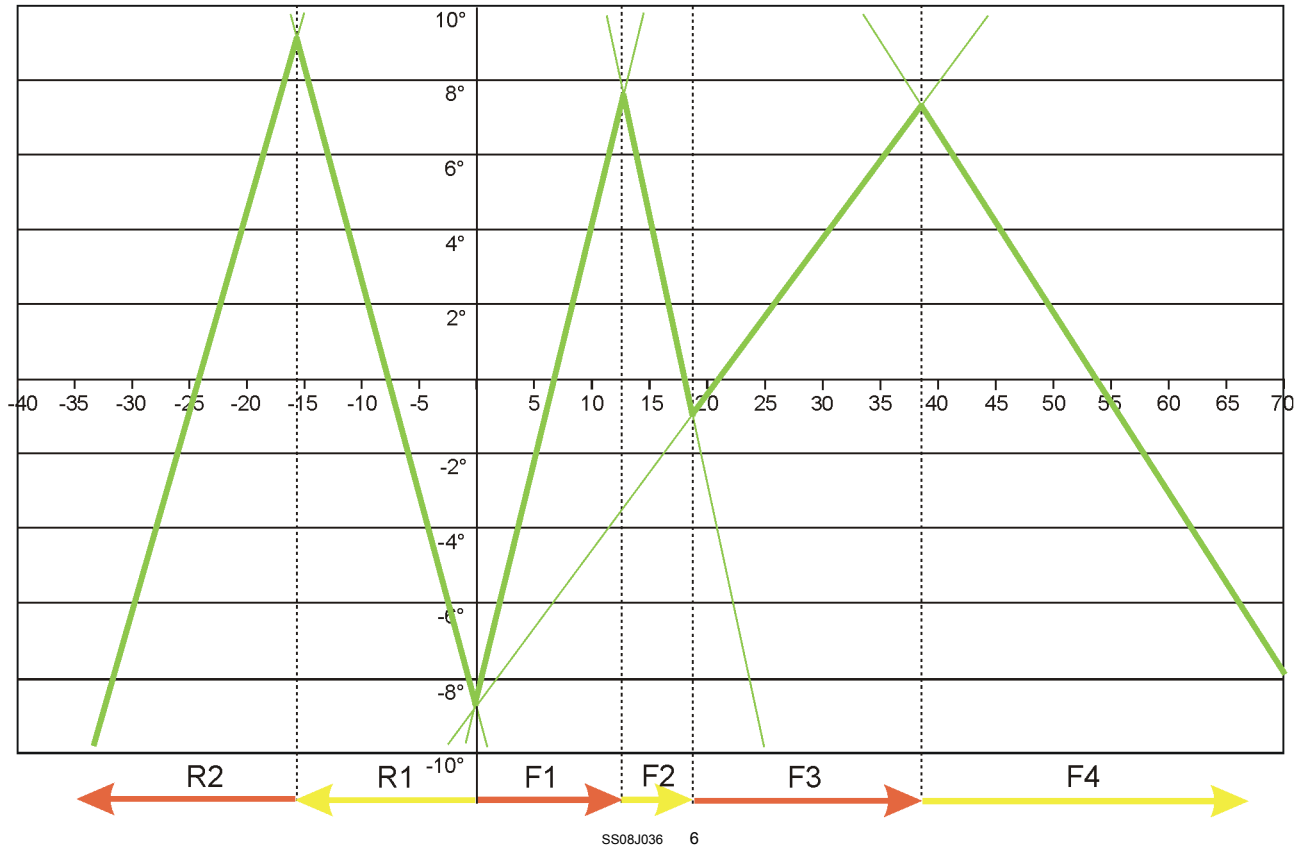


Diagram showing swing angle - travelling speed

Clutch "A"
Clutch "B"
Swing angle

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TRANSMISSION Continuously Variable Transmission (CVT) - Static description

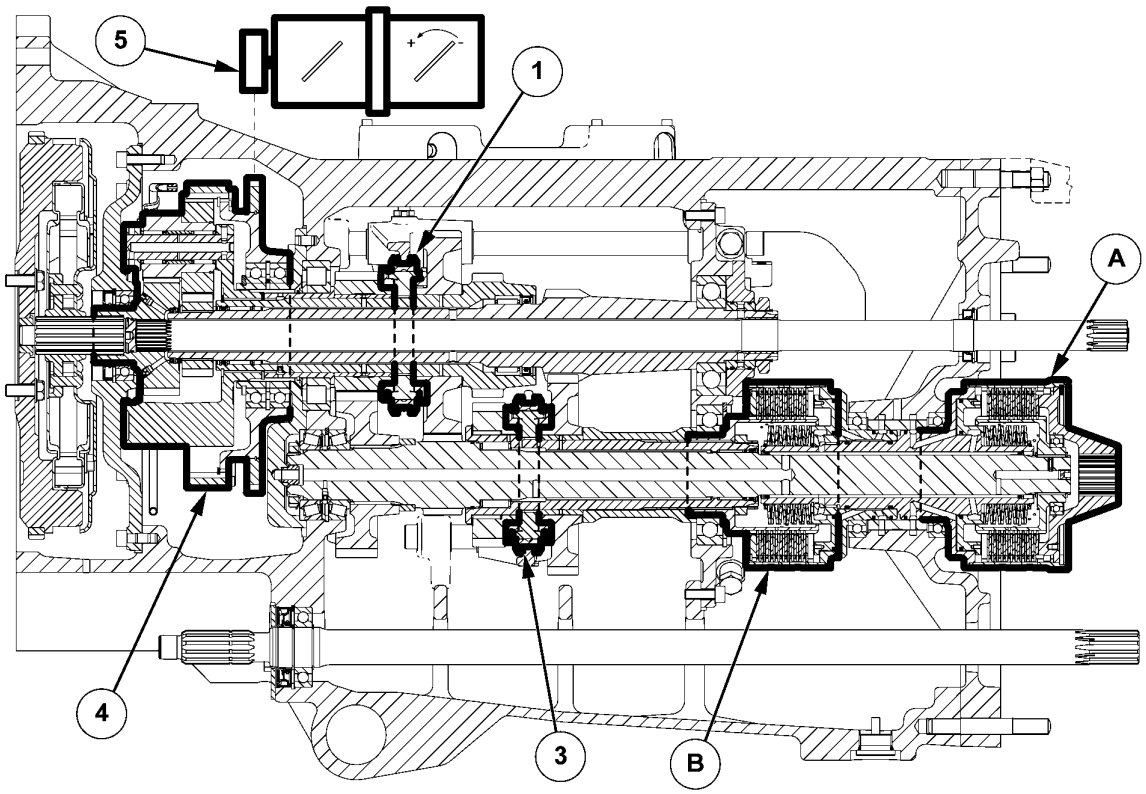
Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

General description of the transmission

The CVT transmission is a hydro-mechanical, electronically controlled continuously variable transmission. It comprises 3 forwards and 1 reverse transmission ranges that are shifted via the synchronisers F1/F3 **(1)** and F2/R1 **(3)**. The transmission input speed is continuously adjusted in the summing planetary gear **(4)** that is coupled with a hydraulic motor **(5)**. Depending on the level of the transmission, the driving power is provided by clutch **(A)** or clutch **(B)**. Ein **35 km/h** transmission and a **40 km/h** transmission are optionally available.

Some of the main advantages of the CVT transmission are:

- Variable power transmission instead of fixed gears.
- Engine speed and vehicle speed are decoupled. This allows the engine and power transmission to work as efficiently as possible according to the current conditions of use (e.g. with partial loads).
- A stationary control mode ("powered zero") is available.



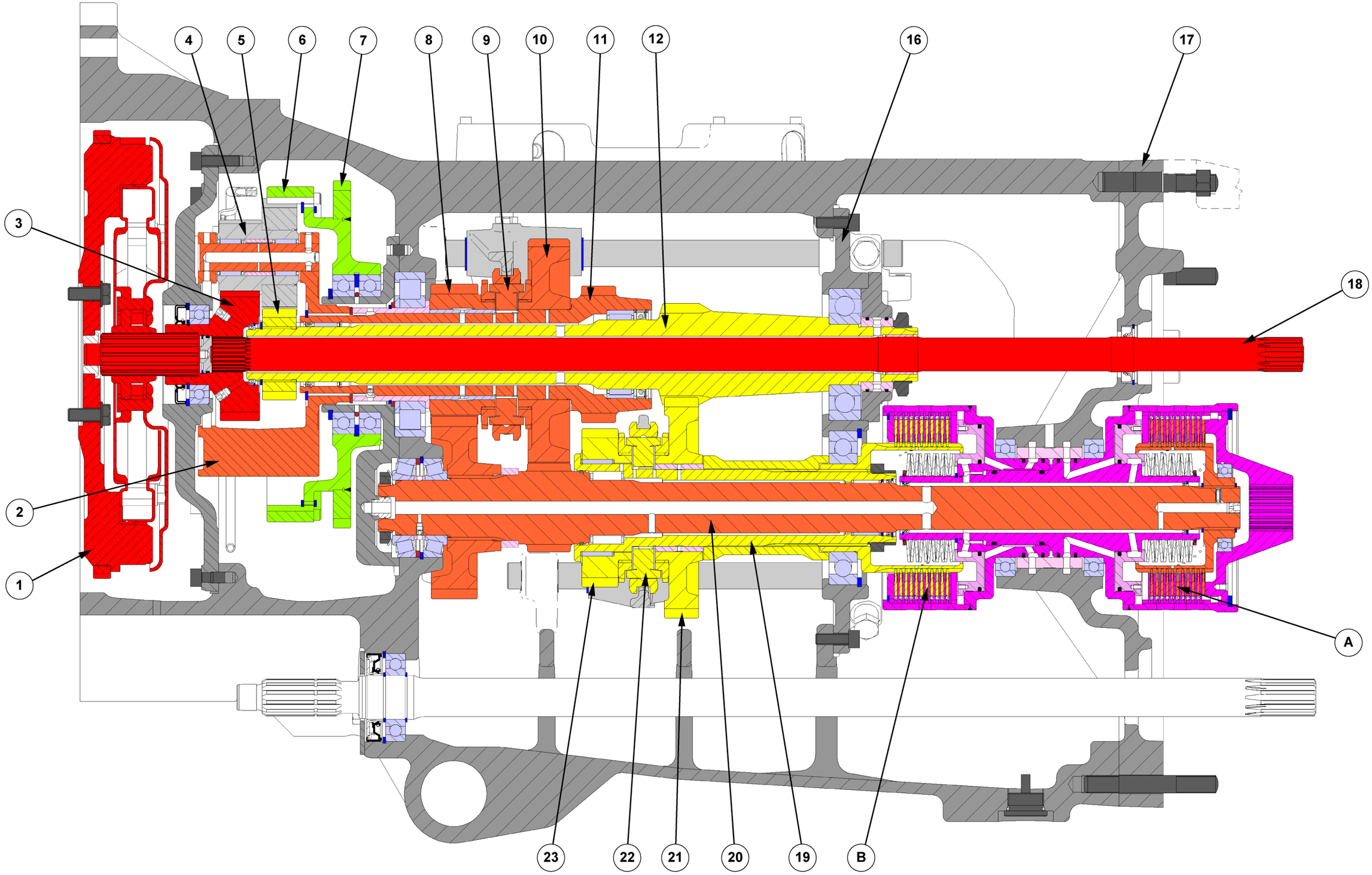
SS08M128 1

Cross-sectional view of the transmission

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Parts			
A	Clutch A	B	Clutch B
1	Flywheel with hydraulic damper	2	Planetary carrier
3	Sun gear	4	Planetary gear
5	Sun gear	6	Ring gear
7	Gear wheel	8	Gear, F1
9	Synchroniser F1/F3	10	Gear, F3
11	Input sleeve shaft F1/F3	12	Input sleeve shaft
		16	Cover plate
17	Spacer ring	18	Power take-off
19	Output sleeve shaft F2/R1 (clutch B)	20	Output shaft (clutch A)
21	Gear, F2	22	Synchroniser F2/R1
23	Gear, R1		

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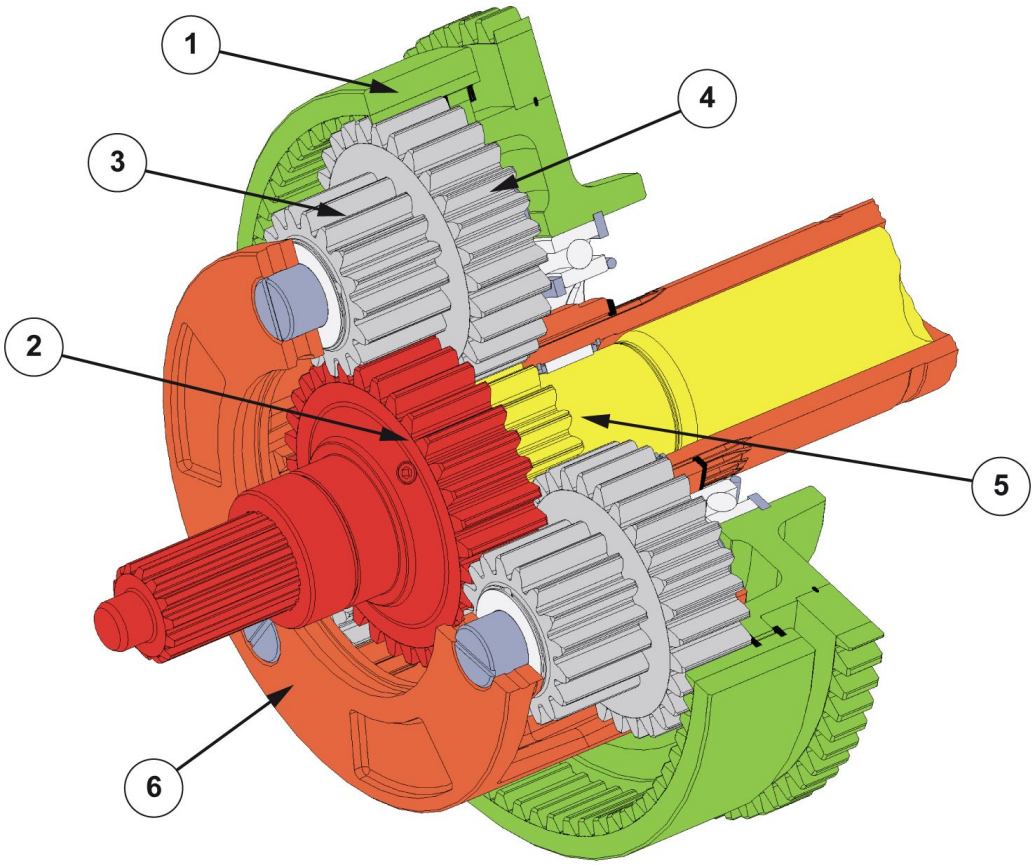
SS08M130 2

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Summing planetary gear

The summing planetary gear is a "four shaft planetary gear drive" with two input shafts and two output shafts. The sun gear **(2)** and the ring gear **(1)** are in a figurative sense the two input shafts. The planetary carrier **(6)** and the sun gear **(5)** are each permanently attached to an output shaft. The ring gear **(1)** is powered directly by the hydrostatic motor via a spur wheel. The sun gear **(2)** is powered directly by the combustion engine. The driving power **(3)** is transferred from the three twin planetary gears to the relevant output shaft either via the planetary carrier **(6)** or via the sun gear **(5)**.
Four forwards and two reverse transmission ranges can be continuously realised with the aid of the summing planetary gear's two output shafts in connection with the downstream synchronisers and clutches.
As a result all of the requirements such as a high degree of tractive force, high final speed, the necessary transmission spread and an excellent degree of efficiency are attained.



SS08H103 3

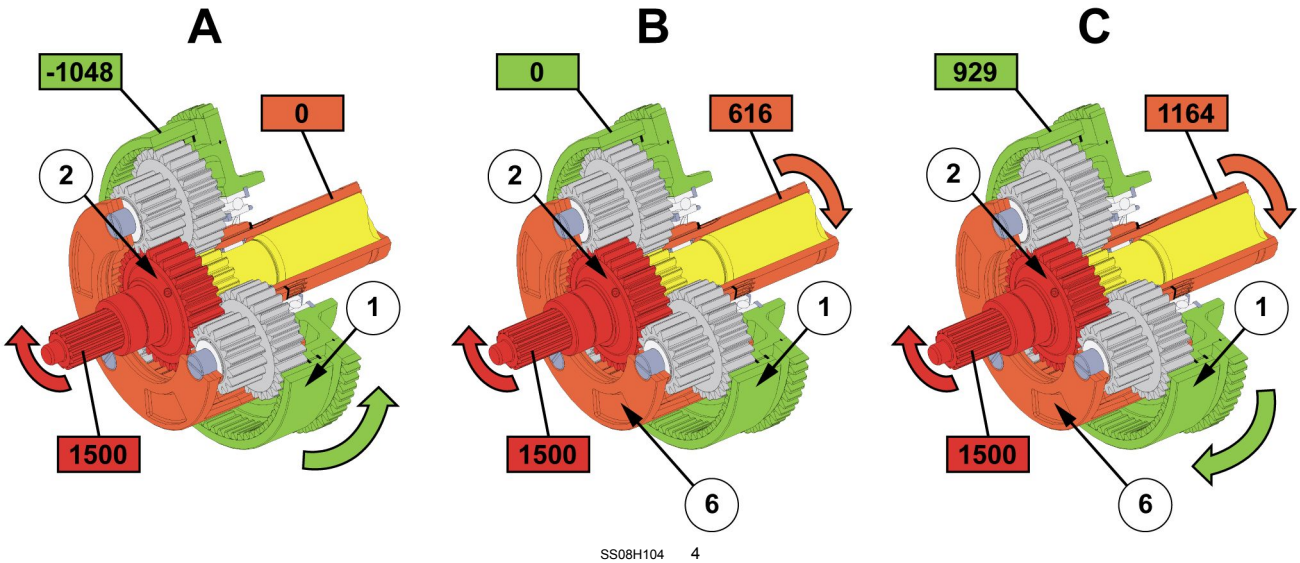
View of the summing planetary gear

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Summing planetary gear - functional principle

The following diagrams illustrate the functional principle of the summing planetary gear using three transmission ranges. (Stationary control mode ("powered zero"), driving operation with 0% hydrostatic portion and driving operation with 100% hydrostatic portion) The resulting speeds correspond to the mechanical shifting position F1 at an engine speed of 1500 rpm.

- Stationary control mode **(A)**
  The speed of the sun gear **(2)** is 1500 rpm. The rotational direction of the ring gear **(1)** is opposite to that of the sun gear and is maintained at 1048 rpm by means of the hydrostatic motor. In this transmission ratio range the output shafts on the summing planetary gear come to a halt.
- Hydrostatic portion is 0% **(B)**
  The speed of the sun gear **(2)** is 1500 rpm. The swing angle of the swash plate in the hydrostatic pump is 0°, which causes the ring gear **(1)** to come to a halt. In this transmission ratio range the planetary carrier **(6)** has a speed of 616 rpm.
- Hydrostatic portion is 100% **(C)**
  The speed of the sun gear **(2)** is 1500 rpm. The rotational direction of the ring gear **(1)** is the same as that of the sun gear and is maintained at 929 rpm by means of the hydrostatic motor. In this transmission ratio range the planetary carrier **(6)** has a speed of 1164 rpm.



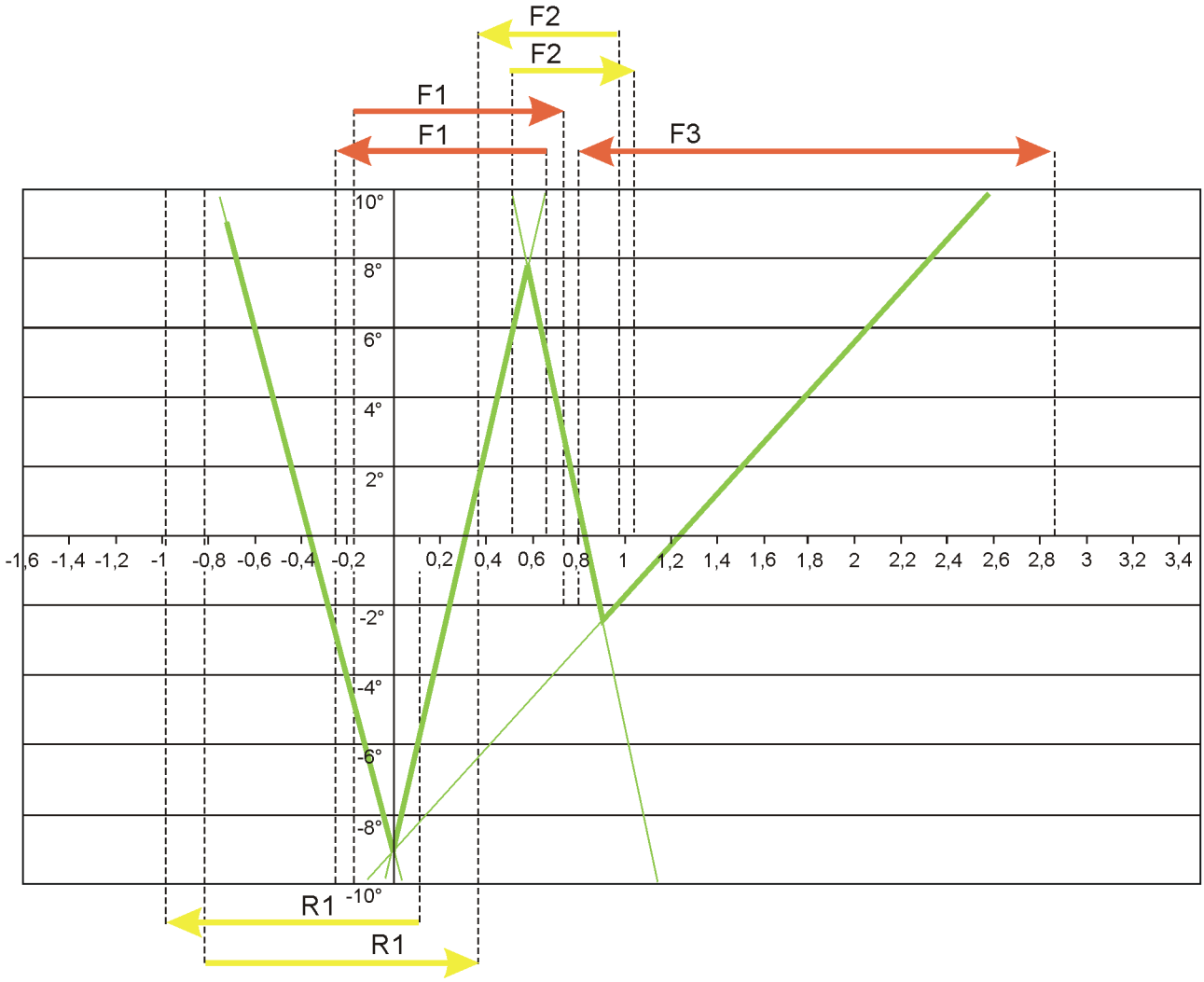
SS08H104 4

Summing planetary gear - functional principle

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Swing angle diagram of the hydrostat

The following two diagrams show the relationship between the swing angle of the swash plate in the hydrostat and transmission ratio ranges/ travelling speed at the rated engine speed.

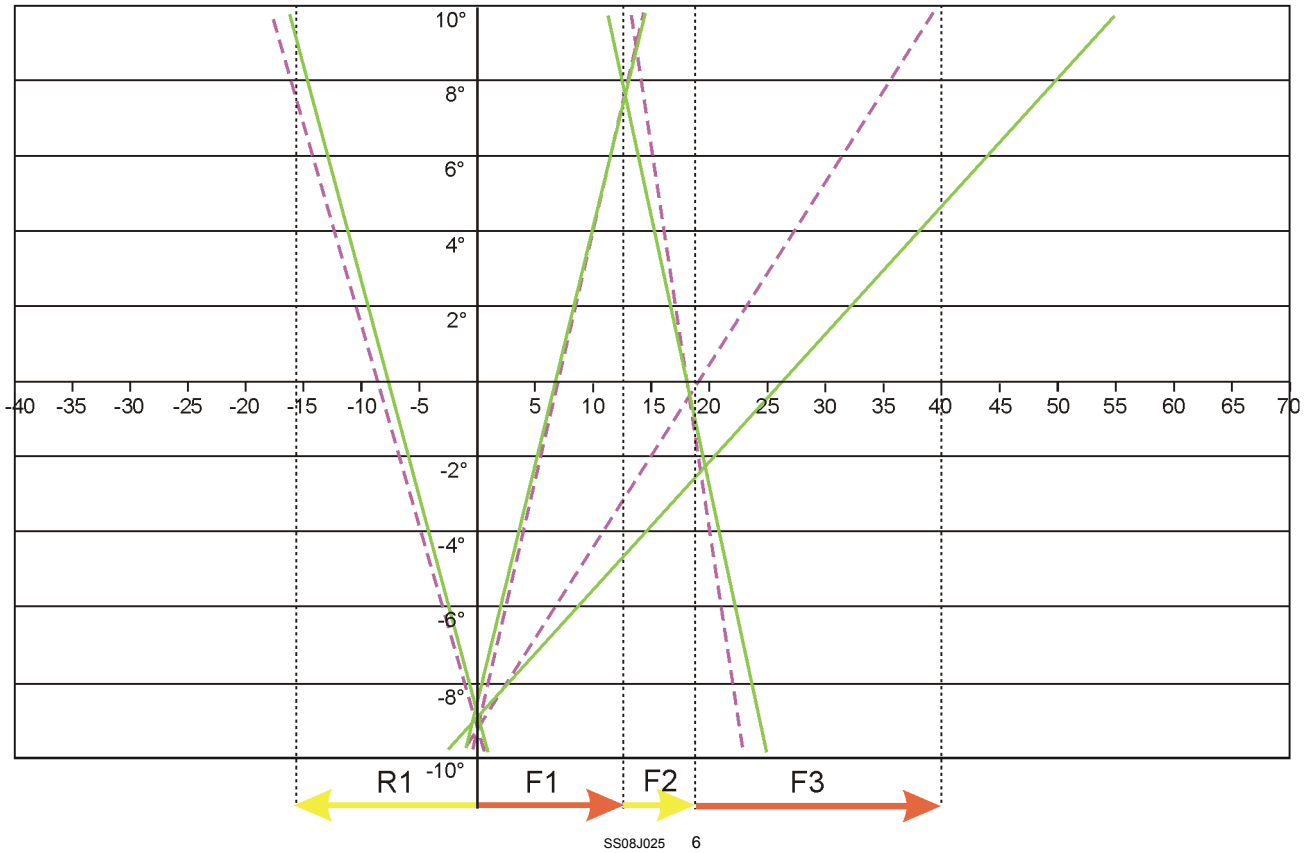


SS08M129 5

Relationship between swing angle and transmission ratio ranges

Clutch A
Clutch B
Swing angle

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Relationship between swing angle and travelling speed

Clutch A
Clutch B
Swing angle

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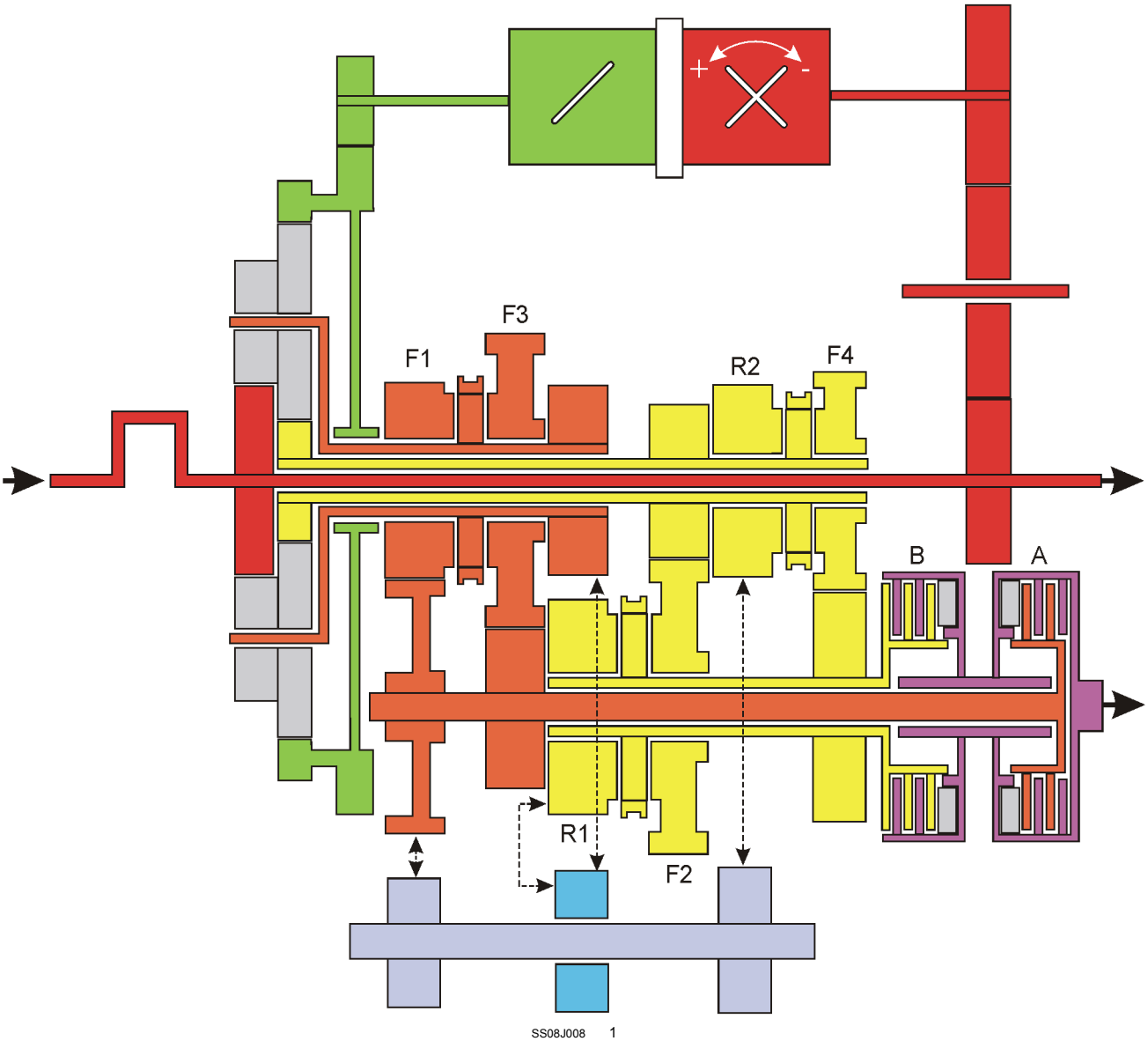
TRANSMISSION Continuously Variable Transmission (CVT) - Functional diagram

Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

The following diagrams show the power flow of the transmission in the individual mechanical gears and in the stationary control (powered zero) and neutral position / park position operating modes.

Colour coding

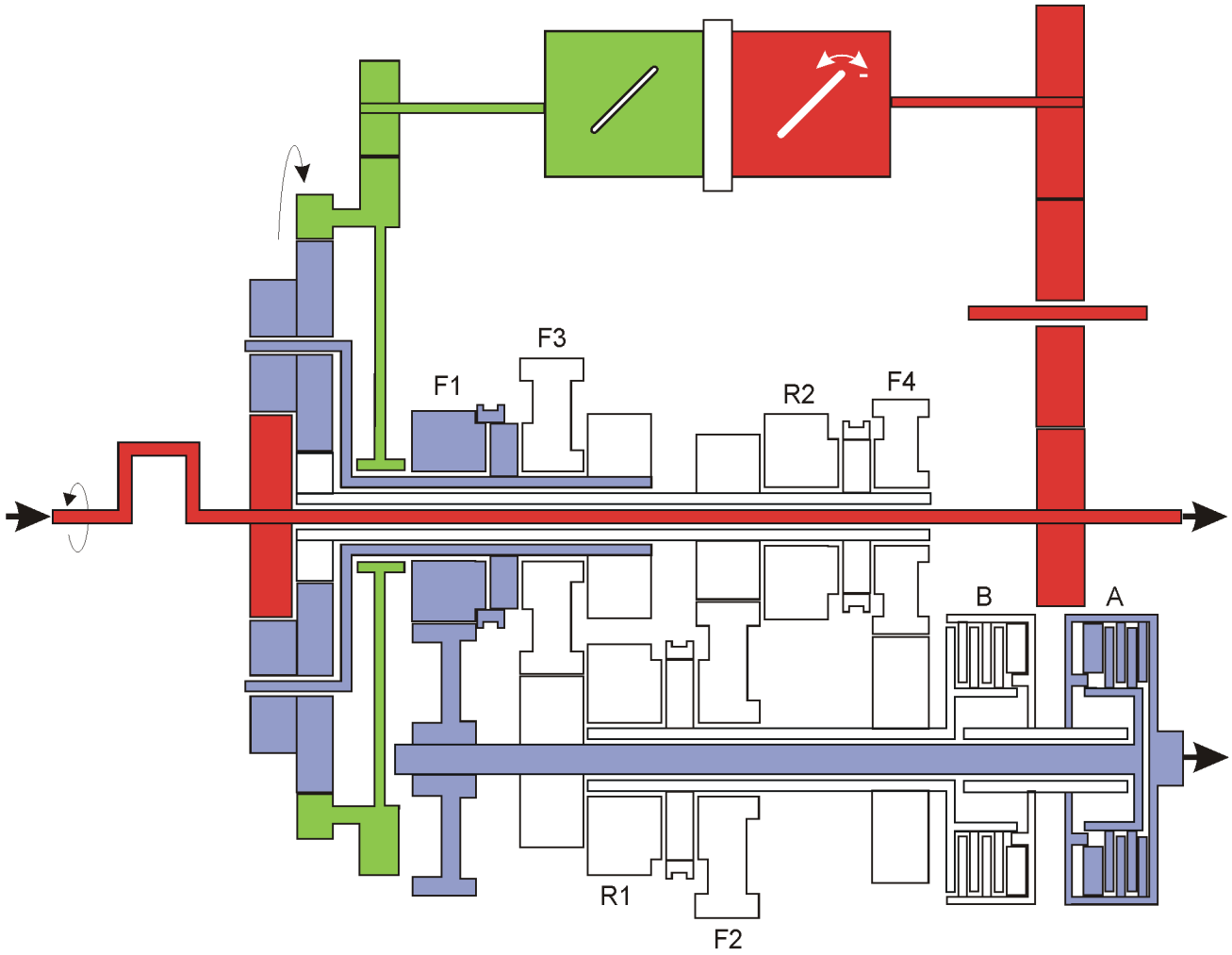
Transmission input and hydrostat drive	Hydrostat output - ring gear summing planetary gears
Power train summing planetary gear / planetary carrier - clutch A	Power train summing planetary gear / sun gear - clutch B
Power flow	



Neutral position / park position

In the neutral position and the park position the transmission is not engaged. No mechanical gear is engaged and the clutches A / B are open. If the tractor rolls off inadvertently in the neutral position, the speed differences arising as a result are equalized by the hydrostat. This means that when shifting out of the neutral position the relevant gear can be engaged again at the synchronous speed.

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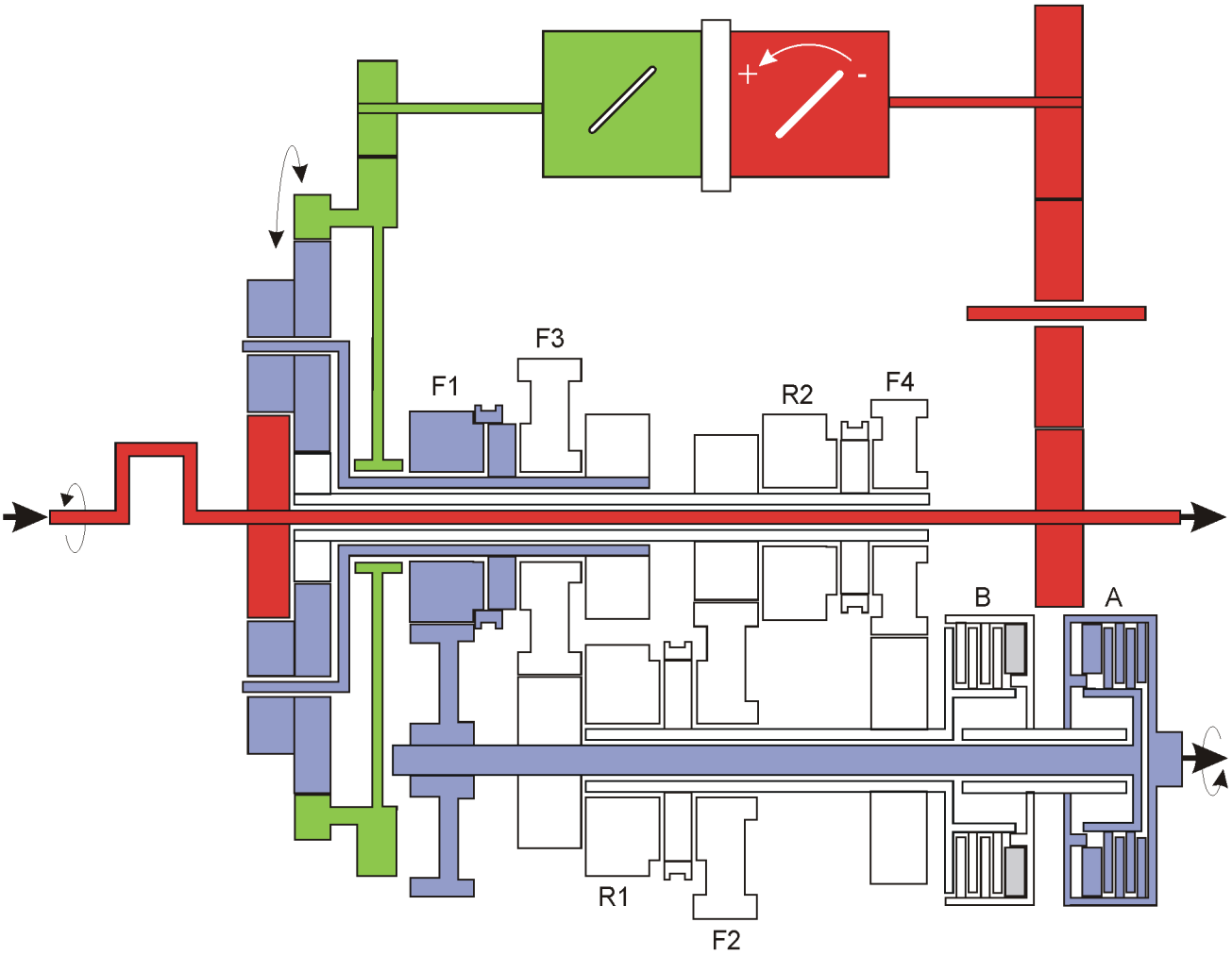


SS08J010 2

Stationary control mode (powered zero)

This diagram shows the stationary control (powered zero) at the gear level F1. The gear F1 is engaged and the clutch A is closed. (Transmission is engaged) The transmission control holds the tractor in a stationary position via the hydrostat. The stationary control mode is possible in gears F1 and R1. This depends on which direction of travel is selected.

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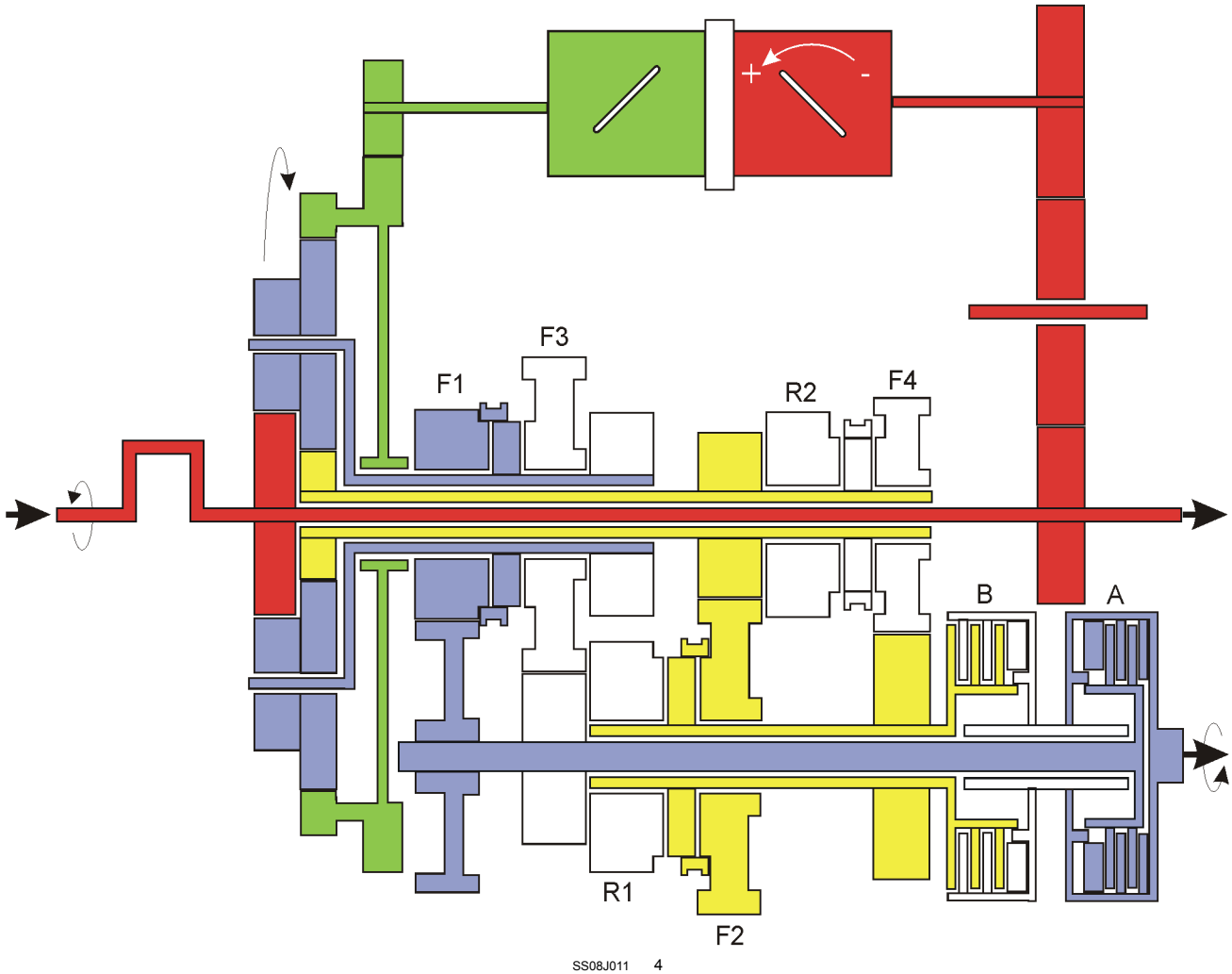


SS08J009 3

Gear level F1

The gear F1 is engaged. The power train of the summing planetary gear / planetary carrier via the gear F1 to clutch A is engaged. The swivel angle of the swash plate in the hydrostat is adjusted in the direction of the positive swivel angle **(+)** in order to increase the travelling speed.

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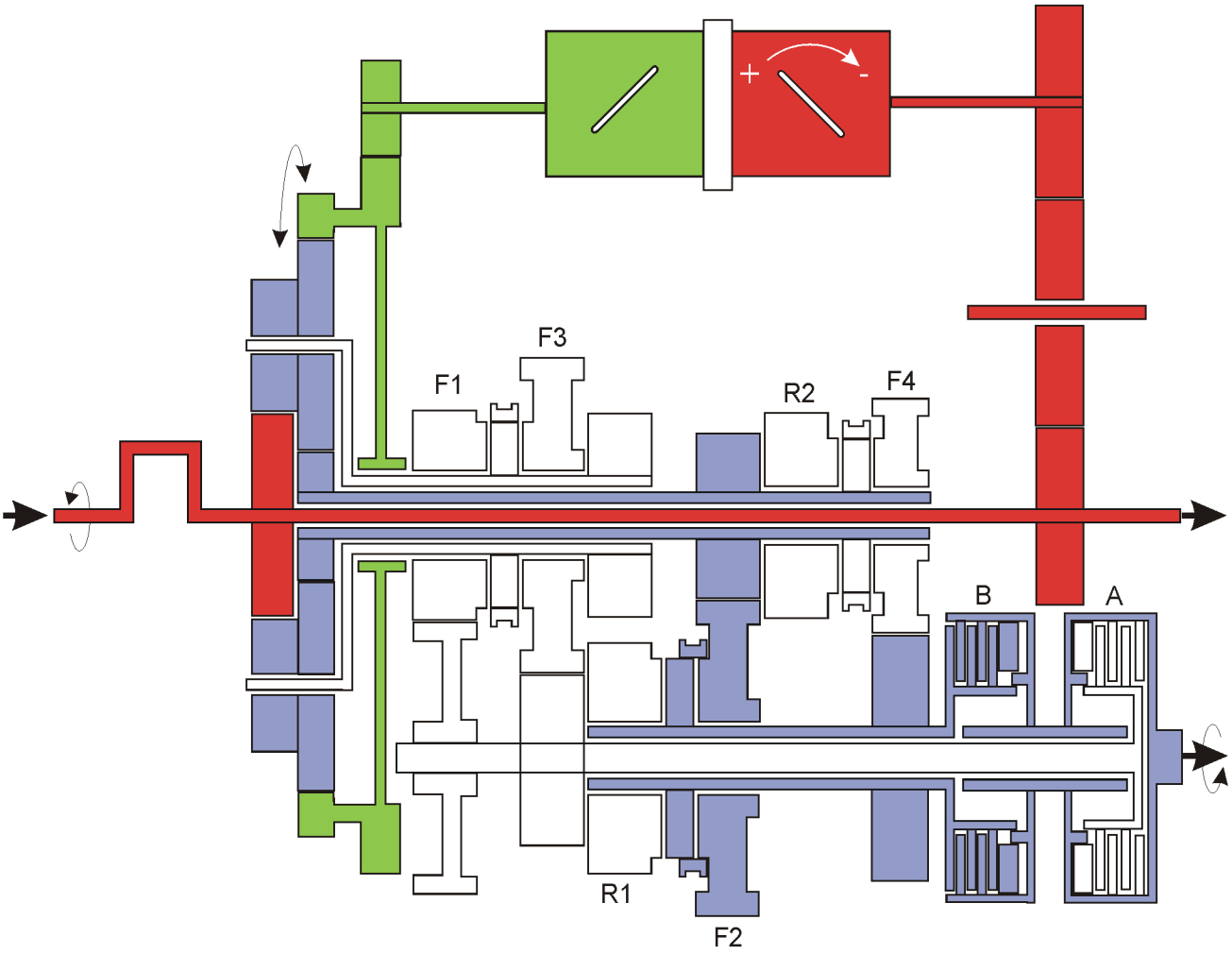


SS08J011 4

Preparing to shift gear from F1 to F2

The gear F2 is engaged during acceleration at a defined swivel angle, shortly before the shift point F1 - F2 is reached. This creates the pre-conditions that by opening clutch A and closing clutch B the power train is engaged via gear F2.

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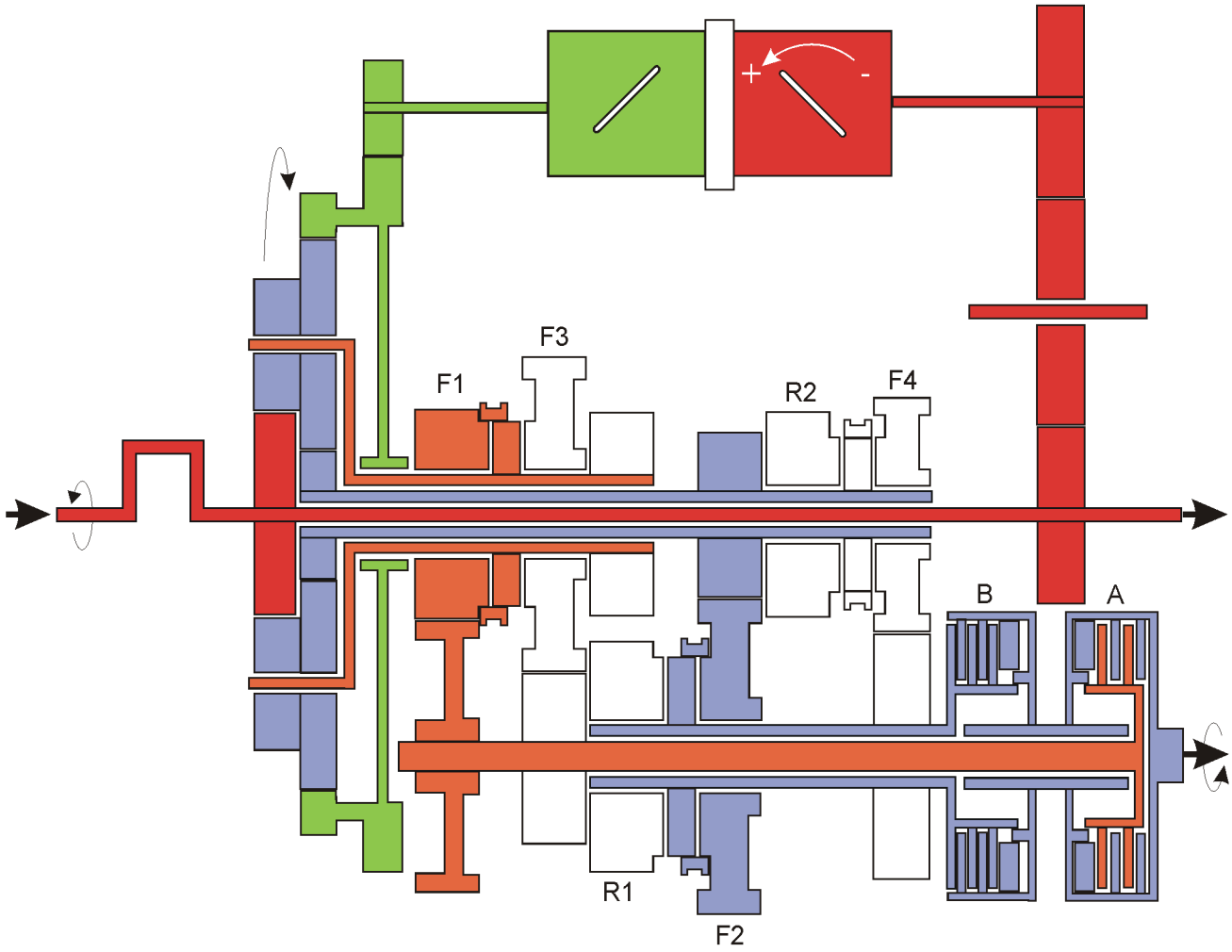


SS08J012 5

Gear level F2

The gear F2 is engaged. The power train of the summing planetary gear / sun gear via the gear F2 to clutch B is engaged. The swivel angle of the swash plate in the hydrostat is adjusted in the direction of the negative swivel angle **(-)** in order to increase the travelling speed.

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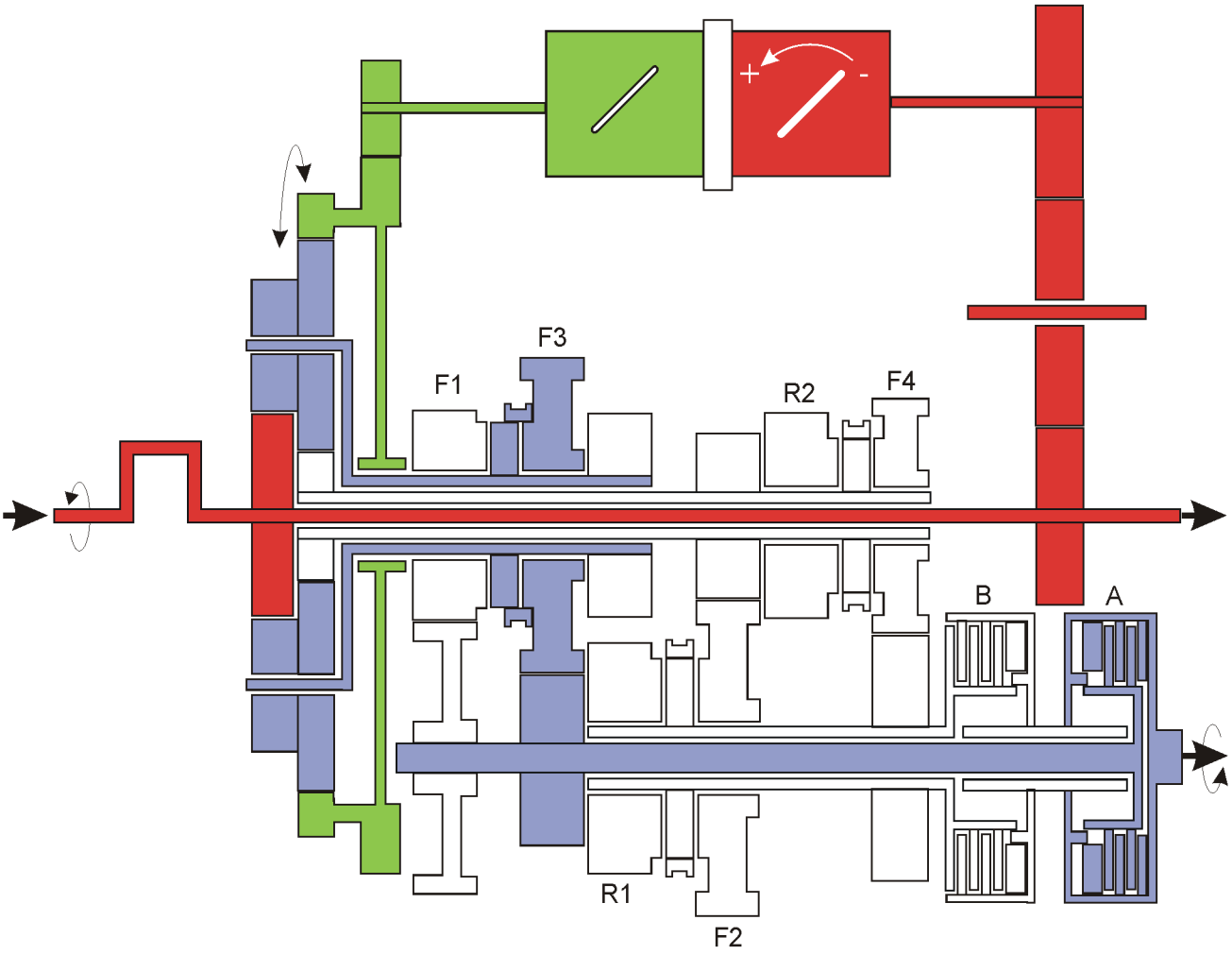


SS08J013 6

Preparing to shift gear from F2 to F1

The gear F2 is engaged during deceleration at a defined swivel angle, shortly before the shift point F2 - F1 is reached. This creates the pre-conditions that by opening clutch B and closing clutch A the power train is engaged via gear F1.

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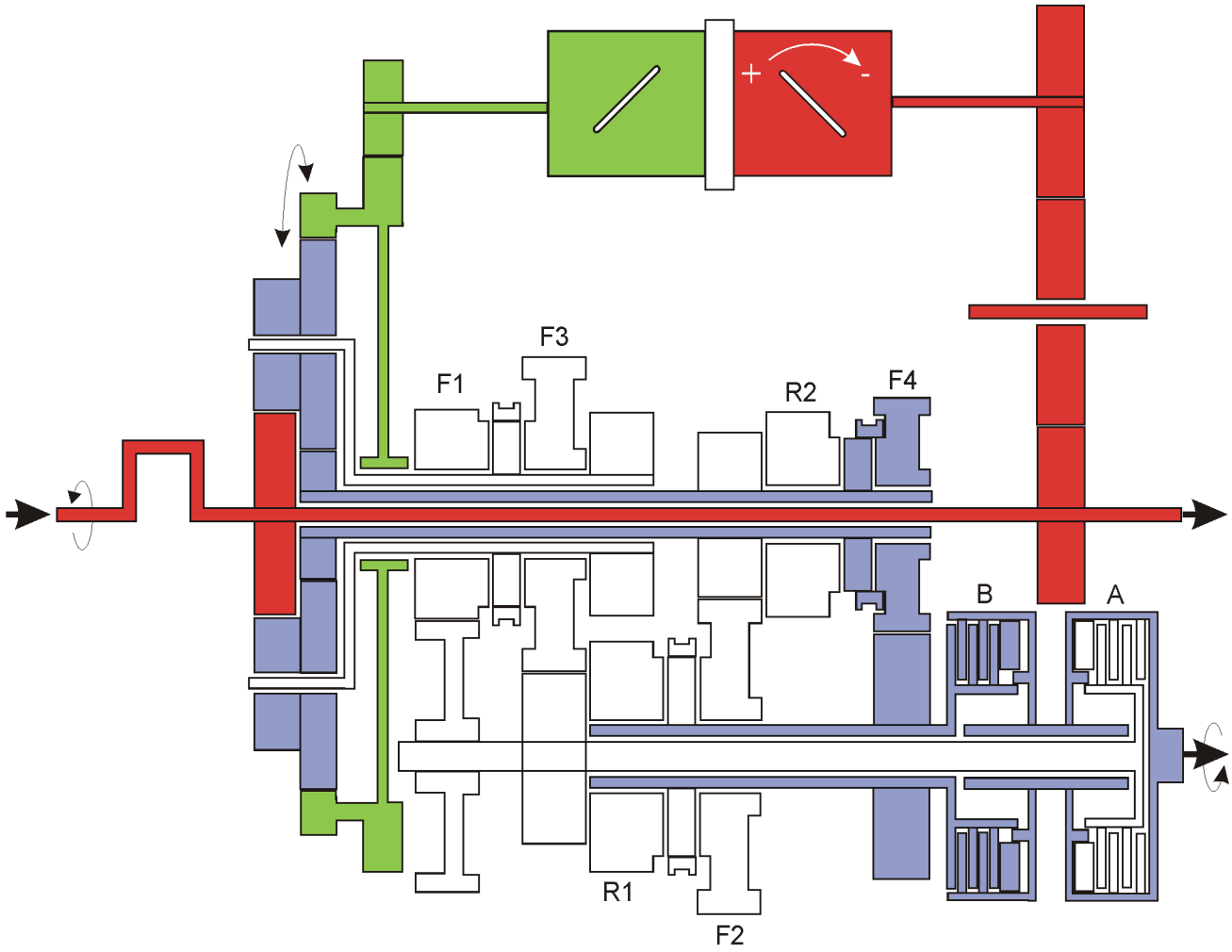


SS08J014 7

Gear level F3

The gear F3 is engaged. The power train of the summing planetary gear / planetary carrier via the gear F3 to clutch A is engaged. The swivel angle of the swash plate in the hydrostat is adjusted in the direction of the positive swivel angle **(+)** in order to increase the travelling speed.

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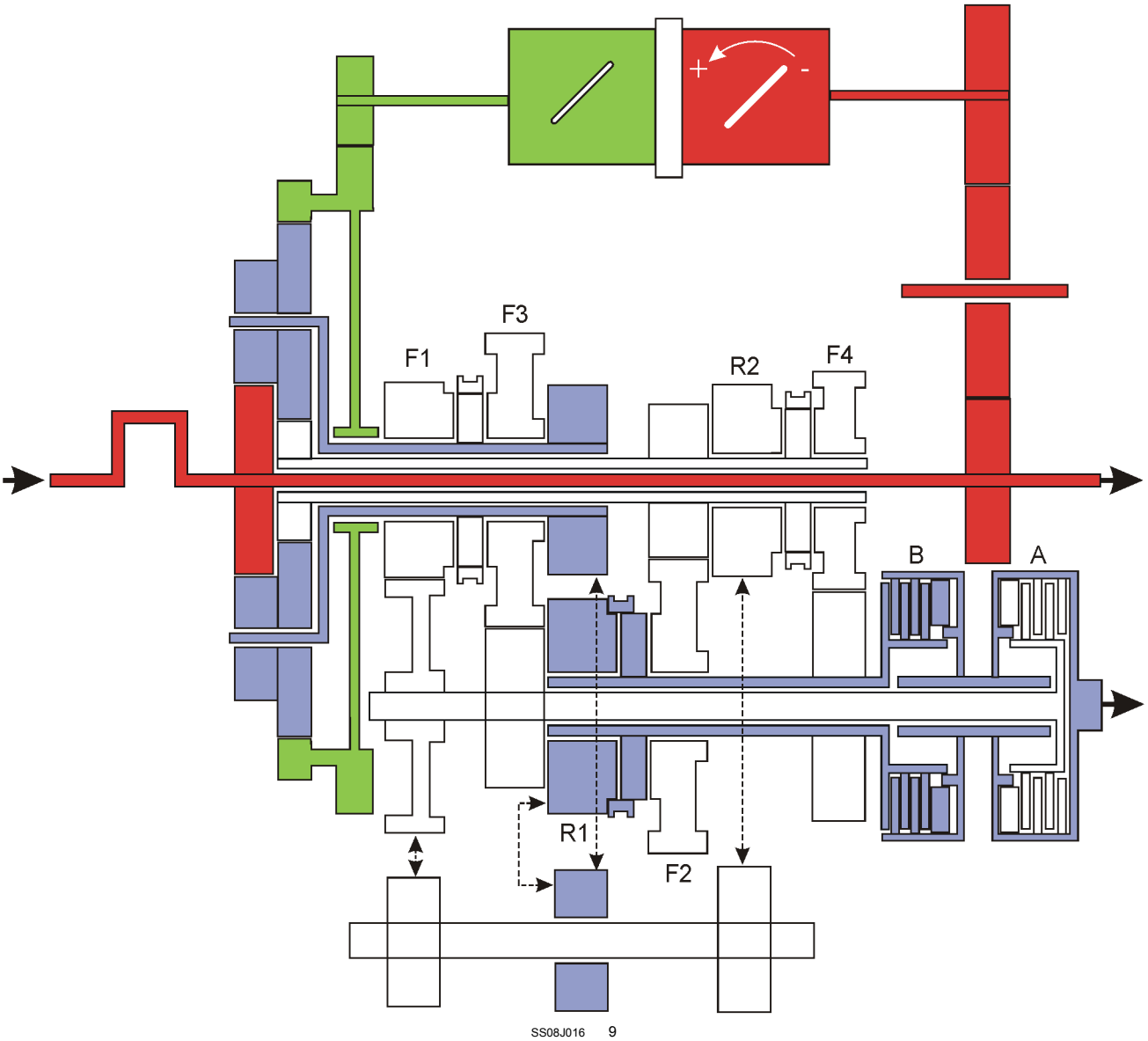


SS08J015 8

Gear level F4

The gear F4 is engaged. The power train of the summing planetary gear / sun gear via the gear F4 to clutch B is engaged. The swivel angle of the swash plate in the hydrostat is adjusted in the direction of the negative swivel angle **(-)** in order to increase the travelling speed.

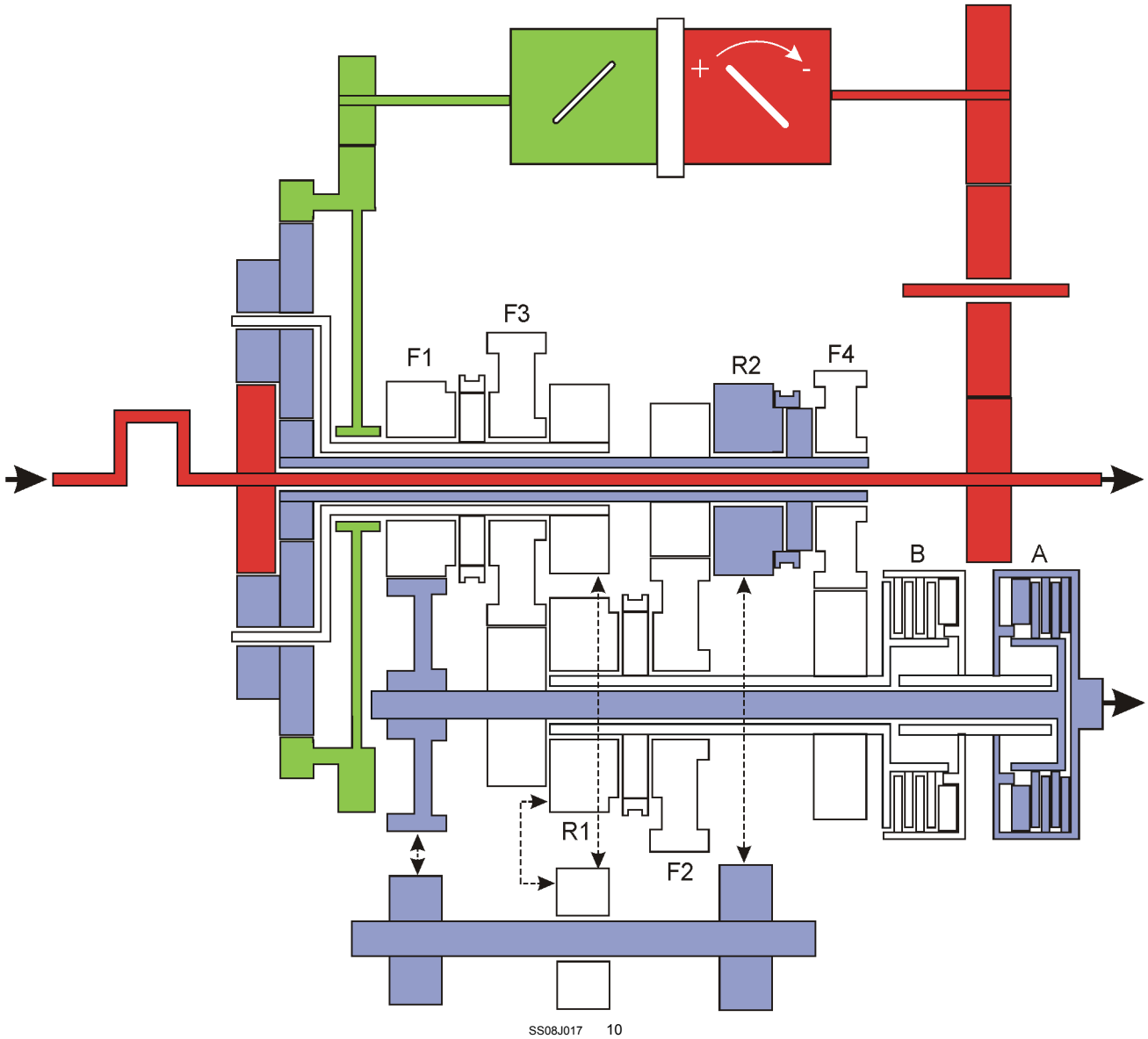
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Gear level R1

The gear R1 is engaged. The power train of the summing planetary gear / planetary carrier via the gear R1 to clutch B is engaged. The swivel angle of the swash plate in the hydrostat is adjusted in the direction of the positive swivel angle **(+)** in order to increase the travelling speed.

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Gear level R2

The gear R2 is engaged. The power train of the summing planetary gear / sun gear via the gear R2 to clutch A is engaged. The swivel angle of the swash plate in the hydrostat is adjusted in the direction of the negative swivel angle **(-)** in order to increase the travelling speed.

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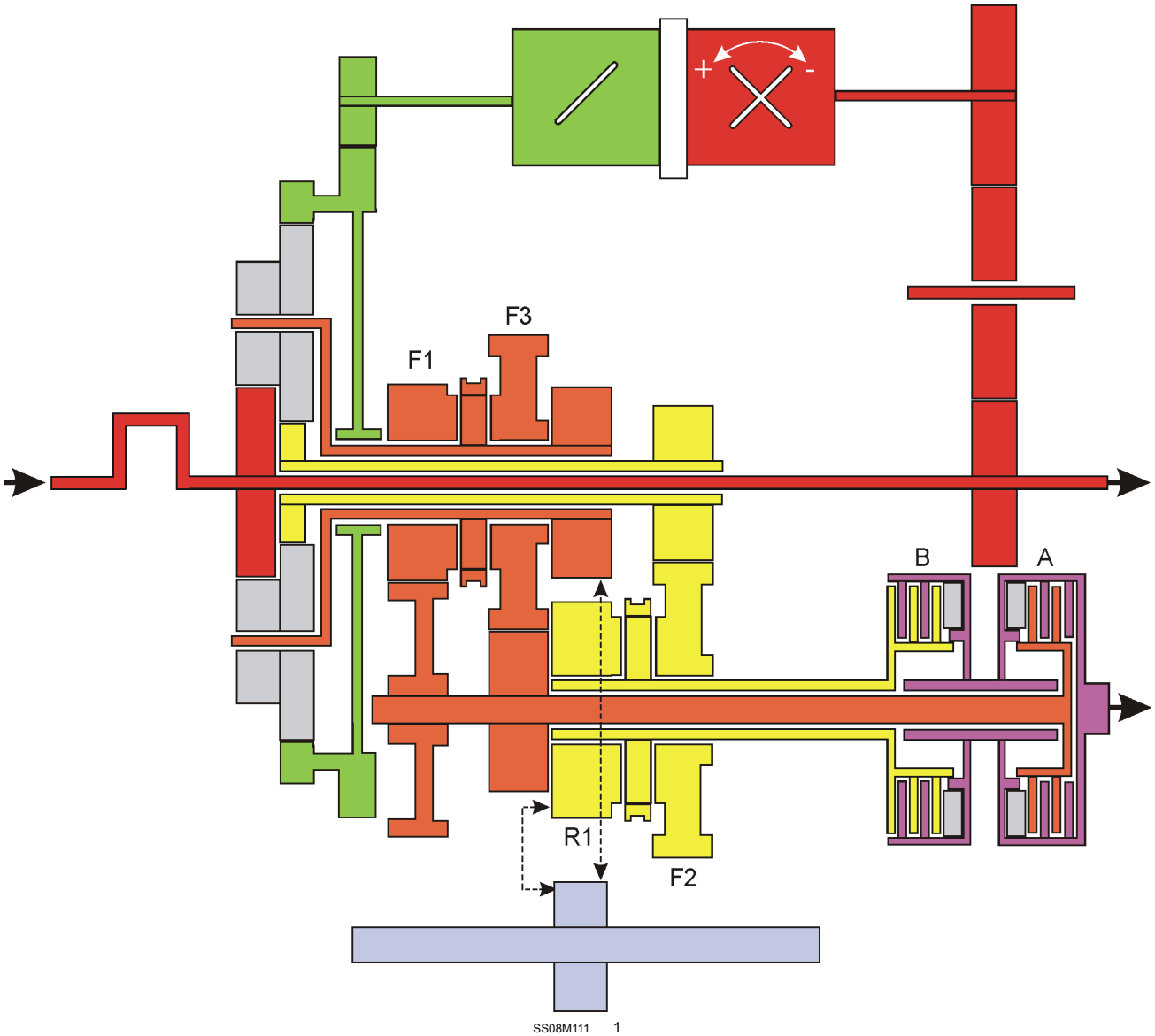
TRANSMISSION Continuously Variable Transmission (CVT) - Functional diagram

Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

The following diagrams show the power flow of the transmission in the individual mechanical gears and in the stationary control (powered zero) and neutral position / park position operating modes.

Colour coding

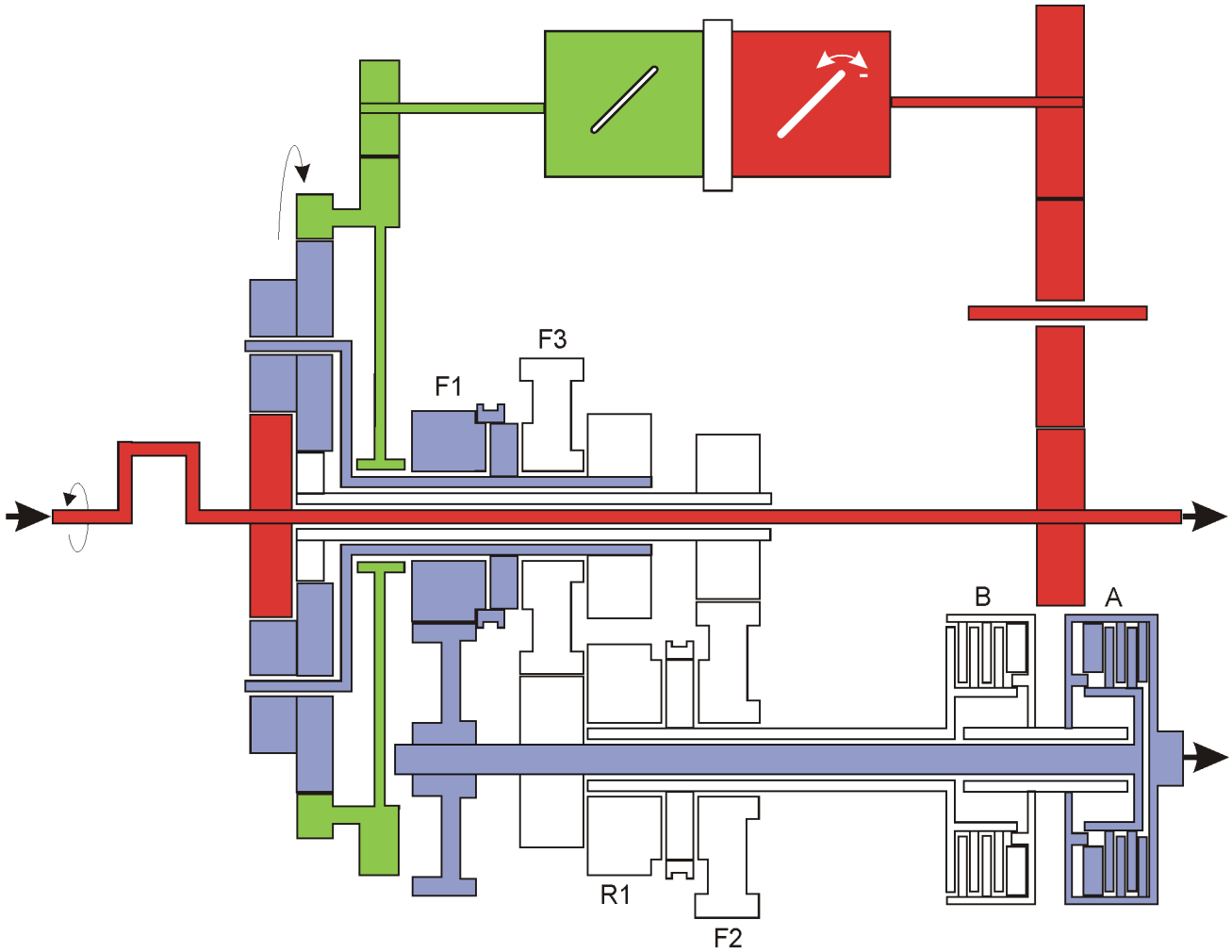
Transmission input and hydrostat drive	Hydrostat output - ring gear summing planetary gears
Power train summing planetary gear / planetary carrier - clutch A	Power train summing planetary gear / sun gear - clutch B
Power flow	



Neutral position / park position

In the neutral position and the park position the transmission is not engaged. No mechanical gear is engaged and the clutches A / B are open. If the tractor rolls off inadvertently in the neutral position, the speed differences arising as a result are equalized by the hydrostat. This means that when shifting out of the neutral position the relevant gear can be engaged again at the synchronous speed.

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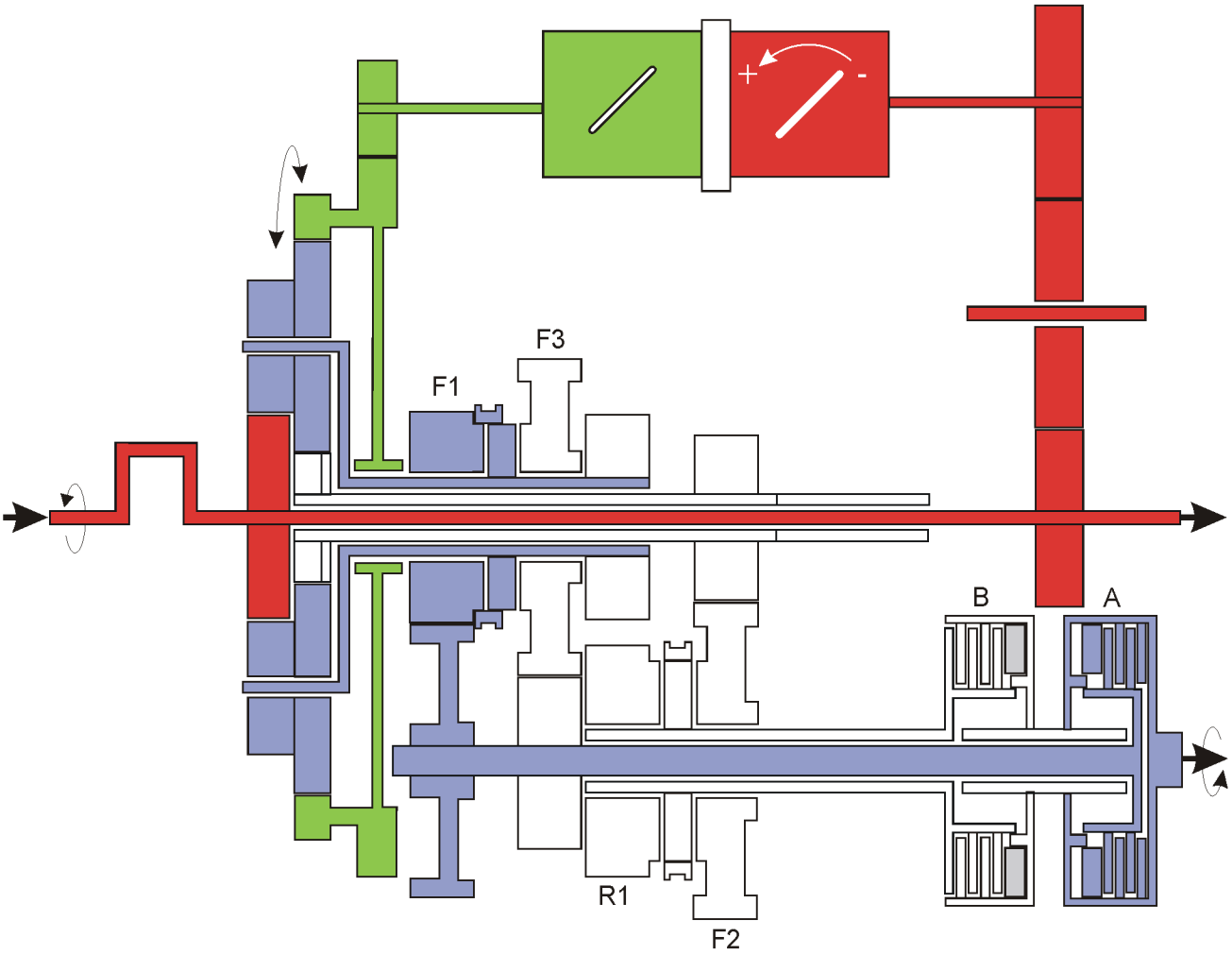


SS08J155 2

Stationary control mode (powered zero)

This diagram shows the stationary control (powered zero) at the gear level F1. The gear F1 is engaged and the clutch A is closed. (Transmission is engaged) The transmission control holds the tractor in a stationary position via the hydrostat. The stationary control mode is possible in gears F1 and R1. This depends on which direction of travel is selected.

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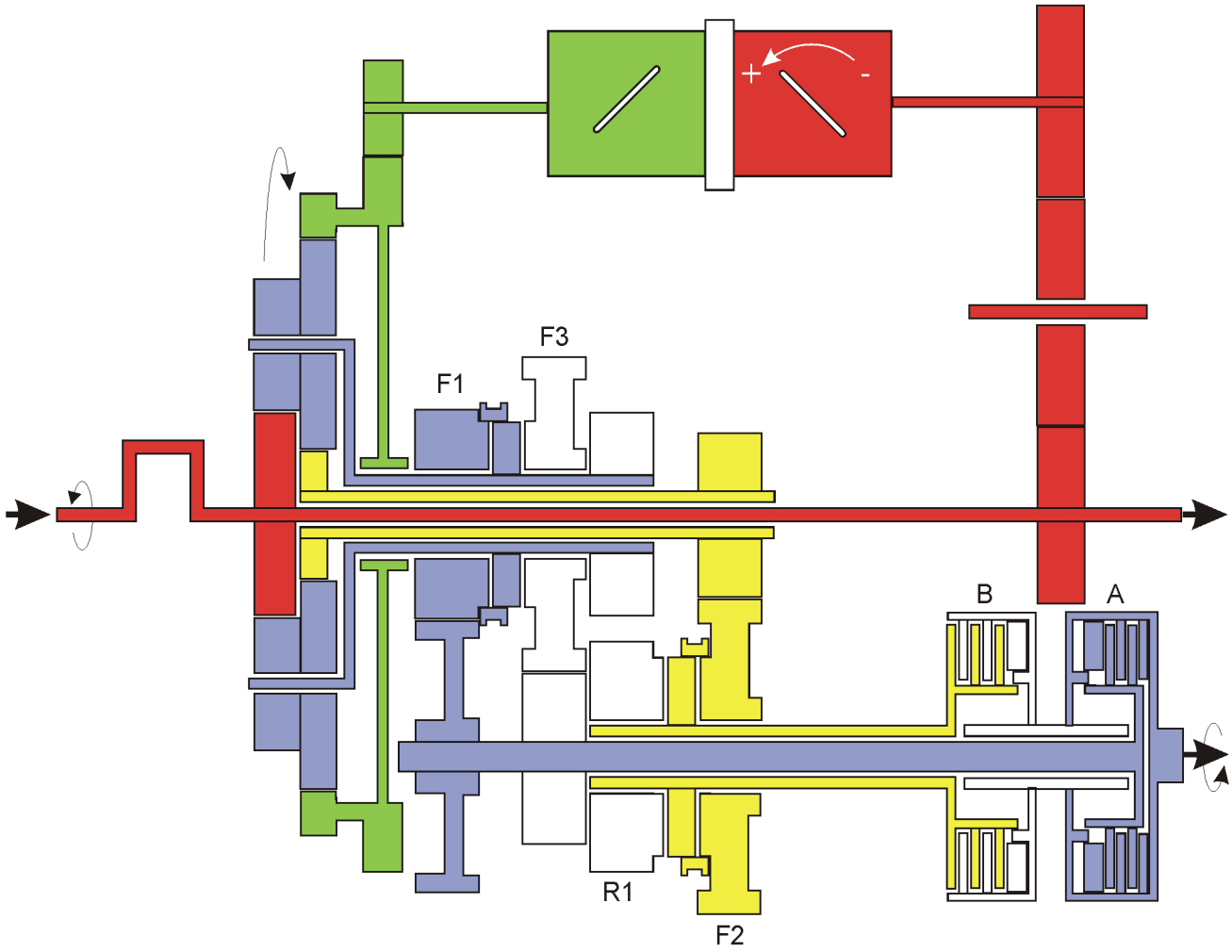


SS08J154 3

Gear level F1

The gear F1 is engaged. The power train of the summing planetary gear / planetary carrier via the gear F1 to clutch A is engaged. The swivel angle of the swash plate in the hydrostat is adjusted in the direction of the positive swivel angle **(+)** in order to increase the travelling speed.

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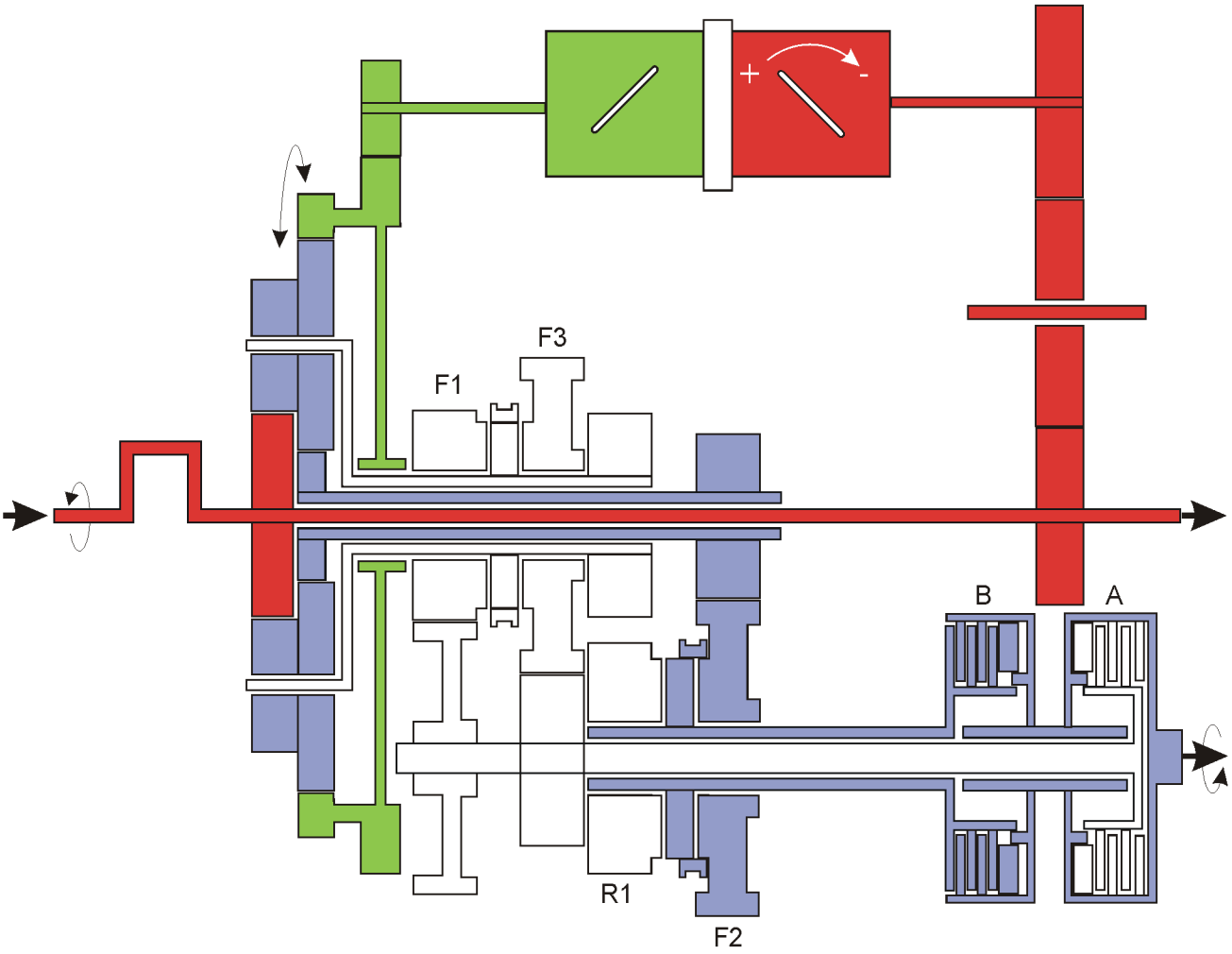


SS08J156 4

Preparing to shift gear from F1 to F2

The gear F2 is engaged during acceleration at a defined swivel angle, shortly before the shift point F1 - F2 is reached. This creates the pre-conditions that by opening clutch A and closing clutch B the power train is engaged via gear F2.

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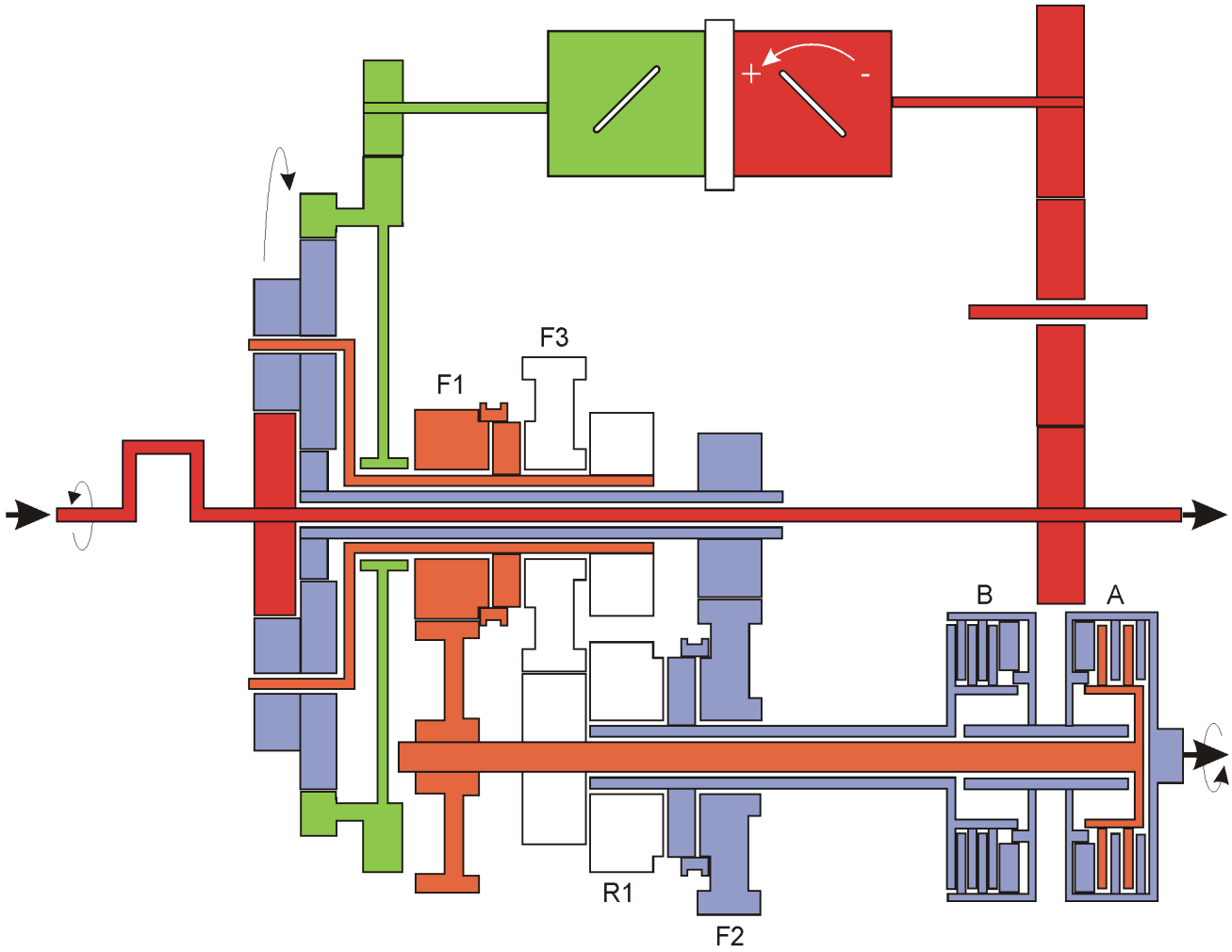


SS08J157 5

Gear level F2

The gear F2 is engaged. The power train of the summing planetary gear / sun gear via the gear F2 to clutch B is engaged. The swivel angle of the swash plate in the hydrostat is adjusted in the direction of the negative swivel angle **(-)** in order to increase the travelling speed.

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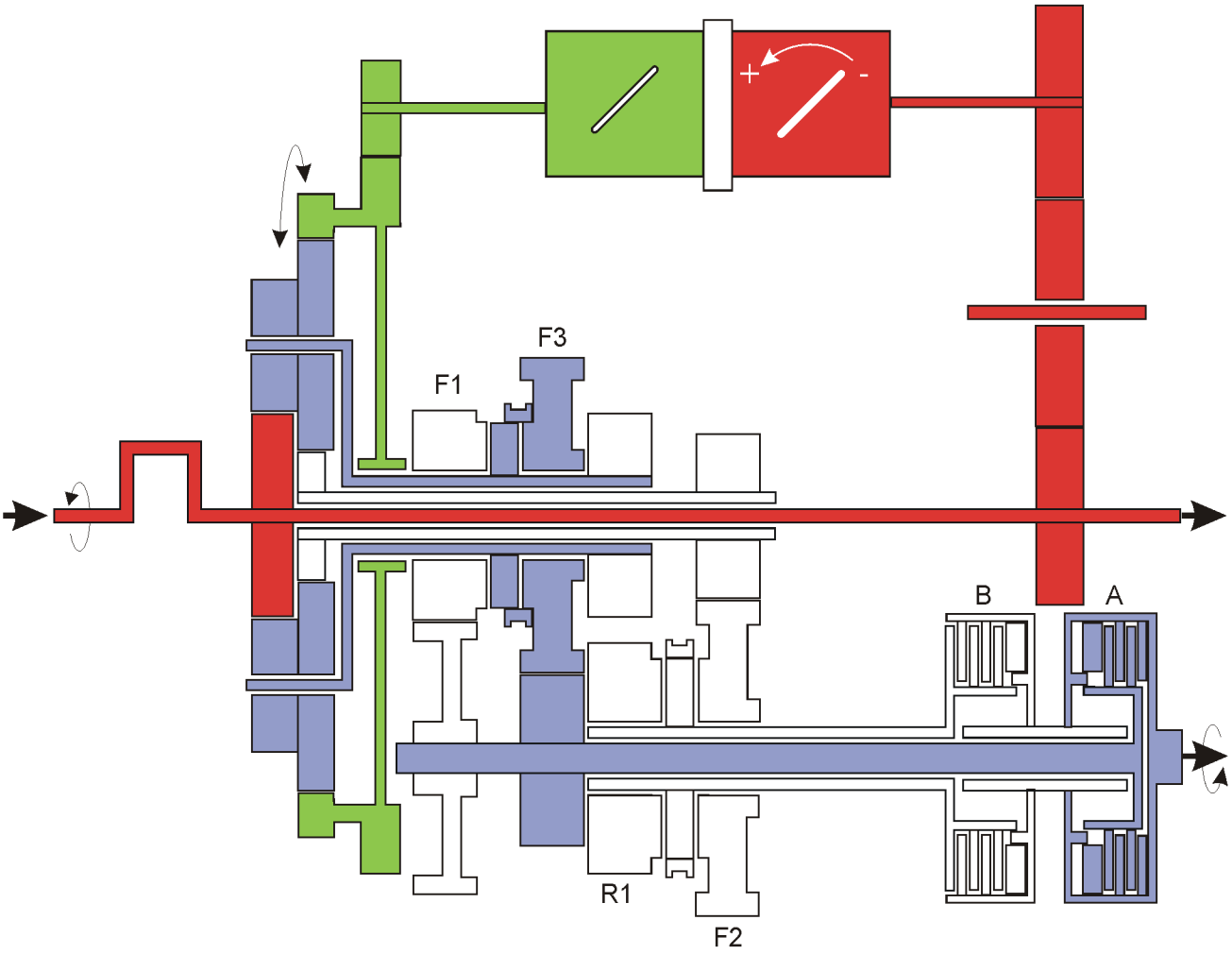


SS08J158 6

Preparing to shift gear from F2 to F1

The gear F2 is engaged during deceleration at a defined swivel angle, shortly before the shift point F2 - F1 is reached. This creates the pre-conditions that by opening clutch B and closing clutch A the power train is engaged via gear F1.

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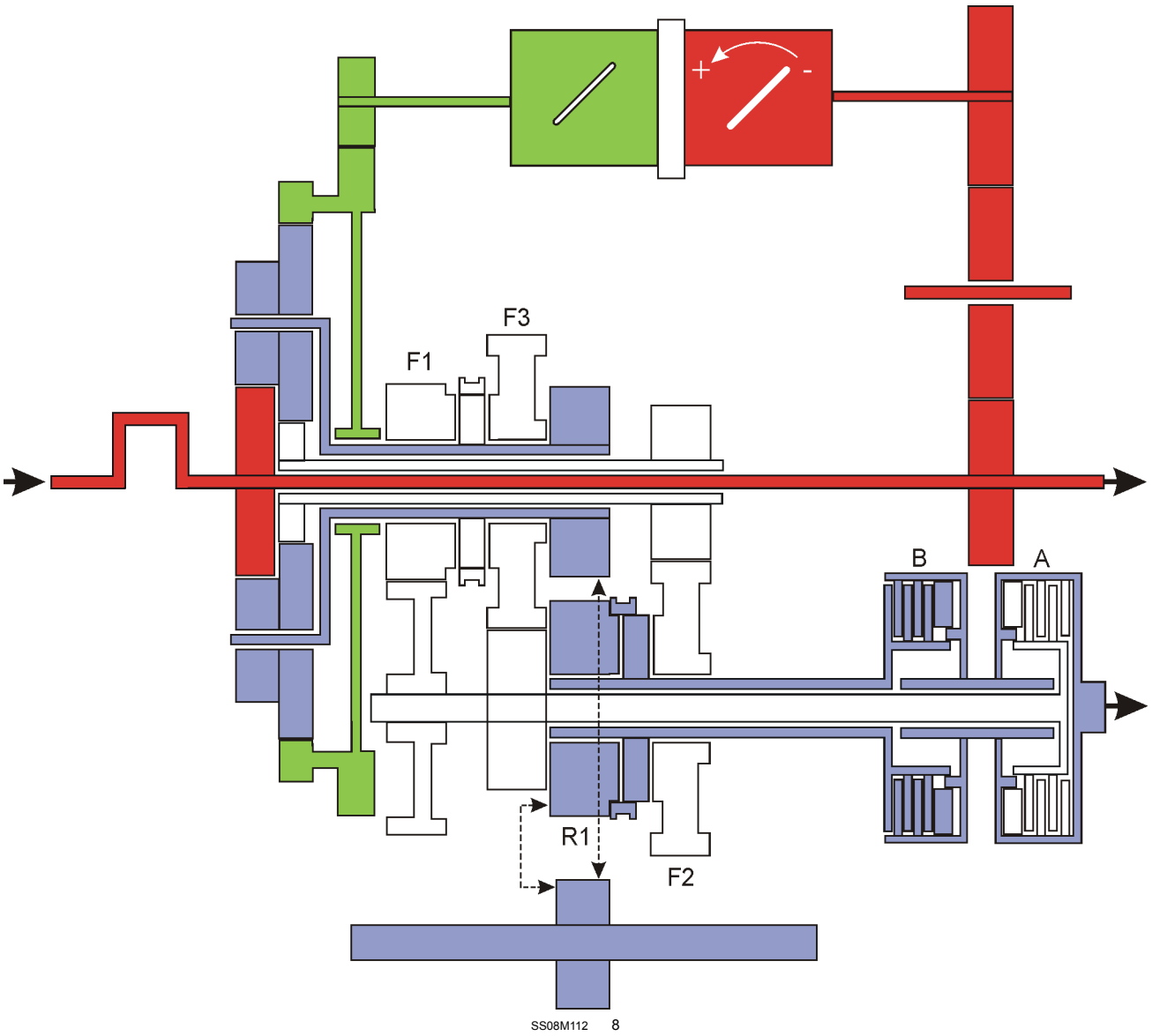


SS08J159 7

Gear level F3

The gear F3 is engaged. The power train of the summing planetary gear / planetary carrier via the gear F3 to clutch A is engaged. The swivel angle of the swash plate in the hydrostat is adjusted in the direction of the positive swivel angle **(+)** in order to increase the travelling speed.

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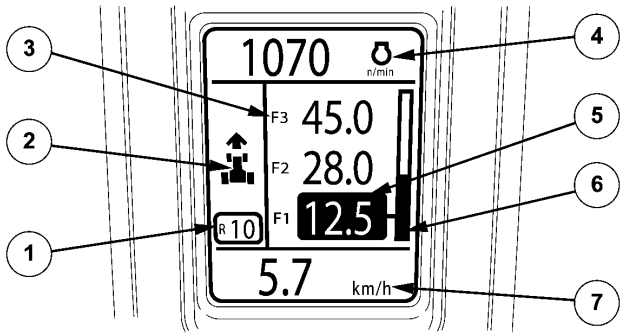
Gear level R1

The gear R1 is engaged. The power train of the summing planetary gear / planetary carrier via the gear R1 to clutch B is engaged. The swivel angle of the swash plate in the hydrostat is adjusted in the direction of the positive swivel angle **(+)** in order to increase the travelling speed.

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TRANSMISSION Continuously Variable Transmission (CVT) - Dynamic description

Display showing power transmission



SS08J020 1

1	Display showing the set “reverse” travelling speed	2	Direction of travel indicator
3	Cruising ranges, forwards (F1, F2, F3)	4	Engine speed
5	Display showing the set “forwards” nominal speed	6	Display showing the selected cruising range
7	Travelling speed		

The display for the continuously variable transmission is located in the upper dot matrix display. (Transmission display) When using this transmission the driver does not need to select any gears, but does however need to specify nominal speeds **(5)** for the vehicle which are shown in the transmission display. In this section the details of the selection options are described.
The direction of travel is indicated by a tractor symbol **(2)** and an arrow. An arrow that is shown continuously indicates that the vehicle is moving in the direction indicated. A flashing arrow indicates the selected direction. Both can also be shown at the same time, e.g. if the vehicle is travelling in one direction at high speed and the "shuttle lever" is placed in the opposite direction. In this case the permanently shown arrow points in the current direction of travel and the flashing one indicates the selected direction of travel. When the vehicle has changed direction of travel the flashing arrow changes into an arrow that is shown permanently. In stationary control mode (powered zero) (transmission is engaged, but vehicle is stationary) the selected direction of travel is indicated by a flashing arrow. If the transmission is in the neutral position (transmission is not engaged), the tractor symbol and the arrow are replaced by an "N". When "Park" is set, a "P" is shown.

Start-up

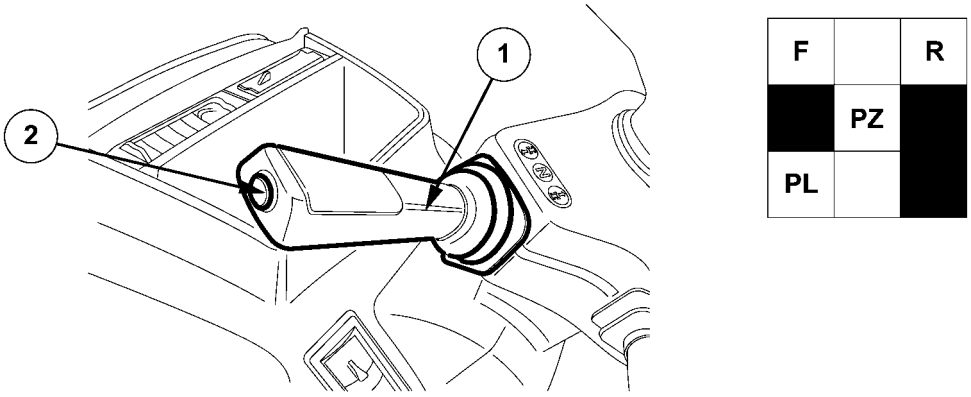
While the "shuttle lever" is in the "Park position", (see Fig. **2**), fully actuate the clutch pedal and start the engine. The engine only starts when both of the prerequisites are fulfilled. The speed range can be set prior to start-up. The clutch pedal can be released either before or after selecting the direction of travel, depending on whether the start-up is to be slow or automatic.

Shuttle lever

The initial selection of forwards or reverse travel is made using the "shuttle lever" **(2)** which is located on the left side of the steering wheel column. It is not necessary to actuate the clutch pedal if Forwards or Reverse is selected. Pull the "shuttle lever" out of the rest position towards the steering wheel against a light spring pressure and then move it away from the driver to select the Forwards direction of travel, or move the lever towards the driver to select the Reverse direction of travel. "Forwards" or "Reverse" are each shown on the transmission display. If the clutch pedal has already been released, selecting "Forwards" or "Reverse" can cause the tractor to move (also depending on the status of the transmission). The lever positions "Forwards" and "Reverse" are not locked into place. If the lever is released, it automatically returns to the rest position "PZ". This is not "neutral". "Neutral" is activated by pressing the button **(2)** on the "shuttle lever". The corresponding position on the transmission display then shows "N".

IMPORTANT: *If the "NEUTRAL" position is selected the transmission is not engaged!*

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SS08J021 2

F	Forwards	R	Reverse
PL	Park position	PZ	Rest position ("powered zero")

NOTE: *When the tractor is started up or whenever the tractor determines that the driver has left the seat for more than five seconds (criteria: clutch pedal released, brake pedal not actuated, vehicle is not moving), the Forwards and the Reverse directions of travel cannot be set. ("Cp" appears in the transmission display) This lock remains in place until either:*

- the clutch pedal is actuated and released again and the driver remains on the seat.
- the clutch pedal is actuated, then "Forwards" or "Reverse" is selected and the clutch pedal is released.

NOTE: *If the transmission is in the neutral position and the "shuttle lever" is moved to "Forwards" or "Reverse" while the handbrake is actuated, the transmission remains in the neutral position. The handbrake must be released (this will be indicated to the driver), before the transmission moves to the Forwards or Reverse position.*

After a direction has been selected, the opposite direction can be selected using either the "shuttle lever" or the "shuttle push button" on the multi-function knob. This is also allowed while travelling. It is not necessary to use the clutch pedal.

If the driver attempts to actuate the "shuttle lever" when he is not sitting on the seat, the tractor becomes slower until the stationary control mode (powered zero) has been reached. The tractor remains stationary until "Forwards", "Reverse" or "Neutral" has been selected and the usual prerequisites are also been met. These are that the driver is sitting on the seat and uses the clutch pedal to drive off. If the vehicle is in stationary control mode (powered zero) for 5 seconds, the park lock is activated.

The park position is a secure position. If the "shuttle lever" is moved to this position the park lock is activated. If the tractor moves while the lever is being moved into the park position the transmission ratio is reduced until the vehicle is stationary. After this the park lock is activated. The park lock can be released by selecting "Forwards" or "Reverse"; or if the "shuttle lever" is moved to the rest position, or both brake pedals are pressed and the neutral switch is pressed.

ATTENTION: *To prevent the tractor from moving unintentionally, always actuate the handbrake before switching off the engine and leaving the tractor.*

Clutch pedal

There is a clutch pedal, but it is not needed for shifting gears or changing the direction of travel. The clutch pedal is only required for starting the tractor and, if necessary, as a support when positioning if auxiliary implements are attached or if narrow points require precise control. If required the clutch pedal can be used in the usual manner for controlling the movement of the tractor.

NOTE: *When the seat switch intermittently checks whether the driver has left the seat, the clutch pedal must be actuated and released again before "Drive" can be re-set.*

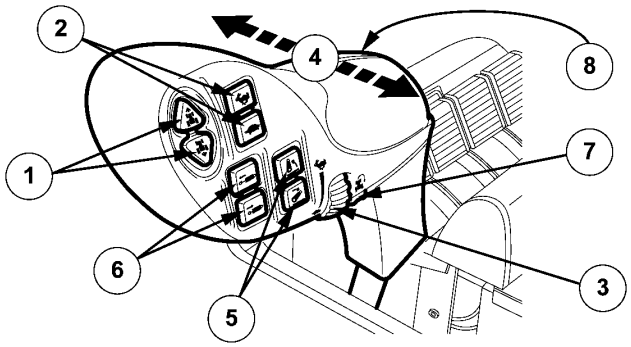
IMPORTANT: *To prevent undue wear, do not use the clutch pedal as a footrest.*

Multi-function knob (propulsion control lever)

The multi-function knob (including propulsion control lever) is the main operating device used to control the continuously variable transmission. It allows the operator to define, adjust and select one of three travelling speed ranges.

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In addition it provides the possibility of working in only one sub-range of an entire working range. The knob has a pushbutton for changing the direction of travel and for actuating the electronic hitch control, an electrical auxiliary implement and the headland management control system.



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1	"Forwards / Reverse" pushbutton	2	"Travelling speed ranges" pushbutton
3	Rotating wheel for adjusting the "Travelling speed ranges" (nominal value)	4	Propulsion control lever
5	Pushbutton for rapid Raise/Lower of the rear hitch	6	Pushbutton for actuating an electro-hydraulic auxiliary control valve
7	Pushbutton for controlling the headland management control "HMC"	8	2. Function button (at rear of propulsion control lever)

"FORWARDS / REVERSE" PUSHBUTTON **(1)**
To change the direction of travel the pushbutton with the opposite direction of travel must be actuated. It is not possible to drive off using these buttons. This can only be carried out using the "shuttle lever" on the steering column. The pushbuttons are also used for other control functions for driving operation.

"TRAVELLING SPEED RANGES" PUSHBUTTON **(2)**
The driver can use two pushbuttons to select one of three travelling speed ranges. The confirmation about the range selected and its set nominal value takes place via the transmission display.

ADJUSTING THE TRAVELLING SPEED RANGES (NOMINAL VALUE)
The rotary switch **(3)** is used to set the nominal value speed of any speed range. The ranges can be adjusted to any required speeds and can also be the same if so desired. There is however a logic to ensure that each higher range is allocated at least the same or a higher speed than the previous one. (e.g. F2 ≥ F1) This means that if F1 is set higher than the nominal value of F2, F2 is automatically also increased. If the nominal value of F3 has been attained and the driver further increases the value for F1, all three speeds are simultaneously increased.

Useable speed ranges in km/h:
From 0.03 to 0.10 in steps of 0.01 km/h
From 0.10 to 0.22 in steps of 0.02 km/h
From 0.25 to 1.00 in steps of 0.05 km/h
From 1.00 to 10.0 in steps of 0.10 km/h
From 10.0 to 12.0 in steps of 0.20 km/h
From 12.0 to 15.0 in steps of 0.50 km/h
From 15.0 to 50.0* in steps of 1.00 km/h

An additional speed set with similar steps in mph is available, if non-metric specifications have been selected for the displays:
From 0.02 to 0.10 in steps of 0.01 mph
From 0.10 to 0.22 in steps of 0.02 mph
From 0.25 to 1.00 in steps of 0.05 mph
From 1.00 to 8.00 in steps of 0.10 mph
From 8.00 to 12.0 in steps of 0.20 mph
From 12.0 to 15.0 in steps of 0.50 mph
From 15.0 to 31.0* in steps of 1.00 mph

* or the maximum permitted highest speed of each respective sales market.

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Nominal speeds can be set in the same way for reverse travel also. The highest speed for reverse travel is 30 km/h with a 4x2 transmission or 15 km/h for vehicles that are equipped with a 3x1 transmission.

The nominal speed can be changed more quickly using the rotating wheel by turning it quickly for at least 3 clicks. If the nominal value is reduced, it decreases by 1/3. If the nominal value is increased, it increases by 1/2 or by 2 km/h, depending on which is currently the larger value.

PROPULSION CONTROL LEVER **(4)**
The propulsion control lever is used for setting the travelling speed. The lever can be moved forwards or backwards, leading to a travelling speed in the selected travelling speed range that is in accordance with the lever position and the set nominal value. If the lever is completely forward, the requested speed corresponds with the nominal value that is shown on the display. (only in normal operating mode, not in manual mode) If the lever is completely pushed back, the vehicle pauses regardless of the nominal value set or the engine speed when stationary (powered zero), as long as the accelerator pedal is not pressed.

The rear 8% of the lever stroke always controls the low travelling speeds that are suited to very slow locomotion, independent of the nominal value shown in the display. In combination with the brake pedals this device can be very useful for slow approaches on slopes as the wheels do not turn freely.

The propulsion control lever has an additional braking function. When the propulsion control lever is quickly moved back to slow the tractor, the all-wheel drive switches on automatically. As a result the engine braking action when the vehicle slows is also transferred to the front wheels.

CONTROL ELEMENTS THAT DO NOT AFFECT ANY TRANSMISSION FUNCTIONS
Pushbutton for rapid Raise/Lower of the rear hitch **(5)**
Pushbutton for actuating an electro-hydraulic auxiliary control valve **(6)**
Pushbutton for controlling the headland management control "HMC" **(7)**

Accelerator pedal

The accelerator pedal controls the vehicle speed by adjusting the pedal in proportion to the set nominal speed. This means that it works in the same way as the propulsion control lever. When the accelerator pedal is pressed to the floor the tractor attempts to attain or maintain the set nominal speed. The control logic takes into account the higher respective required value for the nominal speed between the propulsion control lever and the accelerator pedal. This means that when the current position of the propulsion control lever requires 50% of the nominal value, but the position of the accelerator pedal requires 65%, the travelling speed is increased to the higher requirement (65%).

The first 8% of the pedal lever travel always controls the slow travelling speeds. (e.g.: for connecting attached implements)

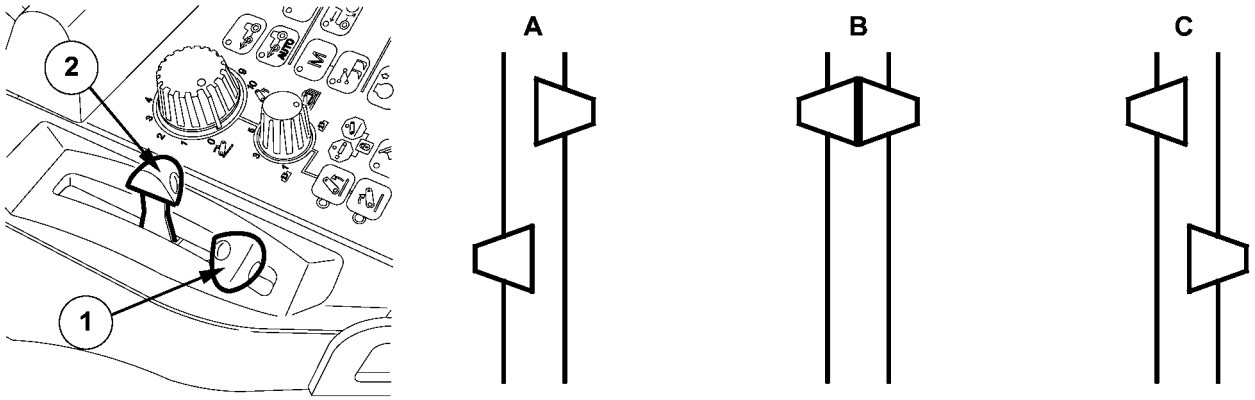
The accelerator pedal becomes a simple accelerator pedal in the "manual mode" operating mode, in the "Neutral position" or if "Park" is selected. (in such case only the engine speed is controlled)

NOTE: *The all-wheel drive is not automatically switched on (such as when the propulsion control lever is rapidly pulled back) if the accelerator pedal is released.*

Controlling the engine speed

In normal use the engine speed should be controlled by the vehicle controller in order to maximize efficiency. To ensure this, the accelerator levers **(1/2)** should be set under **(A)** as in the following example. That is, in such a way that the lever **(1)** is in the minimal position and the lever **(2)** on the other hand is in the maximum position. This setting allows the vehicle control system the largest possible range of possible engine speeds. The control logic of the vehicle control system sets up the engine speed to be as low as possible. However, if additional power is required, the engine can be driven to its maximum output without restriction. Fuel consumption is minimized if the lever **(2)** is pushed back. This prevents high engine speeds.

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Setting **(A)** can be used for many kinds of work, including tillage and transport. If necessary, the minimum engine speed can be increased in order to support hydraulic auxiliary devices using the lever **(1)**.

Setting **(B)** can e.g.: be used together with a trailer with a loading facility, when maintaining the engine speed is crucial. In such case there is a minimal deviation from the engine speed. A required change in the vehicle speed is carried out using the continuously variable transmission ratio. If necessary, the "constant engine speed control mode" can be used to maintain the engine speed more precisely.

Setting **(C)** is used when working with rotary hoes or baling presses, when the cyclical loads are best assimilated by changing the engine speed without continually changing the transmission ratio of the transmission in the process. The desired engine speed is set using the lever **(1)**. The engine can however be "pressed" to the speed set using the lever **(2)** before the transmission automatically changes the transmission ratio.

The engine speed can also be controlled using the "constant engine speed control mode" which overrides the hand lever settings and holds the engine speed constant.

Control logic of the vehicle speed - General

In normal driving operation the vehicle control system operates in cruise control mode. This means that, within the specifications set by the driver, the control system attempts to find the optimum engine speed and the optimum transmission ratio at which the set speed is most efficiently attained and maintained. Typically this is attained by decreasing the engine speed and increasing the transmission ratio.

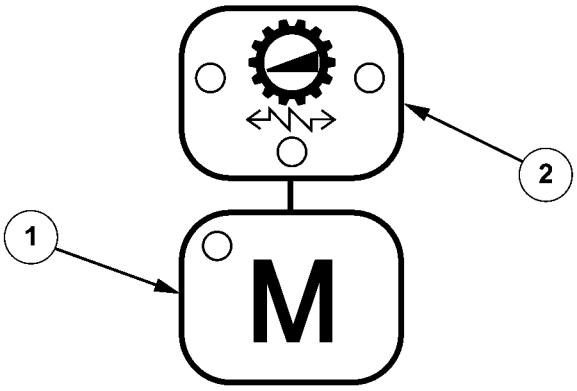
If the vehicle is loaded and the engine speed lowers as a result, the control logic (speed fluctuation control) limits the acceleration or lowers the transmission ratio accordingly such that an optimum engine load is maintained. The engine speed is regulated according to the requirements in order to maintain the nominal travelling speed within the specifications set by the driver.

In the "constant engine speed control mode" the control algorithm switches to controlling the engine speed based on the torque (instead of speed fluctuation control). As a result the gear transmission ratio is changed as required while the engine speed is held constant.

Manual mode

If it is necessary to obtain a fixed gear transmission ratio and only vary the engine speed in order to achieve various speeds, the tractor can be switched to manual operating mode (manual mode). This is done by pressing the push-button **(1)** on the control panel of the armrest. Confirmation is given by way of the light in the switch.

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In this operating mode the accelerator pedal directly controls the engine speed. This mode can be cancelled by pressing the pushbutton **(1)** in order to return to the normal operating mode. (the light goes out) If the manual operating mode was set when the vehicle was switched off this is retained unchanged when the vehicle is next switched on.

In the manual operating mode the accelerator pedal and the accelerator lever **(1)** (Fig. **4**) work together exactly as for a conventional foot throttle and hand throttle. This means that the higher set value of the two determines the engine speed.

Stationary control mode (powered-zero)

The CVT transmission is able to pause in a stationary position when a gear is engaged (F1 or R1). This stops the tractor on a slope without having to actuate the brakes. The stationary control mode is attained simply by releasing the accelerator pedal and fully pulling back the propulsion control lever.

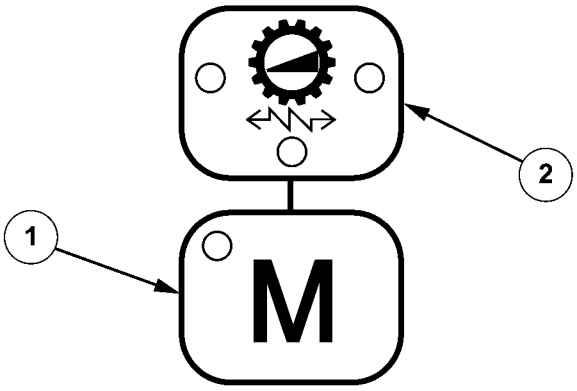
If the transmission remains in stationary control mode for 45 seconds the park lock is automatically activated and drive shaft is disabled. To re-select a direction of travel the "shuttle lever" must be used again. The control logic is such that the park lock is switched on and off in stationary control mode, as a result of which the vehicle cannot roll freely. See **TRANSMISSION Continuously Variable Transmission (CVT) - Dynamic description “Electronic park lock” (C.20.G)** for further details.

Deceleration levels

Press the pushbutton **(2)** on the control panel of the armrest to select three acceleration levels. The selected acceleration level is displayed using one, two or three illuminated lamp(s). These acceleration levels control the reactions of the transmission if the driver requests a change in the travelling speed, including a change in direction. This allows the driver to select a more gentle or a more aggressive acceleration or deceleration.

ATTENTION: *When the ground is slippery (snow on road surface, dirty road surface, gravel road, ,...) a low acceleration level / deceleration level must be selected. (Level 1 or maximum level 2)*

NOTE: *If the acceleration is limited due to the engine power, selecting a higher acceleration level has no effect. This can be the case if the accelerator lever* ***(2)*** *(Fig.* ***4****) is set with restrictions.*



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Brake logic

If both brake pedals are pressed, the gear transmission ratio is automatically adjusted in order to decrease the travelling speed. The gear transmission ratio increases at a greater rate if the pedals are pressed more firmly. If the engine is not providing any braking power the clutch pressure is decreased by way of the engine load and the gear transmission ratio. In this way the brake can easily override the clutch if the gear transmission ratio does not change quickly enough. Then the clutch pressure is lowered until the clutch has disengaged. As a result a more even change-over from driving to braking is achieved. When the brakes are released the control returns to the normal condition.

A logic against stalling the engine opens the clutch in the event of a full application of the brake in order to prevent a death.

As for tractors with powershift transmission the all-wheel drive is activated when the brake is actuated.

Logic of brake lubrication

In order to reduce the loss of power a solenoid valve controls the flow of the lubricating oil to the braking system. When the brakes are pressed (left, right or both) the lubrication valve is always activated until the brake pedals have been released again. After being released the lubrication valve is activated each minute for 30 seconds.

Trailer safety braking

In certain situations, e.g. when travelling with a trailer on a slope, it can be desirable to actuate only the brakes of the trailer without activating the brakes of the tractor at the same time.

If the "Forwards" direction (when travelling forwards) pushbutton on the multi-function knob is pressed and held, the brake pedals can be actuated without activating the tractor’s brake control function at the same time. The brake pedals must be actuated within 5 seconds of pressing the "Forwards" direction of travel pushbutton. Otherwise the control function continues using the normal logic. This logic is only ever used if the accelerator pedal has been released in order to actuate the brake. The same control logic applies to the Reverse direction of travel in connection with the "Reverse" direction of travel pushbutton.

The normal control logic is resumed when the pushbutton is released while braking. Provided that the "Forwards" direction of travel pushbutton continues to be depressed, the driver likewise has a period of 5 seconds between releasing the brake and re-actuating the accelerator pedal before the vehicle decelerates.

Aligning the speed

Always, when the wheels turn and the transmission is in the neutral position or the clutch is fully depressed the gear transmission ratio is automatically adjusted in order to align the current engine speed with the wheel speed. If the transmission clutch has re-engaged, the control system continues with normal control via the transmission ratio. The speed selection ranges shown do not change.

Protective devices

The tractor offers a multitude of controls to protect against damage. The following situations can lead to automatic reactions from the vehicle:

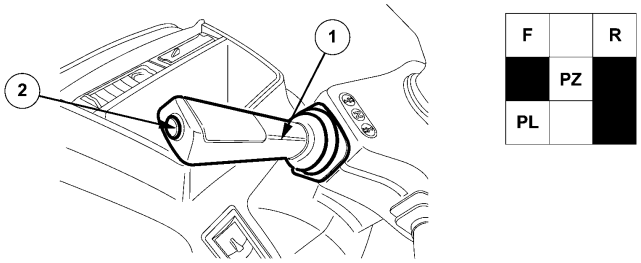
- Over-revving the engine.
  The gear transmission ratio is automatically increased if the engine speed exceeds 2,375 rpm.
- Excess pressure in hydrostat unit.
  The gear transmission ratio is automatically reduced if the hydrostat unit is overloaded.
- Low transmission oil temperature.
  An automatic heating process controls the engine speed and the hydrostat unit in order to heat the transmission oil without damaging the hydrostat unit in the process. (the drive shafts are not disengaged at this time) A symbol for low temperature is shown on the control display during the heating process. The clutch pedal can be used to drive the tractor before the heating process is complete. The transmission is set to a fixed transmission ratio (F1 / R1) at this time and the engine speed is limited. As a result the maximum speed is only 3 km/h.
- Low system pressure.
  If the system pressure becomes too low the engine speed can be automatically increased to up to 1,300 rpm in order to increase the hydraulic flow.

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TRANSMISSION Continuously Variable Transmission (CVT) - Dynamic description “Electronic park lock”

Engaging and releasing

The electronic park lock is a standard component of the continuously variable transmission. The system functions in parallel with the handbrake which has been installed as a homologated device for parking and as an additional braking mechanism. To engage the park lock the "shuttle lever" **(1)** must be moved into the park position **(PL)**. The park lock is automatically engaged if the vehicle pauses more than 45 seconds in the stationary control mode (powered zero). If he driver leaves the driver’s seat the park lock is engaged after only 5 seconds.



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F	Forwards	R	Reverse
PL	Park position	PZ	Rest position ("powered zero")

The electronic park lock can be released in several ways:

1. Normal release of the park lock:
   To release the park lock, actuate the brake pedal and press the neutral switch **(2)** and move the "shuttle lever" into the **(PZ)** position. This disengages the park lock.
2. By automatically driving off:
   Move the "shuttle lever" into the direction of travel position **(F)** or **(R)**. The power train engages. At the same time the drive-off control function regulates the transmission and the park lock such that unintentional movement is prevented.
3. Slowly driving off using the clutch pedal:
   With the clutch pedal depressed, move the "shuttle lever" into the direction of travel position **(F)** or **(R)**. The park lock is released and the vehicle remains in the rest position until the clutch pedal is released.

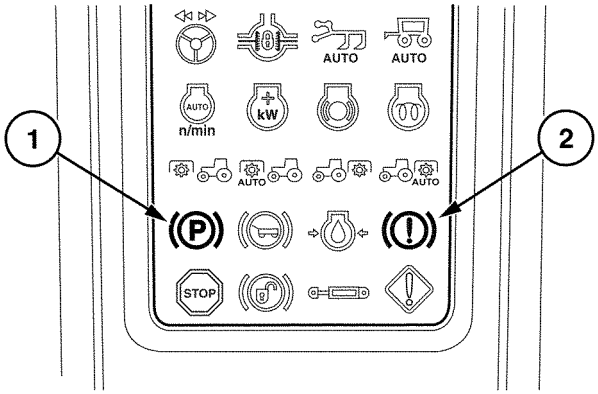
   NOTE: *In this rest position the vehicle can move unintentionally!*

As soon as the park lock is engaged the display lamp lights up **(1)** (Fig. **2**).

NOTE: *In the normal operation mode the vehicle speed must be less than 0.5 km/h in order to engage the park lock. If the ignition switch is turned off when the vehicle is moving the park lock is applied using dynamic braking effort. To increase the service life of the brake and to ensure safe operation, it is recommended that the ignition switch be turned off only when the vehicle is stationary.*

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Park lock - display lamps on the instrument panel



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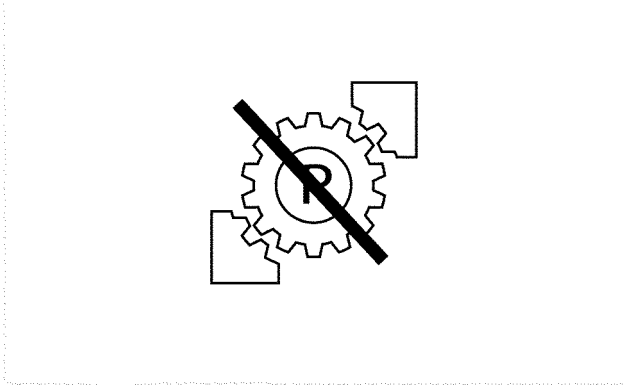
The display lamp **(1)** has two functions. It shows either the status of the park lock or the status of the handbrake. When the ignition switch is switched on the lamp flashes while the park lock is being engaged or released. When the ignition switch is switched off the lamp flashes continuously to indicate that neither the park lock nor the handbrake is engaged!

The display lamp **(2)** is used to indicate a general malfunction of the park lock. There could be a fault related to the park lock, or the function for automatically engaging when the ignition switch is switched off could be blocked.

Automatic engagement of the park lock when the ignition switch is switched off

When the tractor recognises that the ignition switch has been switched off, the park lock is automatically engaged. If there is a delay in the complete activation of the park lock (more than 2 seconds), the display lamp begins to flash **(2)** (Fig. **2**) and a buzzer sounds. This switches off as soon as the park lock is completely engaged. Every movement of the "shuttle lever" after switching off the ignition switch has no effect and the park lock remains engaged.

Blocking the "automatic engagement" function of the park lock



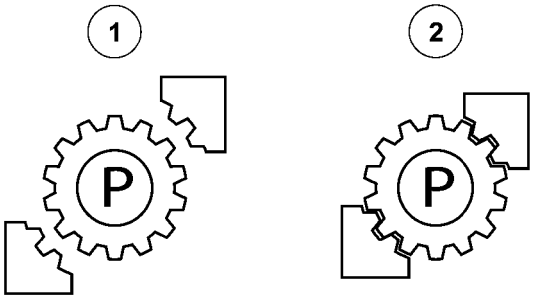
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To tow the vehicle it is intended that the "automatic engagement" function of the park lock when the ignition switch is switched off be deactivated. To do this the following procedure must be carried out prior to switching off the ignition switch:
The park lock must be in the released position. The "shuttle lever" must be pushed downwards out of the rest position and held for at least 3 sec. at the same time as both brake pedals are pressed. This disengages the automatic engagement of the park lock. The display lamp **(2)** (Fig. **2**) becomes active and a warning symbol appears in the display. (Fig. **3**)
The driver must switch off the ignition prior to releasing the brake pedals otherwise the lock will be lifted again.

NOTE: *If the park lock is already engaged when the ignition switch is switched off, this procedure will not release it.*

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Initialising the park lock



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If initial configuration of the park lock is required, such as after an interruption in the power supply, the park lock may still show a status of "not initialised" when the power supply resumes. The same condition can arise after manually releasing the park lock.
The "action required" **(1)** symbol shows the driver that he should reset the function by releasing the park lock. To do this, with the brake pedal depressed and the neutral switch pressed **(2)** (Fig. **1**), the "shuttle lever" must be moved to position **(PZ)** (Fig. **1**). When doing so the handbrake must be released and the tractor must be stationary.

After this the driver is requested to engage the park lock. The symbol on the display panel is updated **(2)** and the driver must move the "shuttle lever" into the park position.
When the park lock is fully engaged again the procedure is complete and the park lock is fully functional.

Trailer brakes

The trailer brake is controlled in the same way by both the park lock and the handbrake.

Release in the event of an interruption in the power supply

In the event of a disruption as a result of which the park lock cannot be electronically released, it can be manually released. A crank that is attached to the handbrake lever is used for this. Remove the tool from the retainer. Locate the park lock on the rear left panel of the cab and remove the two protective rubber caps. (one inside and one outside) Insert the crankshaft and ensure that the shaft has been fully inserted into the receptacle by moving it back and forth slightly. Turn the small crank handle in a clockwise direction to release the park lock. Stop when it becomes more difficult to turn the crank handle. A completely engaged park lock requires approximately 150 revolutions to release it.

NOTE: *In an emergency it is possible to move the tractor even if the park brake is engaged. We recommend doing this only in an emergency and where possible to release it manually instead. In such a situation the travelling speed is limited to 2 km/h.*

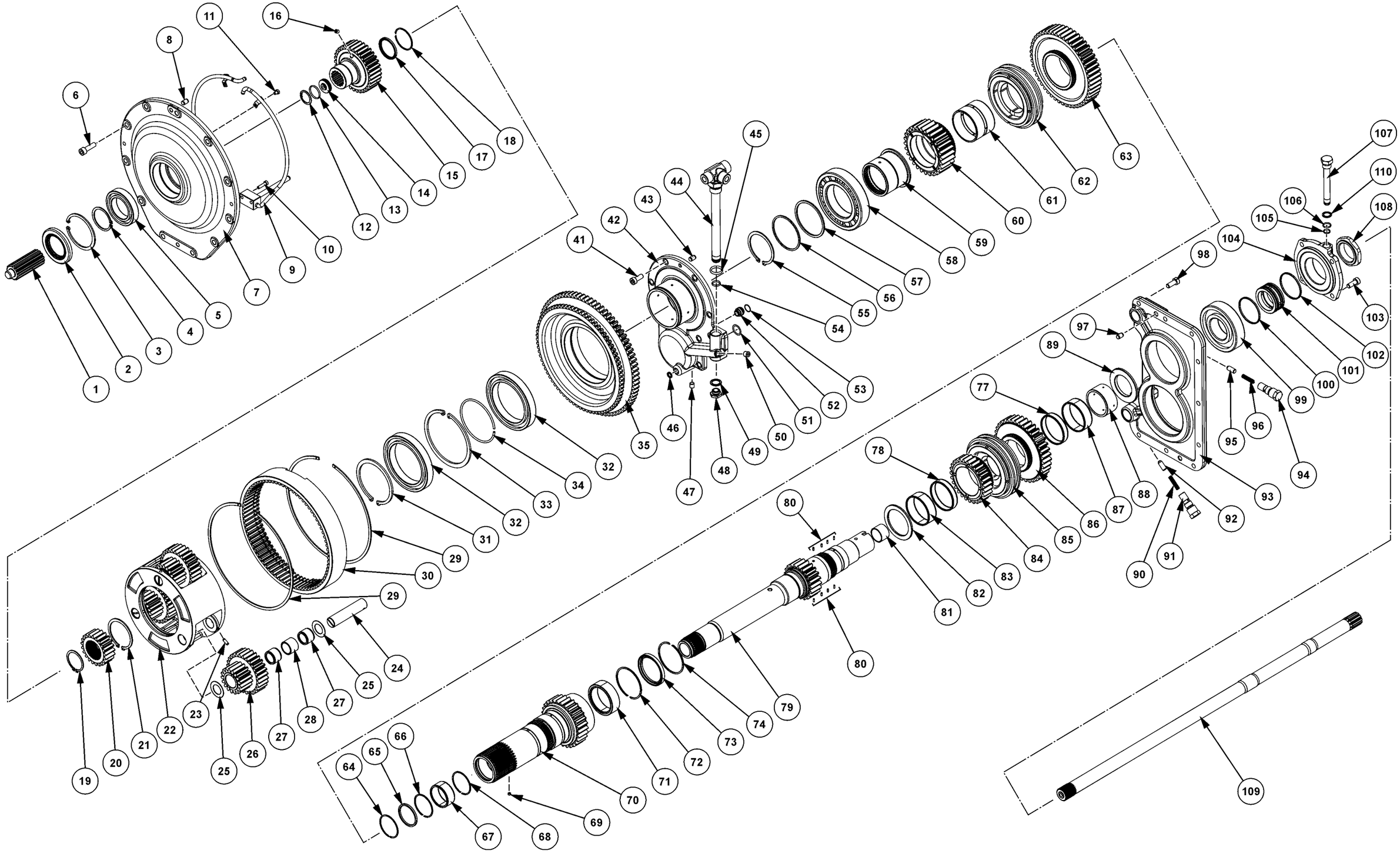
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TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input)

Parts - 40 km/h ECO and 50 km/h gearbox variants			
1	Shaft	2	Shaft sealing ring
3	Snap ring	4	Snap ring
5	Bearings	6	Screw
7	Cover	8	Dowel pin
9	Lubrication pipe	10	Screw
11	Screw	12	Snap ring
13	Seal ring	14	Plug
15	Sun gear	16	Restrictor
17	Seal ring	18	Snap ring
19	Snap ring	20	Sun gear
21	Snap ring	22	Planetary carrier
23	Pin	24	Bolt
25	Washer	26	Planetary gear
27	Needle bearing	28	Bushing
29	Snap ring	30	Ring gear
31	Snap ring	32	Ball bearing
33	Snap ring	34	Ring
35	Gear		
41	Screw	42	Cover
43	Dowel pin	44	Oil feed
45	O-ring	46	Seal ring
47	Plug	48	Screw
49	Seal ring	50	Plug
51	O-ring	52	Connection
53	Seal ring	54	O-ring
55	Snap ring	56	Snap ring
57	Washer	58	Roller bearing
59	Bushing	60	Gear wheel, F1
61	Liner	62	Synchroniser unit F1/F3
63	Gear wheel, F3	64	Snap ring
65	Seal ring	66	Snap ring
67	Needle bearing	68	Snap ring
69	Restrictor	70	Input sleeve shaft F1/F3
71	Needle bearing	72	Snap ring
73	Seal ring	74	Snap ring
77	Sleeve	78	Sleeve
79	Input sleeve shaft	80	Restrictor
81	Bearing bush	82	Washer
83	Needle bearing	84	Gear wheel, R2
85	Synchroniser unit F4/R2	86	Gear wheel, F4
87	Needle bearing	88	Bushing
89	Washer	90	Spring
91	Screw sleeve	92	Bolt
93	Cover	94	Screw sleeve
95	Bolt	96	Spring
97	Dowel pin	98	Screw
99	Ball bearing	100	Seal ring
101	Sleeve	102	Seal ring
103	Screw	104	Cover
105	O-ring	106	O-ring
107	Banjo bolt	108	Nut
109	PTO shaft	110	Seal ring

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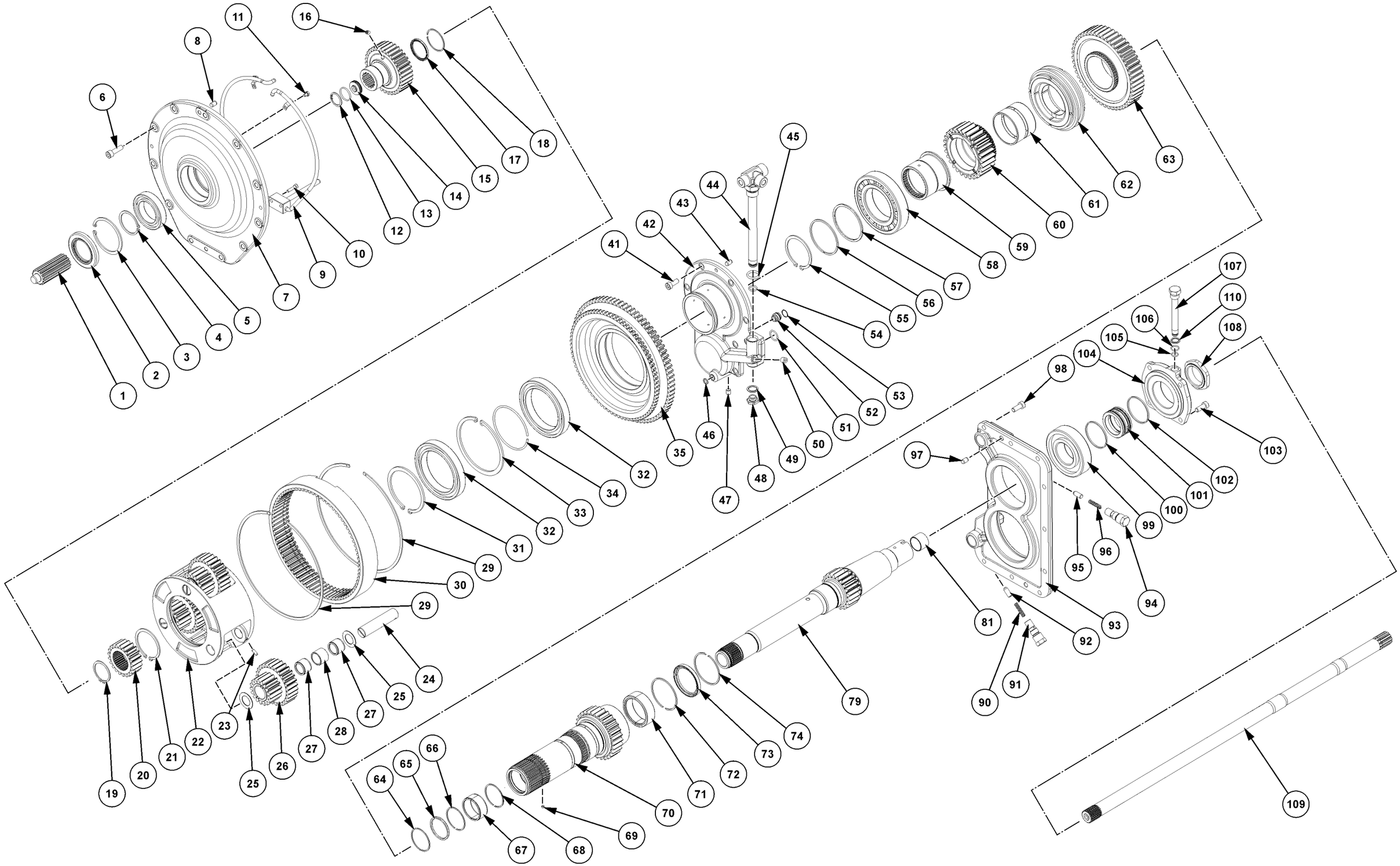


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Parts - 35 km/h and 40 km/h gearbox variants			
1	Shaft	2	Shaft sealing ring
3	Snap ring	4	Snap ring
5	Bearings	6	Screw
7	Cover	8	Dowel pin
9	Lubrication pipe	10	Screw
11	Screw	12	Snap ring
13	Seal ring	14	Plug
15	Sun gear	16	Restrictor
17	Seal ring	18	Snap ring
19	Snap ring	20	Sun gear
21	Snap ring	22	Planetary carrier
23	Pin	24	Bolt
25	Washer	26	Planetary gear
27	Needle bearing	28	Bushing
29	Snap ring	30	Ring gear
31	Snap ring	32	Ball bearing
33	Snap ring	34	Ring
35	Gear		
41	Screw	42	Cover
43	Dowel pin	44	Oil feed
45	O-ring	46	Seal ring
47	Plug	48	Screw
49	Seal ring	50	Plug
51	O-ring	52	Connection
53	Seal ring	54	O-ring
55	Snap ring	56	Snap ring
57	Washer	58	Roller bearing
59	Bushing	60	Gear wheel, F1
61	Liner	62	Synchroniser unit F1/F3
63	Gear wheel, F3	64	Snap ring
65	Seal ring	66	Snap ring
67	Needle bearing	68	Snap ring
69	Restrictor	70	Input sleeve shaft F1/F3
71	Needle bearing	72	Snap ring
73	Seal ring	74	Snap ring
79	Input sleeve shaft		
81	Bearing bush	90	Spring
91	Screw sleeve	92	Bolt
93	Cover	94	Screw sleeve
95	Bolt	96	Spring
97	Dowel pin	98	Screw
99	Ball bearing	100	Seal ring
101	Sleeve	102	Seal ring
103	Screw	104	Cover
105	O-ring	106	O-ring
107	Banjo bolt	108	Nut
109	PTO shaft	110	Seal ring

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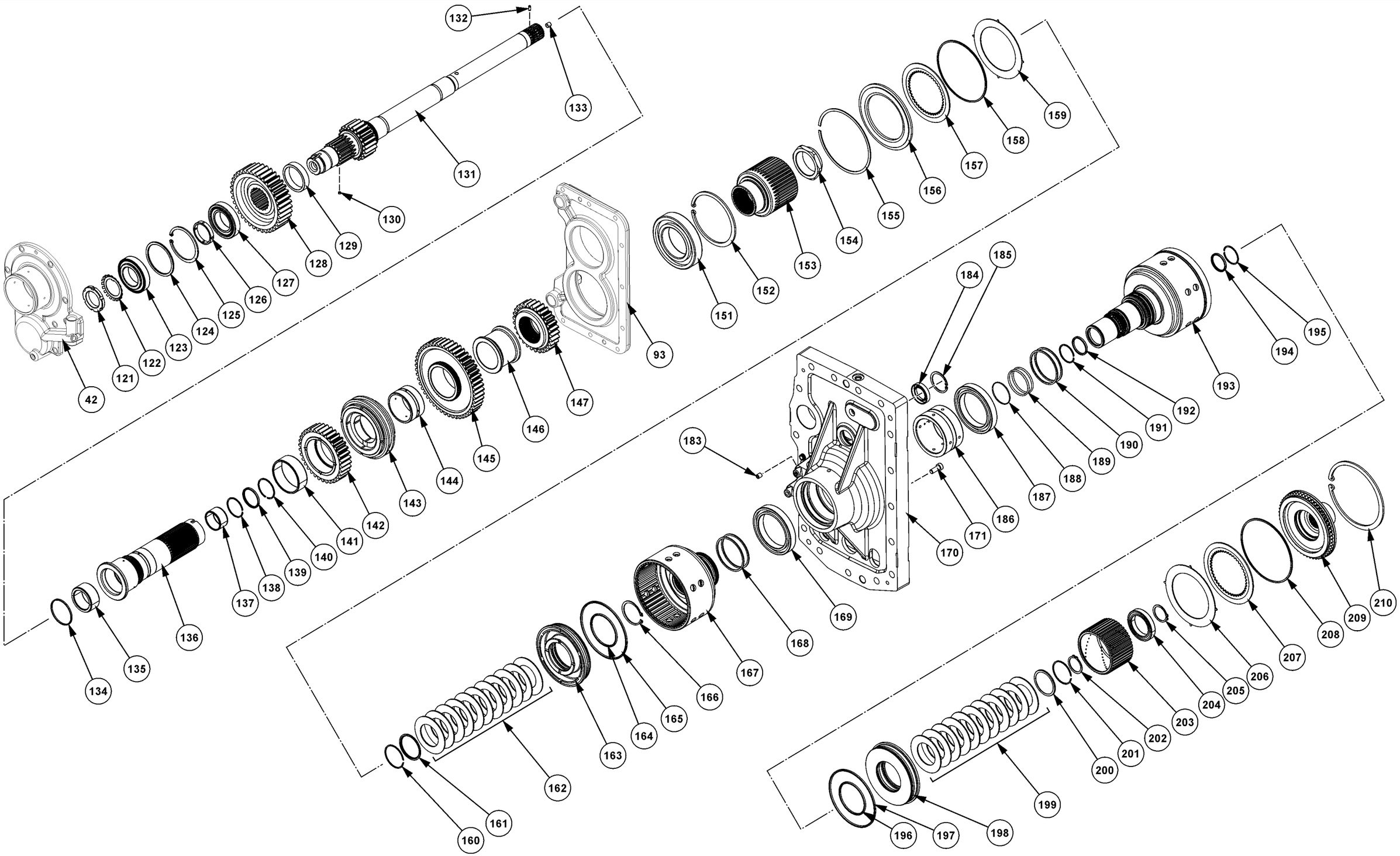
SS08H149 2

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TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output)

Parts - 40 km/h ECO and 50 km/h gearbox variants			
42	Cover	93	Cover
121	Grooved nut	122	Locking plate
123	Oblique roller bearing	124	Spacer ring
125	Snap ring	126	Ring
127	Oblique roller bearing	128	Gear
129	Ring	130	Restrictor
131	Output shaft	132	Restrictor
133	Restrictor	134	Seal ring
135	Needle bearing	136	Output sleeve shaft F2/R1
137	Needle bearing	138	Snap ring
139	Seal ring	140	Snap ring
141	Needle bearing	142	Gear wheel, R1
143	Synchroniser unit F2/R1	144	Bearing bush
145	Gear wheel, F2	146	Spacer sleeve
147	Gear		
151	Ball bearing	152	Snap ring
153	Inner disc support	154	Nut
155	Snap ring	156	End plate
157	Coated discs (10 units)	158	Separator springs (10 units)
159	Steel discs (11 units)	160	Snap ring
161	L-ring	162	Belleville washers
163	Piston	164	Seal ring
165	Seal ring	166	Snap ring
167	Outer disc support	168	Seal rings
169	Ball bearing	170	Separator plate
171	Screw		
183	Plug	184	Seal ring
185	Snap ring	186	Bushing (is pressed into the separator plate (171))
187	Ball bearing	188	Seal ring
189	Seal rings	190	Seal rings
191	Snap ring	192	Seal ring
193	Outer disc support	194	Seal ring
195	Snap ring	196	Seal ring
197	Seal ring	198	Piston
199	Belleville washers	200	L-ring
201	Snap ring	202	Snap ring
203	Inner disc support	204	Ball bearing
205	Snap ring	206	Steel discs (11 units)
207	Coated discs (10 units)	208	Separator springs (10 units)
209	End plate	210	Snap ring

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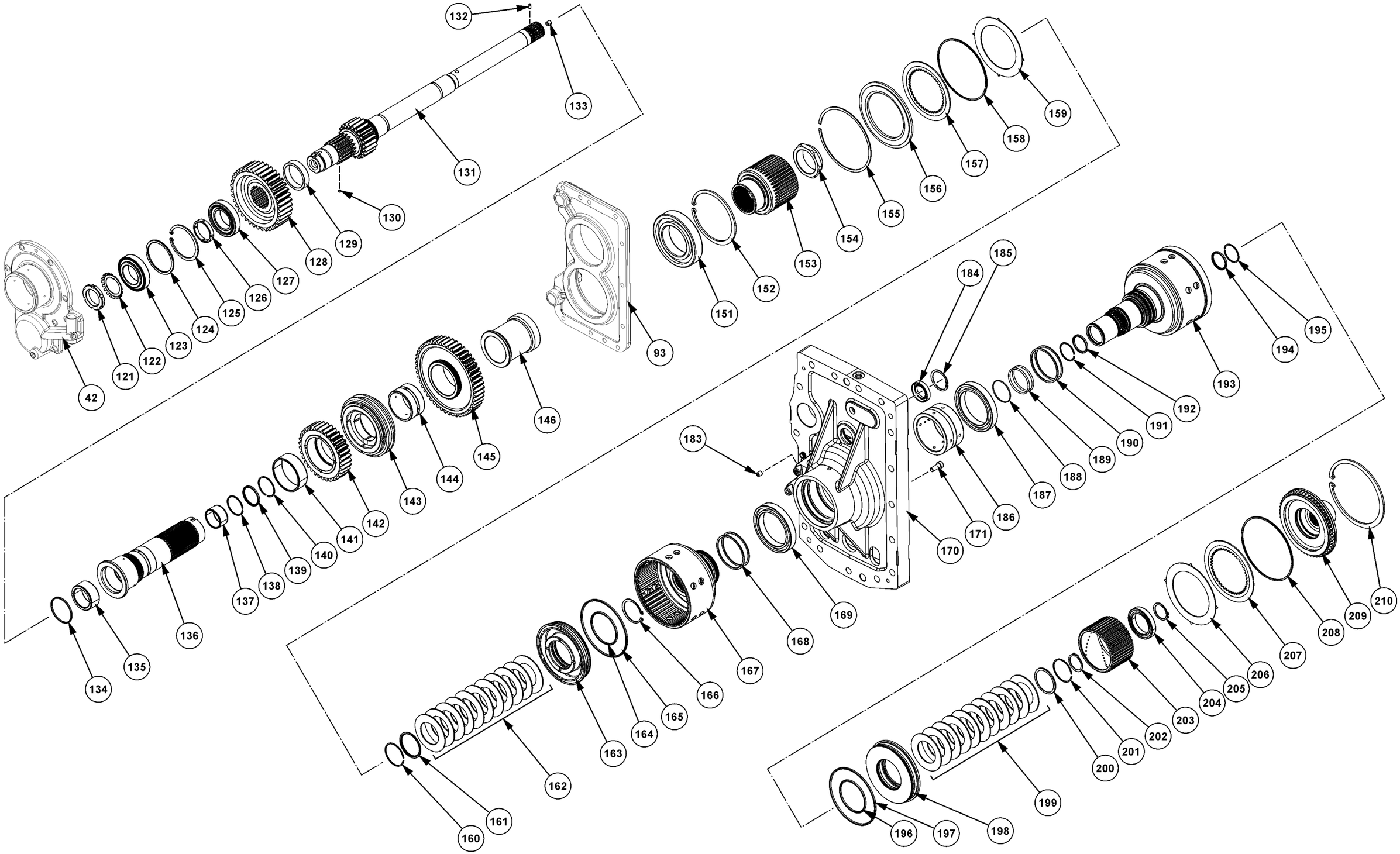


SS08G448 1

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Parts - 35 km/h and 40 km/h gearbox variants			
42	Cover	93	Cover
121	Grooved nut	122	Locking plate
123	Oblique roller bearing	124	Spacer ring
125	Snap ring	126	Ring
127	Oblique roller bearing	128	Gear
129	Ring	130	Restrictor
131	Output shaft	132	Restrictor
133	Restrictor	134	Seal ring
135	Needle bearing	136	Output sleeve shaft F2/R1
137	Needle bearing	138	Snap ring
139	Seal ring	140	Snap ring
141	Needle bearing	142	Gear wheel, R1
143	Synchroniser unit F2/R1	144	Bearing bush
145	Gear wheel, F2	146	Spacer sleeve
151	Ball bearing	152	Snap ring
153	Inner disc support	154	Nut
155	Snap ring	156	End plate
157	Coated discs (10 units)	158	Separator springs (10 units)
159	Steel discs (11 units)	160	Snap ring
161	L-ring	162	Belleville washers
163	Piston	164	Seal ring
165	Seal ring	166	Snap ring
167	Outer disc support	168	Seal rings
169	Ball bearing	170	Separator plate
171	Screw		
183	Plug	184	Seal ring
185	Snap ring	186	Bushing (is pressed into the separator plate (171))
187	Ball bearing	188	Seal ring
189	Seal rings	190	Seal rings
191	Snap ring	192	Seal ring
193	Outer disc support	194	Seal ring
195	Snap ring	196	Seal ring
197	Seal ring	198	Piston
199	Belleville washers	200	L-ring
201	Snap ring	202	Snap ring
203	Inner disc support	204	Ball bearing
205	Snap ring	206	Steel discs (11 units)
207	Coated discs (10 units)	208	Separator springs (10 units)
209	End plate	210	Snap ring

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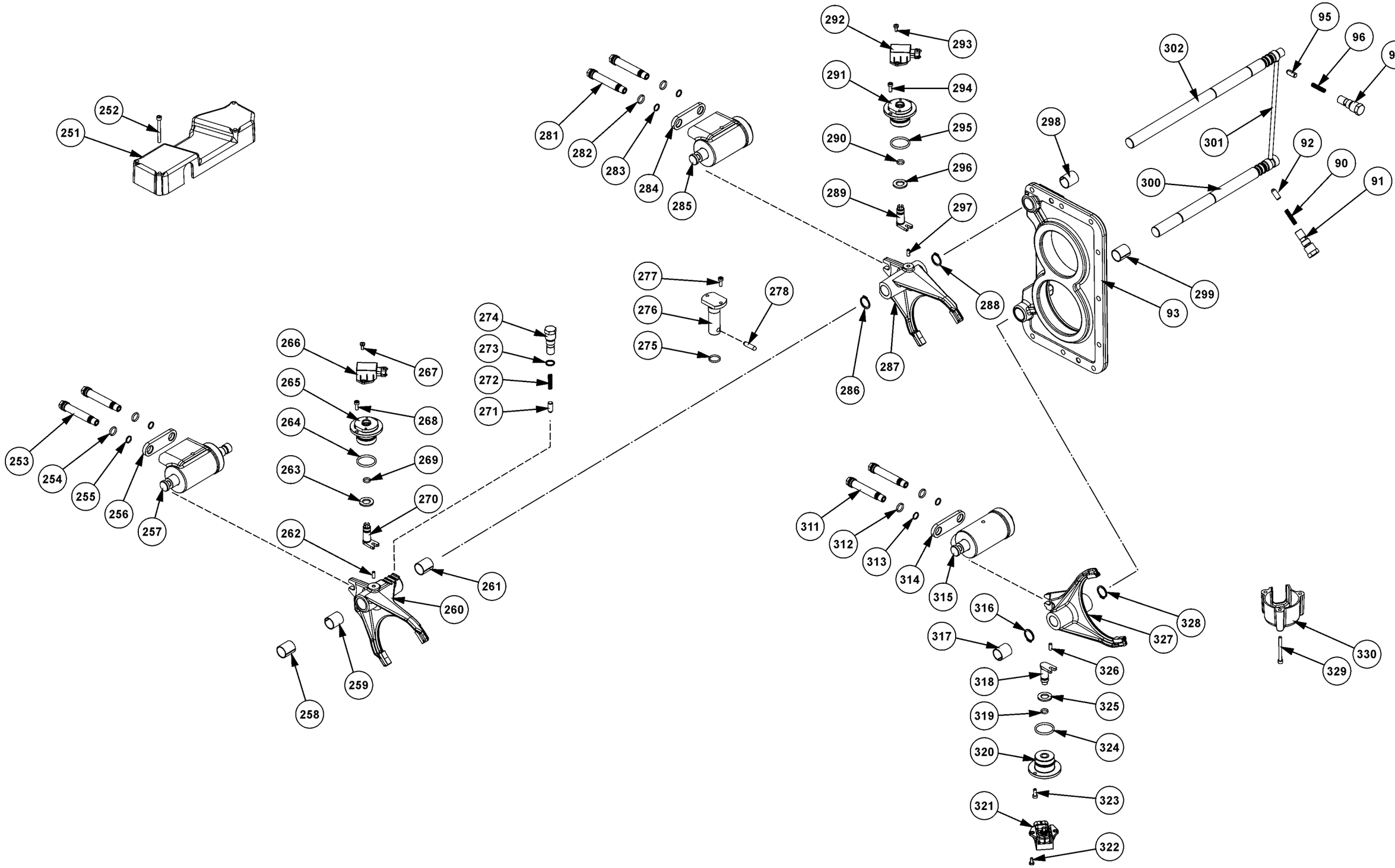
SS08H038 2

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TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system)

Parts - 40 km/h ECO and 50 km/h gearbox variants			
90	Spring	91	Screw sleeve
92	Bolt	93	Cover
94	Screw sleeve	95	Bolt
96	Spring		
251	Cap	252	Screw
253	Pressure pipe	254	O-ring
255	O-ring	256	Plate
257	Shift cylinder F1/F3	258	Bushing
259	Bushing	260	Shift fork F1/F3
261	Bushing	262	Pin
263	Washer	264	O-ring
265	Flange	266	Adjustment potentiometer F1/F3
267	Screw	268	Screw
269	O-ring	270	Shaft
271	Bolt	272	Spring
273	O-ring	274	Screw sleeve
275	O-ring	276	Bolt
277	Screw	278	Pin
281	Pressure pipe	282	O-ring
283	O-ring	284	Plate
285	Shift cylinder F4/R2	286	Snap ring
287	Shift fork F4/R2	288	Snap ring
289	Shaft	290	O-ring
291	Flange	292	Adjustment potentiometer F4/R2
293	Screw	294	Screw
295	O-ring	296	Washer
297	Pin	298	Bushing
299	Bushing	300	Actuator shaft
301	Ratch	302	Actuator shaft
311	Pressure pipe	312	O-ring
313	O-ring	314	Plate
315	Shift cylinder F2/R1	316	Snap ring
317	Bushing	318	Shaft
319	O-ring	320	Flange
321	Adjustment potentiometer F2/R1	322	Screw
323	Screw	324	Screw
325	Washer	326	Pin
327	Shift fork F2/R1	328	Snap ring
329	Screw	330	Cap

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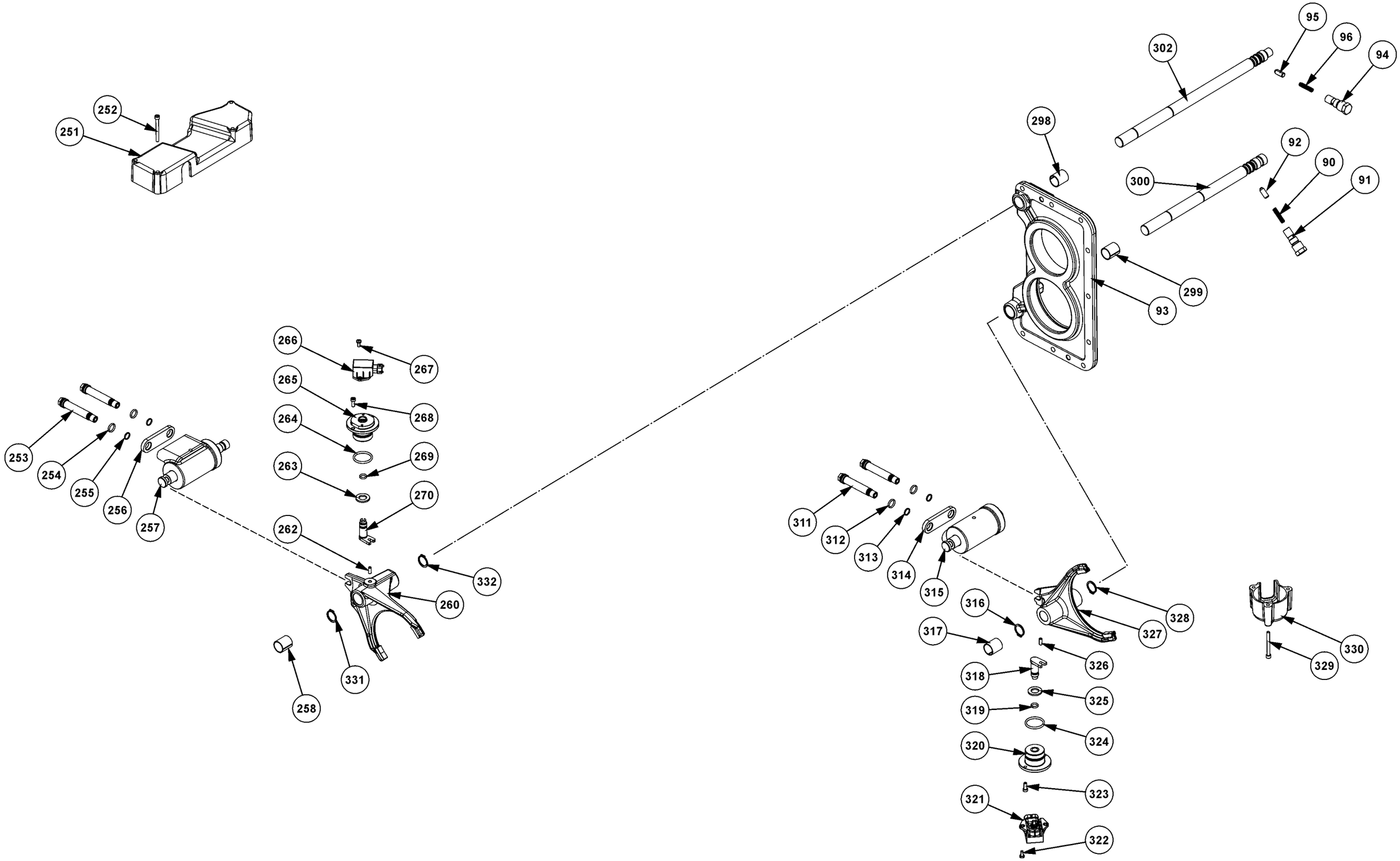


SS08H036 1

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Parts - 35 km/h and 40 km/h gearbox variants			
90	Spring	91	Screw sleeve
92	Bolt	93	Cover
94	Screw sleeve	95	Bolt
96	Spring		
251	Cap	252	Screw
253	Pressure pipe	254	O-ring
255	O-ring	256	Plate
257	Shift cylinder F1/F3	258	Bushing
		260	Shift fork F1/F3
		262	Pin
263	Washer	264	O-ring
265	Flange	266	Adjustment potentiometer F1/F3
267	Screw	268	Screw
269	O-ring	270	Shaft
		298	Bushing
299	Bushing	300	Actuator shaft
		302	Actuator shaft
311	Pressure pipe	312	O-ring
313	O-ring	314	Plate
315	Shift cylinder F2/R1	316	Snap ring
317	Bushing	318	Shaft
319	O-ring	320	Flange
321	Adjustment potentiometer F2/R1	322	Screw
323	Screw	324	Screw
325	Washer	326	Pin
327	Shift fork F2/R1	328	Snap ring
329	Screw	330	Cap
331	Snap ring	332	Snap ring

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SS08H039 2

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TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components)

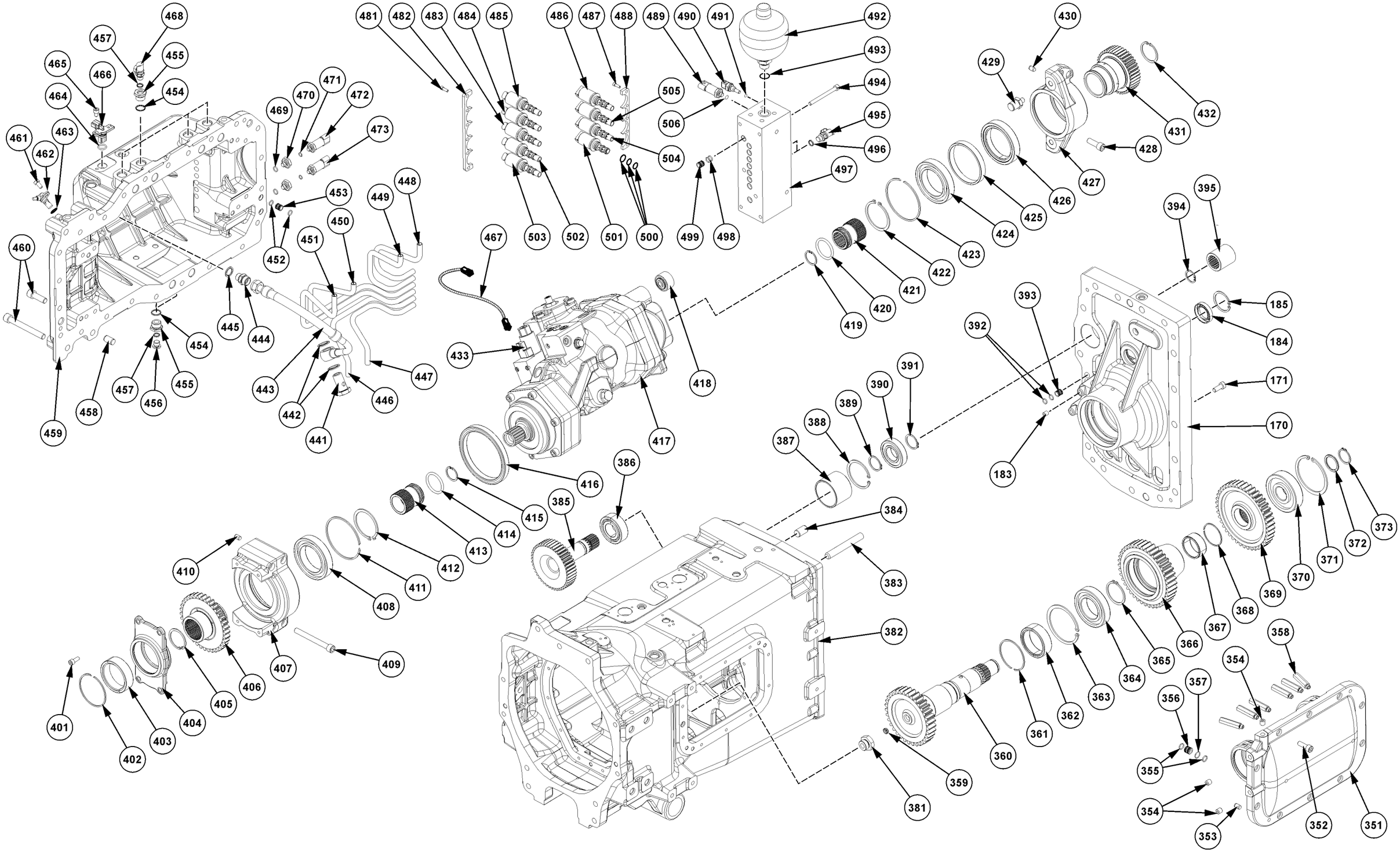
Parts - 40 km/h ECO and 50 km/h gearbox variants			
351	Cover	352	Screw
353	Dowel pin	354	Screw plug
355	Seal rings	356	Connecting piece
357	Snap ring	358	Nozzles
359	Screw plug	360	Shaft
361	Snap ring	362	Needle bearing
363	Snap ring	364	Ball bearing
365	Snap ring	366	Gear
367	Needle bearing	368	Snap ring
369	Gear	370	Ball bearing
371	Snap ring	372	Washer
373	Snap ring		
381	Nozzle	382	Gearbox case
383	Stud bolt	384	Dowel pin
385	Drive wheel	386	Roller bearing
387	Bushing	388	Snap ring
389	Snap ring	390	Ball bearing
391	Snap ring	392	Seal rings
393	Connecting piece	394	Snap ring
395	Connecting sleeve		
401	Screw	402	Snap ring
403	Needle bearing	404	Cover
405	Snap ring	406	Gear
407	Bearing block	408	Ball bearing
409	Screw	410	Dowel pin
411	Snap ring	412	Snap ring
413	Connecting sleeve	414	O-ring
415	Snap ring	416	Silent block
417	Hydrostat	418	Silent block
419	Snap ring	420	O-ring
421	Connecting sleeve	422	Snap ring
423	Snap ring	424	Ball bearing
425	Sleeve	426	Roller bearing
427	Bearing block	428	Screw
429	Bolt	430	Dowel pin
431	Gear	432	Snap ring
433	Solenoid valve, hydrostat		
441	Banjo bolt	442	Seal ring
443	Hose	444	Screw-in piece
445	Seal ring	446	Pressure line F2
447	Pressure line R1	448	Pressure line R2
449	Pressure line F4	450	Pressure line F1
451	Pressure line F3	452	Seal rings
453	Connecting piece	454	Seal ring
455	Screw-in piece	456	Screw Screw plug
457	Seal ring	458	Dowel pin
459	Cover	460	Screws
461	Screw	462	Speed sensor, ring gear
463	O-ring	464	O-ring
465	Screw	466	Adaptor Screw plug

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467	Tube	468	Test port
469	Seal ring	470	Screw-in piece
471	Seal ring	472	Pressure sensor, clutch "A"
473	Pressure sensor, clutch "B"		
481	Screw	482	Mount bracket
483	Solenoid valve F2	484	Solenoid valve F1
485	Solenoid valve R2	486	Solenoid valve F4
487	Screw	488	Mount bracket
489	System pressure sensor P1	490	Temperature sensor, transmission oil
491	Seal ring	492	Accumulator
493	Seal ring	494	Screw
495	Test port	496	Seal ring
497	Valve block	498	Seal rings
499	Connecting piece	500	O-rings
501	Safety valve	502	Solenoid valve, clutch “A”
503	Solenoid valve, clutch “B”	504	Solenoid valve R1
505	Solenoid valve F3	506	Seal ring

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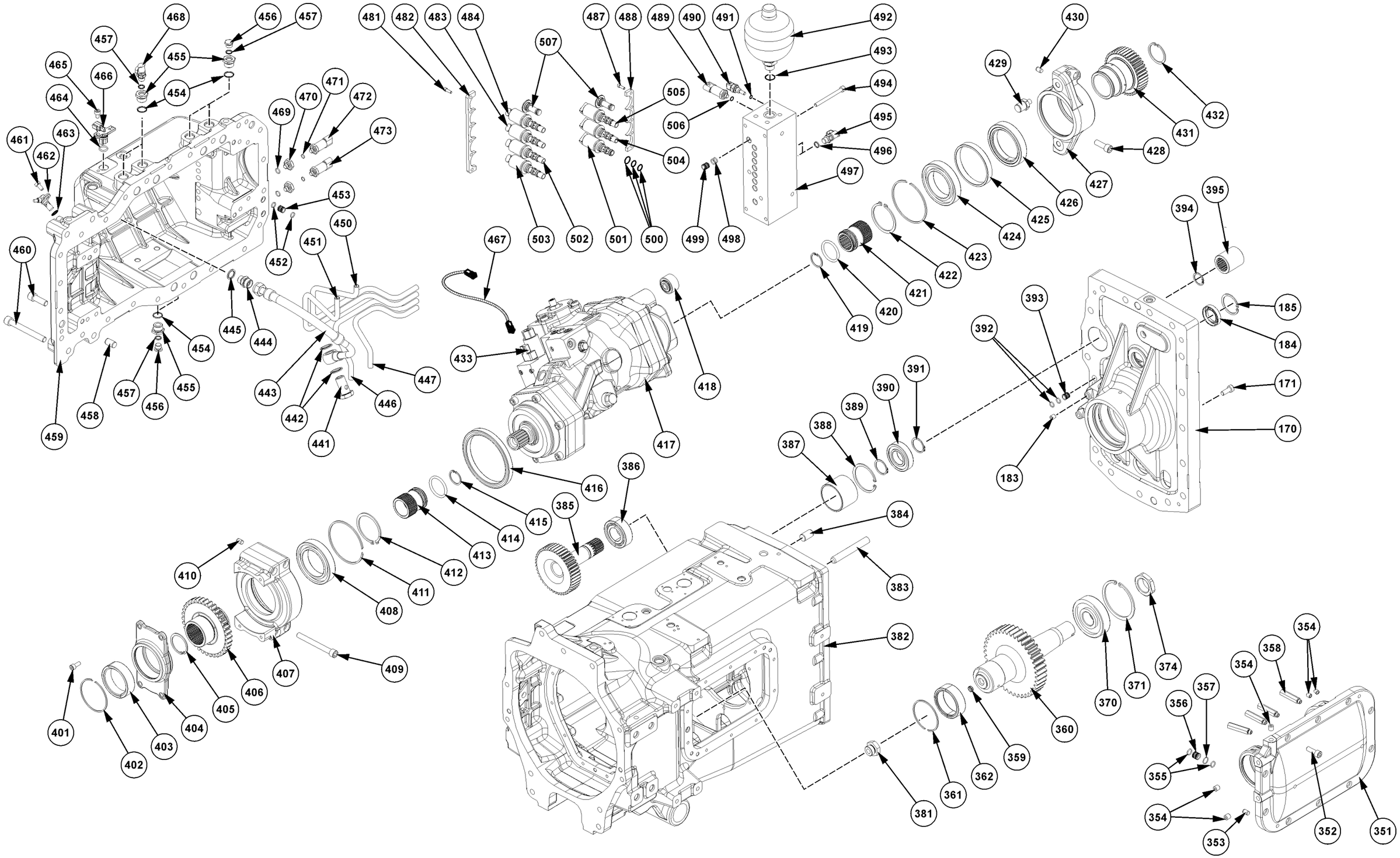


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Parts - 35 km/h and 40 km/h gearbox variants			
351	Cover	352	Screw
353	Dowel pin	354	Screw plug
355	Seal rings	356	Connecting piece
357	Snap ring	358	Nozzles
359	Screw plug	360	Shaft
361	Snap ring	362	Needle bearing
		370	Ball bearing
371	Snap ring	374	Nut
381	Nozzle	382	Gearbox case
383	Stud bolt	384	Dowel pin
385	Drive wheel	386	Roller bearing
387	Bushing	388	Snap ring
389	Snap ring	390	Ball bearing
391	Snap ring	392	Seal rings
393	Connecting piece	394	Snap ring
395	Connecting sleeve		
401	Screw	402	Snap ring
403	Needle bearing	404	Cover
405	Snap ring	406	Gear
407	Bearing block	408	Ball bearing
409	Screw	410	Dowel pin
411	Snap ring	412	Snap ring
413	Connecting sleeve	414	O-ring
415	Snap ring	416	Silent block
417	Hydrostat	418	Silent block
419	Snap ring	420	O-ring
421	Connecting sleeve	422	Snap ring
423	Snap ring	424	Ball bearing
425	Sleeve	426	Roller bearing
427	Bearing block	428	Screw
429	Bolt	430	Dowel pin
431	Gear	432	Snap ring
433	Solenoid valve, hydrostat		
441	Banjo bolt	442	Seal ring
443	Hose	444	Screw-in piece
445	Seal ring	446	Pressure line F2
447	Pressure line R1	450	Pressure line F1
451	Pressure line F3	452	Seal rings
453	Connecting piece	454	Seal ring
455	Screw-in piece	456	Screw plug
457	Seal ring	458	Dowel pin
459	Cover	460	Screws

Parts - 35 km/h and 40 km/h gearbox variants			
461	Screw	462	Speed sensor, ring gear
463	O-ring	464	O-ring
465	Screw	466	Adaptor plug
467	Tube	468	Test port
469	Seal ring	470	Screw-in piece
471	Seal ring	472	Pressure sensor, coupling "A"
473	Pressure sensor, coupling "B"		
481	Screw	482	Mount bracket
483	Solenoid valve F2	484	Solenoid valve F1
487	Screw	488	Mount bracket
489	System pressure sensor P1	490	Temperature sensor, transmission oil
491	Seal ring	492	Accumulator
493	Seal ring	494	Screw
495	Test port	496	Seal ring
497	Valve block	498	Seal rings
499	Connecting piece	500	O-rings
501	Safety valve	502	Solenoid valve, clutch “A”
503	Solenoid valve, clutch “B”	504	Solenoid valve R1
505	Solenoid valve F3	506	Seal ring
507	Plug		

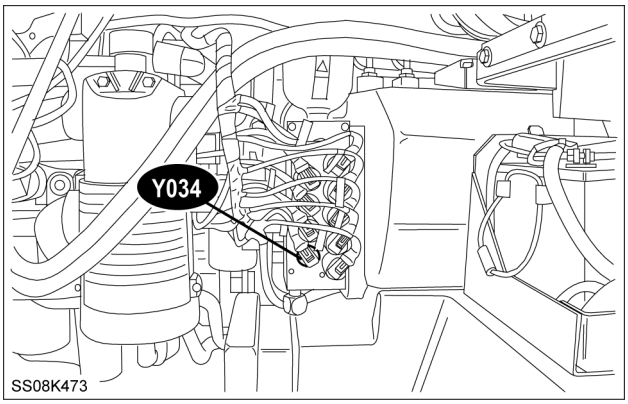
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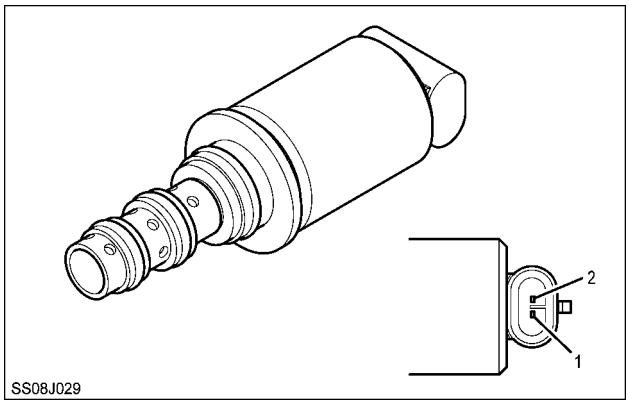
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Control valve - Overview Safety valve



SS08K473 1



SS08J029 2

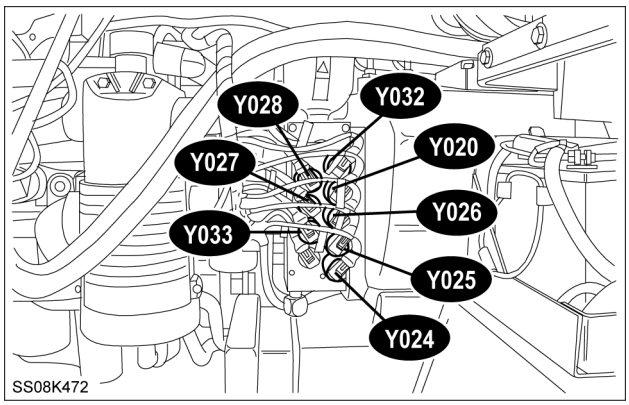
Safety valve (Y034)

Valve construction	On / Off
Nominal supply	**12 V**
Resistance of the coil at **20 °C** (**68 °F**)	**7,3 Ω ± 5 %**
Insulating resistance	> **100 k Ω**
Current max.	**1,35 A**

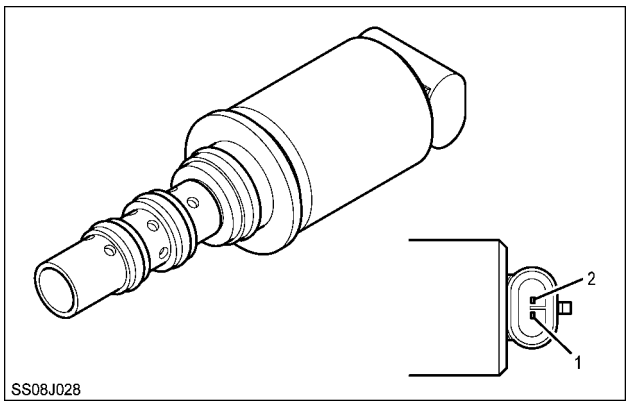
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Control valve - Overview (Solenoid valves)

Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox



SS08K472 1



SS08J028 2

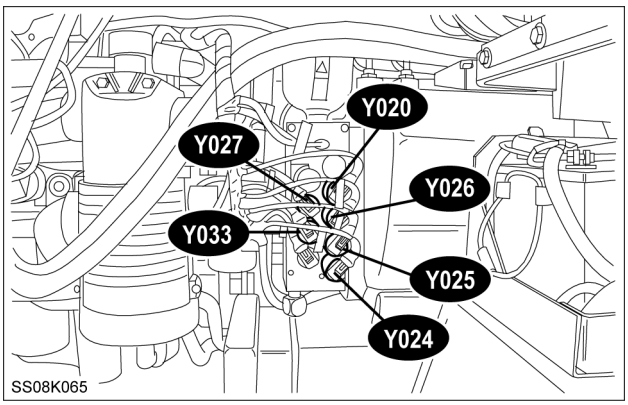
PWM valves F1 (Y020), F2 (Y026), F3 (Y027), F4 (Y028), R1 (Y033), R2 (Y032) and clutch A (Y025) & B (Y024)

Valve construction	Proportional (PWM)
Nominal (clocked) supply	**12 V**
Clock frequency	**100 Hz**
Voltage (measured using DMM)	**7,5 V**
Resistance of the coil at **20 °C** (**68 °F**)	**9,9 Ω ± 5 %**
Insulating resistance	**> 100 k Ω**
Current consumption	**100 - 750 mA**
Power consumption	**14 W**

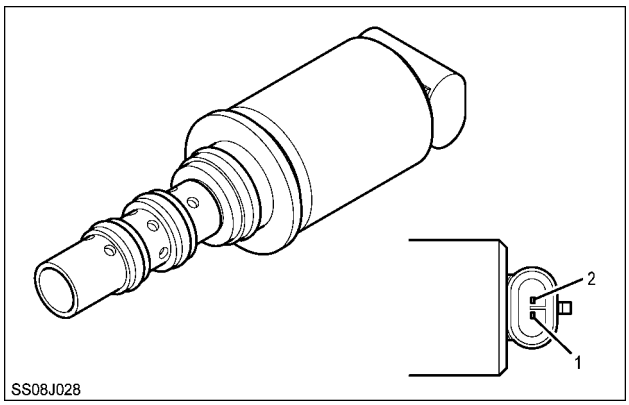
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Control valve - Overview (Solenoid valves)

Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox



SS08K065 1



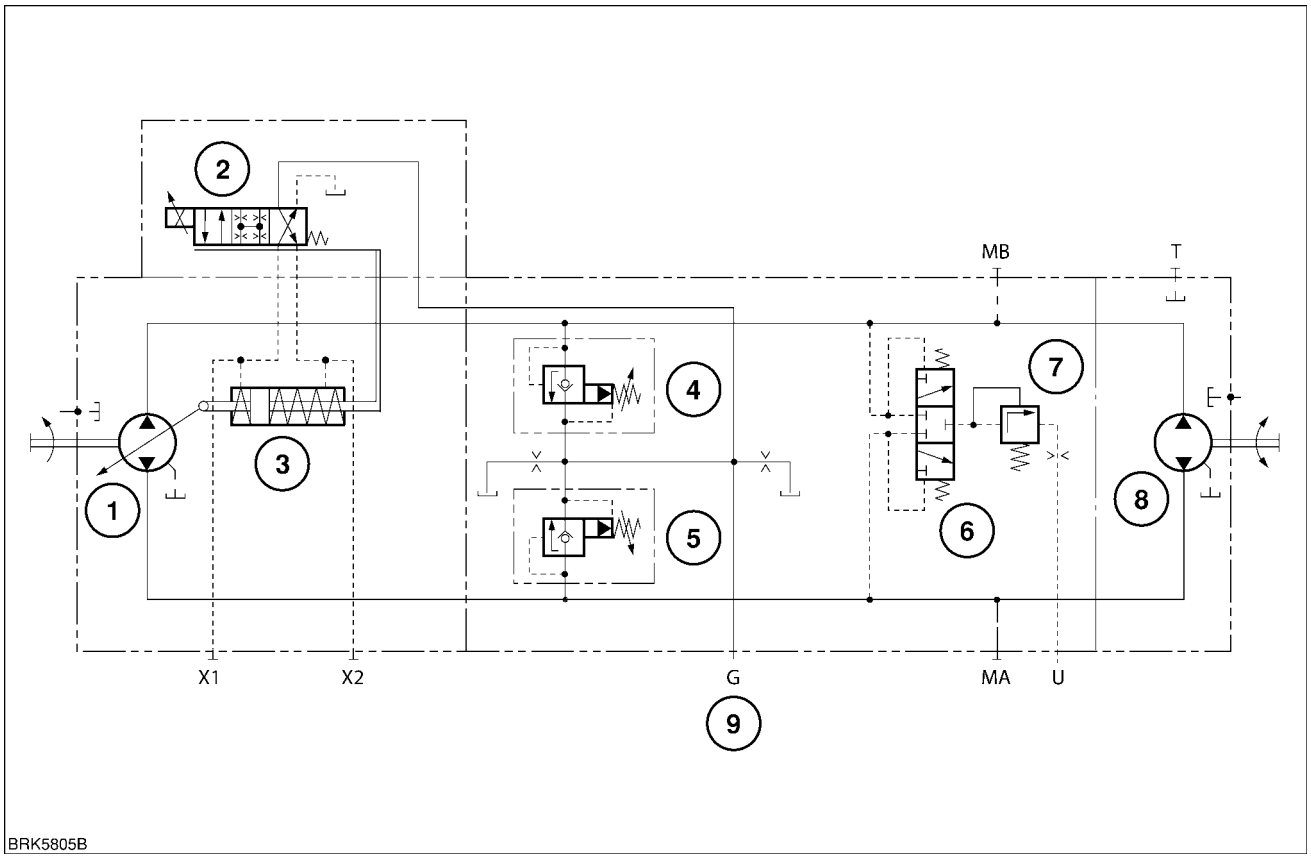
SS08J028 2

PWM valves F1 (Y020), F2 (Y026), F3 (Y027), R1 (Y033) and clutch A (Y025) & B (Y024)

Valve construction	Proportional (PWM)
Nominal (clocked) supply	**12 V**
Clock frequency	**100 Hz**
Voltage (measured using DMM)	**7,5 V**
Resistance of the coil at **20 °C** (**68 °F**)	**9,9 Ω ± 5 %**
Insulating resistance	**> 100 k Ω**
Current consumption	**100 - 750 mA**
Power consumption	**14 W**

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Hydrostat - Hydraulic schema



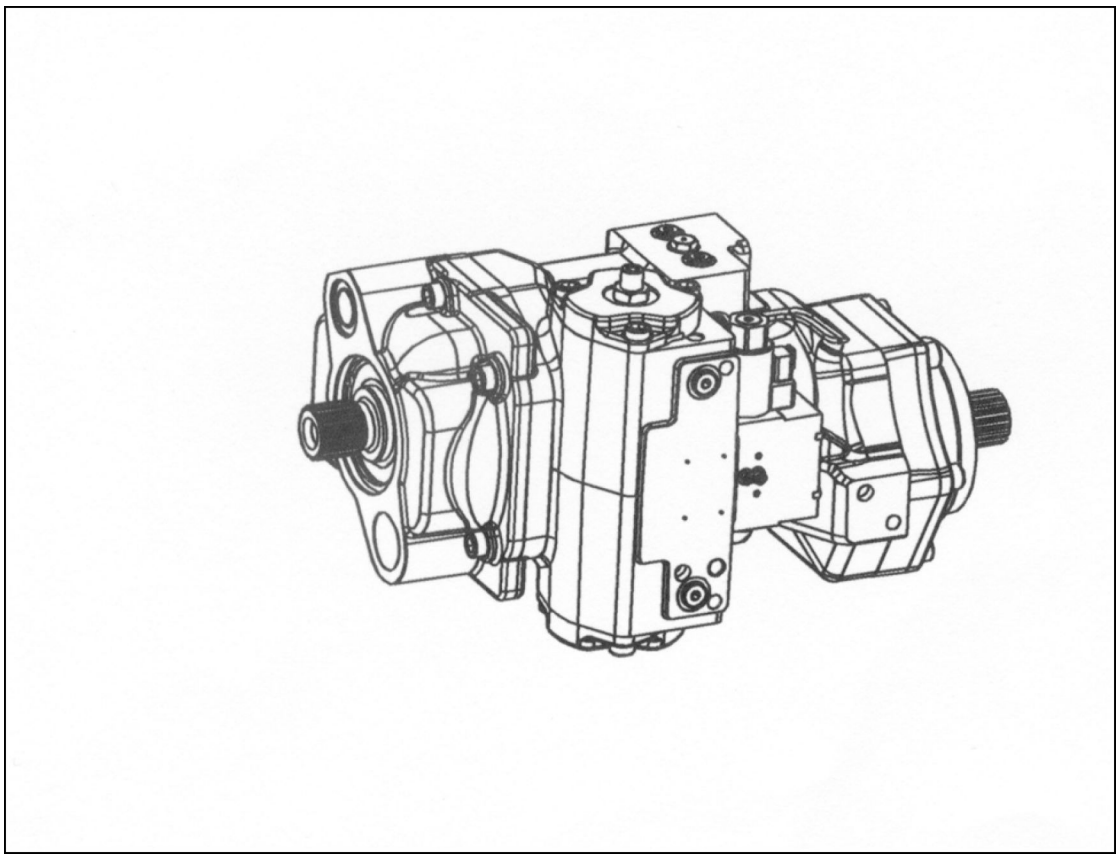
BAIL08CVT122FSA 1

1.Variable displacement pump
2.Hydrostatic controller
3.Swash plate
4.Pressure limiting valve
5.Pressure limiting valve
6.Flush valve spool
7.Relief valve **480 bar** (**6960.0 psi**)
8.Hydrostatic motor
9.Pressure port **22 bar** (**319.0 psi**)

(X1) and **(X2)** : Control pressure ports
(MA) and **(MB)** : High pressure gauge ports
(U) : Flushing oil port

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Hydrostat - Static description



BAIL08CVT124FSA 1

The hydrostatic unit consists of an electrically controlled variable displacement pump and a fixed displacement motor within a common housing, complete with high pressure relief and flushing valves. The unit itself is fitted within a further housing which is located by dowels and provides a flange fitting to the side of the transmission housing. This flanged housing ensures that the hydrostatic unit is aligned correctly within the transmission.

Pump

The pump is an electrically controlled variable displacement pump and is of the swash plate type. The power flow of the pump can be negative (motor operation) or positive (pump operation) in particular operating conditions. (Refer to **Hydrostat - General specification (C.20.G)**

Pump displacement control

The pump displacement control is a single sided electrical control. The actuator has to be middle centred. This means that without boost pressure the pump is at zero displacement.(Refer to **Hydrostat - General specification (C.20.G)**

Motor

The motor is a fixed displacement type. The power flow of the motor can be negative (pump operation) or positive (motor operation).

Boost line

The hydrostatic unit has a boost port to enable replacement of fluid flushed or leaked out of the closed circuit. This also provides the actuator of the swash plate with fluid and pressure. The pressure in the low pressure side of the hydrostat is set by the boost pressure. The boost flow conditions are shown at **Hydrostat - General specification (C.20.G)**

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High pressure relief valve

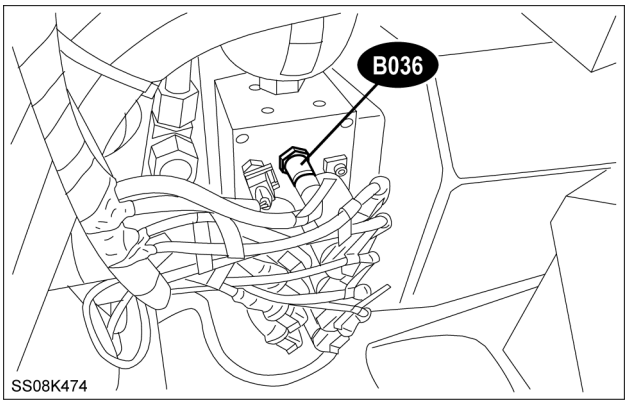
These valves protect the hydrostatic unit from overpressure. If the pressure exceeds the setting value, the valves open a connection between the high and low pressure side of the circuit. (Refer to **Hydrostat - General specification (C.20.G)**

Flushing

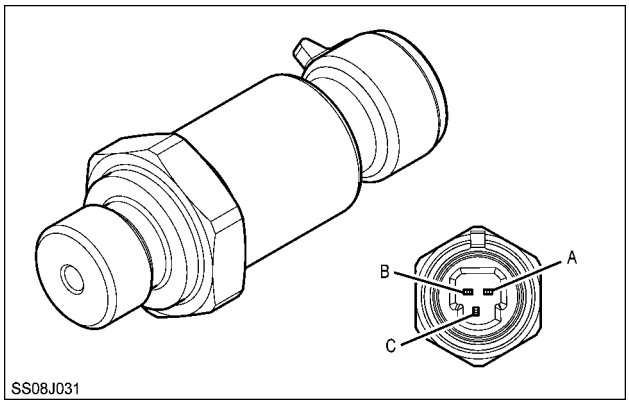
To maintain the temperature in the hydrostatic unit at a constant level, a certain amount of oil from the closed circuit has to be steadily replaced with oil from the boost line. The flushing valve flushes out a constant amount of oil from the low pressure side of the circuit directly to tank.

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Sensing system System pressure sensor - Overview (P1)



SS08K474 1



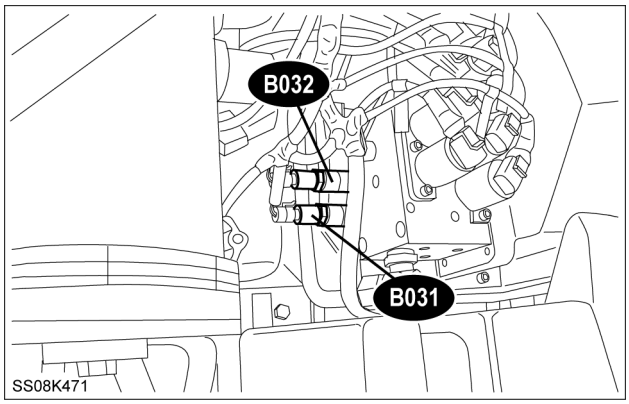
SS08J031 2

Pressure sensor system pressure P1 (B036)

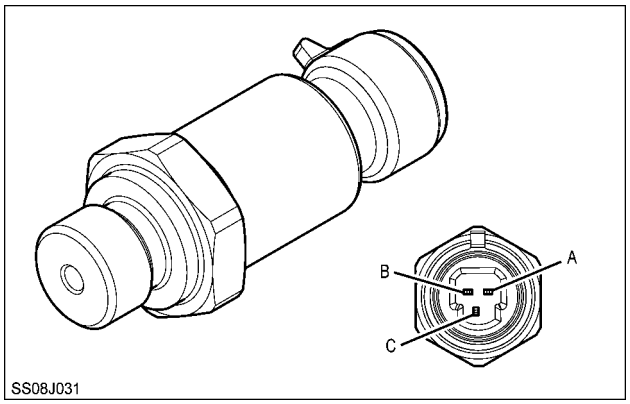
Measuring range	**0 - 40 bar** (**0 - 580 psi**)
PIN A (supply)	Ground
PIN B (supply)	**5 V**
PIN C (signal) at **0 bar** (**0 psi**) at **22 bar** (**319 psi**) at **40 bar** (**580 psi**)	 **0,5 V** **2,7 V** **4,5 V**
Insulating resistance	> **100 k Ω**
Tightening torque	**20 Nm** (**14.8 lb ft**)

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Sensing system Pressure sensor - Overview (clutch "A", clutch "B")



SS08K471 1



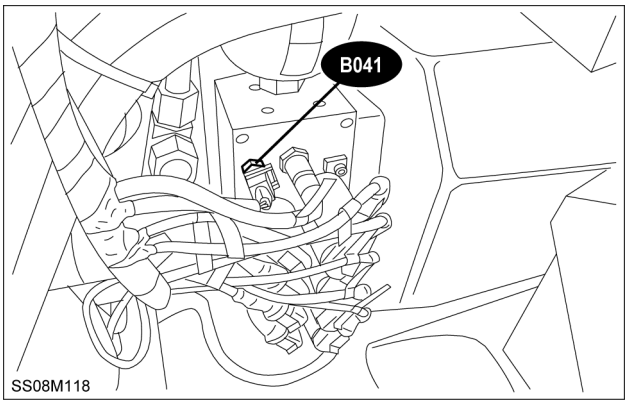
SS08J031 2

Pressure sensor for clutch A (B031) & B (B032)

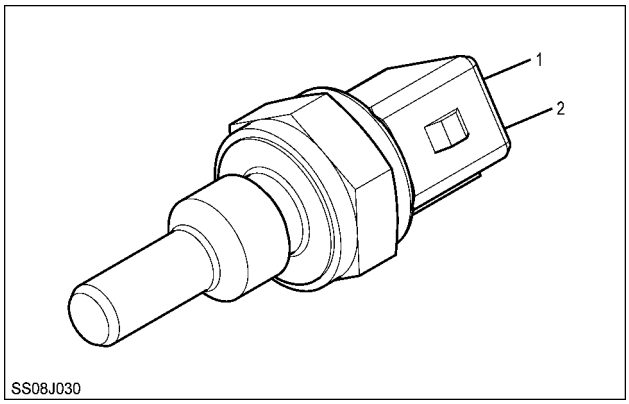
Measuring range	**0 - 40 bar** (**0 - 580 psi**)
PIN A (supply)	Ground
PIN B (supply)	**5 V**
PIN C (signal) at **0 bar** (**0 psi**) at **22 bar** (**319 psi**) at **40 bar** (**580 psi**)	 **0,5 V** **2,7 V** **4,5 V**
Insulating resistance	> **100 k Ω**
Tightening torque	**20 Nm** (**14.8 lb ft**)

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Sensing system Temperature sensor - Overview



SS08M118 1



SS08J030 2

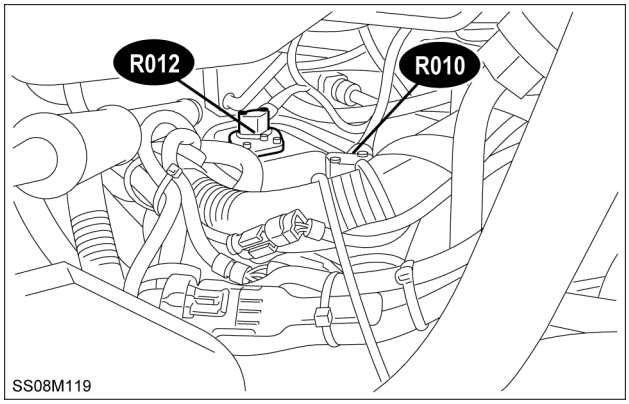
Sensor, transmission oil temperature (B041)

Construction	PTC
Measuring range	**-50 °C** (**-58.0 °F**) to **+200 °C** (**+392 °F**)
Nominal voltage	**5 V**
Signal voltage at **15 °C** (**59 °F**)	**3,3 V**
Insulating resistance	> **100 k Ω**
Resistance at **25 °C** (**77 °F**)	**1097,34 Ω** ± **1 %**
Resistance at **80 °C** (**176 °F**)	**1308,93 Ω** ± **1 %**
Resistance at **90 °C** (**194 °F**)	**1347,02 Ω** ± **1 %**
Resistance at **100 °C** (**212 °F**)	**1385,00 Ω** ± **1 %**
Resistance at **110 °C** (**230 °F**)	**1442,86 Ω** ± **1 %**
Tightening torque	**14 - 18 Nm** (**10.3 - 13.3 lb ft**)

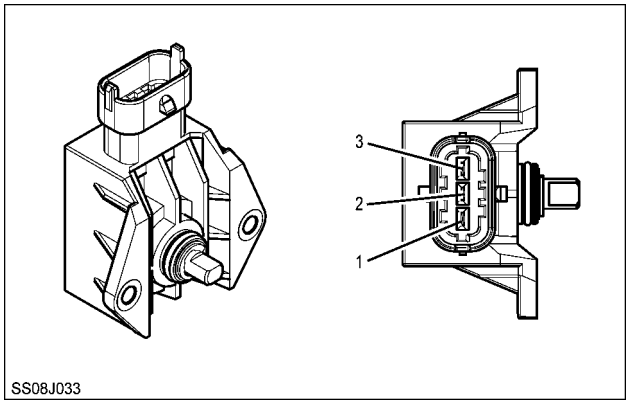
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Sensing system Position potentiometer - Overview (F1/F3, F2/R1, F4/R2)

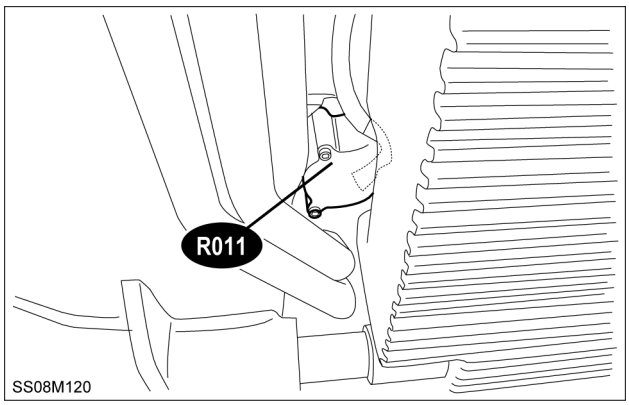
Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox



SS08M119 1



SS08J033 2



SS08M120 3

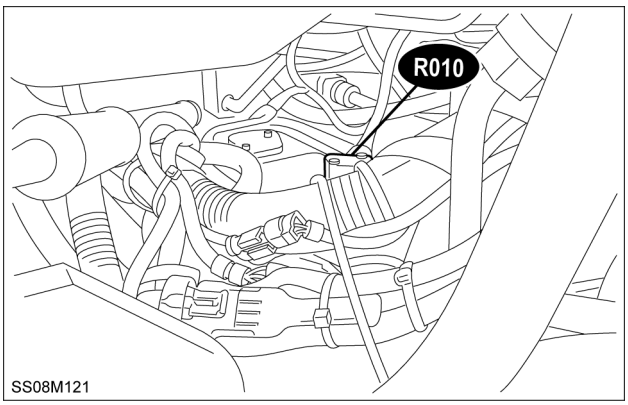
Potentiometer synchronisation F1/F3 (R010), F2/R1 (R011), F4/R2 (R012)

Potentiometer construction	Linear
working range (mechanical turning range)	**117 °**
working range (electrical turning range)	**102 °**
Torque of return spring	**0.2 - 0.4 Nm** (**0.15 - 0.30 lb ft**)
Resistance at **20 °C** (**68 °F**) (PIN 1-3)	**4 k Ω** ± **20 %**
PIN 1 (supply)	**5 V**
PIN 3 (supply)	Ground
PIN 2 (signal)	
When shifted into gear (F1, R1, R2)	approx. **0,8 V**
When shifted into "neutral position"	approx. **2,2 V**
When shifted into gear (F2, F3, F4)	approx. **3,5 V**
Insulating resistance	> **100 k Ω**
Tightening torque	**2 Nm** (**1.48 lb ft**)

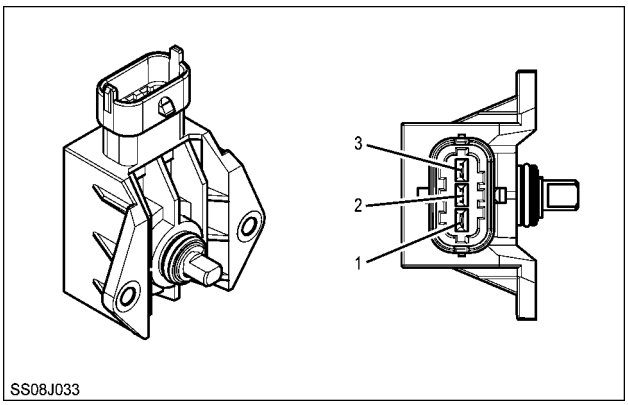
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Sensing system Position potentiometer - Overview (F1/F3, F2/R1)

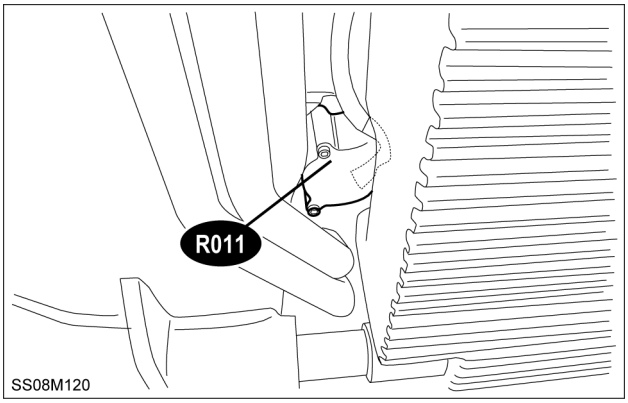
Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox



SS08M121 1



SS08J033 2



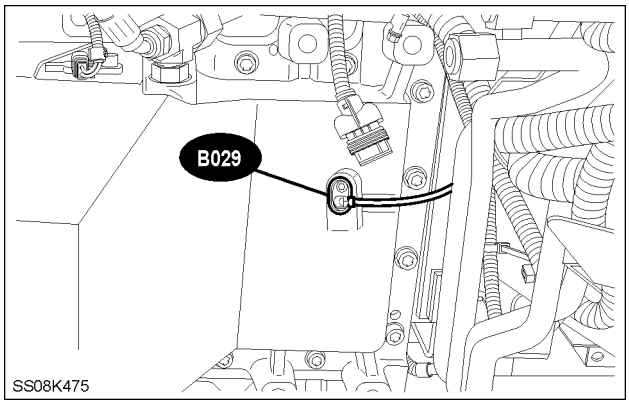
SS08M120 3

Potentiometer synchronisation F1/F3 (R010), F2/R1 (R011)

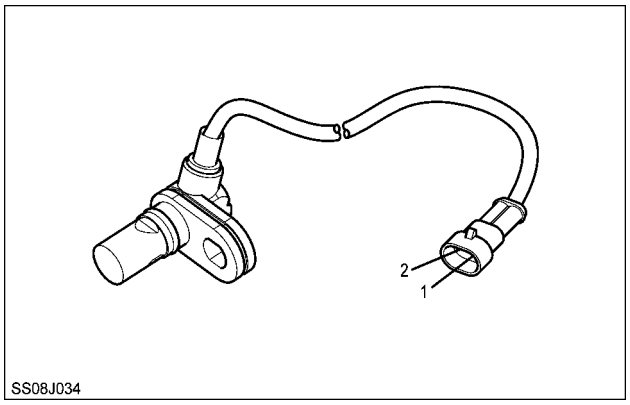
Potentiometer construction	Linear
working range (mechanical turning range)	**117 °**
working range (electrical turning range)	**102 °**
Torque of return spring	**0.2 - 0.4 Nm** (**0.15 - 0.30 lb ft**)
Resistance at **20 °C** (**68 °F**) (PIN 1-3)	**4 k Ω** ± **20 %**
PIN 1 (supply)	**5 V**
PIN 3 (supply)	Ground
PIN 2 (signal) When shifted into gear (F1, R1) When shifted into "neutral position" When shifted into gear (F2, F3)	 approx. **0,8 V** approx. **2,2 V** approx. **3,5 V**
Insulating resistance	> **100 k Ω**
Tightening torque	**2 Nm** (**1.48 lb ft**)

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Sensing system Speed sensor - Overview Ring gear



SS08K475 1



SS08J034 2

Speed sensor, ring gear (B029)

Sensor type	Inductive
Insulating resistance	> **100 k Ω**
Tightening torque	**6 - 10 Nm** (**4.43 - 7.38 lb ft**)

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TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission

NOTE: *The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the wheels, front and rear. Check that the Ground speed display is Zero before commencing.*

NOTE: *Prior to performing a clutch and synchroniser calibration the transmission oil temperature must be between* ***60 - 95 °C****, the optimum temperature for calibration is* ***80 °C***

.

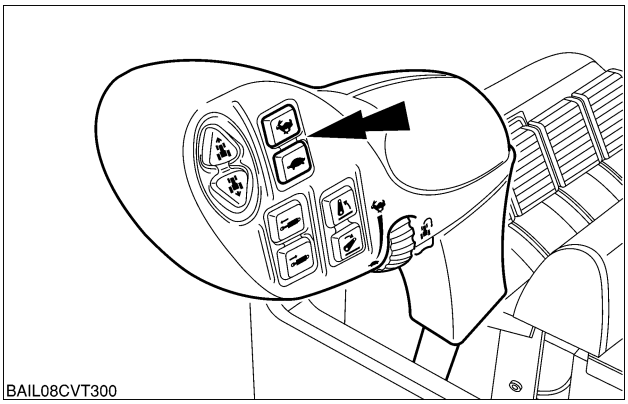
NOTE: *Make sure that the air conditioning (if equipped) is switched off and all electrical hydraulic applications are deselected.*

NOTE: *If a four-digit number starting with "2" is displayed at any time during the calibration procedure, it is a standard error code. The fault condition must be corrected before calibration can be performed.*

1. There are two methods of entering the calibration mode:
   - Quick entry -
     Depress and hold both the range increase and range decrease switches while starting the engine.
   - HH menu entry - Using the diagnostic connector **380000843** and H1 calibrations in the HH menu's.

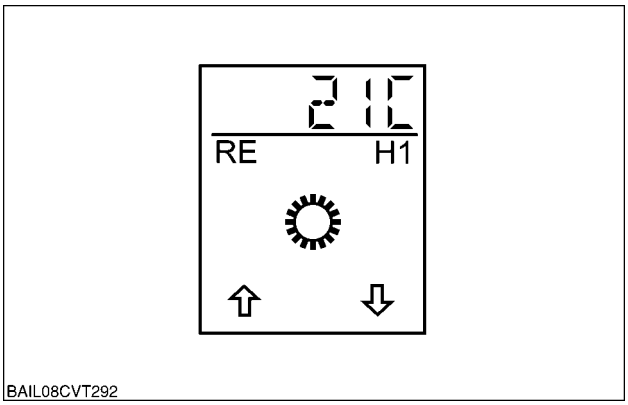
Quick Entry

2. Depress and hold both the range increase and range decrease switches while starting the engine.



BAIL08CVT300 1

3. The system being calibrated will be shown on the ICU3 and the transmission oil temperature will be displayed on the top section of the display.



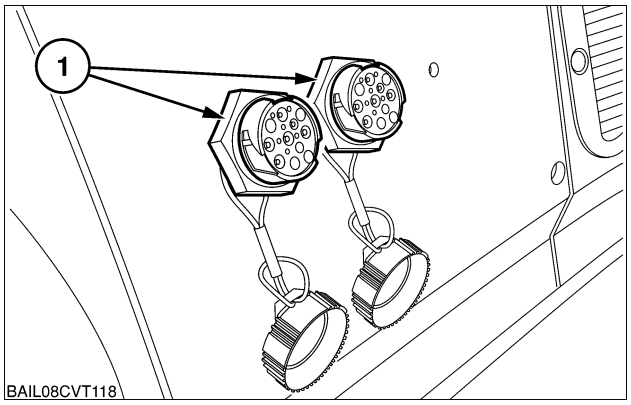
BAIL08CVT292 2

4. Continue from step 7.

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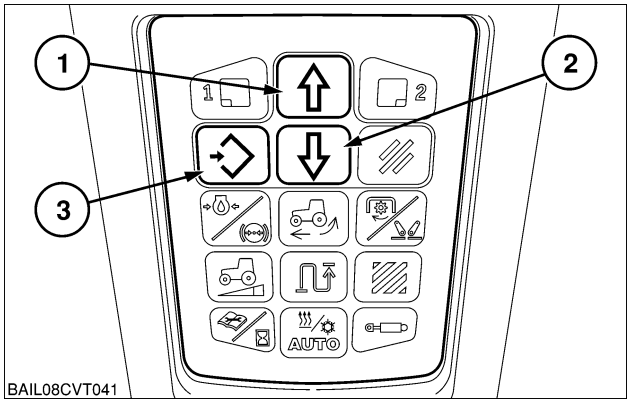
HH Menu Entry

5. Install the diagnostic connector **380000843** into the diagnostic socket.

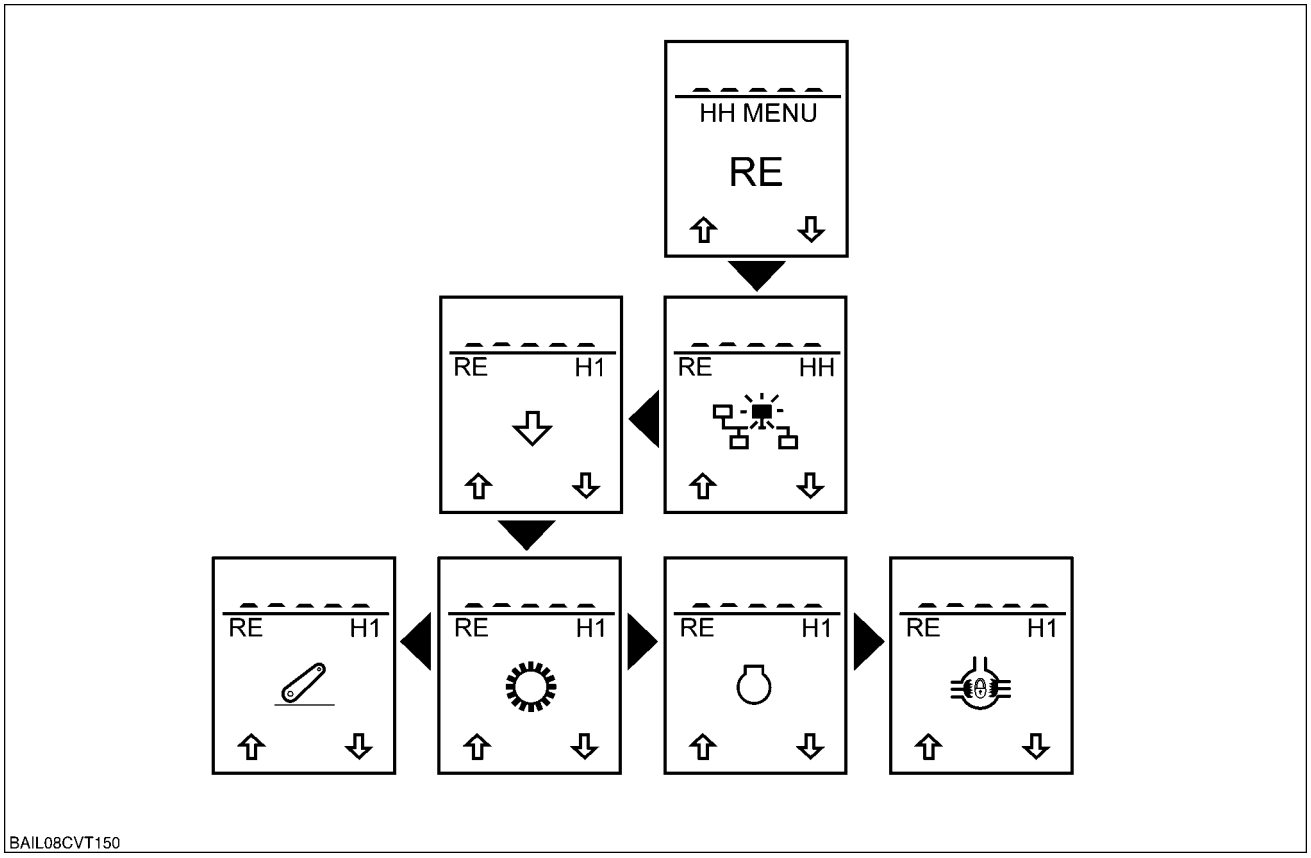


BAIL08CVT118A 3

6. Use the up **(1)** button, and down, **(2)** button, and the Menu button **(3)** on the ICU3 scroll through the HH menu until the Option H1 and the transmission symbol appear on the RE controller. Select using the menu button.



BAIL08CVT041 4



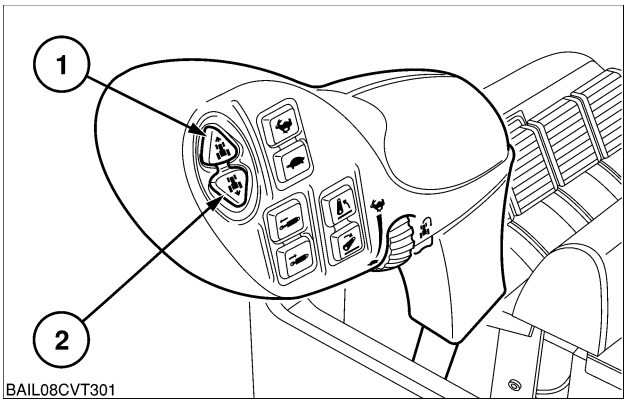
BAIL08CVT150 5

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7. "CAL" will be displayed for a few seconds then the oil temperature will be displayed in the top section of the display.

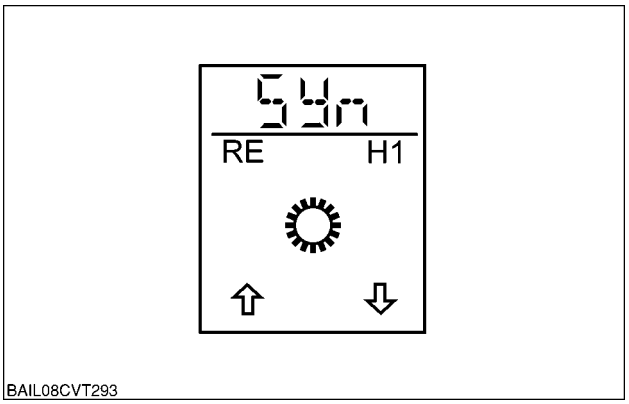
8. Depress the clutch pedal, place the shuttle lever into forward and release the clutch pedal.

9. Pressing the forward **(1)**, or reverse **(2)**, button will the change the display to show the transmission oil temperature. If "U19" is displayed the oil will need to be warmed before calibration can proceed. If the start up procedure was incorrect this will also cause a "U" code to be displayed and prevent the calibration from proceeding.



BAIL08CVT301 6

10. If "CL" is displayed this indicates that the oil temperature is between **10 - 60 °C**, if "CH" is displayed this indicates that the oil temperature is above **95 °C**, after a few seconds the display will return to oil temperature and the tractor may be operated to obtain the correct transmission oil temperature. If necessary it is possible to proceed with calibration at this point by pressing either the forward or reverse button while "CL" or "CH" is being displayed. The display will then show "Syn" and calibration can proceed.

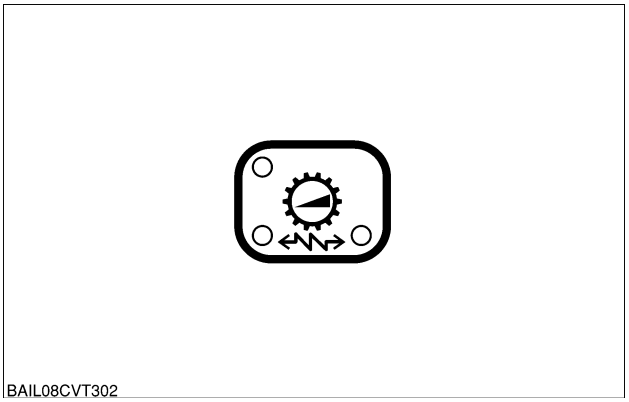


BAIL08CVT293 7

11. There are two methods of calibrating the CVT transmission. The entire sequence can be automated or each item can be calibrated manually.

Automatic Transmission calibration

12. Automatic calibration procedure.
    - When the display is showing "Syn" press and release the "Accel/shuttle" speed button on the armrest control panel to start the automatic calibration procedure.
    - In turn, the synchronisers, flywheel torque, PTO twist and clutches A and B will be calibrated.
    - When the procedure is complete the display will return to show 'Syn'.

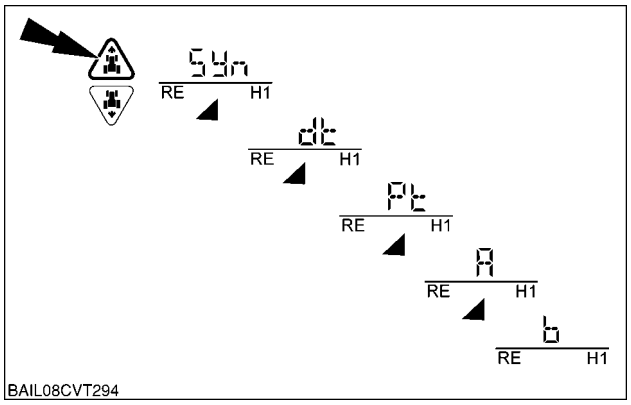


BAIL08CVT302 8

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Manual Transmission Calibration

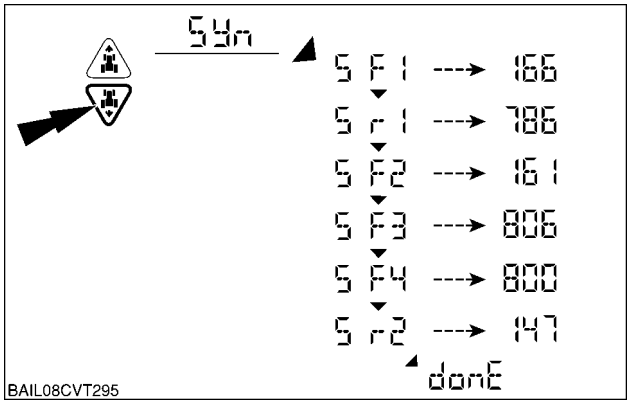
13. Manual calibration procedure
    - When the display is showing "Syn" use the forward button to scroll through and select the item to be calibrated:-
      - ’Syn’ - Synchroniser Calibration
      - ’dt’ - Flywheel torque calibration
      - ’Pt’ - PTO twist calibration
      - ’A’ - Clutch A calibration
      - ’B’ - Clutch B calibration



BAIL08CVT294 9

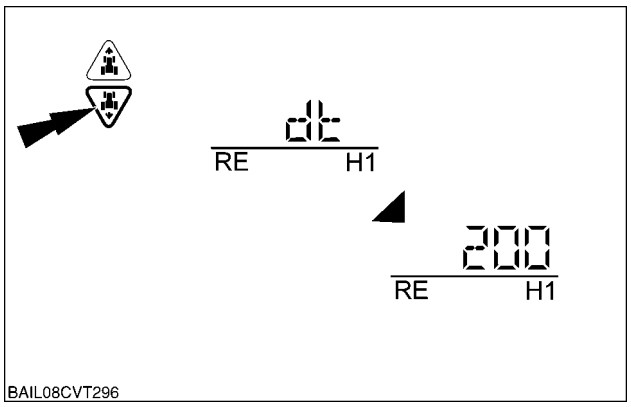
14. To calibrate the synchronisers press and hold the reverse button on the hand controller while ’Syn’ is displayed. The engine will automatically be set to **1100 - 1300 RPM**. The display will show ’S F1’ while calibrating the F1 synchroniser and will then show the calibration value for 2 seconds. The display will then show ’S r1’, ’S F2’, ’S F3’, ’S F4’, and S r2’ in turn as each synchroniser is calibrated. On completion of the synchroniser calibration the display will show ’donE’ and the engine speed will return to idle and the reverse button can be released.

NOTE: *On the 3x1 transmission the F4 and R2 synchroniser calibration steps will be omitted.*



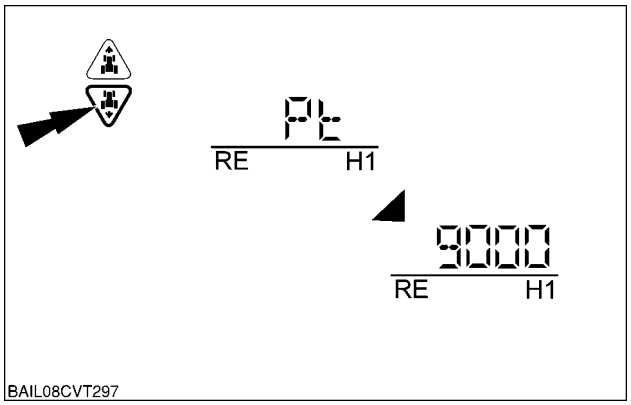
BAIL08CVT295 10

15. To calibrate the flywheel torque, press and hold the reverse buttom on the hand controller while the display is showing ’dt’. The display will continue to show ’dt’ while calibration is in progress. The engine speed will rise to **2000 RPM** and return to idle twice during the procedure . Once complete the display will show the calibrated torque value and the reverse button can be released.



BAIL08CVT296 11

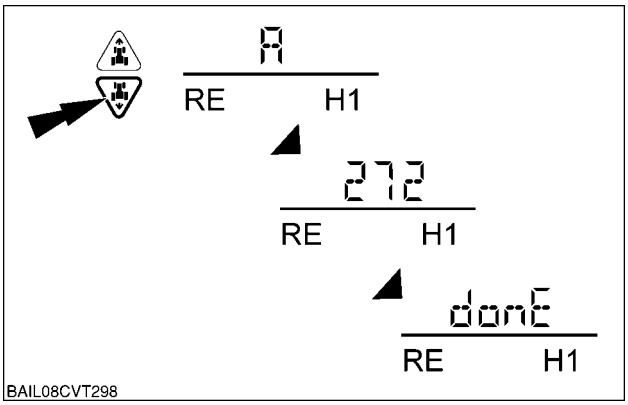
16. To calibrate the PTO twist, press and hold the reverse buttom on the hand controller while the display is showing ’Pt’. The display will continue to show ’Pt’ while calibration is in progress. Once complete the display will show the calibrated twist value and the reverse button can be released.



BAIL08CVT297 12

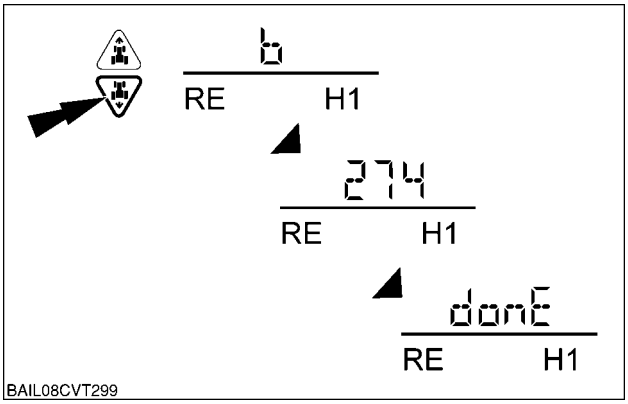
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17. To calibrate the Clutch A, press and hold the reverse button on the hand controller while the display is showing 'A'. The engine will automatically be set to **1100 - 1300 RPM**. The display will show the solenoid current value during the procedure. On completion of calibration the display will show the calibrated current value for several seconds and then show 'donE', the engine speed will return to idle and the reverse button can be released.



BAIL08CVT298 13

18. To calibrate the Clutch B, press and hold the reverse button on the hand controller while the display is showing 'B'. The engine will automatically be set to **1100 - 1300 RPM**. The display will show the solenoid current value during the procedure. On completion of calibration the display will show the calibrated current value for several seconds and then show 'donE', the engine speed will return to idle and the reverse button can be released.



BAIL08CVT299 14

19. Key OFF for at least 2 seconds to store the calibration values.

NOTE: *If an error occurs during calibration a "U" code will be displayed and the procedure will need to be repeated. Refer to the "U" code listing in* ***ELECTRONIC SYSTEM - Calibrate (A.50.A)****.*

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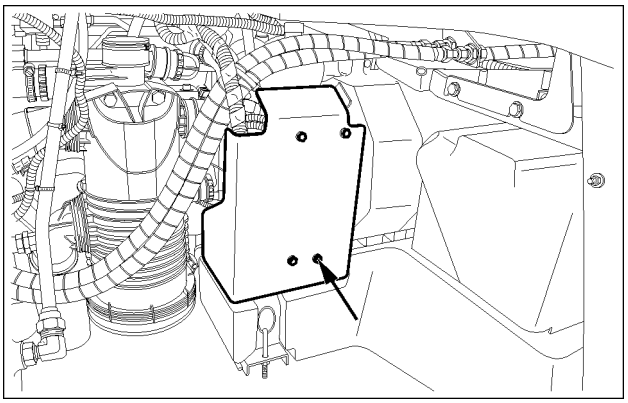
Accumulator - Replace

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.

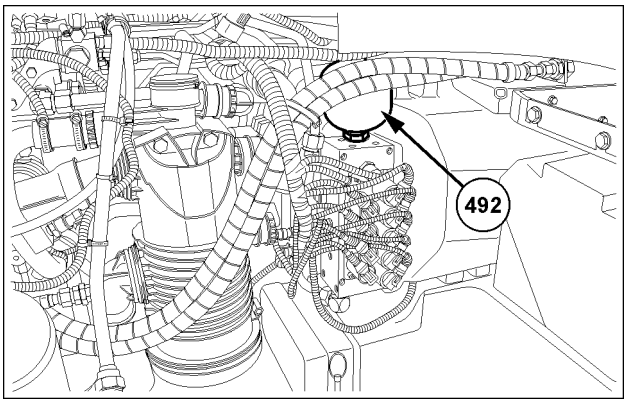
Disassembly

1. Remove the four retaining bolts and take off the cover.



SS08H017 1

2. Remove the accumulator **(492)**.

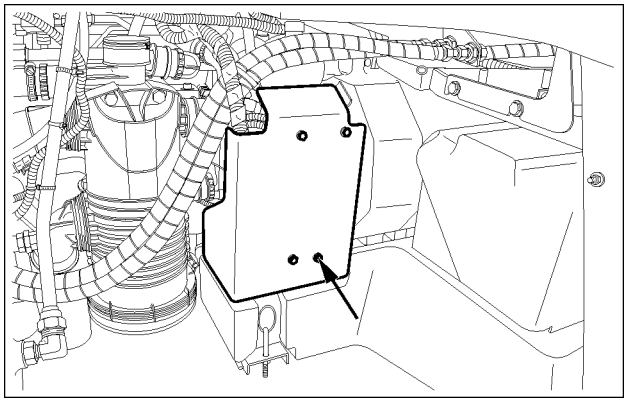


SS08J122 2

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Assembly

3. Fit the accumulator **(492)** with a new seal ring **(493)** and tighten to **90 - 100 Nm** (**66.4 - 73.8 lb ft**).
4. Fit the cover. Insert the screws and tighten.



SS08H017 3

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)***.

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.

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Control valve - Replace (Safety valve, R1, F3, F4)

Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

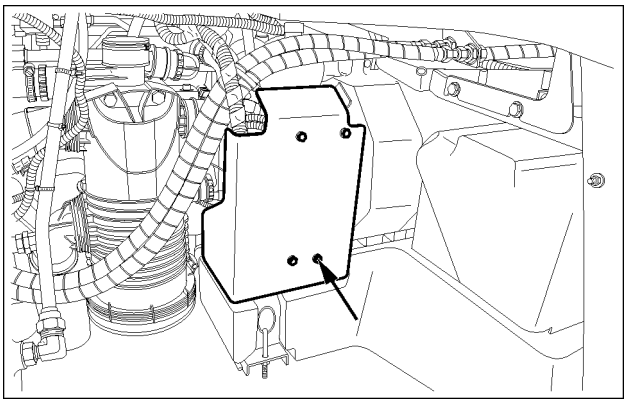
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.

Disassembly

1. Remove the four retaining bolts and take off the cover.

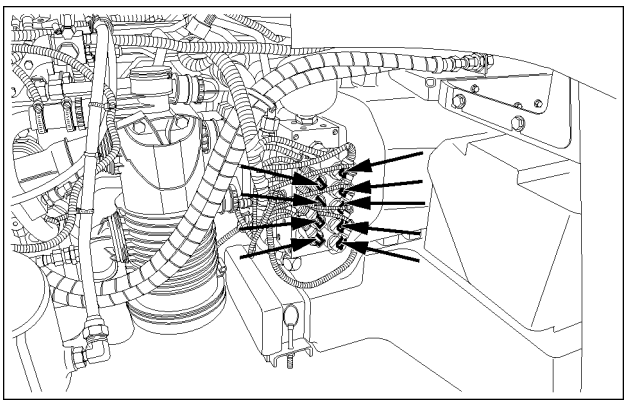
NOTE: *Carefully clean the area around the solenoid valves.*



SS08H017 1

2. Label the electrical lines that connect to the solenoid valves and disconnect.

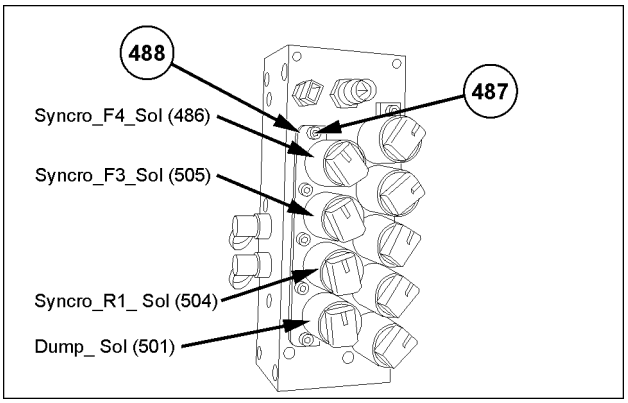
NOTE: *The wires do not need to be marked if there are pre-defined markings and they are legible - see* ***Valve block - Install (C.20.G)*** *Step 5.*



SS08J135 2

3. Remove the screws **(487)** and the retaining bracket **(488)**. Remove the corresponding solenoid valve.

(486) Solenoid valve F4
(501) Safety valve
(504) Solenoid valve R1
(505) Solenoid valve F3

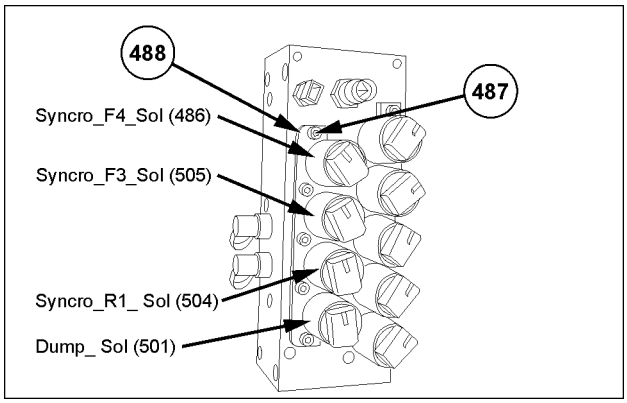


SS08J136 3

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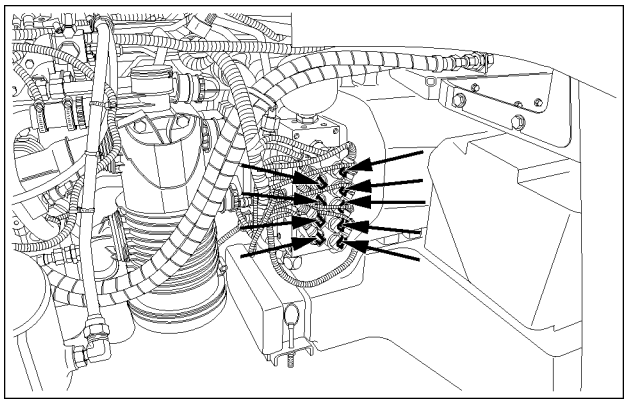
Assembly

4. Insert the relevant solenoid valve together with new seal rings **(500)** inside the valve block.
   (486) Solenoid valve F4
   (501) Safety valve
   (504) Solenoid valve R1
   (505) Solenoid valve F3
   Fit the retaining bracket **(488)**, insert the screws **(487)** and tighten to **24 Nm** (**17.7 lb ft**).



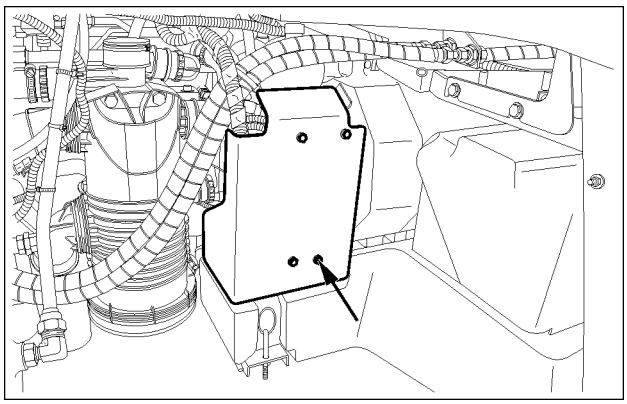
SS08J136 4

5. Connect the electrical lines according to the component coding scheme - see **Valve block - Install (C.20.G)** Step 5.



SS08J135 5

6. Fit the cover. Insert the screws and tighten.



SS08H017 6

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.

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Control valve - Replace (Safety valve, R1, F3)

Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

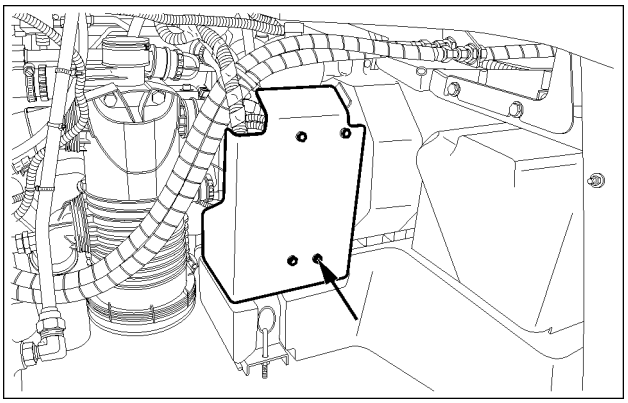
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.

Disassembly

1. Remove the four retaining bolts and take off the cover.

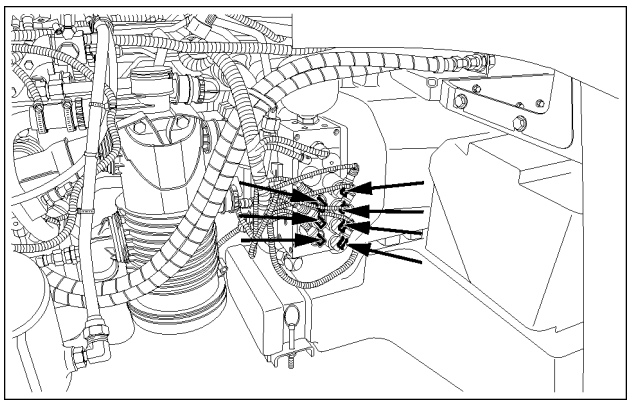
NOTE: *Carefully clean the area around the solenoid valves.*



SS08H017 1

2. Label the electrical lines that connect to the solenoid valves and disconnect.

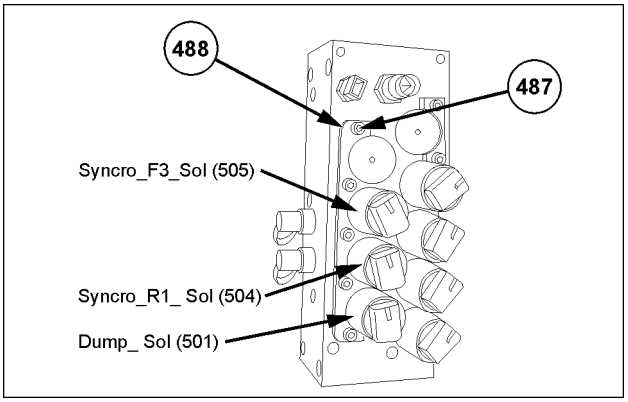
NOTE: *The wires do not need to be marked if there are pre-defined markings and they are legible - see* ***Valve block - Install (C.20.G)*** *Step 5.*



SS08M124 2

3. Remove the screws **(487)** and the retaining bracket **(488)**. Remove the corresponding solenoid valve.

(501) Safety valve
(504) Solenoid valve R1
(505) Solenoid valve F3

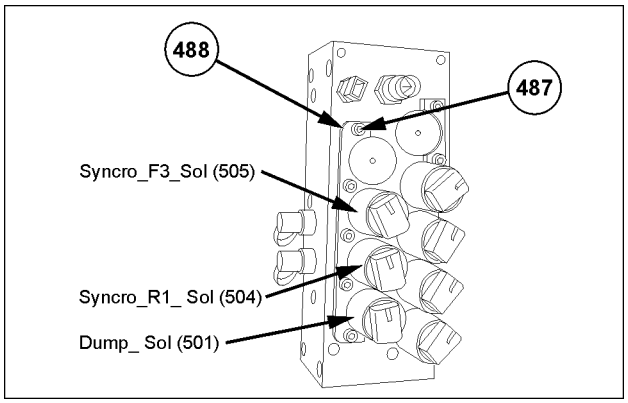


SS08J137 3

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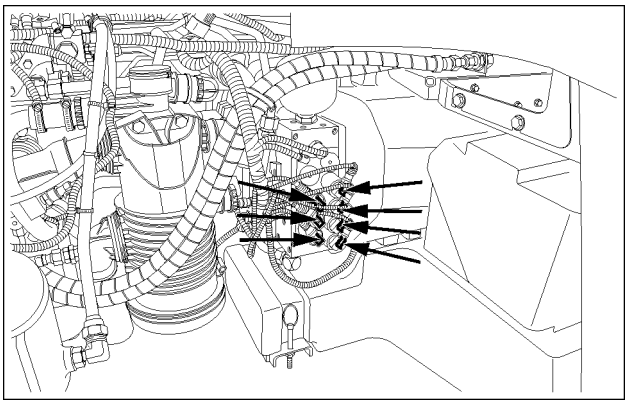
Assembly

4. Insert the relevant solenoid valve together with new seal rings **(500)** inside the valve block.
   (501) Safety valve
   (504) Solenoid valve R1
   (505) Solenoid valve F3
   Fit the retaining bracket **(488)**, insert the screws **(487)** and tighten to **24.25 Nm** (**17.9 lb ft**).



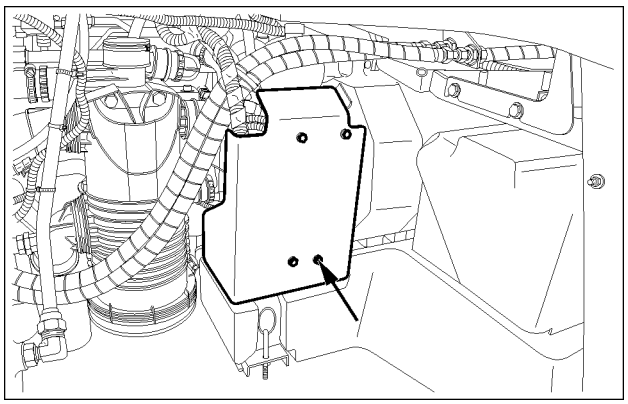
SS08J137 4

5. Connect the electrical lines according to the component coding scheme - see **Valve block - Install (C.20.G)** Step 5.



SS08M124 5

6. Fit the cover. Insert the screws and tighten.



SS08H017 6

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.

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Control valve - Replace (Clutch "A", clutch "B", F2, F1, R2)

Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

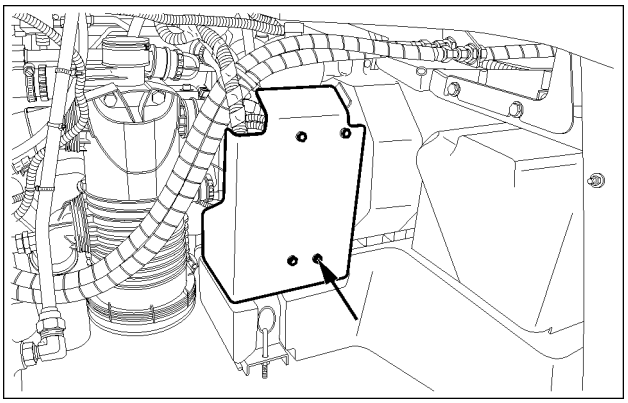
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.

Disassembly

1. Remove the four retaining bolts and take off the cover.

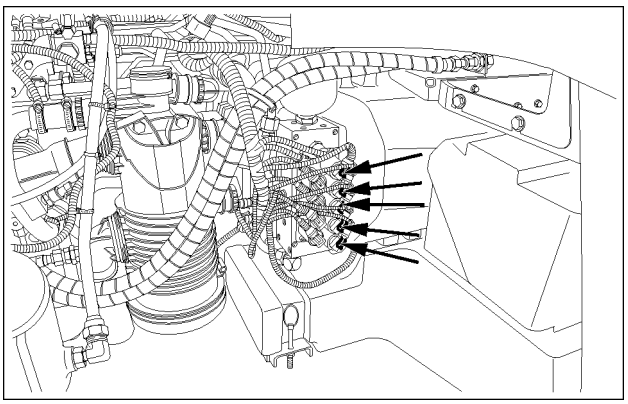
NOTE: *Carefully clean the area around the solenoid valves.*



SS08H017 1

2. Label the electrical lines that connect to the solenoid valves and disconnect.

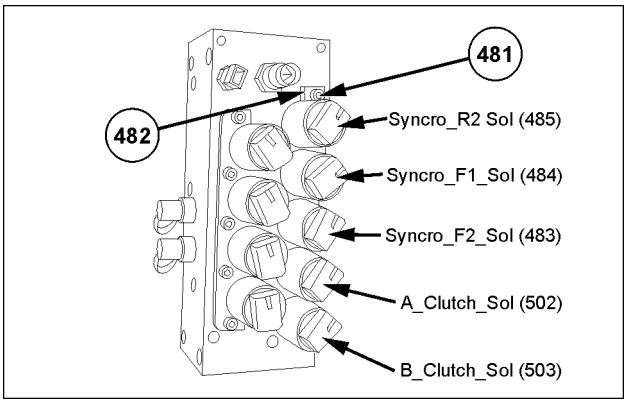
NOTE: *The wires do not need to be marked if there are pre-defined markings and they are legible - see Figure **3**.*



SS08J132 2

3. Remove the screws **(481)** and the retaining bracket **(482)**. Remove the corresponding solenoid valve.

(483) Solenoid valve F2
(484) Solenoid valve F1
(485) Solenoid valve R2
(502) Solenoid valve, clutch “A”
(503) Solenoid valve, clutch “B”

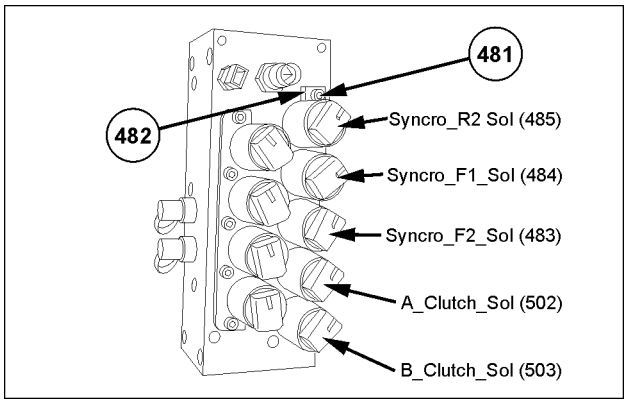


SS08J133 3

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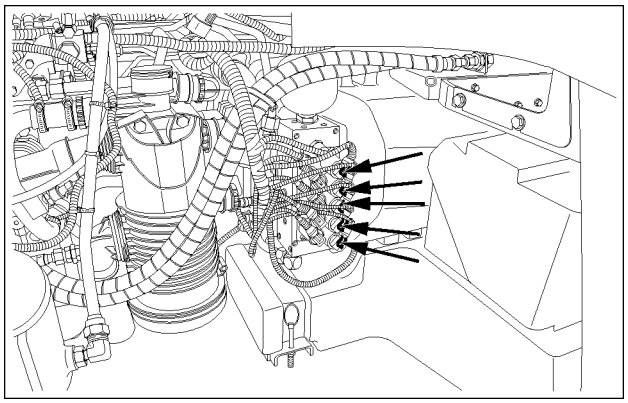
Assembly

4. Insert the relevant solenoid valve together with new seal rings **(500)** inside the valve block.
   (483) Solenoid valve F2
   (484) Solenoid valve F1
   (485) Solenoid valve R2
   (502) Solenoid valve, clutch “A”
   (503) Solenoid valve, clutch “B”
   Fit the retaining bracket **(482)**, insert the screws **(481)** and tighten to **24 Nm** (**17.7 lb ft**).



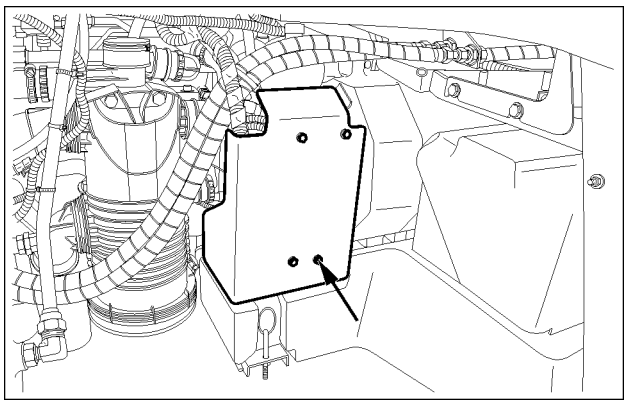
SS08J133 4

5. Connect the electrical lines according to the component coding scheme - see Figure **4**.



SS08J132 5

6. Fit the cover. Insert the screws and tighten.



SS08H017 6

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.

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Control valve - Replace (Clutch "A", clutch "B", F2, F1)

Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

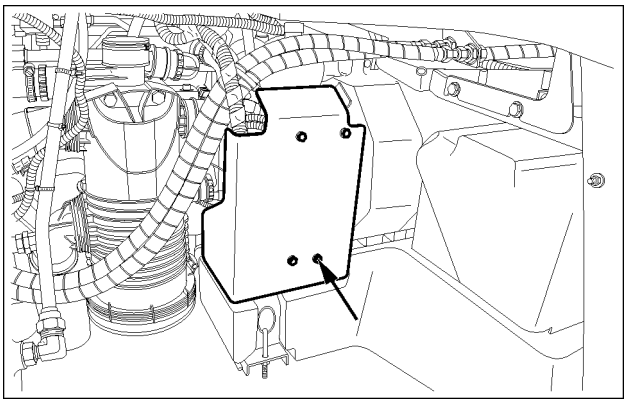
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.

Disassembly

1. Remove the four retaining bolts and take off the cover.

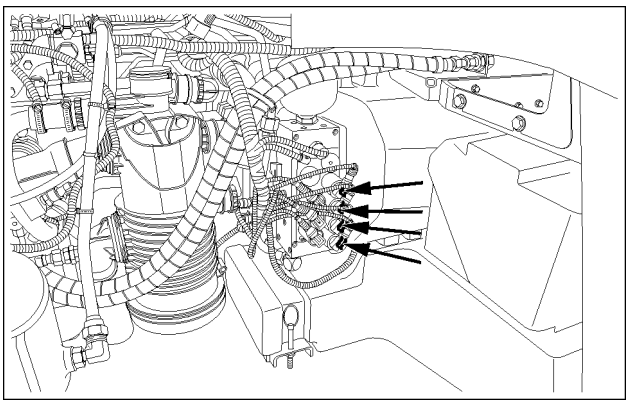
NOTE: *Carefully clean the area around the solenoid valves.*



SS08H017 1

2. Label the electrical lines that connect to the solenoid valves and disconnect.

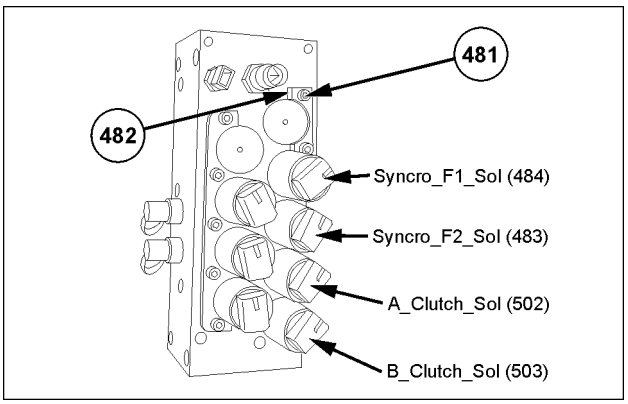
NOTE: *The wires do not need to be marked if there are pre-defined markings and they are legible - see Figure **3**.*



SS08M125 2

3. Remove the screws **(481)** and the retaining bracket **(482)**. Remove the corresponding solenoid valve.

(483) Solenoid valve F2
(484) Solenoid valve F1
(502) Solenoid valve, clutch “A”
(503) Solenoid valve, clutch “B”

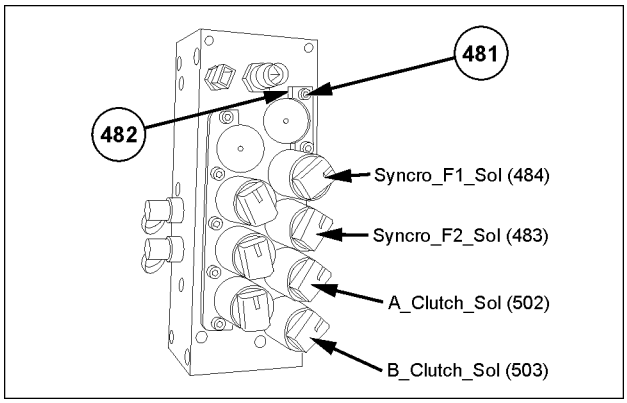


SS08J134 3

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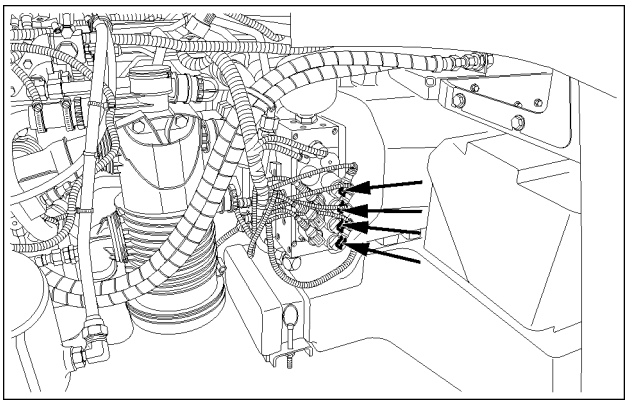
Assembly

4. Insert the relevant solenoid valve together with new seal rings **(500)** inside the valve block.
   (483) Solenoid valve F2
   (484) Solenoid valve F1
   (502) Solenoid valve, clutch “A”
   (503) Solenoid valve, clutch “B”
   Fit the retaining bracket **(482)**, insert the screws **(481)** and tighten to **24.25 Nm** (**17.9 lb ft**).



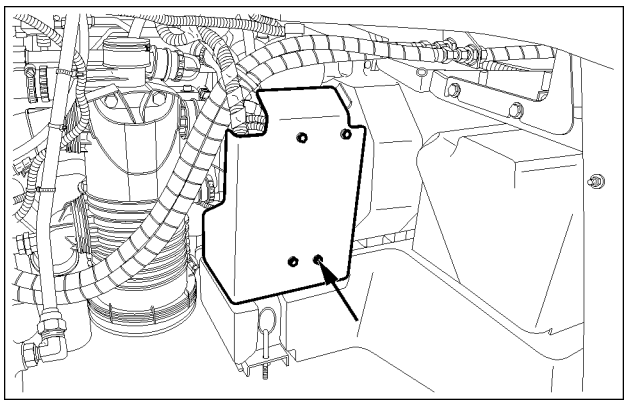
SS08J134 4

5. Connect the electrical lines according to the component coding scheme - see Figure **4**.



SS08M125 5

6. Fit the cover. Insert the screws and tighten.



SS08H017 6

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.

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Valve block - Remove

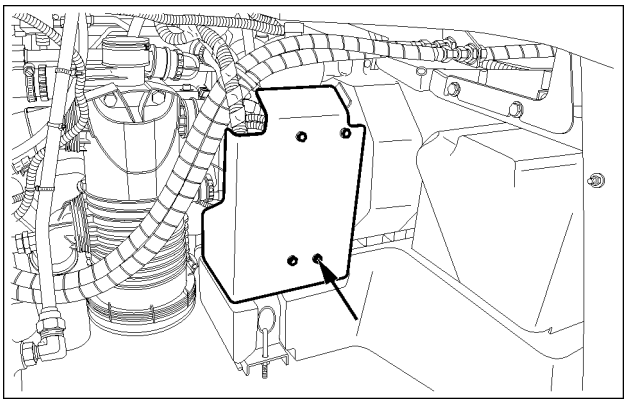
Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.
Clutch - Remove ("A" and "B") (C.20.G)

NOTE: *If the transmission has been removed, steps **1** to **4** are not required.*

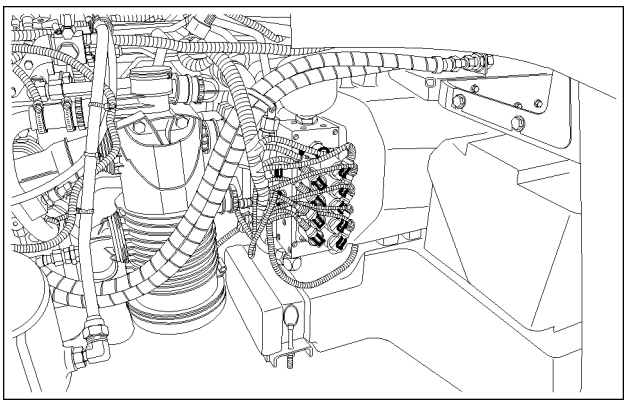
1. Remove the four retaining bolts and take off the cover.



SS08H017 1

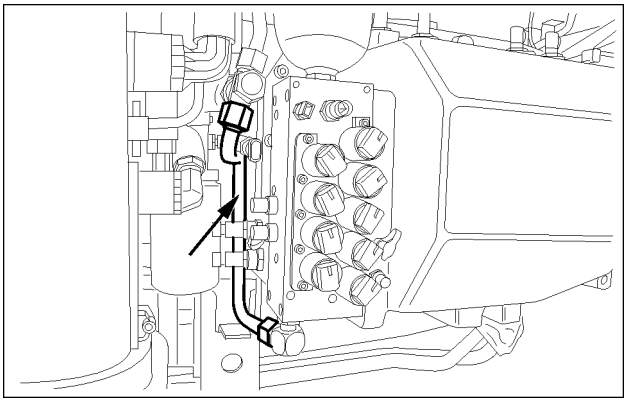
2. Mark all the electrical wires on the valve block for the relevant components and disconnect.

NOTE: *The wires do not need to be marked if there are pre-defined markings and they are legible - see **Valve block - Install (C.20.G)** Step 5.*



SS08H018 2

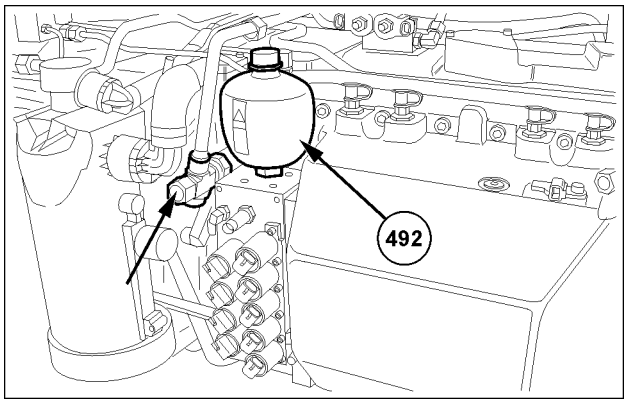
3. Dismantle the system pressure lines.



SS08H022 3

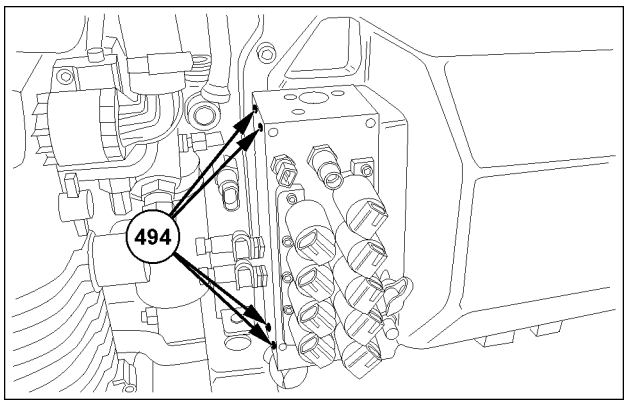
www.truck-freeworkshop.com

4. Remove the bladder accumulator **(492)** and the T-piece.



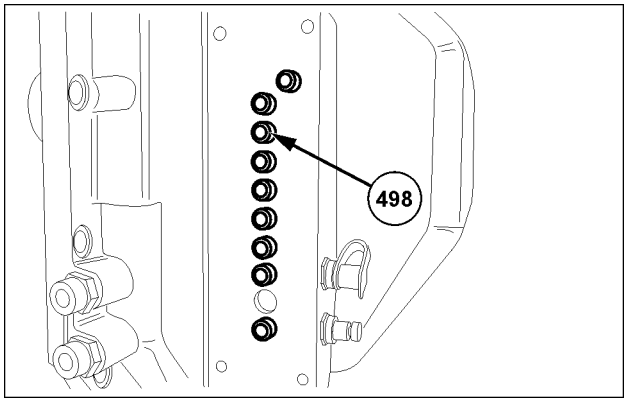
SS08H024 4

5. Unscrew the four screw **(494)** of the valve block and remove the valve block **(497)**.



SS08H025 5

6. Remove all connecting pieces **(498)** out of the cover.



SS08H029 6

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Valve block - Install (C.20.G)
Cover - Remove (Hydrostat) Transmission uninstalled (C.20.G)
Cover - Remove (Hydrostat) Transmission installed (C.20.G)

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Valve block - Install

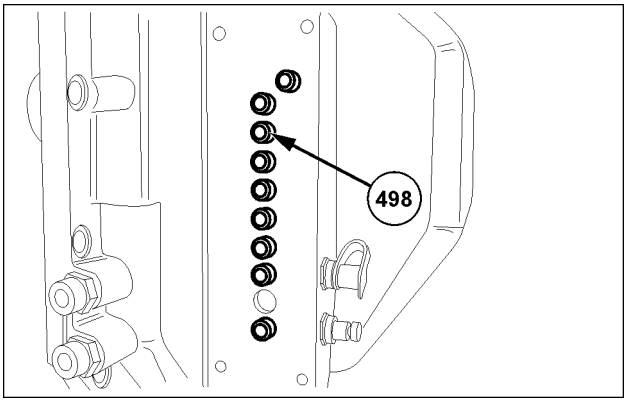
Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Valve block - Remove (C.20.G)
Cover - Install (Hydrostat) Transmission uninstalled (C.20.G)
Cover - Install (Hydrostat) Transmission installed (C.20.G)

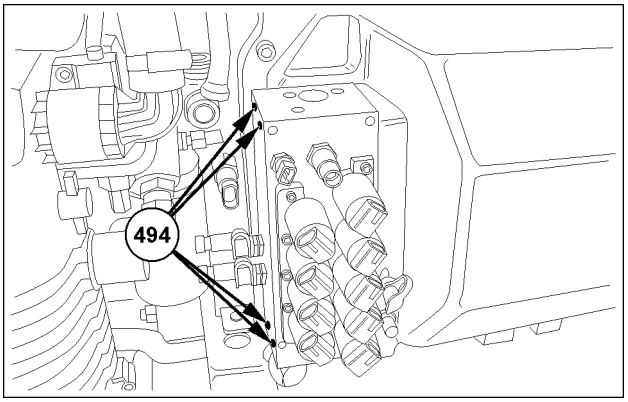
NOTE: *If the transmission has been removed, steps **3** to **6** are not required.*

1. Grease the new seal rings **(499)** with industrial vaseline and fit onto the connecting pieces **(498)**. Fit all the connecting pieces into the cover **(459)**.



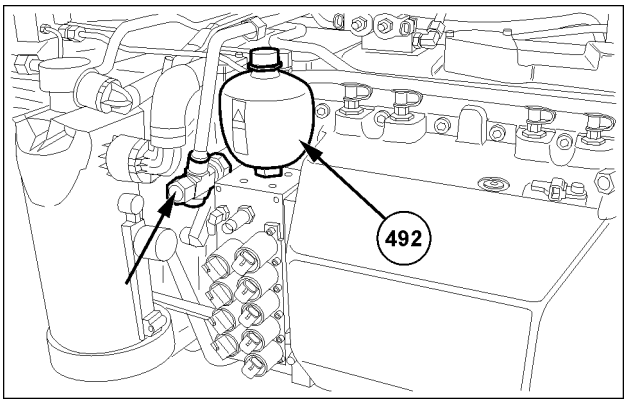
SS08H029 1

2. Fit the valve block **(497)** on the cover **(459)**. Insert the screws **(494)** and tighten to **24 Nm** (**17.7 lb ft**).



SS08H025 2

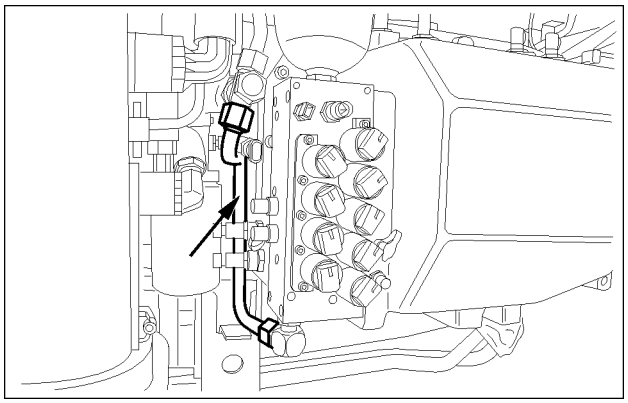
3. Fit the T-piece. Fit the bladder accumulator **(492)** with a new seal ring **(493)** and tighten to **90 - 100 Nm** (**66.4 - 73.8 lb ft**).



SS08H024 3

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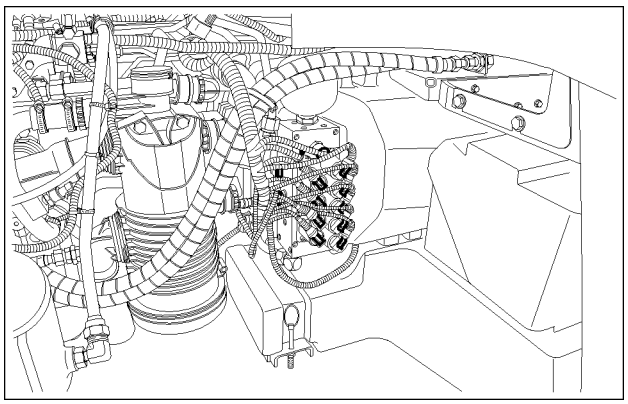
4. Assemble the system pressure line.



SS08H022 4

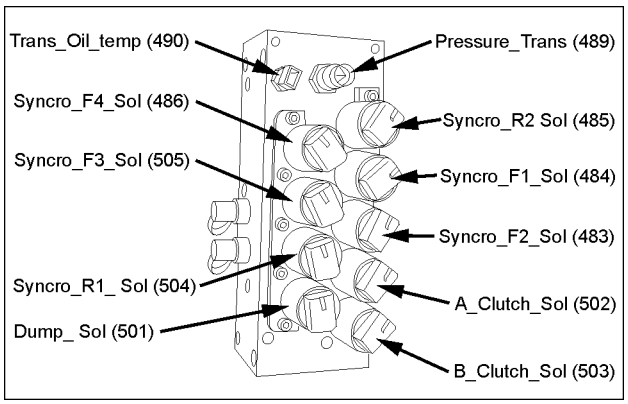
5. Connect all electrical lines to the valve block according to component coding scheme.

NOTE: *The labelling of the electrical lines is shown in Figure* ***6****.*



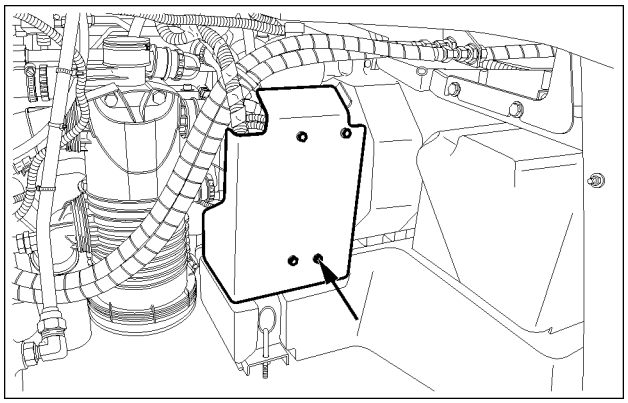
SS08H018 5

(483) Solenoid valve F2
(484) Solenoid valve F1
(485) Solenoid valve R2
(486) Solenoid valve F4
(489) System pressure sensor P1
(490) Temperature sensor, transmission oil
(501) Safety valve
(502) Solenoid valve, clutch “A”
(503) Solenoid valve, clutch “B”
(504) Solenoid valve R1
(505) Solenoid valve F3



SS08H069 6

6. Fit the cover. Insert the screws and tighten.



SS08H017 7

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.
Clutch - Install ("A" and "B") (C.20.G)

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Valve block - Remove

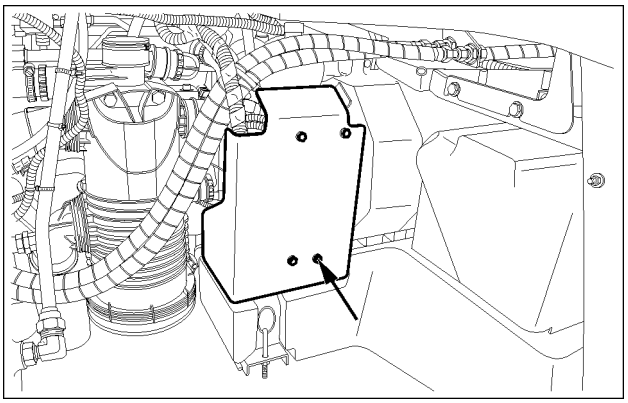
Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.
Clutch - Remove ("A" and "B") (C.20.G)

NOTE: *If the transmission has been removed, steps **1** to **4** are not required.*

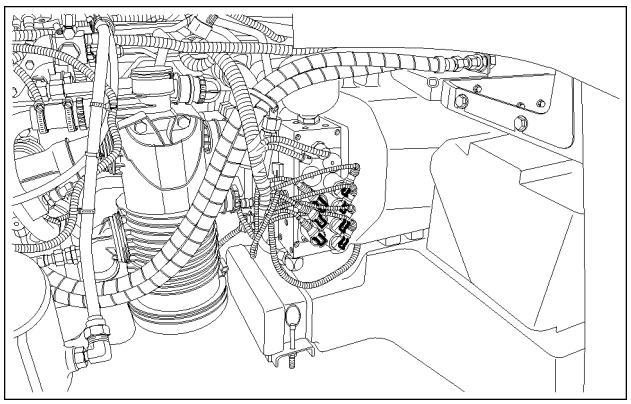
1. Remove the four retaining bolts and take off the cover.



SS08H017 1

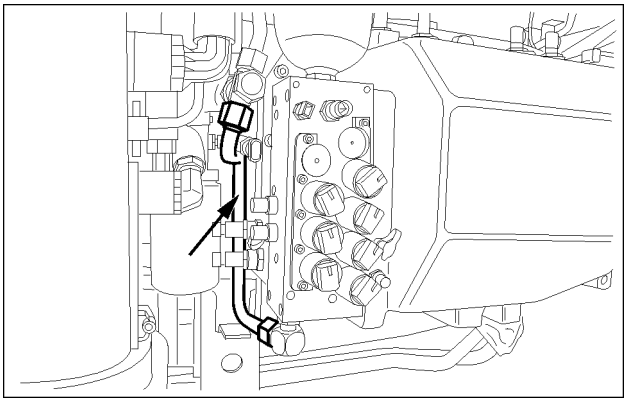
2. Mark all the electrical wires on the valve block for the relevant components and disconnect.

NOTE: *The wires do not need to be marked if there are pre-defined markings and they are legible - see **Valve block - Install (C.20.G)** Step 5.*



SS08M126 2

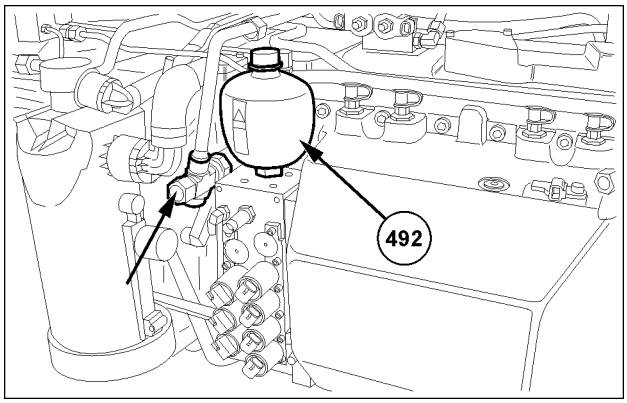
3. Dismantle the system pressure line.



SS08H115 3

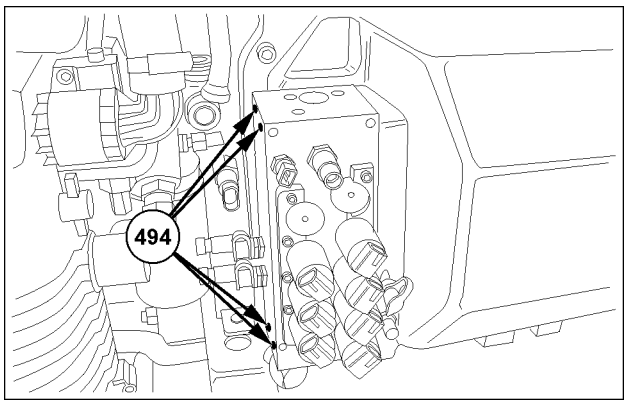
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4. Remove the bladder accumulator **(492)** and the T-piece.



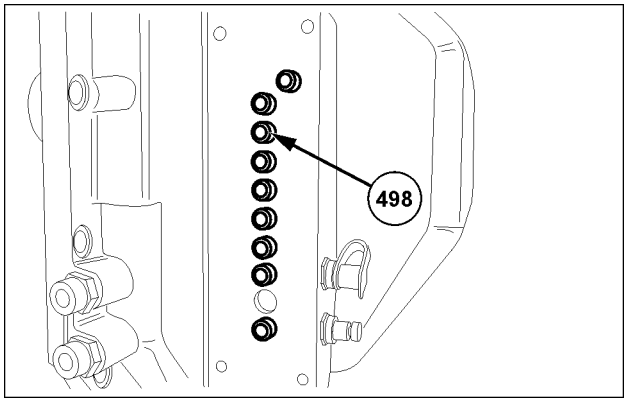
SS08H114 4

5. Unscrew the four screw **(494)** of the valve block and remove the valve block **(497)**.



SS08H113 5

6. Remove all connecting pieces **(498)** out of the cover.



SS08H029 6

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Valve block - Install (C.20.G)
Cover - Remove (Hydrostat) Transmission uninstalled (C.20.G)
Cover - Remove (Hydrostat) Transmission installed (C.20.G)

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Valve block - Install

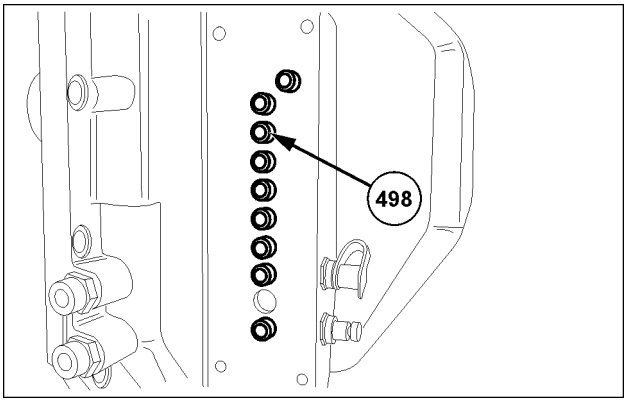
Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Valve block - Remove (C.20.G)
Cover - Install (Hydrostat) Transmission uninstalled (C.20.G)
Cover - Install (Hydrostat) Transmission installed (C.20.G)

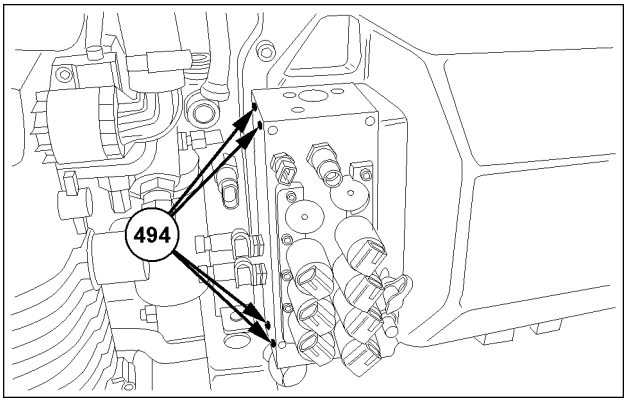
NOTE: *If the transmission has been removed, steps **3** to **6** are not required.*

1. Grease the new seal rings **(499)** with industrial vaseline and fit onto the connecting pieces **(498)**. Fit all the connecting pieces into the cover **(459)**.



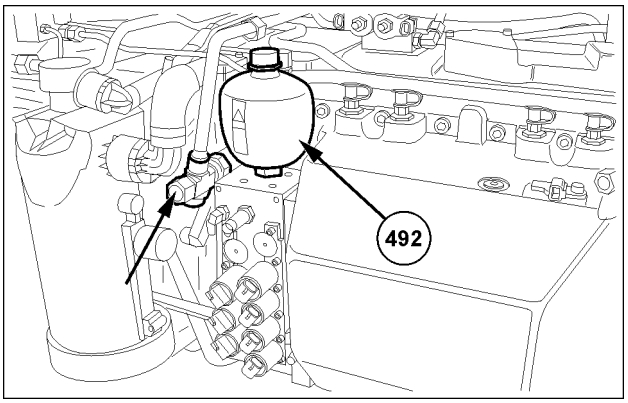
SS08H029 1

2. Fit the valve block **(497)** on the cover **(459)**. Insert the screws **(494)** and tighten to **24.25 Nm** (**17.9 lb ft**).



SS08H113 2

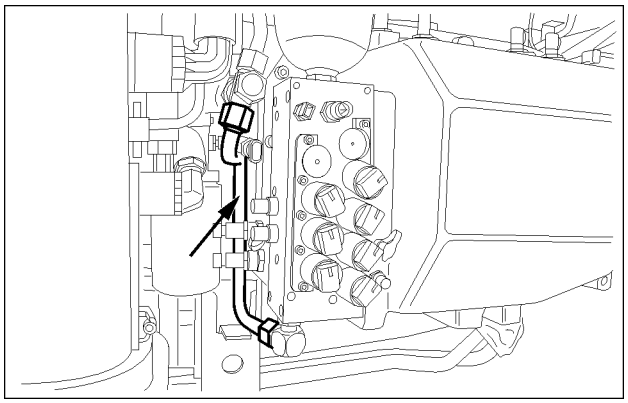
3. Fit the T-piece. Fit the bladder accumulator **(492)** with a new seal ring **(493)** and tighten to **90 - 100 Nm** (**66.4 - 73.8 lb ft**).



SS08H114 3

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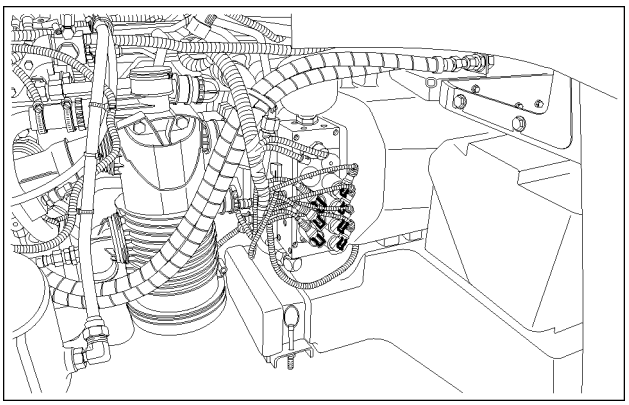
4. Assemble the system pressure line.



SS08H115 4

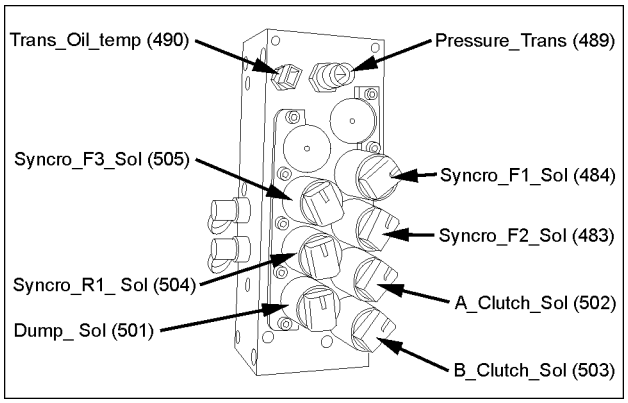
5. Connect all electrical lines to the valve block according to component coding scheme.

NOTE: *The labelling of the electrical lines is shown in Figure* ***6****.*



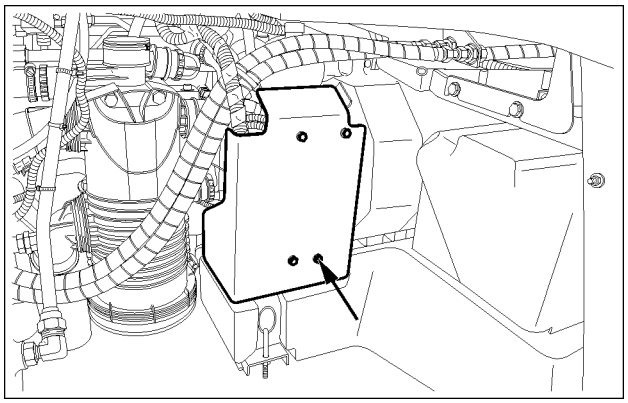
SS08M126 5

(483) Solenoid valve F2
(484) Solenoid valve F1
(489) System pressure sensor P1
(490) Temperature sensor, transmission oil
(501) Safety valve
(502) Solenoid valve, clutch “A”
(503) Solenoid valve, clutch “B”
(504) Solenoid valve R1
(505) Solenoid valve F3



SS08H108 6

6. Fit the cover. Insert the screws and tighten.



SS08H017 7

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.
Clutch - Install ("A" and "B") (C.20.G)

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Cover Cover reverse gears - Remove

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

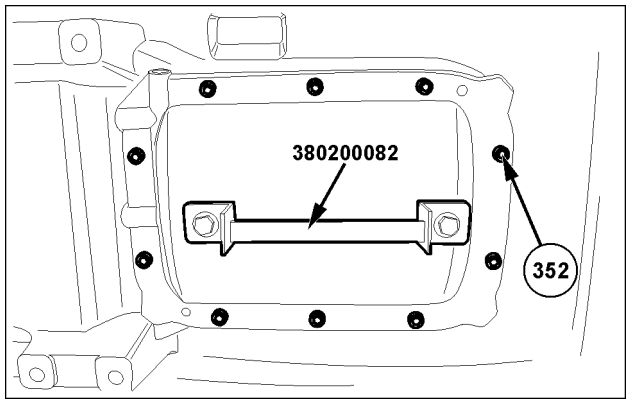
B012

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the transmission from the rear axle - see **Housing - Remove (C.20.G)**.

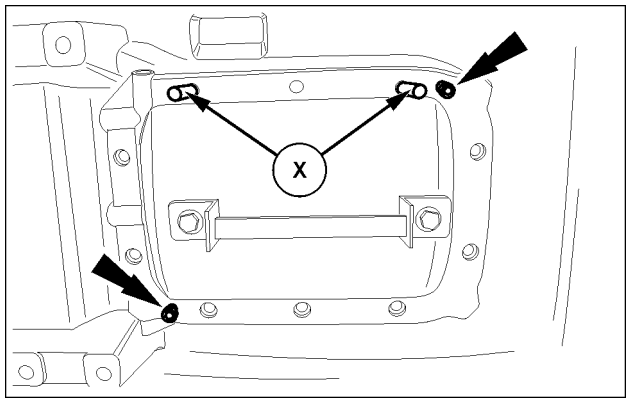
NOTE: *If only the cover is to be removed (transmission is not uninstalled), the transmission oil must first be drained and the left fuel tank removed - see* ***Fuel tank - Remove (B.20.A)****.*

1. Fit the carrying handle **380200082**. Remove the screws **(352)**.



SS08H001 1

2. Screw in the two stud bolts **(X)**. Press off the cover **(351)** with 2 screws and remove.

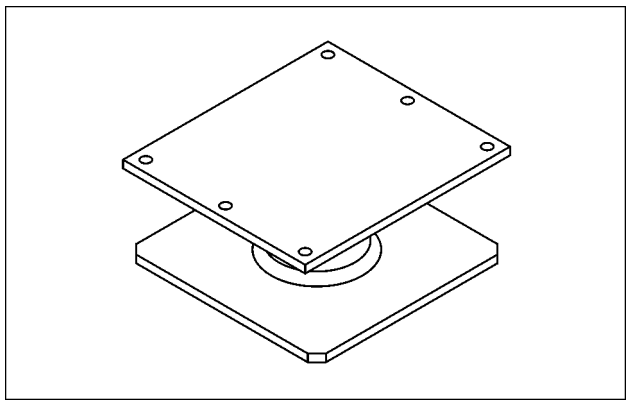


SS08H002 2

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary. Remove any sealant residue from the sealing surfaces.*

3. To carry out further dismantling the transmission must be mounted on a commercially available pivotable assembly block. To this end an adapter plate (which must be made by the workshop) is fitted to the transmission instead of the cover **(351)**.
Adapter plate - see **TRANSMISSION Continuously Variable Transmission (CVT) - Special tools (C.20.G)**

IMPORTANT: *The assembly block must be licensed for a minimum bearing load of* ***800 kg*** *(****1764 lb****)!*



SS08J144 3

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Next operation:
Cover Cover reverse gears - Disassemble (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Cover Cover reverse gears - Disassemble (C.20.G) - (35 km/h and 40 km/h gearbox)
Summing planetary gear - Remove (C.20.G)

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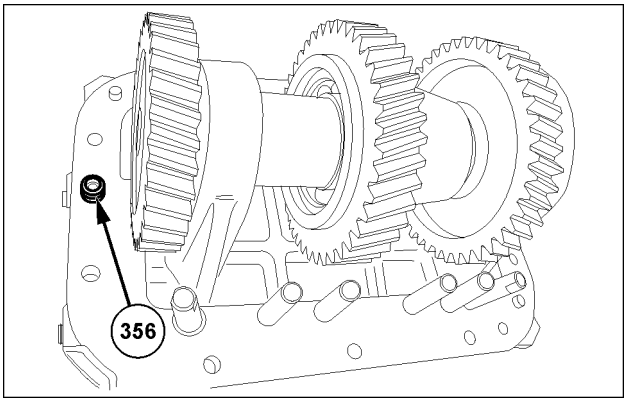
Cover Cover reverse gears - Disassemble

Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

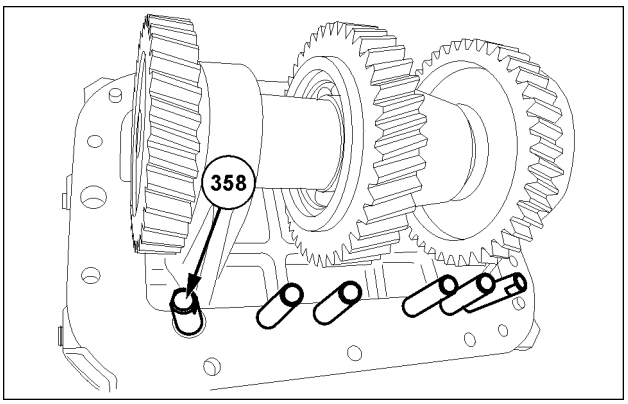
Prior operation:
Cover Cover reverse gears - Remove (C.20.G)

1. Pull the connecting piece **(356)** out of the cap. Remove the seal rings **(355)** and the snap ring **(357)** from the connecting piece.



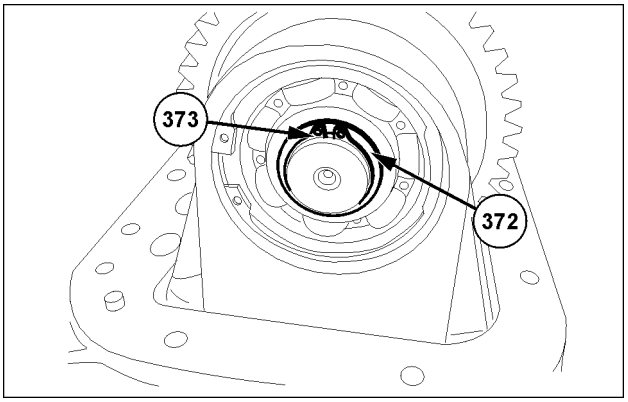
SS08G270 1

2. Dismantle the nozzles **(358)** and clean them.



SS08H055 2

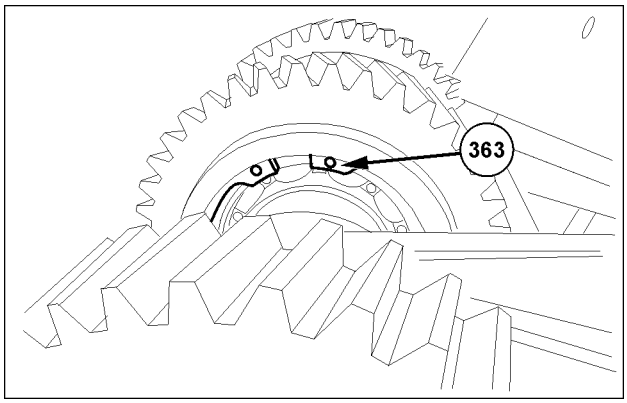
3. Remove the snap ring **(373)** and the washer **(372)**.



SS08G351 3

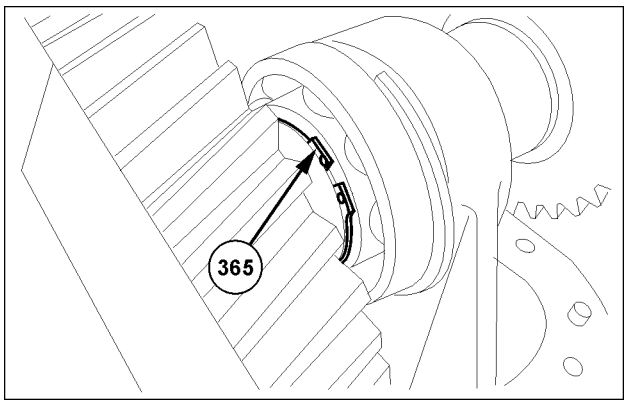
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4. Remove the snap ring **(363)** in the gear wheel **(366)** and pull out the shaft **(360)** only until the ball bearing **(364)** rests against the cap **(351)**.



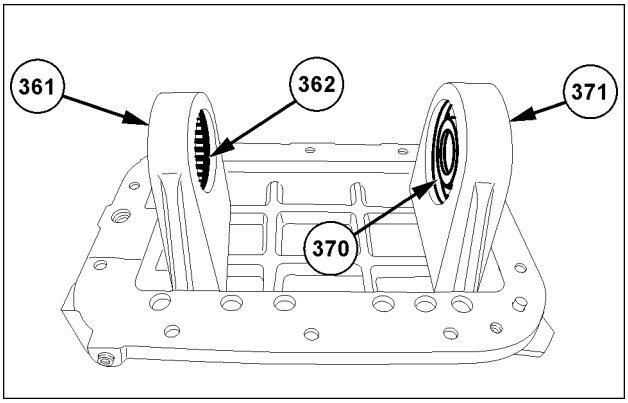
SS08G352 4

5. Remove the snap ring **(365)** and pull out the shaft. Remove all remaining parts.



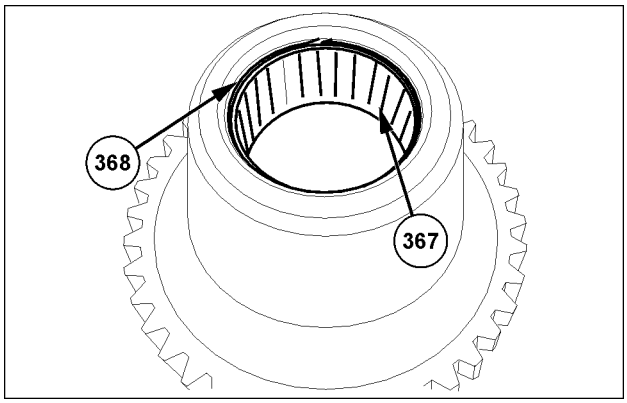
SS08G353 5

6. Remove the snap rings **(361)** and **(371)**, remove the ball bearing **(370)** and needle bearing **(362)** from the cap.



SS08H058 6

7. Remove the snap ring **(368)** and pull out the needle bearing **(367)**.



SS08G354 7

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Cover Cover reverse gears - Assemble (C.20.G)

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Cover Cover reverse gears - Assemble

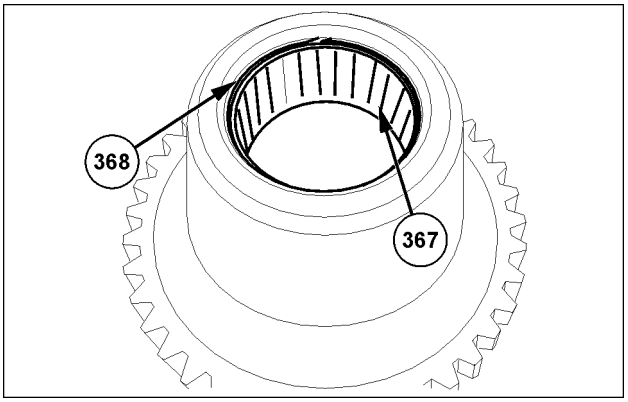
Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Cover Cover reverse gears - Disassemble (C.20.G)

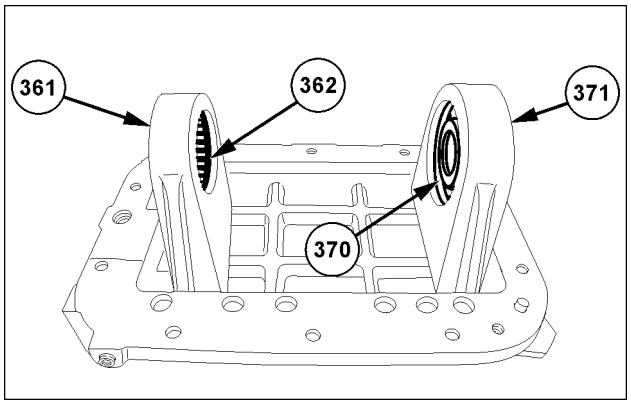
NOTE: *All parts must be oiled before being fitted.*

1. Insert the needle bearing **(367)** into the gear wheel **(366)** and fit the snap ring **(368)**.



SS08G354 1

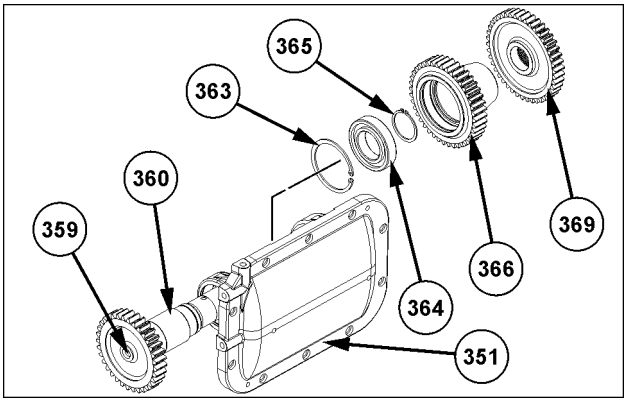
2. Fit the ball bearing **(370)** and the snap ring **(371)**. Fit the needle bearing **(362)** and the snap ring **(361)** into the cover.



SS08H058 2

3. Push the shaft **(360)** into the cover **(351)** and thread on the snap ring **(363)**, the ball bearing **(364)**, the snap ring **(365)**, the gear wheels **(366)** and **(369)**.

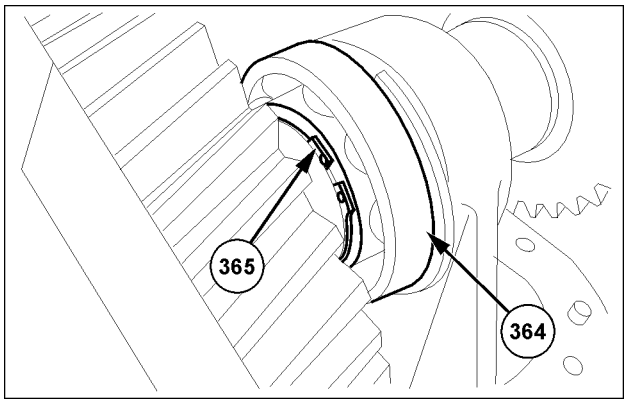
NOTE: *If the plug **(359)** has been removed from the shaft this must also be fitted with **LOCTITE® 271**.*



SS08H109 3

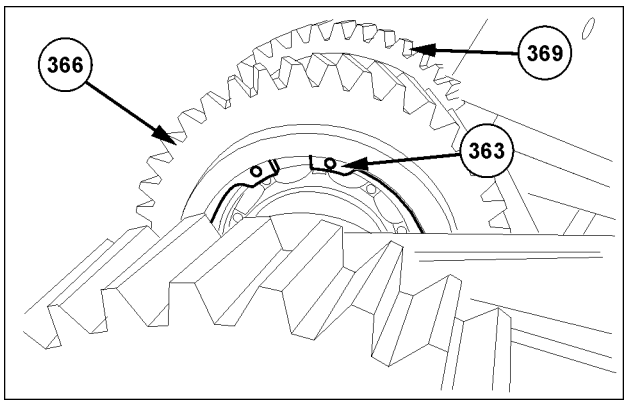
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4. Slide the bearing **(364)** onto the shaft and fit the snap ring **(365)**.



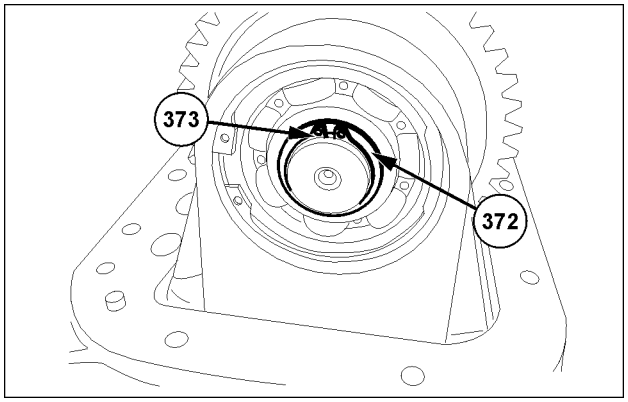
SS08H107 4

5. Push the shaft **(360)** together with the ball bearing **(364)** into the gear wheels **(366)** and **(399)**. Fit the snap ring **(363)** into the gear wheel **(366)**.



SS08H110 5

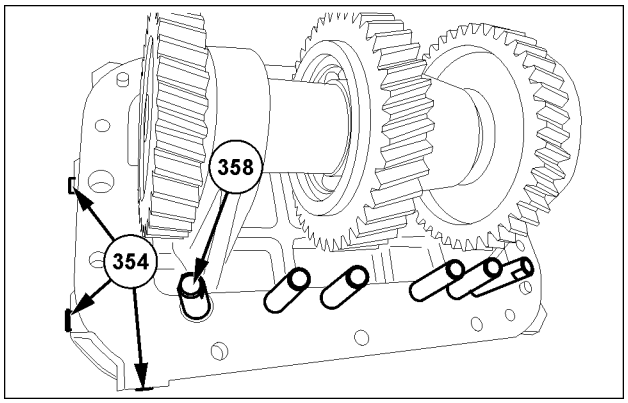
6. Fit the washer **(372)** and the snap ring **(373)**.



SS08G351 6

7. Spray the thread of the cleaned nozzles **(358)** with **LOCTITE® 243**, fit the nozzles and tighten to **25 - 30 Nm** (**18.4 - 22.1 lb ft**).

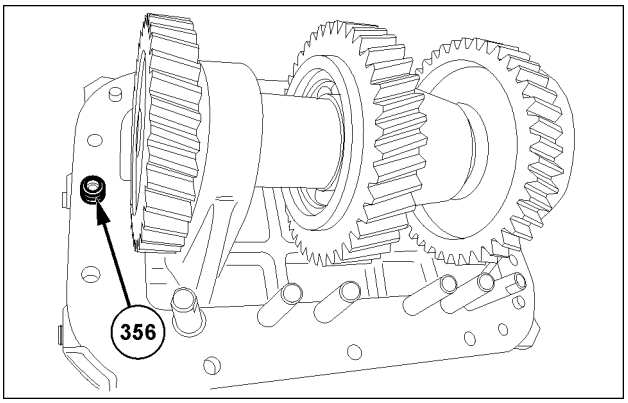
NOTE: *If the plugs **(354)** were removed from the cover **(351)** spray them with **LOCTITE® 243** and screw in.*



SS08J099 7

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8. Fit the connecting piece **(356)** together with the snap ring **(357)** and the new 'O' rings **(355)** into the cover. Fit the dowel pins **(353)**.



SS08G270 8

Next operation:
Cover Cover reverse gears - Install (C.20.G)

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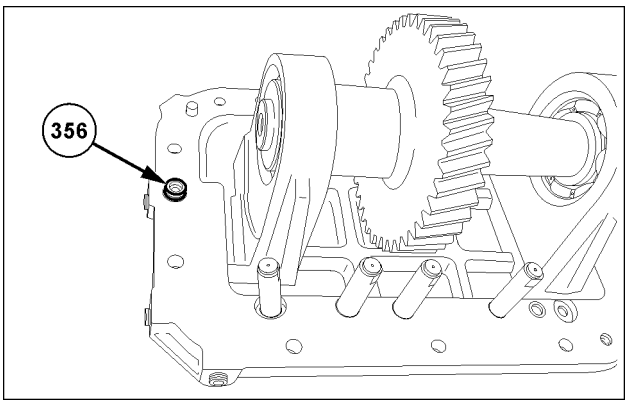
Cover Cover reverse gears - Disassemble

Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

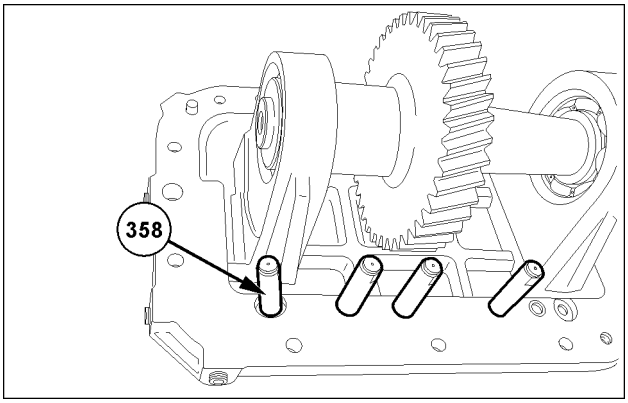
Prior operation:
Cover Cover reverse gears - Remove (C.20.G)

1. Pull the connecting piece **(356)** out of the cap. Remove the seal rings **(355)** and the circlip **(357)** from the connecting piece.



SS08M108 1

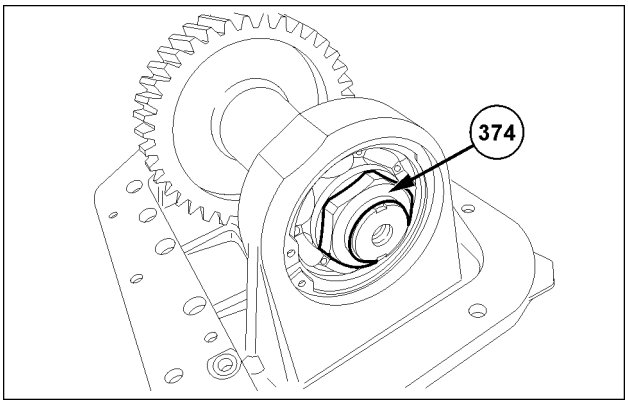
2. Dismantle the nozzles **(358)** and clean them.



SS08M107 2

3. Loosen and unscrew the nut **(374)**.

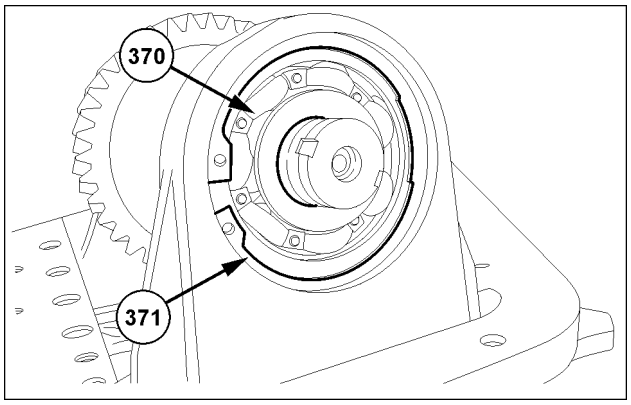
NOTE: *Left-hand thread*



SS08M109 3

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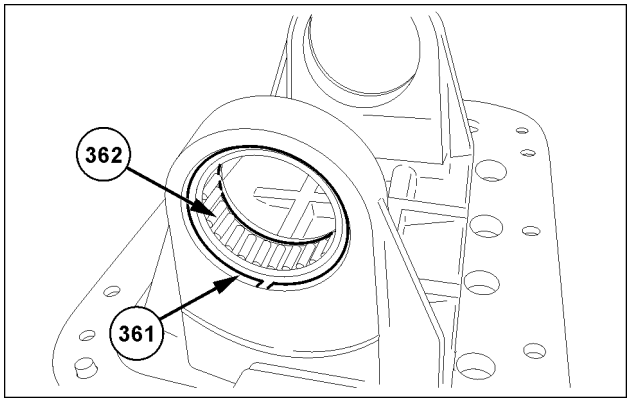
4. Remove the circlip **(371)** and remove the ball bearing **(370)**.



SS08M110 4

5. Pull out the shaft **(360)**.

6. Remove the circlip **(361)** and remove the needle bearing **(362)**.



SS08M106 5

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Cover Cover reverse gears - Assemble (C.20.G)

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Cover Cover reverse gears - Assemble

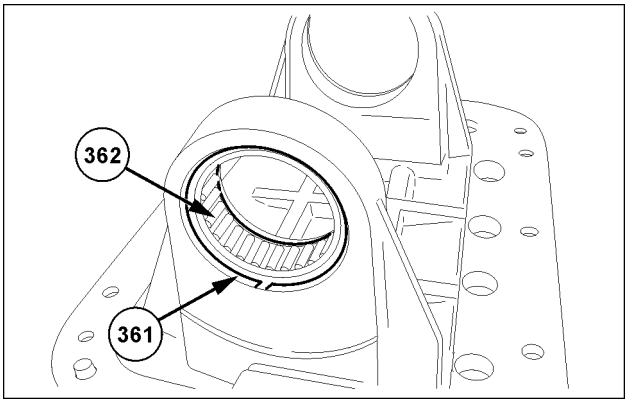
Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Cover Cover reverse gears - Disassemble (C.20.G)

NOTE: *All parts must be oiled before being fitted.*

1. Insert the needle bearing **(362)** and fit the circlip **(361)**.

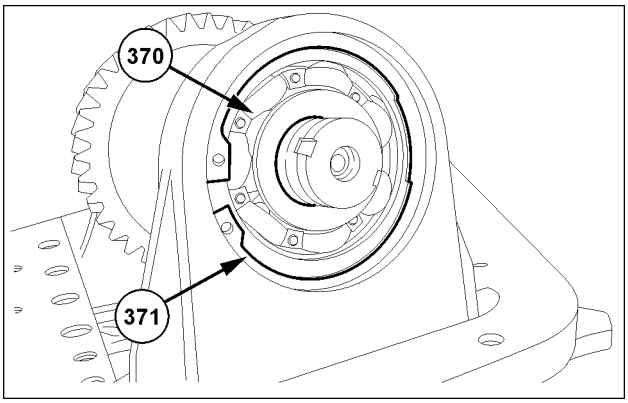


SS08M106 1

2. Fit the shaft **(360)**.

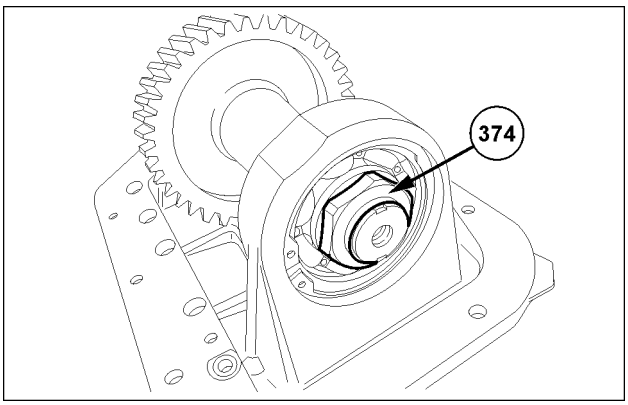
NOTE: *If the plug **(359)** has been removed from the shaft this must be fitted using **LOCTITE® 271** .*

3. Fit the ball bearing **(370)** and insert the circlip **(371)**.



SS08M110 2

4. Fit the nut **(374)** and tighten to **275 - 315 Nm** (**203 - 232 lb ft**). Strike the nut in order to secure it.

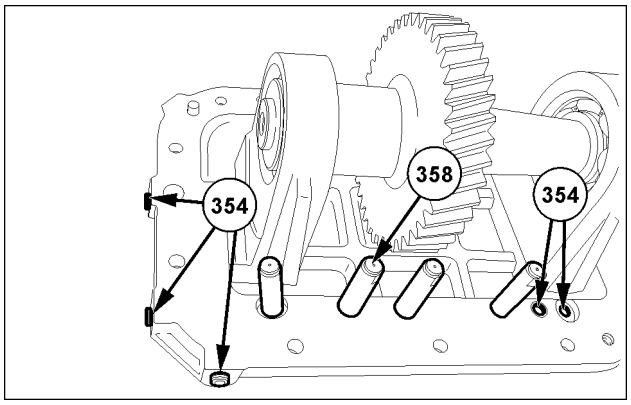


SS08M109 3

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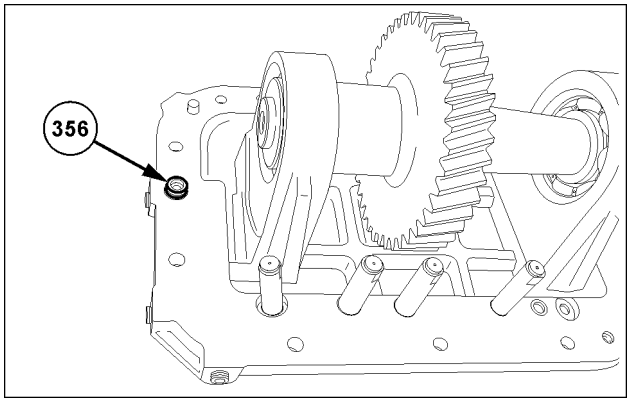
5. Spray the thread of the cleaned nozzles **(358)** with **LOCTITE® 243** screw in and tighten to **25 - 30 Nm** (**18.4 - 22.1 lb ft**).

NOTE: *If the plugs* ***(354)*** *were removed from the cover* ***(351)*** *spray them with* ***LOCTITE® 243*** *and screw in.*



SS08M132 4

6. Fit the connecting piece into the cover **(356)** together with the circlip **(357)** and the new 'O' rings **(355)**. Fit the dowel pins **(353)**.



SS08M108 5

Next operation:
Cover Cover reverse gears - Install (C.20.G)

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Cover Cover reverse gears - Install

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

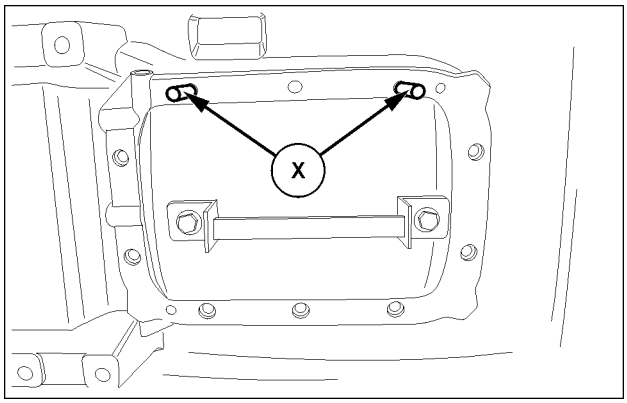
B012

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Cover Cover reverse gears - Assemble (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Cover Cover reverse gears - Assemble (C.20.G) - (35 km/h and 40 km/h gearbox)
Cover - Install (Hydrostat) Transmission uninstalled (C.20.G)

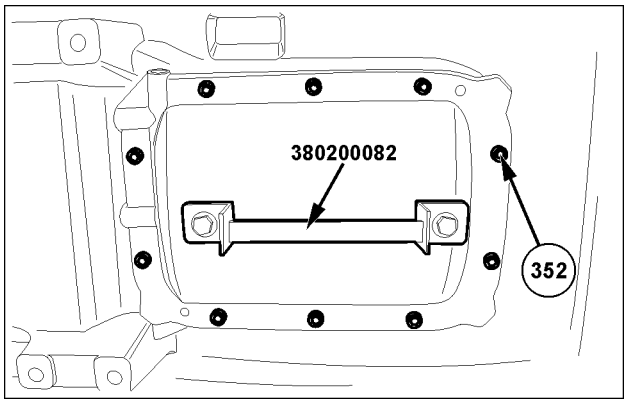
1. Disassemble the transmission from the assembly block and remove the adapter plate.
2. Grease the sealing surfaces and apply **LOCTITE® 518** to the transmission casing.
3. Screw in the two stud bolts **(X)** on the transmission casing. Fit the cover **(351)**.

NOTE: *When assembling the cover ensure that the teeth of the gear wheels are not aligned tooth to tooth.*



SS08H112 1

4. Remove the stud bolts.
   Fit the screws **(352)** and tighten to **48.5 Nm** (**35.8 lb ft**). Remove the carrying handle **380200082**.



SS08H001 2

NOTE: *If only the cover **(351)** has been removed (transmission has not been uninstalled), the left fuel tank must be fitted next - see **Fuel tank - Install (B.20.A)** and the transmission oil must be topped up. The specifications and the oil quantity must be as per the operating instructions.*

Next operation:
Fit the rear axle to the transmission - see **Housing - Install (C.20.G)**.

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Cover - Remove (Hydrostat) Transmission uninstalled

⚠ CAUTION ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

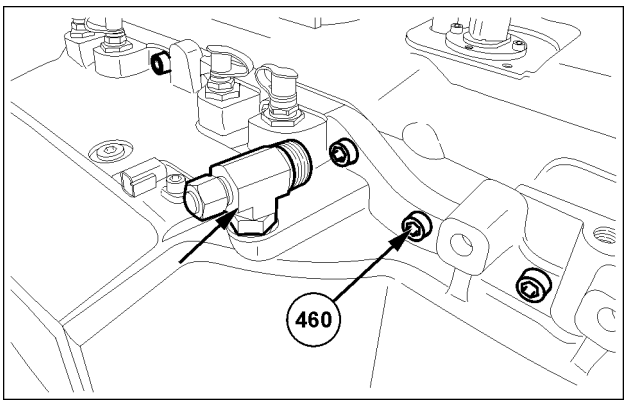
B012

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Valve block - Remove (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Valve block - Remove (C.20.G) - (35 km/h and 40 km/h gearbox)

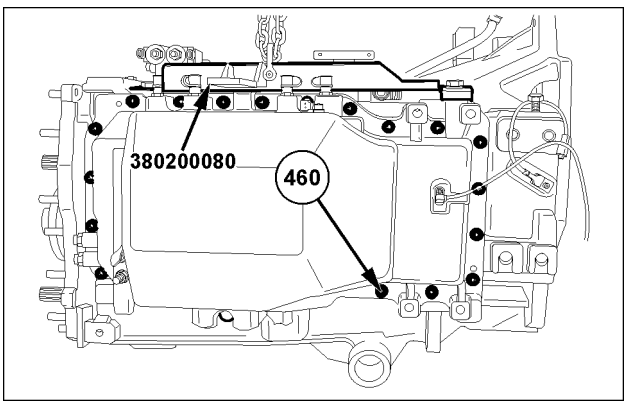
1. Dismantle the T-piece. Remove the screws **(460)** from the cover **(459)**.

IMPORTANT: *To secure the cover two easily accessible screws remain screwed in place.*



SS08H076 1

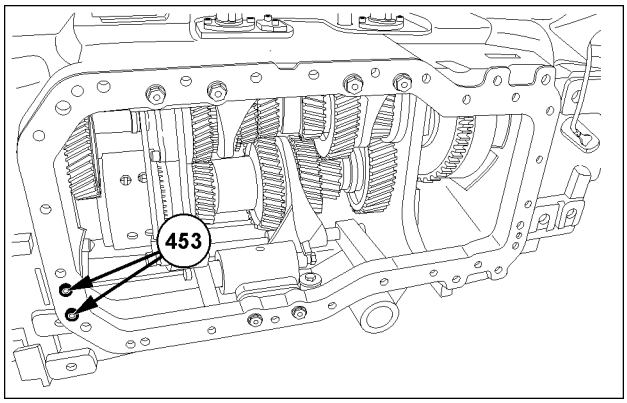
2. Fit the upper part of the special tool **380200080** using two screws. Remove the remaining screws **(460)** and press the cover **(459)** off the dowel pins on the transmission.



SS08H075 2

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3. Remove the two connecting pieces **(453)** from the transmission casing.



SS08H074 3

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary. Remove any sealant residue from the sealing surfaces.*

Next operation:
Hydrostat - Remove (C.20.G)
Shift cylinder - Remove (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Shift cylinder - Remove (C.20.G) - (35 km/h and 40 km/h gearbox)
Cover - Install (Hydrostat) Transmission uninstalled (C.20.G)

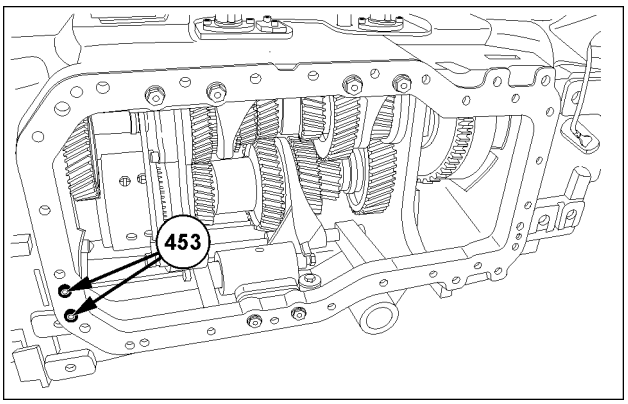
www.truck-freeworkshop.com

Cover - Install (Hydrostat) Transmission uninstalled

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Cover - Remove (Hydrostat) Transmission uninstalled (C.20.G)
Hydrostat - Install (C.20.G)
Shift cylinder - Install (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Shift cylinder - Install (C.20.G) - (35 km/h and 40 km/h gearbox)

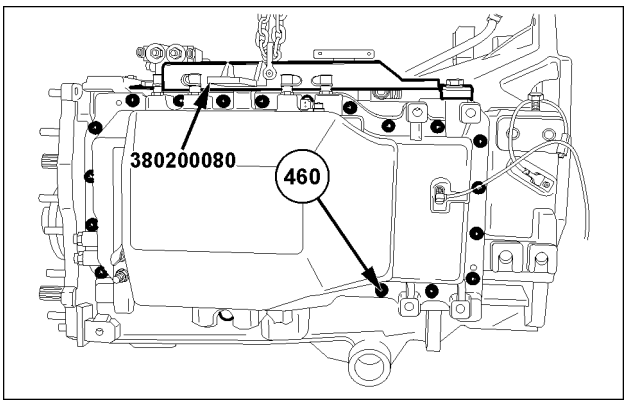
1. Fit the dowel pins **(458)** inside the cover or inside the casing. Grease the sealing surfaces and apply **LOCTITE® 518** to the sealing surface of the transmission casing. Fit the two connecting pieces **(453)** with new seal rings **(452)** inside the transmission casing.



SS08H074 1

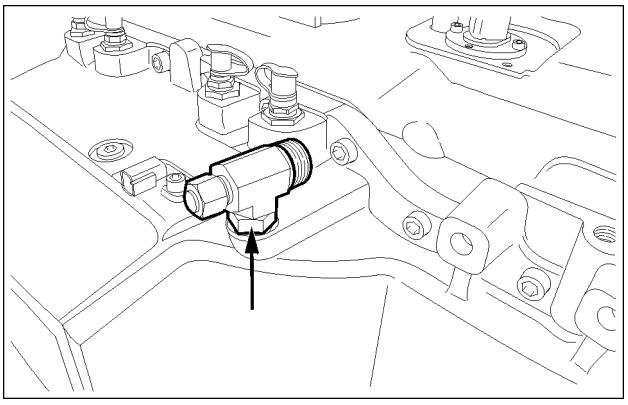
2. Place the cover **(459)** onto the dowel pins. Insert the screws **(460)** and tighten to **86 Nm** (**63.4 lb ft**). Remove the upper part of the special tool **380200080**.

NOTE: *When assembling the cover ensure that the teeth of the gear wheels are not aligned tooth to tooth.*



SS08H075 2

3. Fit the T-piece with a new ‘O’ ring.



SS08H165 3

Next operation:
Valve block - Install (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Valve block - Install (C.20.G) - (35 km/h and 40 km/h gearbox)

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Cover - Remove (Hydrostat) Transmission installed

⚠ CAUTION ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

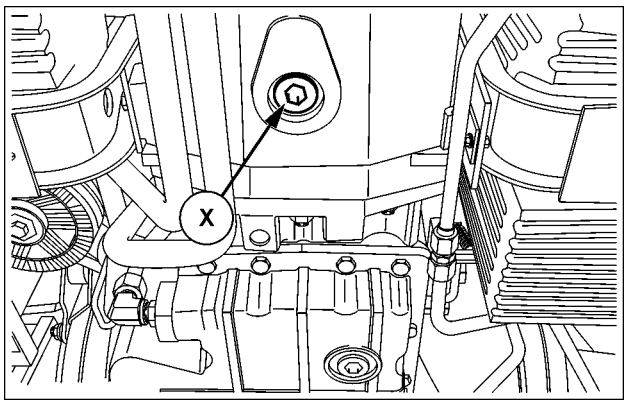
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Battery - Remove (A.30.A)
Remove the right fuel tank - see **Fuel tank - Remove (B.20.A)**.
Remove the mid-mount remote control valves (if equipped) - see **Mid-mount remote control valve - Remove (A.10.C)**.
Valve block - Remove (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Valve block - Remove (C.20.G) - (35 km/h and 40 km/h gearbox)

NOTE: *Steps **2** to **4** are not required for vehicles without mid-mount remote control valves.*

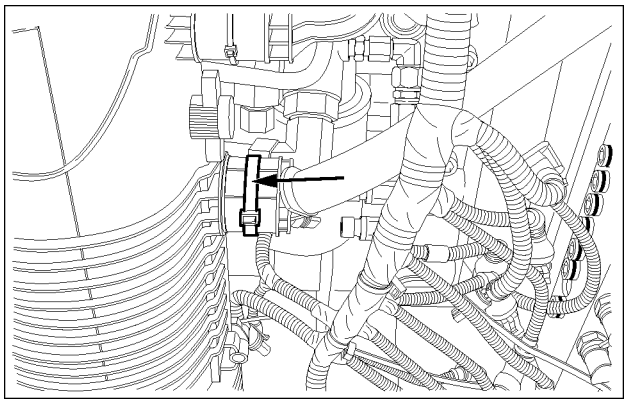
1. Remove the drain plug **(X)** and drain the transmission oil.

NOTE: *The container must hold at least **84 l (22.2 US gal)**.*



SS08H175 1

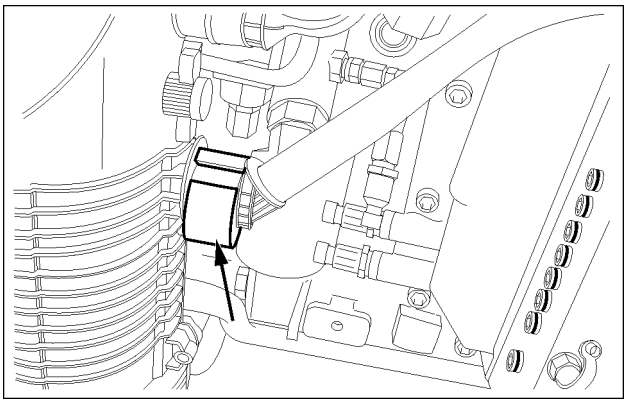
2. Remove the cable tie.



SS08H154 2

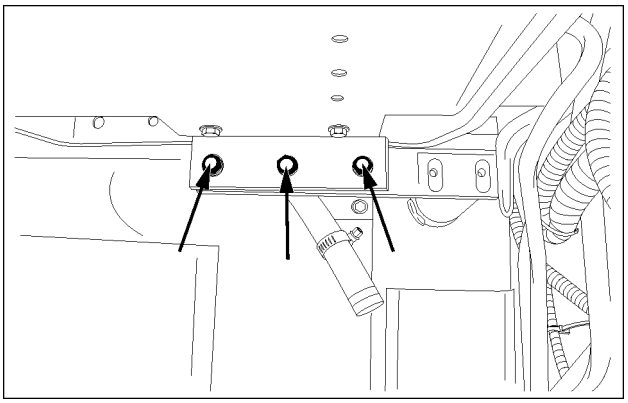
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3. Take off the retaining clip and remove the hose.



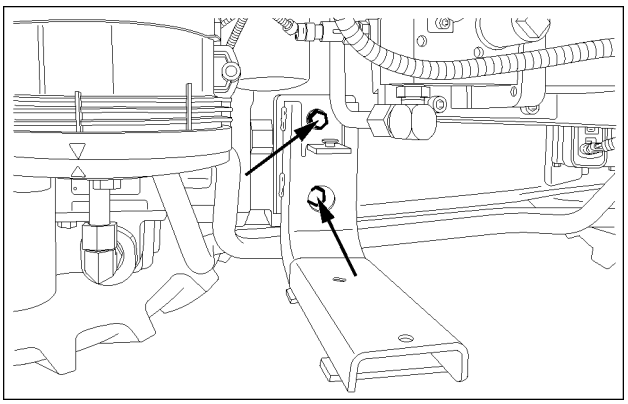
SS08H155 3

4. Thread the supply lines for the mid-mount remote control valves out of the guide bracket.
5. Unscrew the three screws and remove together with the bracket.



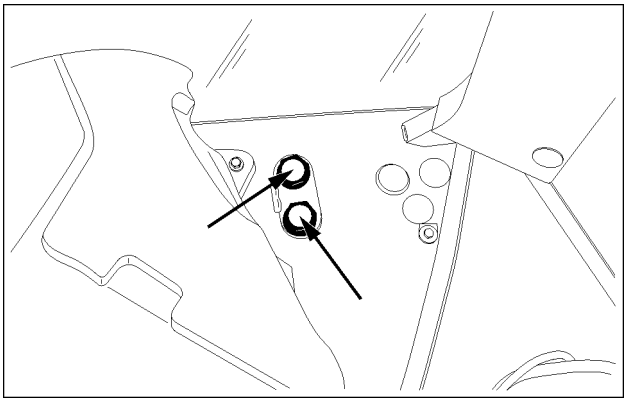
SS08H156 4

6. Unscrew the screws on the tank console and remove together with the console.



SS08H167 5

7. Lift the right side of the cab floor mat and remove the two screws for the cab mounting.



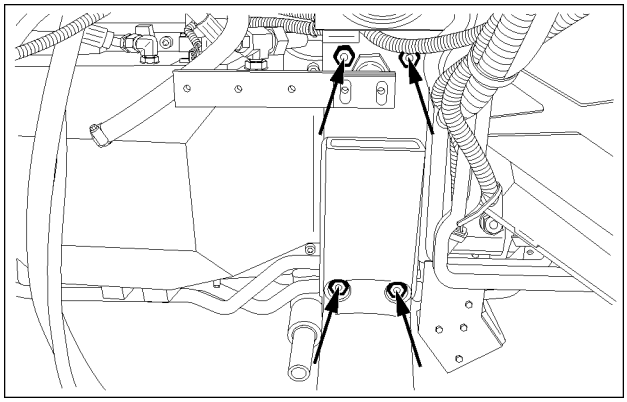
SS08H157 6

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8. Carefully prop up the cab on the right side using suitable supports.

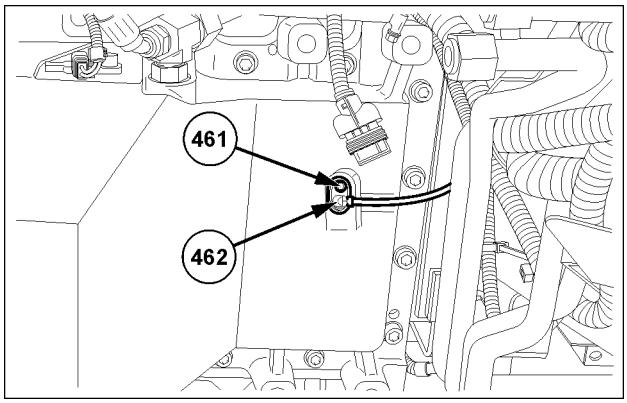
9. Unscrew the four screws and dismantle the console for the cab mounting using a suitable hoisting device.

NOTE: *The weight of the console is approximately* ***35 kg*** *(****77.2 lb****).*



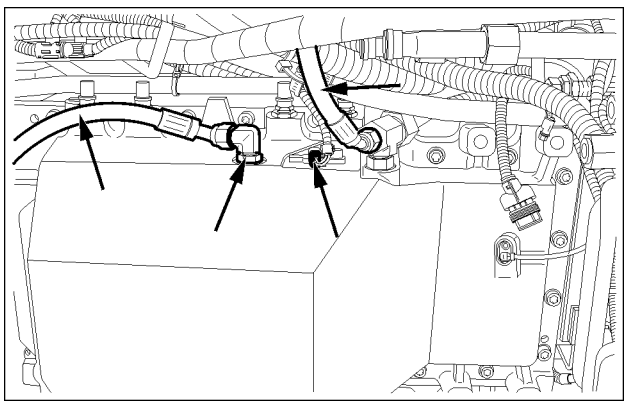
SS08H158 7

10. Remove the screw **(461)** and dismantle the speed sensor for the ring gear **(462)**.



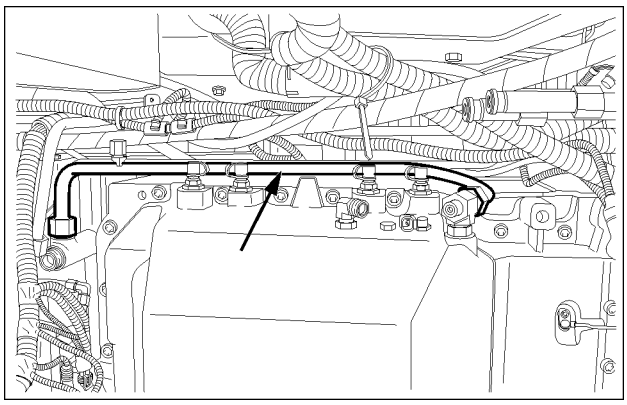
SS08H159 8

11. Disconnect the electrical connector for the hydrostat solenoid valve.
Remove the feed pressure hose and the return hose for the mid-mount remote control valves (if equipped). Unscrew the elbow and twist it.



SS08H160 9

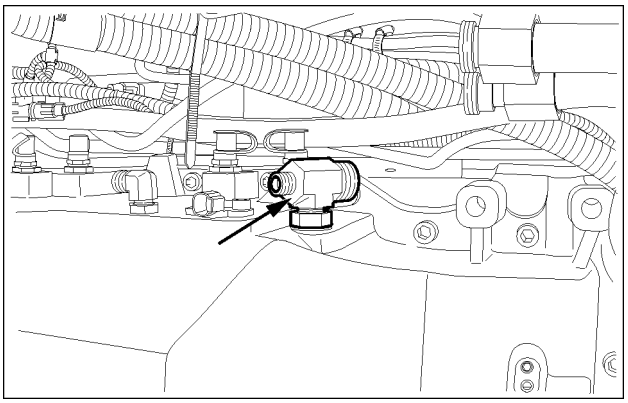
12. Remove the feed pressure line for the hydrostat.



SS08H161 10

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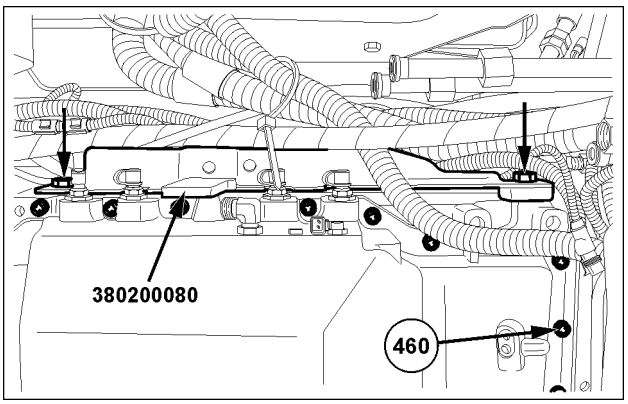
13. Dismantle the T-piece.



SS08H162 11

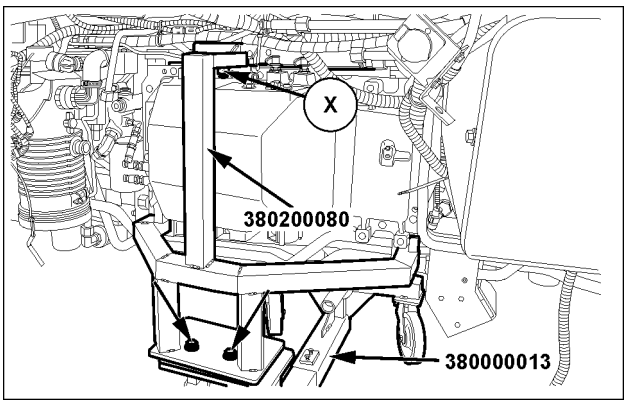
14. Fit the upper part of the special tool **380200080** using two screws. Remove the screws **(460)**.

IMPORTANT: *To secure the cover **(459)** two easily accessible screws remain on the cover.*



SS08H163 12

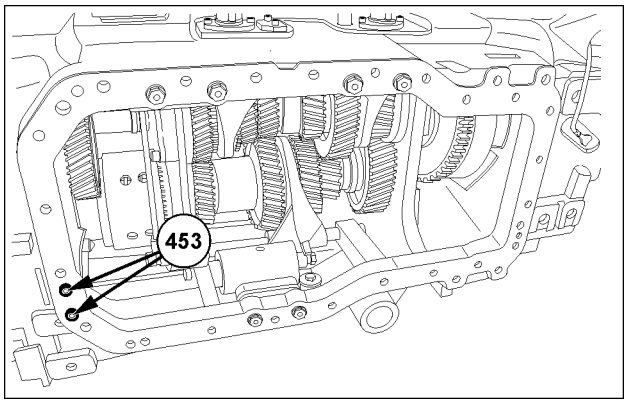
15. Fit the lower part of the special tool **380200080** onto the assembly dolly **380000013** using two screws. Position the lower part of the special tool **380200080**, insert the screw **(X)** and tighten. Remove the remaining screws **(460)** and press the cover **(459)** off the dowel pins on the transmission. Carefully push the assembly dolly away from the vehicle.



SS08H164 13

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16. Remove the connecting pieces **(453)** out of the transmission casing.



SS08H074 14

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary. Remove any sealant residue from the sealing surfaces.*

Next operation:
Shift cylinder - Remove (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Shift cylinder - Remove (C.20.G) - (35 km/h and 40 km/h gearbox)
Hydrostat - Remove (C.20.G)
Cover - Install (Hydrostat) Transmission installed (C.20.G)

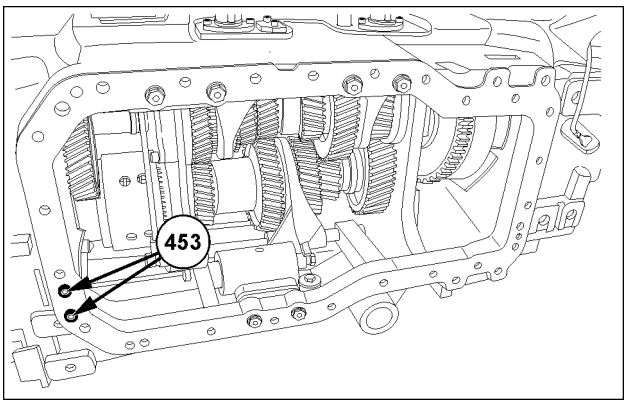
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Cover - Install (Hydrostat) Transmission installed

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Cover - Remove (Hydrostat) Transmission installed (C.20.G)
Hydrostat - Install (C.20.G)
Shift cylinder - Install (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Shift cylinder - Install (C.20.G) - (35 km/h and 40 km/h gearbox)

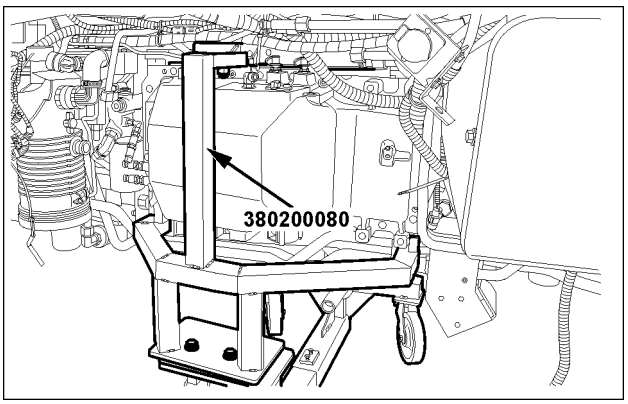
1. If the dowel pins **(458)** have been removed, fit them inside the cover or on the housing. Grease the sealing surfaces and apply **LOCTITE® 518** to the sealing surface of the transmission casing. Fit the two connecting pieces **(453)** with new seal rings **(452)** inside the transmission casing.



SS08H074 1

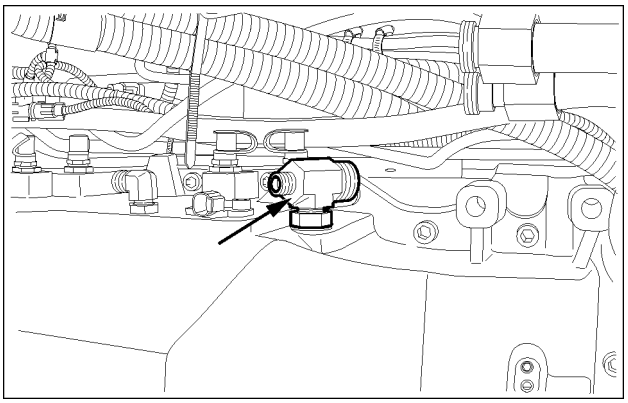
2. Place the cover **(459)** on the dowel pins, fit the screws **(460)** and tighten to **86 Nm** (**63.4 lb ft**). Remove the special tool **380200080**.

NOTE: *When assembling the cover ensure that the teeth of the gear wheels are not aligned tooth to tooth.*



SS08J130 2

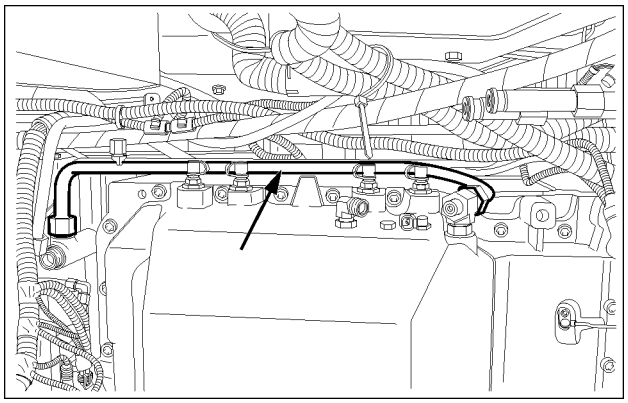
3. Fit the T-piece with a new ‘O’ ring.



SS08H162 3

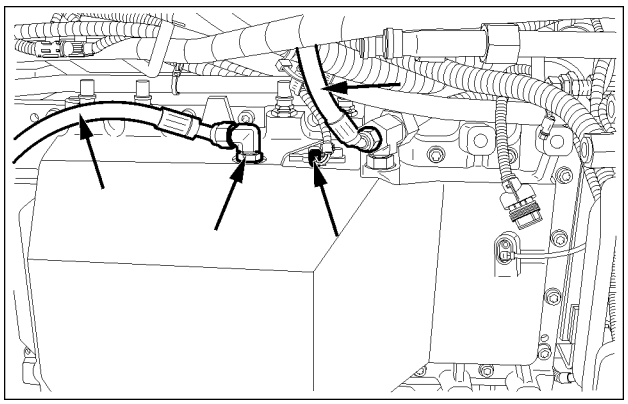
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4. Fit the feed pressure line for the hydrostat with new ‘O’rings.



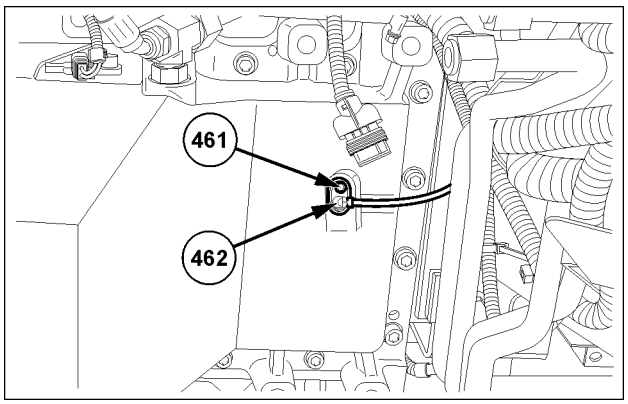
SS08H161 4

5. Connect the electrical connector for the hydrostat solenoid valve.
Fit the feed pressure hose and the return hose for the mid-mount remote control valves (if equipped). Turn the elbow to the correct position and tighten.



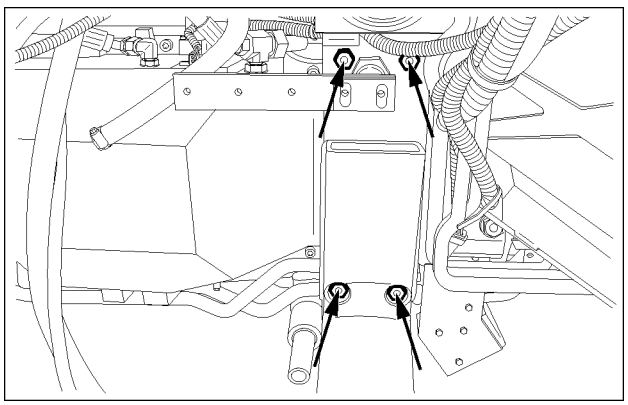
SS08H160 5

6. Place the speed sensor for the ring gear **(462)** inside, tighten the screw **(461)** and tighten to **6 - 10 Nm** (**4.43 - 7.38 lb ft**).



SS08H159 6

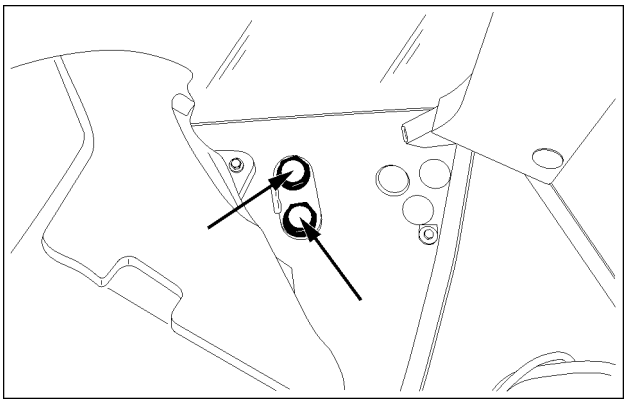
7. Fit the cab mounting using four screws.



SS08H158 7

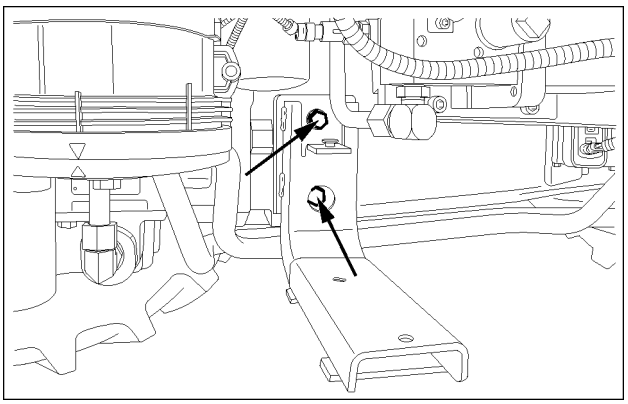
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8. Spray the two screws of the cab mounting with **LOCTITE® 243** and turn them several times.
Remove the supports on the right side of the cab and tighten the two screws to **390 - 430 Nm** (**288 - 317 lb ft**). Place the cab floor mats inside.



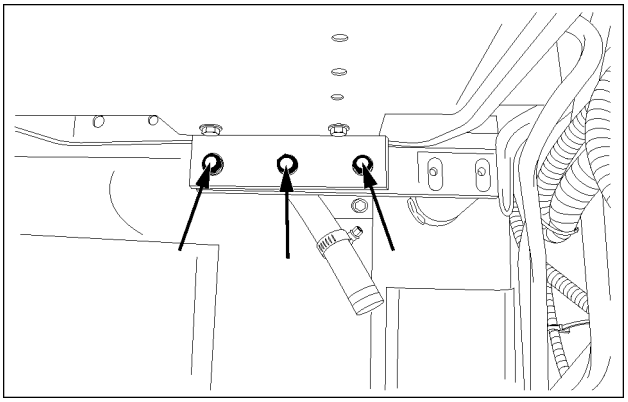
SS08H157 8

9. Fit the tank console on the transmission using the screws.



SS08H167 9

10. Fit the bracket using three screws.



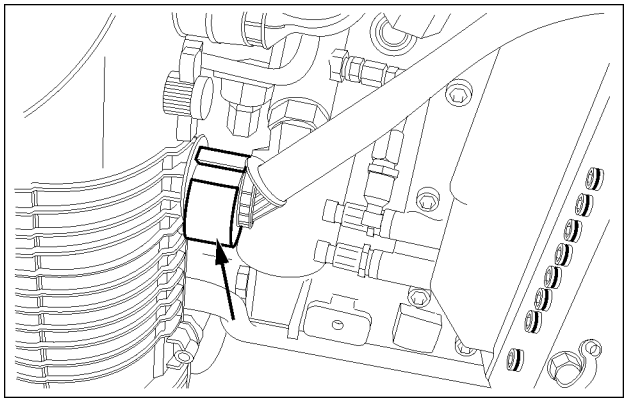
SS08H156 10

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NOTE: *Steps **11** to **13** are not required for vehicles without mid-mount remote control valves.*

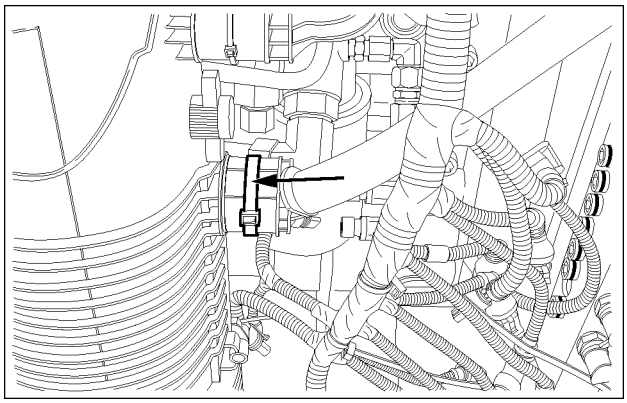
11. Thread the supply lines for the mid-mount remote control valves (if equipped) into the guide bracket.

12. Fit the hose with a new ‘O’ ring. Attach the retaining clip.



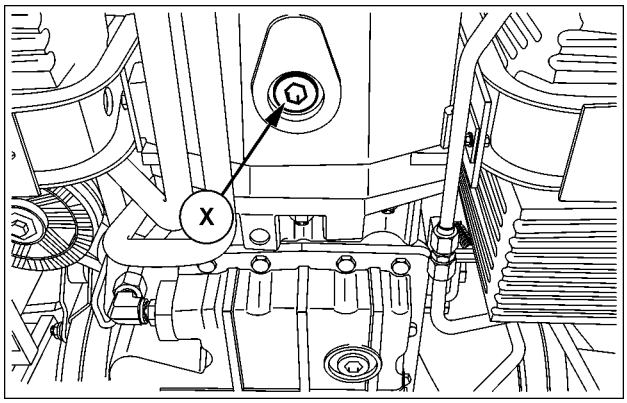
SS08H155 11

13. Fit the cable tie.



SS08H154 12

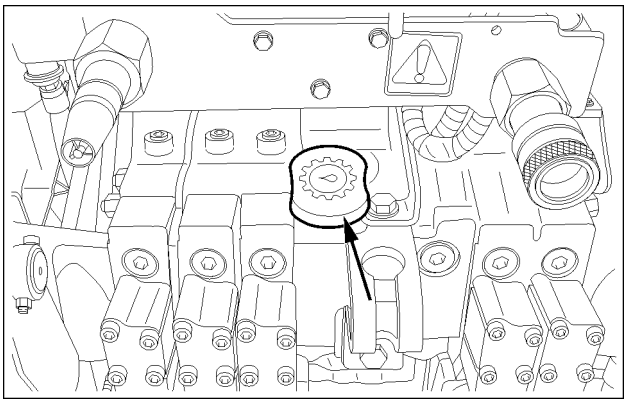
14. Fit a new seal ring to the drain plug **(X)** and tighten.



SS08H175 13

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15. Top up transmission oil. The specifications and the oil quantity can be found in the operating instructions.



SS08J127 14

Next operation:
Valve block - Install (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Valve block - Install (C.20.G) - (35 km/h and 40 km/h gearbox)
Mid-mount remote control valve - Install (A.10.C)
Install the right fuel tank - see **Fuel tank - Install (B.20.A)**
Battery - Install (A.30.A)

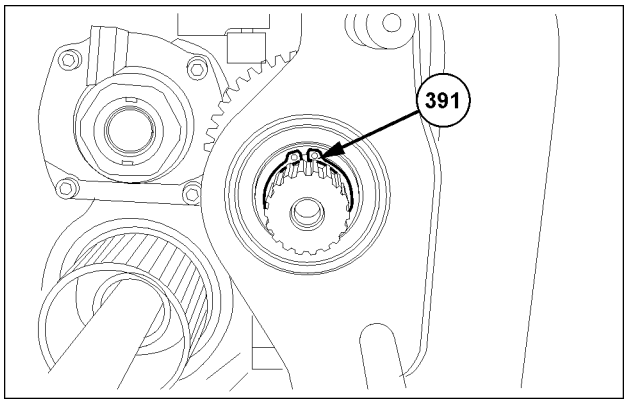
www.truck-freeworkshop.com

Hydrostat Hydrostat drive - Remove

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

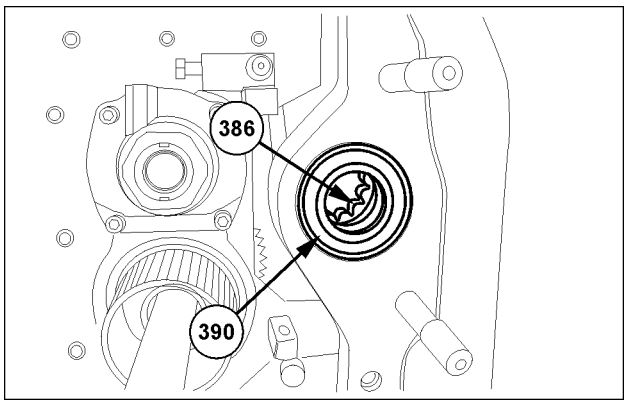
Prior operation:
Fork and shift rail - Remove (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Fork and shift rail - Remove (C.20.G) - (35 km/h and 40 km/h gearbox)

1. Take off the connecting sleeve **(395)** and remove the snap ring **(391)**.



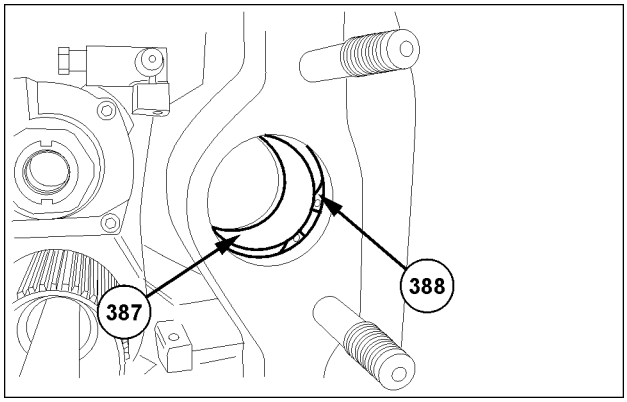
SS08G109 1

2. Remove the drive wheel **(385)** by pulling it forwards.
3. Remove the roller bearing **(386)** and the ball bearing **(390)** using a suitable puller.



SS08G110 2

4. Remove the snap ring **(388)** and the bushing **(387)**.



SS08G111 3

5. Remove the inner bearing race of the roller bearing **(386)** from the drive wheel **(385)** using a commercially available puller.

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Hydrostat Hydrostat drive - Install (C.20.G)
Gear - Remove (F2/R1 and F4/R2) (C.20.G) - (40 km/h ECO and 50 km/h gearbox)

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Gear - Remove (F2/R1) (C.20.G) - (35 km/h and 40 km/h gearbox)

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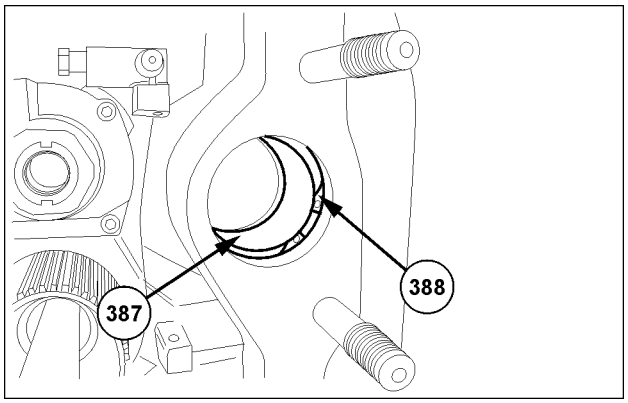
Hydrostat Hydrostat drive - Install

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Hydrostat Hydrostat drive - Remove (C.20.G)
Gear - Install (F2/R1 and F4/R2) (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Gear - Install (F2/R1) (C.20.G) - (35 km/h and 40 km/h gearbox)

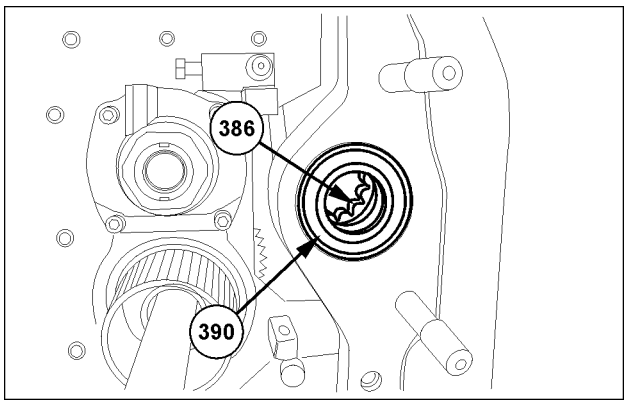
NOTE: *All parts must be oiled before being fitted.*

1. Fit the bushing **(387)** and the snap ring **(388)**.



SS08G111 1

2. Fit the roller bearing **(386)** and the ball bearing **(390)**.

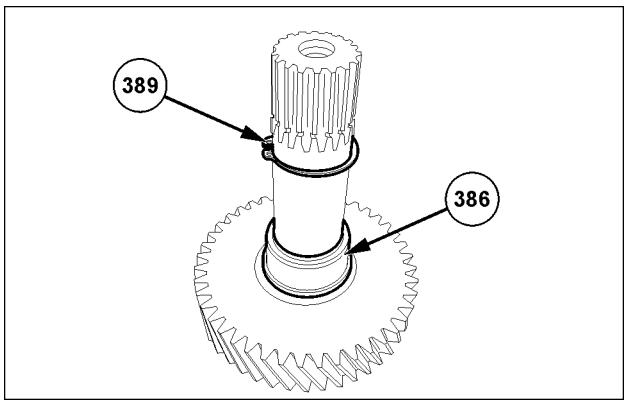


SS08G110 2

3. Heat the inner bearing race of the roller bearing **(386)** to **60 °C** (**140 °F**) and push onto the drive wheel **(385)**. Fit the snap ring **(389)**.

⚠ WARNING ⚠
Always wear heat protective gloves to prevent burning your hands when handling heated parts.

SM121A

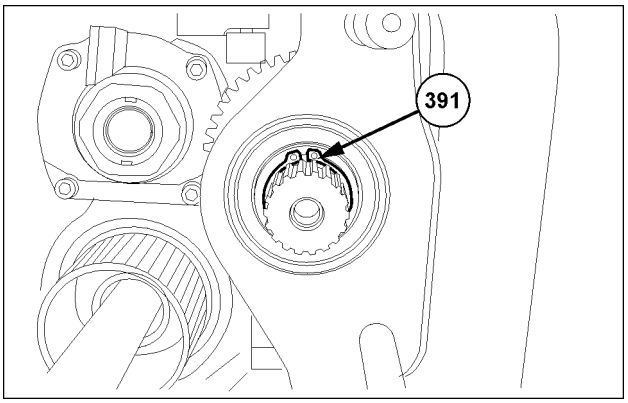


SS08H056 3

4. Insert the drive wheel **(385)** from the front.

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5. Fit the snap ring **(391)** and slide the connecting sleeve **(395)** onto the shaft.



SS08G109 4

Next operation:
Fork and shift rail - Install (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Fork and shift rail - Install (C.20.G) - (35 km/h and 40 km/h gearbox)

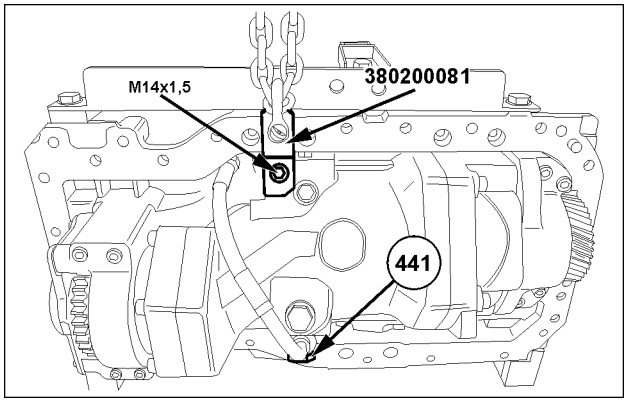
www.truck-freeworkshop.com

Hydrostat - Remove

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

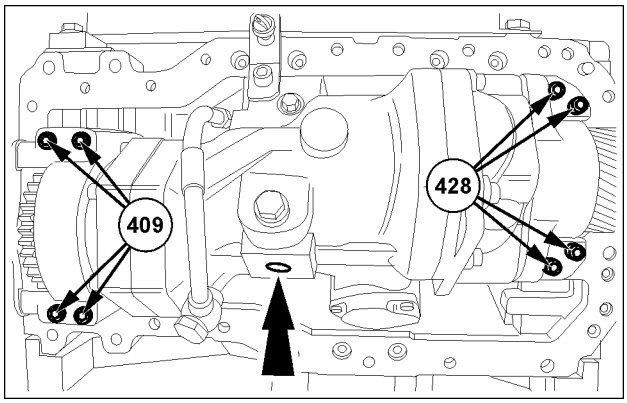
Prior operation:
Cover - Remove (Hydrostat) Transmission uninstalled (C.20.G)
Cover - Remove (Hydrostat) Transmission installed (C.20.G)

1. Tighten the retaining plate **380200081** on the hydrostat using the screw M14x1.5. Disassemble the screw **(441)**.



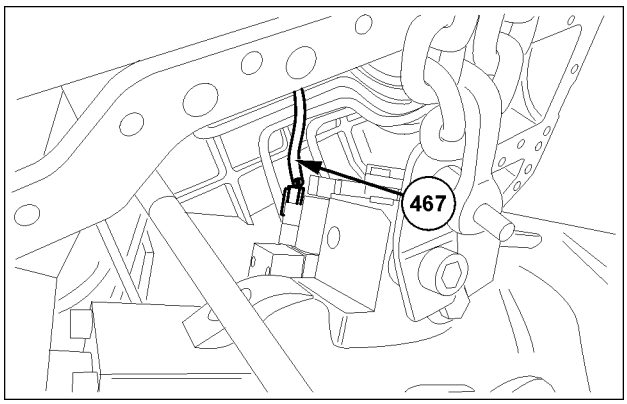
SS08H009 1

2. Seal the open threaded hole in the hydrostat housing using a suitable plug. Remove the screws **(409)** and **(428)** on the bearing blocks **(407)** and **(427)**.



SS08H146 2

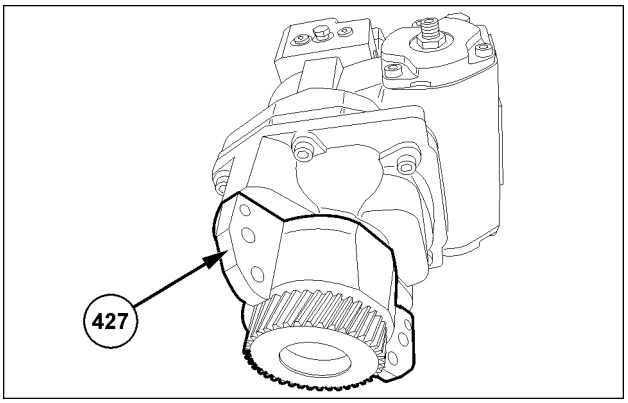
3. Press the bearing blocks **(407)** and **(427)** away from the dowel pins. Remove the hydrostat from the cover only until the line **(467)** can be disconnected from the hydrostat solenoid valve. Then remove the hydrostat.



SS08H011 3

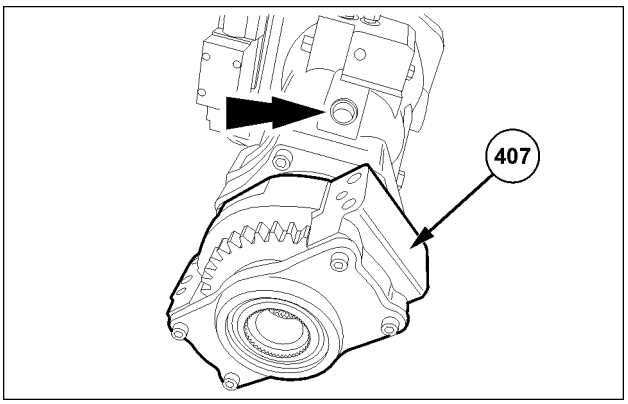
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4. Remove the complete bearing block **(427)** together with the drive wheel from the hydrostat.



SS08H012 4

5. Seal the open threaded hole in the hydrostat housing using a suitable plug. Remove the complete bearing block **(407)** together with the drive wheel from the hydrostat.



SS08H147 5

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Hydrostat - Install (C.20.G)
Shift cylinder - Remove (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Shift cylinder - Remove (C.20.G) - (35 km/h and 40 km/h gearbox)

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Hydrostat - Install

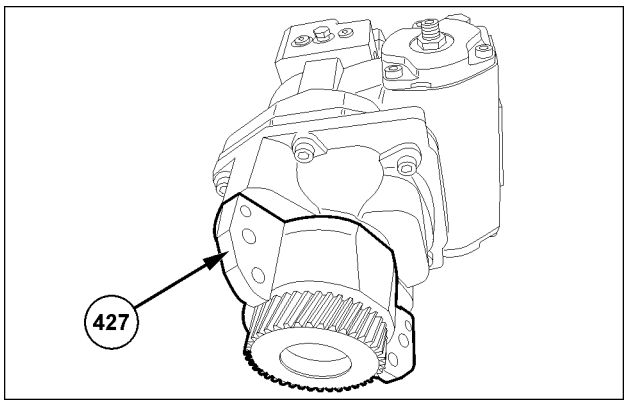
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Hydrostat - Remove (C.20.G)
Summing planetary gear - Install (C.20.G)

NOTE: *All parts must be oiled before being fitted.*

1. Fit the complete bearing block **(427)** together with the drive wheel onto the hydrostat.

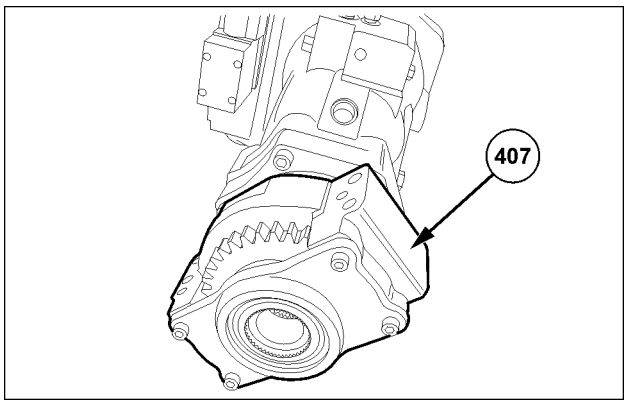
NOTE: *If a new hydrostat is installed, both silent blocks **(418)** must be fitted in the hydrostat.*



SS08H012 1

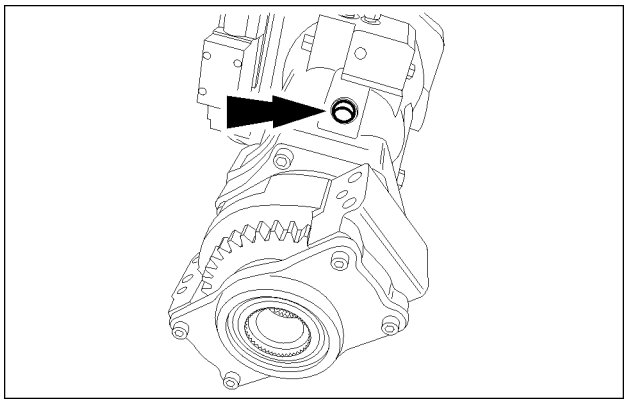
2. Fit the complete bearing block **(407)** together with the drive wheel onto the hydrostat.

NOTE: *Align bearing block **(407)** with bearing block **(427)**.*



SS08H013 2

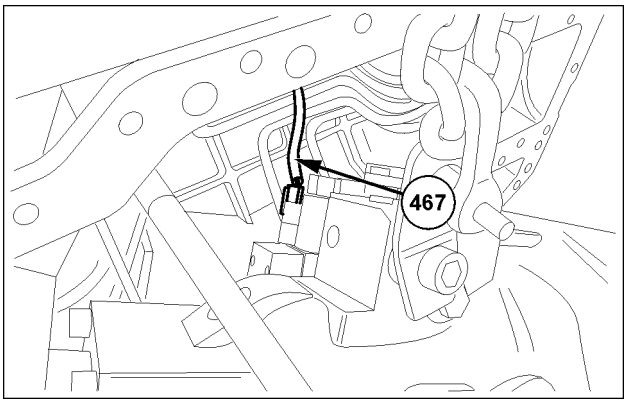
3. Remove the drain plugs from the threaded hole. Fill the hydrostat to approximately the half-way mark with pure transmission oil.
   Fit the dowel pins **(410)** and **(430)** inside the cover **(459)**.



SS08H166 3

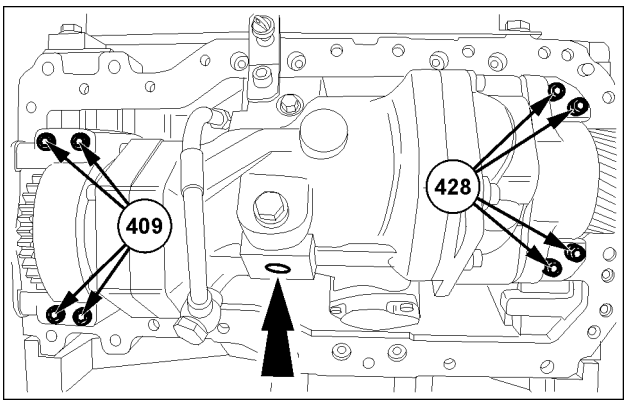
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4. Place the hydrostat close enough to the cover to allow the line **(467)** to be connected to the solenoid valve. Place the bearing blocks **(407)** and **(427)** onto the dowel pins **(410)** and **(430)**.



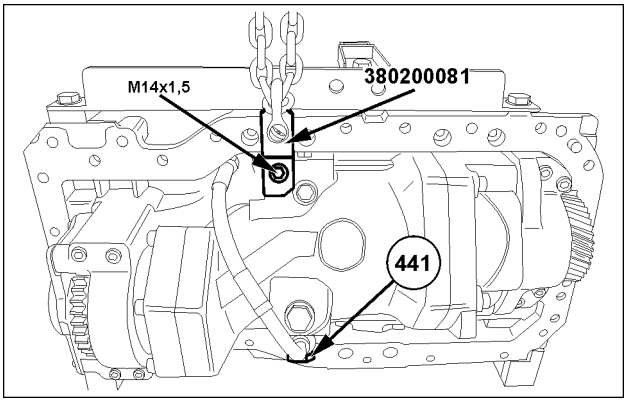
SS08H011 4

5. Fit the screws **(409)** and **(428)** and tighten to **86 Nm** (**63.4 lb ft**).
Remove the drain plugs.



SS08H146 5

6. Fit the screw **(441)** with new seal rings **(442)** and tighten. Remove the retaining strap **380200081** from the hydrostat.



SS08H009 6

Next operation:
Cover - Install (Hydrostat) Transmission uninstalled (C.20.G)
Cover - Install (Hydrostat) Transmission installed (C.20.G)

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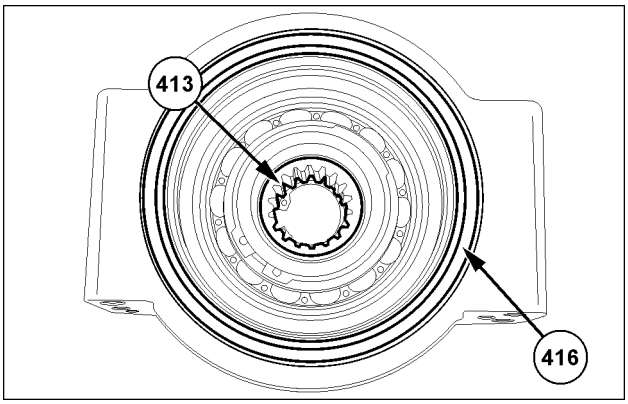
Hydrostat Hydrostat drive - Disassemble

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Hydrostat - Remove (C.20.G)

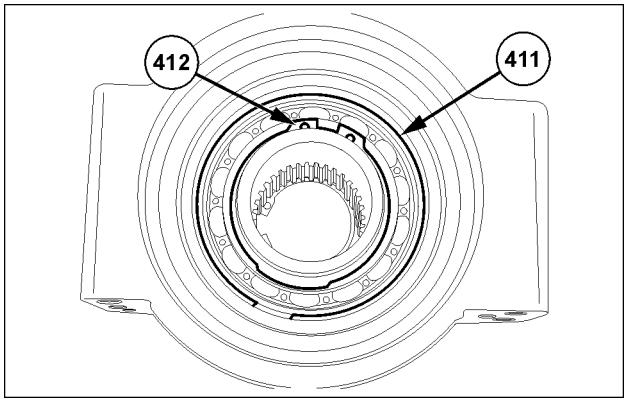
Output side

1. Remove the connecting sleeve **(413)** and disassemble the 'O' ring **(414)**. Pull the rubber mounting **(416)** out of the bearing block.



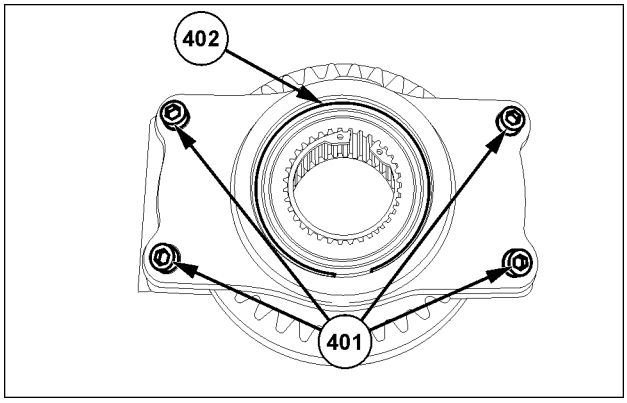
SS08K478 1

2. Remove the circlips **(411)** and **(412)**.



SS08K479 2

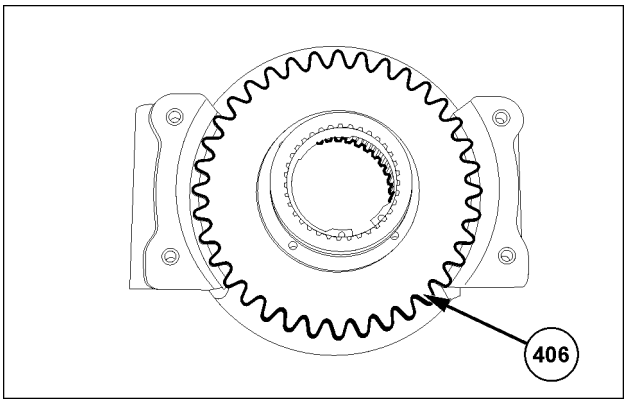
3. Remove the screws **(401)** and the circlip **(402)**. Take off the cover **(404)** and remove the needle bearing **(403)**.



SS08K480 3

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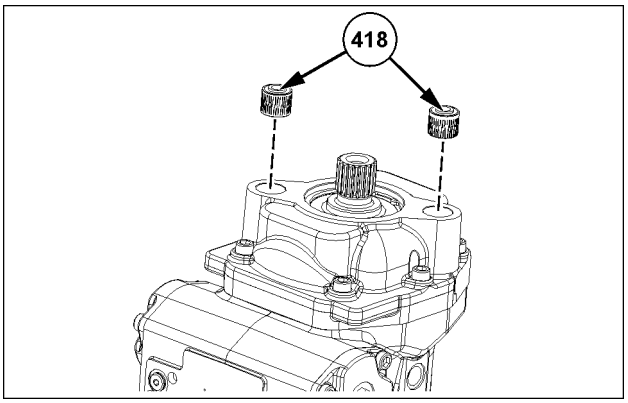
4. Pull the gear wheel **(406)** out of the bearing block and remove the ball bearing **(408)**.



SS08K481 4

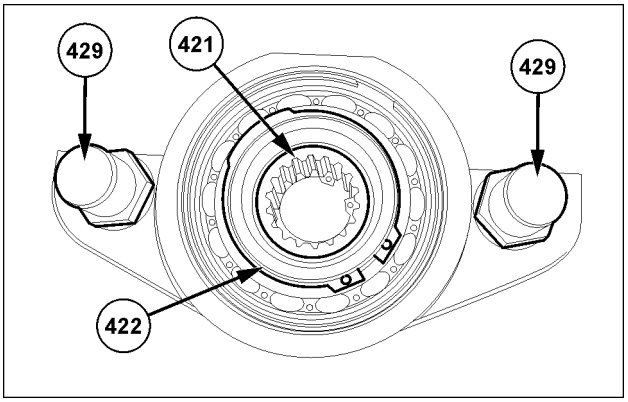
Drive side

5. Disassemble the rubber mountings **(418)** using a commercially available internal puller.



SS08K482 5

6. Remove the connecting sleeve **(421)** and disassemble the 'O' ring **(420)**. Remove the circlip **(422)**. Remove the bolt **(429)**.

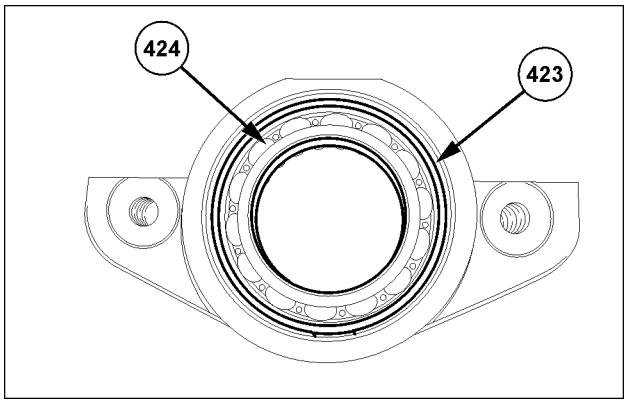


SS08K483 6

7. Press the gear wheel **(431)** out of the bearing block.

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8. Remove the circlip **(423)** and remove the bearings **(424)** and **(426)** together with the bush **(425)**.



SS08K484 7

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Hydrostat Hydrostat drive - Assemble (C.20.G)

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Hydrostat Hydrostat drive - Assemble

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

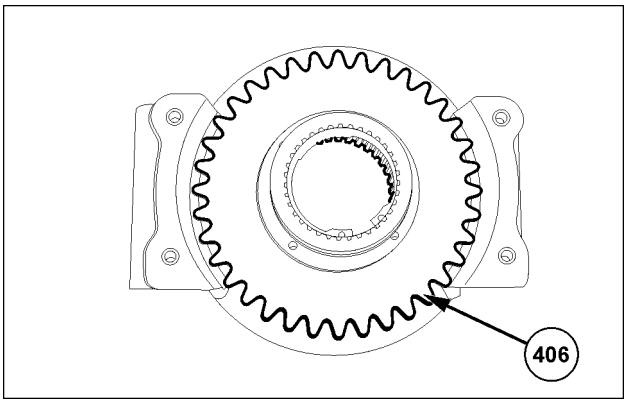
Prior operation:
Hydrostat Hydrostat drive - Disassemble (C.20.G)

NOTE: *All parts must be oiled before being fitted.*

Output side

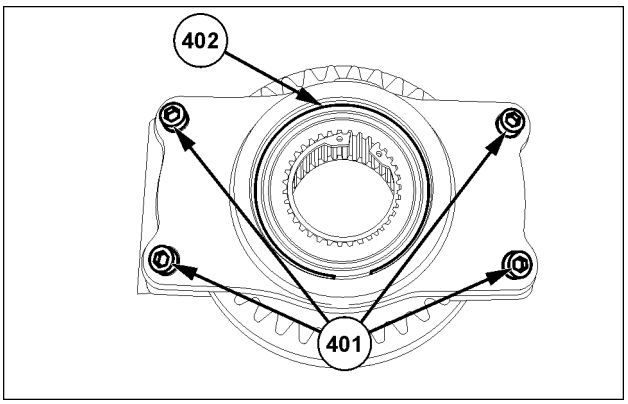
1. Fit the ball bearing **(408)** and the circlip **(411)** into the bearing block **(407)**.
2. Insert the gear wheel **(406)** and fit the circlip **(412)**.

NOTE: *If the circlip has been removed **(405)**, fit this into the gear wheel.*



SS08K481 1

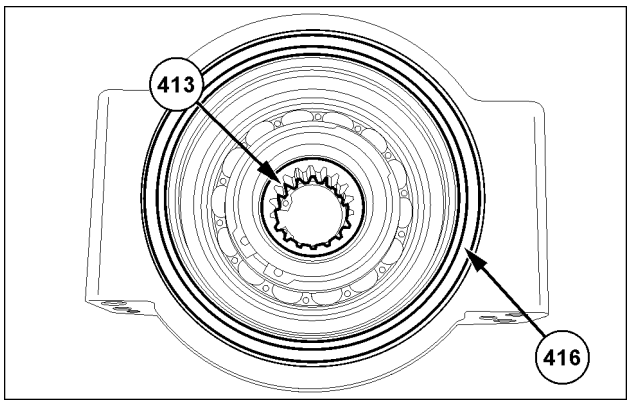
3. Fit the needle bearing **(403)** and the circlip **(402)** inside the cover **(404)**. Put the cover on. Spray the screws **(401)** with **LOCTITE® 243** and tighten to **24.25 Nm** (**17.9 lb ft**).



SS08K480 2

4. Insert the rubber mounting **(416)** into the bearing block using a suitable drift. Fit the connecting sleeve **(413)** with a new 'O' ring **(414)**.

NOTE: *If the circlip has been removed **(415)**, fit this into the gear wheel.*

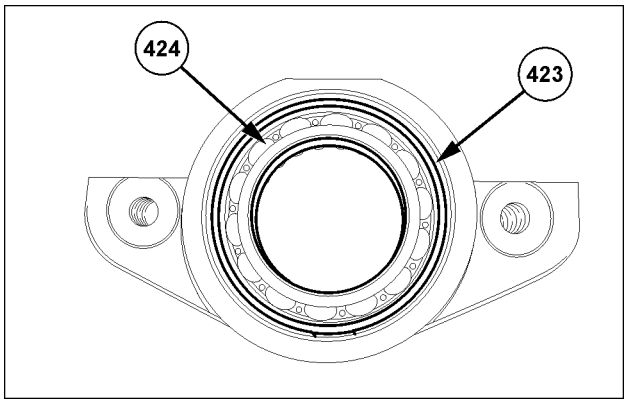


SS08K478 3

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Drive side

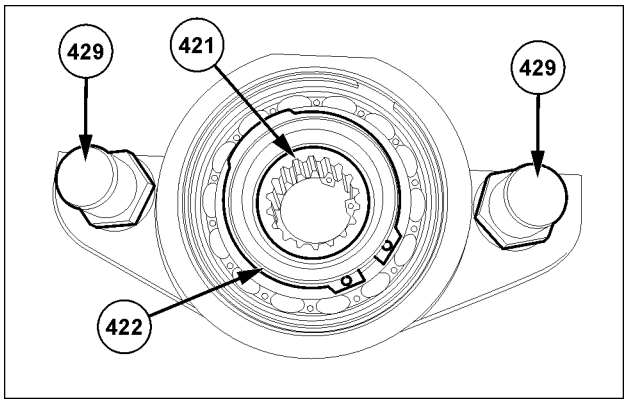
5. Fit the bearing **(424)** and **(426)** together with the bush **(425)**. Insert the circlip **(423)**.



SS08K484 4

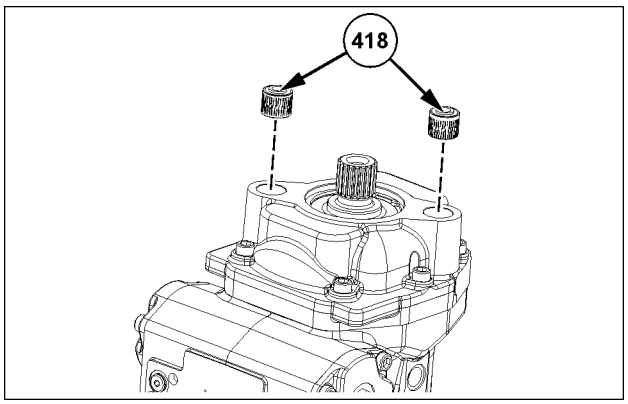
6. Insert the gear wheel **(431)** and fit the circlip **(422)**. Fit the connecting sleeve **(421)** with a new 'O' ring **(420)**. Fit the bolts **(429)** and tighten to **120 - 140 Nm** (**89 - 103 lb ft**).

NOTE: *If the circlip has been removed* ***(419)****, fit this into the gear wheel.*



SS08K483 5

7. Insert the rubber mounts **(418)** into the housing using a suitable drift.



SS08K482 6

Next operation:
Hydrostat - Install (C.20.G)

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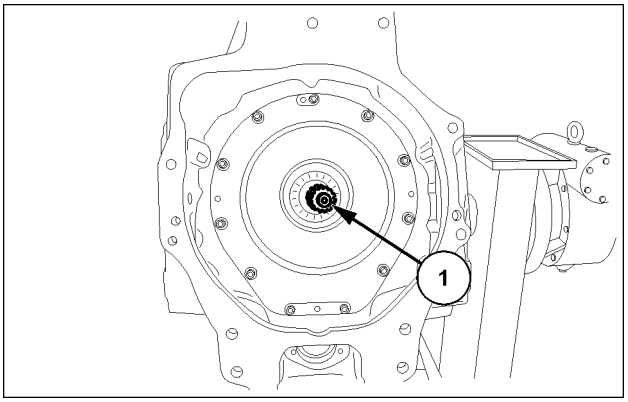
Summing planetary gear - Remove

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)

Prior operation:
Cover Cover reverse gears - Remove (C.20.G)

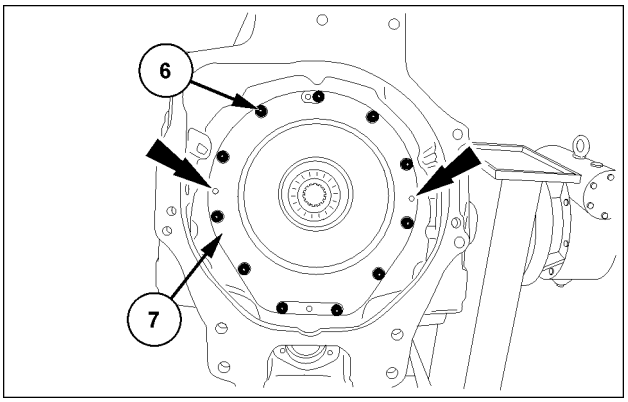
NOTE: *If repairs are needed to be carried out on the summing planetary gear only, the transmission does not need to be uninstalled. Prior to this the transmission oil must be drained and the engine uninstalled - see* ***ENGINE - Remove (B.10.A)****.*

1. Remove the shaft **(1)**.



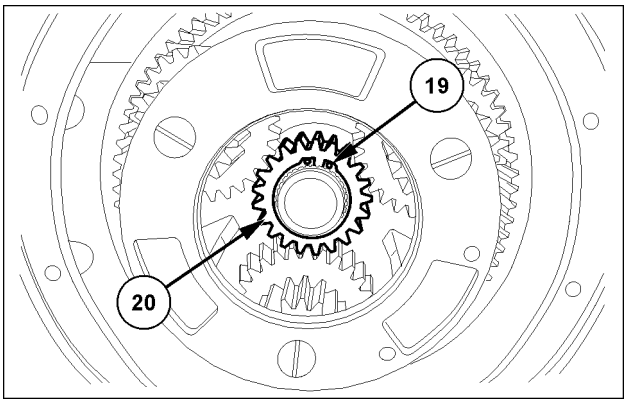
SS08G112 1

2. Remove the screws **(6)**, press off the cover **(7)** using two screws and remove.



SS08G113 2

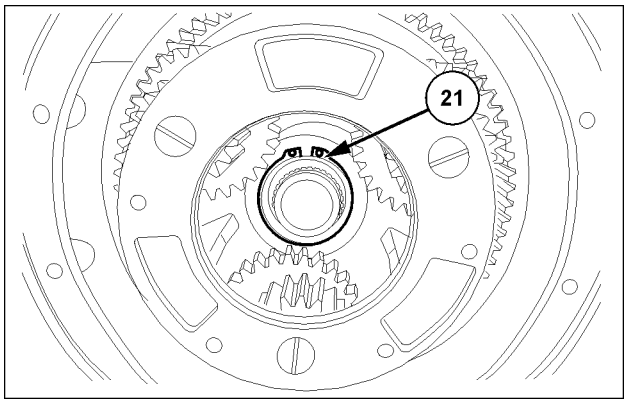
3. Remove the snap ring **(19)** and pull out the sun gear **(20)**.



SS08G114 3

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4. Remove the snap ring **(21)** and pull out the planetary carrier **(22)**.



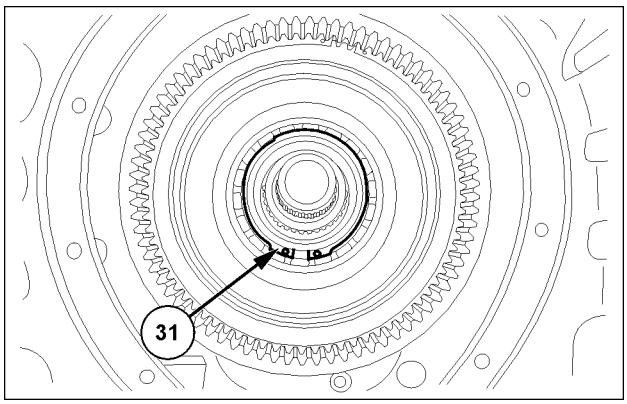
SS08G116 4

5. Remove the snap ring **(31)** and pull out the ring gear together with the ring gear carrier (complete).

⚠ DANGER ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026



SS08G117 5

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary. Remove any sealant residue from the sealing surfaces.*

Next operation:
Summing planetary gear - Disassemble (C.20.G)
Clutch - Remove ("A" and "B") (C.20.G)

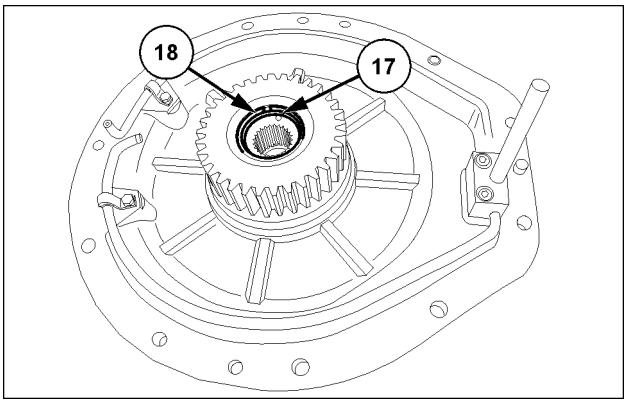
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Summing planetary gear - Disassemble

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)

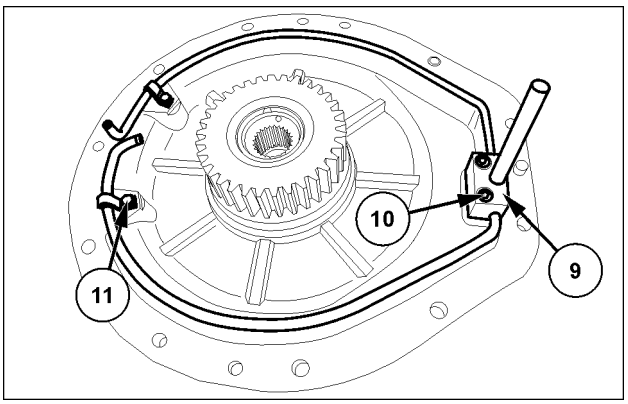
Prior operation:
Summing planetary gear - Remove (C.20.G)

1. Remove the snap ring **(18)** and take out the seal ring **(17)**.



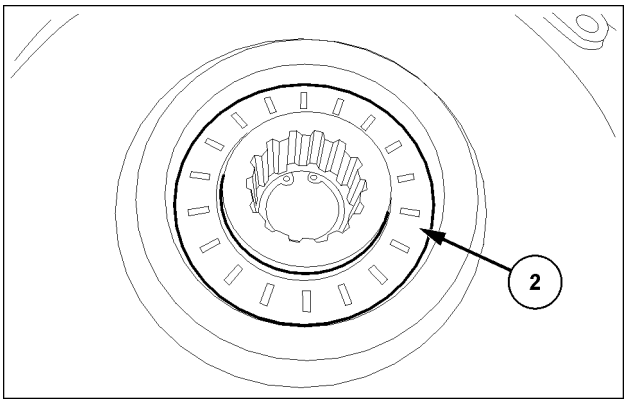
SS08G264 1

2. Remove the screws **(10)** and **(11)** and take off the lubrication line **(9)**.



SS08H020 2

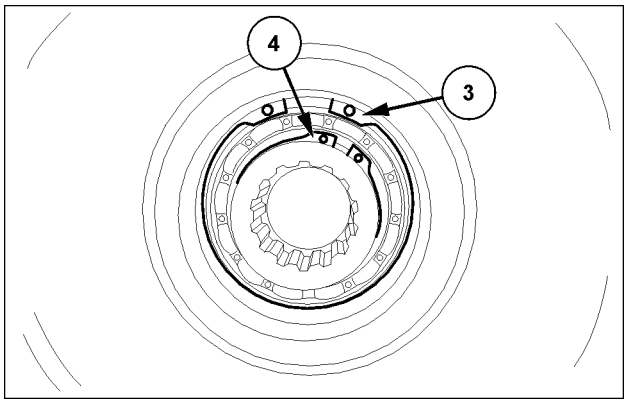
3. Remove the shaft seal ring **(2)**.



SS08G265 3

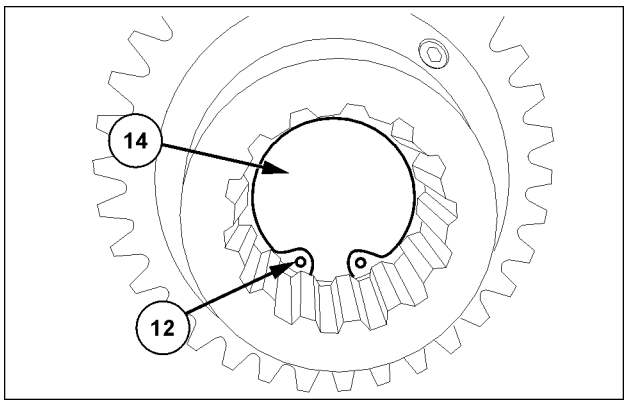
www.truck-freeworkshop.com

4. Remove the snap rings **(3)** and **(4)**. Remove the bearing **(5)** and the sun gear **(15)**.



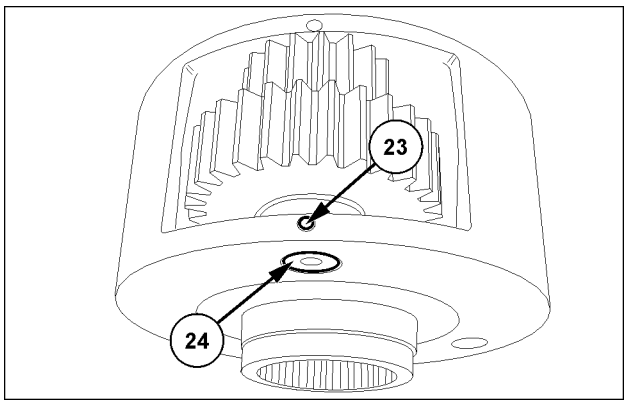
SS08H189 4

5. Remove the snap ring **(12)** and press out the cover **(14)** together with the seal ring **(13)**.



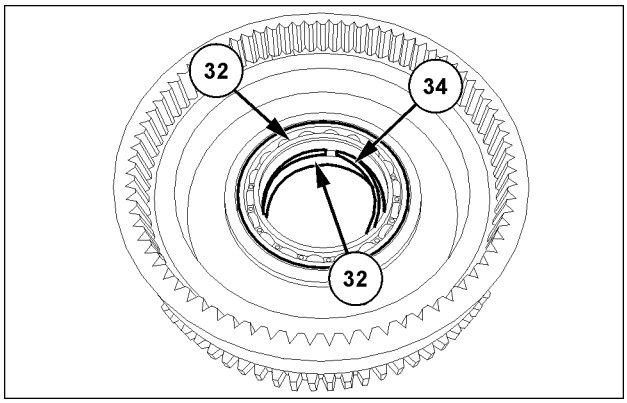
SS08G269 5

6. Push the pins **(23)** into the bolts **(24)**. Pull out the bolt and remove the planetary gears **(26)** together with the thrust washers **(25)**, needle bearings **(27)** and bushings **(28)** from the planetary carrier **(22)**. Push the pins **(23)** out of the bolts **(24)**.



SS08G366 6

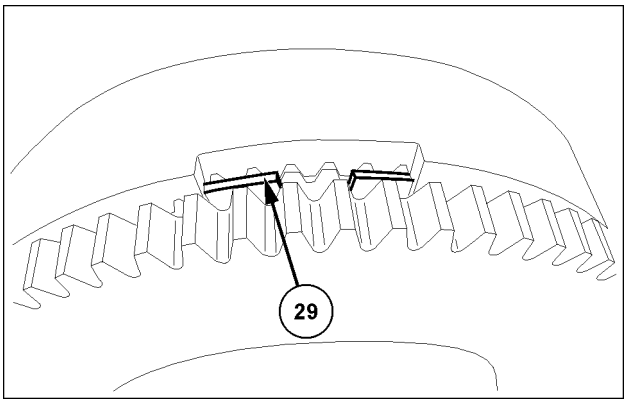
7. Press the ball bearing **(32)** out of the gear wheel **(35)** and remove the snap ring **(33)** and the ring **(34)**.



SS08H188 7

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8. Take out the snap ring **(29)** and remove the ring gear **(30)**.



SS08G268 8

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Summing planetary gear - Assemble (C.20.G)

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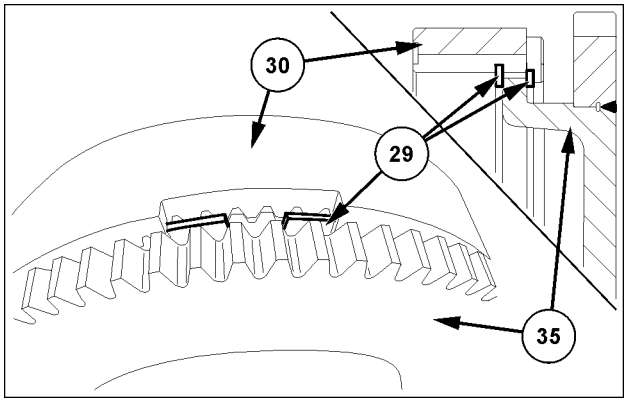
Summing planetary gear - Assemble

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)

Prior operation:
Summing planetary gear - Disassemble (C.20.G)

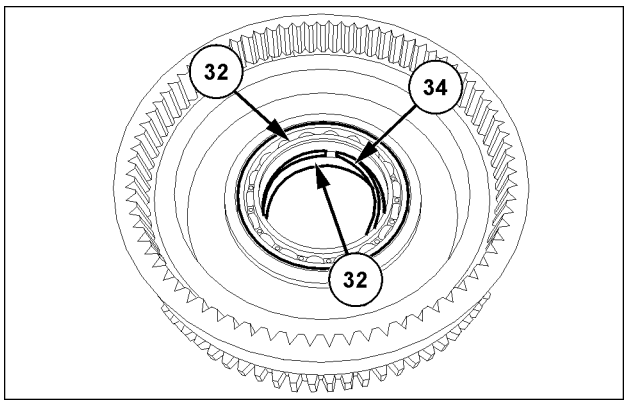
NOTE: *All parts must be oiled before being fitted.*

1. Fit the sleeve shaft **(30)** together with the snap ring **(29)** onto the gear wheel **(35)** and insert the snap ring.



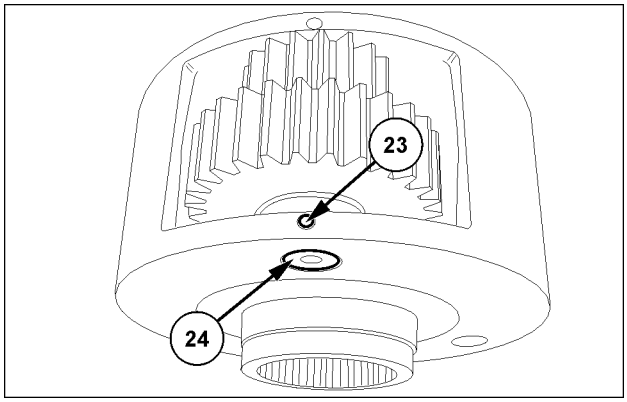
SS08H062 1

2. Fit the snap ring **(33)**, the ball bearing **(32)** with the ring **(34)** in the gear wheel **(35)**.



SS08H188 2

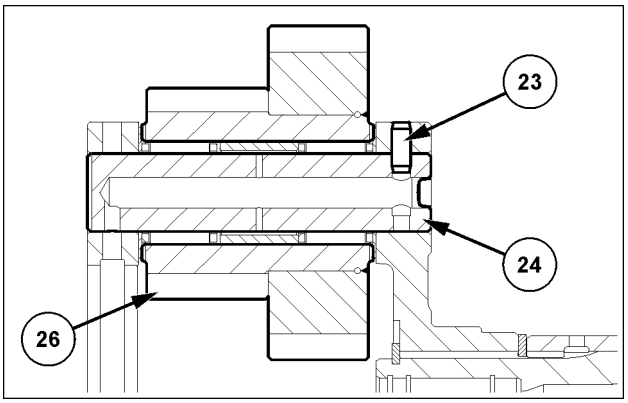
3. Place the planetary gears **(26)** with thrust washers **(25)**, needle bearings **(27)** and bushings **(28)** into the planetary carrier **(22)**. Insert the bolts **(24)** and use new pins **(23)** to secure them in the planetary carrier.



SS08G366 3

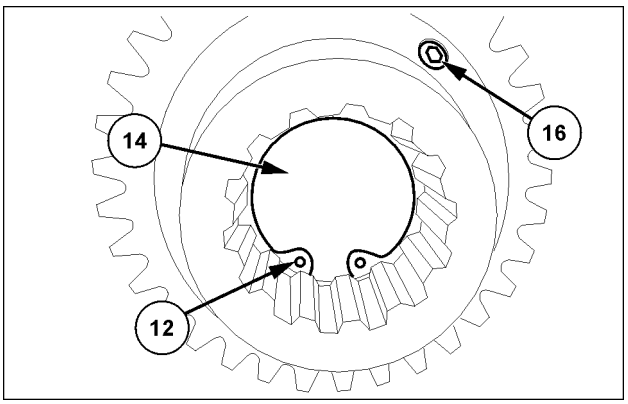
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NOTE: *Install the planetary gears* ***(26)****, the bolts* ***(24)*** *and the pins* ***(23)*** *as illustrated in Figure* ***4****.*



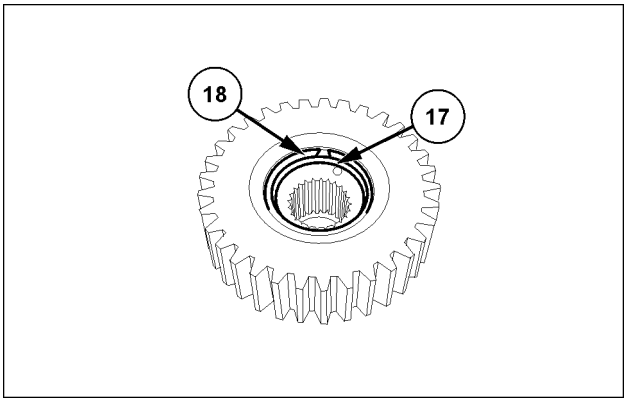
SS08J121 4

4. Spray the two restrictors **(16)** with **LOCTITE® 243** and screw in. Fit the cover **(14)** with a new seal ring **(13)** and snap ring **(12)** into the sun gear **(15)**.



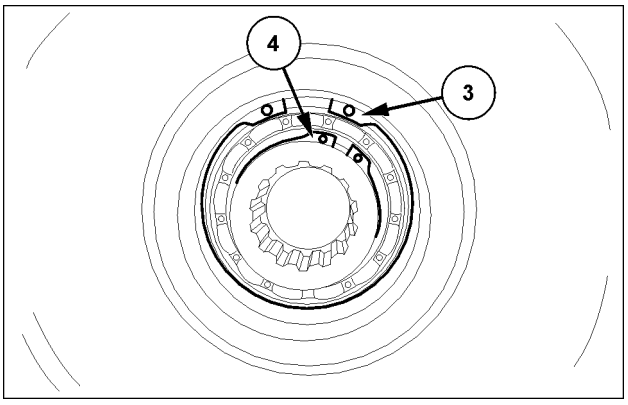
SS08H063 5

5. Insert the seal ring **(17)** using the drift **380001744** until the stop. Fit the snap ring **(18)**.



SS08H064 6

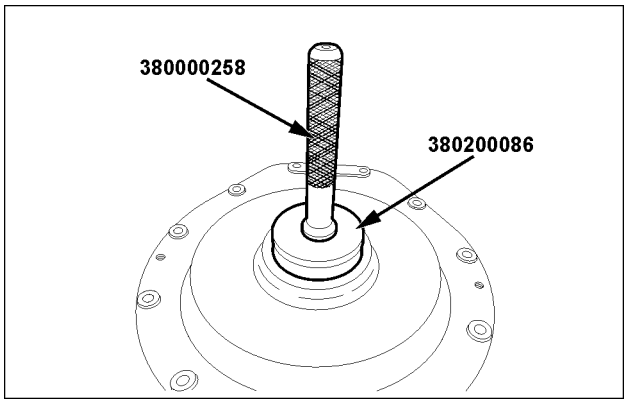
6. Fit the bearing **(5)** and the snap ring **(3)** into the cover **(7)**. Insert the sun gear **(15)** and fit the snap ring **(4)**.



SS08H189 7

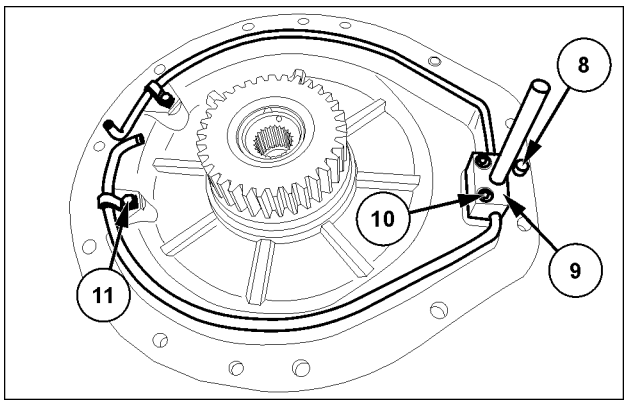
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7. Fit the shaft seal ring **(2)** on the sun gear using the drift **380200086** and the handle **380000258** until the drift is at the stop.



SS08H057 8

8. Fit the cleaned lubrication line **(9)**. Spray the screws **(10)** and **(11)** with **LOCTITE® 243** and screw in. Fit the dowel pins **(8)** inside the cover.



SS08H065 9

Next operation:
Summing planetary gear - Install (C.20.G)

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Summing planetary gear - Install

⚠ DANGER ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

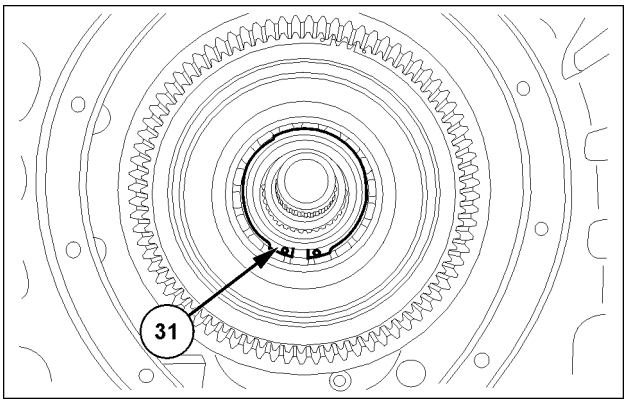
B026

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)

Prior operation:
Summing planetary gear - Assemble (C.20.G)
Shift cylinder - Install (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Shift cylinder - Install (C.20.G) - (35 km/h and 40 km/h gearbox)

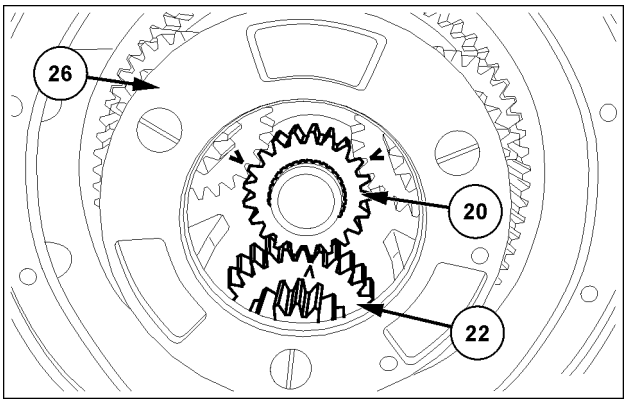
NOTE: *All parts must be oiled before being fitted.*

1. Fit the (complete) ring gear onto the cover **(42)** and fit the snap ring **(31)**.



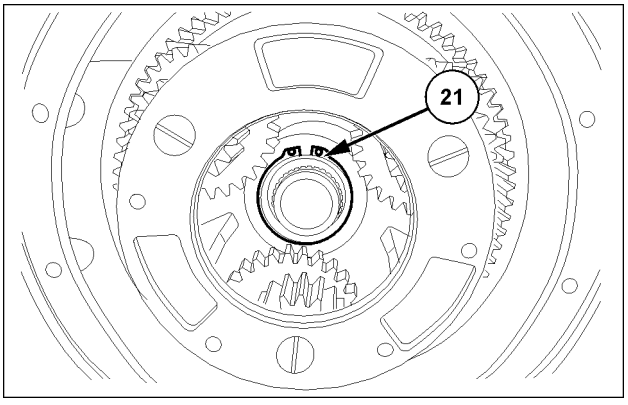
SS08G117 1

2. Insert the planetary carrier **(22)** and align the planetary gears **(26)** with the marking. Insert the sun gear **(20)** to check the markings. When all the markings are in the correct position, remove the sun gear again.



SS08H066 2

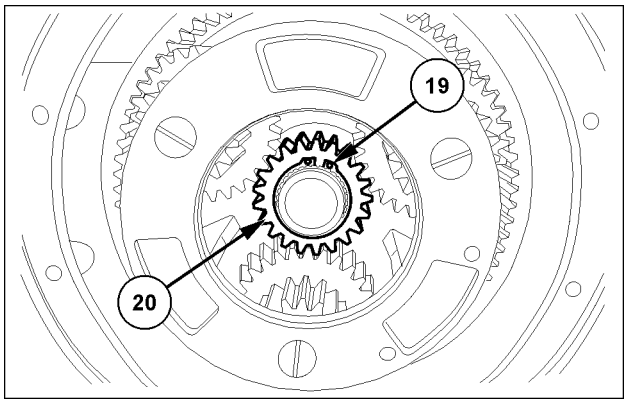
3. Fit the snap ring **(21)**.



SS08G116 3

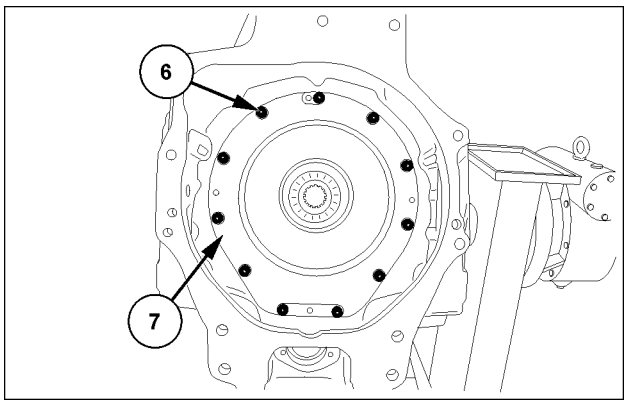
www.truck-freeworkshop.com

4. Fit the sun gear **(20)** and the snap ring **(19)**.



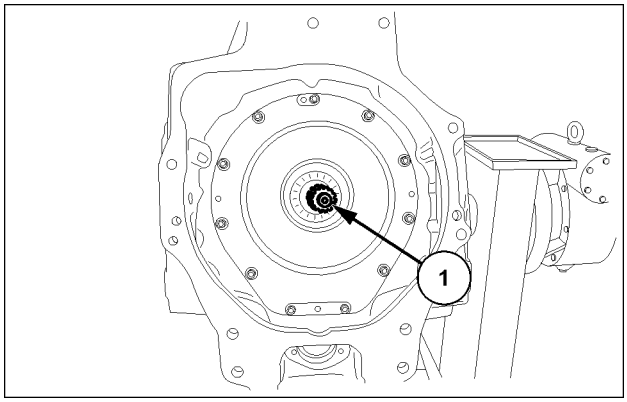
SS08G114 4

5. Fit the dowel pins **(8)** in the cover or in the housing. Grease the sealing surfaces and apply **LOCTITE® 518** to the sealing surface of the transmission casing. Fit the cover **(7)**. Insert the screws **(6)** and tighten to **48.5 Nm** (**35.8 lb ft**).



SS08H067 5

6. Grease the profile of the shaft **(1)** and insert.



SS08G112 6

NOTE: *If repairs have been carried out on the summing planetary gears only (transmission has not been uninstalled), the engine must be fitted next - see* ***ENGINE - Install (B.10.A)*** *and the transmission oil must be topped up. The specifications and the oil quantity must be as per the operating instructions.*

Next operation:
Cover - Install (Hydrostat) Transmission uninstalled (C.20.G)
Cover Cover reverse gears - Install (C.20.G)

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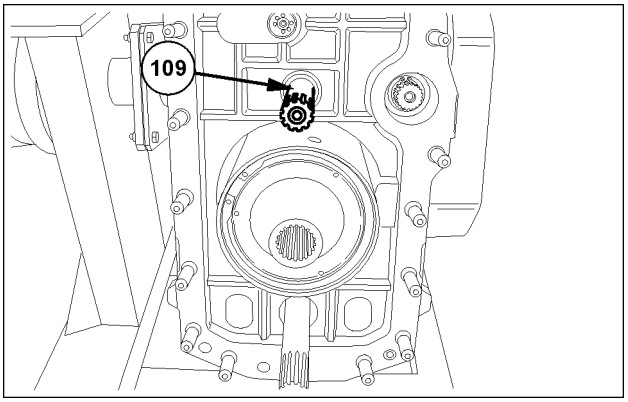
Clutch - Remove ("A" and "B")

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

Prior operation:
Remove the transmission from the rear axle - see **Housing - Remove (C.20.G)**.
Summing planetary gear - Remove (C.20.G)

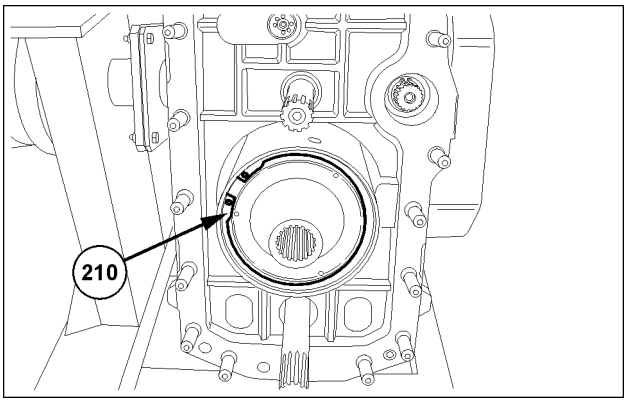
NOTE: *If the repairs are limited to clutch "A" or clutch "B", only the rear axle needs to be dismantled.*

1. Remove the PTO shaft **(109)**.



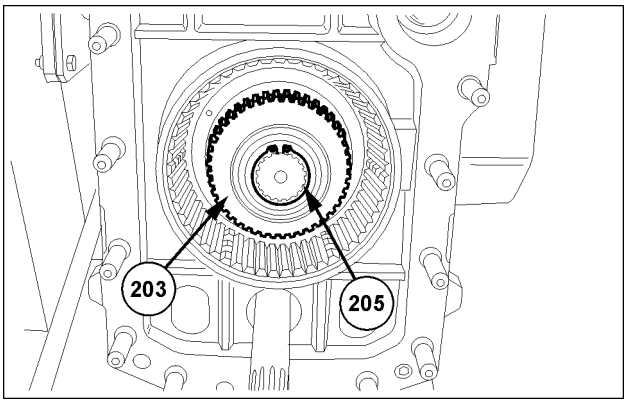
SS08G101 1

2. Remove the snap ring **(210)**. Remove the clutch end plate **(209)** together with the disc pack.



SS08G321 2

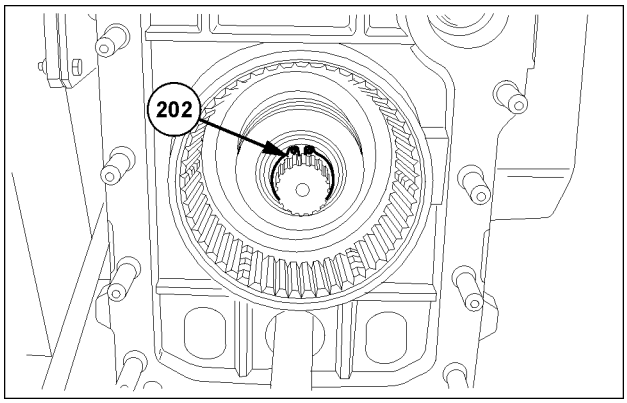
3. Remove the snap ring **(205)** and pull off the inner disc support **(203)**.



SS08G102 3

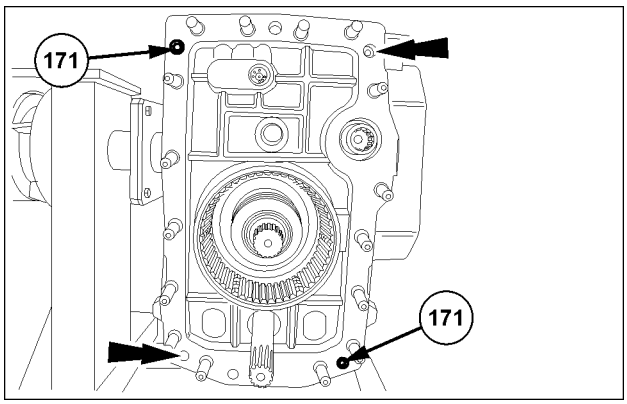
www.truck-freeworkshop.com

4. Remove the snap ring **(202)**.



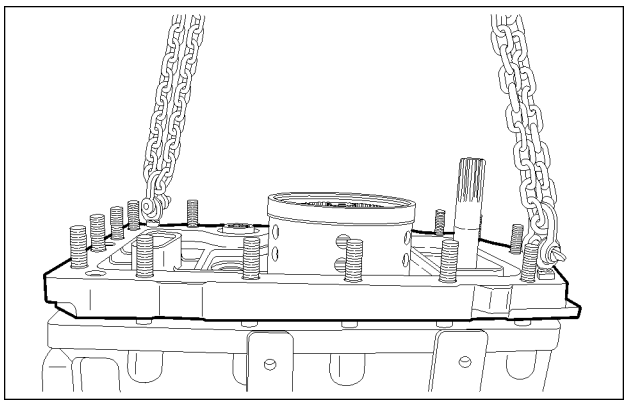
SS08G103 4

5. Remove the screws **(171)** for the separator plate, press off the separator plate with 2 screws (M10x1.25).



SS08G106 5

6. Insert two ring bolts (M10x1.25) into the separator plate. Raise the separator plate from the transmission casing using a suitable hoisting device. Remove the connecting pieces **(393)**.



SS08H071 6

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary. Remove any sealant residue from the sealing surfaces.*

Next operation:
Clutch - Disassemble ("A" and "B") (C.20.G)
Valve block - Remove (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Valve block - Remove (C.20.G) - (35 km/h and 40 km/h gearbox)

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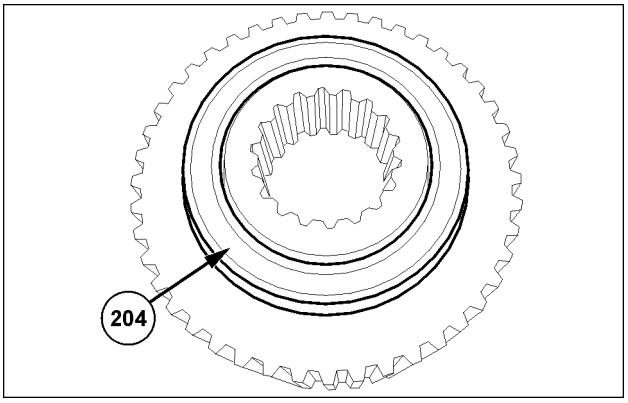
Clutch - Disassemble ("A" and "B")

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

Prior operation:
Clutch - Remove ("A" and "B") (C.20.G)

Clutch "A"

1. Remove the bearing **(204)** from the inner disc support **(203)** using a commercially available puller.

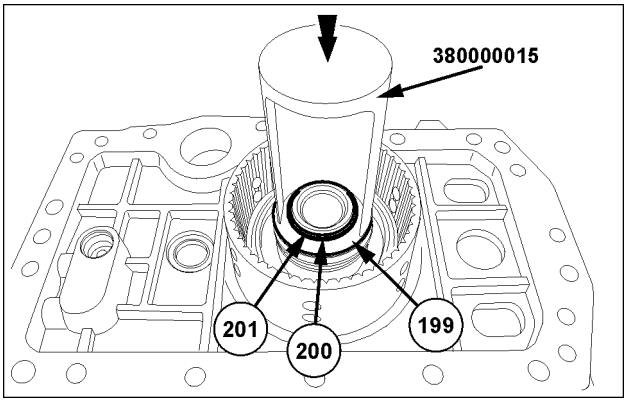


SS08G360 1

2. Pre-load the Belleville washers **(199)** using the special tool **380000015**. Pull off the snap ring **(201)** and remove the L-ring **(200)** together with the Belleville washers.

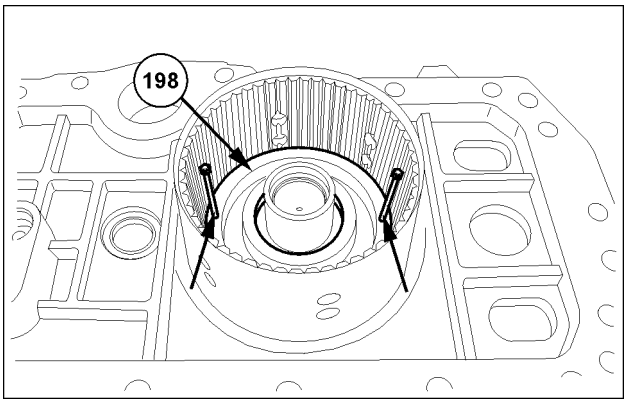
⚠ WARNING ⚠
Take care when compressing springs.

B032



SS08G355 2

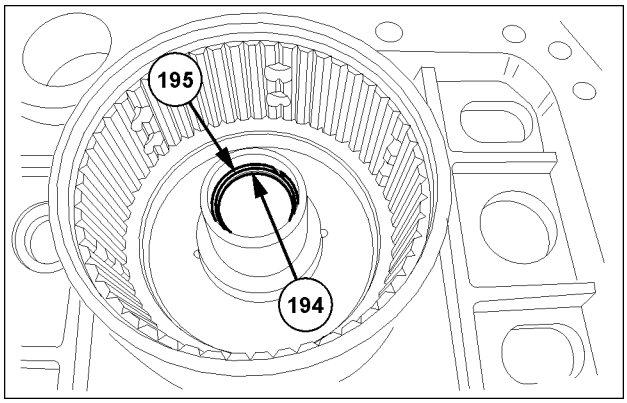
3. Turn two M4 screws into the thread of the piston **(198)** and pull out the piston with the screws.



SS08G356 3

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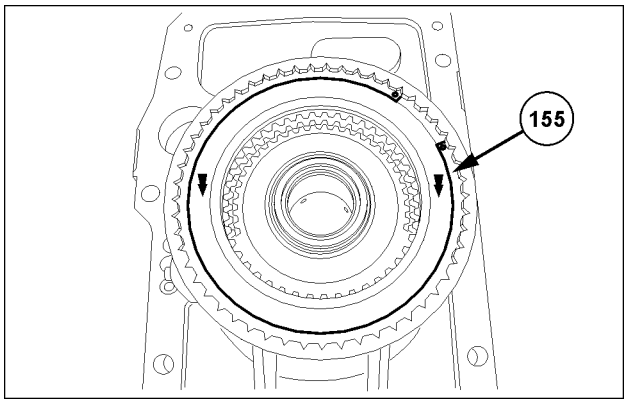
4. Pull out the snap ring **(195)** and remove the seal ring **(194)**.



SS08G357 4

Clutch "B"

5. Press down the end plate **(156)** and remove the snap ring **(155)**. Remove the end plate and the complete disc pack.



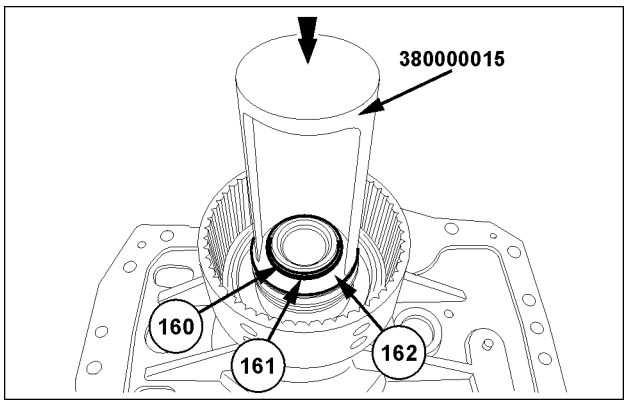
SS08G359 5

6. Pre-load the Belleville washers **(162)** using the special tool **380000015**. Pull off the snap ring **(160)** and remove the L-ring **(161)** together with the Belleville washers.

⚠ WARNING ⚠

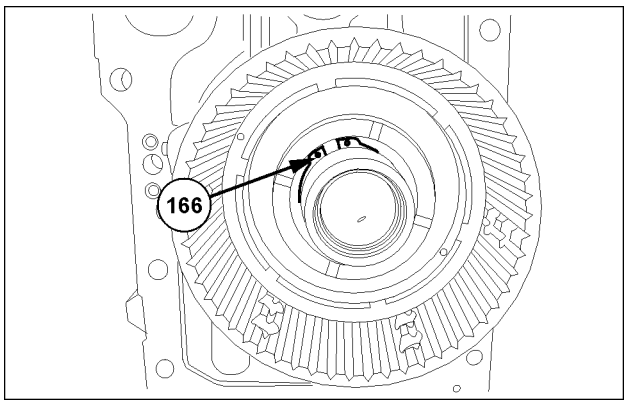
Take care when compressing springs.

B032



SS08G365 6

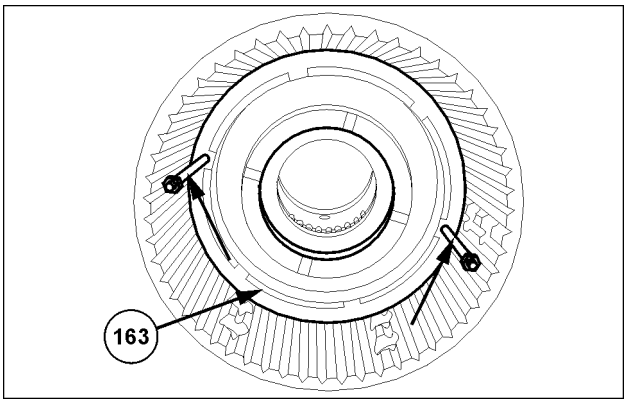
7. Remove the snap ring **(166)** and pull out the outer disc support **(167)**.



SS08G361 7

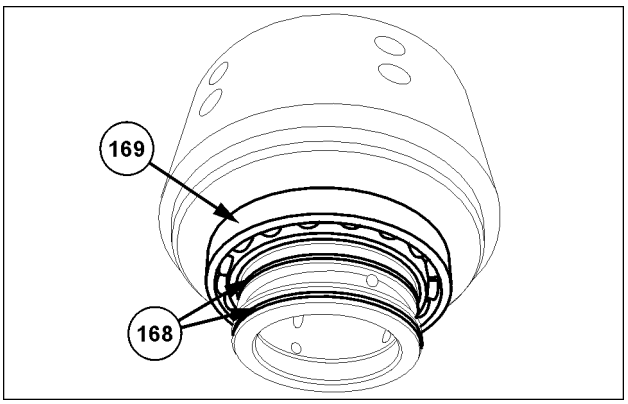
www.truck-freeworkshop.com

8. Turn two M4 screws into the thread of the piston **(163)** and pull out the piston with the screws.



SS08G362 8

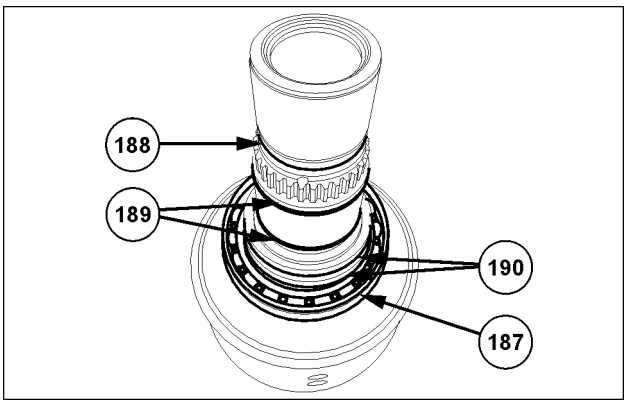
9. Remove the seal rings **(168)** and pull the ball bearing **(169)** from the outer disc support **(167)** using a commercially available puller.



SS08G363 9

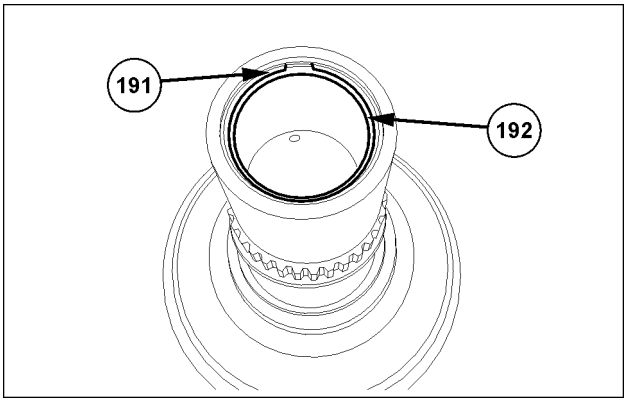
10. Remove the outer disc support **(193)** from the separator plate **(170)**.

11. Remove the seal ring **(188)**, the seal rings **(189)** and the seal rings **(190)** from the outer disc support **(193)**. Remove the ball bearing **(187)** from the outer disc support using a commercially available puller.



SS08G364 10

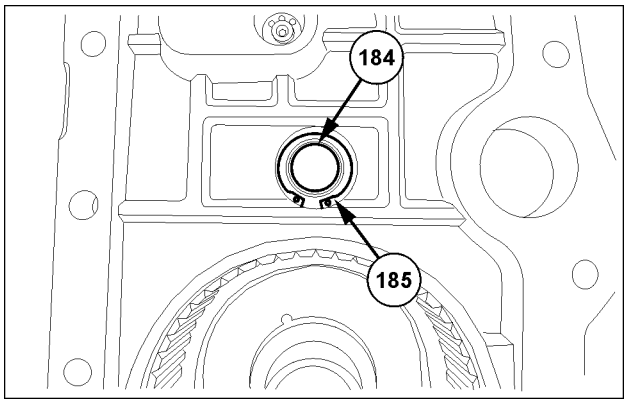
12. Pull out the snap ring **(191)** and remove the seal ring **(192)**.



SS08G370 11

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13. Pull out the snap ring **(185)** and remove the seal ring **(184)** for the PTO shaft.



SS08G358 12

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Clutch - Assemble ("A" and "B") (C.20.G)

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Clutch - Assemble ("A" and "B")

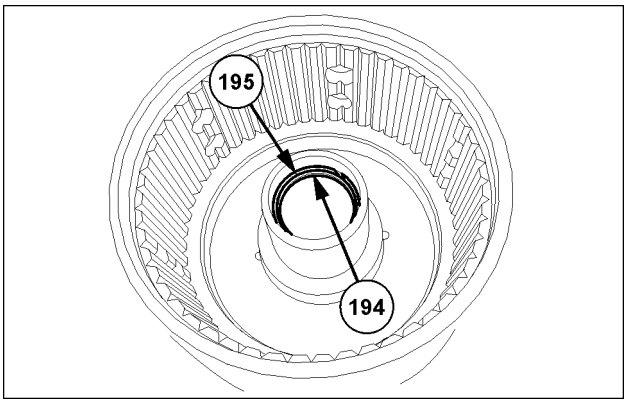
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

Prior operation:
Clutch - Disassemble ("A" and "B") (C.20.G)

NOTE: *All parts must be oiled before being fitted.*

Clutch "A"

1. Insert the seal ring **(194)** using the drift **380200087** until firmly home and fit the snap ring **(195)**.



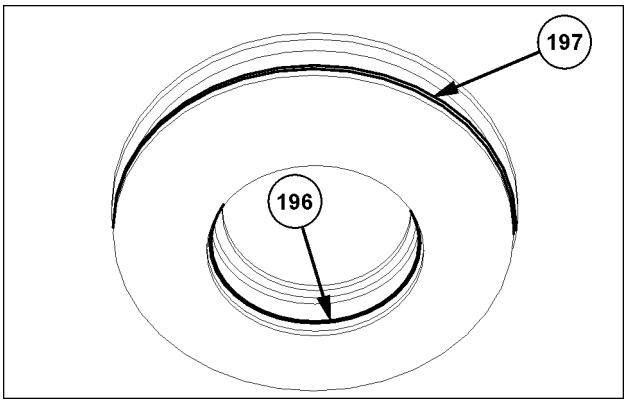
SS08H048 1

2. Heat the new seal rings **(196)** and **(197)** in approximately **60 °C** (**140 °F**) hot oil and fit them onto the piston **(198)**.

NOTE: *Do not stretch or bend the rings too much during assembly.*

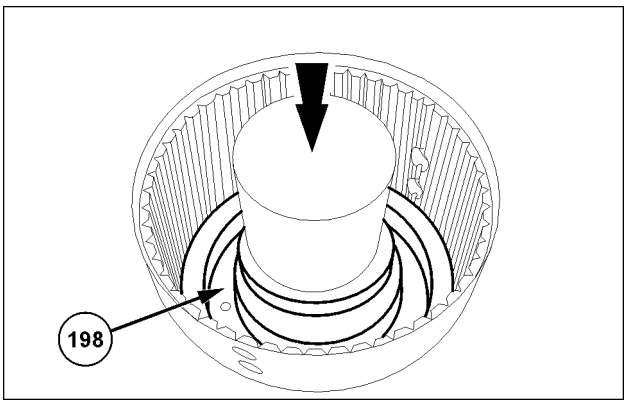
⚠ WARNING ⚠
Always wear heat protective gloves to prevent burning your hands when handling heated parts.

SM121A



SS08H004 2

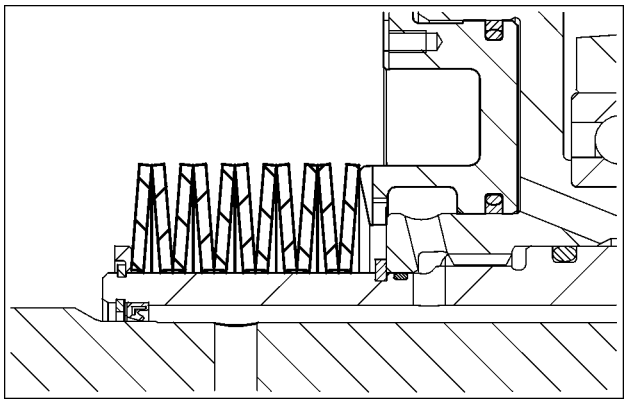
3. Grease the seal rings with industrial vaseline. Carefully press the piston **(198)** into the outer disc support **(193)**.



SS08H003 3

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4. Fit the Belleville washers **(199)** as shown in Figure **4**.



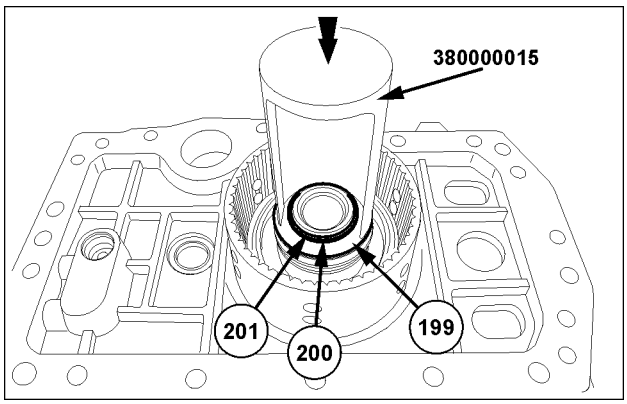
SS08H007 4

5. Pre-load the Belleville washers using the special tool **380000015**. Fit the 'L' ring **(200)** and the snap ring **(201)**.

⚠ CAUTION ⚠

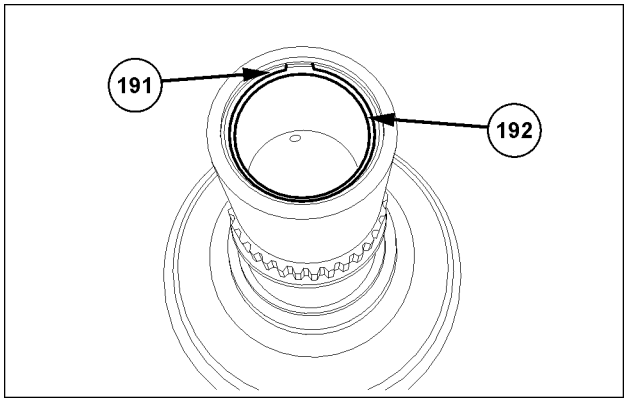
The springs are compressed under extreme pressure. Use caution releasing the tool when decompressing the springs. Always wear safety glasses. Failure to comply may result in minor or moderate injury.

M1271



SS08G355 5

6. Insert the new seal ring **(192)** using the drift **380200087** until firmly home and fit the snap ring **(191)**.



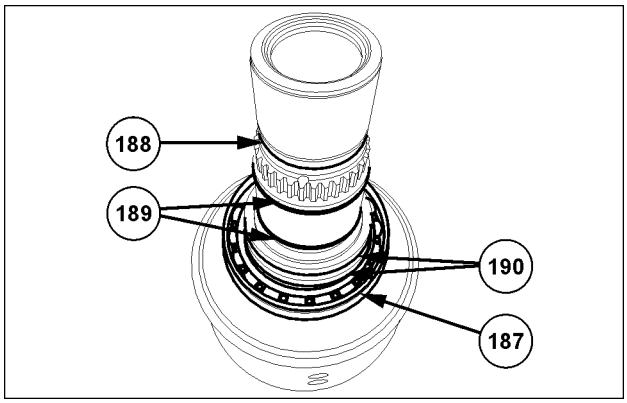
SS08G370 6

7. Heat the ball bearing **(187)** to **60 °C** (**140 °F**) and fit it to the outer disc support **(193)**. Grease all of the new seal rings **(188)**, **(189)** and **(190)** with industrial Vaseline and fit them.

⚠ WARNING ⚠

Always wear heat protective gloves to prevent burning your hands when handling heated parts.

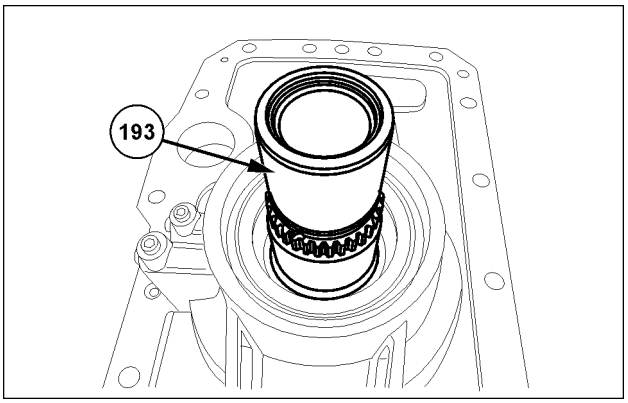
SM121A



SS08G364 7

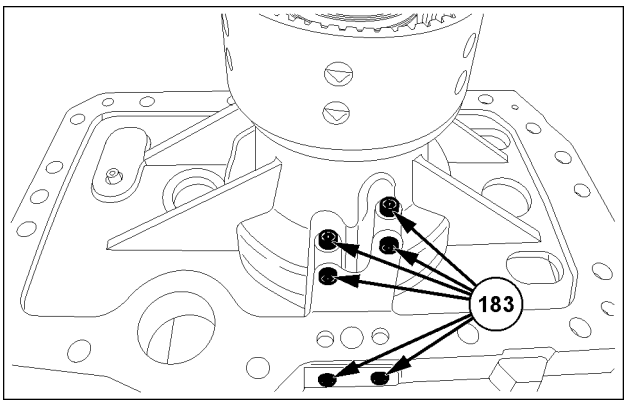
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8. Fit the outer disc support **(193)** inside the separator plate **(170)**.



SS08H005 8

9. If the plugs **(183)** have been removed spray them with **LOCTITE® 243** and screw in.



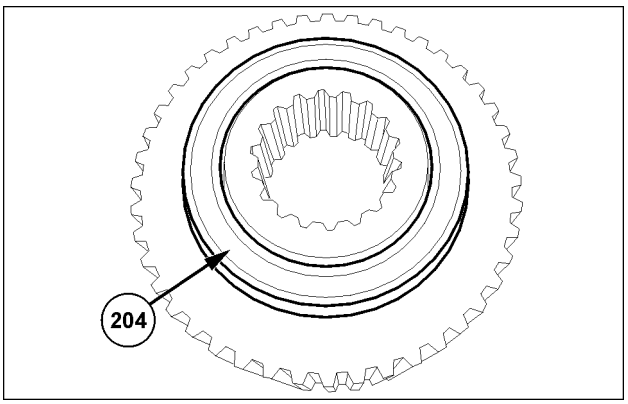
SS08J138 9

10. Heat the bearing **(204)** to **60 °C** (**140 °F**) and fit it on the inner disc support **(203)**.

⚠ WARNING ⚠

Always wear heat protective gloves to prevent burning your hands when handling heated parts.

SM121A



SS08G360 10

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Clutch "B"

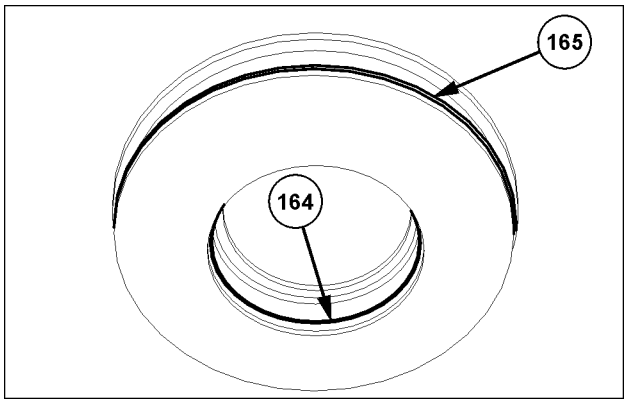
11. Heat the new seal rings **(164)** and **(165)** in approximately **60 °C** (**140 °F**) hot oil and fit them onto the piston **(163)**.

NOTE: *Do not stretch or bend the rings too much during assembly.*

⚠ WARNING ⚠

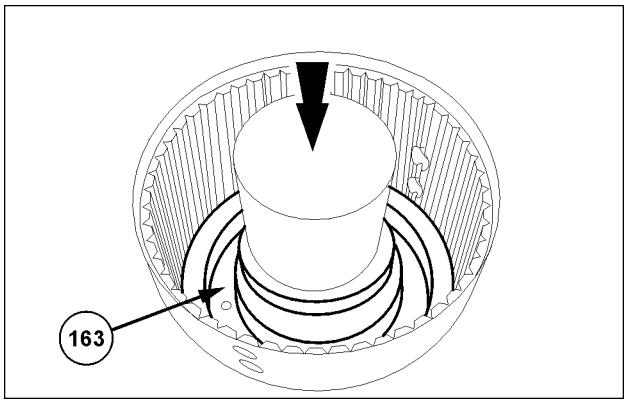
Always wear heat protective gloves to prevent burning your hands when handling heated parts.

SM121A



SS08H049 11

12. Grease the seal rings with industrial vaseline. Carefully press the piston **(163)** into the outer disc support **(167)**.



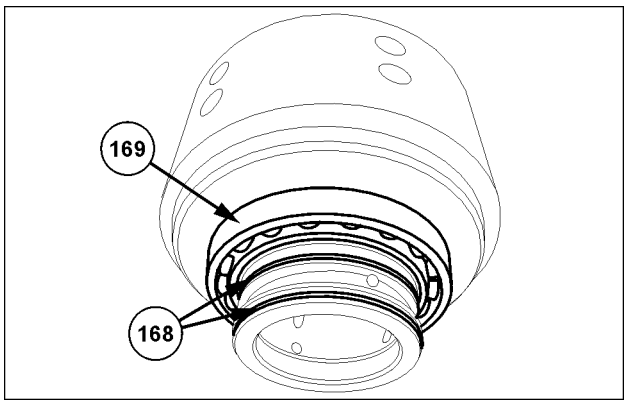
SS08H050 12

13. Heat the ball bearing **(169)** to **60 °C** (**140 °F**) and fit it onto the outer disc support **(167)**. Grease the new seal rings **(168)** with industrial vaseline and fit them.

⚠ WARNING ⚠

Always wear heat protective gloves to prevent burning your hands when handling heated parts.

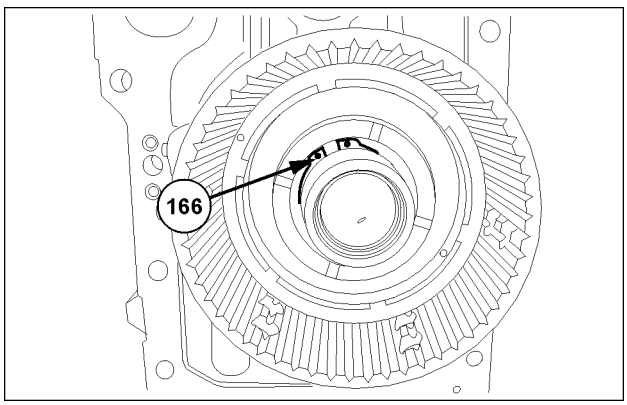
SM121A



SS08G363 13

14. Place the outer disc carrier **(167)** onto the outer disc carrier **(193)** and fit the snap ring **(166)**.

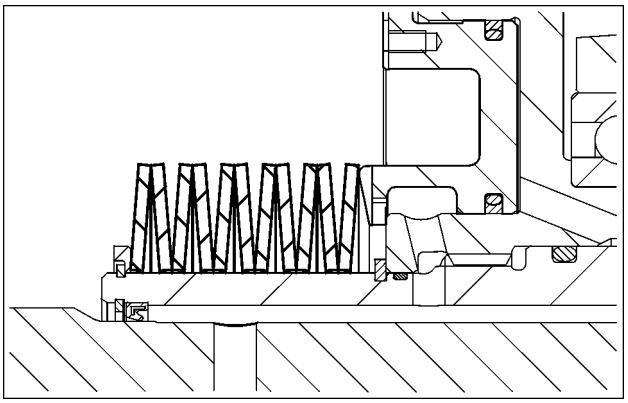
NOTE: *Do not damage the seal rings when fitting the outer disc carrier.*



SS08G361 14

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15. Fit the Belleville washers **(162)** as shown in Figure **15**.



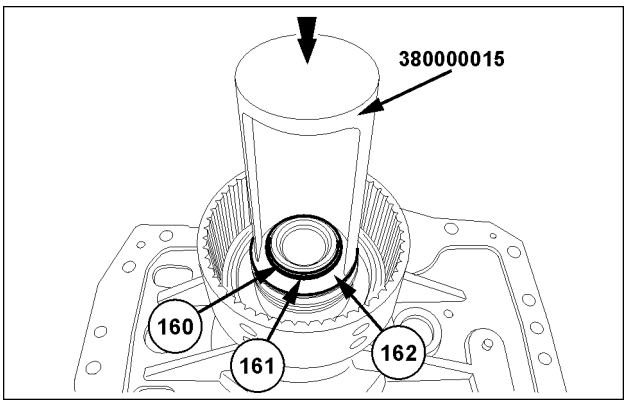
SS08H007 15

16. Pre-load the Belleville washers using the special tool **380000015**. Fit the 'L' ring **(161)** and the snap ring **(160)**.

⚠ CAUTION ⚠

The springs are compressed under extreme pressure. Use caution releasing the tool when decompressing the springs. Always wear safety glasses. Failure to comply may result in minor or moderate injury.

M1271

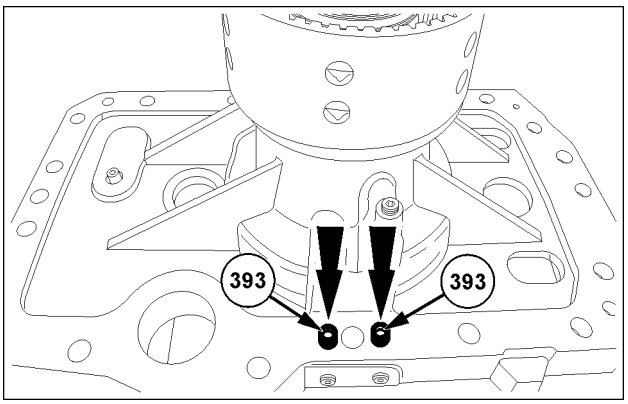


SS08G365 16

Sealing function check for clutch "A" and clutch "B"

17. To carry out the check, fit the two connecting pieces **(393)** with new 'O' rings **(392)** into the separator plate **(170)**. Fill the pressure channels with oil to ensure a better sealing function. Using a suitable air pistol, place both pressure channels under approximately **10 bar** (**145 psi**) pressure; the pistons must move in the process.

NOTE: *A leak tightness of one hundred percent cannot be expected as the pressure medium used can leak air considerably more easily than oil.*



SS08H059 17

⚠ WARNING ⚠

To prevent injury, always wear eye protection when working with compressed air.

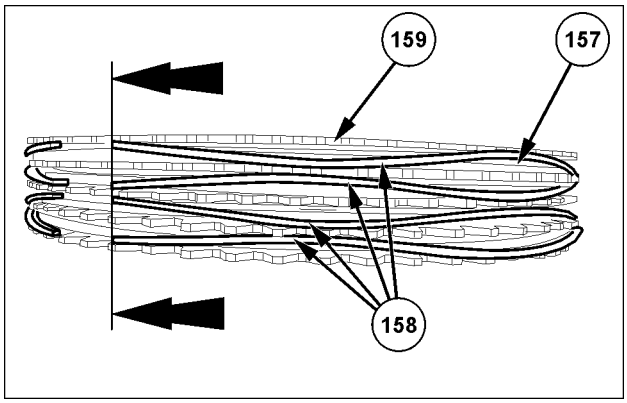
M459

18. Before fitting the disc pack the degree of wear of the friction plates must be checked. If the wear limit is **2,4 mm** (**0.94 in**) close to being reached the plates must be replaced.

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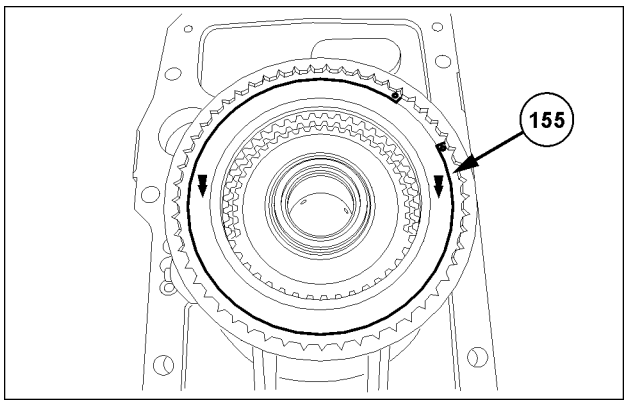
19. Fit the friction plates **(157)** alternately with the steel discs **(159)** and the intermediate separator springs **(158)**. Begin at the piston **(163)** using a steel disc, as shown in Figure **18**.

NOTE: *If new friction plates are used they must be placed in transmission oil for at least 30 minutes.*



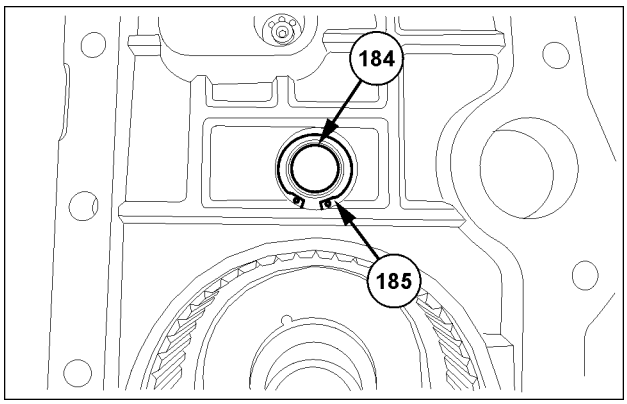
SS08H006 18

20. Fit the end plate **(156)** and press it down. Fit the snap ring **(155)**.



SS08G359 19

21. Insert the seal ring **(184)** using the drift **380200089** until firmly home and fit the snap ring **(185)**.



SS08G358 20

Next operation:
Clutch - Install ("A" and "B") (C.20.G)

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Clutch - Install ("A" and "B")

⚠ **DANGER** ⚠

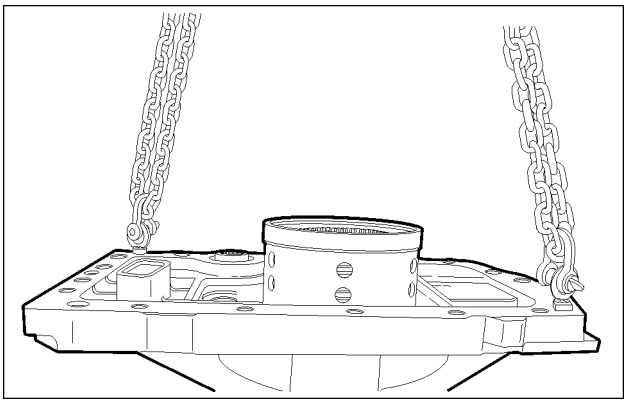
Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

Prior operation:
Clutch - Assemble ("A" and "B") (C.20.G)

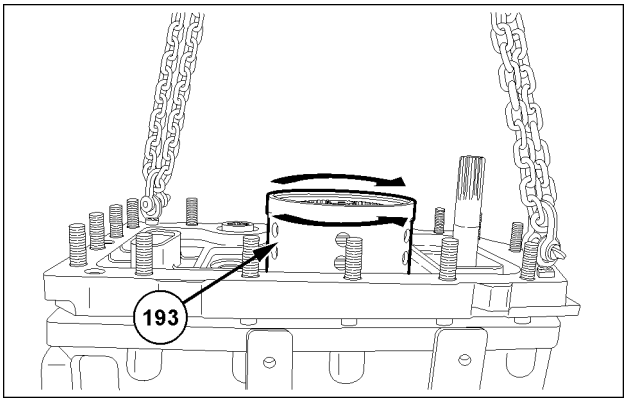
1. Fit the dowel pins **(384)** in the housing. Fit the ring bolts to the separator plate **(170)**. Grease the sealing surfaces and apply **LOCTITE® 518** to the sealing surface of the transmission casing. Position the separator plate above the transmission using a suitable hoisting device.



SS08J146 1

2. Carefully lower the separator plate. To ensure that the discs of clutch "B" can mesh with the outer disc support, the inner disc support **(153)** of clutch "B" must be held steady and at the same time the outer disc support **(193)** of clutch "A" must be moved to and fro.

NOTE: *Do not damage the seal rings **(192)** and **(194)**.*



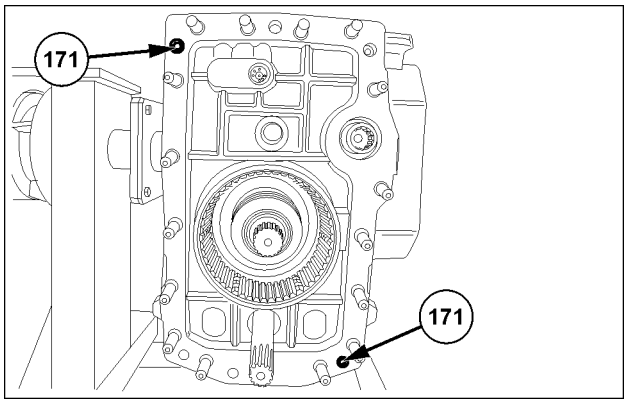
SS08J139 2

NOTE: *The transmission should be flanged to the rear axle within a maximum of 10 minutes. As the separator plate is attached to the transmission casing using only two screws, it is only pressed together only at certain points. This leads to uneven sealant thickness and can subsequently result in an uneven flange connection.*

NOTE: *If it is not possible to flange the transmission to the rear axle within 10 minutes, at least eight spacer sleeves and flange nuts should be used to evenly press the separator plate onto the transmission casing.*

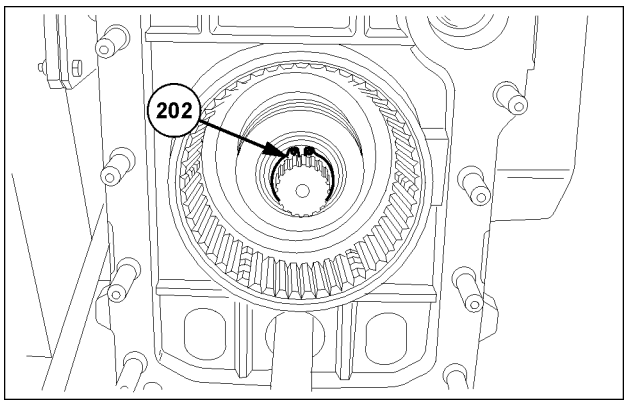
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3. Fit the separator plate using two screws **(171)** and tighten to **86 Nm** (**63.4 lb ft**).



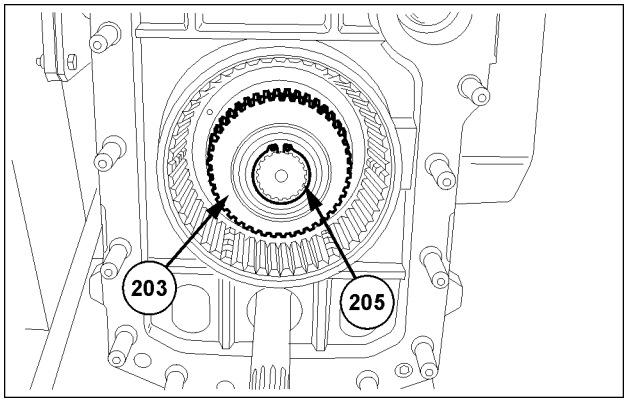
SS08H051 3

4. Fit the snap ring **(202)**.



SS08G103 4

5. Fit the inner disc support **(203)** and snap ring **(205)**.

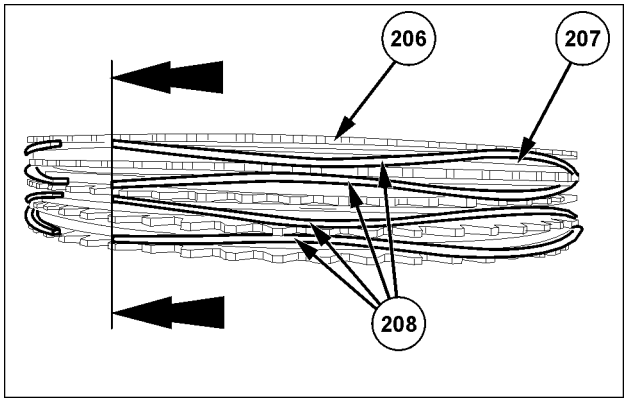


SS08G102 5

6. Before fitting the disc pack the degree of wear of the friction plates must be checked. If the wear limit is **2.4 mm** (**0.09 in**) close to being reached the plates must be replaced.

7. Fit the friction plates **(207)** alternately with the steel discs **(206)** and the intermediate separator springs **(208)**. Begin at the piston **(198)** using a steel disc, as shown in Figure **6**.

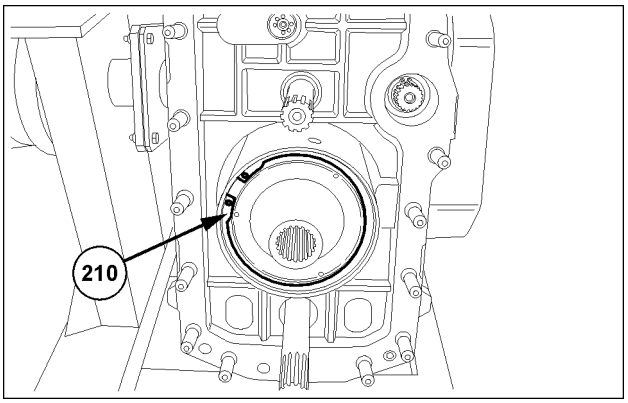
NOTE: *If new friction plates are used they must be placed in transmission oil for at least 30 minutes.*



SS08H052 6

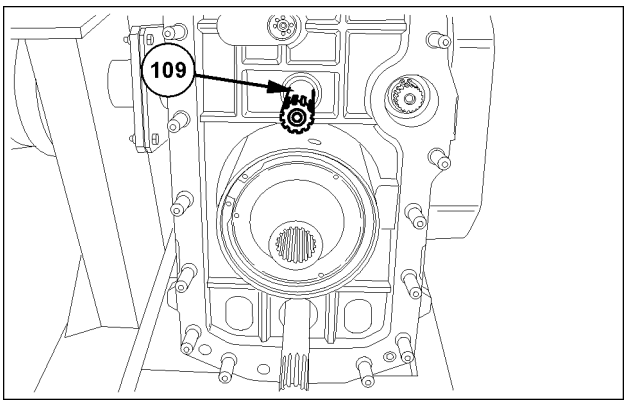
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8. Fit the clutch end plate **(209)** and the snap ring **(210)**.



SS08G321 7

9. Carefully fit the PTO shaft **(109)** without damaging the seal ring.



SS08G101 8

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Summing planetary gear - Install (C.20.G)
Fit the transmission to the rear axle - see **Housing - Install (C.20.G)**.

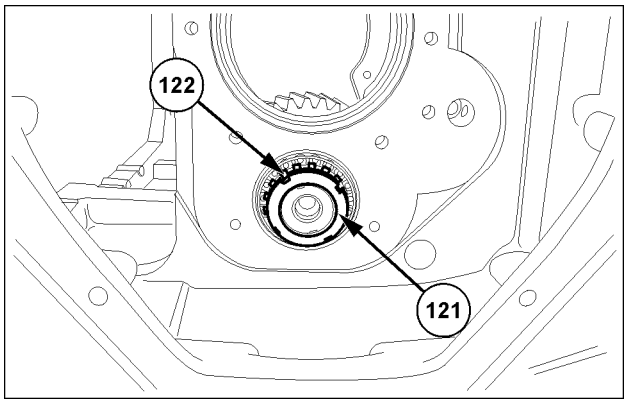
www.truck-freeworkshop.com

Shaft Output shaft - Remove

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

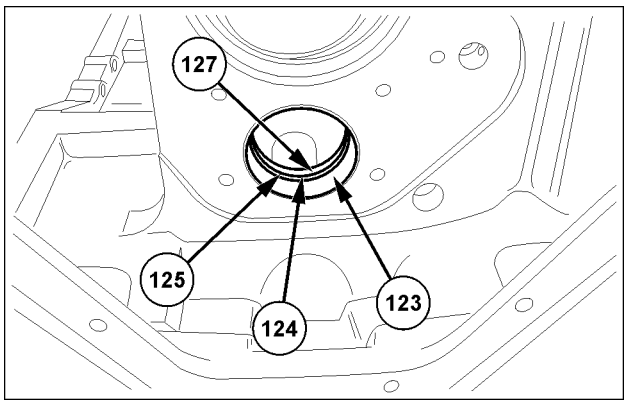
Prior operation:
Gear - Remove (F1/F3) (C.20.G)

1. Remove the grooved nut **(121)** together with the locking plate **(122)**. Push off the drive shaft.



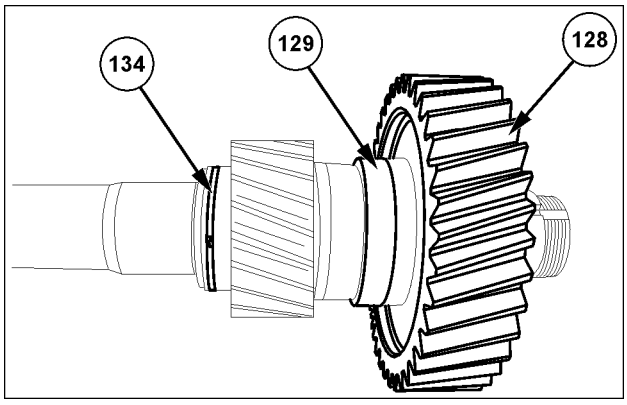
SS08G108 1

2. Dismantle the bearing races of bearings **(123)** and **(127)**, the spacer ring **(124)** and the snap ring **(125)**.



SS08H015 2

3. Pull the bearing **(127)** from the shaft using a suitable puller.
4. Remove the gear wheel **(128)**, the ring **(129)** and the seal ring **(134)**.



SS08G371 3

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Shaft Output shaft - Install (C.20.G)

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Shaft Output shaft - Install

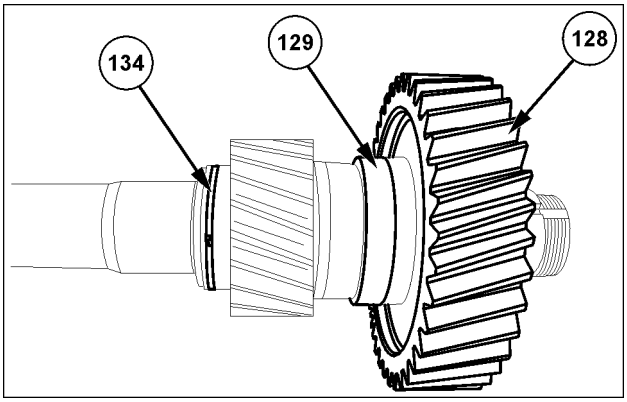
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

Prior operation:
Shaft Output shaft - Remove (C.20.G)

NOTE: *Prior to fitting the shaft **(131)**, ensure that the restrictors **(130)**, **(132)** and **(133)** are fitted in the shaft.*

NOTE: *All parts must be oiled before being fitted.*

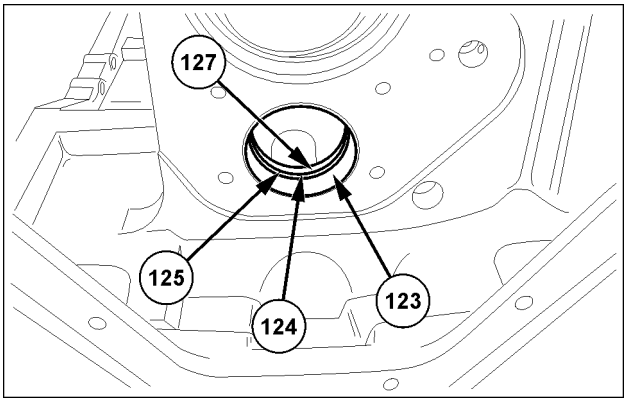
1. Fit the ring **(129)**, the gear wheel **(128)**, and the seal ring **(134)** onto the shaft **(131)**.



SS08G371 1

2. Fit the snap ring **(125)**, the spacer ring **(124)** and the outer bearing races of bearings **(123)** and **(127)** inside the housing.

NOTE: *The two oblique roller bearings **(123)** and **(127)** as well as the ring **(126)**, spacer ring **(124)** and snap ring **(125)** are only available as a set and may only be replaced together. The parts have been manufactured such that adjustment of the bearing pre-load is not required.*

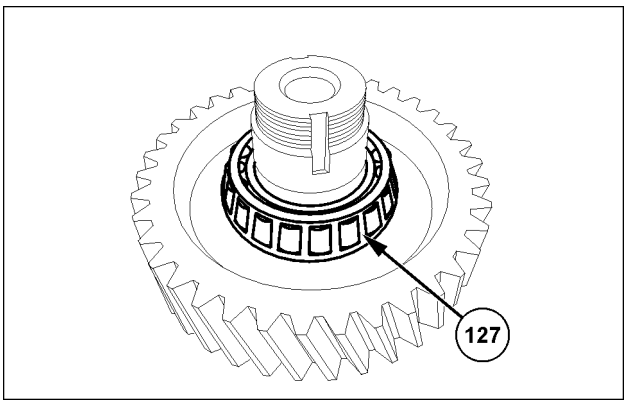


SS08H015 2

3. Heat the bearing **(127)** to **60 °C** (**140 °F**) and fit it.

⚠ DANGER ⚠
Always wear heat protective gloves to prevent burning your hands when handling heated parts.

SM121A



SS08H031 3

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4. Place the shaft into position and push the ring **(126)** onto the shaft. Heat the bearing **(123)** to **60 °C** (**140 °F**) and fit it.

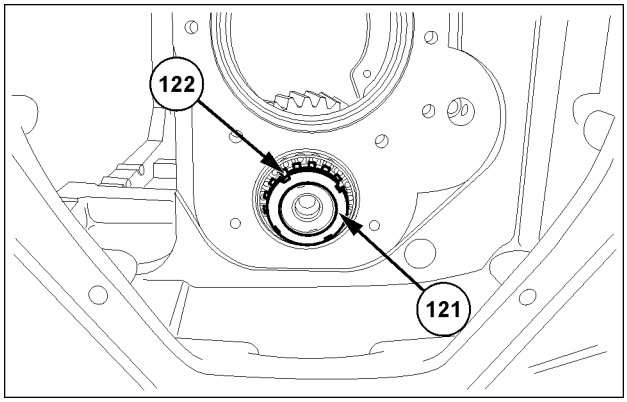
⚠ DANGER ⚠

Always wear heat protective gloves to prevent burning your hands when handling heated parts.

SM121A

5. Fit the locking plate **(122)** and the grooved nut **(121)**.

NOTE: *The grooved nut **(121)** is tightened and locked when the synchroniser unit F1/F3 is installed - see **Gear - Install (F1/F3) (C.20.G)**.*



SS08G108 4

Next operation:
Gear - Install (F1/F3) (C.20.G)

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Gear - Remove (F2/R1 and F4/R2)

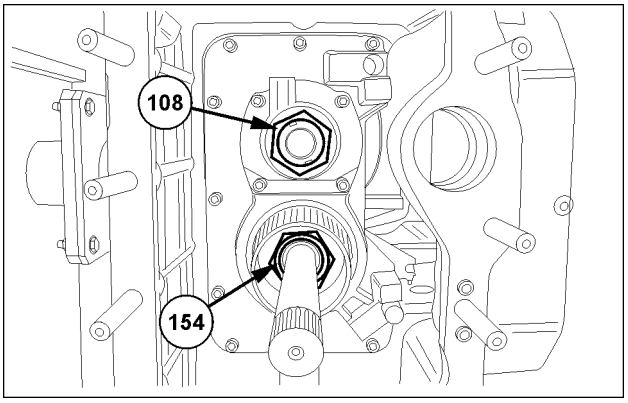
Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

Prior operation:
Hydrostat Hydrostat drive - Remove (C.20.G)

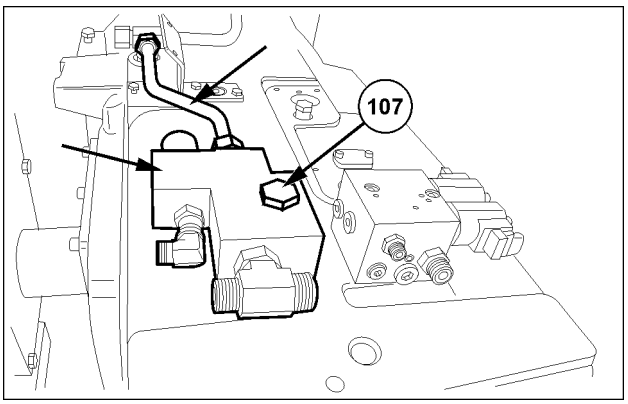
1. Unlock the nuts and block the gear wheels. Unscrew the nuts **(154)** using the pipe key **380200084** and the nuts **(108)** using the socket (SW70).

NOTE: *If the synchroniser units (F2/R1 and F4/R2) are not to be disassembled, step **1** is not required.*



SS08G259 1

2. Remove the lubrication oil line and the banjo bolt **(107)**. Remove the valve block for the brake cooling oil.

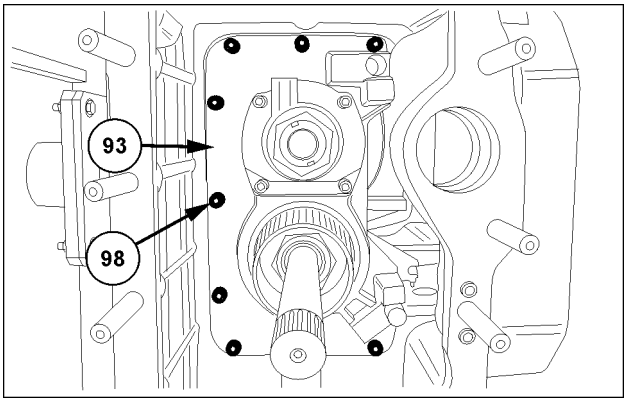


SS08H106 2

3. Remove the screws **(98)** from the cover. Push the cover **(93)** together with the output sleeve shaft and the input sleeve shaft backwards to remove them.

⚠ WARNING ⚠
Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026



SS08H019 3

Next operation:
Gear - Disassemble (F2/R1 and F4/R2) (C.20.G)

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Gear - Disassemble (F2/R1 and F4/R2)

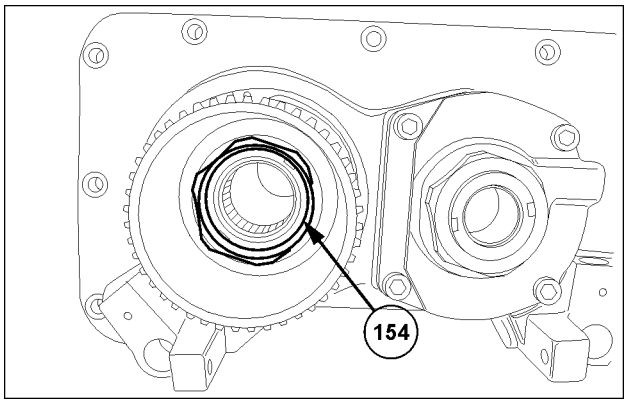
Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

Prior operation:
Gear - Remove (F2/R1 and F4/R2) (C.20.G)

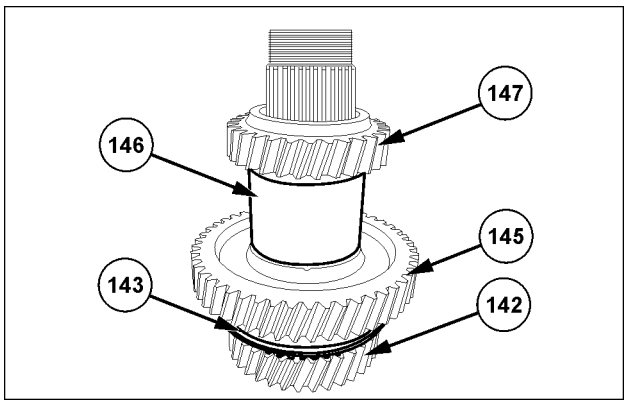
Synchroniser F2/R1

1. Remove the nut **(154)** pull out the output sleeve shaft **(136)**.



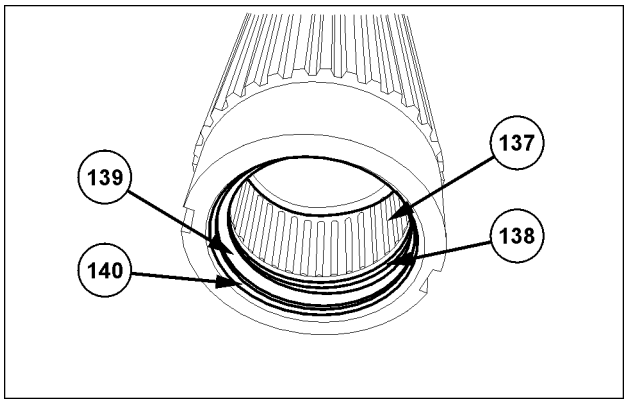
SS08G372 1

2. Remove the gear wheel **(147)** and the spacer sleeve **(146)** from the output sleeve shaft **(136)**. Remove the gear wheels **(142)** and **(145)** together with the synchronizer unit **(143)**, needle bearing **(141)** and bearing bush **(144)**.



SS08G373 2

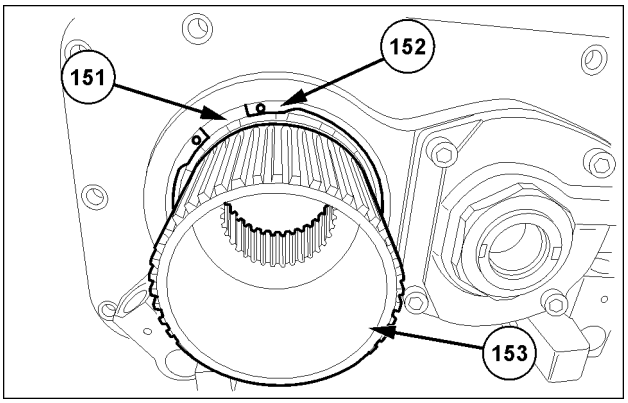
3. Remove the snap rings **(138)** and **(140)**, the seal ring **(139)** and the needle bearing **(137)** from the output sleeve shaft **(136)**.



SS08H032 3

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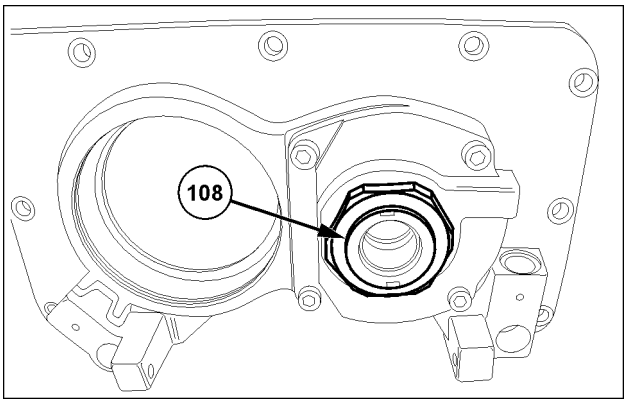
4. Remove the inner disc support **(153)**. Remove the snap ring **(152)** and pull the ball bearing **(151)** out of the cover **(93)**.



SS08G374 4

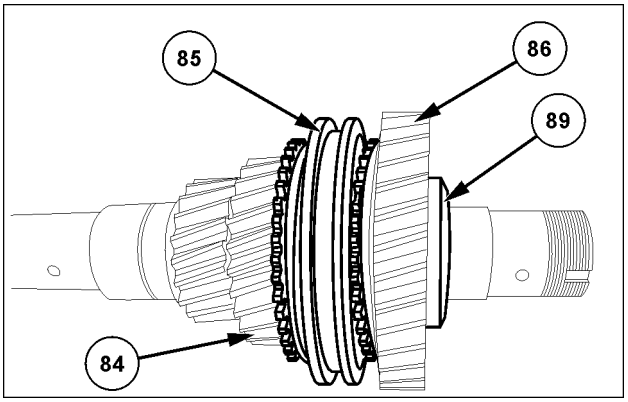
Synchroniser F4/R2

5. Disassemble the nut **(108)** from the input sleeve shaft **(79)** and pull the shaft out of the cover.



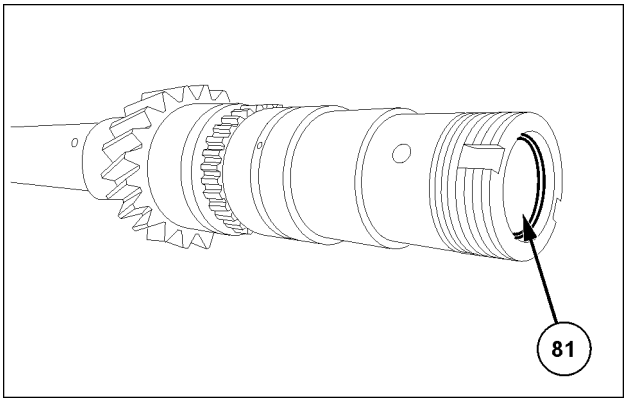
SS08G375 5

6. Remove the washer **(89)**, the gear wheels **(84)** and **(86)** together with the synchronizer unit **(85)**, the needle bearings **(83)**, **(87)** and the bushing **(88)** from the shaft **(79)**. Remove the washer **(82)** in the same way.



SS08G422 6

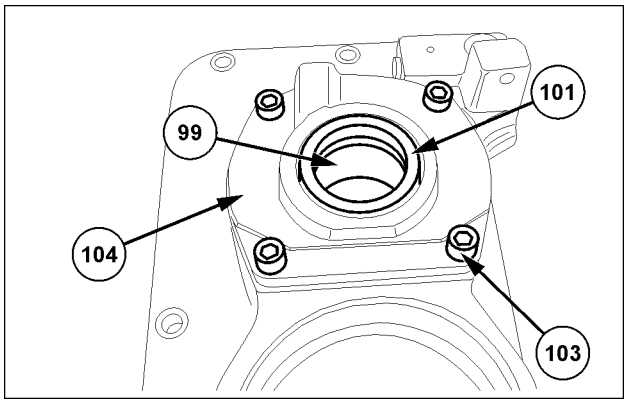
7. Pull the bearing bush **(81)** out of the input sleeve shaft **(79)** using a suitable internal puller device.



SS08G380 7

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8. Remove the screws **(103)**. Dismantle the bearing cover **(104)** together with the sleeve **(101)** and the seal rings **(100)** and **(102)**. Press the ball bearing **(99)** out of the cover **(93)**.



SS08G421 8

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Gear - Assemble (F2/R1 and F4/R2) (C.20.G)

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Gear - Assemble (F2/R1 and F4/R2)

Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

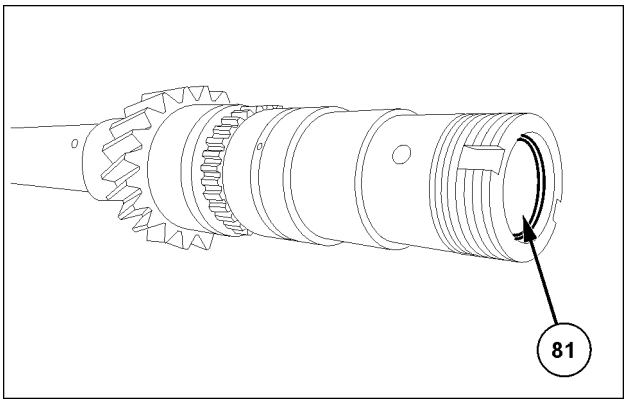
Prior operation:
Gear - Disassemble (F2/R1 and F4/R2) (C.20.G)

NOTE: *All parts must be oiled before being fitted.*

NOTE: *Prior to assembly you must ensure that all 8 restrictors **(80)** have been cleaned and fitted into the input sleeve shaft **(79)**.*

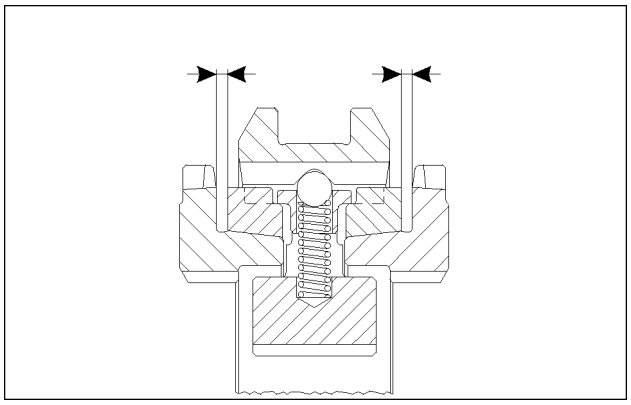
Synchroniser F4/R2

1. Insert the bearing bush **(81)** into the input sleeve shaft **(79)** until the stop using a suitable drift.



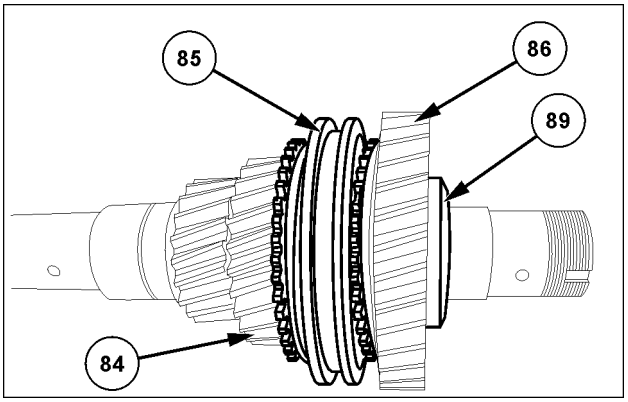
SS08G380 1

2. Check the wear of the synchroniser rings prior to assembling the synchroniser unit. If the wear limit of the synchroniser rings is **1 mm** (**0.04 in**) close to being reached, the synchroniser unit must be replaced.



SS08J091 2

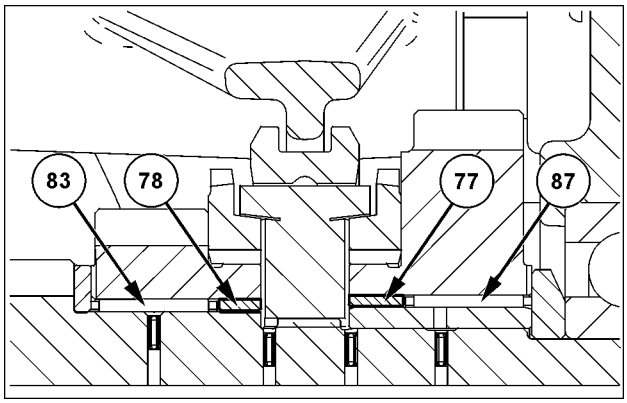
3. Place the washer **(82)**, gear wheel **(84)** with needle bearing **(83)** and sleeve **(78)** on the shaft **(79)**. Fit the synchroniser unit **(85)** and the bushing **(88)**. Fit the gear wheel **(86)** together with the needle bearing **(87)**, the sleeve **(77)** and the washer **(89)**.



SS08G422 3

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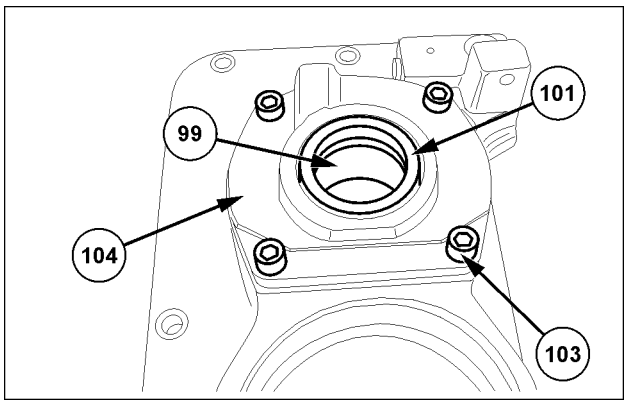
NOTE: *When assembling ensure that the sleeves* ***(77)*** *and* ***(78)*** *and the needle bearing* ***(83)*** *and* ***(87)*** *are in the correct position.*



SS08H078 4

4. Fit the ball bearing **(99)** into the cover **(93)**. Fit the bearing cover **(104)** using the screws **(103)** and tighten to **48.5 Nm** (**35.8 lb ft**). Fit the seal rings **(100)** and **(102)** onto the sleeve **(101)**. Push the sleeve carefully into the cover.

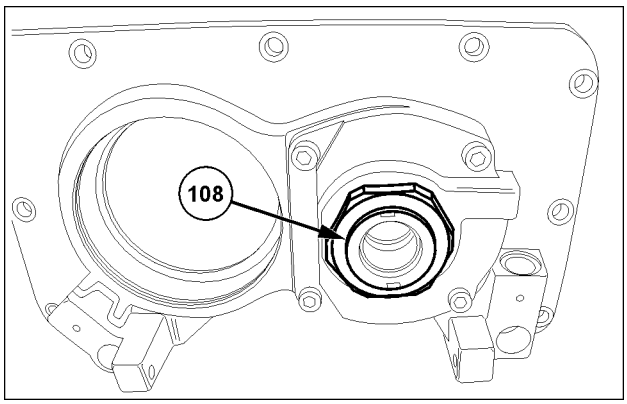
NOTE: *Grease the seal rings with industrial vaseline.*



SS08G421 5

5. Push the pre-assembled shaft into the cover. Fit the nuts **(108)** onto the input sleeve shaft **(79)**. For tightening and locking the nuts- see **Gear - Install (F2/R1 and F4/R2) (C.20.G)**.

NOTE: *Before fitting (tightening) the nut, check whether the synchronizer rings F4/R2 are correctly fitted.*

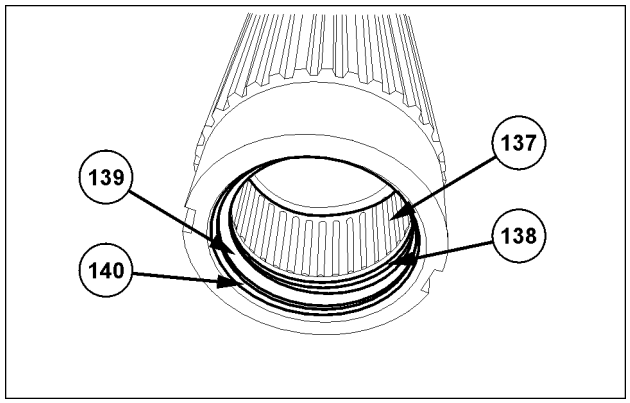


SS08G375 6

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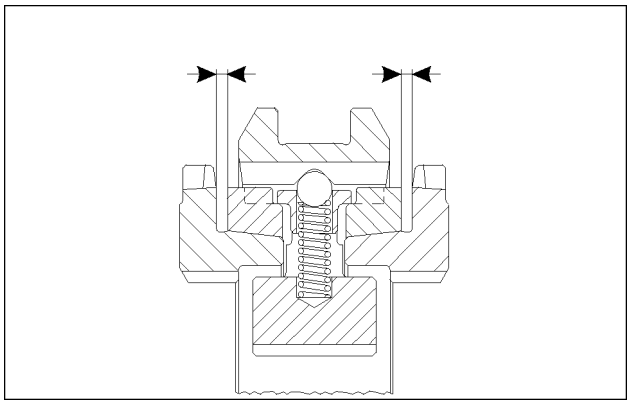
Synchroniser F2/R1

6. Fit the needle bearing **(137)**, the snap ring **(138)** into the output sleeve shaft **(136)**. Insert the seal ring **(139)** using the drift **380200089** until the stop. Fit the snap ring **(140)**.



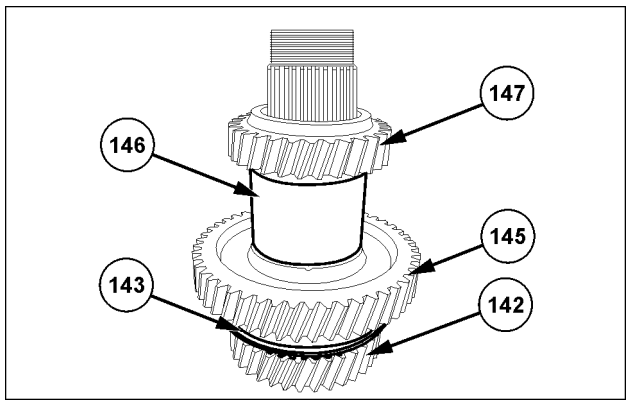
SS08H032 7

7. Check the wear of the synchroniser rings prior to assembling the synchroniser unit. If the wear limit of the synchroniser rings is **1 mm** (**0.04 in**) close to being reached, the synchroniser unit must be replaced.



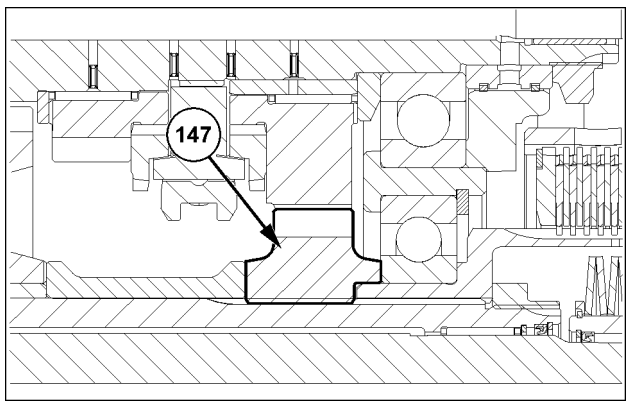
SS08J091 8

8. Place the gear wheel **(142)** together with the needle bearing **(141)** onto the output sleeve shaft **(136)**. Fit the synchroniser unit **(143)**, gear wheel **(145)** together with the bearing bush **(144)**, spacer sleeve **(146)** and gear wheel **(147)**.



SS08G373 9

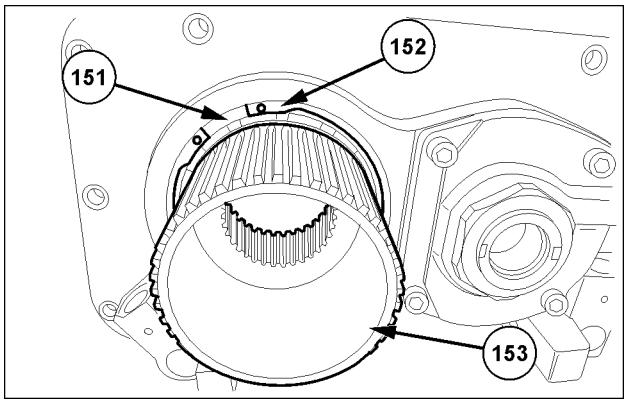
NOTE: *Ensure that the gear wheel* ***(147)*** *is fitted correctly.*



SS08H079 10

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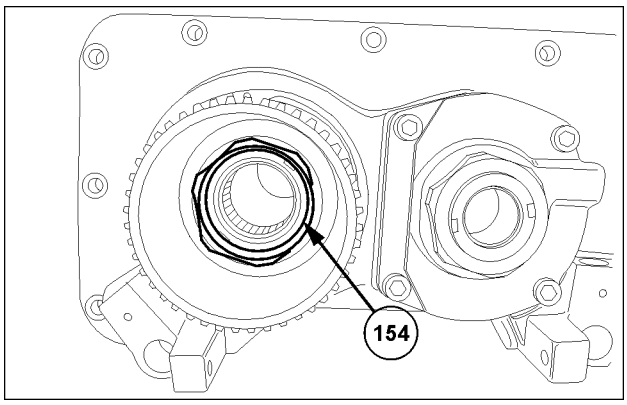
9. Fit the ball bearing **(151)** and the snap ring **(152)** into the cover **(93)**. Slide in the inner disc support **(153)**.



SS08G374 11

10. Place the output sleeve shaft **(136)** inside the cover. Fit the nuts **(154)**. For tightening and locking the nuts- see **Gear - Install (F2/R1 and F4/R2) (C.20.G)**.

NOTE: *Before fitting (tightening) the nut you must check whether the synchroniser rings F2/R1 are correctly fitted.*



SS08G372 12

Next operation:
Gear - Install (F2/R1 and F4/R2) (C.20.G)

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Gear - Install (F2/R1 and F4/R2)

Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

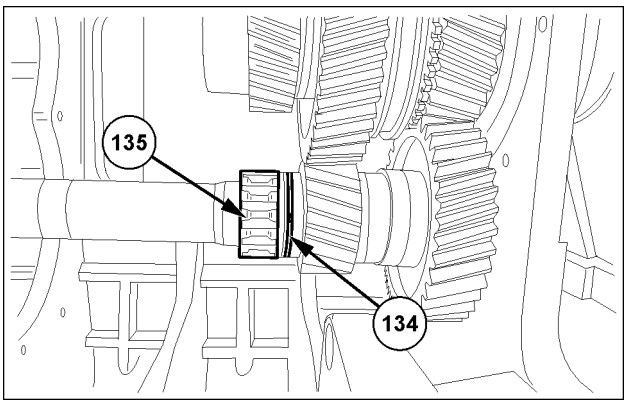
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

Prior operation:
Gear - Assemble (F2/R1 and F4/R2) (C.20.G)
Gear - Install (F1/F3) (C.20.G)

NOTE: *All parts must be oiled before being fitted.*

1. Push the needle bearing **(135)** onto the shaft **(131)** that has already been fitted.

NOTE: *Grease the needle bearing **(135)** and the seal ring **(134)** with industrial vaseline.*



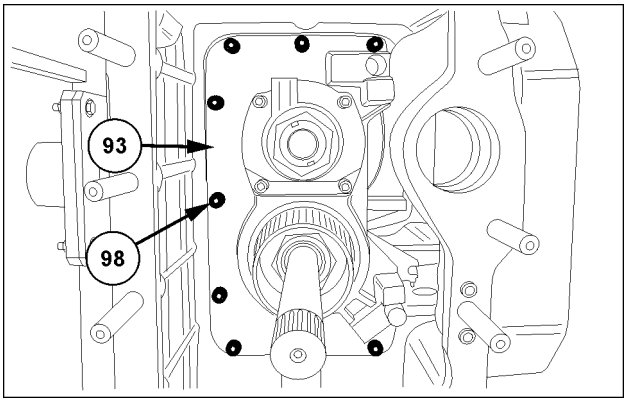
SS08H033 1

2. Insert the dowel pins **(97)** into the housing. Insert the cover **(93)** together with the output sleeve shaft and the input sleeve shaft carefully without damaging the seal rings. Insert the screws **(98)** and tighten to **48.5 Nm** (**35.8 lb ft**).

⚠ WARNING ⚠

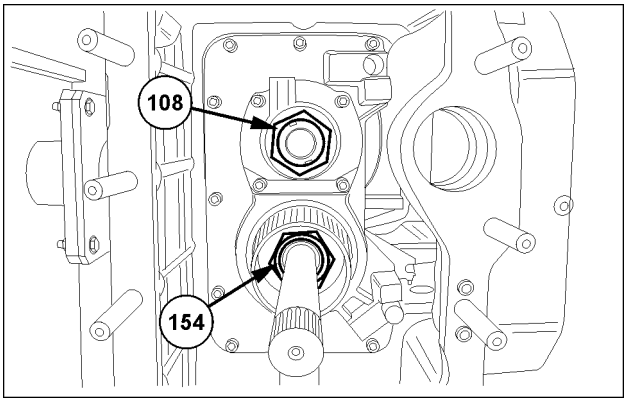
Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026



SS08H019 2

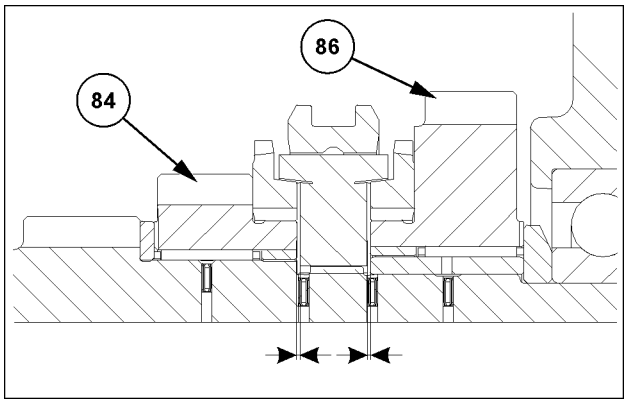
3. Block the gear wheels. Spray the thread of the sleeve shaft **(136)** with **LOCTITE® 243**, screw the nut **(154)** onto the sleeve shaft **380200084** using the pipe key and tighten to **490 - 525 Nm** (**361 - 387 lb ft**). Screw the nut **(108)** onto the sleeve shaft **(79)** using the socket (SW70) and tighten to **490 - 525 Nm** (**361 - 387 lb ft**). Lock both nuts by hitting them.



SS08G259 3

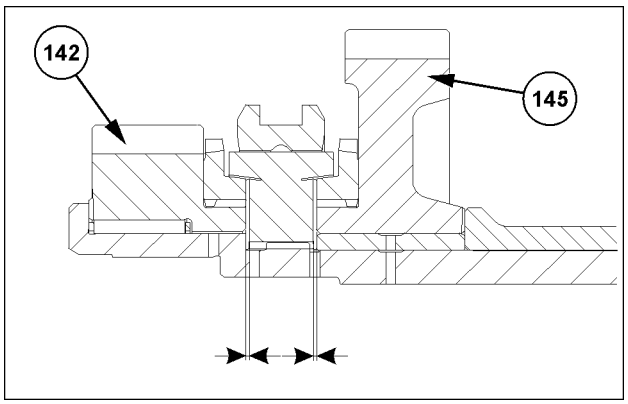
www.truck-freeworkshop.com

NOTE: *The gear wheels* ***(84)*** *and* ***(86)*** *must have minimal axial play if fitted correctly.*



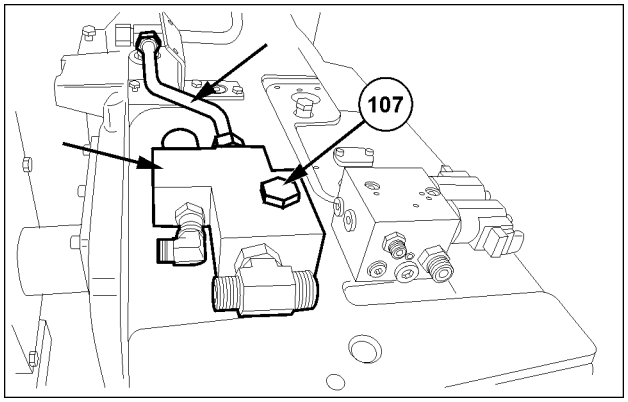
SS08H034 4

NOTE: *The gear wheels* ***(142)*** *and* ***(145)*** *must have minimal axial play if fitted correctly.*



SS08H035 5

4. Fit the valve block for the brake cooling oil with a new ‘O’ ring **(106)**. Screw in the banjo bolt **(107)** together with the ‘O’ ring **(105)** and the seal ring **(110)**. Fit the lubrication line and tighten the banjo bolt.



SS08H106 6

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Hydrostat Hydrostat drive - Install (C.20.G)

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Gear - Remove (F2/R1)

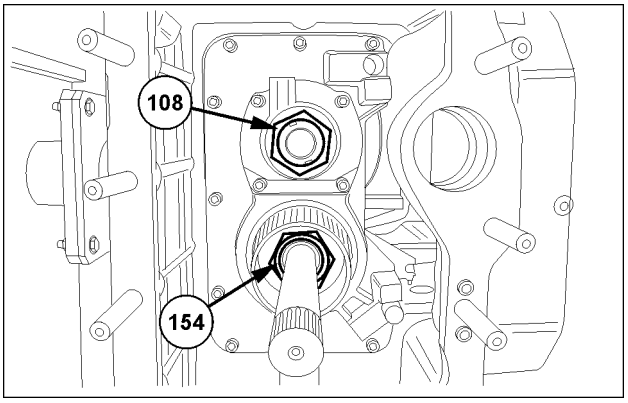
Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

Prior operation:
Hydrostat Hydrostat drive - Remove (C.20.G)

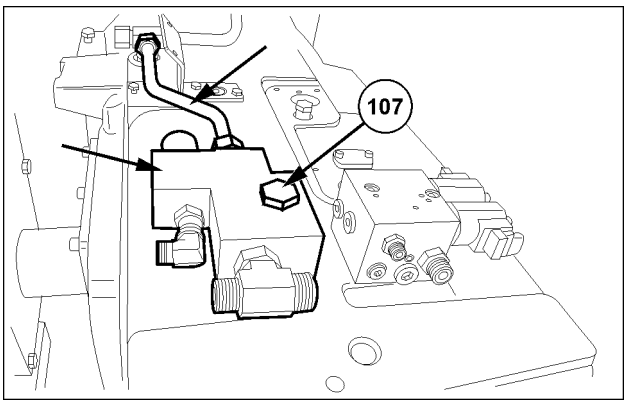
1. Unlock the nuts and block the gear wheels. Unscrew the nuts **(154)** using the pipe key **380200084** and the nuts **(108)** using the socket (SW70).

NOTE: *If the synchroniser unit (F2/R1) is not to be disassembled, step **1** is not required.*



SS08G259 1

2. Remove the lubrication oil line and the banjo bolt **(107)**. Remove the valve block for the brake cooling oil.

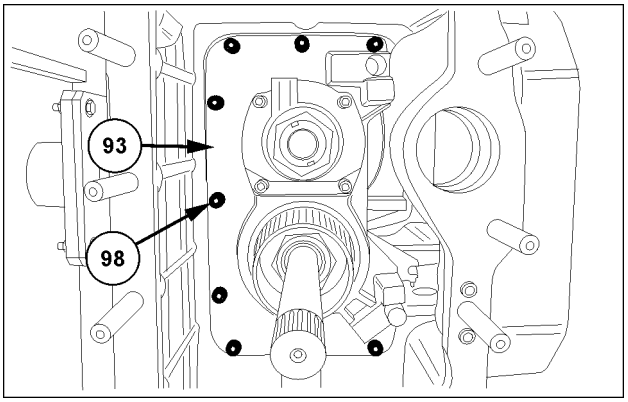


SS08H106 2

3. Remove the screws **(98)** from the cover. Push the cover **(93)** together with the output sleeve shaft and the input sleeve shaft backwards to remove them.

⚠ WARNING ⚠
Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026



SS08H019 3

Next operation:
Gear - Disassemble (F2/R1) (C.20.G)

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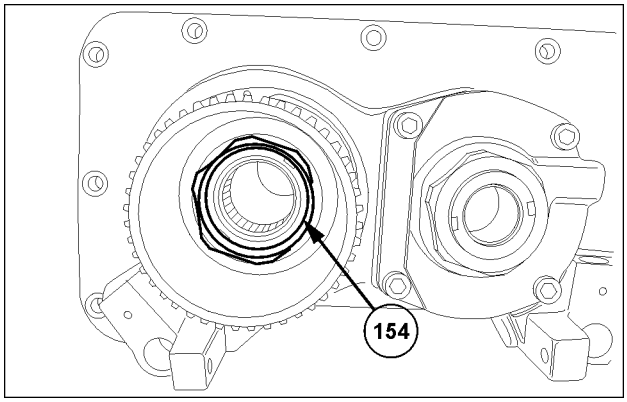
Gear - Disassemble (F2/R1)

Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

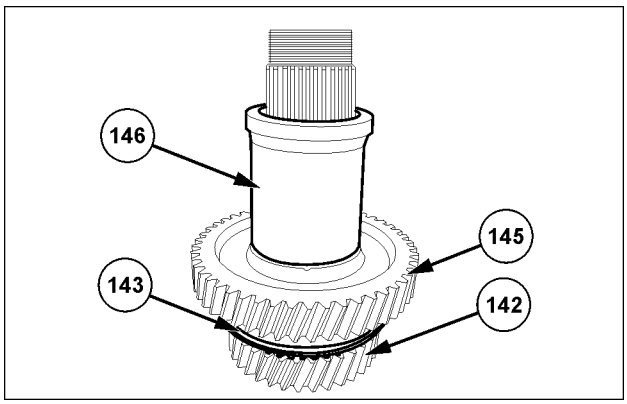
Prior operation:
Gear - Remove (F2/R1) (C.20.G)

1. Remove the nut **(154)** pull out the output sleeve shaft **(136)**.



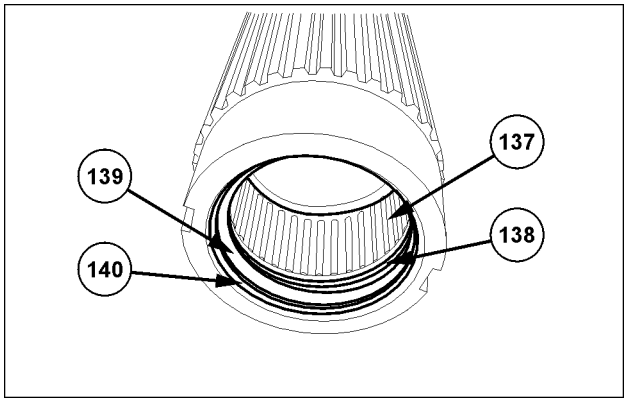
SS08G372 1

2. Remove the spacer sleeve **(146)** from the output sleeve shaft **(136)**. Remove the gear wheels **(142)** and **(145)** together with the synchroniser unit **(143)**, needle bearing **(141)** and bearing bush **(144)**.



SS08K476 2

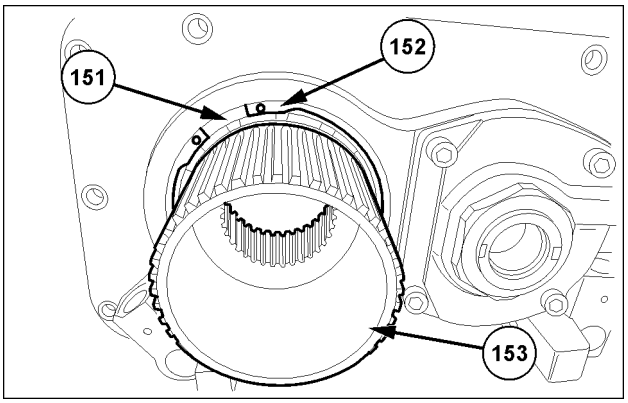
3. Remove the snap rings **(138)** and **(140)**, the seal ring **(139)** and the needle bearing **(137)** from the output sleeve shaft **(136)**.



SS08H032 3

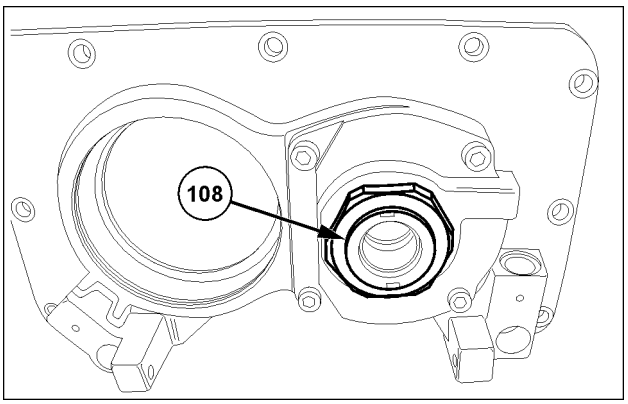
www.truck-freeworkshop.com

4. Remove the inner disc support **(153)**. Remove the snap ring **(152)** and pull the ball bearing **(151)** out of the cover **(93)**.



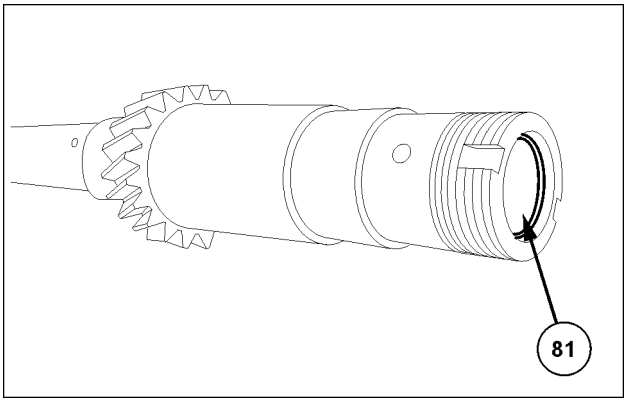
SS08G374 4

5. Disassemble the nut **(108)** from the input sleeve shaft **(79)** and pull the shaft out of the cover.



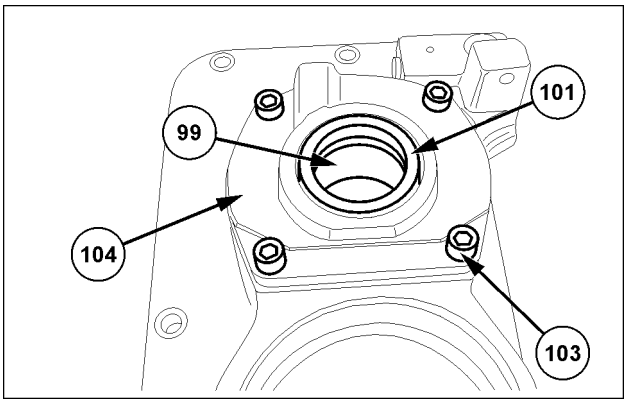
SS08G375 5

6. Pull the bearing bush **(81)** out of the input sleeve shaft **(79)** using a suitable internal puller device.



SS08H073 6

7. Remove the screws **(103)**, dismantle the bearing cover **(104)** together with the sleeve **(101)** and the seal rings **(100)** and **(102)**. Press the ball bearing **(99)** out of the cover **(93)**.



SS08G421 7

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Gear - Assemble (F2/R1) (C.20.G)

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Gear - Assemble (F2/R1)

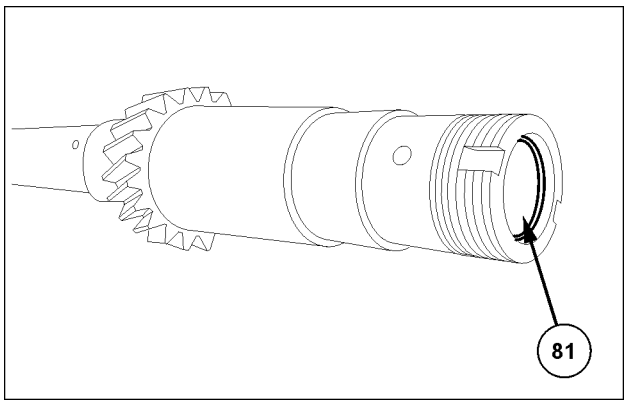
Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

Prior operation:
Gear - Disassemble (F2/R1) (C.20.G)

NOTE: *All parts must be oiled before being fitted.*

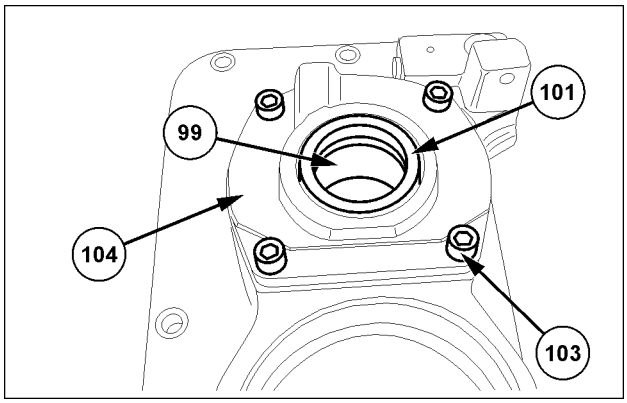
1. Insert the bearing bush **(81)** into the input sleeve shaft **(79)** until the stop using a suitable drift.



SS08H073 1

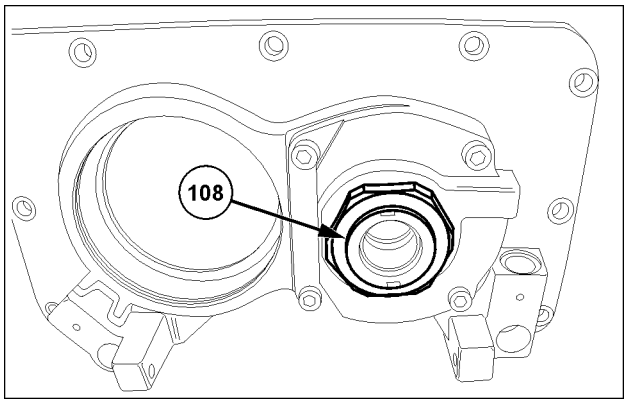
2. Fit the ball bearing **(99)** into the cover **(93)**. Fit the bearing cover **(104)** using the screws **(103)** and tighten to **48.5 Nm** (**35.8 lb ft**). Fit the seal rings **(100)** and **(102)** onto the sleeve **(101)**. Push the sleeve carefully into the cover.

NOTE: *Grease the seal rings with industrial vaseline.*



SS08G421 2

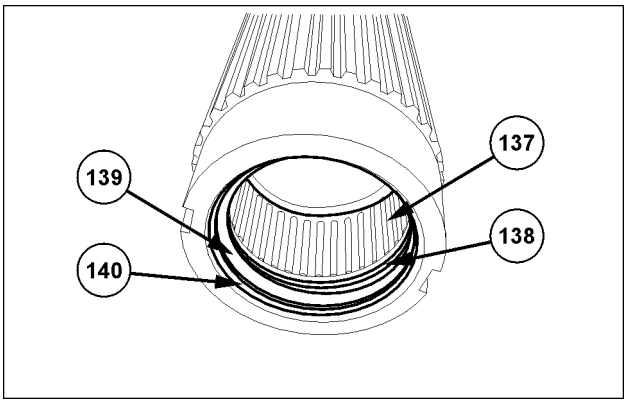
3. Push the shaft into the cover. Fit the nut **(108)** onto the input sleeve shaft **(79)**. For tightening and locking the nuts- see **Gear - Install (F2/R1) (C.20.G)**.



SS08G375 3

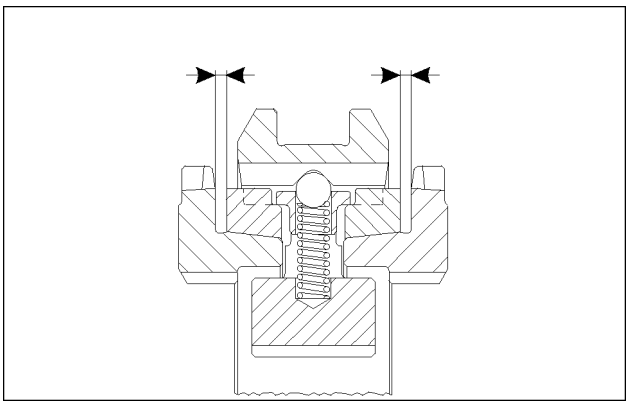
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4. Fit the needle bearing **(137)**, the snap ring **(138)** into the output sleeve shaft **(136)**. Insert the seal ring **(139)** using the drift **380200089** until the stop. Fit the snap ring **(140)**.



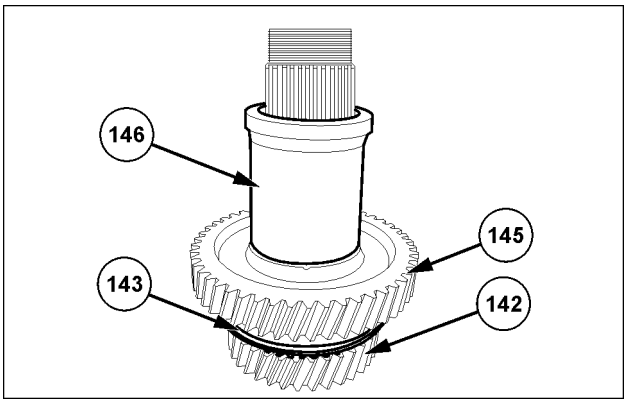
SS08H032 4

5. Check the wear of the synchroniser rings prior to assembling the synchroniser unit. If the wear limit of the synchroniser rings is **1 mm** (**0.04 in**) close to being reached, the synchroniser unit must be replaced.



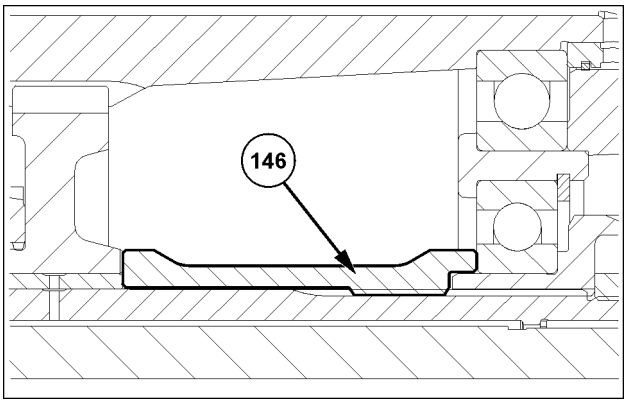
SS08J091 5

6. Place the gear wheel **(142)** together with the needle bearing **(141)** onto the output sleeve shaft **(136)**. Fit the synchroniser unit **(143)**, gear wheel **(145)** together with the bearing bush **(144)** and the spacer sleeve **(146)**.



SS08K476 6

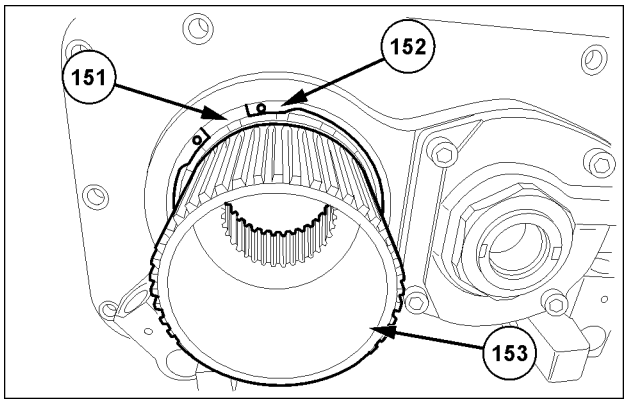
NOTE: *Ensure that the spacer sleeve **(146)** is correctly fitted.*



SS08H080 7

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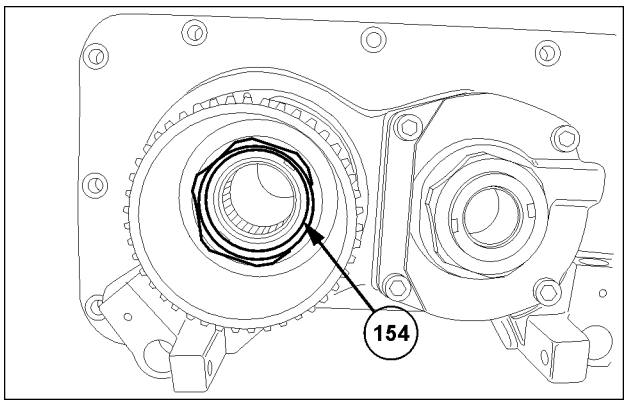
7. Fit the ball bearing **(151)** and the snap ring **(152)** into the cover **(93)**. Slide in the inner disc support **(153)**.



SS08G374 8

8. Place the output sleeve shaft **(136)** inside the cover. Fit the nut **(154)**. For tightening and locking the nuts- see **Gear - Install (F2/R1) (C.20.G)**.

NOTE: *Before fitting (tightening) the nut you must check whether the synchronizer rings F2/R1 are correctly fitted.*



SS08G372 9

Next operation:
Gear - Install (F2/R1) (C.20.G)

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Gear - Install (F2/R1)

Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

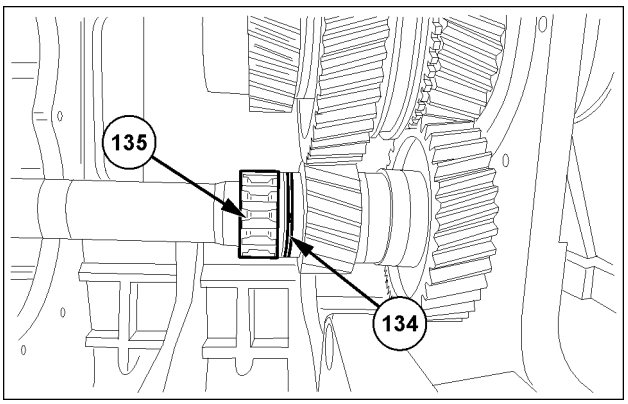
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

Prior operation:
Gear - Assemble (F2/R1) (C.20.G)
Gear - Install (F1/F3) (C.20.G)

NOTE: *All parts must be oiled before being fitted.*

1. Push the needle bearing **(135)** onto the shaft **(131)** that has already been fitted.

NOTE: *Grease the needle bearing **(135)** and the seal ring **(134)** with industrial vaseline.*



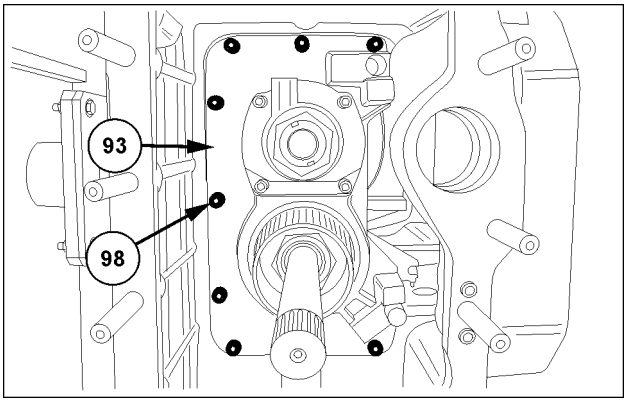
SS08H033 1

2. Insert the dowel pins **(97)** into the housing. Insert the cover **(93)** together with the output sleeve shaft and the input sleeve shaft carefully without damaging the seal rings. Insert the screws **(98)** and tighten to **48.5 Nm** (**35.8 lb ft**).

⚠ WARNING ⚠

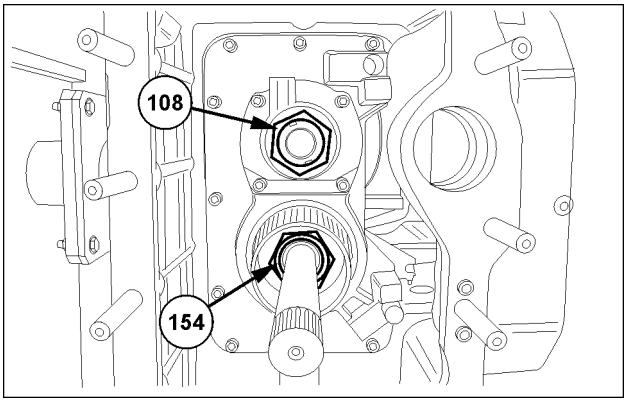
Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026



SS08H019 2

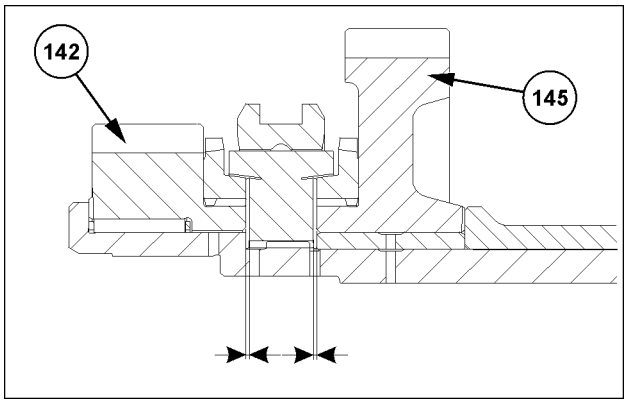
3. Block the gear wheels. Spray the thread of the sleeve shaft **(136)** with **LOCTITE® 243**, screw the nut **(154)** onto the sleeve shaft **380200084** using the pipe key and tighten to **490 - 525 Nm** (**361 - 387 lb ft**). Screw the nut **(108)** onto the sleeve shaft **(79)** using the socket (SW70) and tighten to **490 - 525 Nm** (**361 - 387 lb ft**). Lock both nuts by hitting them.



SS08G259 3

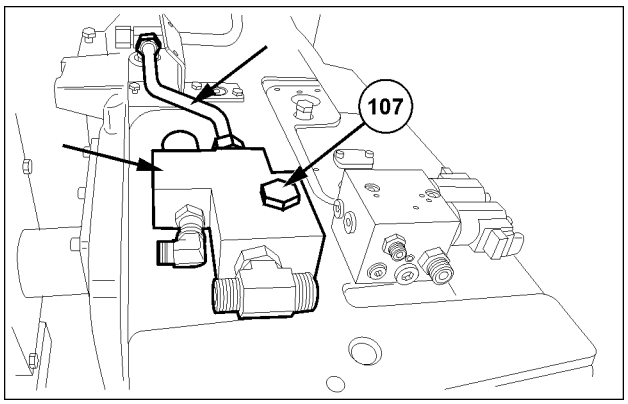
www.truck-freeworkshop.com

NOTE: *The gear wheels* ***(142)*** *and* ***(145)*** *must have minimal axial play if fitted correctly.*



SS08H035 4

4. Fit the valve block for the brake cooling oil with a new ‘O’ ring **(106)**. Screw in the banjo bolt **(107)** together with the ‘O’ ring **(105)** and the seal ring **(110)**. Fit the lubrication line and tighten the banjo bolt.



SS08H106 5

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Hydrostat Hydrostat drive - Install (C.20.G)

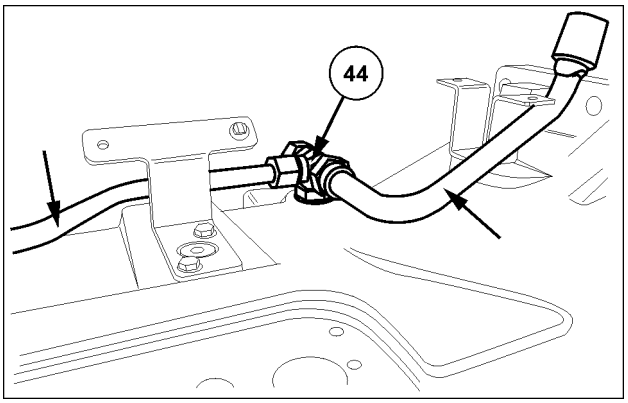
www.truck-freeworkshop.com

Gear - Remove (F1/F3)

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

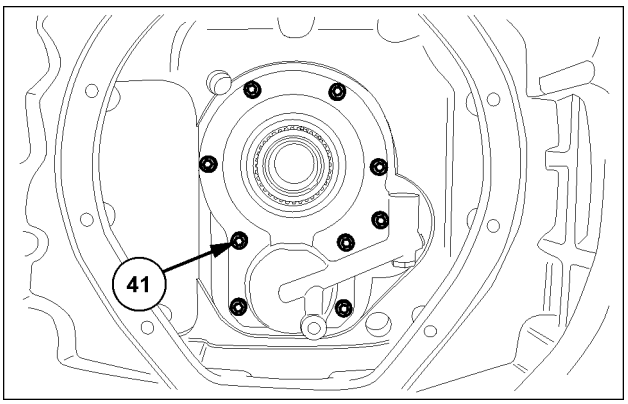
Prior operation:
Gear - Remove (F2/R1 and F4/R2) (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Gear - Remove (F2/R1) (C.20.G) - (35 km/h and 40 km/h gearbox)

1. Remove the lines and the oil feed **(44)**.



SS08G367 1

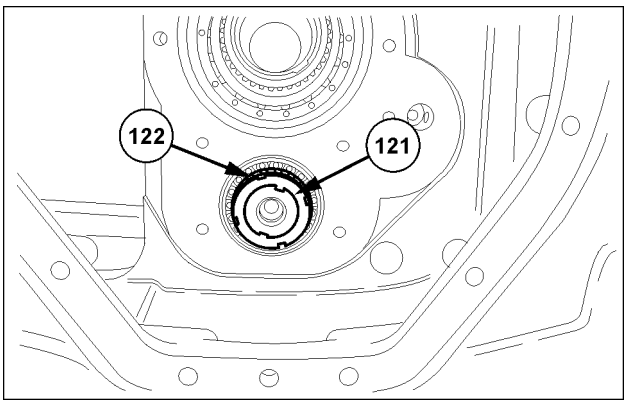
2. Remove the screws **(41)** push off and remove the cover **(42)**.



SS08G119 2

3. Open the locking plate **(122)** of the grooved nut. Block the shaft and unscrew the grooved nut **(121)**.

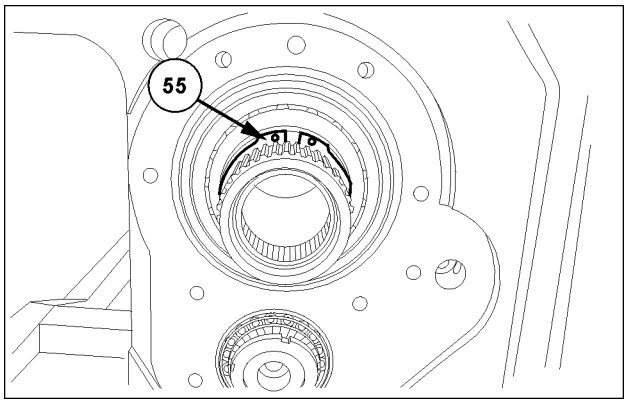
NOTE: *Only unscrew the grooved nut **(121)** if the shaft **(131)** also needs to be dismantled.*



SS08G120 3

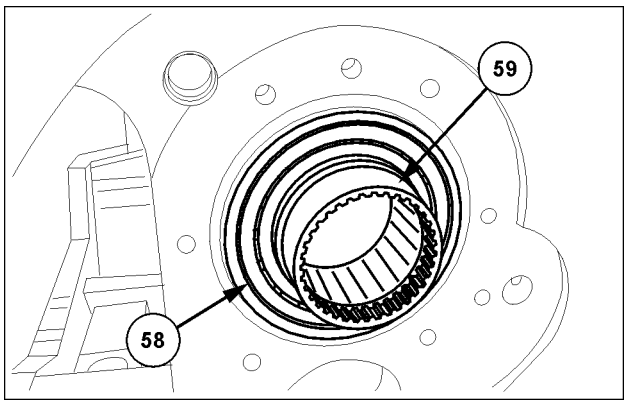
www.truck-freeworkshop.com

4. Remove the snap ring **(55)** and remove the synchroniser unit (F1/F3) together with the sleeve shaft.



SS08G251 4

5. Dismantle the roller bearing **(58)** together with the bushing **(59)** by pulling it forwards.



SS08G369 5

Next operation:
Gear - Disassemble (F1/F3) (C.20.G)
Shaft Output shaft - Remove (C.20.G)

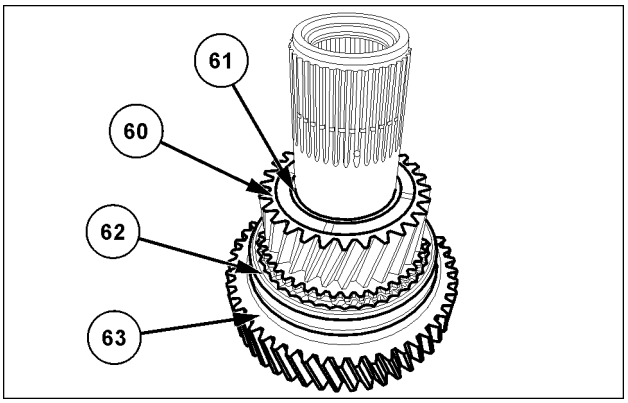
www.truck-freeworkshop.com

Gear - Disassemble (F1/F3)

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)

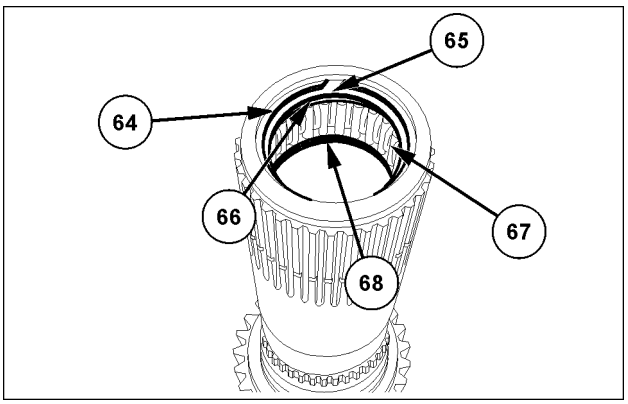
Prior operation:
Gear - Remove (F1/F3) (C.20.G)

1. Remove the gear wheels **(60)** and **(63)** together with the synchroniser unit **(62)** and the bushing **(61)** from the shaft **(70)**.



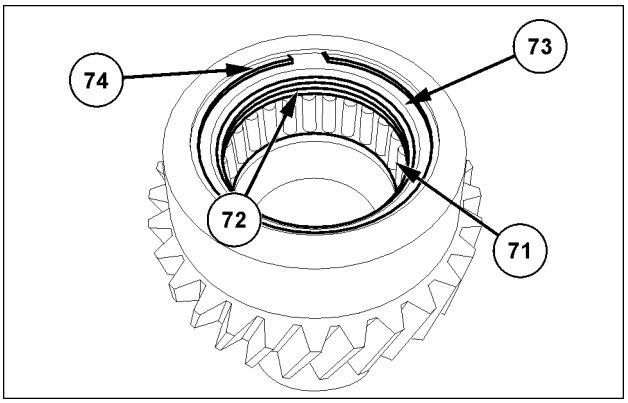
SS08G377 1

2. Remove the snap rings **(64)**, **(66)** and **(68)**, the seal ring **(65)** and the needle bearing **(67)**.



SS08G376 2

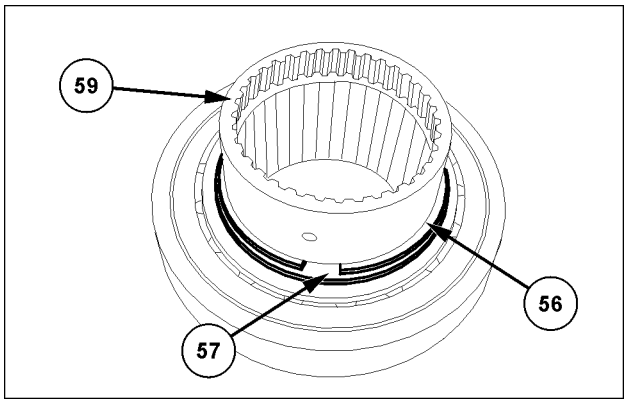
3. Remove the snap rings **(72)** and **(74)** and the seal ring **(73)**. Dismantle the needle bearing **(71)**.



SS08G378 3

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4. Remove the snap ring **(56)** and the washer **(57)**. Pull out the bushing **(59)** and pull the inner bearing race from the bushing using a suitable puller.



SS08G379 4

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Gear - Assemble (F1/F3) (C.20.G)

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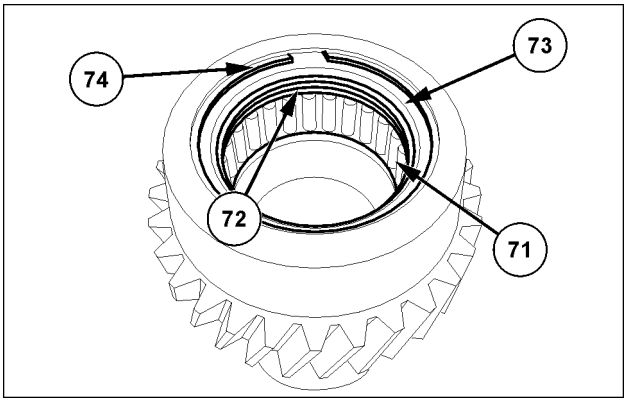
Gear - Assemble (F1/F3)

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)

Prior operation:
Gear - Disassemble (F1/F3) (C.20.G)

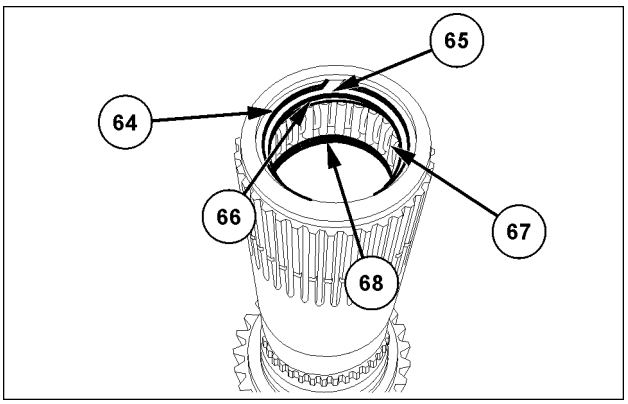
NOTE: *All parts must be oiled before being fitted.*

1. Fit the needle bearing **(71)** and the snap ring **(72)**. Insert the seal ring **(73)** using the drift **380001750** until firmly home and fit the snap ring **(74)**.



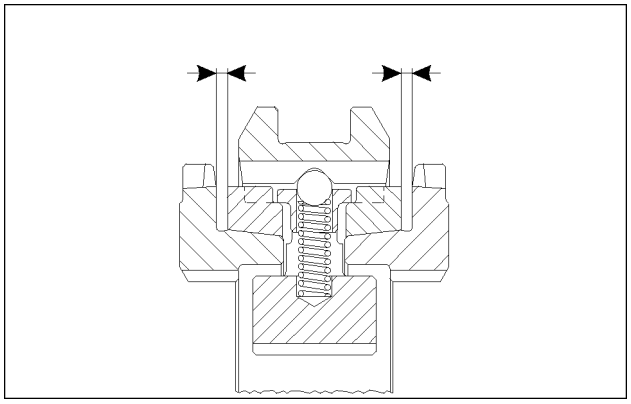
SS08G378 1

2. Fit the snap rings **(68)** and **(66)** and the needle bearing **(67)**. Insert the seal ring **(65)** using the drift **380002552** until firmly home and fit the snap ring **(64)**.



SS08G376 2

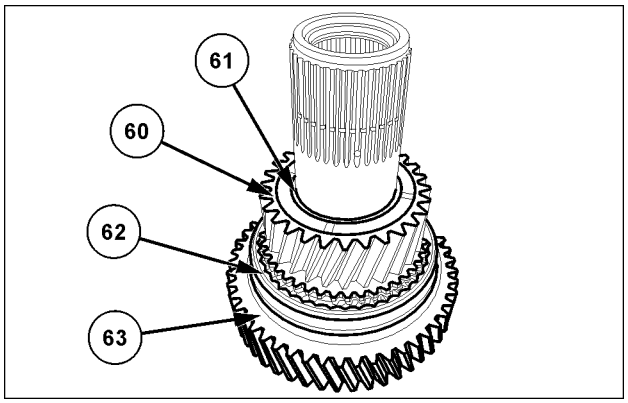
3. Check the wear of the synchroniser rings prior to assembling the synchroniser unit. If the wear limit of the synchroniser rings is **1 mm** (**0.04 in**) close to being reached, the synchroniser unit must be replaced.



SS08J091 3

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4. Fit the gear wheels **(60)** and **(63)** together with the synchroniser unit **(62)** and the bushing **(62)** onto the shaft **(70)**.



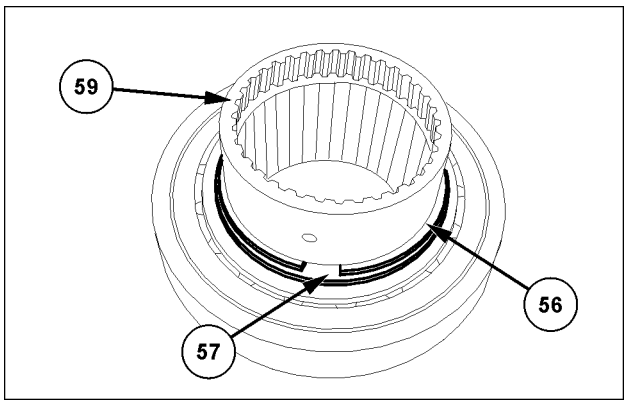
SS08G377 4

5. Heat the inner bearing race of the bearing **(58)** to **60 °C** (**140 °F**) and press onto the bushing **(59)**. Fit the roller bearing **(58)**, the washer of the inner race, washer **(57)** and snap ring **(56)**.

⚠ DANGER ⚠

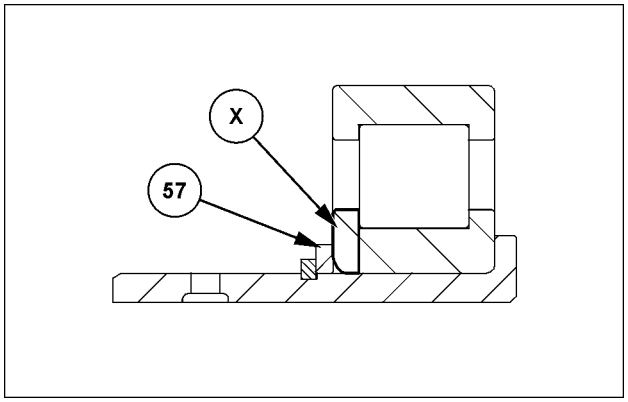
Always wear heat protective gloves to prevent burning your hands when handling heated parts.

SM121A



SS08G379 5

NOTE: *The inner race of the roller bearing comprises two parts. The washer* ***(X)*** *must be fitted such that the larger radius lies against the washer* ***(57)****.*



SS08H026 6

Next operation:
Gear - Install (F1/F3) (C.20.G)

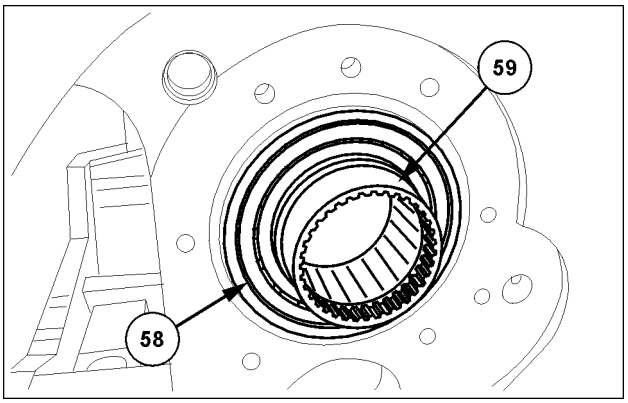
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Gear - Install (F1/F3)

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission input) (C.20.G)
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Transmission output) (C.20.G)

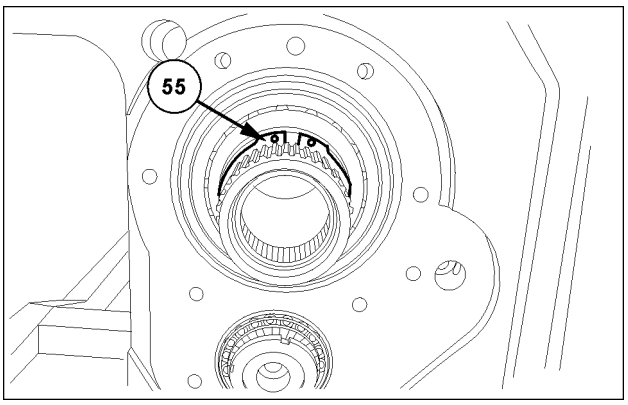
Prior operation:
Gear - Assemble (F1/F3) (C.20.G)
Shaft Output shaft - Install (C.20.G)

1. Install the pre-assembled roller bearing **(58)** from the front.



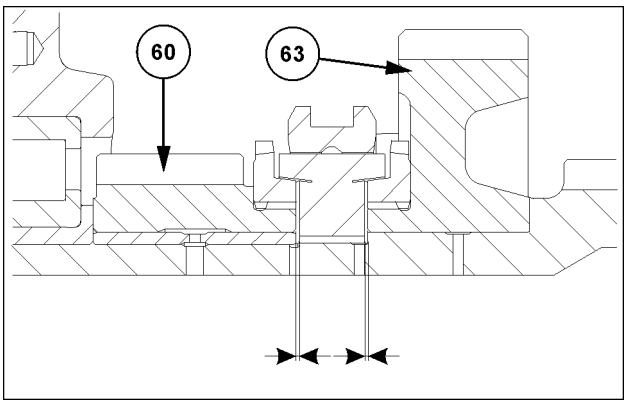
SS08G369 1

2. Insert the sleeve shaft **(70)** together with the synchroniser unit (F1/F3) from the rear and fit the snap ring **(55)**.



SS08G251 2

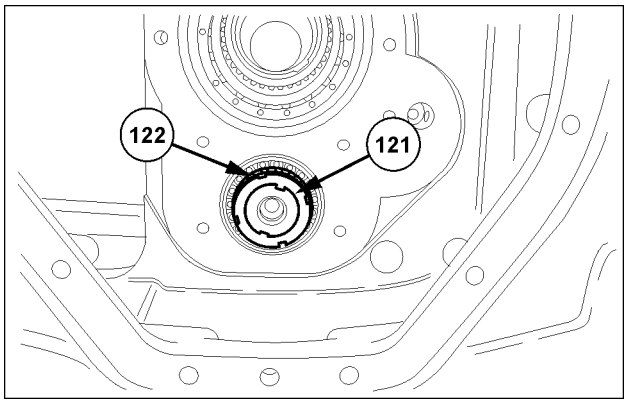
NOTE: *The two gear wheels **(60)** and **(63)** must have a little axial play if fitted correctly.*



SS08H028 3

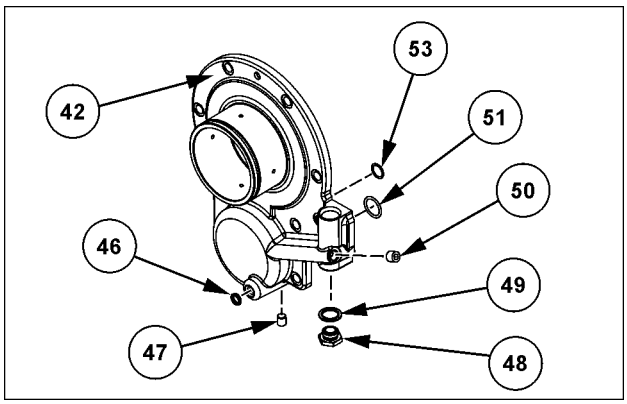
www.truck-freeworkshop.com

3. Block the shafts. Spray the thread with **LOCTITE® 243**, screw the grooved nut **(121)** onto the shaft using the grooved nut key **380200083** and tighten to **467 - 515 Nm** (**344 - 380 lb ft**). Lock the grooved nut with the locking plate **(122)**.



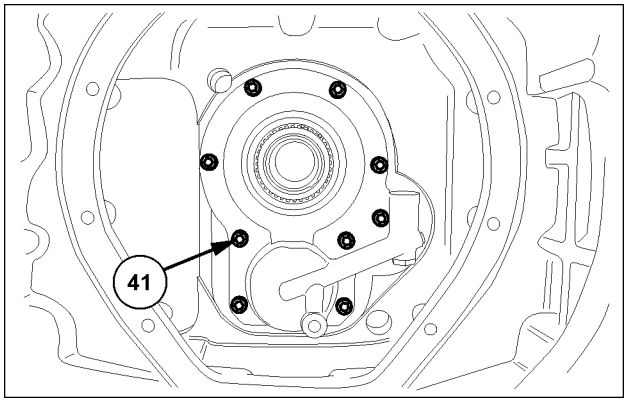
SS08G120 4

4. Insert the 'O' rings **(46)** and **(51)** and the seal ring **(53)** inside the cover. Spray the plugs **(47)** and **(50)** with **LOCTITE® 243** and screw them into the cover. Also spray the screw **(48)** with **LOCTITE® 243** and screw in together with the seal ring **(49)**.



SS08H027 5

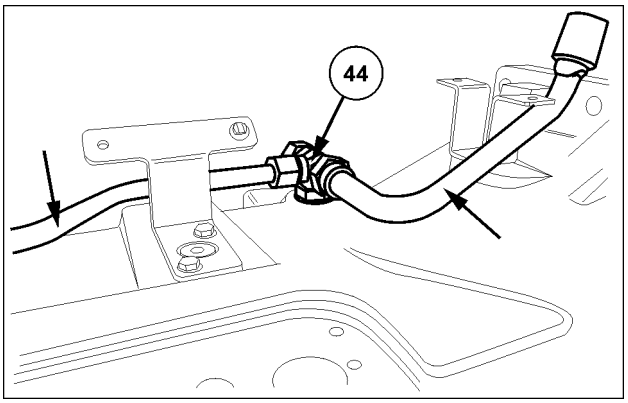
5. Fit the cover **(42)** with the dowel pins **(43)**. Insert the screws **(41)** and tighten to **48.5 Nm** (**35.8 lb ft**).



SS08G119 6

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6. Fit the oil feed **(44)** together with the seal rings **(45)** and **(54)** and the lines.



SS08G367 7

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Gear - Install (F2/R1 and F4/R2) (C.20.G) - (40 km/h ECO and 50 km/h gearbox)
Gear - Install (F2/R1) (C.20.G) - (35 km/h and 40 km/h gearbox)

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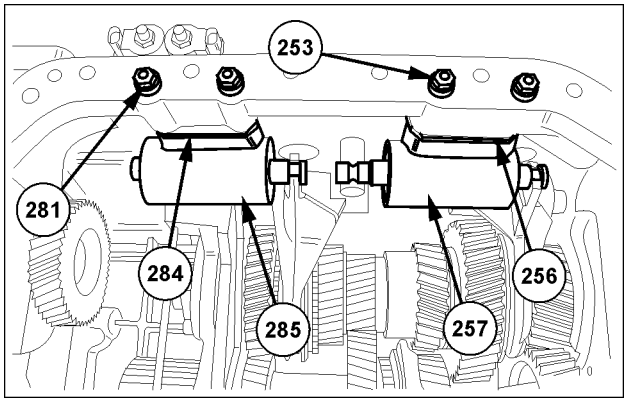
Shift cylinder - Remove

Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system) (C.20.G)

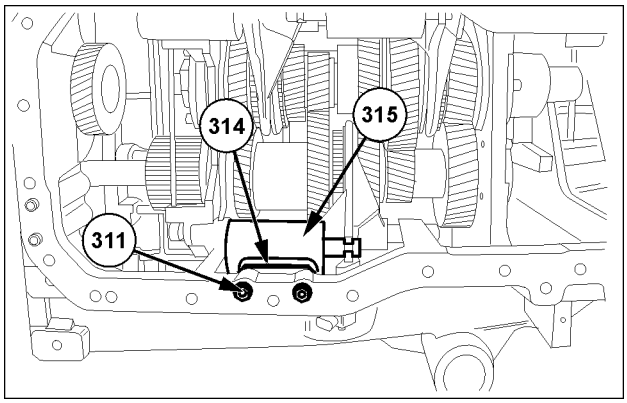
Prior operation:
Cover - Remove (Hydrostat) Transmission uninstalled (C.20.G)
Cover - Remove (Hydrostat) Transmission installed (C.20.G)
Hydrostat - Remove (C.20.G)

1. Unscrew and remove the pressure pipes **(253)** and **(281)**. Remove the shift cylinders **(257)** and **(285)** together with the separator plates **(256)** and **(284)**.



SS08G262 1

2. Unscrew and remove the pressure pipes **(311)**. Remove the shift cylinder **(315)** and the separator plate **(314)**.



SS08G263 2

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Shift cylinder - Install (C.20.G)
Fork and shift rail - Remove (C.20.G)

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Shift cylinder - Install

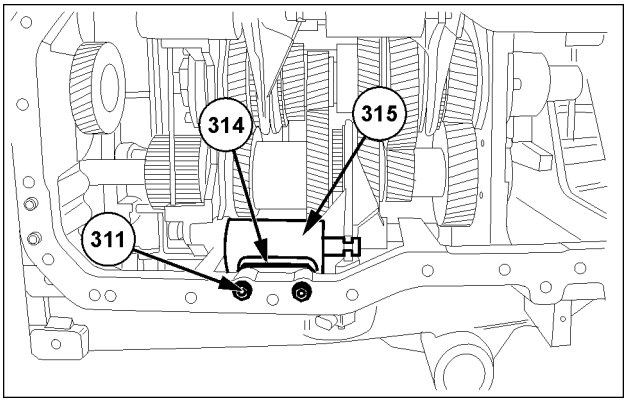
Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system) (C.20.G)

Prior operation:
Shift cylinder - Remove (C.20.G)
Fork and shift rail - Install (C.20.G)

NOTE: *All parts must be oiled before being fitted.*

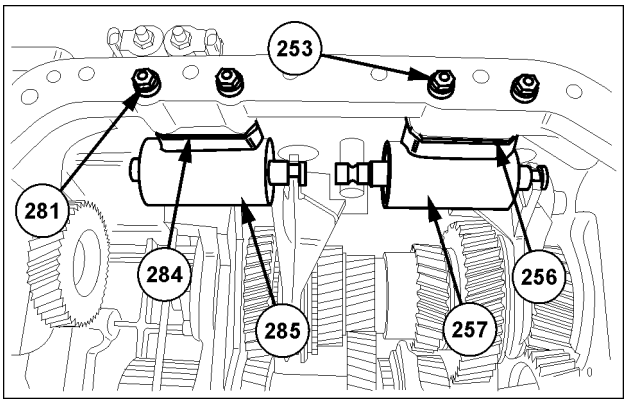
1. Insert the shift cylinder **(315)** and the separator plate **(314)**.
   Fit the pressure pipes **(311)** with new 'O' rings **(312)** and **(313)** and tighten to **80 - 100 Nm** (**59 - 73.8 lb ft**).



SS08G263 1

2. Insert the shift cylinders **(257)** and **(285)** together with the separator plates **(256)** and **(284)**. Fit the pressure pipes **(253)** with new 'O' rings **(254)** and **(255)**, and the pressure pipes **(281)** with new 'O' rings **(282)** and **(283)** and tighten to **80 - 100 Nm** (**59 - 73.8 lb ft**).

NOTE: *When fitting the shift cylinder* ***(257)*** *take care of the pin* ***(278)****.*



SS08G262 2

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Cover - Install (Hydrostat) Transmission uninstalled (C.20.G)
Cover - Install (Hydrostat) Transmission installed (C.20.G)
Summing planetary gear - Install (C.20.G)

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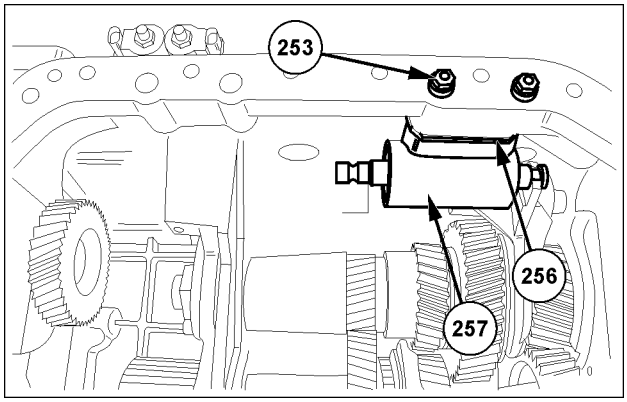
Shift cylinder - Remove

Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system) (C.20.G)

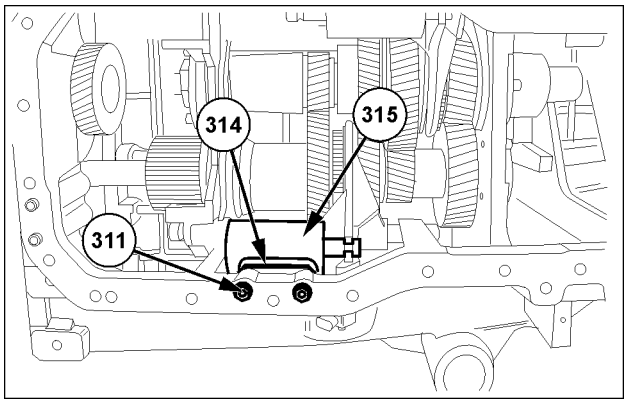
Prior operation:
Cover - Remove (Hydrostat) Transmission uninstalled (C.20.G)
Cover - Remove (Hydrostat) Transmission installed (C.20.G)
Hydrostat - Remove (C.20.G)

1. Unscrew and remove the pressure pipes **(253)**. Remove the shift cylinder **(257)** and the separator plate **(256)**.



SS08H053 1

2. Unscrew and remove the pressure pipes **(311)**. Remove the shift cylinder **(315)** and the separator plate **(314)**.



SS08H054 2

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Shift cylinder - Install (C.20.G)
Fork and shift rail - Remove (C.20.G)

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Shift cylinder - Install

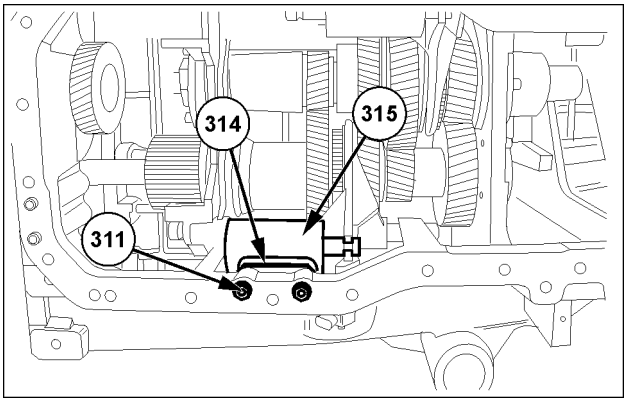
Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system) (C.20.G)

Prior operation:
Shift cylinder - Remove (C.20.G)
Fork and shift rail - Install (C.20.G)

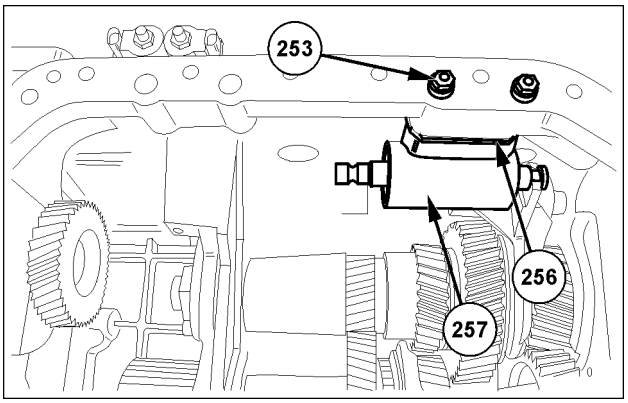
NOTE: *All parts must be oiled before being fitted.*

1. Insert the shift cylinder **(315)** and the separator plate **(314)**.
   Fit the pressure pipes **(311)** with new 'O' rings **(312)** and **(313)** and tighten to **80 - 100 Nm** (**59 - 73.8 lb ft**).



SS08H054 1

2. Insert the shift cylinder **(257)** and the separator plate **(256)**.
   Fit the pressure pipes **(253)** with new 'O' rings **(254)** and **(255)** and tighten to **80 - 100 Nm** (**59 - 73.8 lb ft**).



SS08H053 2

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Cover - Install (Hydrostat) Transmission uninstalled (C.20.G)
Cover - Install (Hydrostat) Transmission installed (C.20.G)
Summing planetary gear - Install (C.20.G)

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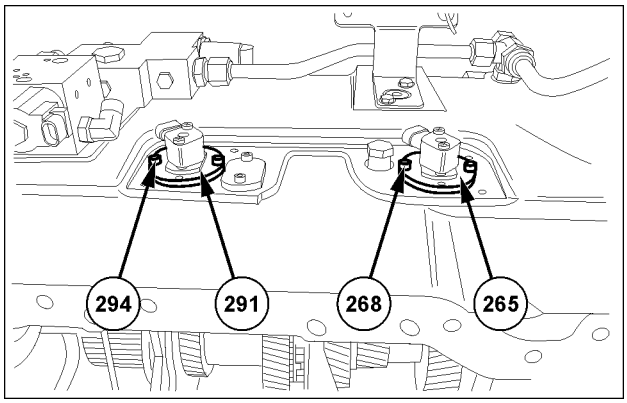
Fork and shift rail - Remove

Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system) (C.20.G)

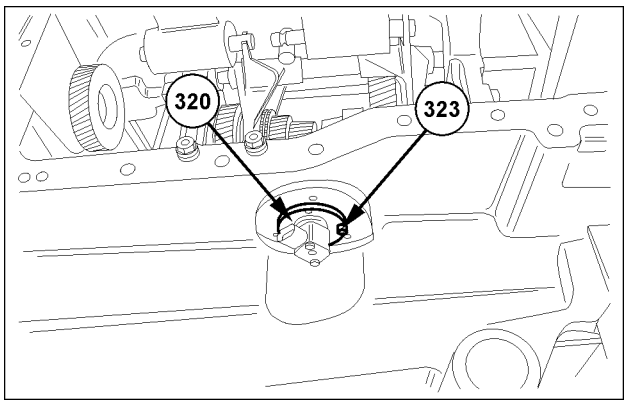
Prior operation:
Shift cylinder - Remove (C.20.G)

1. Remove screws **(268)** and **(294)**. Dismantle the potentiometer including flange **(265)** and **(291)** as well as actuator shafts **(270)** and **(289)**.



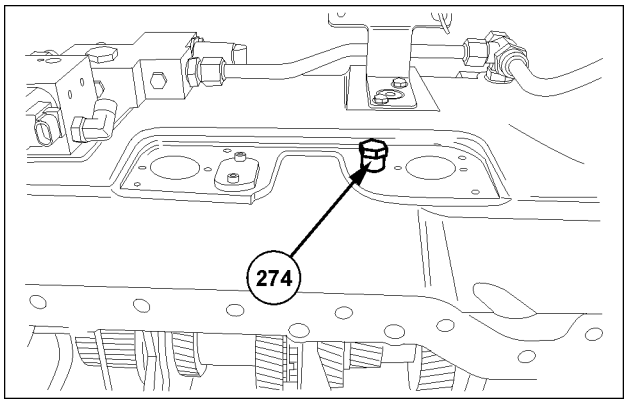
SS08H186 1

2. Dismantle the screws **(323)** and uninstall the potentiometer including flange **(320)** and actuator shaft **(318)**.



SS08G261 2

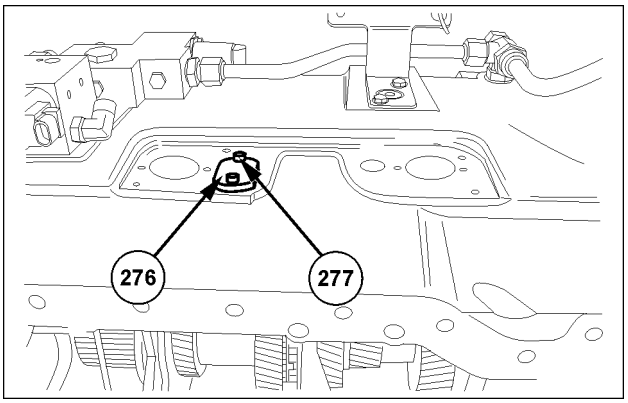
3. Remove the screw sleeve **(274)**, take out the spring **(272)** and the bolt **(271)**.



SS08G254 3

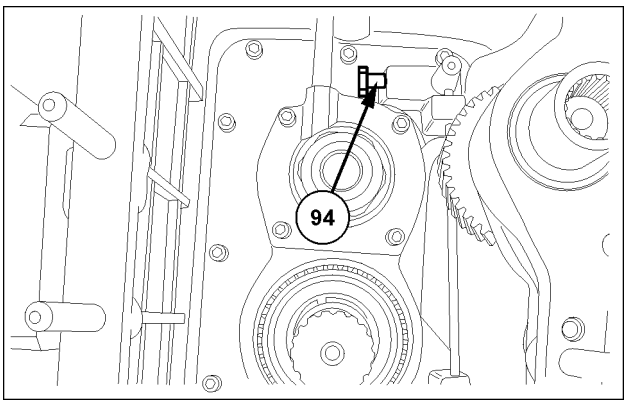
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4. Remove the screws **(277)**. Remove the bolt **(276)** together with the pin **(278)**.



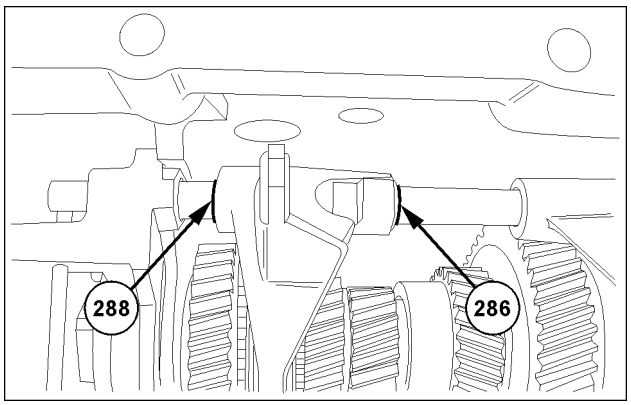
SS08H043 4

5. Loosen the screw sleeve **(94)** for locking the shift fork (F4/R2) and remove it together with the spring **(96)** and the bolt **(95)**.



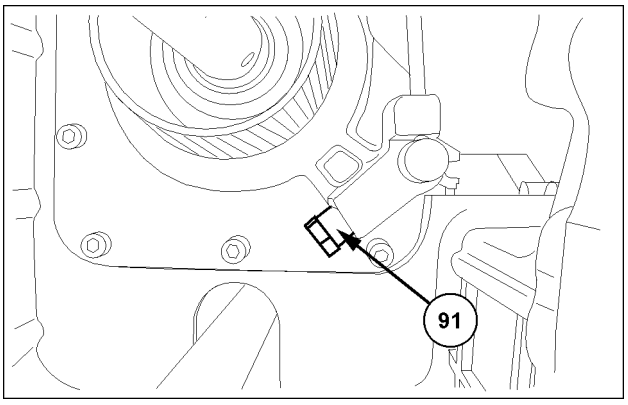
SS08G255 5

6. Remove the safety rings **(286)** and **(288)** on the shift fork (F4/R2). Pull out the shift rod **(302)** rearwards and remove the shift forks **(260)** and **(287)**.



SS08G256 6

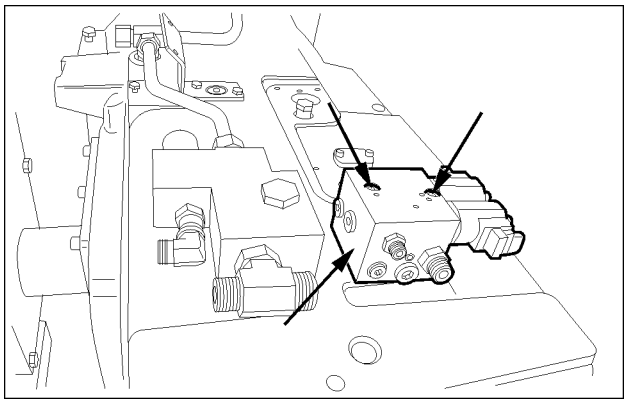
7. Remove the screw sleeve **(91)** on the shift rod (F2/R1) together with the spring **(90)** and the bolts **(92)**.



SS08G253 7

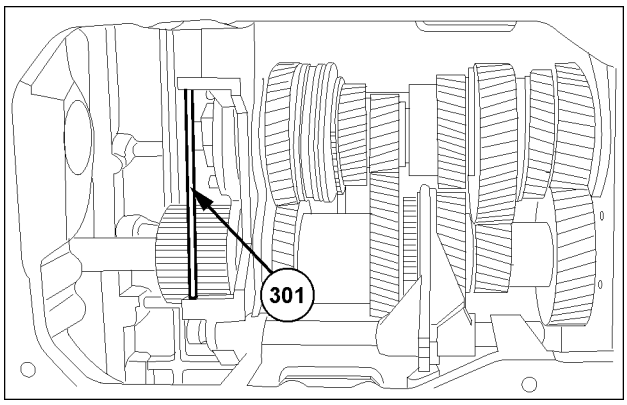
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8. Unscrew the screws and remove the valve block for the suspended front axle.



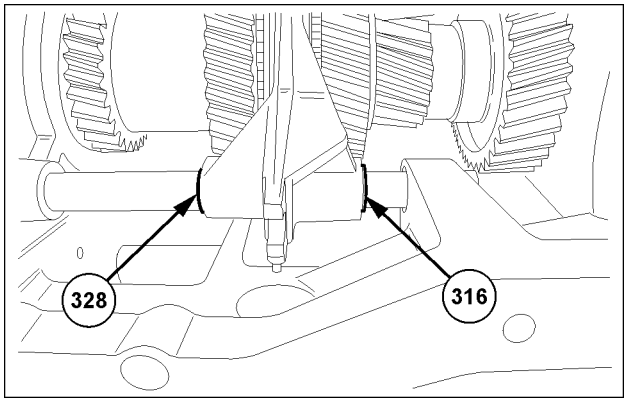
SS08H046 8

9. Pull out the ratch **(301)** in an upwards direction.



SS08G257 9

10. Remove the snap rings **(316)** and **(328)**. Dismantle the shift rod **(300)** and the shift fork (F2/R1).



SS08G258 10

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Fork and shift rail - Install (C.20.G)
Hydrostat Hydrostat drive - Remove (C.20.G)

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Fork and shift rail - Install

Puma 165 CVX 50 km/h gearbox, Puma 165 CVX 40 km/h ECO gearbox, Puma 180 CVX 50 km/h gearbox, Puma 180 CVX 40 km/h ECO gearbox, Puma 195 CVX 50 km/h gearbox, Puma 195 CVX 40 km/h ECO gearbox, Puma 210 CVX 50 km/h gearbox, Puma 210 CVX 40 km/h ECO gearbox, Puma 225 CVX 50 km/h gearbox, Puma 225 CVX 40 km/h ECO gearbox

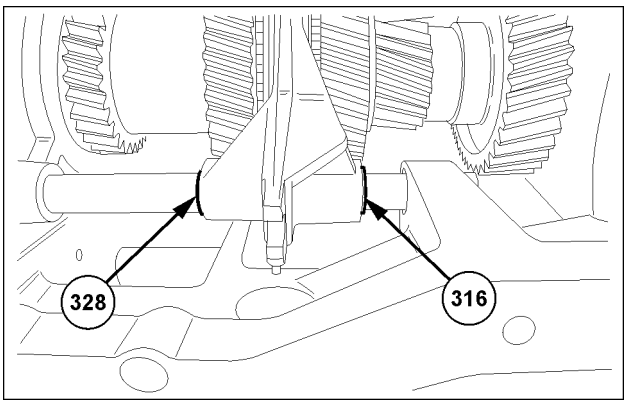
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system) (C.20.G)

Prior operation:
Fork and shift rail - Remove (C.20.G)
Hydrostat Hydrostat drive - Install (C.20.G)

NOTE: *All parts must be oiled before being fitted.*

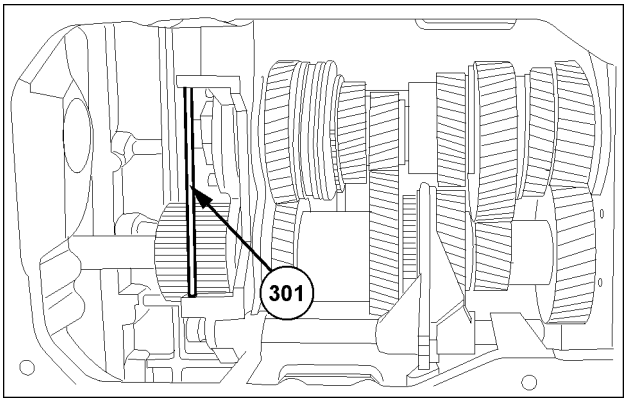
NOTE: *Replace the bearing bushes **(299)** and **(317)** as well as **(258)** and **(298)** if necessary.*

1. Fit the shift fork (F2/R1) together with the snap rings **(316)** and **(328)** onto the shift rod **(300)**. Insert the snap rings **(316)** and **(328)**.



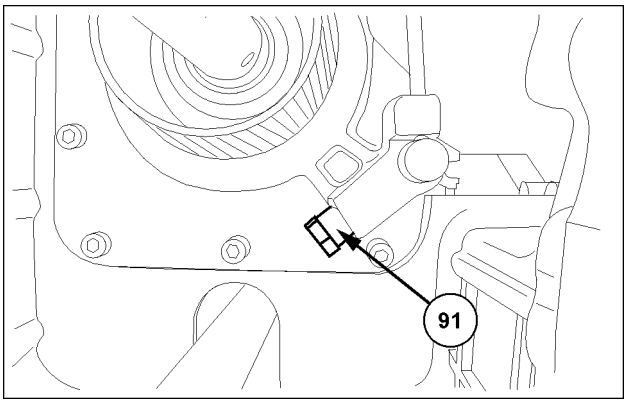
SS08G258 1

2. Insert the ratch **(301)** from above.



SS08G257 2

3. Fit the screw sleeve **(91)** onto the shift rod (F2/R1) with the spring **(90)** and the bolts **(92)** and tighten to **80 - 90 Nm** (**59 - 66.4 lb ft**).

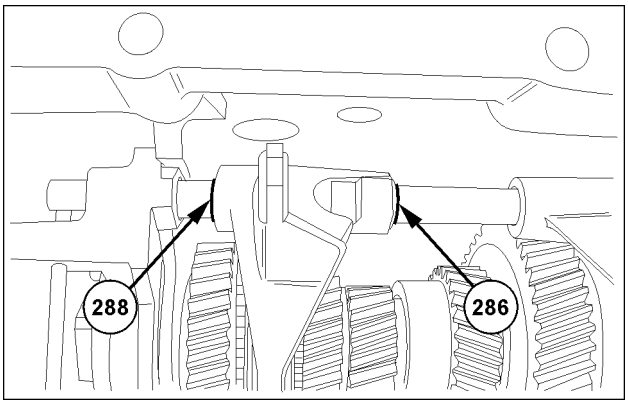


SS08G253 3

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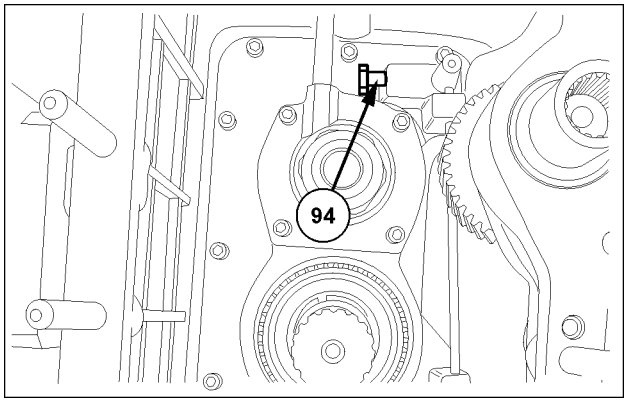
4. Insert the shift rod **(302)** from the rear and fit the shift forks **(260)** and **(287)** together with the snap rings **(286)** and **(288)**. Insert the snap rings **(286)** and **(288)** onto the shift fork (F4/R2).

NOTE: *Replace the bearing bushes **(259)** and **(261)** for the shift fork if necessary.*



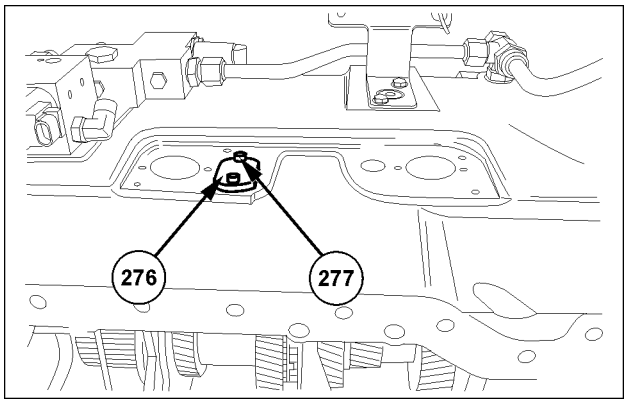
SS08G256 4

5. Fit the screw sleeve **(94)**, the spring **(96)** together with the bolts **(95)** and tighten to **80 - 90 Nm** (**59 - 66.4 lb ft**).



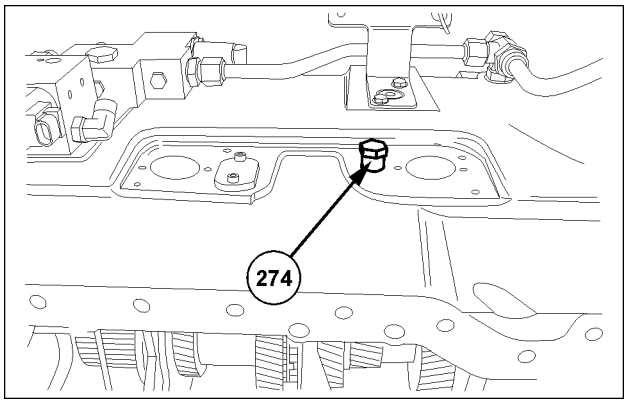
SS08G255 5

6. Fit the bolt **(276)** with a new 'O' ring **(275)** and pin **(278)**. Tighten the screws **(277)**.



SS08H043 6

7. Fit the screw sleeve **(274)** with a new 'O' ring **(273)**, the spring **(272)** and the bolt **(271)** and tighten to **80 - 90 Nm** (**59 - 66.4 lb ft**).

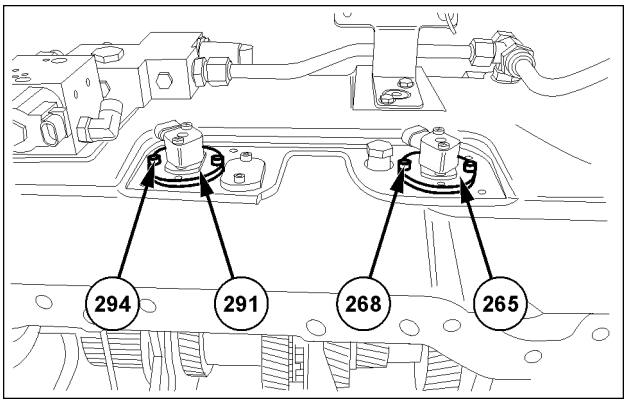


SS08G254 7

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8. Fit the potentiometer together with the flanges **(265)** and **(291)**, new 'O' rings **(264)** and **(295)** and the actuation shafts **(270)** and **(289)**. Fit and tighten the screws **(268)** and **(294)**.

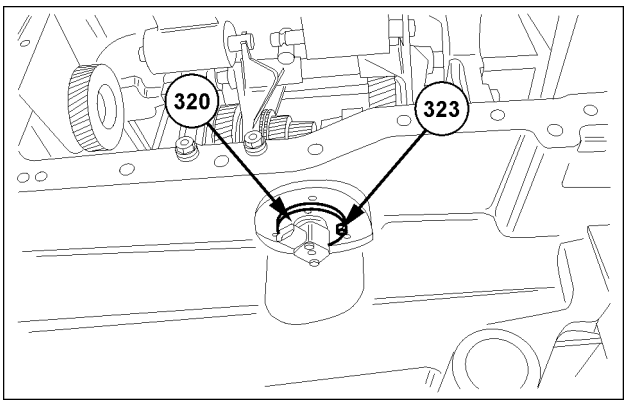
NOTE: *Install the potentiometer and the flange in the correct position - see Figure **8**.*



SS08H186 8

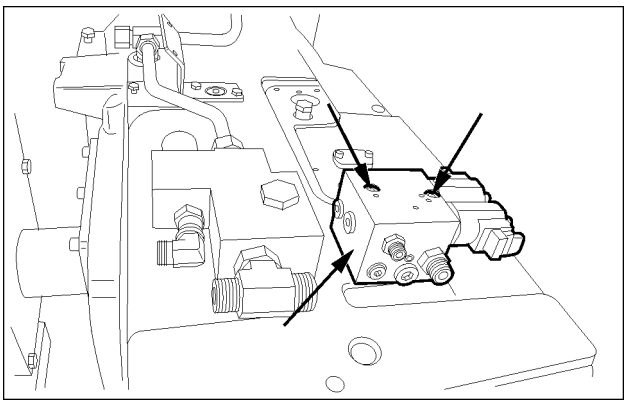
9. Fit the potentiometer together with the flange **(320)**, a new 'O' ring **(324)** and the actuation shaft **(318)**. Fit and tighten the screws **(318)**.

NOTE: *Install the potentiometer and the flange in the correct position - see Figure **9**.*



SS08G261 9

10. Fit the valve block for the suspended front axle together with a new 'O' ring. Insert the screws and tighten.



SS08H046 10

NOTE: *After the vehicle has been completely set up it must be calibrated - see **TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)**.*

Next operation:
Shift cylinder - Install (C.20.G)

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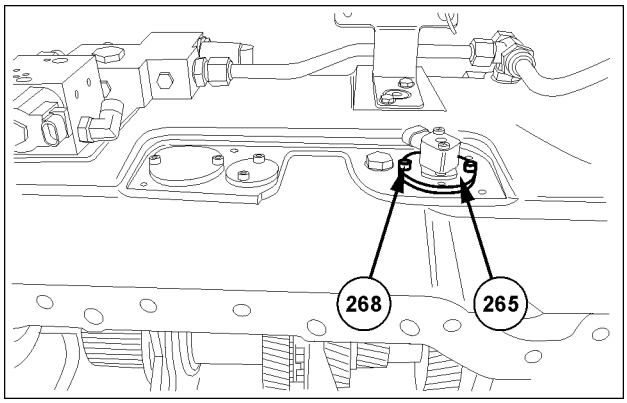
Fork and shift rail - Remove

Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system) (C.20.G)

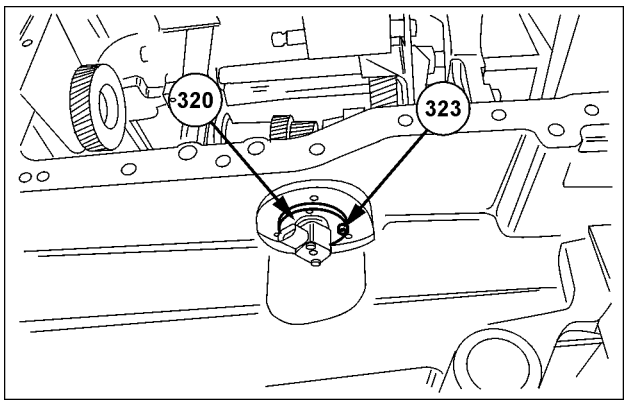
Prior operation:
Shift cylinder - Remove (C.20.G)

1. Dismantle the screws **(268)** and uninstall the potentiometer including flange **(265)** and actuator shaft **(270)**.



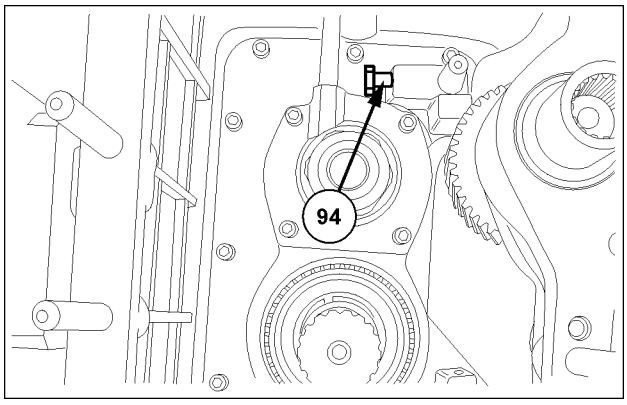
SS08H041 1

2. Dismantle the screws **(323)** and uninstall the potentiometer including flange **(320)** and actuator shaft **(318)**.



SS08H042 2

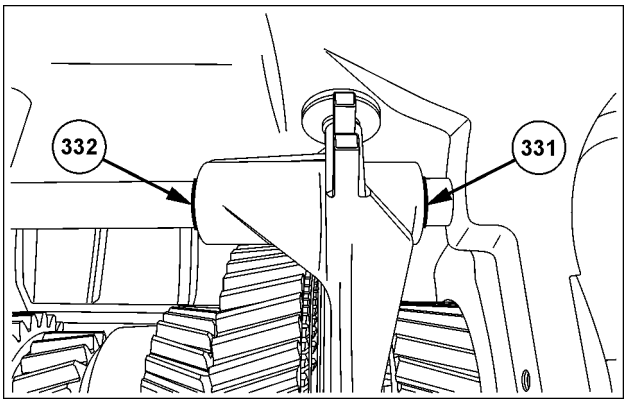
3. Unscrew the screw sleeve **(94)** for locking the shift fork (F4/R2) and remove it together with the spring **(96)** and the bolt **(95)**.



SS08H044 3

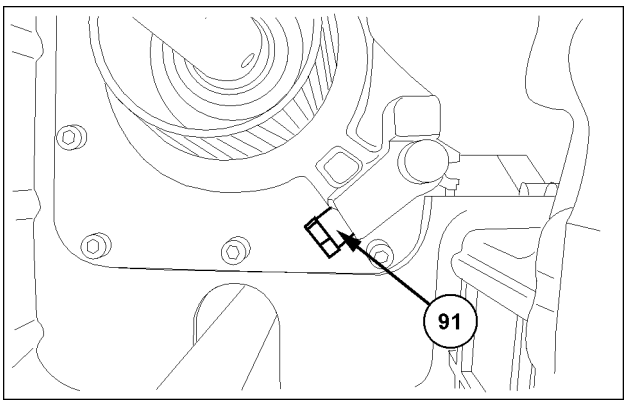
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4. Remove the safety rings **(331)** and **(332)** on the shift fork (F1/F3). Pull out the shift rod **(302)** rearwards and remove the shift fork **(260)**.



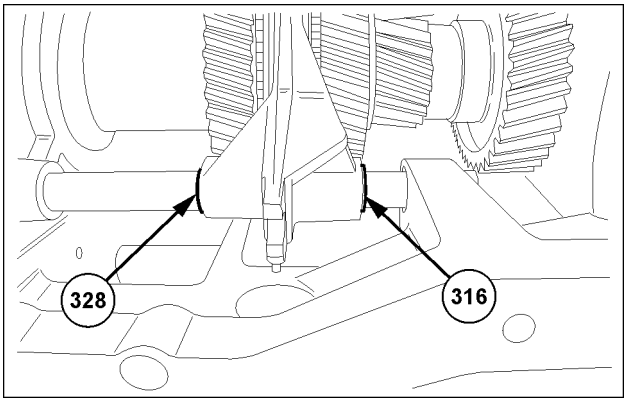
SS08K485 4

5. Remove the screw sleeve **(91)** on the shift rod (F2/R1) together with the spring **(90)** and the bolts **(92)**.



SS08H045 5

6. Remove the snap rings **(316)** and **(328)**. Dismantle the shift rod **(300)** and the shift fork (F2/R1).



SS08H047 6

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

Next operation:
Fork and shift rail - Install (C.20.G)
Hydrostat Hydrostat drive - Remove (C.20.G)

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Fork and shift rail - Install

Puma 165 CVX 40 km/h gearbox, Puma 165 CVX 35 km/h gearbox, Puma 180 CVX 40 km/h gearbox, Puma 180 CVX 35 km/h gearbox, Puma 195 CVX 40 km/h gearbox, Puma 195 CVX 35 km/h gearbox, Puma 210 CVX 40 km/h gearbox, Puma 210 CVX 35 km/h gearbox, Puma 225 CVX 40 km/h gearbox, Puma 225 CVX 35 km/h gearbox

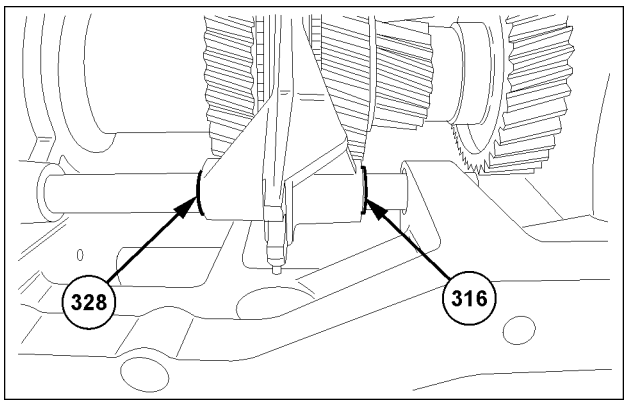
TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system) (C.20.G)

Prior operation:
Fork and shift rail - Remove (C.20.G)
Hydrostat Hydrostat drive - Install (C.20.G)

NOTE: *All parts must be oiled before being fitted.*

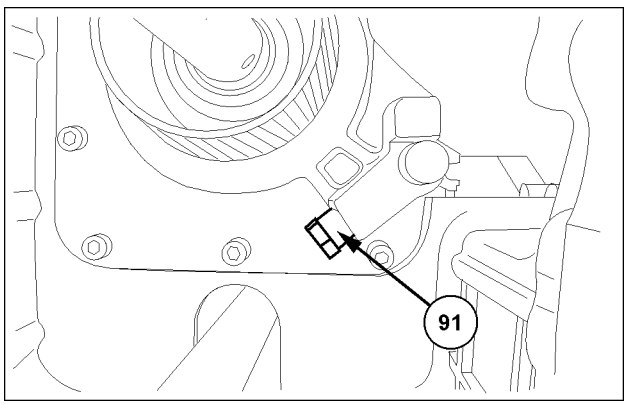
NOTE: *Replace the bearing bushes **(299)** and **(317)** as well as **(258)** and **(298)** if necessary.*

1. Fit the shift fork (F2/R1) together with the snap rings **(316)** and **(328)** onto the shift rod **(300)**. Insert the snap rings **(316)** and **(328)**.



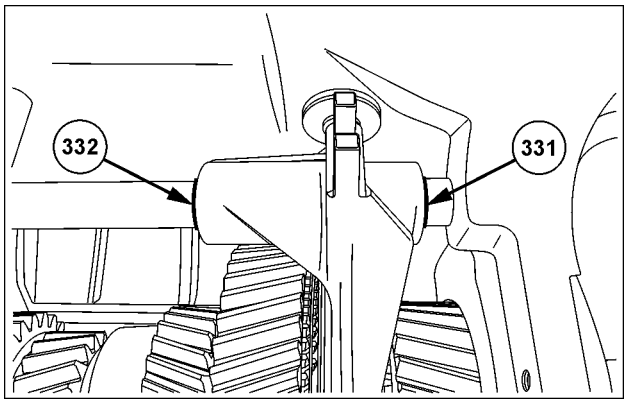
SS08H047 1

2. Fit the screw sleeve **(91)** onto the shift rod (F2/R1) with the spring **(90)** and the bolts **(92)** and tighten to **80 - 90 Nm** (**59 - 66.4 lb ft**).



SS08H045 2

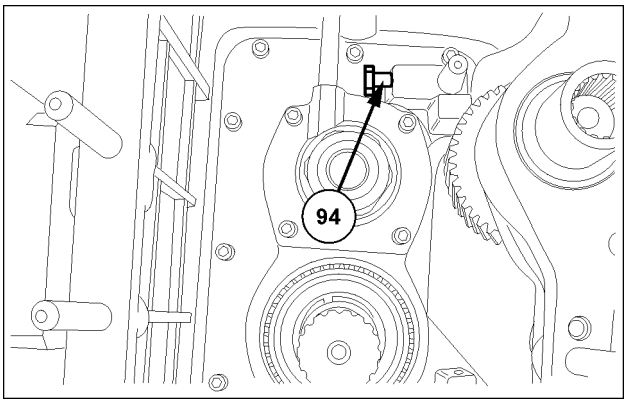
3. Insert the shift rod **(302)** from the rear and fit the shift fork **(260)** together with the snap rings **(331)** and **(332)**. Insert the snap rings **(331)** and **(332)** onto the shift fork (F1/F3).



SS08K485 3

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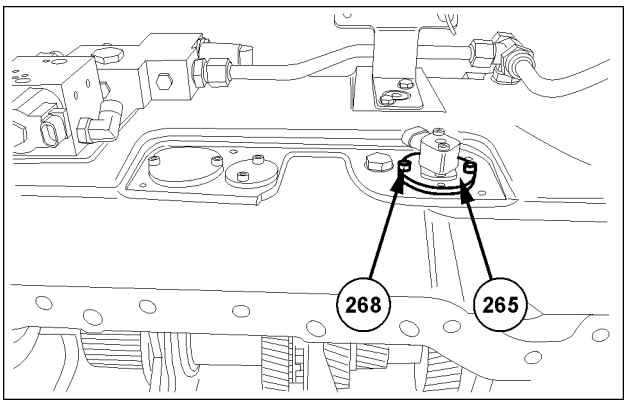
4. Fit the screw sleeve **(94)**, the spring **(96)** together with the bolts **(95)** and tighten to **80 - 90 Nm** (**59 - 66.4 lb ft**).



SS08H044 4

5. Fit the potentiometer together with the flange **(265)**, a new 'O' ring **(264)** and the actuation shaft **(270)**. Fit and tighten the screws **(268)**.

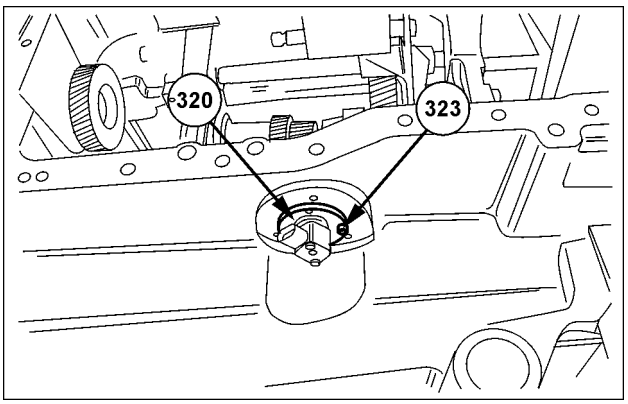
NOTE: *Install the potentiometer and the flange in the correct position - see Figure **5**.*



SS08H041 5

6. Fit the potentiometer together with the flange **(320)**, a new 'O' ring **(324)** and the actuation shaft **(318)**. Fit and tighten the screws **(323)**.

NOTE: *Install the potentiometer and the flange in the correct position - see Figure **6**.*



SS08H042 6

NOTE: *After the vehicle has been completely set up it must be calibrated - see **TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)**.*

Next operation:
Shift cylinder - Install (C.20.G)

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Housing - Remove

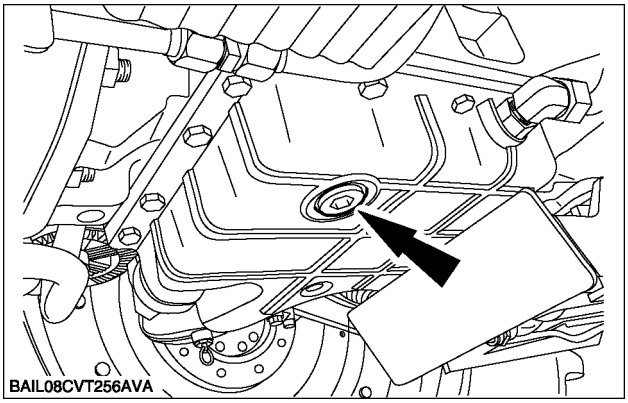
⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

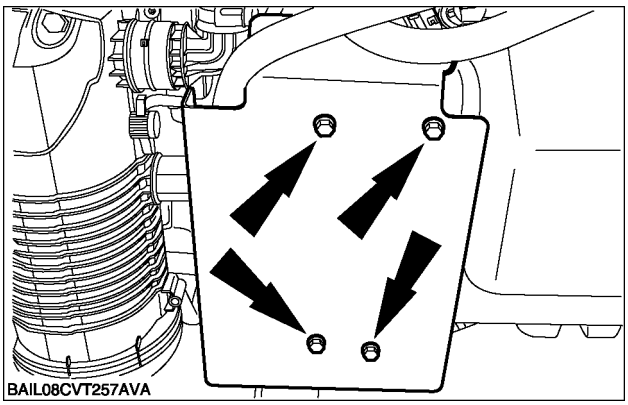
Prior operation:
Remove the cab, for further information refer to **USER PLATFORM - Remove (E.34.A)**
Prior operation:
Remove the fuel tanks, for further information refer to **Fuel tank - Remove (B.20.A)**

1. Remove the transmission housing drain plug and drain the transmission oil into a suitable container. Reinstall the drain plug and tighten to **68 - 82 Nm** (**50 - 60 lbft**).



BAIL08CVT256AVA 1

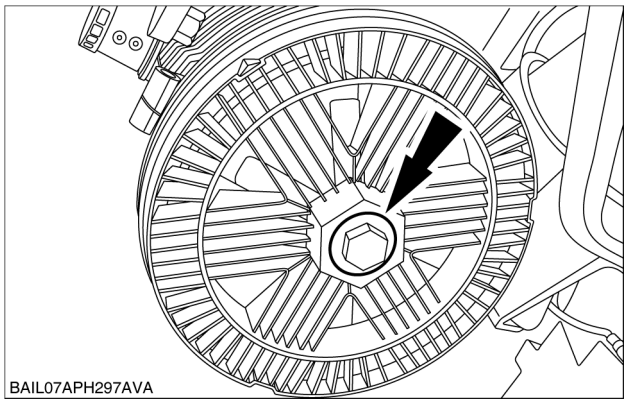
2. Remove the transmission solenoid shield.



BAIL08CVT257AVA 2

3. Remove the hydraulic oil pump filter housing drain plug.

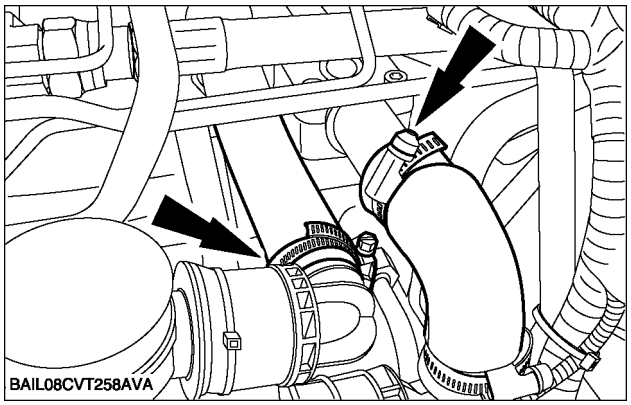
NOTE: *Place a suitable container under the oil filter housing to collect the hydraulic oil.*



BAIL07APH297AVA 3

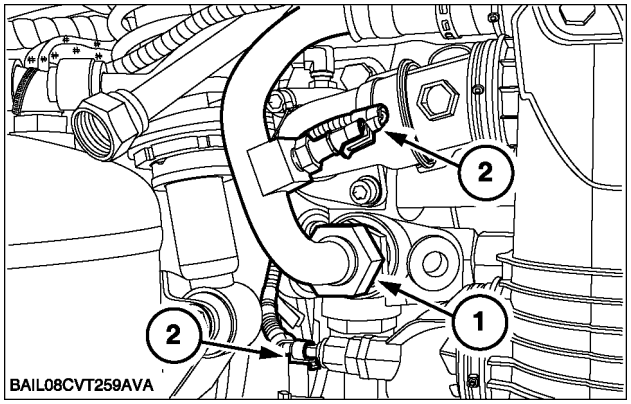
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4. Disconnect the hydraulic oil pipes from the hydraulic oil pump and hydraulic oil pump filter housing.



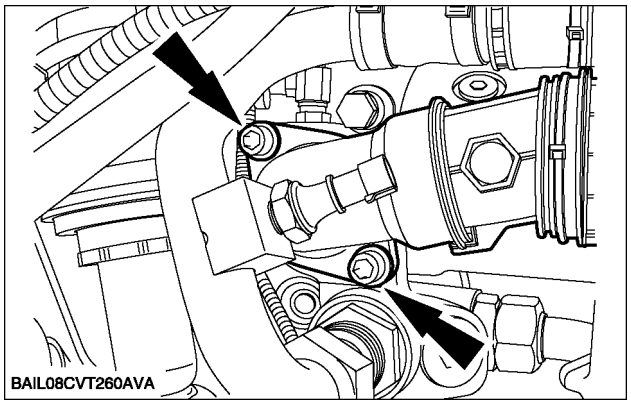
BAIL08CVT258AVA 4

5. Disconnect the hydraulic charge pipe **(1)**.
Disconnect the electrical connectors **(2)**.



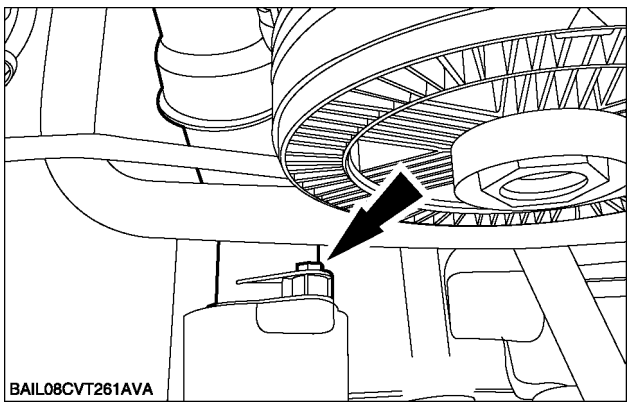
BAIL08CVT259AVA 5

6. Disconnect the hydraulic pipe.



BAIL08CVT260AVA 6

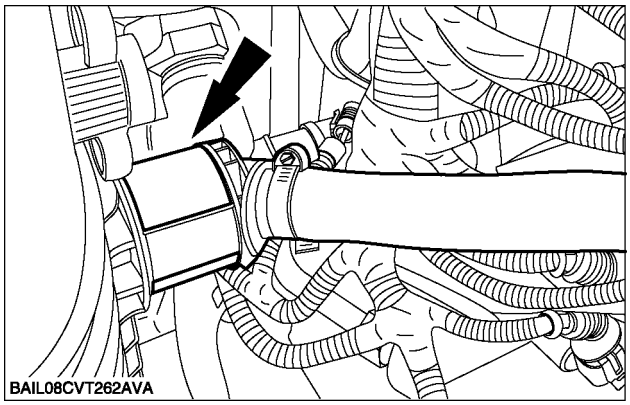
7. Remove the retaining bolt from the rear axle housing.



BAIL08CVT261AVA 7

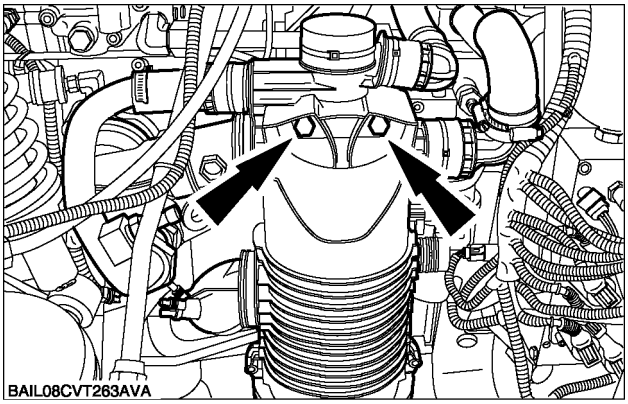
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8. Disconnect the mid mounted EHR hydraulic hose (if fitted).



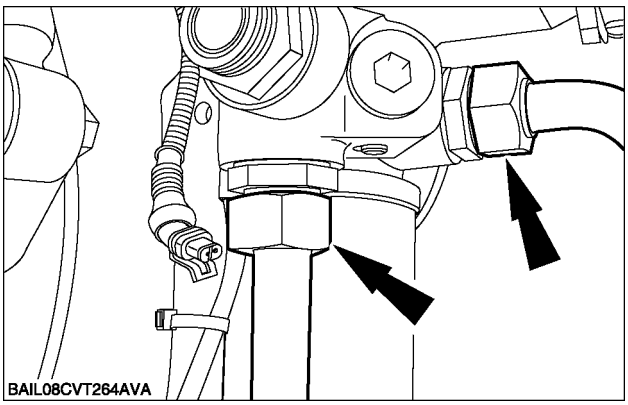
BAIL08CVT262AVA 8

9. Remove the hydraulic oil pump filter housing.



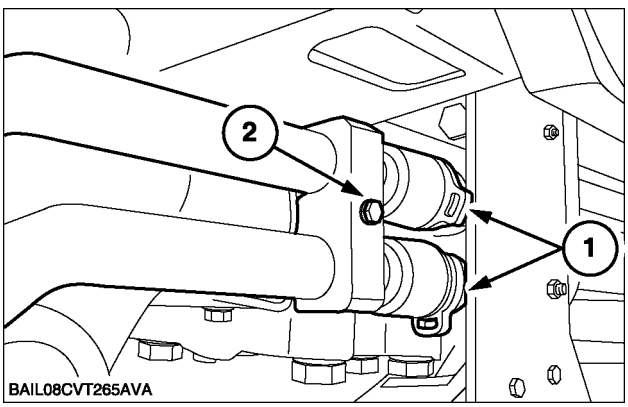
BAIL08CVT263AVA 9

10. Disconnect the oil cooler supply and return pipes from the filter housing.



BAIL08CVT264AVA 10

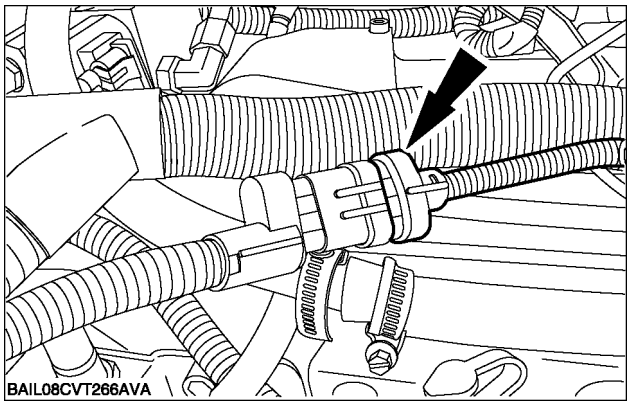
11. Disconnect the oil cooler pipe quick release connectors **(1)**.
Remove the oil cooler pipe bracket **(2)** and remove the oil cooler pipes.



BAIL08CVT265AVA 11

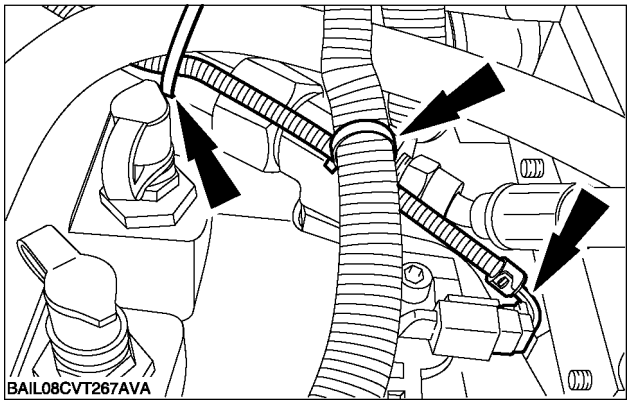
www.truck-freeworkshop.com

12. Disconnect the mid mount electrical connector (if fitted).



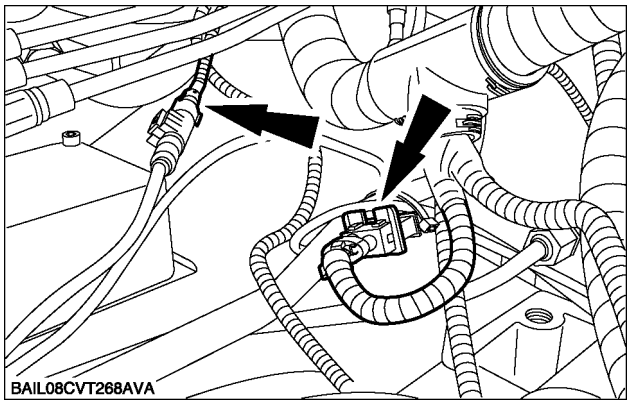
BAIL08CVT266AVA 12

13. Disconnect the electrical connector on top of the hydrostat housing and cut the cable ties.



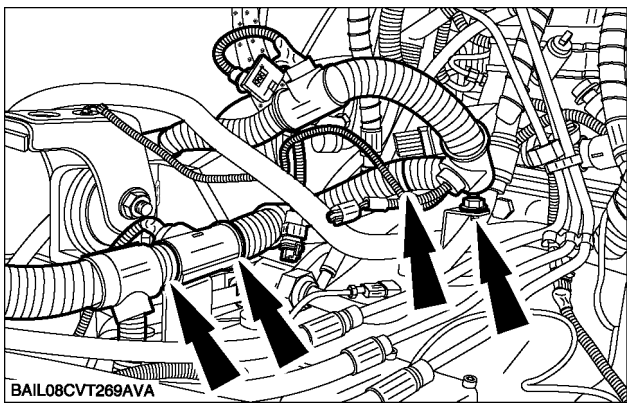
BAIL08CVT267AVA 13

14. Disconnect the torque sensor and ring speed electrical connectors.



BAIL08CVT268AVA 14

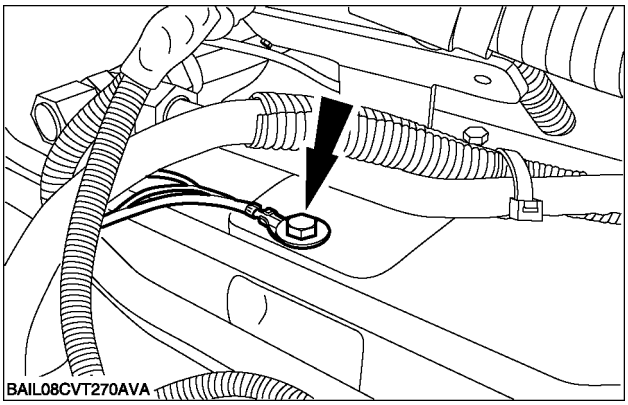
15. Detach the wiring loom fir tree clips.



BAIL08CVT269AVA 15

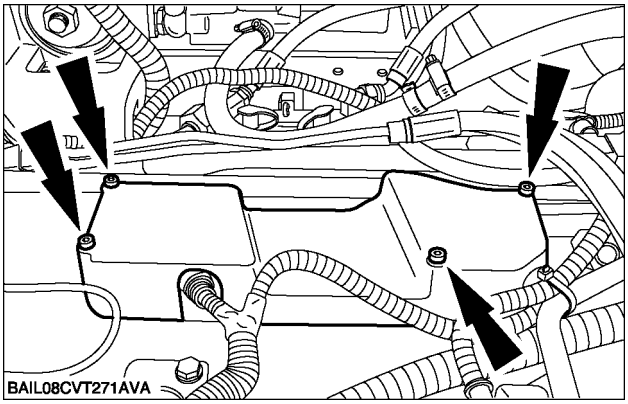
www.truck-freeworkshop.com

16. Disconnect the ground connectors.



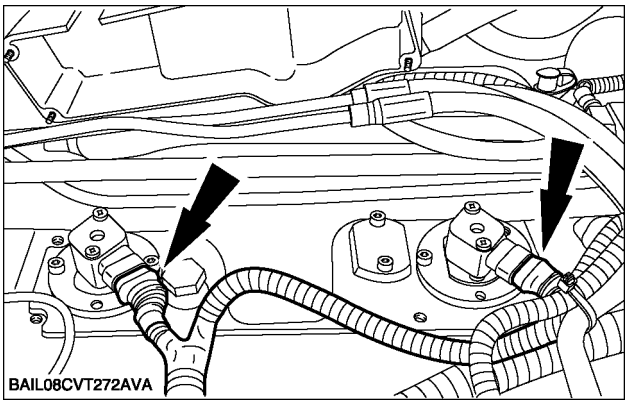
BAIL08CVT270AVA 16

17. Remove the synchroniser cover.



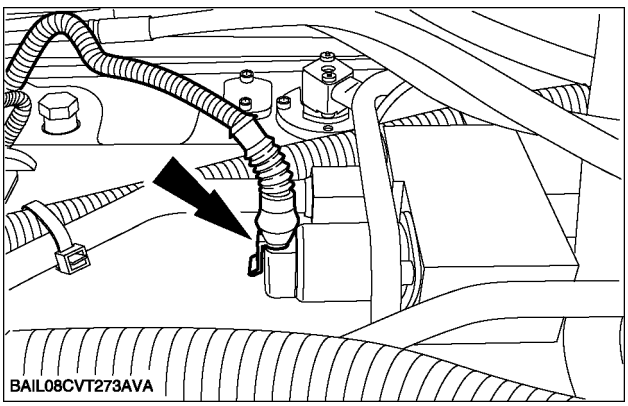
BAIL08CVT271AVA 17

18. Disconnect the synchroniser electrical connectors.



BAIL08CVT272AVA 18

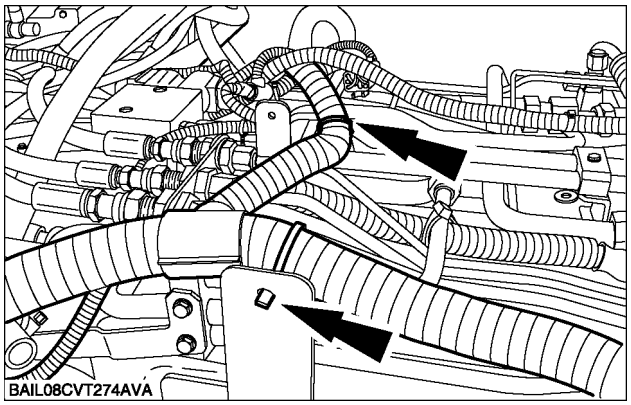
19. Disconnect the brake lubrication solenoid electrical connector.



BAIL08CVT273AVA 19

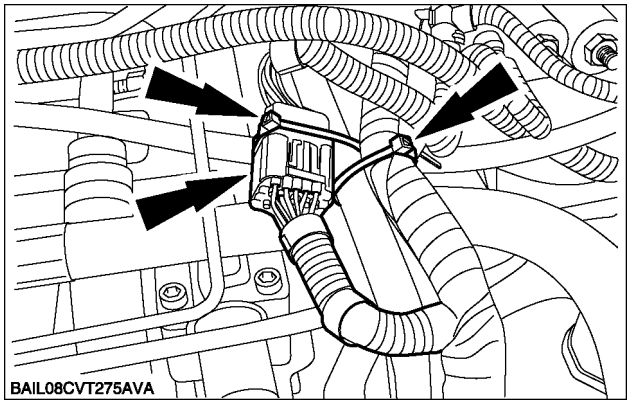
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20. Detach the wiring loom.



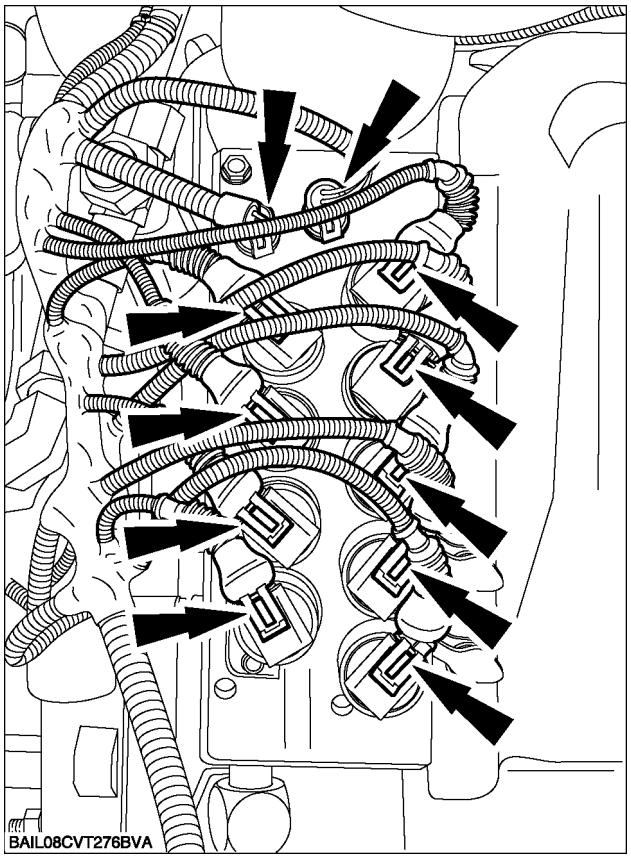
BAIL08CVT274AVA 20

21. Disconnect the SFA valve electrical connector and cut the cable ties.



BAIL08CVT275AVA 21

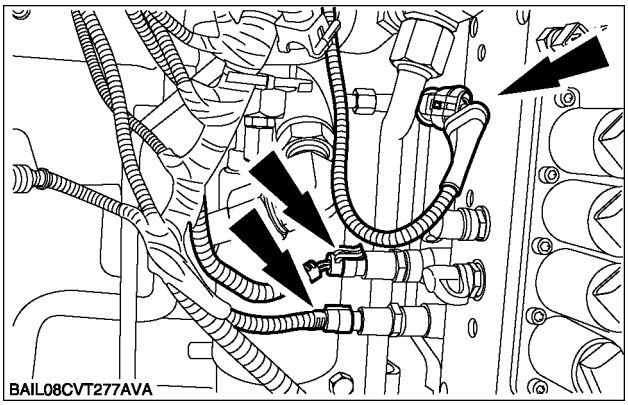
22. Disconnect the transmission solenoid electrical connectors.



BAIL08CVT276BVA 22

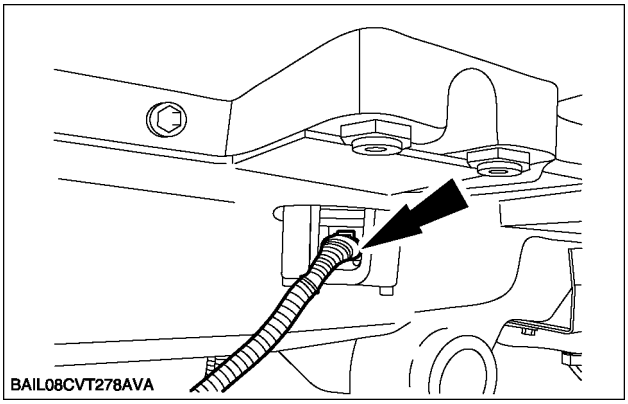
www.truck-freeworkshop.com

23. Disconnect the vane pump pressure sender, the brake pressure sender and the filter pressure switch electrical connectors.



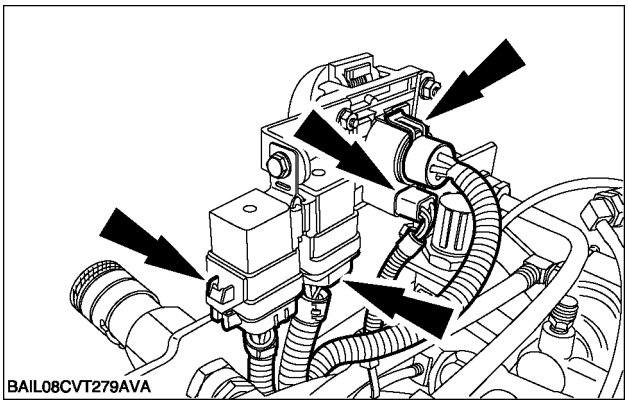
BAIL08CVT277AVA 23

24. Disconnect the F2 - R1 synchroniser electrical connector.



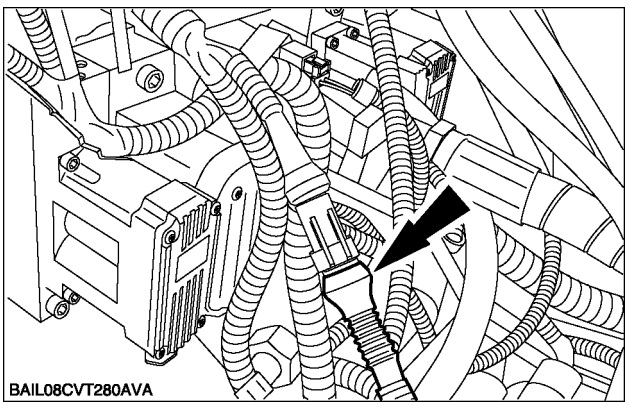
BAIL08CVT278AVA 24

25. Disconnect the trailer brake electrical connectors.



BAIL08CVT279AVA 25

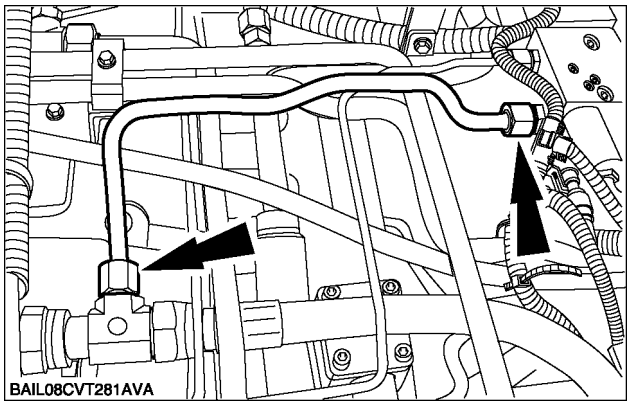
26. Disconnect the ISO electrical connector.



BAIL08CVT280AVA 26

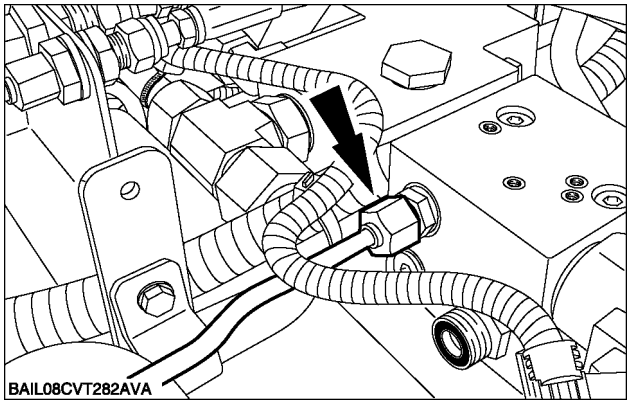
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27. Disconnect the front suspension hydraulic supply pipe.



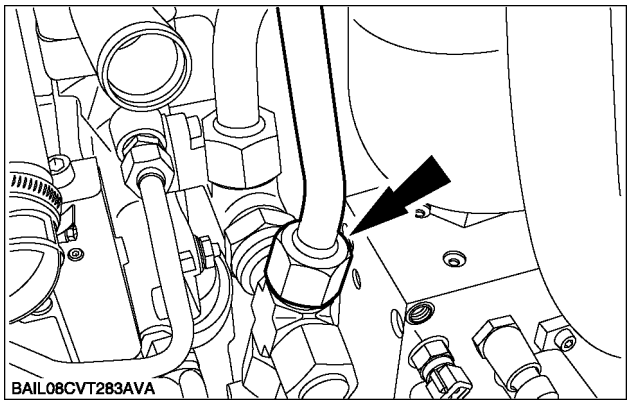
BAIL08CVT281AVA 27

28. Disconnect the brake line.



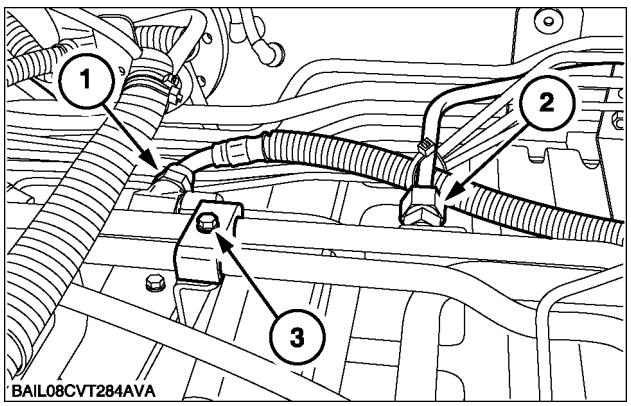
BAIL08CVT282AVA 28

29. Disconnect the vane pump outlet pipe.



BAIL08CVT283AVA 29

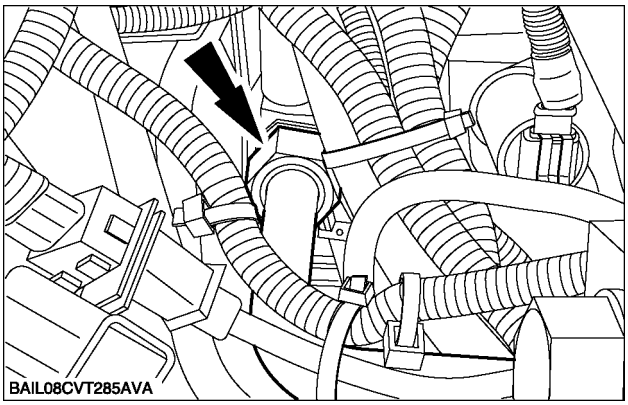
30. Disconnect the vane pump T piece **(1)**.
Disconnect the brake supply pipe **(2)**.
Remove the pipe clamp **(3)**.



BAIL08CVT284AVA 30

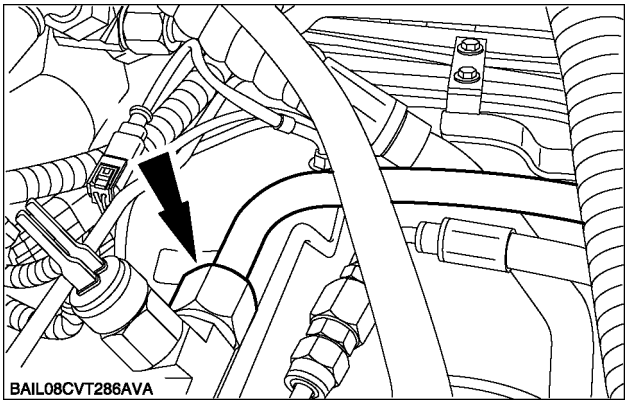
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31. Disconnect the pipe from the low pressure valve block.



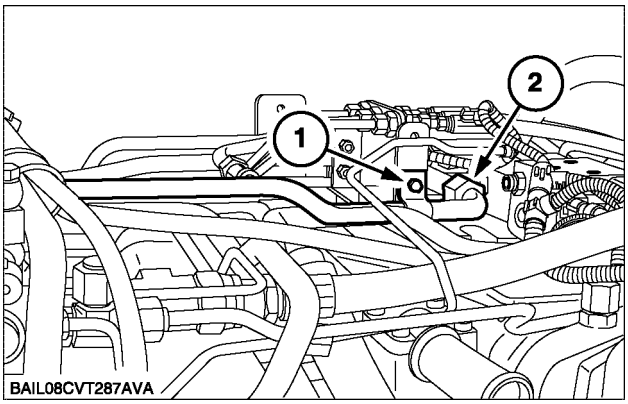
BAIL08CVT285AVA 31

32. Remove the steering pipe.



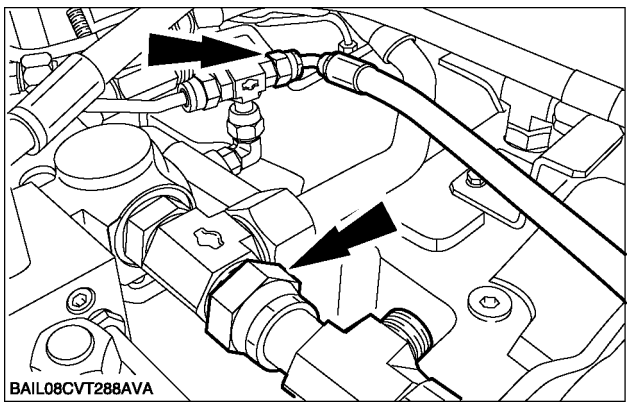
BAIL08CVT286AVA 32

33. Remove the bracket **(1)** and remove the steering hydraulic pipe.



BAIL08CVT287AVA 33

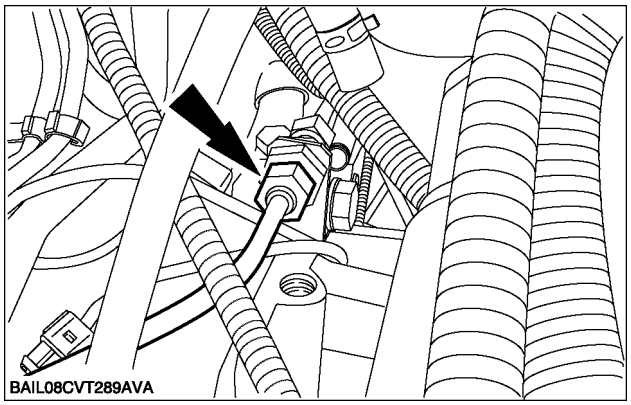
34. Disconnect the mid mount hydraulic supply pipe and load sensing line (if fitted).



BAIL08CVT288AVA 34

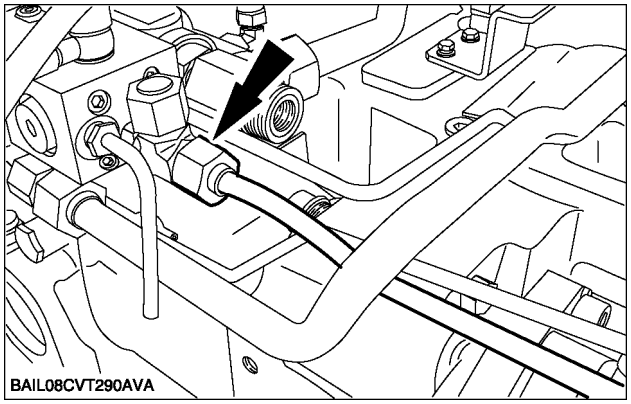
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35. Disconnect the front brake supply pipe.



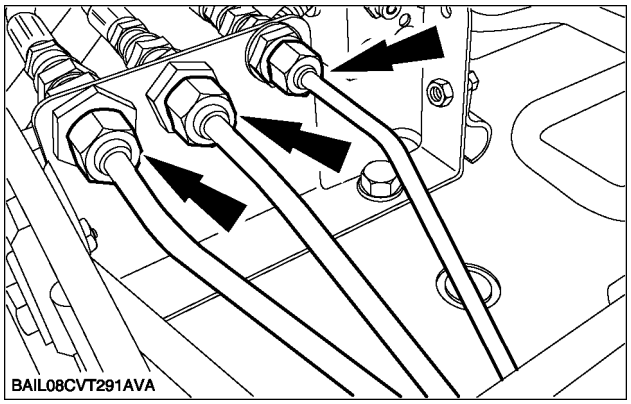
BAIL08CVT289AVA 35

36. Remove the front brake supply pipe.



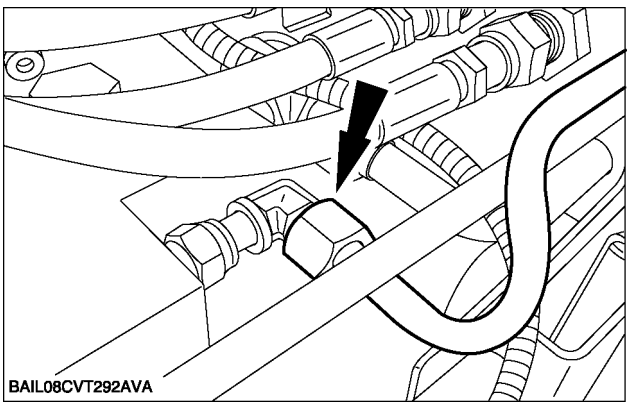
BAIL08CVT290AVA 36

37. Disconnect the brake pipes.



BAIL08CVT291AVA 37

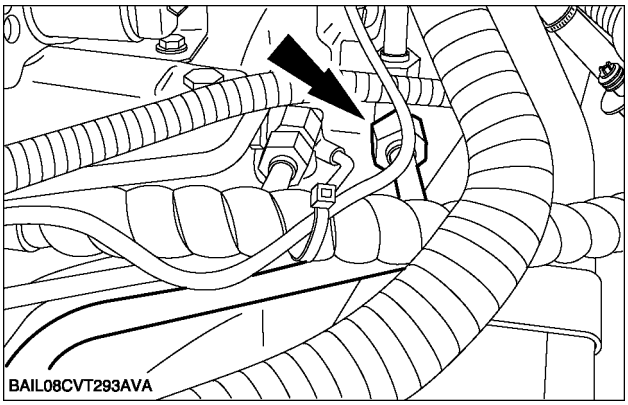
38. Disconnect the brake lubrication supply pipe from the solenoid block.



BAIL08CVT292AVA 38

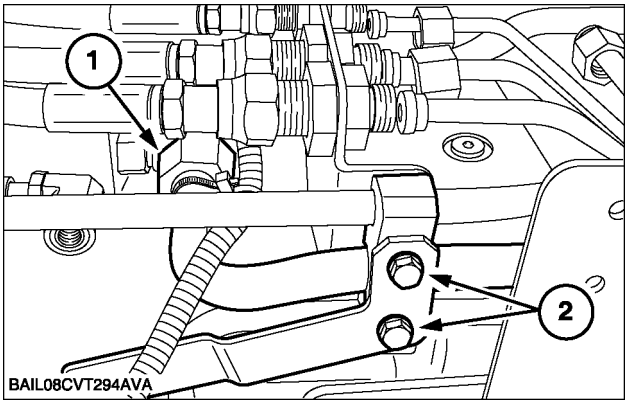
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39. Remove the brake lubrication supply pipe.



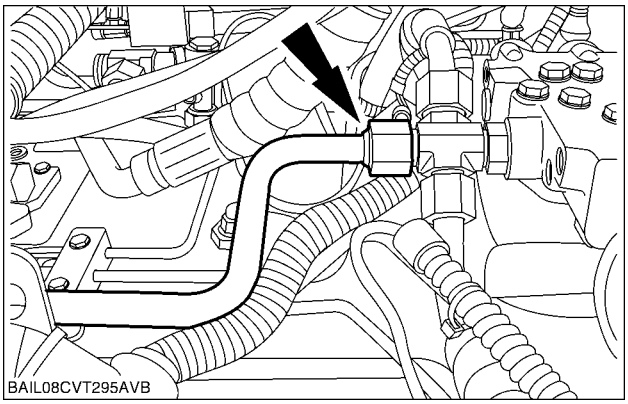
BAIL08CVT293AVA 39

40. Disconnect the EDC low pressure pipe from the valve block **(1)** and remove the pipe bracket **(2)**.



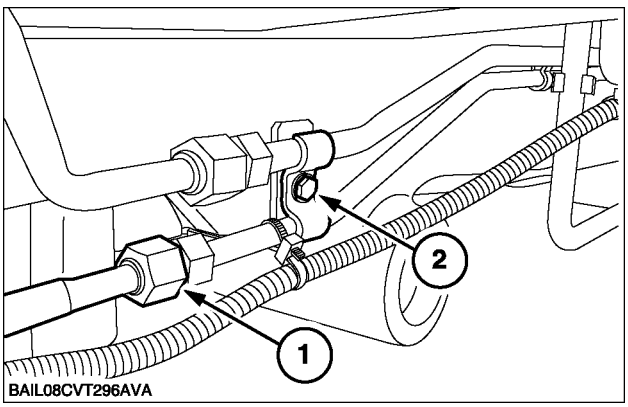
BAIL08CVT294AVA 40

41. Remove the EDC low pressure pipe.



BAIL08CVT295AVB 41

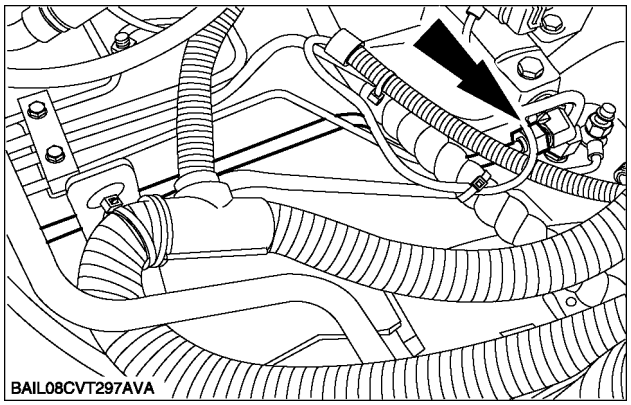
42. Disconnect the diff lock supply pipe **(1)** and remove the bracket **(2)**.



BAIL08CVT296AVA 42

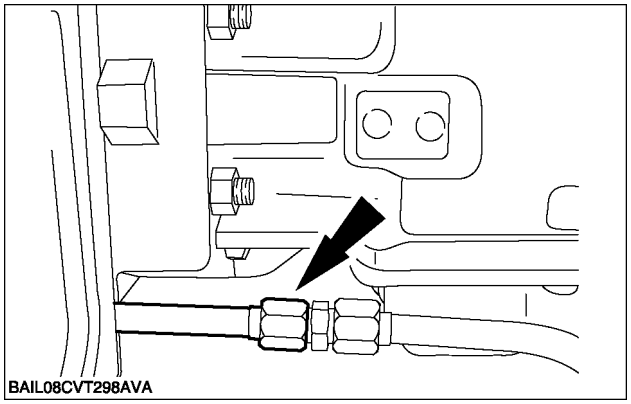
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43. Remove the diff lock pipe.



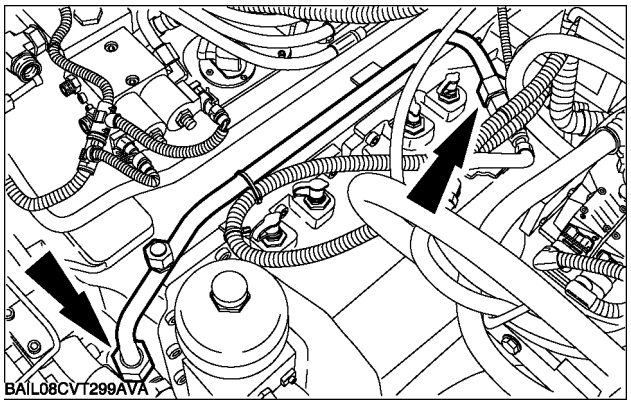
BAIL08CVT297AVA 43

44. Disconnect the pneumatic brake supply pipe.



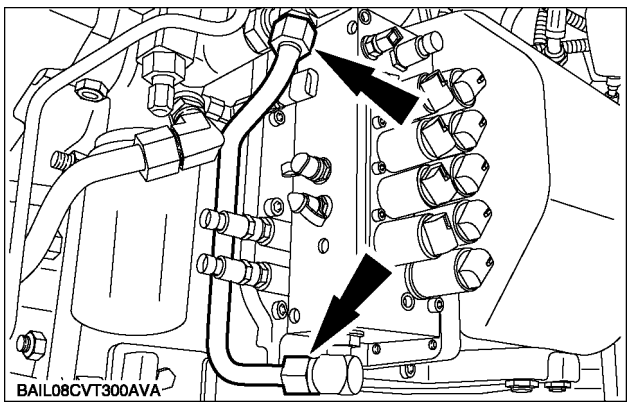
BAIL08CVT298AVA 44

45. Remove the hydrostat low pressure supply pipe.



BAIL08CVT299AVA 45

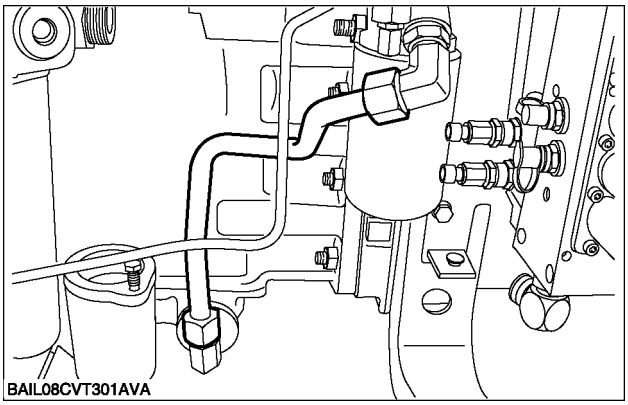
46. Remove the transmission solenoid block low pressure supply pipe.



BAIL08CVT300AVA 46

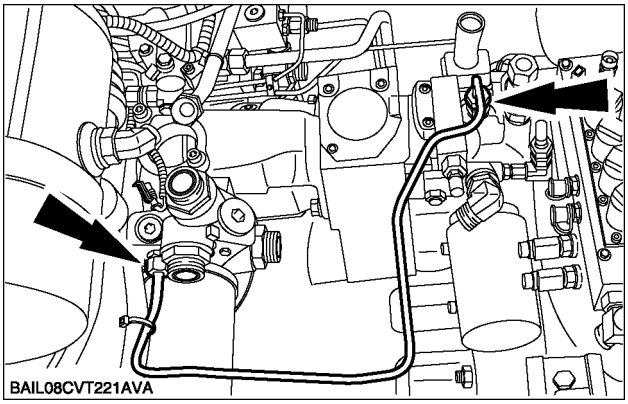
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47. Remove the vane pump supply pipe.



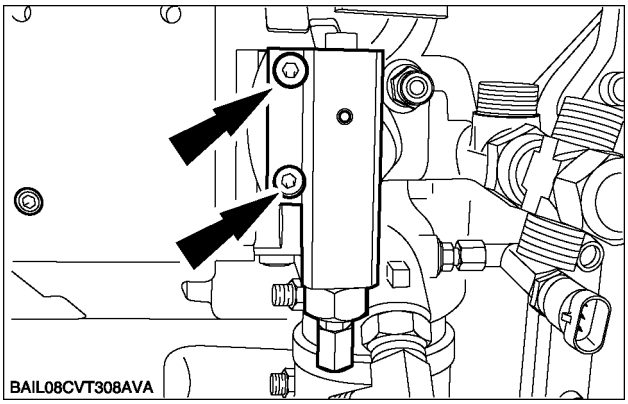
BAIL08CVT301AVA 47

48. Remove the charge pump hydraulic pipe.



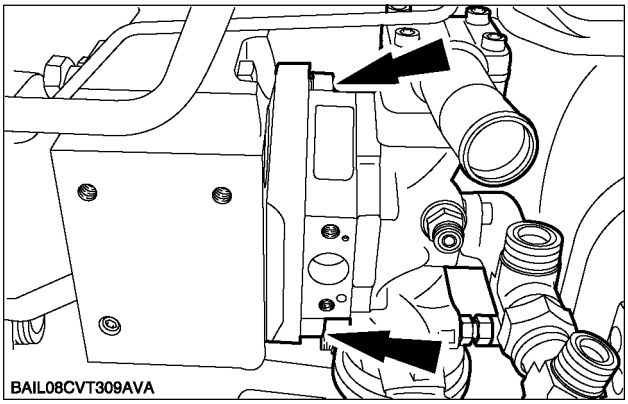
BAIL08CVT221AVA 48

49. Remove the pressure control valve from the vane pump.



BAIL08CVT308AVA 49

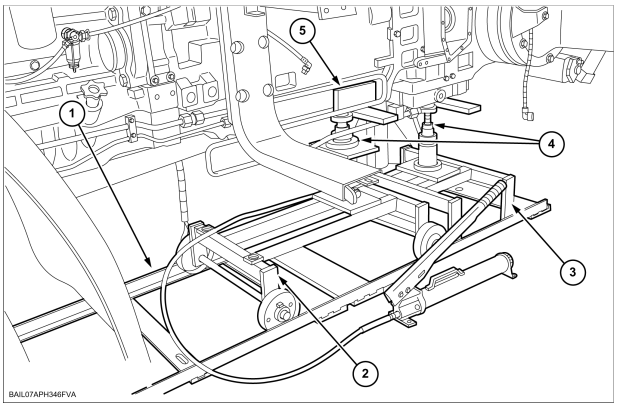
50. Remove the vane pump.



BAIL08CVT309AVA 50

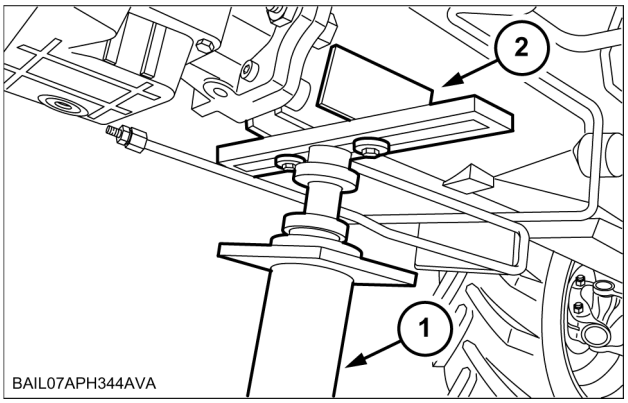
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51. Position the splitting gear rails **(1) MS2700C-1** under the vehicle.
Install the wheeled part of the splitting gear **(2) MS2700C-2**, **(4) MS2700C-4** and **(5) MS2700-3/33** under the transmission.
Install the static part of the splitting gear **(3) MS2700C-2**,and **(4) MS2700C-4** under the rear axle.



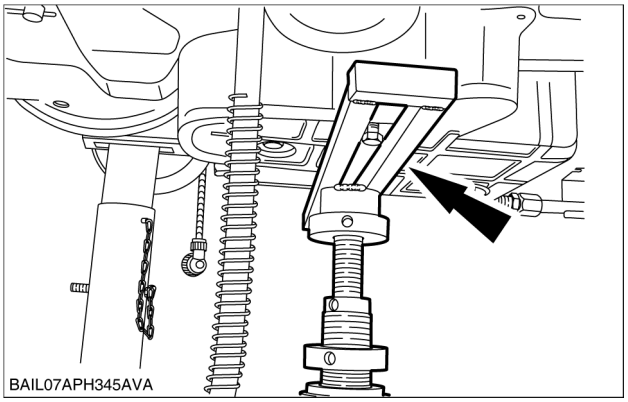
BAIL07APH346FVA 51

52. Support the weight of the transmission with the jack **(1) MS2700C-4** and clamp the transmission with the special tool **(2) MS2700-3/33**.



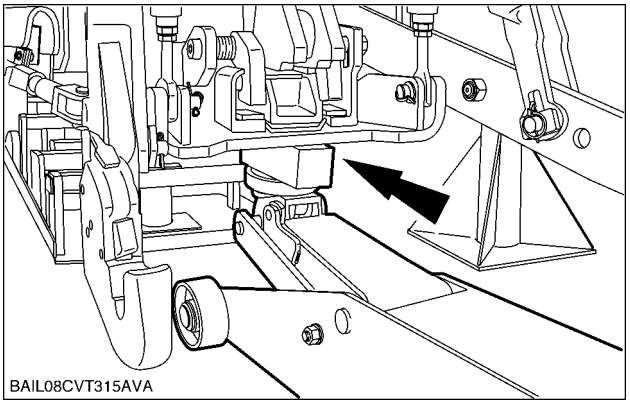
BAIL07APH344AVA 52

53. Secure the static part of the splitting gear to the rear axle.



BAIL07APH345AVA 53

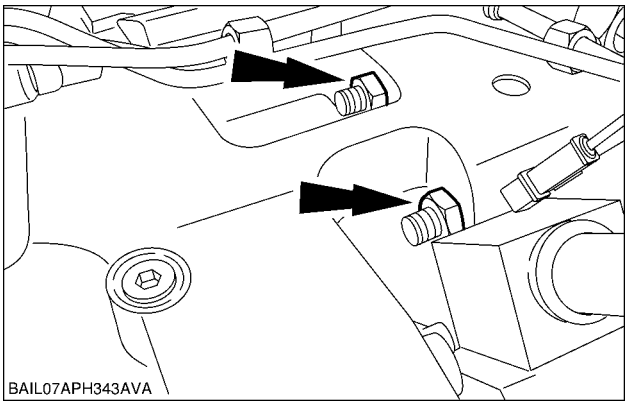
54. Support the rear of the vehicle.



BAIL08CVT315AVA 54

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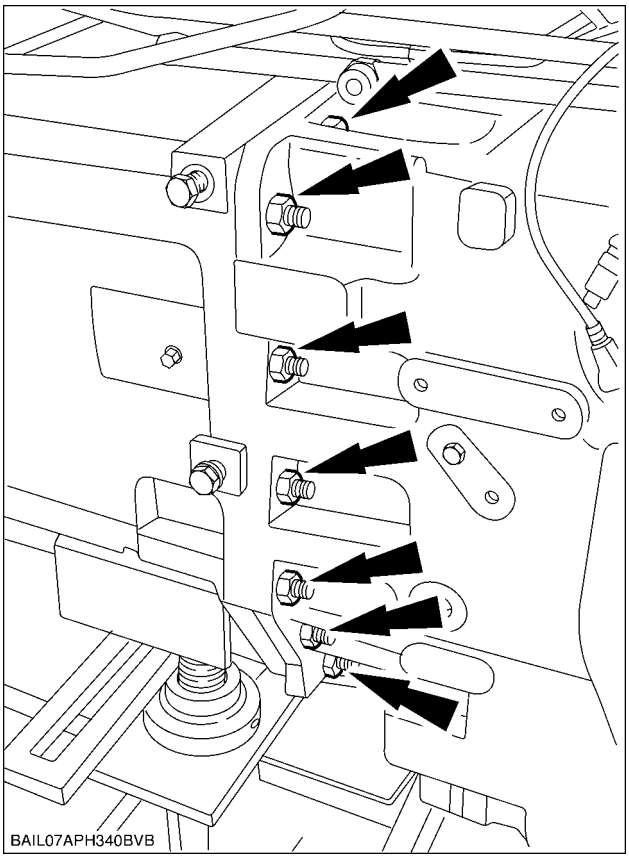
55. Remove the transmission to rear axle upper retaining nuts.



BAIL07APH343AVB 55

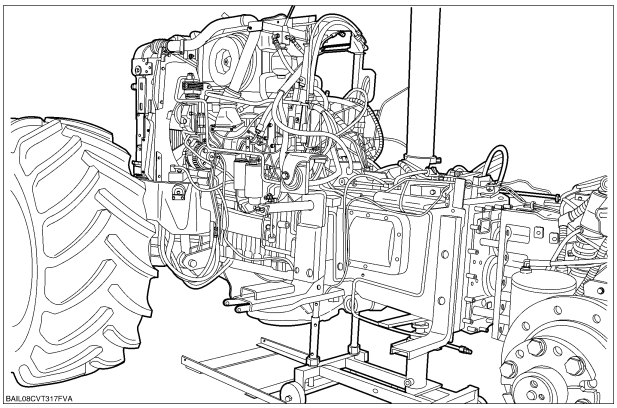
56. Remove the transmission to rear axle left-hand retaining nuts.

NOTE: *Repeat this step for the right-hand side.*



BAIL07APH340BVB 56

57. Disconnect the transmission from the rear axle.



BAIL08CVT317FVA 57

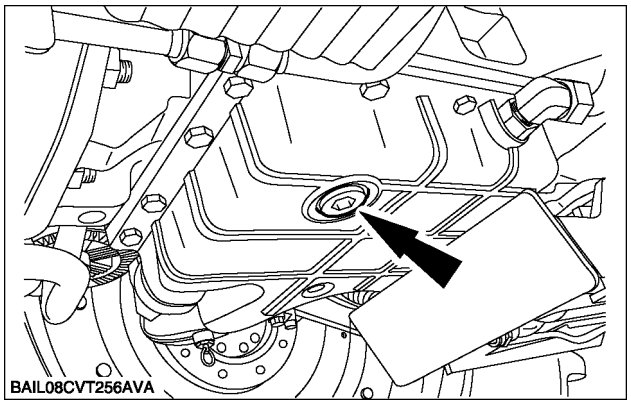
Next operation:
Disconnect the engine from the transmission, for further information refer to **ENGINE - Disconnect (B.10.A)**

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Housing - Disconnect

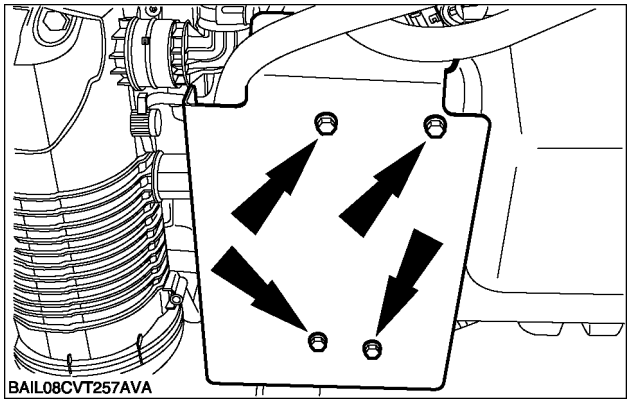
Prior operation:
Remove the cab, for further information refer to **USER PLATFORM - Remove (E.34.A)**.
Prior operation:
Remove the fuel tank, for further information refer to **Fuel tank - Remove (B.20.A)**.

1. Remove the transmission housing drain plug and drain the transmission oil into a suitable container. Reinstall the drain plug and tighten to **68 - 82 Nm** (**50 - 60 lbft**).



BAIL08CVT256AVA 1

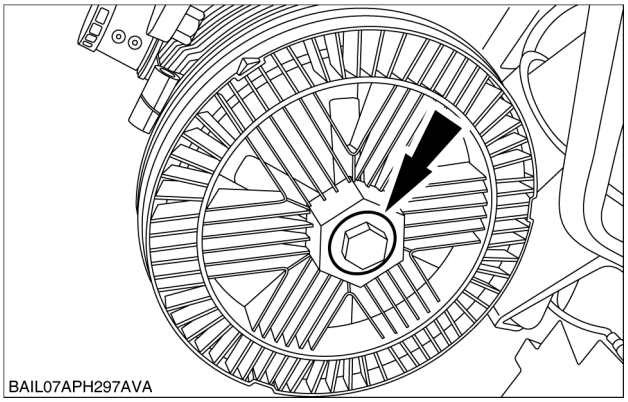
2. Remove the transmission solenoid shield.



BAIL08CVT257AVA 2

3. Remove the hydraulic oil pump filter housing drain plug.

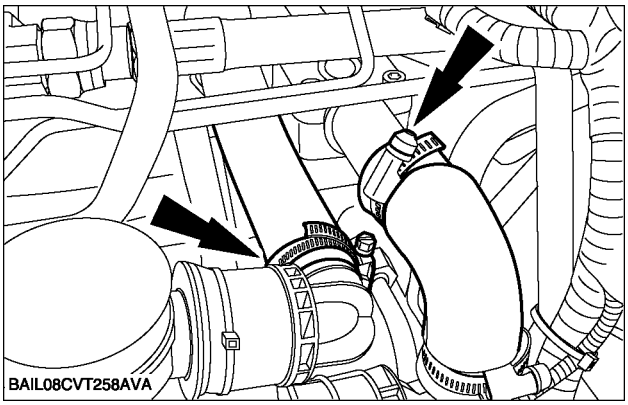
NOTE: *Place a suitable container under the oil filter housing to collect the hydraulic oil.*



BAIL07APH297AVA 3

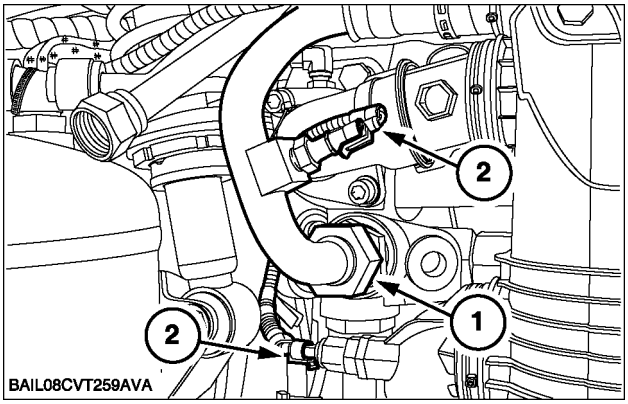
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4. Disconnect the hydraulic oil pipes from the hydraulic oil pump and hydraulic oil pump filter housing.



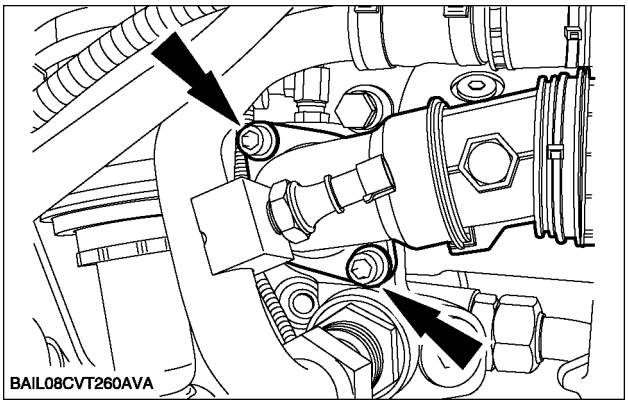
BAIL08CVT258AVA 4

5. Disconnect the hydraulic charge pipe **(1)**.
Disconnect the electrical connectors **(2)**.



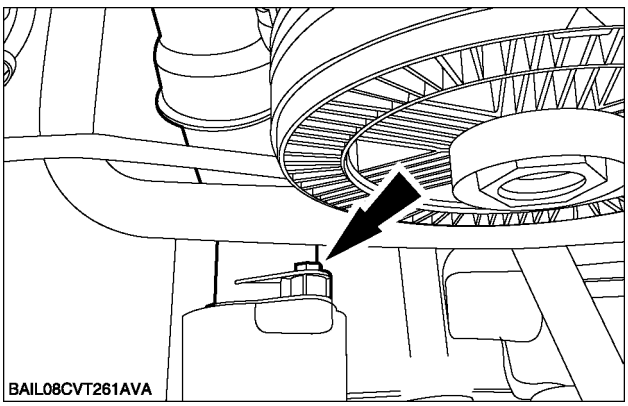
BAIL08CVT259AVA 5

6. Disconnect the hydraulic pipe.



BAIL08CVT260AVA 6

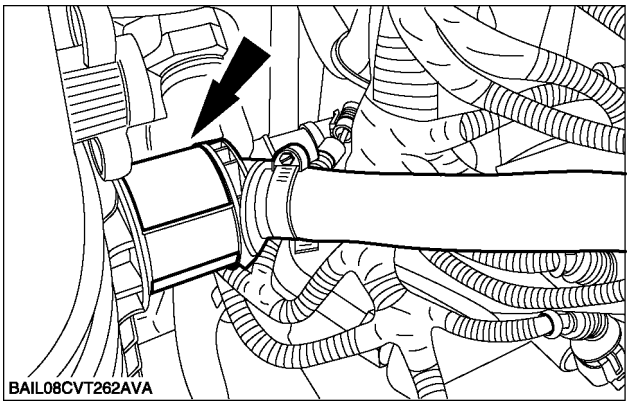
7. Remove the retaining bolt from the rear axle housing.



BAIL08CVT261AVA 7

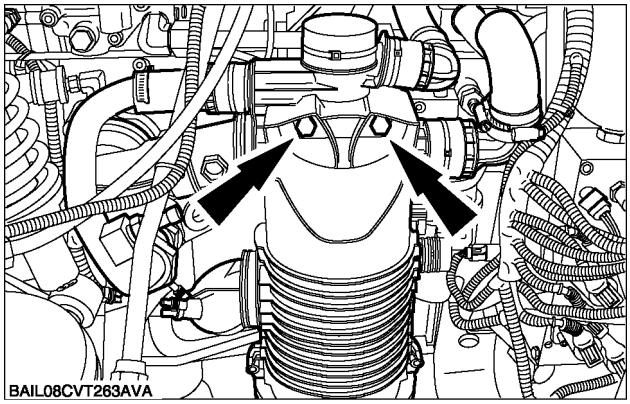
www.truck-freeworkshop.com

8. Disconnect the mid mounted EHR hydraulic hose (if fitted).



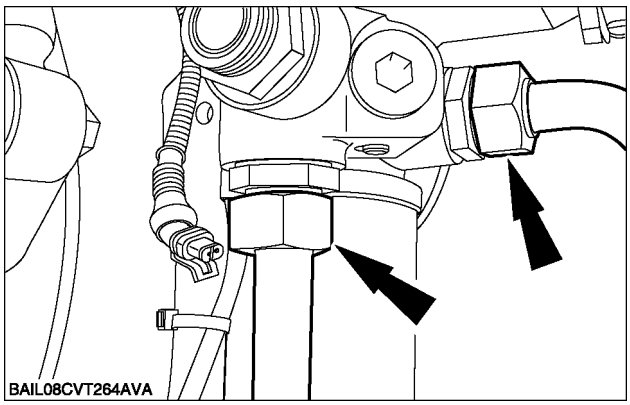
BAIL08CVT262AVA 8

9. Remove the hydraulic oil pump filter housing.



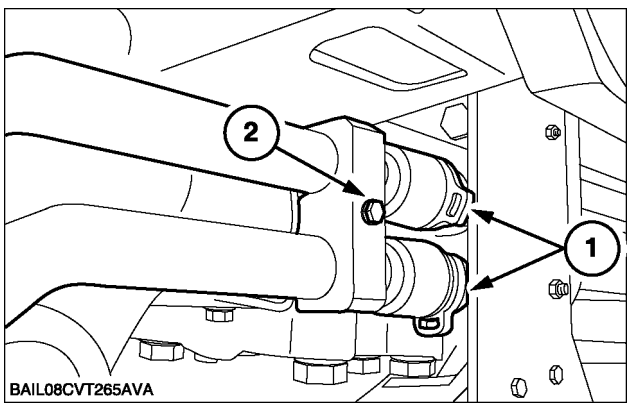
BAIL08CVT263AVA 9

10. Disconnect the oil cooler supply and return pipes from the filter housing.



BAIL08CVT264AVA 10

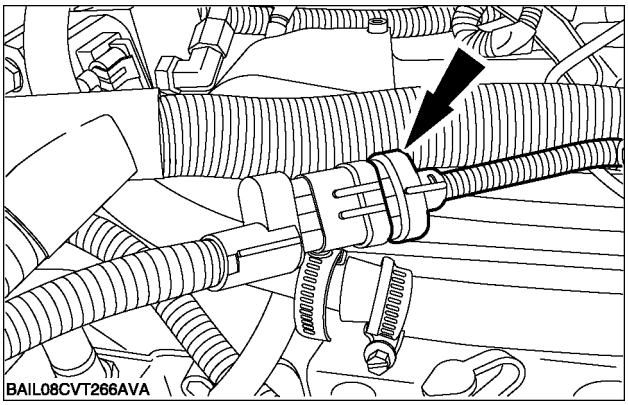
11. Disconnect the oil cooler pipe quick release connectors **(1)**.
Remove the oil cooler pipe bracket **(2)** and remove the oil cooler pipes.



BAIL08CVT265AVA 11

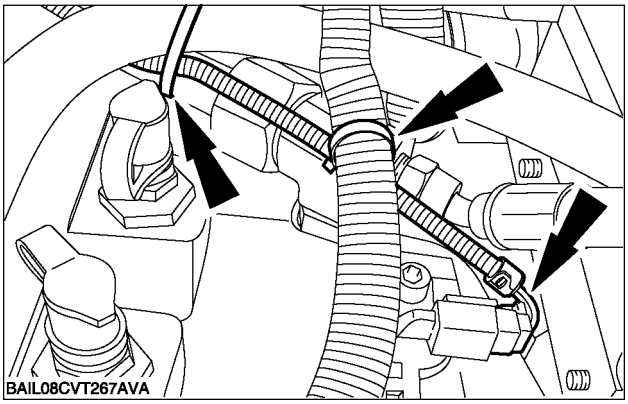
www.truck-freeworkshop.com

12. Disconnect the mid mount electrical connector (if fitted).



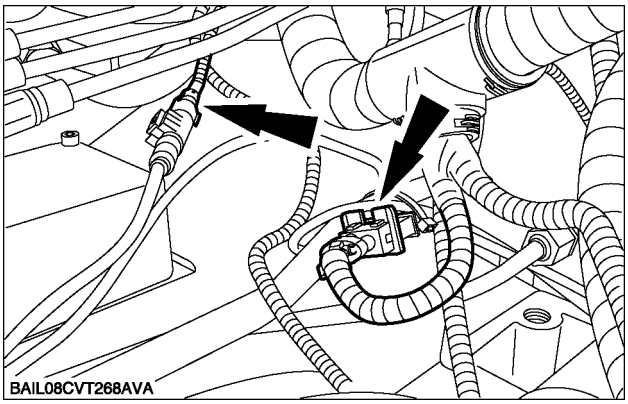
BAIL08CVT266AVA 12

13. Disconnect the electrical connector on top of the hydrostat housing and cut the cable ties.



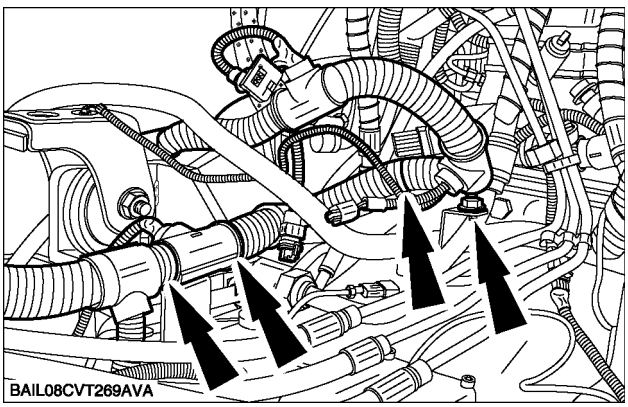
BAIL08CVT267AVA 13

14. Disconnect the torque sensor and ring speed electrical connectors.



BAIL08CVT268AVA 14

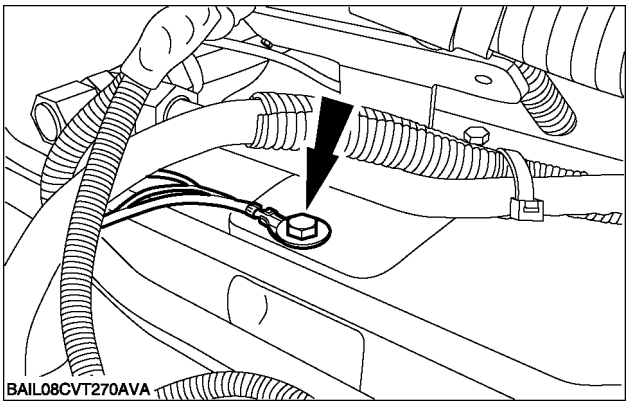
15. Detach the wiring loom fir tree clips.



BAIL08CVT269AVA 15

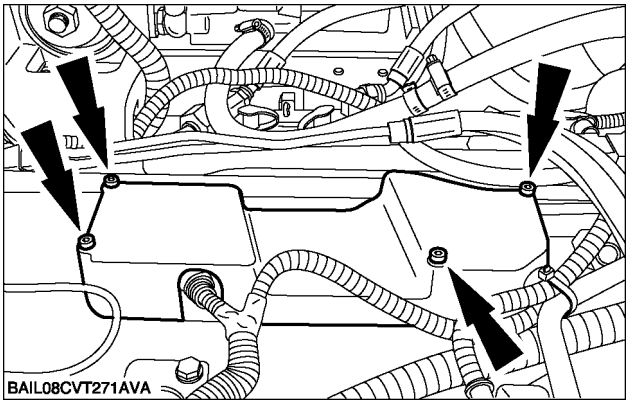
www.truck-freeworkshop.com

16. Disconnect the ground connectors.



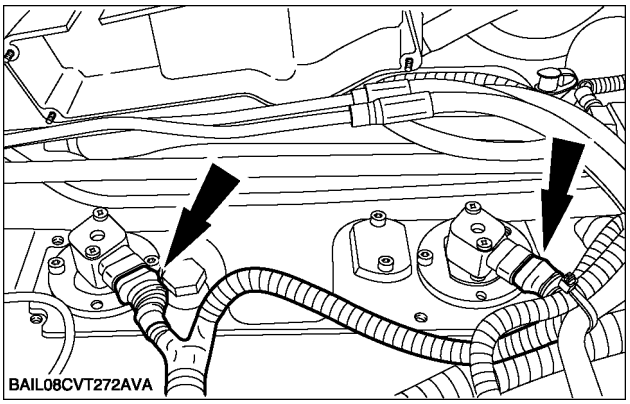
BAIL08CVT270AVA 16

17. Remove the synchroniser cover.



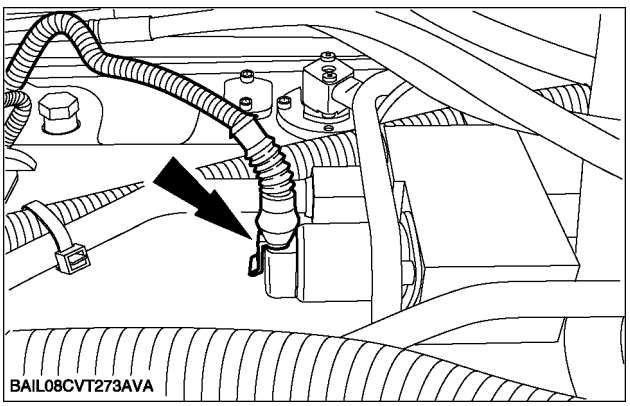
BAIL08CVT271AVA 17

18. Disconnect the synchroniser electrical connectors.



BAIL08CVT272AVA 18

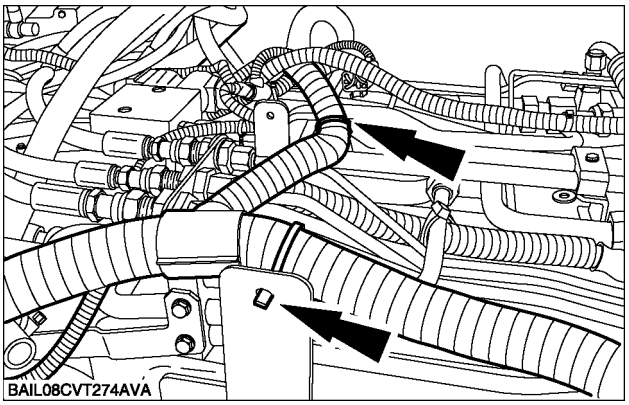
19. Disconnect the brake lubrication solenoid electrical connector.



BAIL08CVT273AVA 19

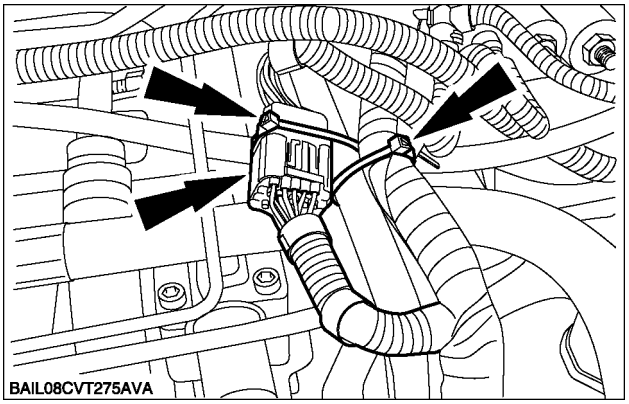
www.truck-freeworkshop.com

20. Detach the wiring loom.



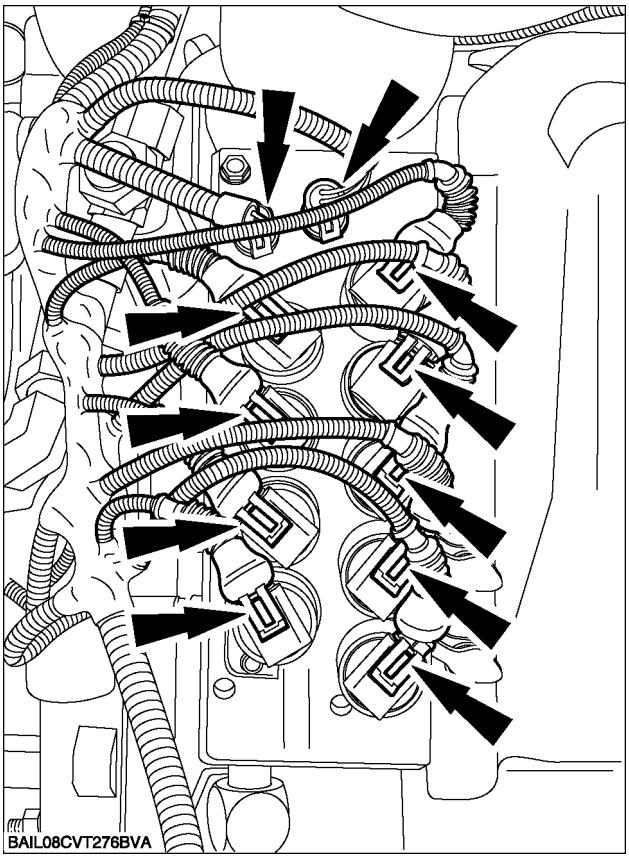
BAIL08CVT274AVA 20

21. Disconnect the SFA valve electrical connector and cut the cable ties.



BAIL08CVT275AVA 21

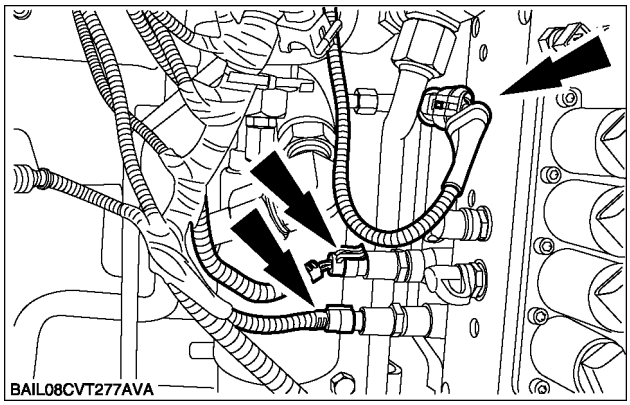
22. Disconnect the transmission solenoid electrical connectors.



BAIL08CVT276BVA 22

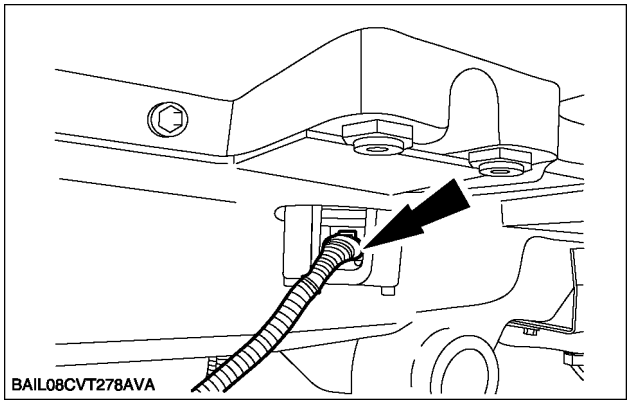
www.truck-freeworkshop.com

23. Disconnect the vane pump pressure sender, the brake pressure sender and the filter pressure switch electrical connectors.



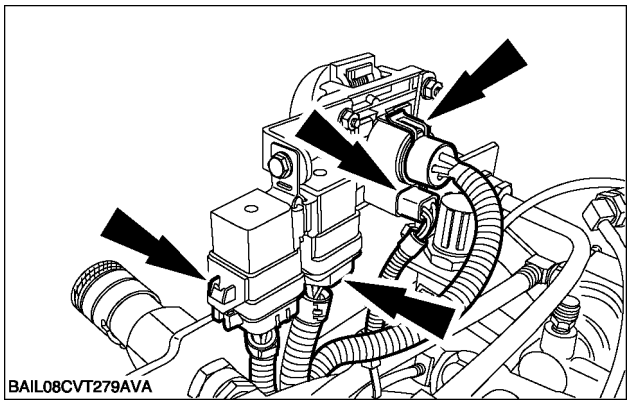
BAIL08CVT277AVA 23

24. Disconnect the F2 - R1 synchroniser electrical connector.



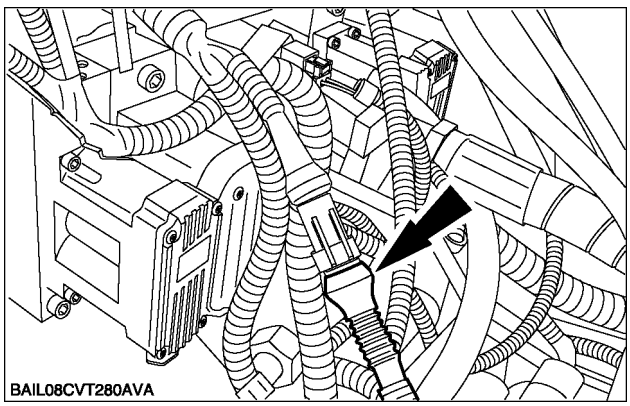
BAIL08CVT278AVA 24

25. Disconnect the trailer brake electrical connectors.



BAIL08CVT279AVA 25

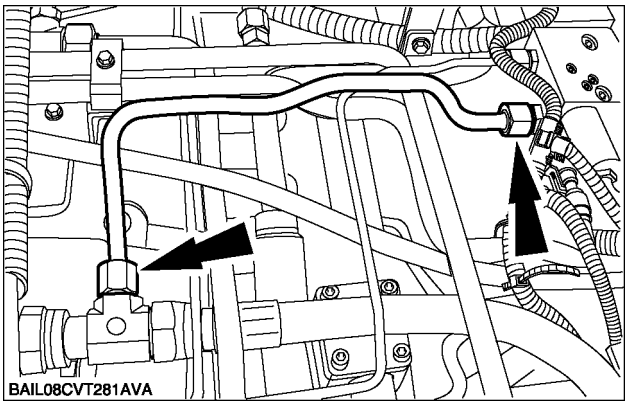
26. Disconnect the ISO electrical connector.



BAIL08CVT280AVA 26

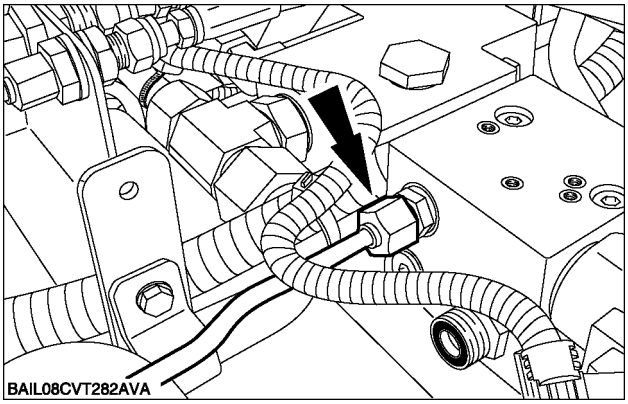
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27. Disconnect the front suspension hydraulic supply pipe.



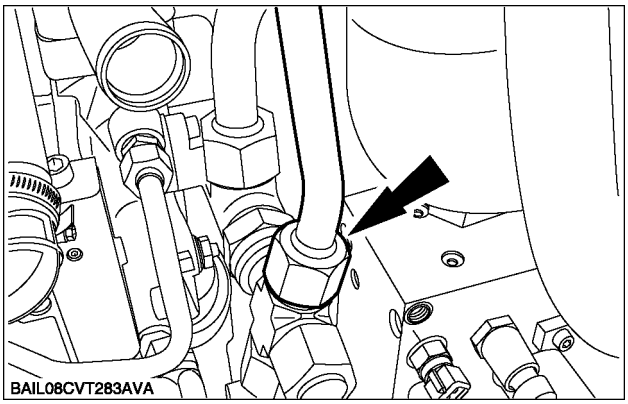
BAIL08CVT281AVA 27

28. Disconnect the brake line.



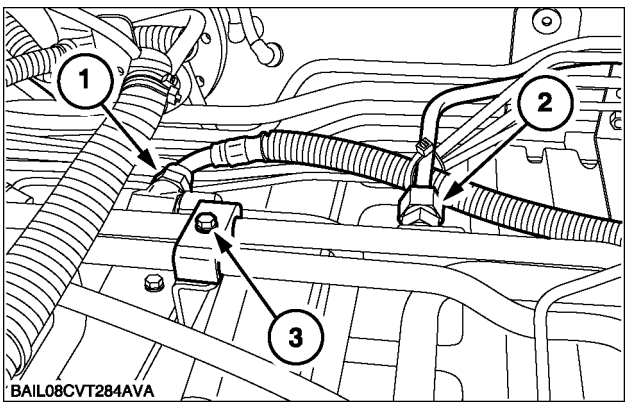
BAIL08CVT282AVA 28

29. Disconnect the vane pump outlet pipe.



BAIL08CVT283AVA 29

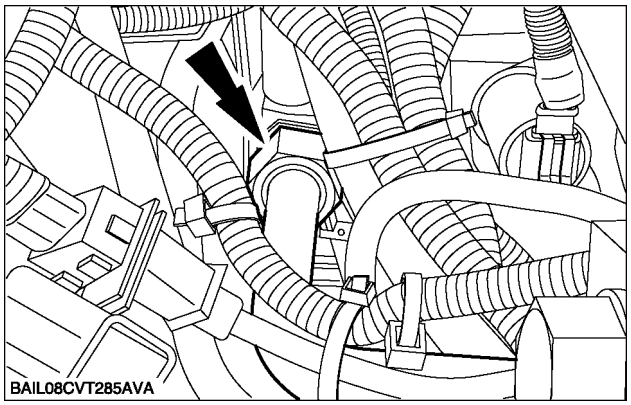
30. Disconnect the vane pump T piece **(1)**.
Disconnect the brake supply pipe **(2)**.
Remove the pipe clamp **(3)**.



BAIL08CVT284AVA 30

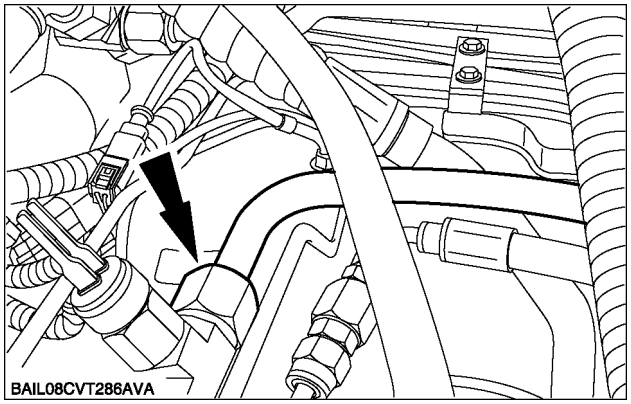
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31. Disconnect the pipe from the low pressure valve block.



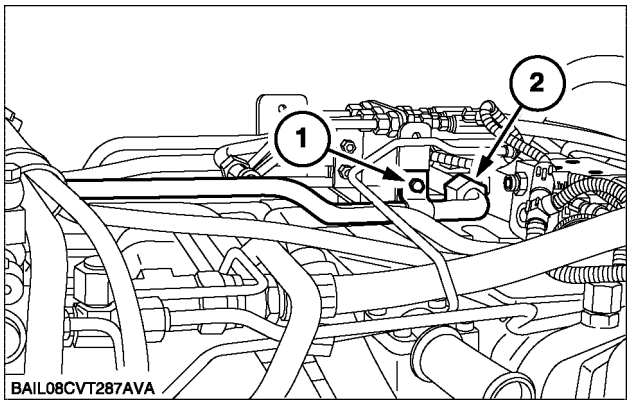
BAIL08CVT285AVA 31

32. Remove the steering pipe.



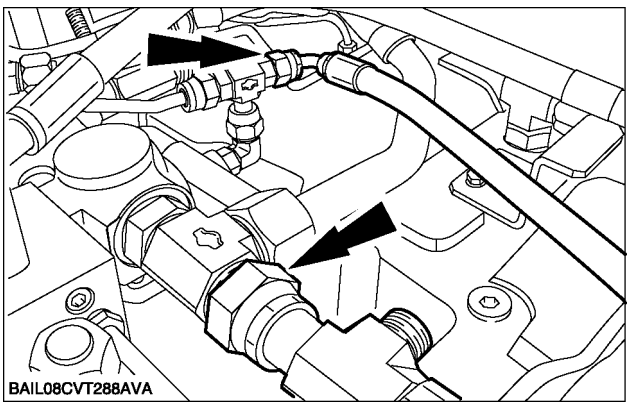
BAIL08CVT286AVA 32

33. Remove the bracket **(1)** and remove the steering hydraulic pipe.



BAIL08CVT287AVA 33

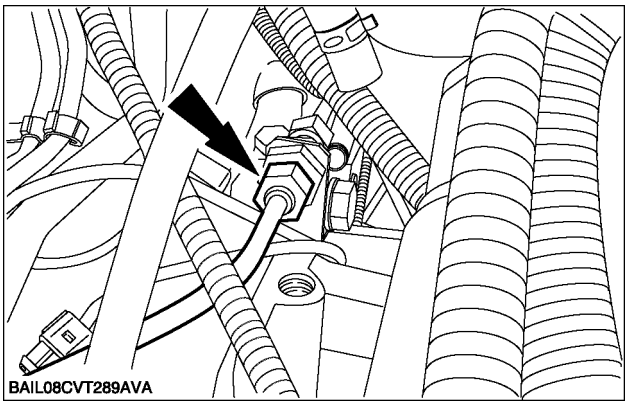
34. Disconnect the mid mount hydraulic supply pipe and load sensing line (if fitted).



BAIL08CVT288AVA 34

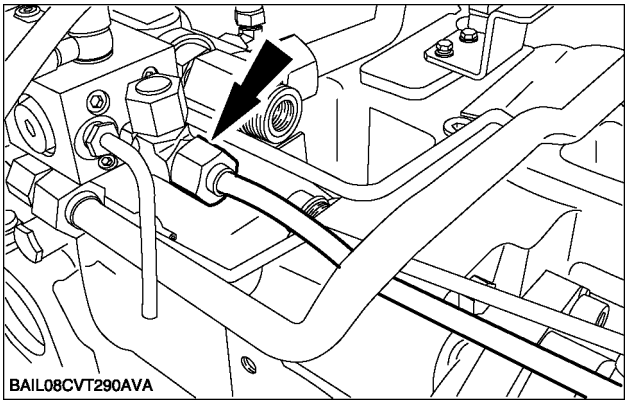
www.truck-freeworkshop.com

35. Disconnect the front brake supply pipe.



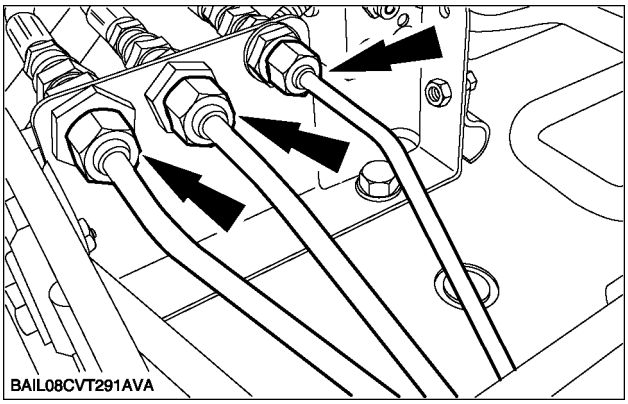
BAIL08CVT289AVA 35

36. Remove the front brake supply pipe.



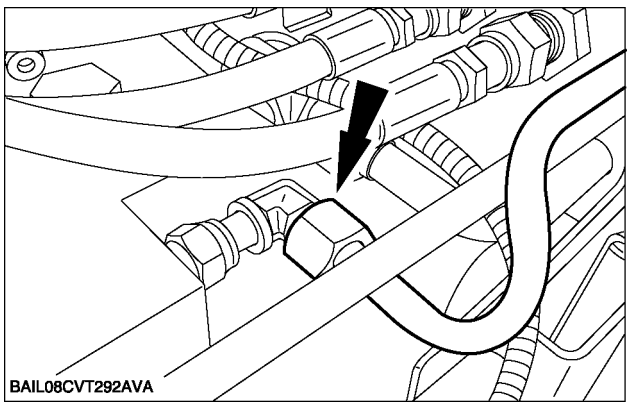
BAIL08CVT290AVA 36

37. Disconnect the brake pipes.



BAIL08CVT291AVA 37

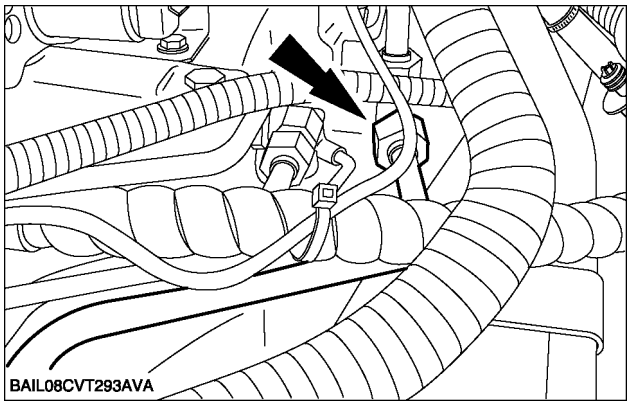
38. Disconnect the brake lubrication supply pipe from the solenoid block.



BAIL08CVT292AVA 38

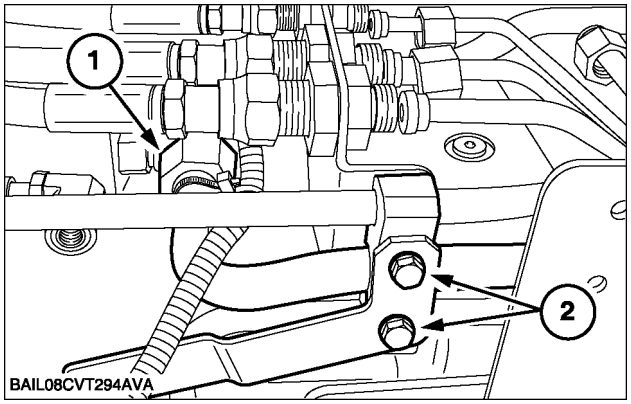
www.truck-freeworkshop.com

39. Remove the brake lubrication supply pipe.



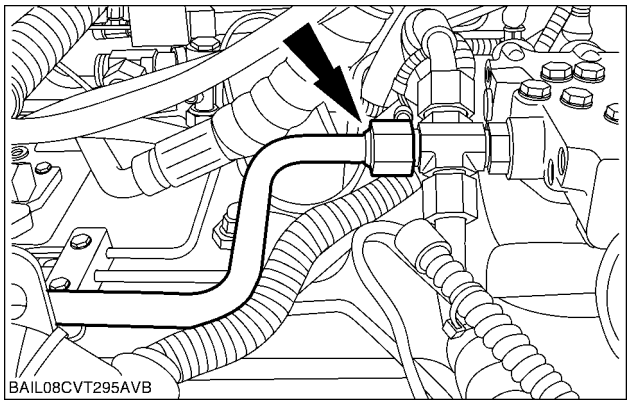
BAIL08CVT293AVA 39

40. Disconnect the EDC low pressure pipe from the valve block **(1)** and remove the pipe bracket **(2)**.



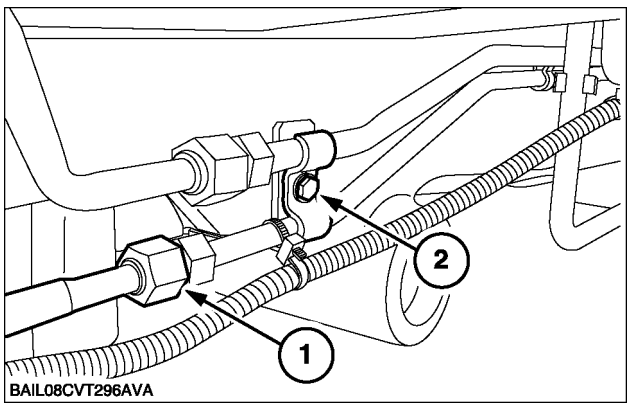
BAIL08CVT294AVA 40

41. Remove the EDC low pressure pipe.



BAIL08CVT295AVB 41

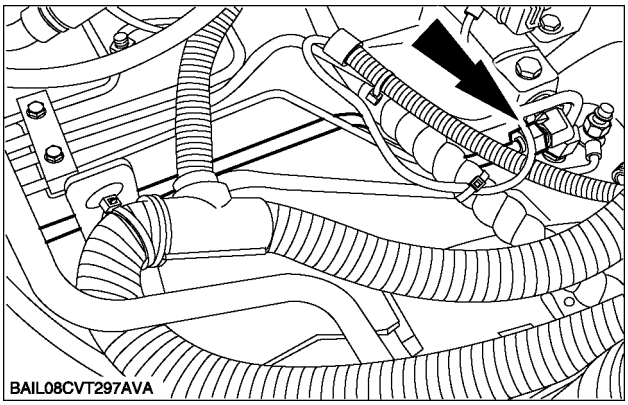
42. Disconnect the diff lock supply pipe **(1)** and remove the bracket **(2)**.



BAIL08CVT296AVA 42

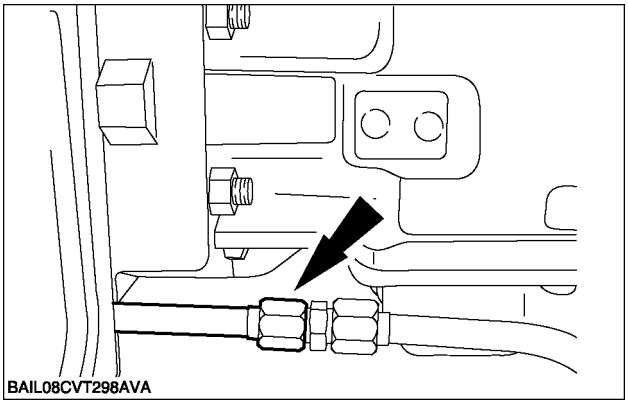
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43. Remove the diff lock pipe.



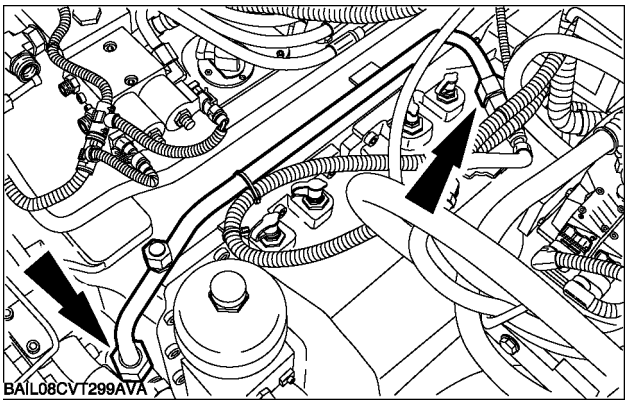
BAIL08CVT297AVA 43

44. Disconnect the pneumatic brake supply pipe.



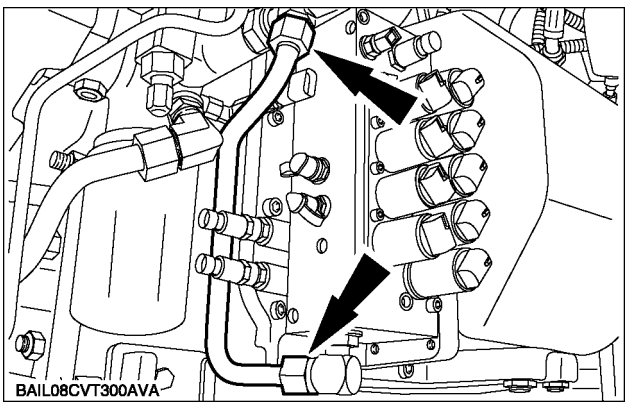
BAIL08CVT298AVA 44

45. Remove the hydrostat low pressure supply pipe.



BAIL08CVT299AVA 45

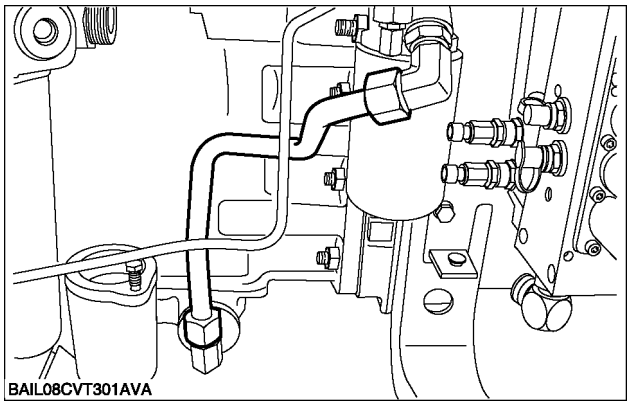
46. Remove the transmission solenoid block low pressure supply pipe.



BAIL08CVT300AVA 46

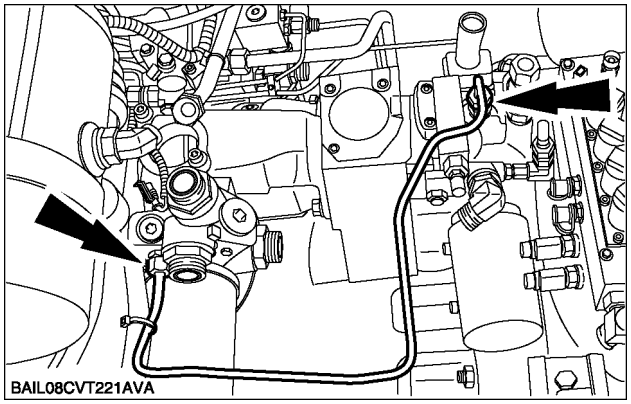
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47. Remove the vane pump supply pipe.



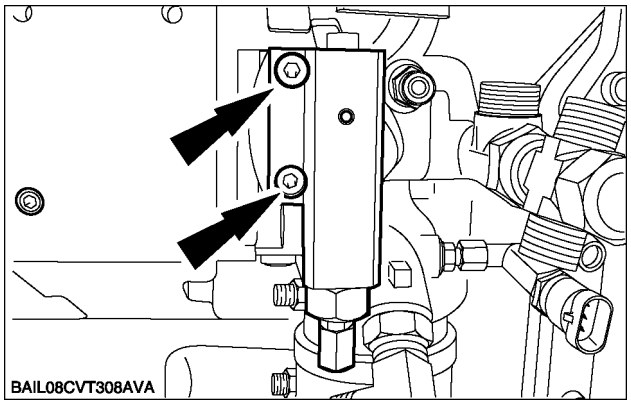
BAIL08CVT301AVA 47

48. Remove the charge pump hydraulic pipe.



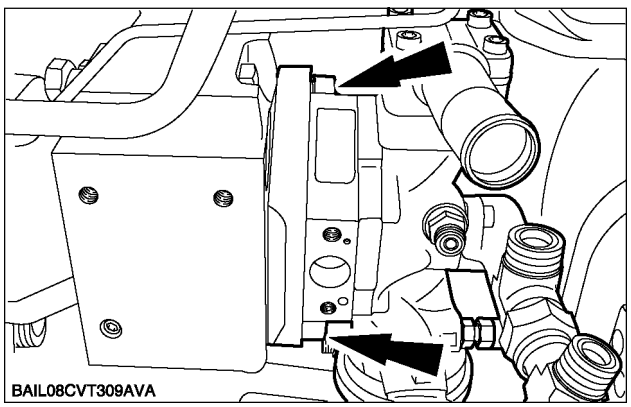
BAIL08CVT221AVA 48

49. Remove the pressure control valve from the vane pump.



BAIL08CVT308AVA 49

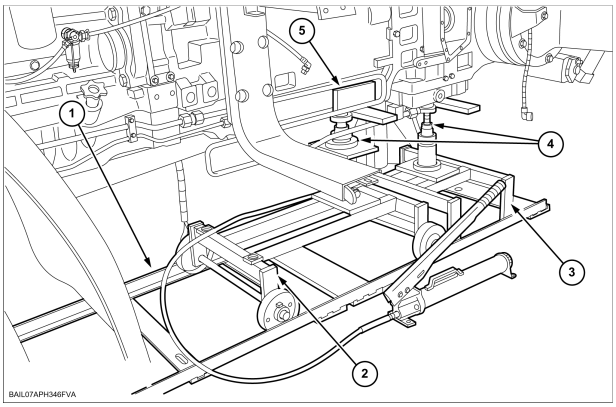
50. Remove the vane pump.



BAIL08CVT309AVA 50

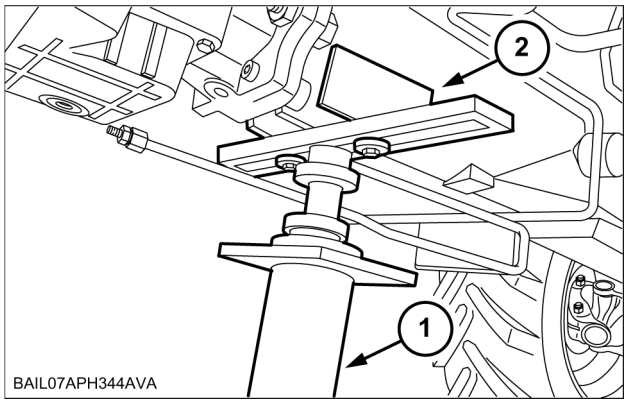
www.truck-freeworkshop.com

51. Position the splitting gear rails **(1) MS2700C-1** under the vehicle.
Install the wheeled part of the splitting gear **(2) MS2700C-2**, **(4) MS2700C-4** and **(5) MS2700-3/33** under the transmission.
Install the static part of the splitting gear **(3) MS2700C-2**,and **(4) MS2700C-4** under the rear axle.



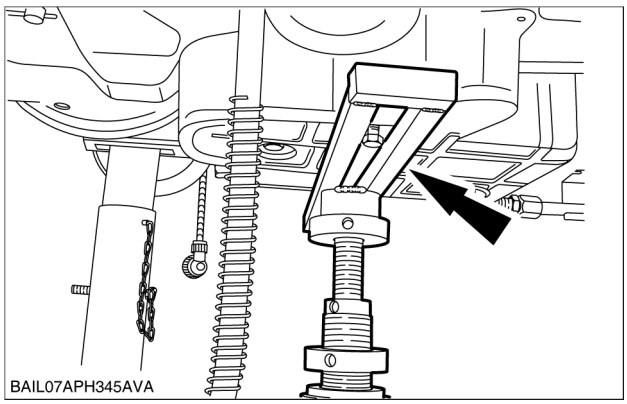
BAIL07APH346FVA 51

52. Support the weight of the transmission with the jack **(1) MS2700C-4** and clamp the transmission with the special tool **(2) MS2700-3/33**.



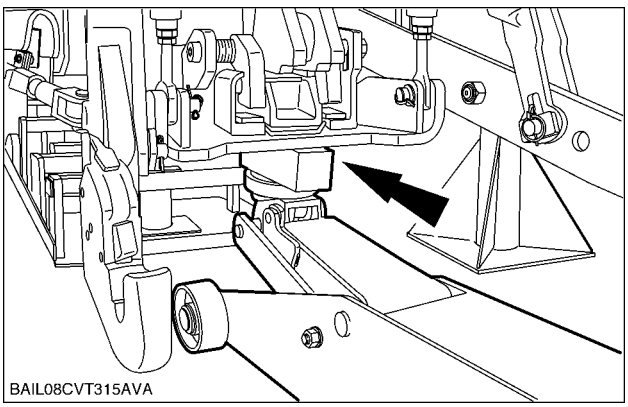
BAIL07APH344AVA 52

53. Secure the static part of the splitting gear to the rear axle.



BAIL07APH345AVA 53

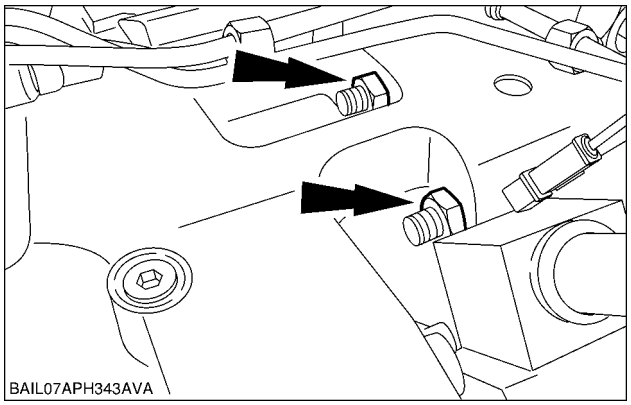
54. Support the rear of the vehicle.



BAIL08CVT315AVA 54

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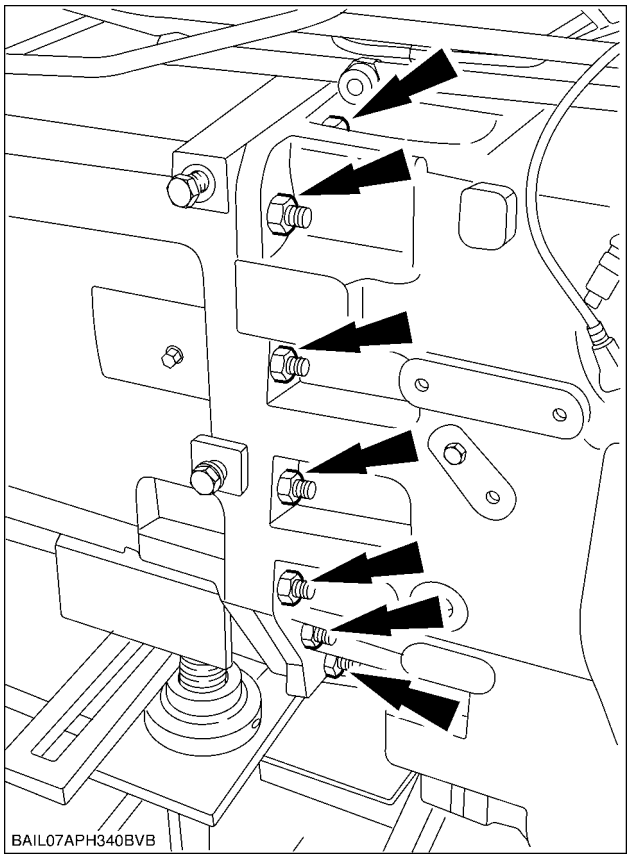
55. Remove the transmission to rear axle upper retaining nuts.



BAIL07APH343AVB 55

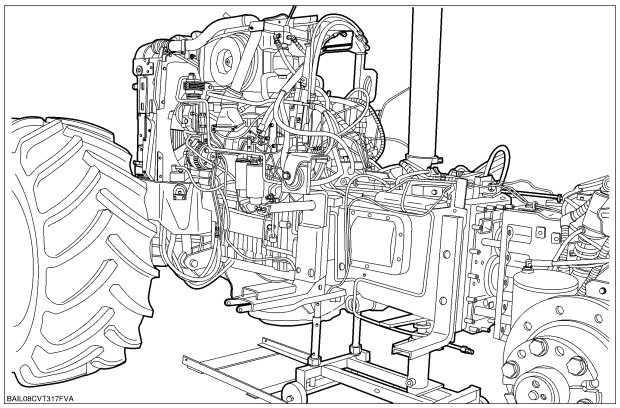
56. Remove the transmission to rear axle left-hand retaining nuts.

NOTE: *Repeat this step for the right-hand side.*



BAIL07APH340BVB 56

57. Disconnect the transmission from the rear axle.



BAIL08CVT317FVA 57

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Housing - Install

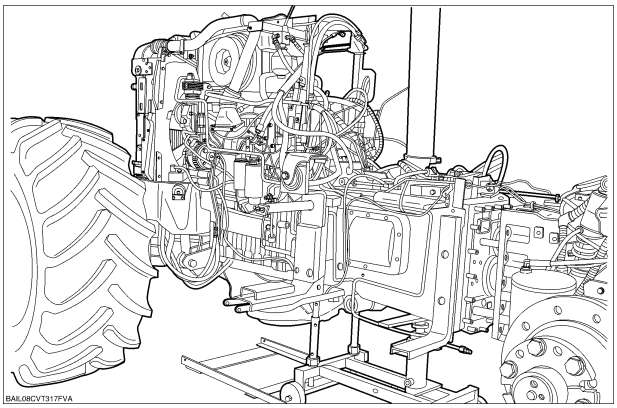
⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

Prior operation:
Connect the engine to the transmission, for further information refer to **ENGINE - Connect (B.10.A)**.

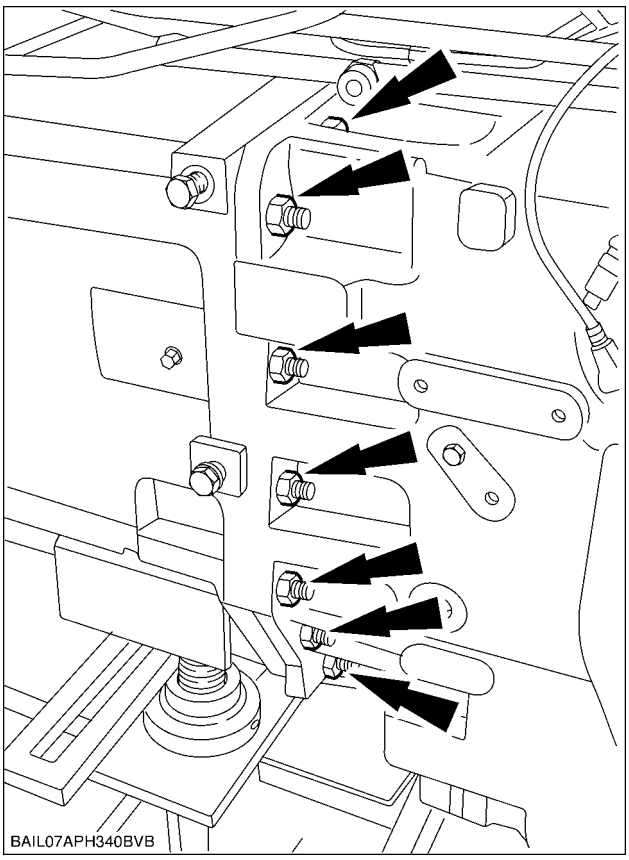
1. Before connecting the transmission housing to the rear axle housing, thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately **2 mm** of diameter.
2. Connect the transmission to the rear axle.



BAIL08CVT317FVA 1

3. Install the transmission to rear axle left-hand retaining nuts.
   Tighten to **200 Nm** (**147.5 lbft**).

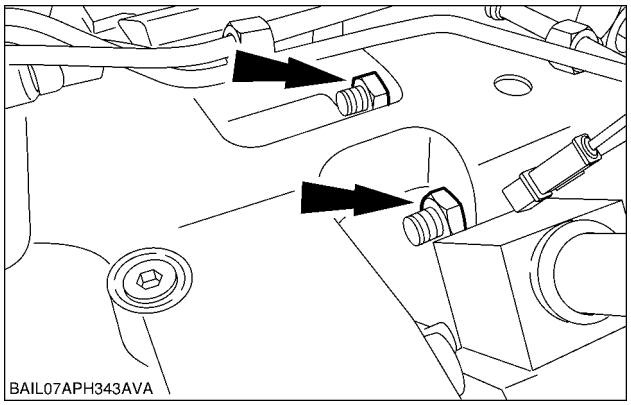
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH340BVB 2

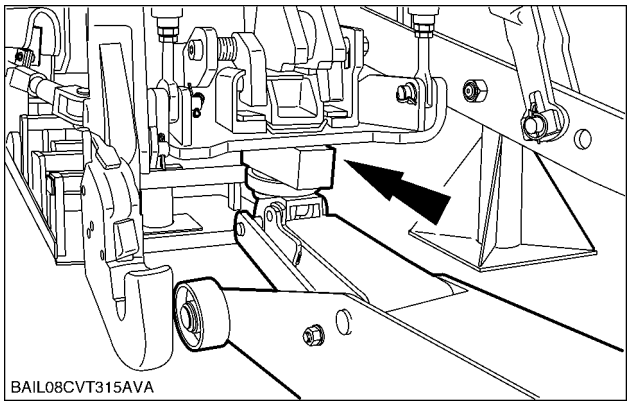
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4. Install the transmission to rear axle upper retaining nuts.
Tighten to **200 Nm** (**147.5 lbft**).



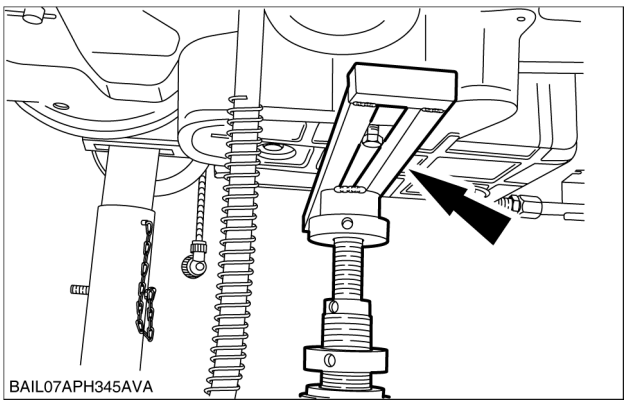
BAIL07APH343AVB 3

5. Remove the support from the rear of the vehicle.



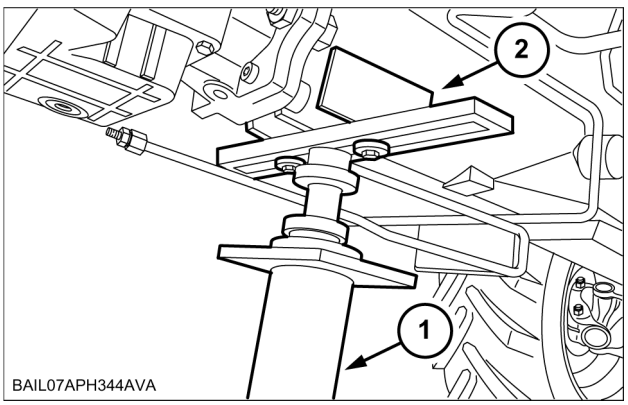
BAIL08CVT315AVA 4

6. Remove the static part of the splitting gear from the rear axle.



BAIL07APH345AVA 5

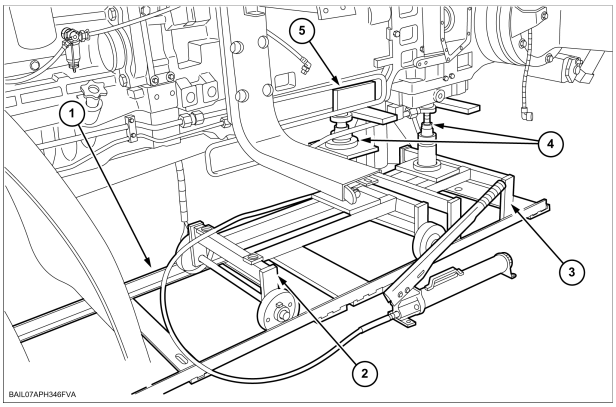
7. Remove the special tool **(2) MS2700-3/33** and the jack **(1) MS2700C-4** from the transmission.



BAIL07APH344AVA 6

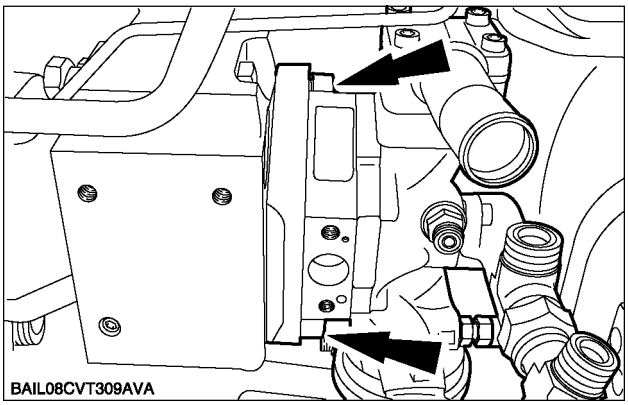
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8. Remove the static part of the splitting gear **(3) MS2700C-2** ,and **(4) MS2700C-4** from under the rear axle.
Remove the wheeled part of the splitting gear **(2) MS2700C-2**, **(4) MS2700C-4** and **(5) MS2700-3/33** from under the transmission.
Remove the splitting gear rails **(1) MS2700C-1** from under the vehicle.



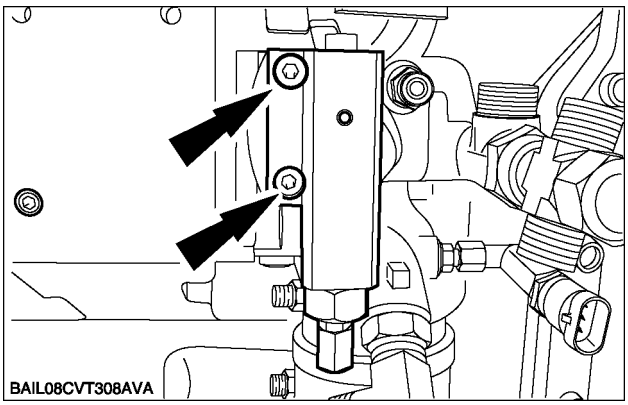
BAIL07APH346FVA 7

9. Install the vane pump.



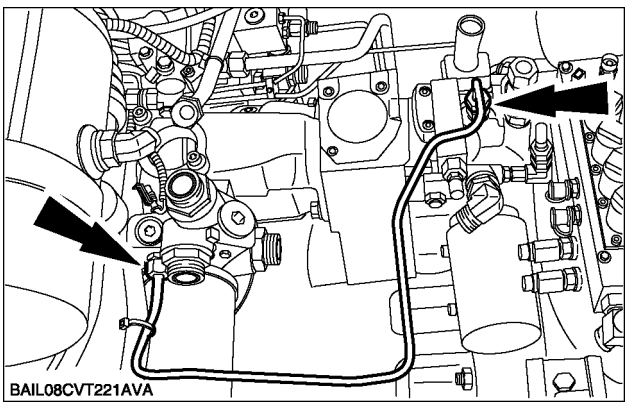
BAIL08CVT309AVA 8

10. Install the pressure control valve to the vane pump.



BAIL08CVT308AVA 9

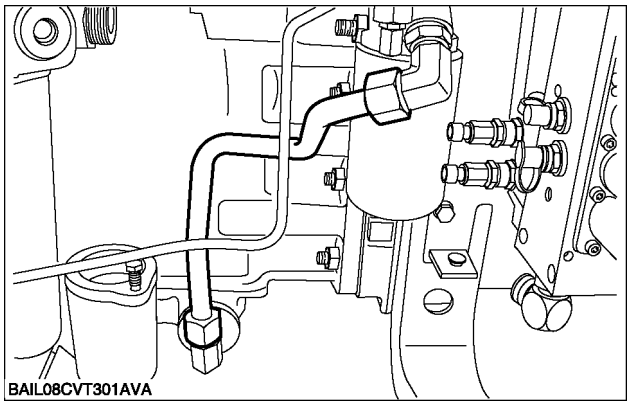
11. Install the charge pump hydraulic pipe.



BAIL08CVT221AVA 10

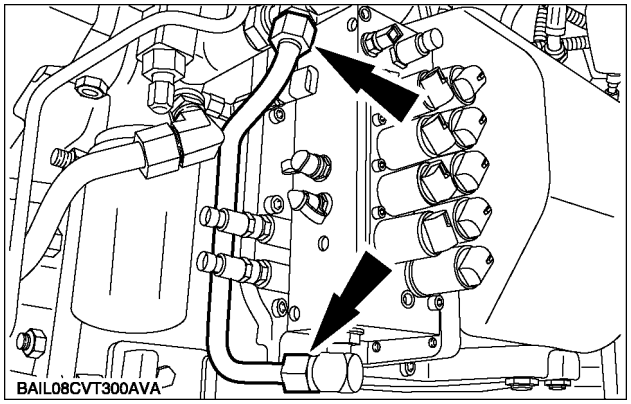
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12. Install the vane pump supply pipe.



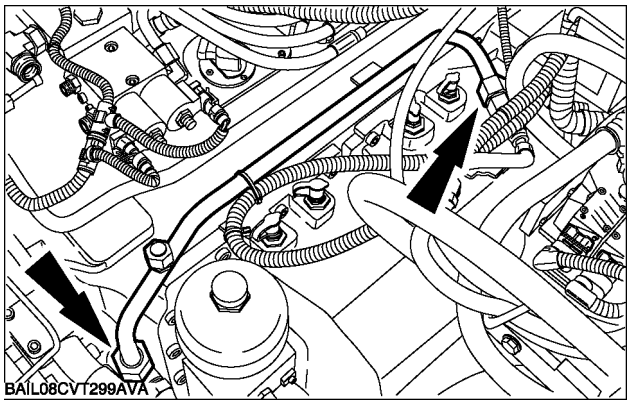
BAIL08CVT301AVA 11

13. Install the transmission solenoid block low pressure supply pipe.



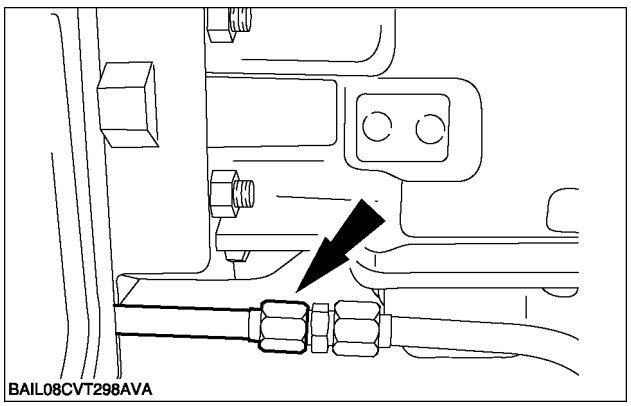
BAIL08CVT300AVA 12

14. Install the hydrostat low pressure supply pipe.



BAIL08CVT299AVA 13

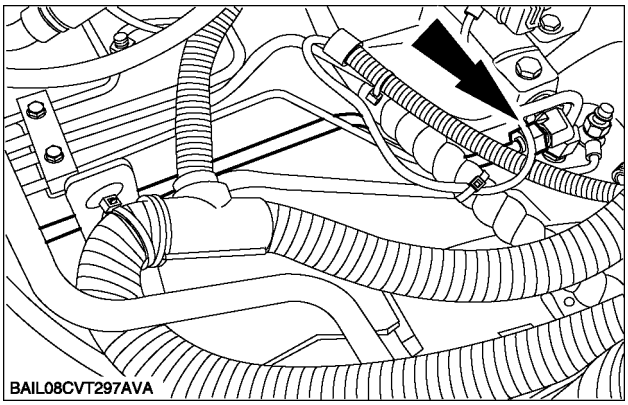
15. Connect the pneumatic brake supply pipe.



BAIL08CVT298AVA 14

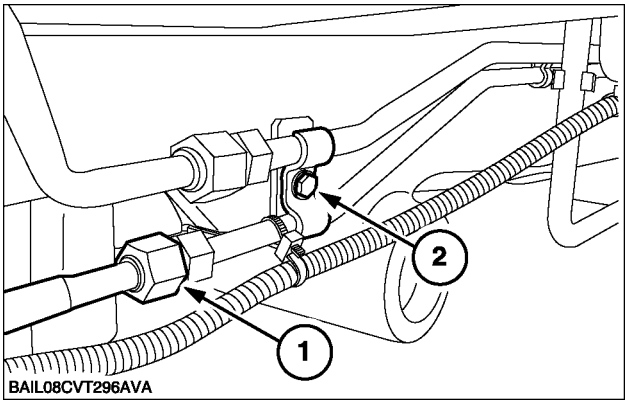
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16. Install the diff lock pipe.



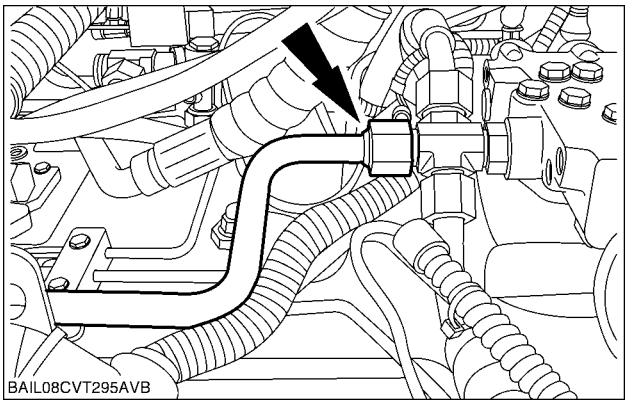
BAIL08CVT297AVA 15

17. Connect the diff lock supply pipe **(1)** and install the bracket **(2)**.



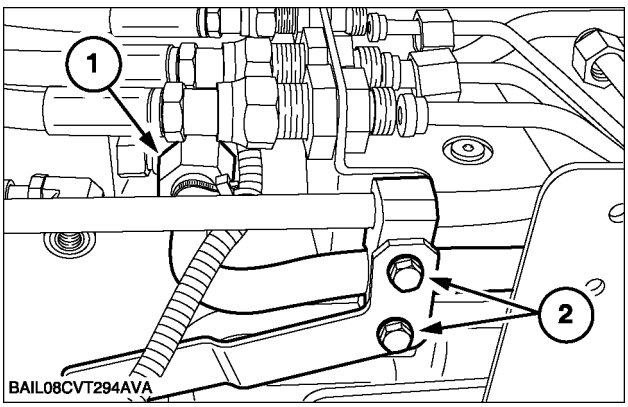
BAIL08CVT296AVA 16

18. Install the EDC low pressure pipe.



BAIL08CVT295AVB 17

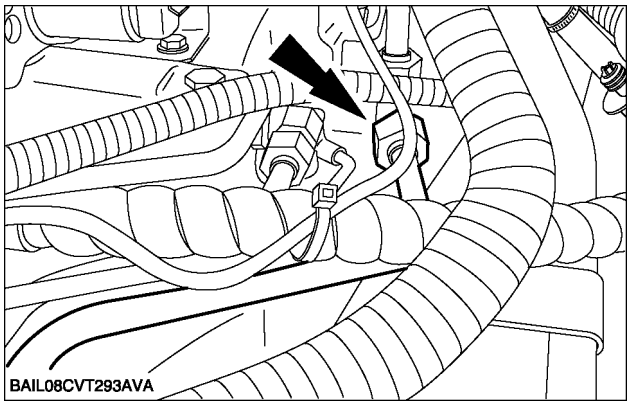
19. Connect the EDC low pressure pipe to the valve block **(1)** and install the pipe bracket **(2)**.



BAIL08CVT294AVA 18

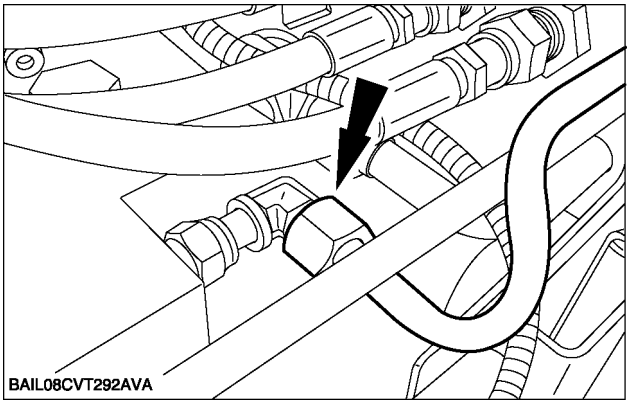
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20. Install the brake lubrication supply pipe.



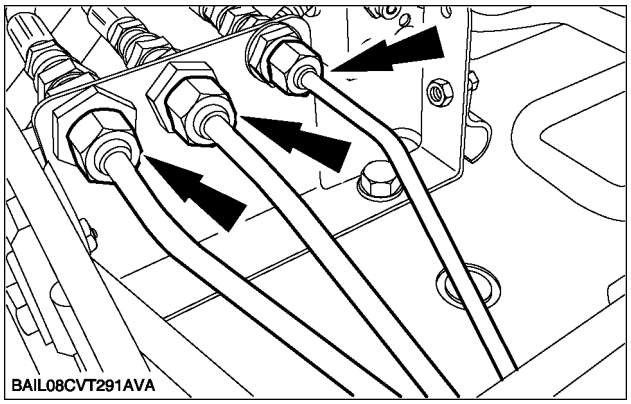
BAIL08CVT293AVA 19

21. Connect the brake lubrication supply pipe to the solenoid block.



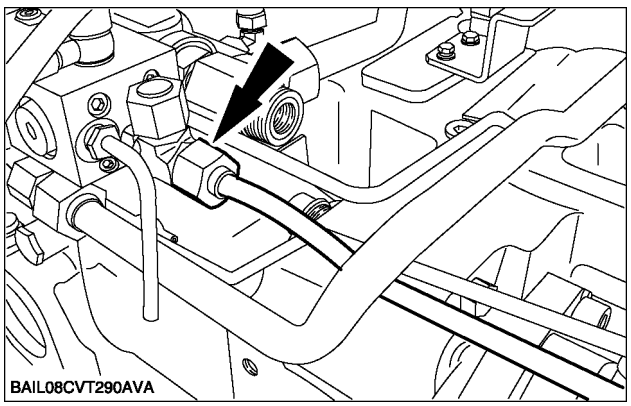
BAIL08CVT292AVA 20

22. Connect the brake pipes.



BAIL08CVT291AVA 21

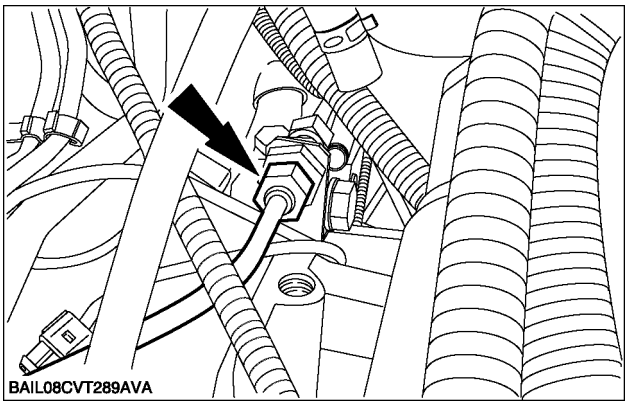
23. Install the front brake supply pipe.



BAIL08CVT290AVA 22

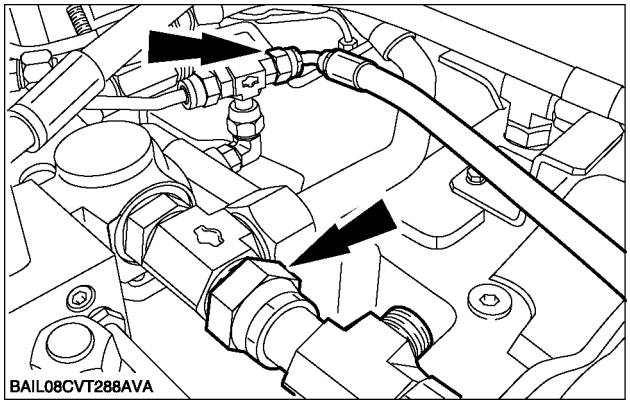
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24. Connect the front brake supply pipe.



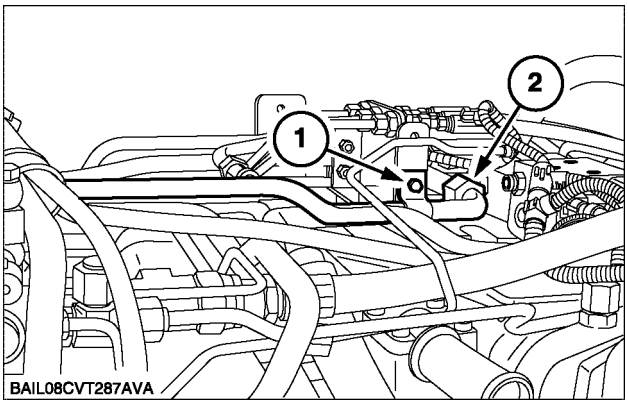
BAIL08CVT289AVA 23

25. Connect the mid mount hydraulic supply pipe and load sensing line (if fitted).



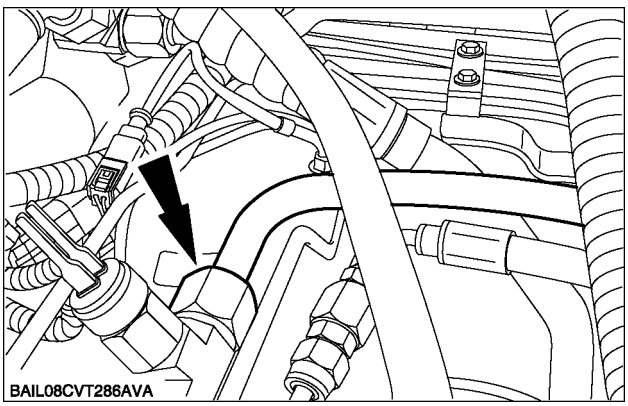
BAIL08CVT288AVA 24

26. Install the steering hydraulic pipe **(2)** and install the bracket **(1)**.



BAIL08CVT287AVA 25

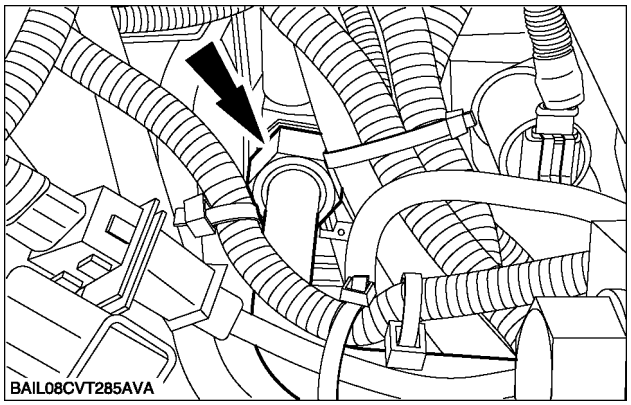
27. Install the steering pipe.



BAIL08CVT286AVA 26

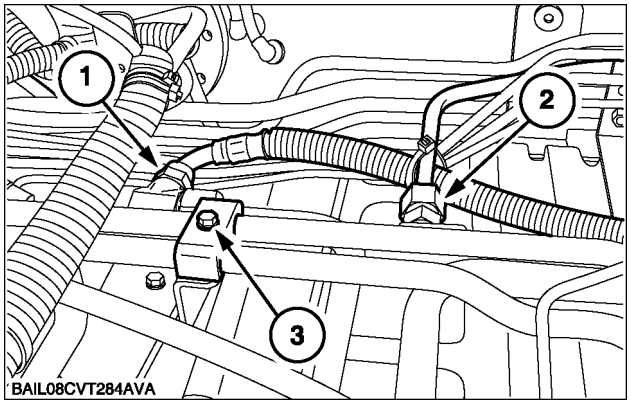
www.truck-freeworkshop.com

28. Connect the pipe to the low pressure valve block.



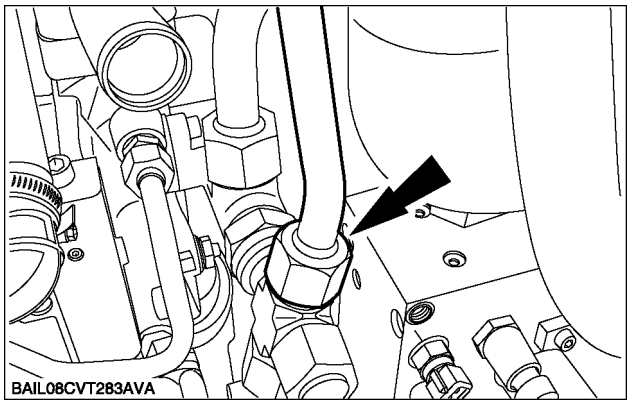
BAIL08CVT285AVA 27

29. Connect the vane pump T piece **(1)**.
Connect the brake supply pipe **(2)**.
Install the pipe clamp **(3)**.



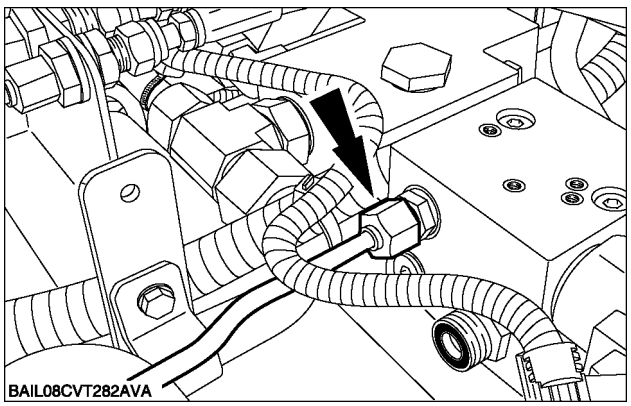
BAIL08CVT284AVA 28

30. Connect the vane pump outlet pipe.



BAIL08CVT283AVA 29

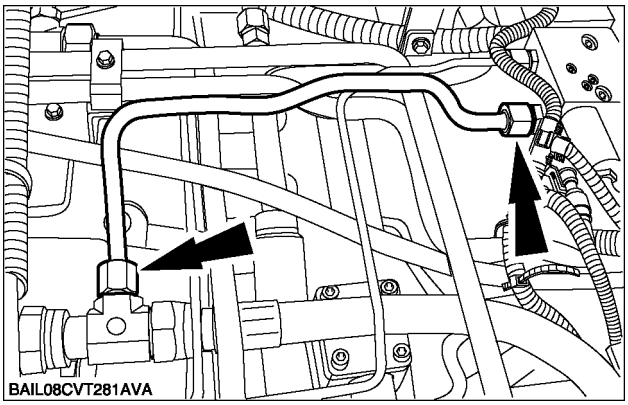
31. Connect the brake line.



BAIL08CVT282AVA 30

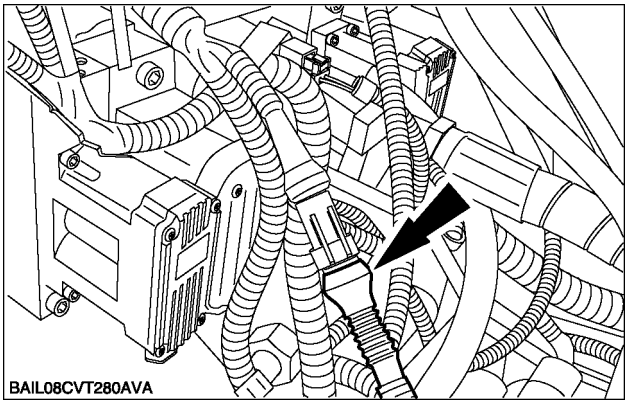
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32. Connect the front suspension hydraulic supply pipe.



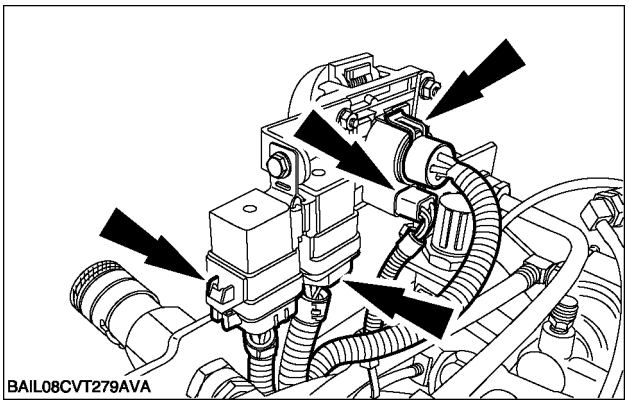
BAIL08CVT281AVA 31

33. Connect the ISO electrical connector.



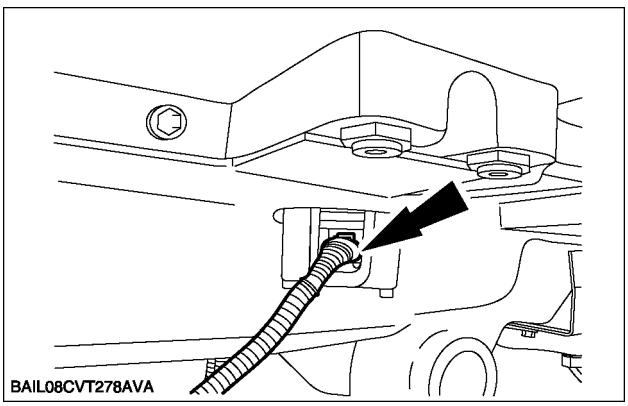
BAIL08CVT280AVA 32

34. Connect the trailer brake electrical connectors.



BAIL08CVT279AVA 33

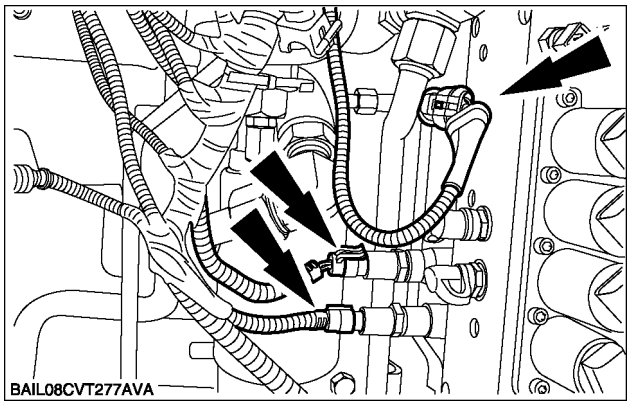
35. Connect the F2 - R1 synchroniser electrical connector.



BAIL08CVT278AVA 34

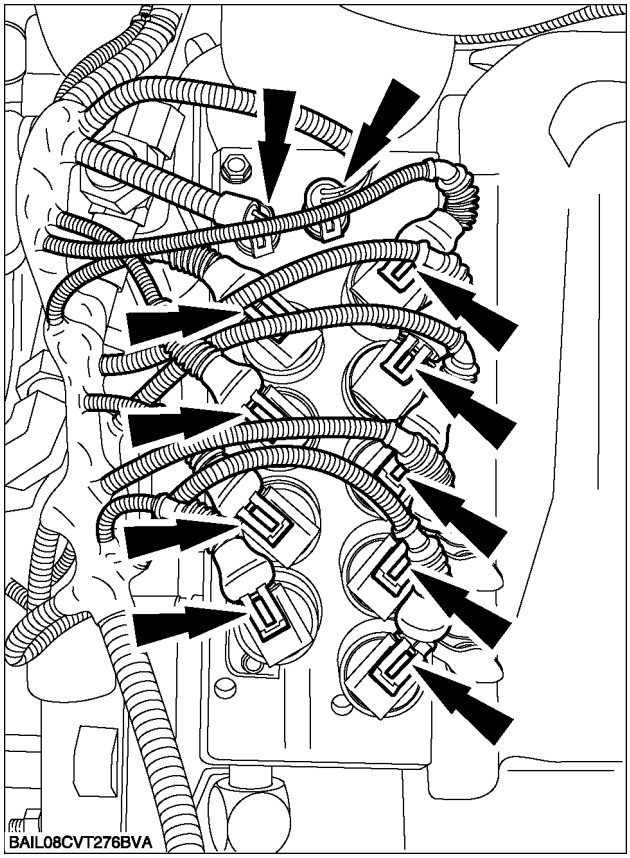
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36. Connect the vane pump pressure sender, the brake pressure sender and the filter pressure switch electrical connectors.



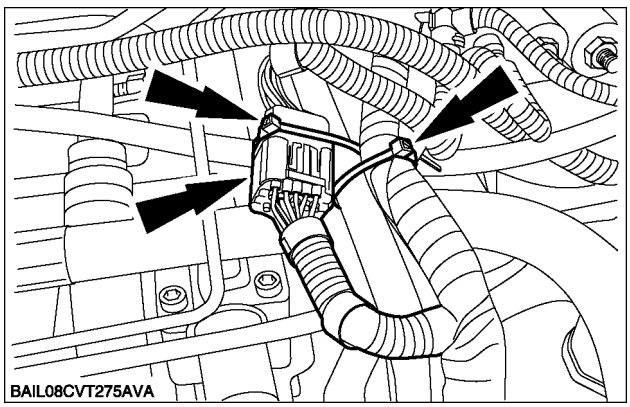
BAIL08CVT277AVA 35

37. Connect the transmission solenoid electrical connectors.



BAIL08CVT276BVA 36

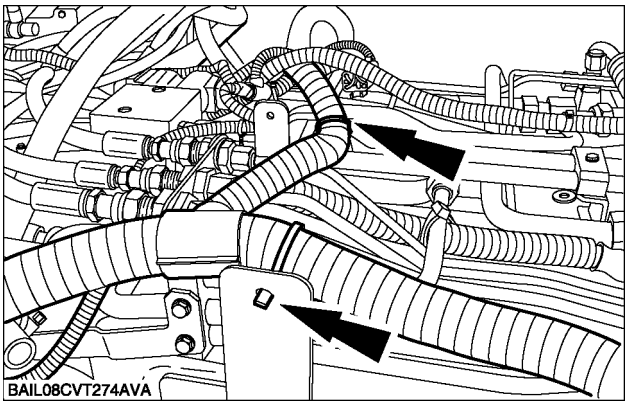
38. Connect the SFA valve electrical connector and install new cable ties.



BAIL08CVT275AVA 37

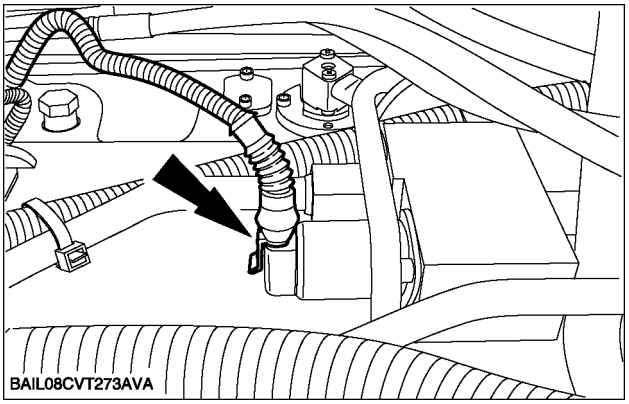
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39. Install the wiring loom.



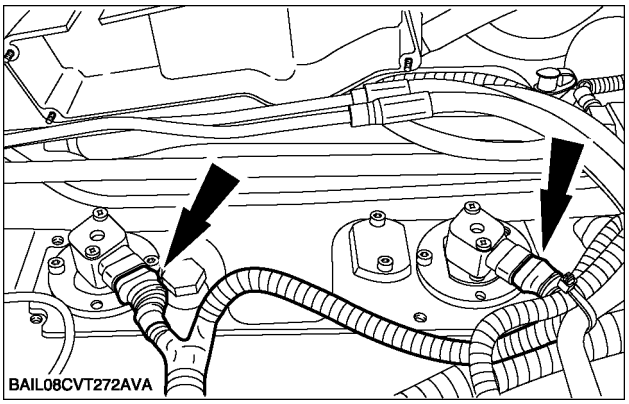
BAIL08CVT274AVA 38

40. Connect the brake lubrication solenoid electrical connector.



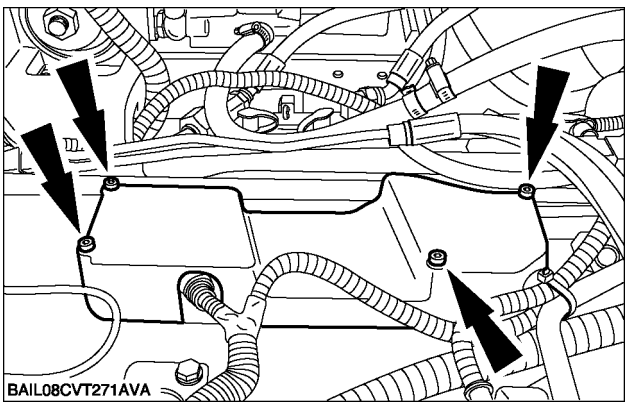
BAIL08CVT273AVA 39

41. Connect the synchroniser electrical connectors.



BAIL08CVT272AVA 40

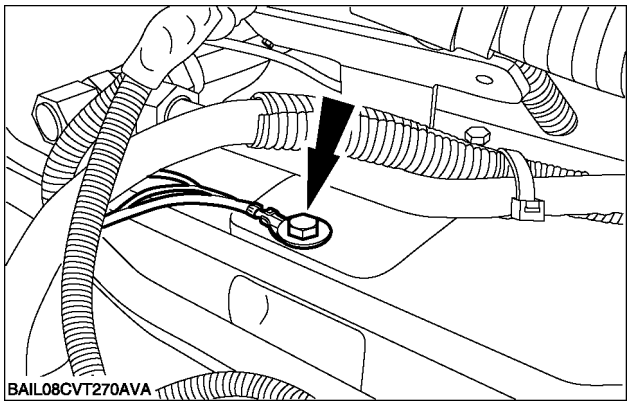
42. Install the synchroniser cover.



BAIL08CVT271AVA 41

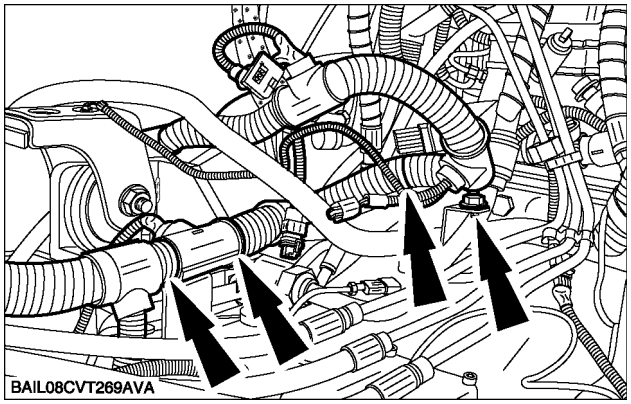
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43. Connect the ground connectors.



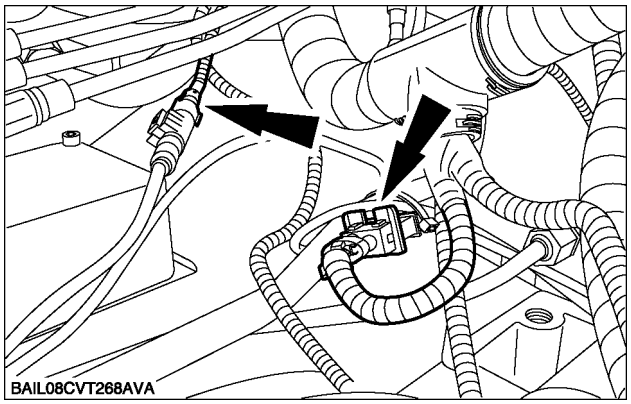
BAIL08CVT270AVA 42

44. Install the wiring loom into the fir tree clips.



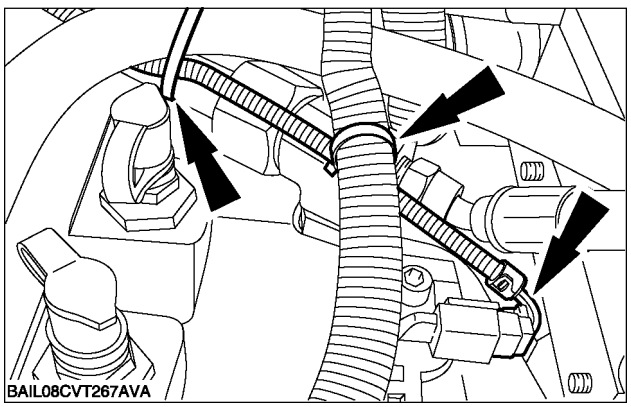
BAIL08CVT269AVA 43

45. Connect the torque sensor and ring speed electrical connectors.



BAIL08CVT268AVA 44

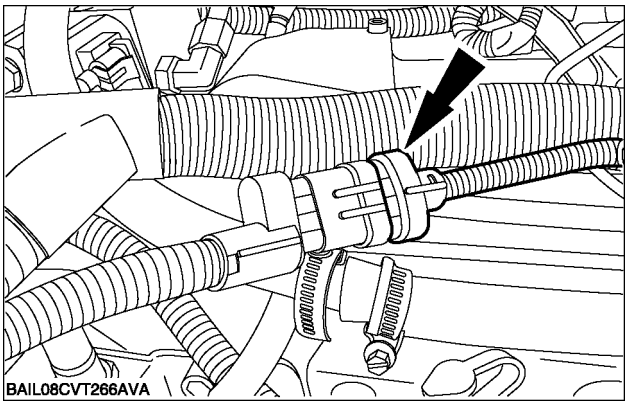
46. Connect the electrical connector on top of the hydrostat housing and install new cable ties.



BAIL08CVT267AVA 45

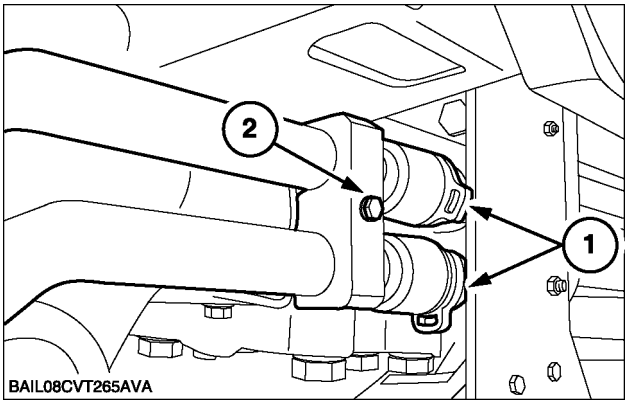
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47. Connect the mid mount electrical connector (if fitted).



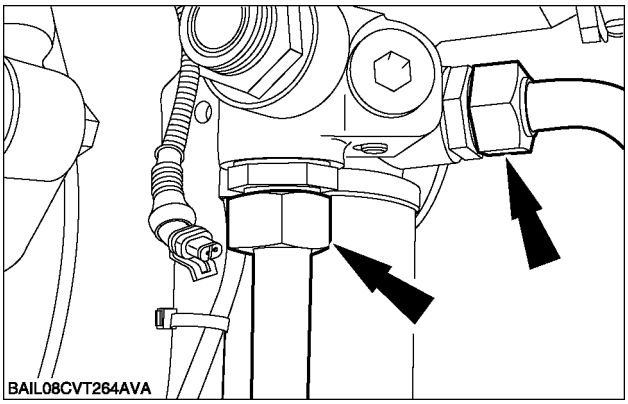
BAIL08CVT266AVA 46

48. Connect the oil cooler pipe quick release connectors **(1)**.
Install the oil cooler pipe bracket **(2)**.



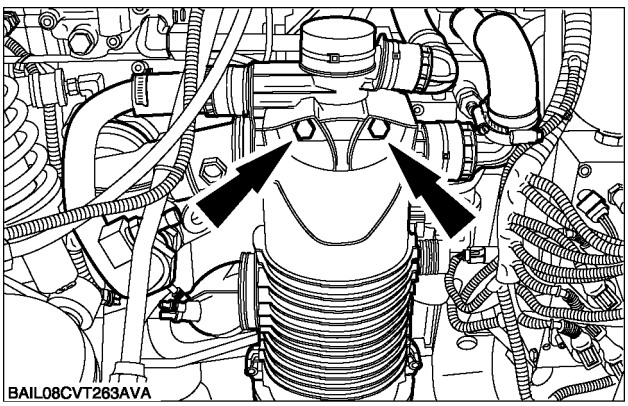
BAIL08CVT265AVA 47

49. Connect the oil cooler supply and return pipes to the filter housing.



BAIL08CVT264AVA 48

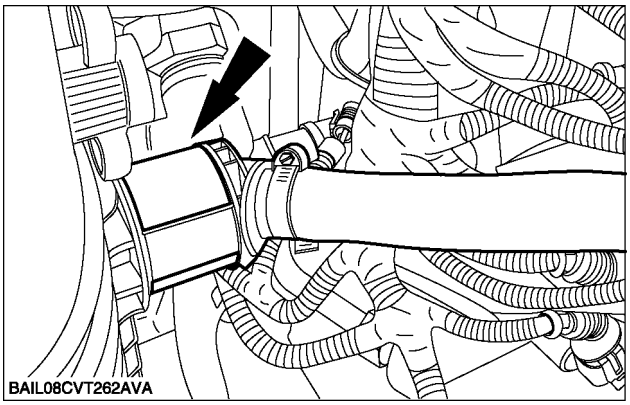
50. Install the hydraulic oil pump filter housing.



BAIL08CVT263AVA 49

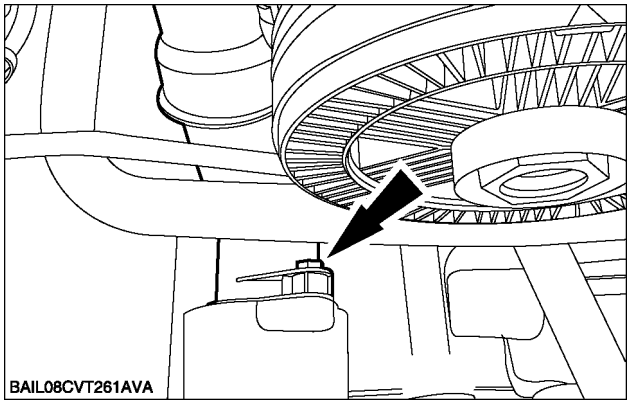
www.truck-freeworkshop.com

51. Connect the mid mounted EHR hydraulic hose (if fitted).



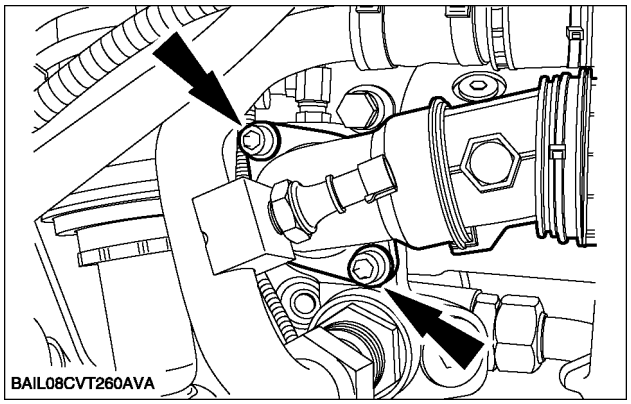
BAIL08CVT262AVA 50

52. Install the retaining bolt into the rear axle housing.



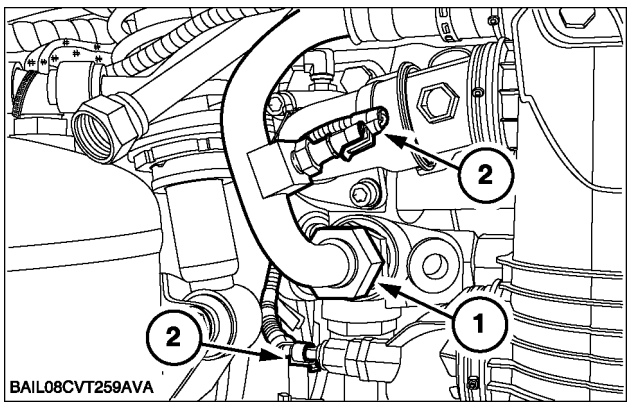
BAIL08CVT261AVA 51

53. Connect the hydraulic pipe.



BAIL08CVT260AVA 52

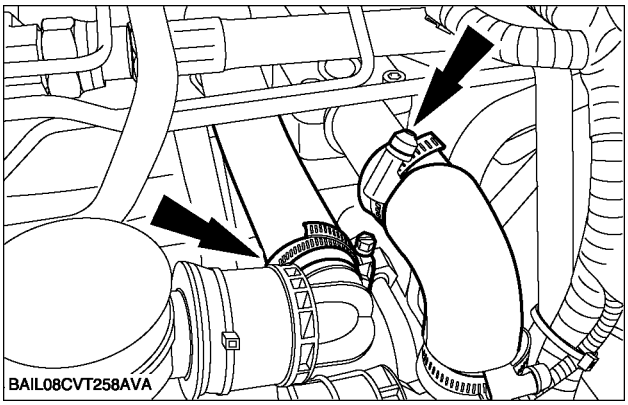
54. Connect the hydraulic charge pipe **(1)**.
Connect the electrical connectors **(2)**.



BAIL08CVT259AVA 53

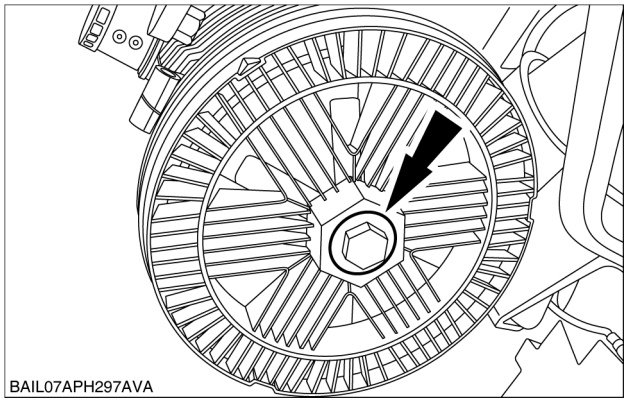
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55. Connect the hydraulic oil pipes to the hydraulic oil pump and hydraulic oil pump filter housing.



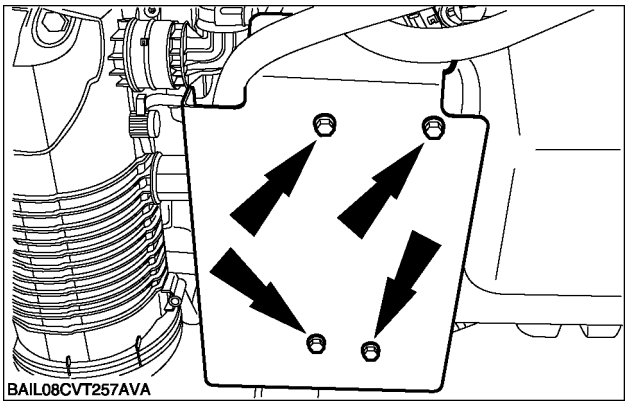
BAIL08CVT258AVA 54

56. Install the hydraulic oil pump filter housing drain plug.



BAIL07APH297AVA 55

57. Install the transmission solenoid shield.



BAIL08CVT257AVA 56

58. Fill the transmission with oil.

Next operation:
Install the fuel tanks, for further information refer to **Fuel tank - Install (B.20.A)**
Next operation:
Install the cab, for further information refer to **USER PLATFORM - Install (E.34.A)**

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Housing - Connect

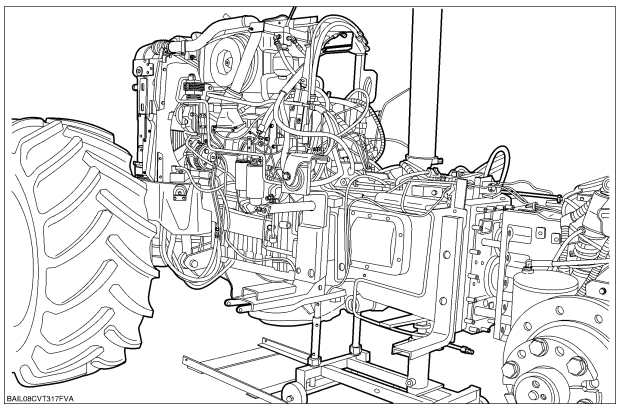
⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

Prior operation:
Connect the engine to the transmission, for further information refer to **ENGINE - Connect (B.10.A)**.

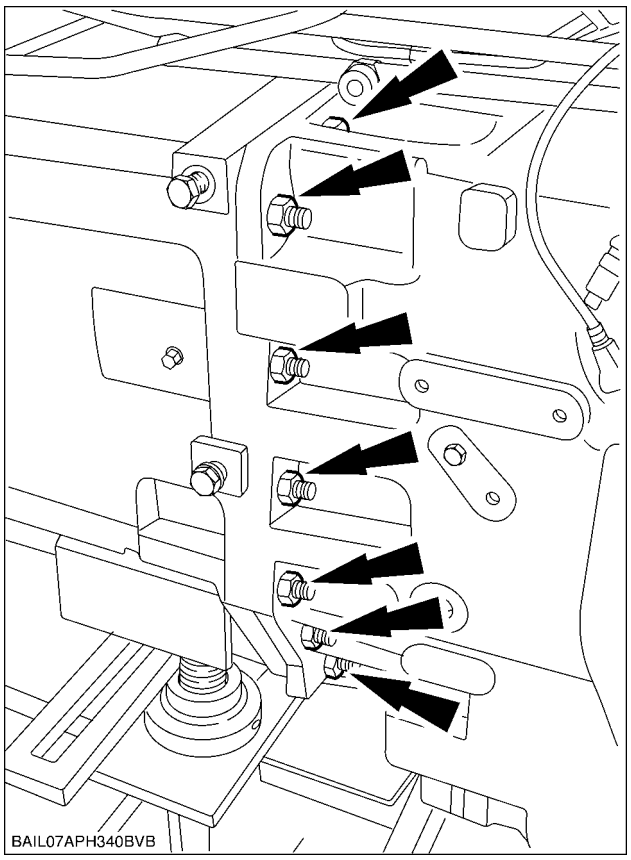
1. Before connecting the transmission housing to the rear axle housing, thoroughly clean and degrease the mating surfaces and apply a bead of liquid gasket of approximately **2 mm** of diameter.
2. Connect the transmission to the rear axle.



BAIL08CVT317FVA 1

3. Install the transmission to rear axle left-hand retaining nuts.
   Tighten to **200 Nm** (**147.5 lbft**).

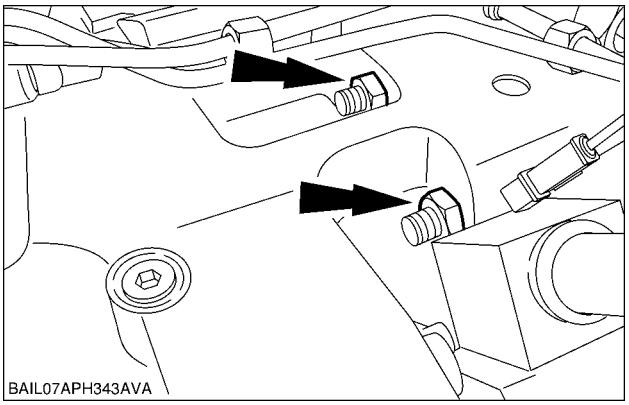
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH340BVB 2

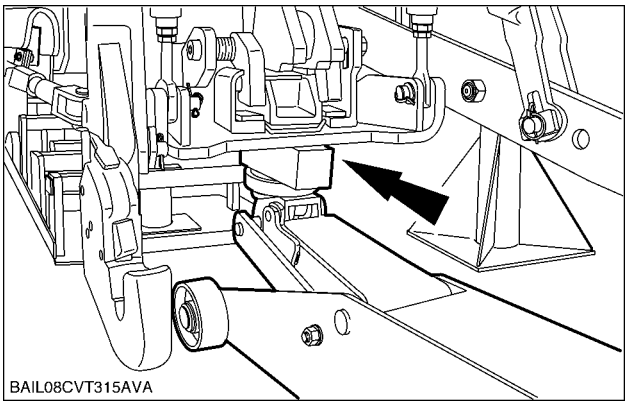
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4. Install the transmission to rear axle upper retaining nuts.
Tighten to **200 Nm** (**147.5 lbft**).



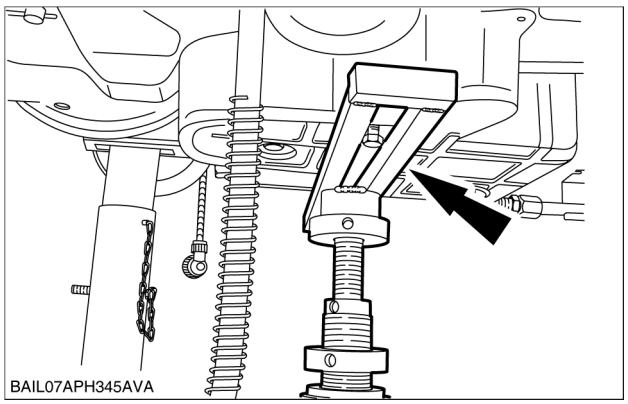
BAIL07APH343AVB 3

5. Remove the support from the rear of the vehicle.



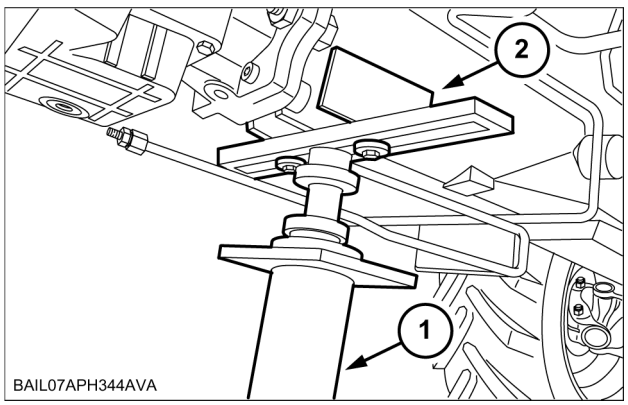
BAIL08CVT315AVA 4

6. Remove the static part of the splitting gear from the rear axle.



BAIL07APH345AVA 5

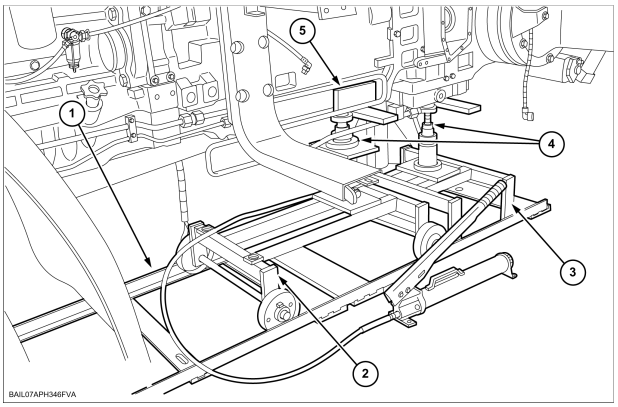
7. Remove the special tool **(2) MS2700-3/33** and the jack **(1) MS2700C-4** from the transmission.



BAIL07APH344AVA 6

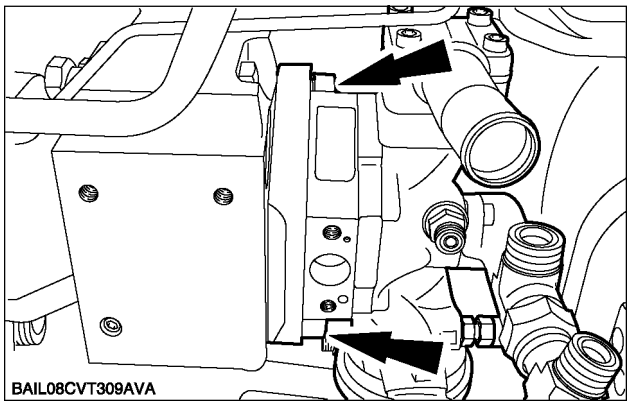
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8. Remove the static part of the splitting gear **(3) MS2700C-2** ,and **(4) MS2700C-4** from under the rear axle.
Remove the wheeled part of the splitting gear **(2) MS2700C-2**, **(4) MS2700C-4** and **(5) MS2700-3/33** from under the transmission.
Remove the splitting gear rails **(1) MS2700C-1** from under the vehicle.



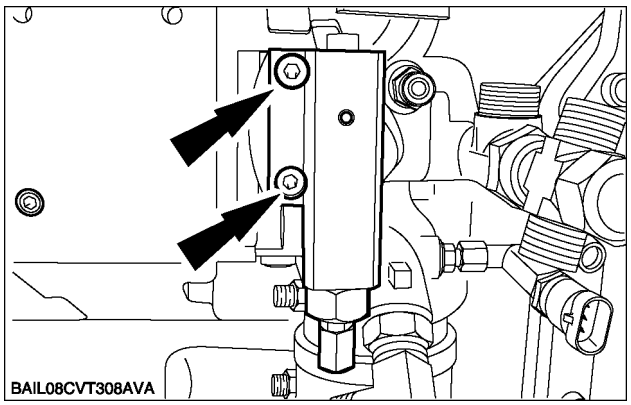
BAIL07APH346FVA 7

9. Install the vane pump.



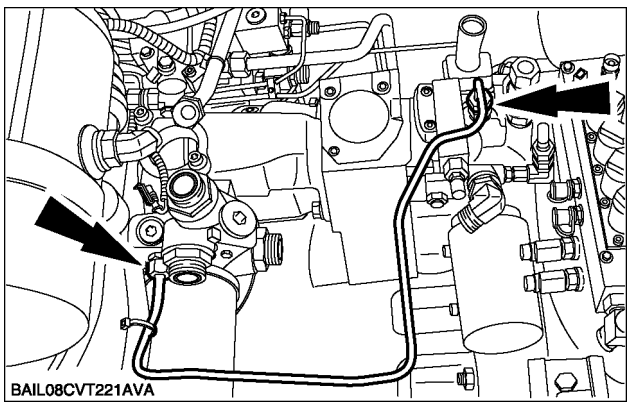
BAIL08CVT309AVA 8

10. Install the pressure control valve to the vane pump.



BAIL08CVT308AVA 9

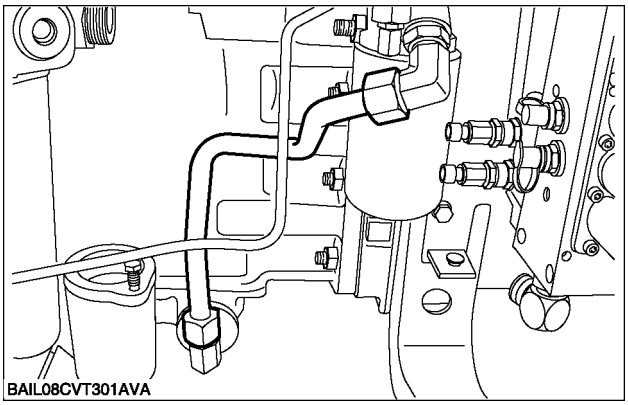
11. Install the charge pump hydraulic pipe.



BAIL08CVT221AVA 10

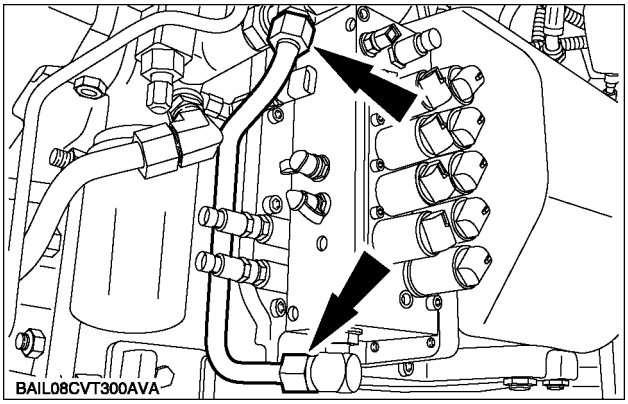
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12. Install the vane pump supply pipe.



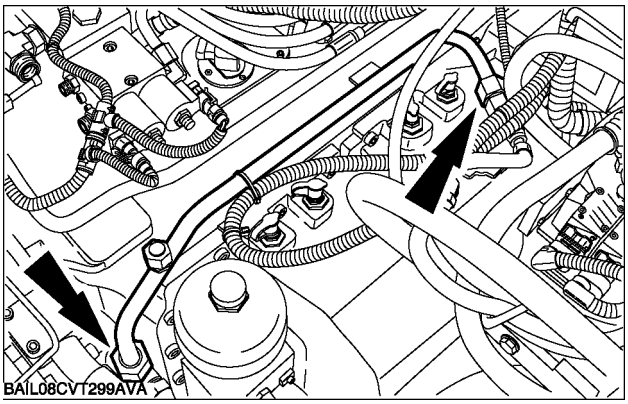
BAIL08CVT301AVA 11

13. Install the transmission solenoid block low pressure supply pipe.



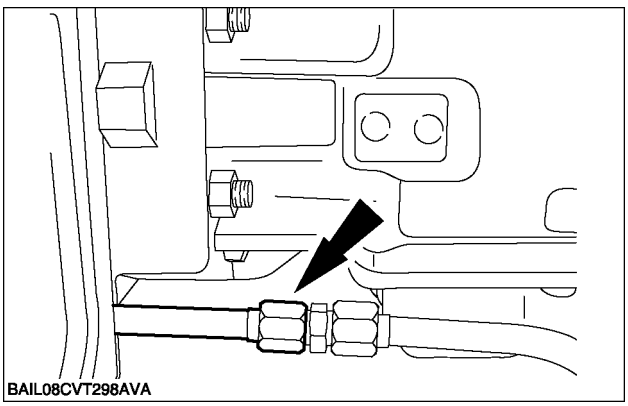
BAIL08CVT300AVA 12

14. Install the hydrostat low pressure supply pipe.



BAIL08CVT299AVA 13

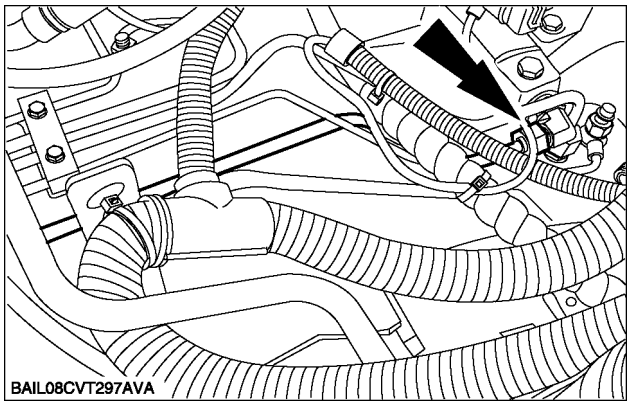
15. Connect the pneumatic brake supply pipe.



BAIL08CVT298AVA 14

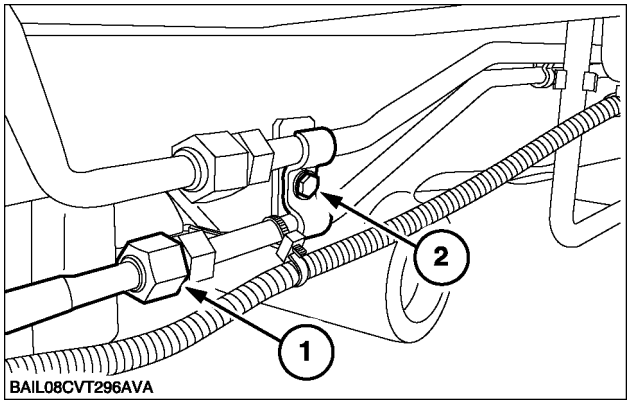
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16. Install the diff lock pipe.



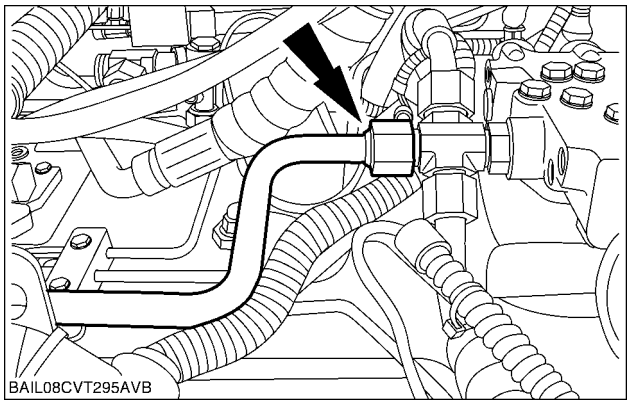
BAIL08CVT297AVA 15

17. Connect the diff lock supply pipe **(1)** and install the bracket **(2)**.



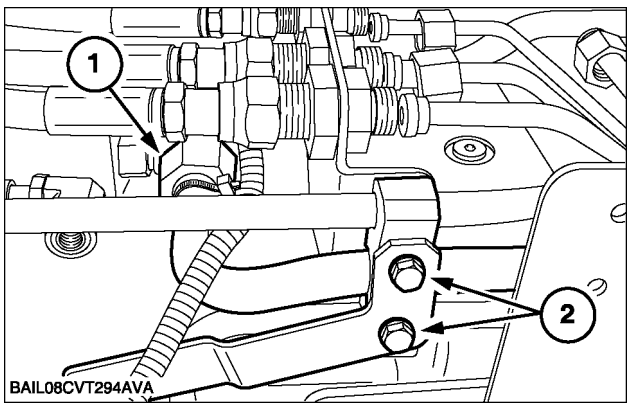
BAIL08CVT296AVA 16

18. Install the EDC low pressure pipe.



BAIL08CVT295AVB 17

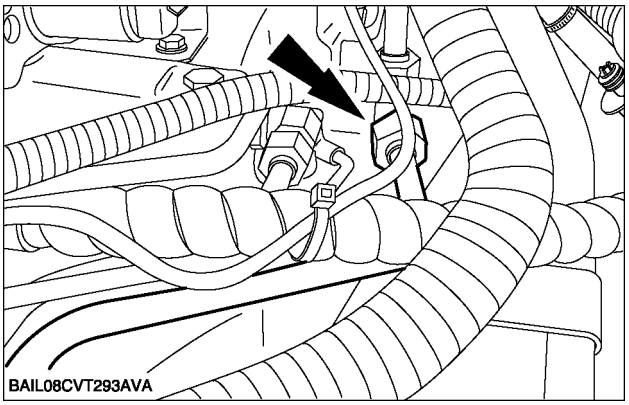
19. Connect the EDC low pressure pipe to the valve block **(1)** and install the pipe bracket **(2)**.



BAIL08CVT294AVA 18

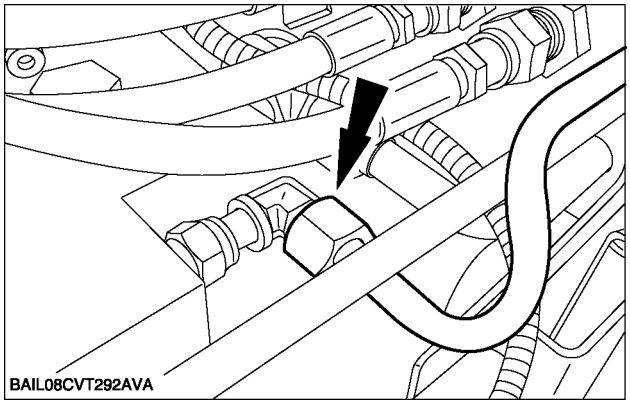
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20. Install the brake lubrication supply pipe.



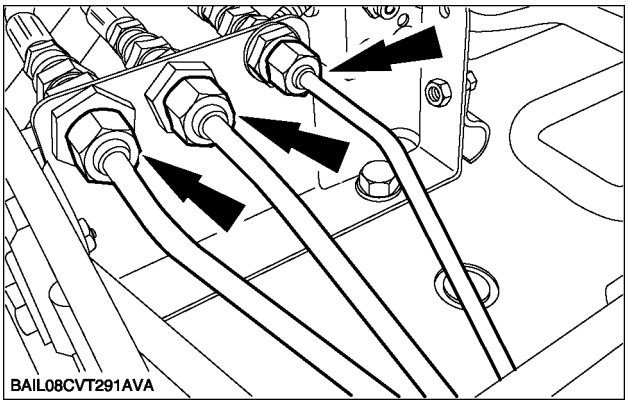
BAIL08CVT293AVA 19

21. Connect the brake lubrication supply pipe to the solenoid block.



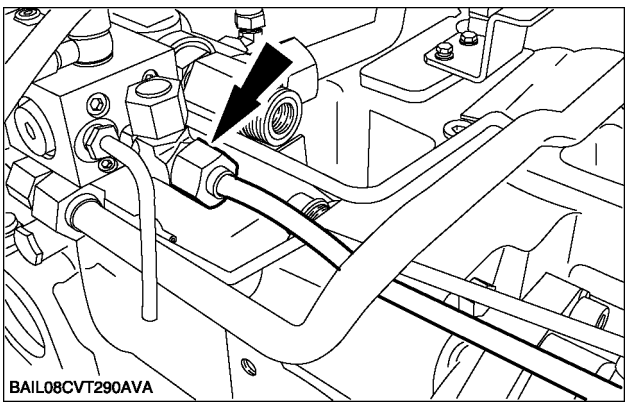
BAIL08CVT292AVA 20

22. Connect the brake pipes.



BAIL08CVT291AVA 21

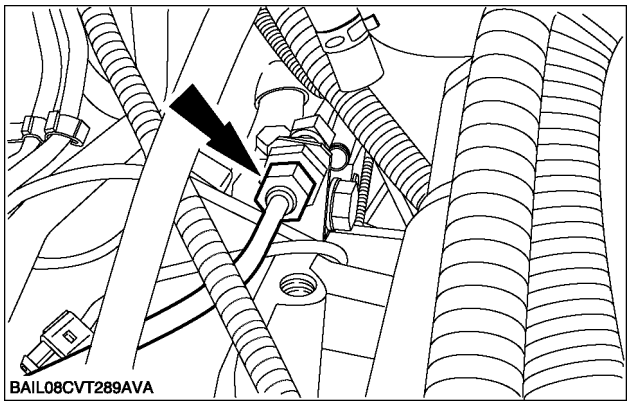
23. Install the front brake supply pipe.



BAIL08CVT290AVA 22

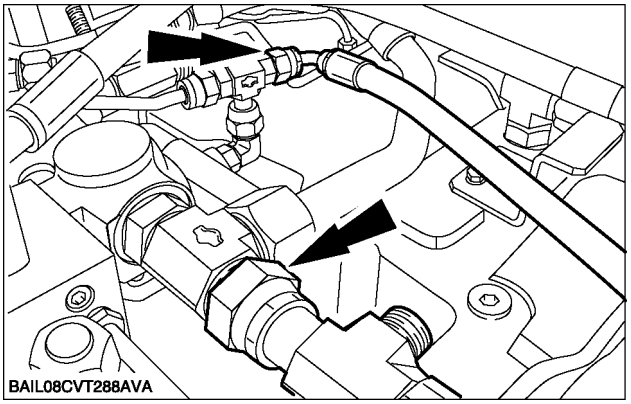
www.truck-freeworkshop.com

24. Connect the front brake supply pipe.



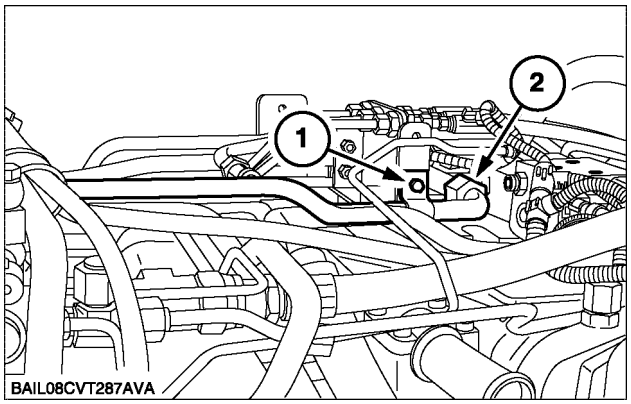
BAIL08CVT289AVA 23

25. Connect the mid mount hydraulic supply pipe and load sensing line (if fitted).



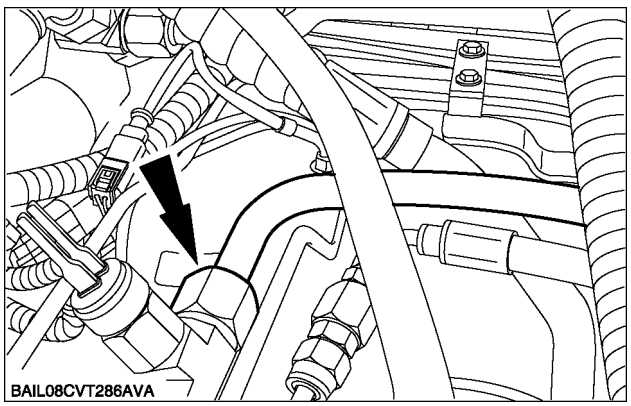
BAIL08CVT288AVA 24

26. Install the steering hydraulic pipe **(2)** and install the bracket **(1)**.



BAIL08CVT287AVA 25

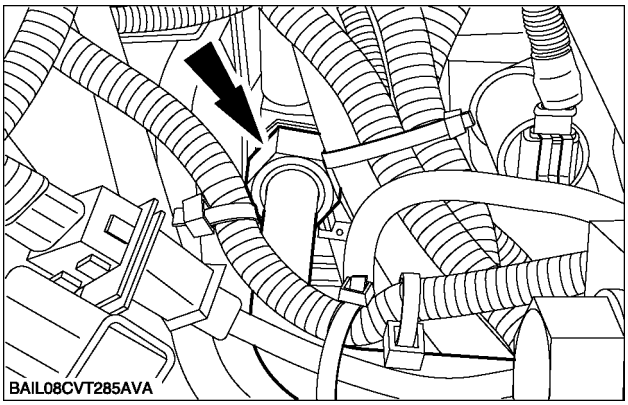
27. Install the steering pipe.



BAIL08CVT286AVA 26

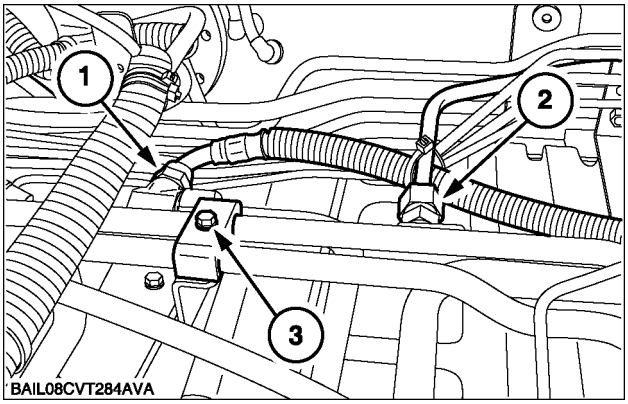
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28. Connect the pipe to the low pressure valve block.



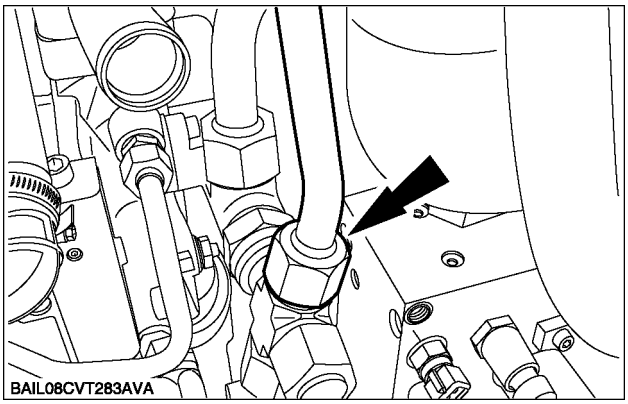
BAIL08CVT285AVA 27

29. Connect the vane pump T piece **(1)**.
Connect the brake supply pipe **(2)**.
Install the pipe clamp **(3)**.



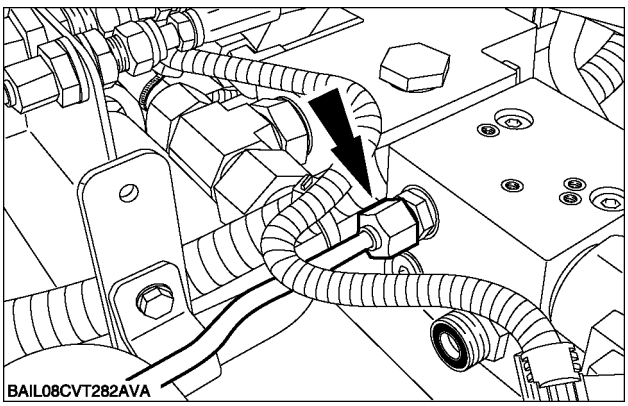
BAIL08CVT284AVA 28

30. Connect the vane pump outlet pipe.



BAIL08CVT283AVA 29

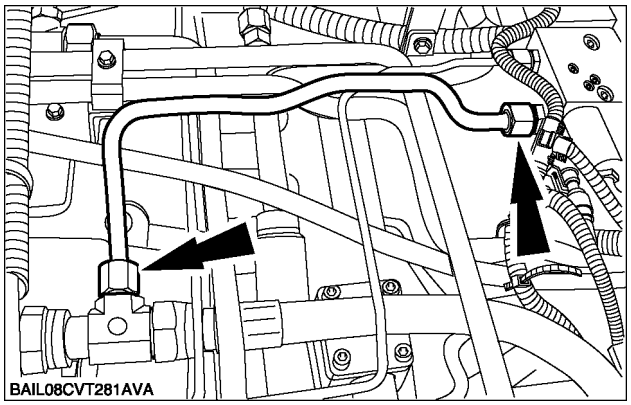
31. Connect the brake line.



BAIL08CVT282AVA 30

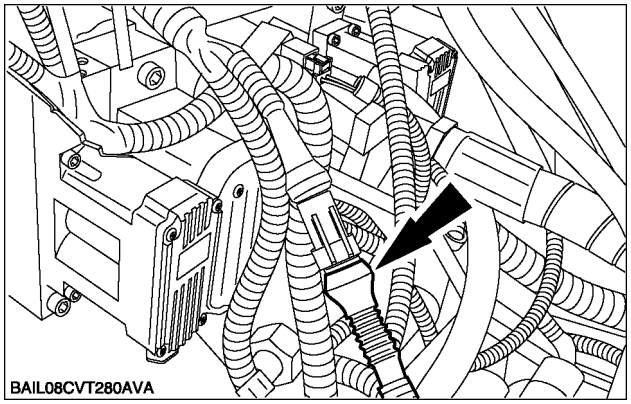
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32. Connect the front suspension hydraulic supply pipe.



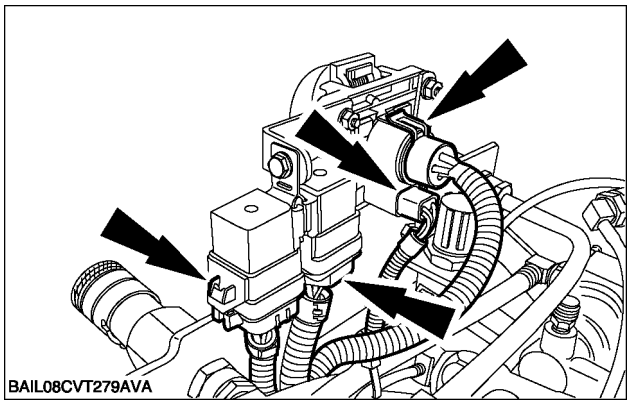
BAIL08CVT281AVA 31

33. Connect the ISO electrical connector.



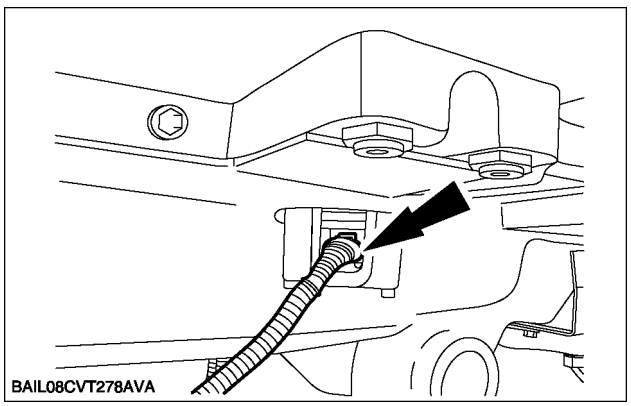
BAIL08CVT280AVA 32

34. Connect the trailer brake electrical connectors.



BAIL08CVT279AVA 33

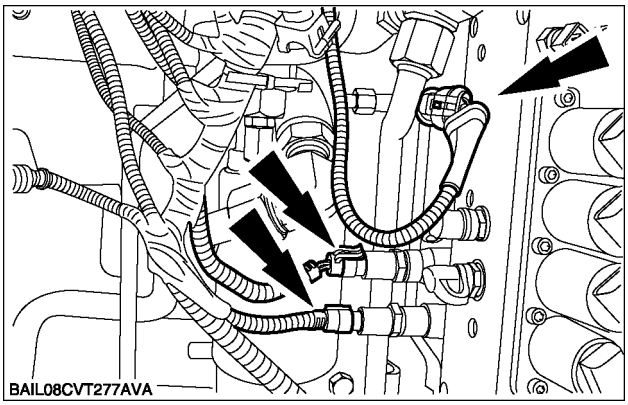
35. Connect the F2 - R1 synchroniser electrical connector.



BAIL08CVT278AVA 34

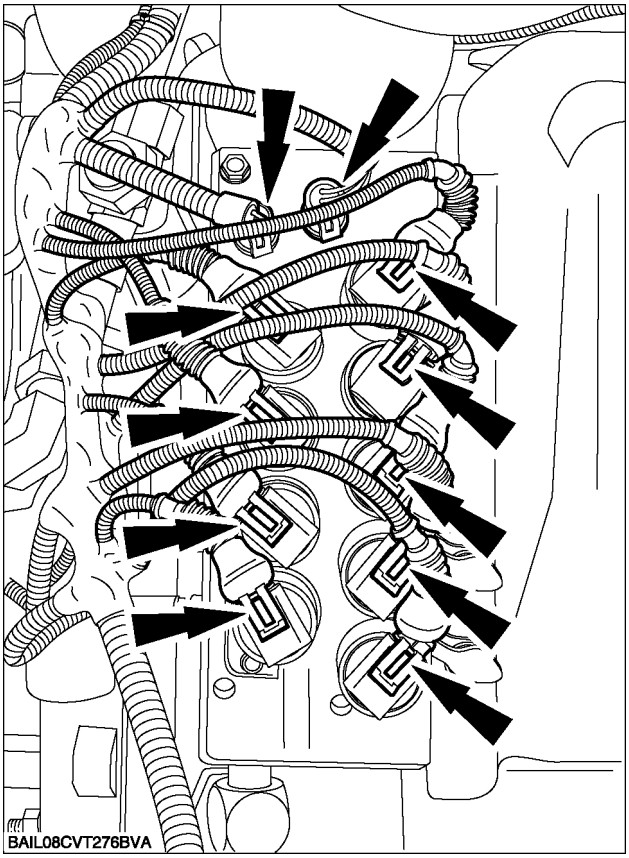
www.truck-freeworkshop.com

36. Connect the vane pump pressure sender, the brake pressure sender and the filter pressure switch electrical connectors.



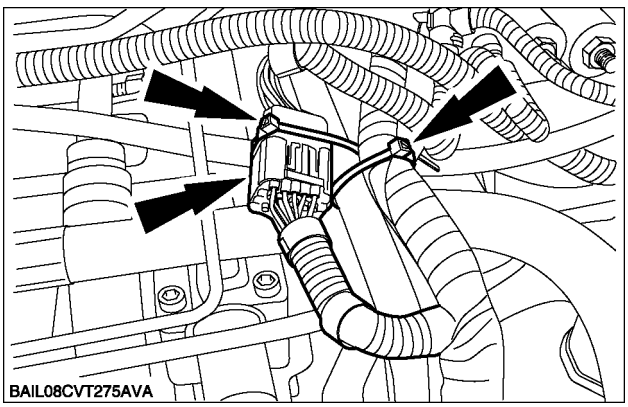
BAIL08CVT277AVA 35

37. Connect the transmission solenoid electrical connectors.



BAIL08CVT276BVA 36

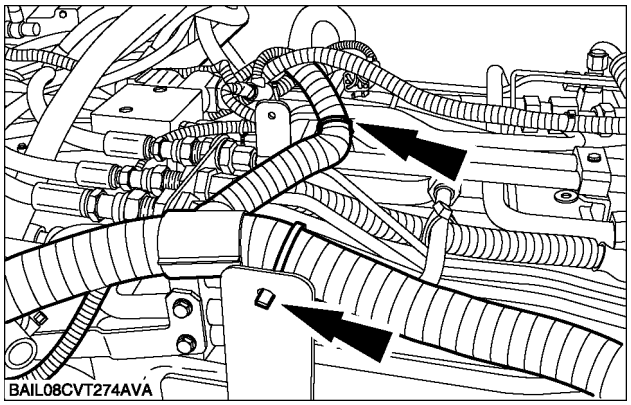
38. Connect the SFA valve electrical connector and install new cable ties.



BAIL08CVT275AVA 37

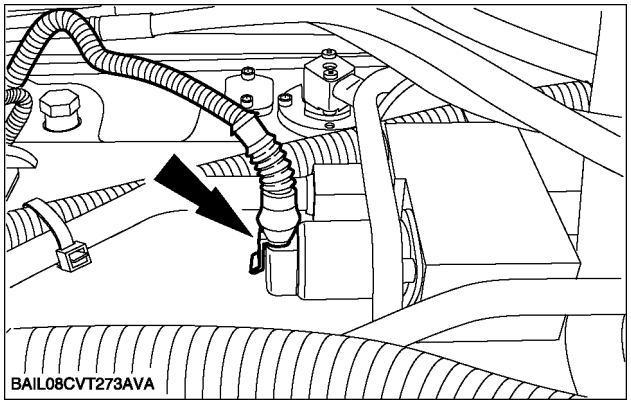
www.truck-freeworkshop.com

39. Install the wiring loom.



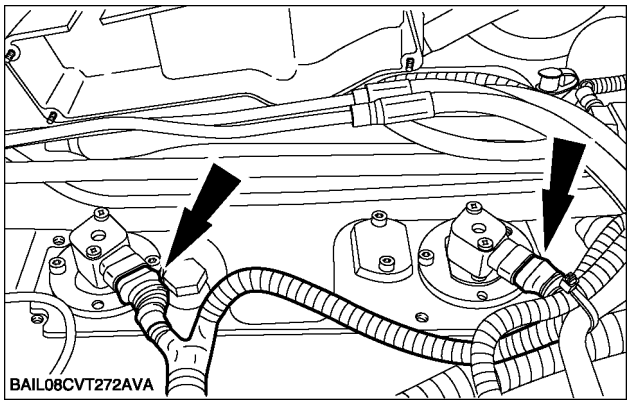
BAIL08CVT274AVA 38

40. Connect the brake lubrication solenoid electrical connector.



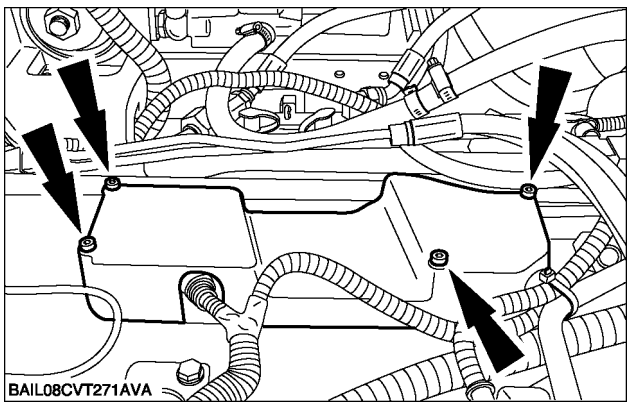
BAIL08CVT273AVA 39

41. Connect the synchroniser electrical connectors.



BAIL08CVT272AVA 40

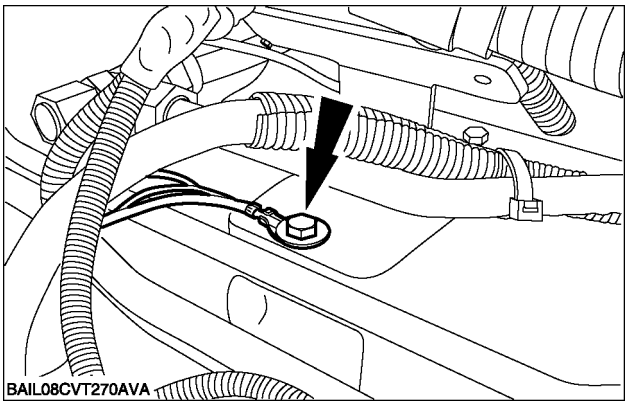
42. Install the synchroniser cover.



BAIL08CVT271AVA 41

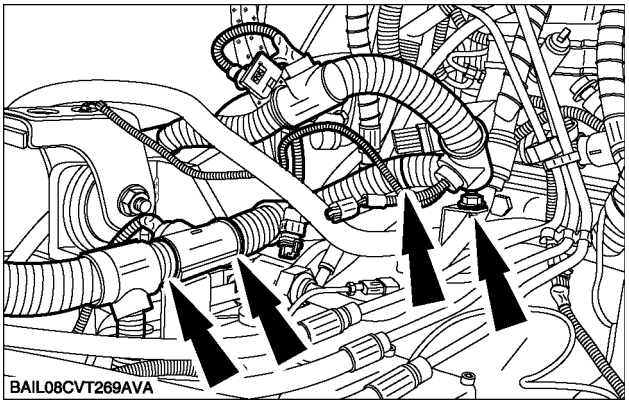
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43. Connect the ground connectors.



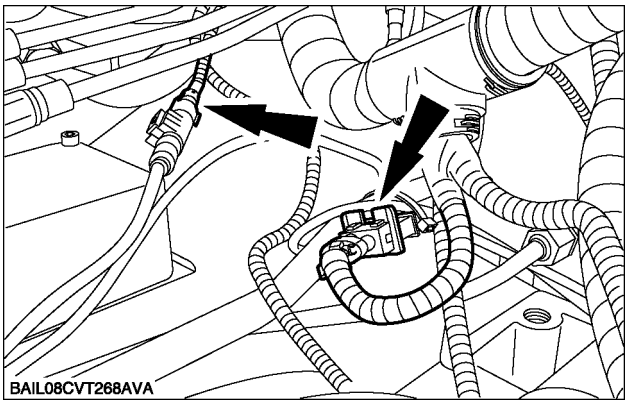
BAIL08CVT270AVA 42

44. Install the wiring loom into the fir tree clips.



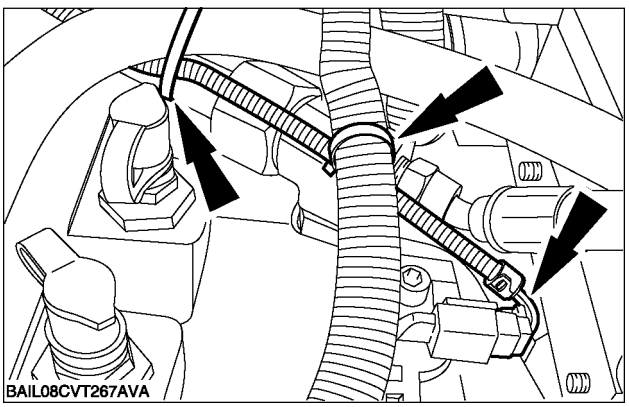
BAIL08CVT269AVA 43

45. Connect the torque sensor and ring speed electrical connectors.



BAIL08CVT268AVA 44

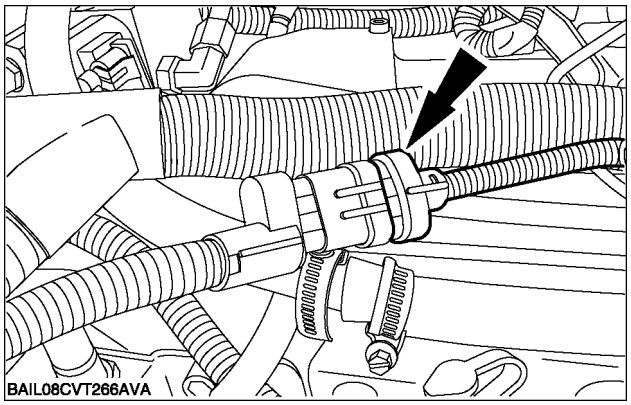
46. Connect the electrical connector on top of the hydrostat housing and install new cable ties.



BAIL08CVT267AVA 45

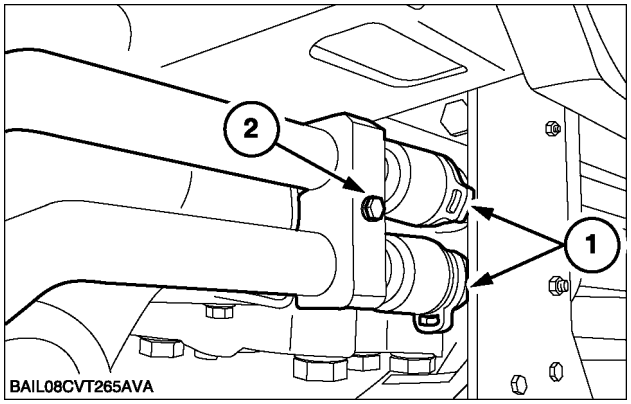
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47. Connect the mid mount electrical connector (if fitted).



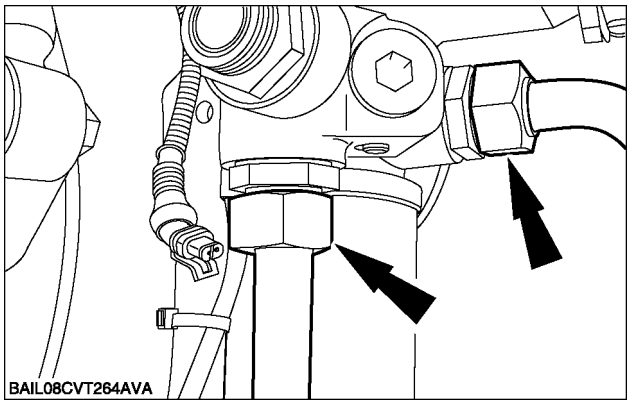
BAIL08CVT266AVA 46

48. Connect the oil cooler pipe quick release connectors **(1)**.
Install the oil cooler pipe bracket **(2)**.



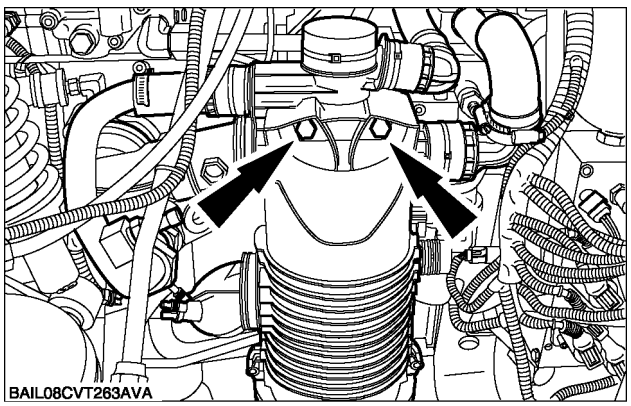
BAIL08CVT265AVA 47

49. Connect the oil cooler supply and return pipes to the filter housing.



BAIL08CVT264AVA 48

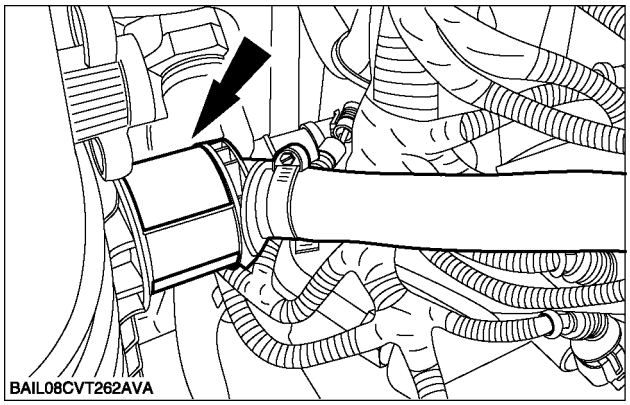
50. Install the hydraulic oil pump filter housing.



BAIL08CVT263AVA 49

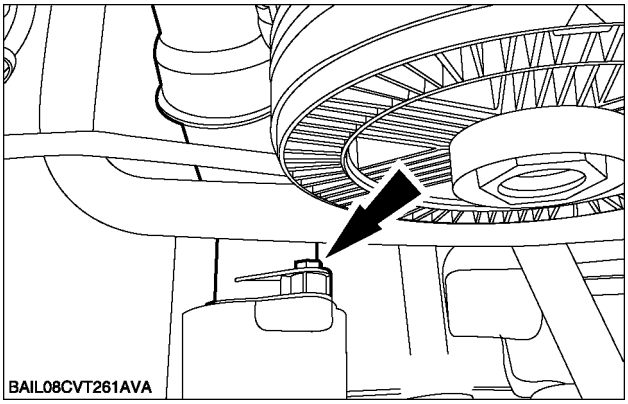
www.truck-freeworkshop.com

51. Connect the mid mounted EHR hydraulic hose (if fitted).



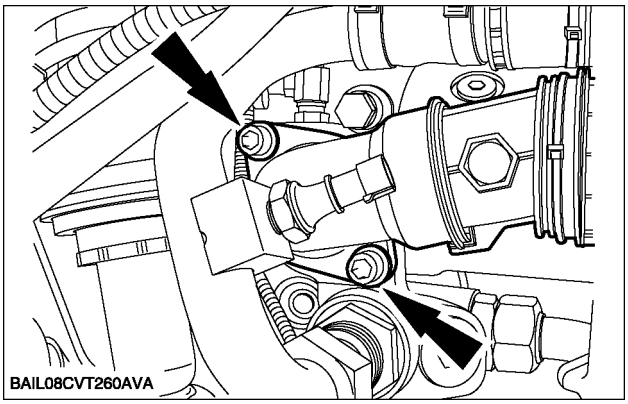
BAIL08CVT262AVA 50

52. Install the retaining bolt into the rear axle housing.



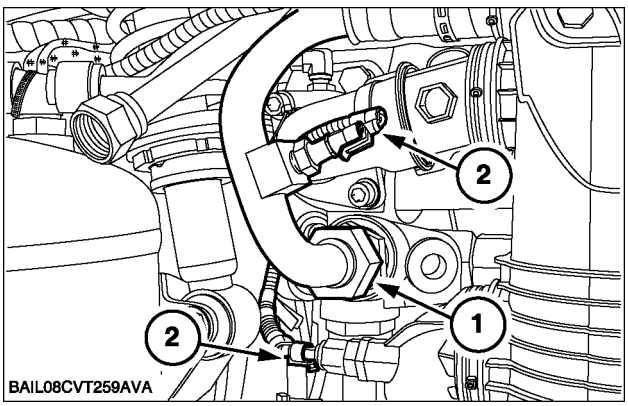
BAIL08CVT261AVA 51

53. Connect the hydraulic pipe.



BAIL08CVT260AVA 52

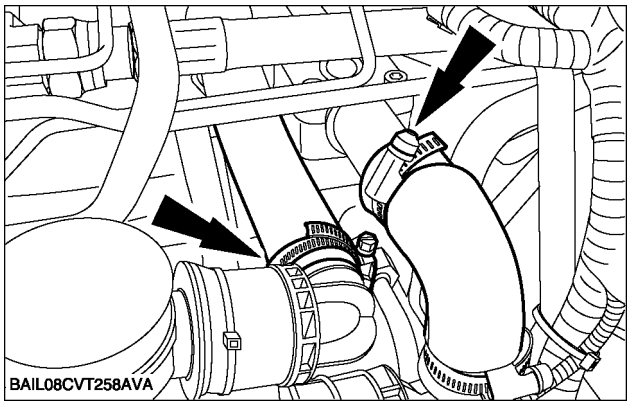
54. Connect the hydraulic charge pipe **(1)**.
Connect the electrical connectors **(2)**.



BAIL08CVT259AVA 53

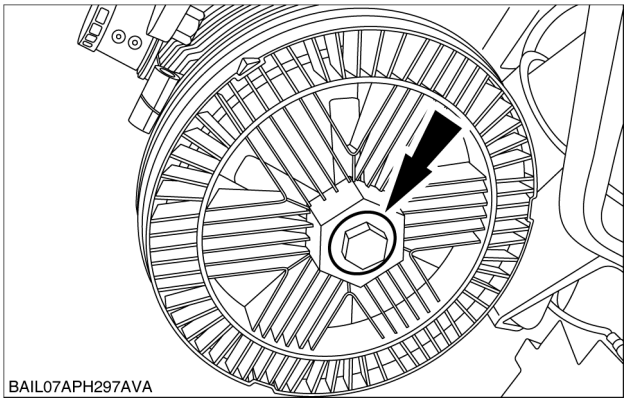
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55. Connect the hydraulic oil pipes to the hydraulic oil pump and hydraulic oil pump filter housing.



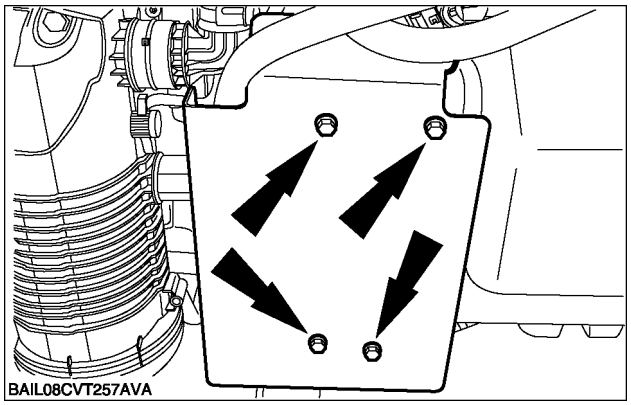
BAIL08CVT258AVA 54

56. Install the hydraulic oil pump filter housing drain plug.



BAIL07APH297AVA 55

57. Install the transmission solenoid shield.



BAIL08CVT257AVA 56

58. Fill the transmission with oil.

Next operation:
Install the fuel tank, for further information refer to **Fuel tank - Install (B.20.A)**
Next operation:
Install the cab, for further information refer to **USER PLATFORM - Install (E.34.A)**

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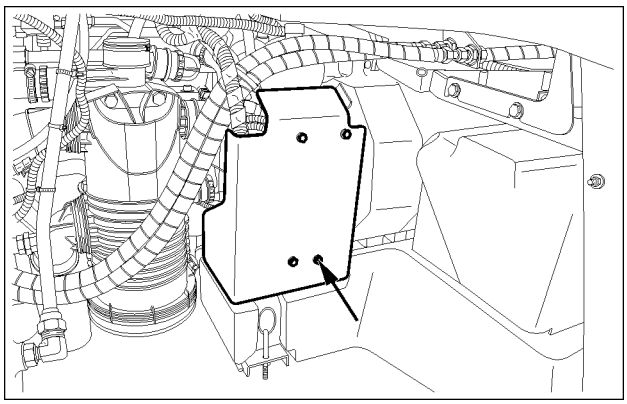
Sensing system System pressure sensor - Replace (P1)

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.

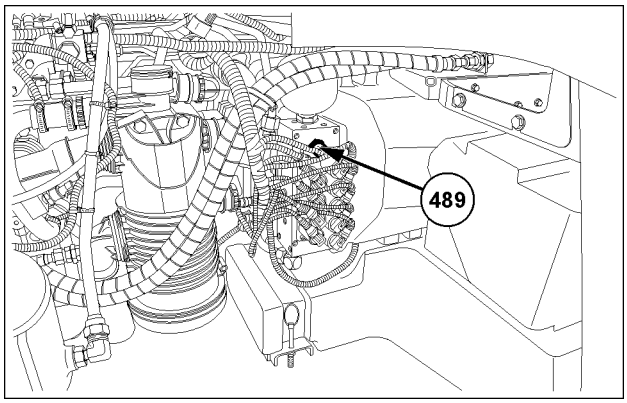
Disassembly

1. Remove the four retaining bolts and take off the cover.



SS08H017 1

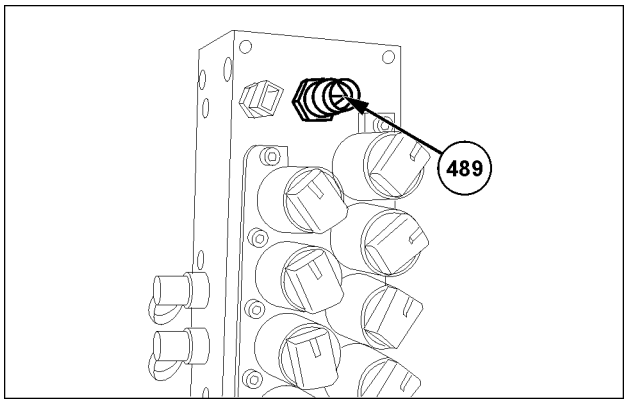
2. Disconnect the electrical line from the system pressure sensor **(489)** and remove the system pressure sensor.



SS08J098 2

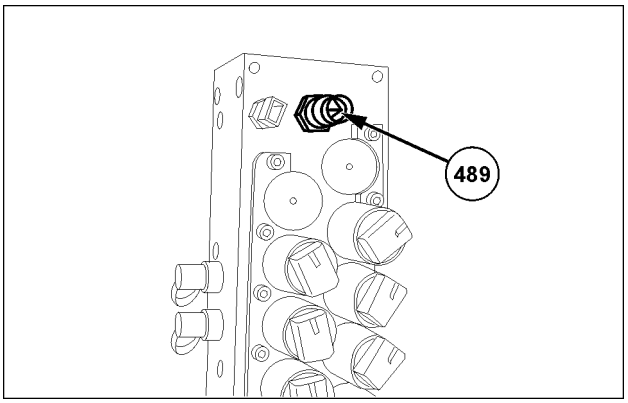
Assembly

3. Fit the system pressure sensor **(489)** with a new seal ring **(506)** and tighten to **20 Nm** (**14.8 lb ft**).
   Image **3** - 40 km/h ECO and 50 km/h gearbox variants
   Image **4** - 35 km/h and 40 km/h gearbox variants



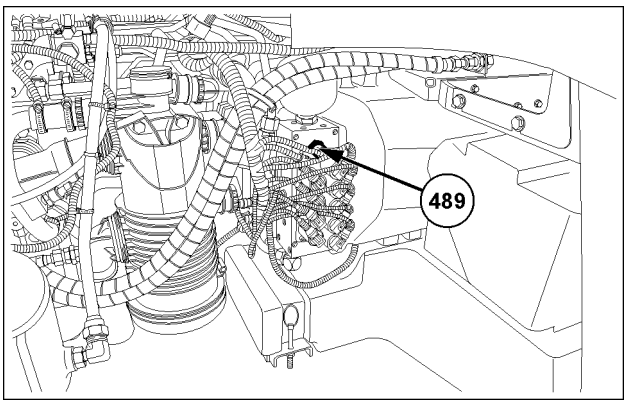
SS08J097 3

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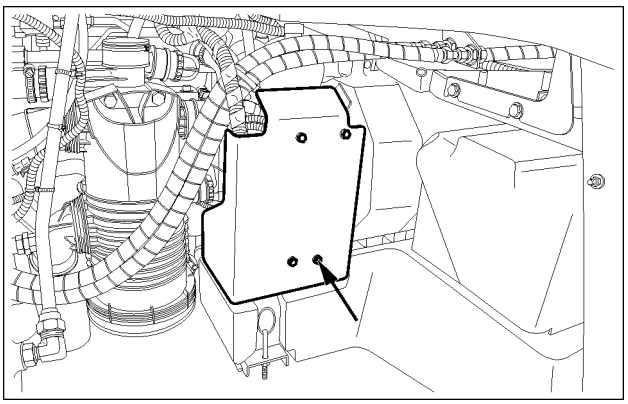
SS08J096 4

4. Connect the electrical line to the system pressure sensor **(489)**.



SS08J098 5

5. Fit the cover. Insert the screws and tighten.



SS08H017 6

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.

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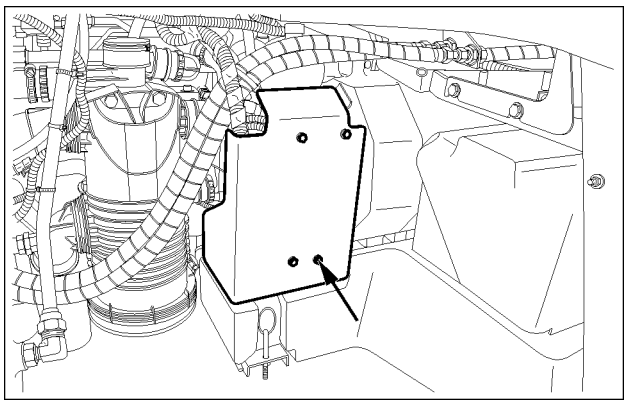
Sensing system Pressure sensor - Replace (Clutch "A")

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.

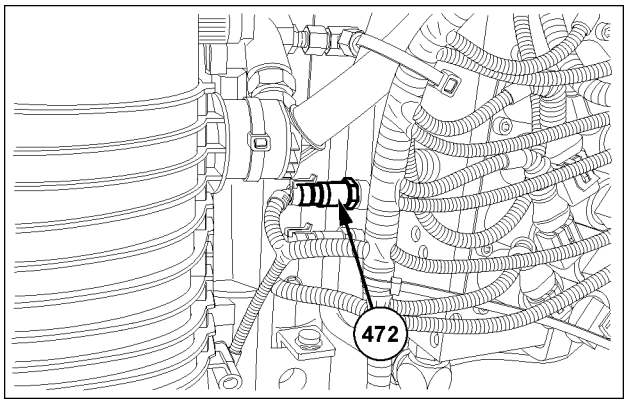
Disassembly

1. Remove the four retaining bolts and take off the cover.



SS08H017 1

2. Disconnect the electrical line from the pressure sensor **(472)** and remove the pressure sensor.



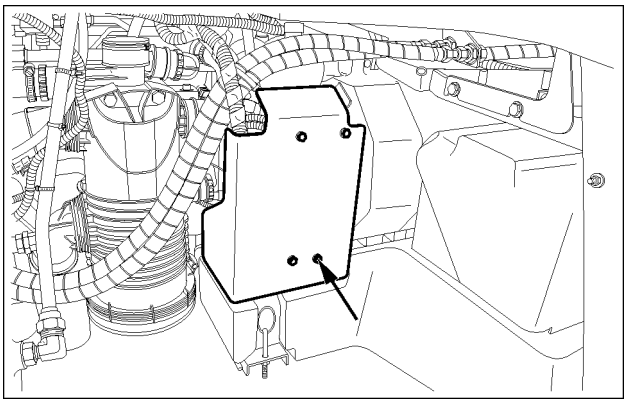
SS08H173 2

Assembly

3. Fit the pressure sensor **(472)** with a new seal ring **(471)** and tighten to . **20 Nm** (**14.8 lb ft**)
Connect the electrical line to the pressure sensor.

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4. Fit the cover. Insert the screws and tighten.



SS08H017 3

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.

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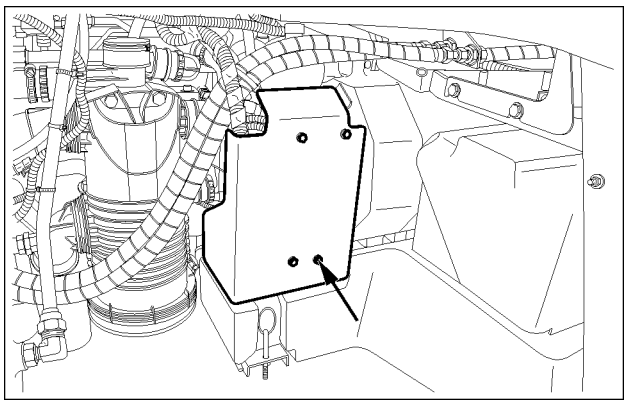
Sensing system Pressure sensor - Replace (Clutch "B")

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.

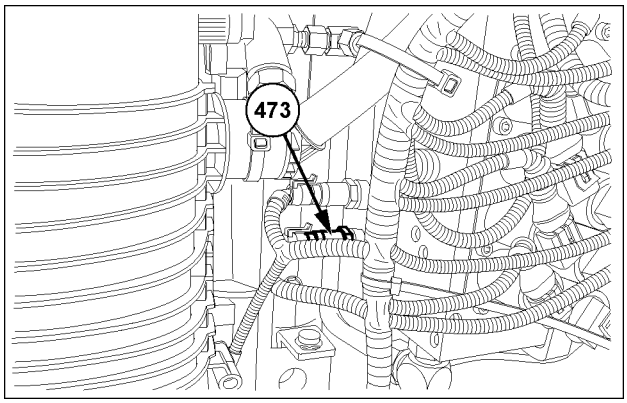
Disassembly

1. Remove the four retaining bolts and take off the cover.



SS08H017 1

2. Disconnect the electrical line from the pressure sensor **(473)** and remove the pressure sensor.



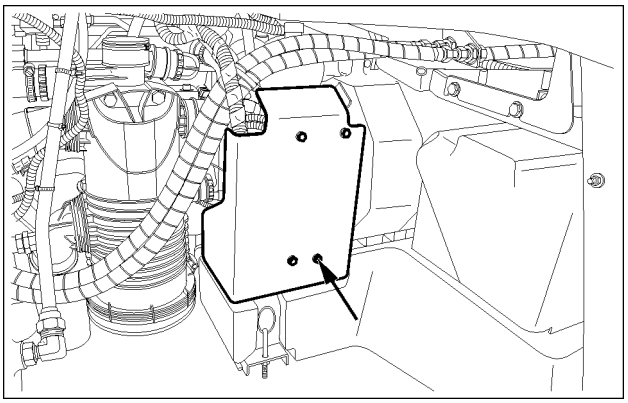
SS08J129 2

Assembly

3. Fit the pressure sensor **(473)** with a new seal ring **(471)** and tighten to . **20 Nm** (**14.8 lb ft**)
Connect the electrical line to the pressure sensor.

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4. Fit the cover. Insert the screws and tighten.



SS08H017 3

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.

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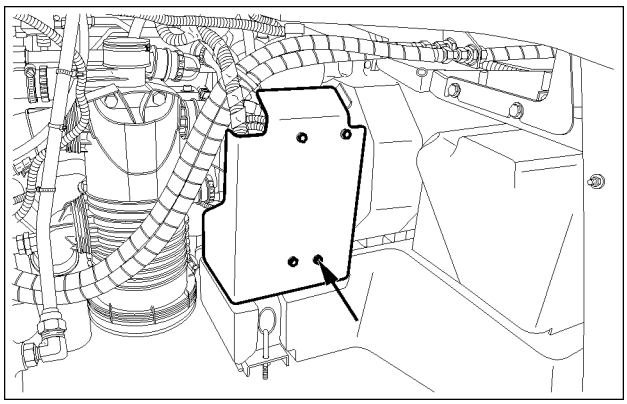
Sensing system Temperature sensor - Replace

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Hydrostat, Reverse Drive Components) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.

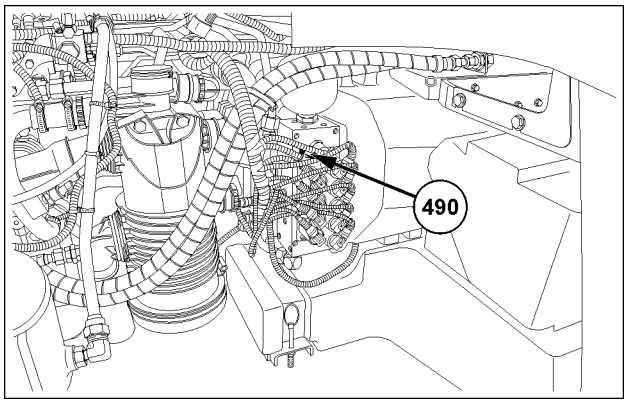
Disassembly

1. Remove the four retaining bolts and take off the cover.



SS08H017 1

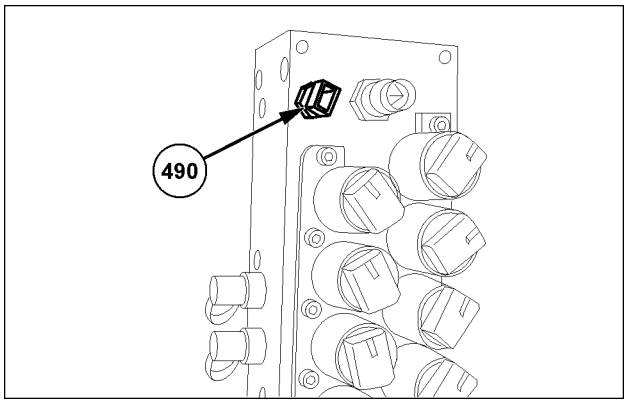
2. Disconnect the electrical line from the temperature sensor **(490)** and remove the temperature sensor.



SS08J093 2

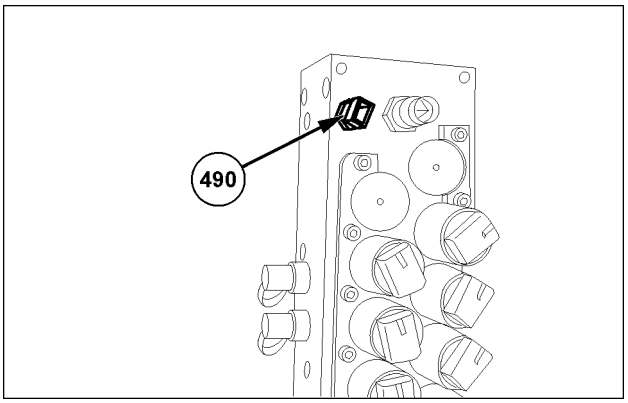
Assembly

3. Fit the temperature sensor **(490)** with a new seal ring **(491)** and tighten to **14 - 18 Nm** (**10.3 - 13.3 lb ft**).
Image **3** - 40 km/h ECO and 50 km/h gearbox variants
Image **4** - 35 km/h and 40 km/h gearbox variants



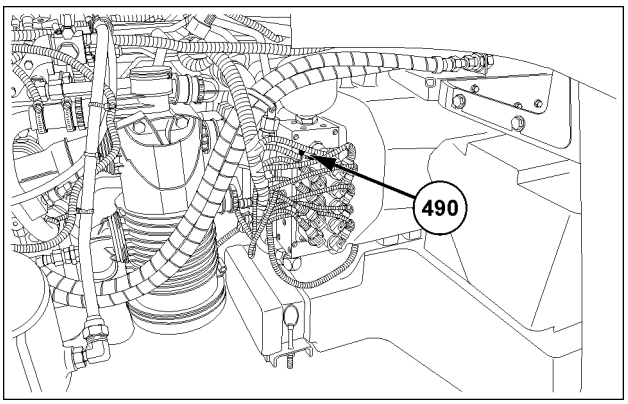
SS08J094 3

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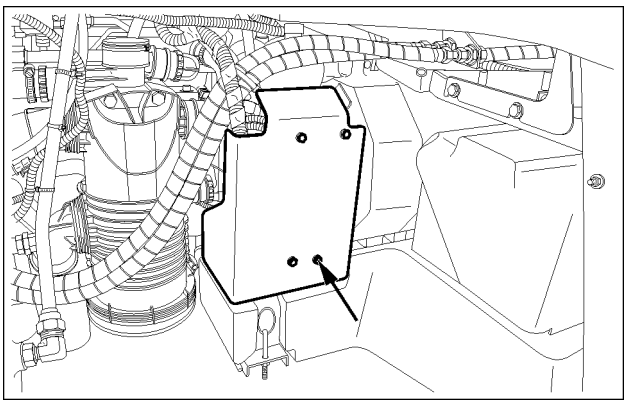
SS08J095 4

4. Connect the electrical line to the temperature sensor **(490)**.



SS08J093 5

5. Fit the cover. Insert the screws and tighten.



SS08H017 6

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.

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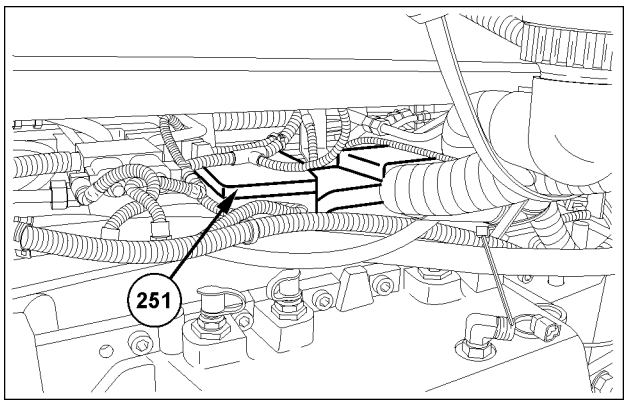
Sensing system Position potentiometer - Replace (F1/F3)

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.

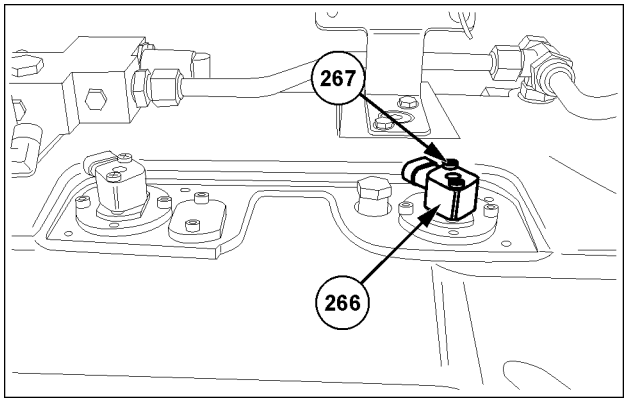
Disassembly

1. Remove the screws **(252)** and take off the cover **(251)**. Disconnect the electrical line from the potentiometer **(266)**.



SS08H172 1

2. Unscrew the screws **(267)** and remove the potentiometer **(266)**.



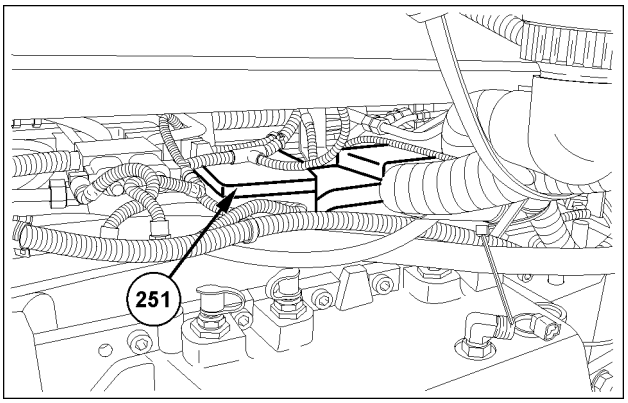
SS08J123 2

Assembly

3. Coat the flange face and the actuation shaft of the potentiometer **(266)** with industrial vaseline and install it. Insert the screws **(267)** and tighten to **2 Nm** (**1.5 lb ft**).

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4. Connect the electrical line to the potentiometer **(266)**. Fit the cover **(251)**. Insert the screws **(252)** and tighten.



SS08H172 3

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.

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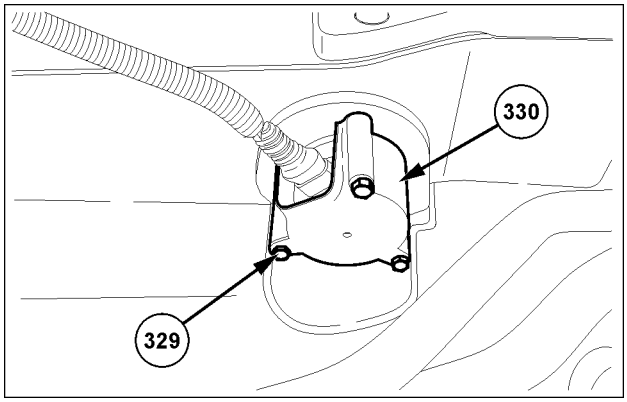
Sensing system Position potentiometer - Replace (F2/R1)

TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system) (C.20.G)

Prior operation:
Battery - Remove (A.30.A)
Remove the right fuel tank - see **Fuel tank - Remove (B.20.A)**
Mid-mount remote control valve - Remove (A.10.C) (if equipped)

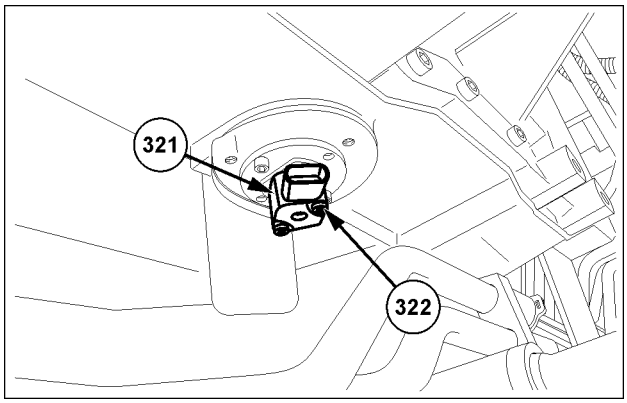
Disassembly

1. Remove the screws **(329)** and take off the cover **(330)**. Disconnect the electrical line from the potentiometer **(321)**.



SS08H170 1

2. Unscrew the screws **(322)** and remove the potentiometer **(321)**.



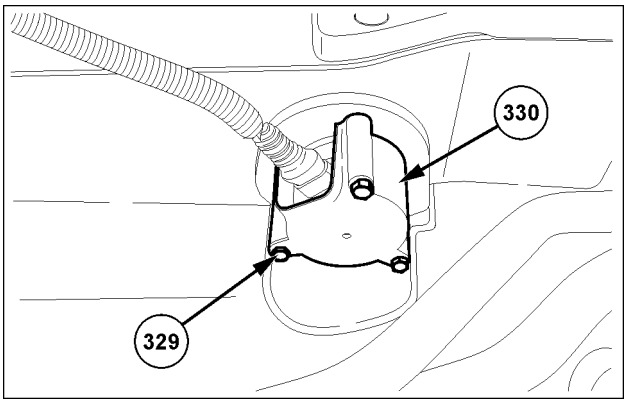
SS08H171 2

Assembly

3. Coat the flange face and the actuation shaft of the potentiometer **(321)** with industrial vaseline and install it. Insert the screws **(322)** and tighten to **2 Nm** (**1.5 lb ft**).

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4. Connect the electrical line to the potentiometer **(321)**. Fit the cover **(330)**. Insert the screws **(329)** and tighten.



SS08H170 3

NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Mid-mount remote control valve - Install (A.10.C)
Install the right fuel tank - see **Fuel tank - Install (B.20.A)**
Battery - Install (A.30.A)

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Sensing system Position potentiometer - Replace (F4/R2)

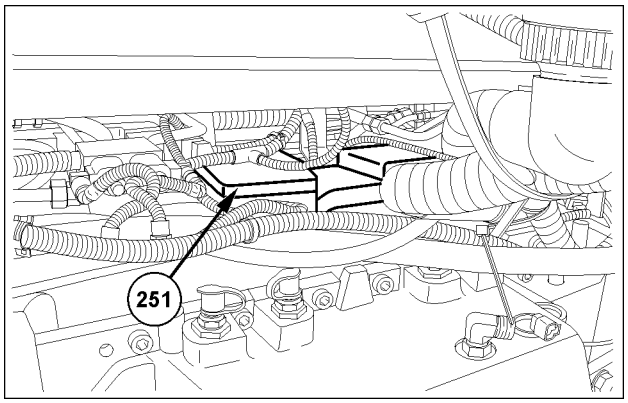
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TRANSMISSION Continuously Variable Transmission (CVT) - Exploded view (Shifting system) (C.20.G)

Prior operation:
Remove the rear right wheel - see **Rear wheel - Remove (D.50.C)**.

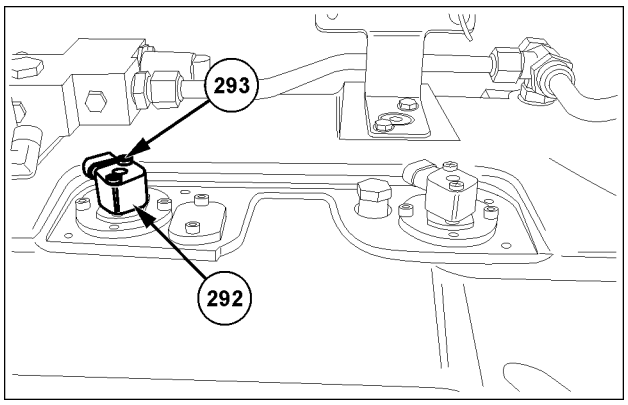
Disassembly

1. Remove the screws **(252)** and take off the cover **(251)**. Disconnect the electrical line from the potentiometer **(292)**.



SS08H172 1

2. Unscrew the screws **(293)** and remove the potentiometer **(292)**.



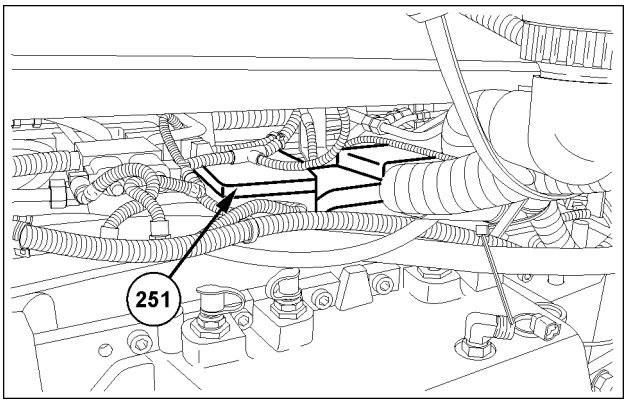
SS08J124 2

Assembly

3. Coat the flange face and the actuation shaft of the potentiometer **(292)** with industrial vaseline and install it. Insert the screws **(293)** and tighten to **2 Nm** (**1.5 lb ft**).

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4. Connect the electrical line to the potentiometer **(292)**. Fit the cover **(251)**. Insert the screws **(252)** and tighten.



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NOTE: *After the vehicle has been completely set up it must be calibrated - see* ***TRANSMISSION Continuously Variable Transmission (CVT) - Calibrate CVT Transmission (C.20.G)****.*

Next operation:
Fit the rear right wheel - see **Rear wheel - Install (D.50.C)**.

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Sensing system Speed sensor - Replace (Ring gear)

⚠ CAUTION ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026

⚠ DANGER ⚠

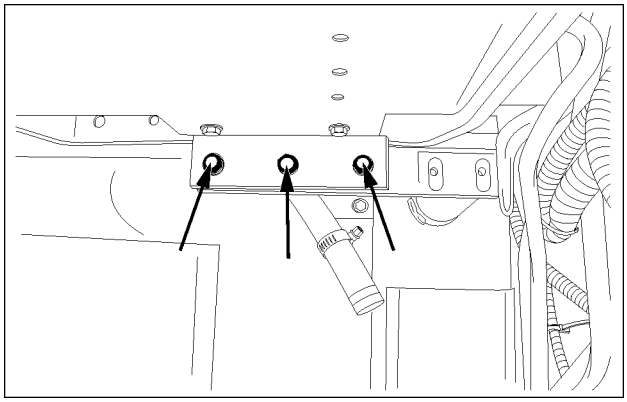
Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

Prior operation:
Battery - Remove (A.30.A).
Remove the right fuel tank - see **Fuel tank - Remove (B.20.A)**.
Remove the mid-mount remote control valves (if equipped) - see **Mid-mount remote control valve - Remove (A.10.C)**.

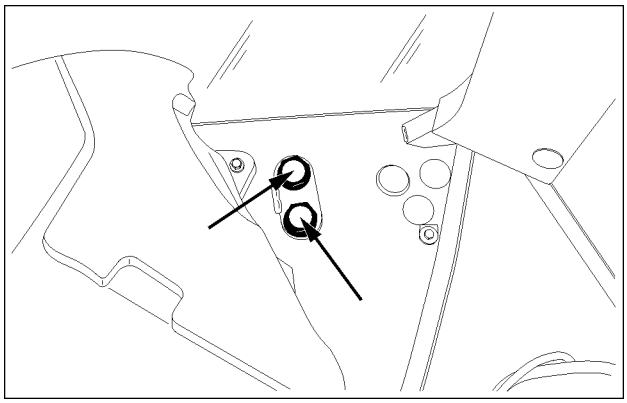
Disassembly

1. Thread the supply lines for the mid-mount remote control valves (if equipped) out of the guide bracket.
2. Unscrew the three screws and remove together with the bracket.



SS08H156 1

3. Lift the right side of the cab floor mat and remove the two screws for the cab mounting.



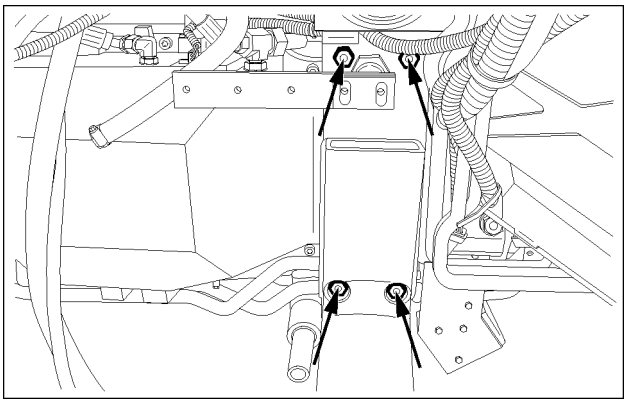
SS08H157 2

4. Carefully prop up the cab on the right side using suitable supports.

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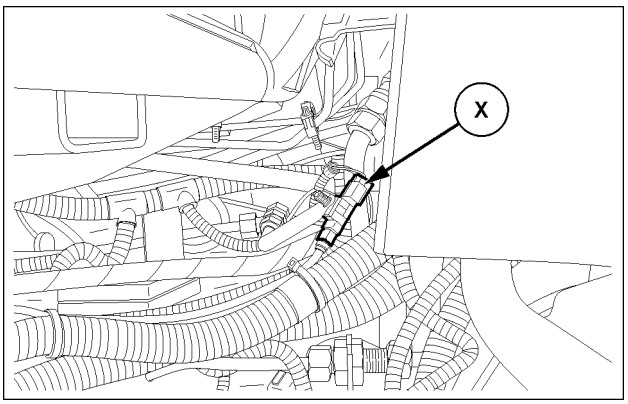
5. Unscrew the four screws and dismantle the console for the cab mounting using a suitable hoisting device.

NOTE: *The weight of the console is approximately* ***35 kg*** *(****77.2 lb****).*



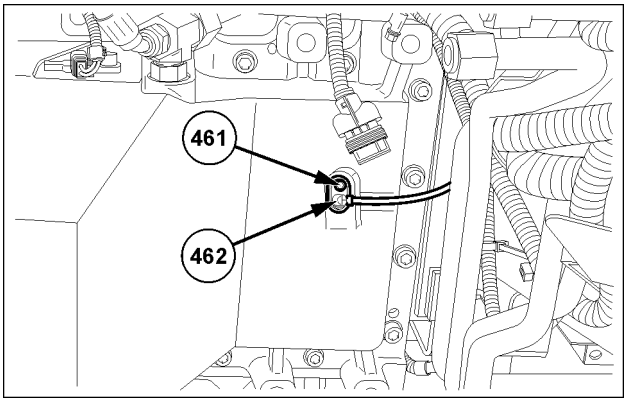
SS08H158 3

6. Disconnect the electrical connector **(X)** from the speed sensor for the ring gear **(462)**.



SS08H169 4

7. Unscrew the screw **(461)** and remove the speed sensor for the ring gear **(462)**.



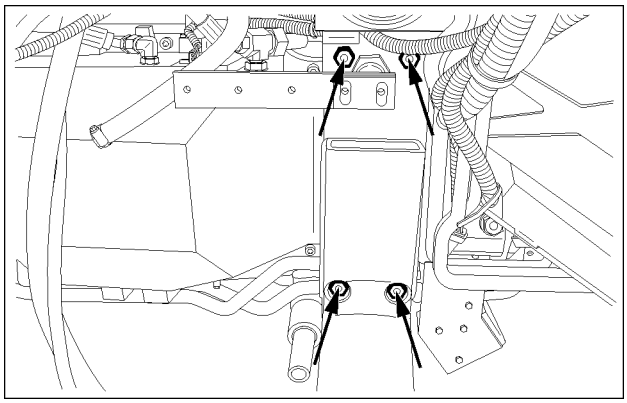
SS08H159 5

Assembly

8. Place the speed sensor for the ring gear **(462)** inside, tighten the screw **(461)** and tighten to **6 - 10 Nm** (**4.43 - 7.38 lb ft**).
Connect the electrical connector - see Figure **4**.

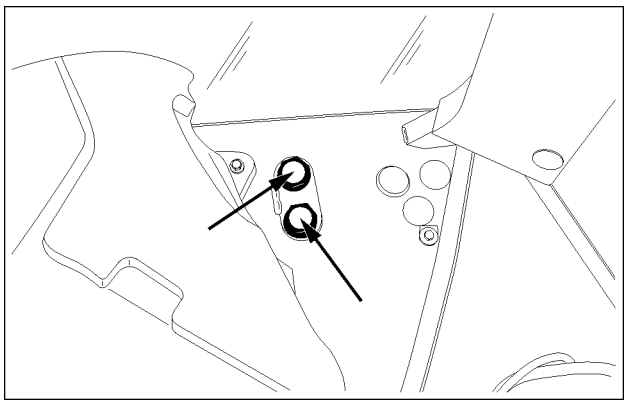
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9. Fit the cab mounting using four screws.



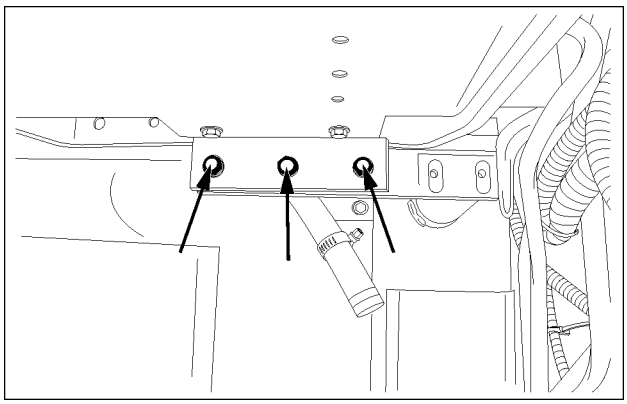
SS08H158 6

10. Spray the two screws of the cab mounting with **LOCTITE® 243** and turn them several times.
Remove the supports on the right side of the cab and tighten the two screws to **390 - 430 Nm** (**288 - 317 lb ft**). Place the cab floor mats inside.



SS08H157 7

11. Fit the bracket using the three screws.



SS08H156 8

12. Thread the supply lines for the mid-mount remote control valves (if equipped) into the guide bracket.

Next operation:
Fit the mid-mount remote control valves (if equipped) - see **Mid-mount remote control valve - Install (A.10.C)**.
Install the right fuel tank - see **Fuel tank - Install (B.20.A)**.
Install the battery - see **Battery - Install (A.30.A)**.

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POWER TRAIN - C

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POWER TRAIN - C

REAR PTO Hydraulic - 40.C

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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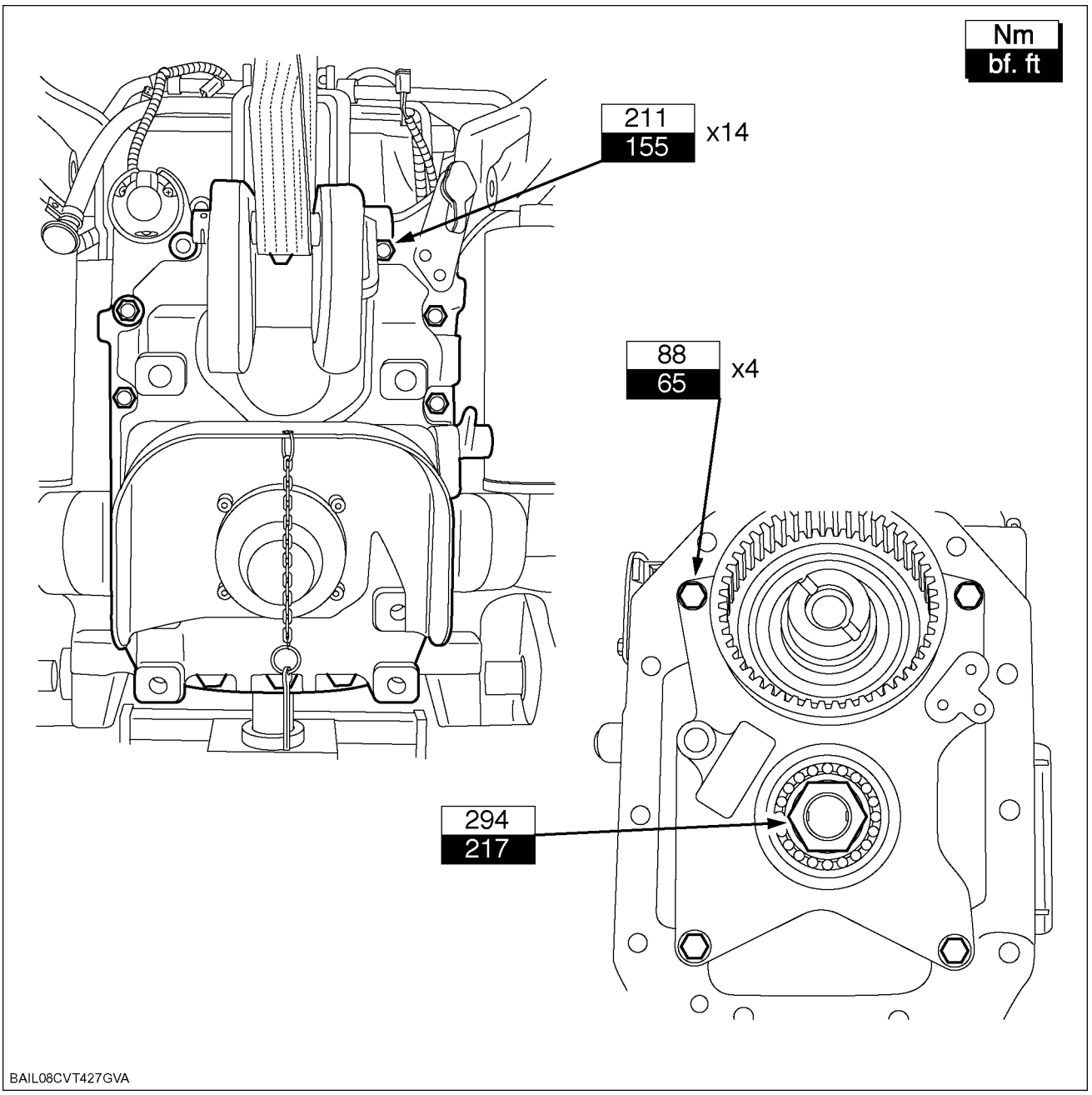
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REAR PTO Hydraulic - Torque



BAIL08CVT427GVA 1

REAR PTO Hydraulic - Special tools

⚠ CAUTION ⚠

The operations described in this section can only be carried out with the ESSENTIAL tools indicated by an (X). To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

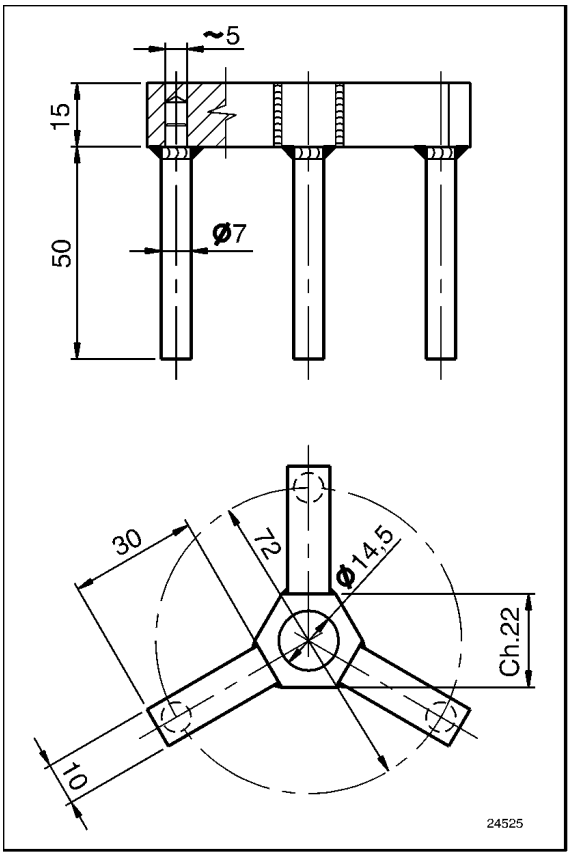
B008

List of special tools necessary to perform service operations covered by this section of the Manual:

380000480	Clutch drive shaft roller bearing installer (with tool **380000258**)
X **380000476**	Clutch drive shaft seal installer (with tool no. **380000258**)

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X **380000540**	Seal Protector
380000258	Attachment (for tools nos. **380000476** and **380000480**)
380000481	Clutch shaft cup installer
380000557	Cup and shaft bush removal pliers



24525 1

PTO hydraulic clutch spring cup tool (Mark tool with no. 50063. Dimensions in mm.)
Fabricate tool using Fe42C material.

REAR PTO Hydraulic - General specification

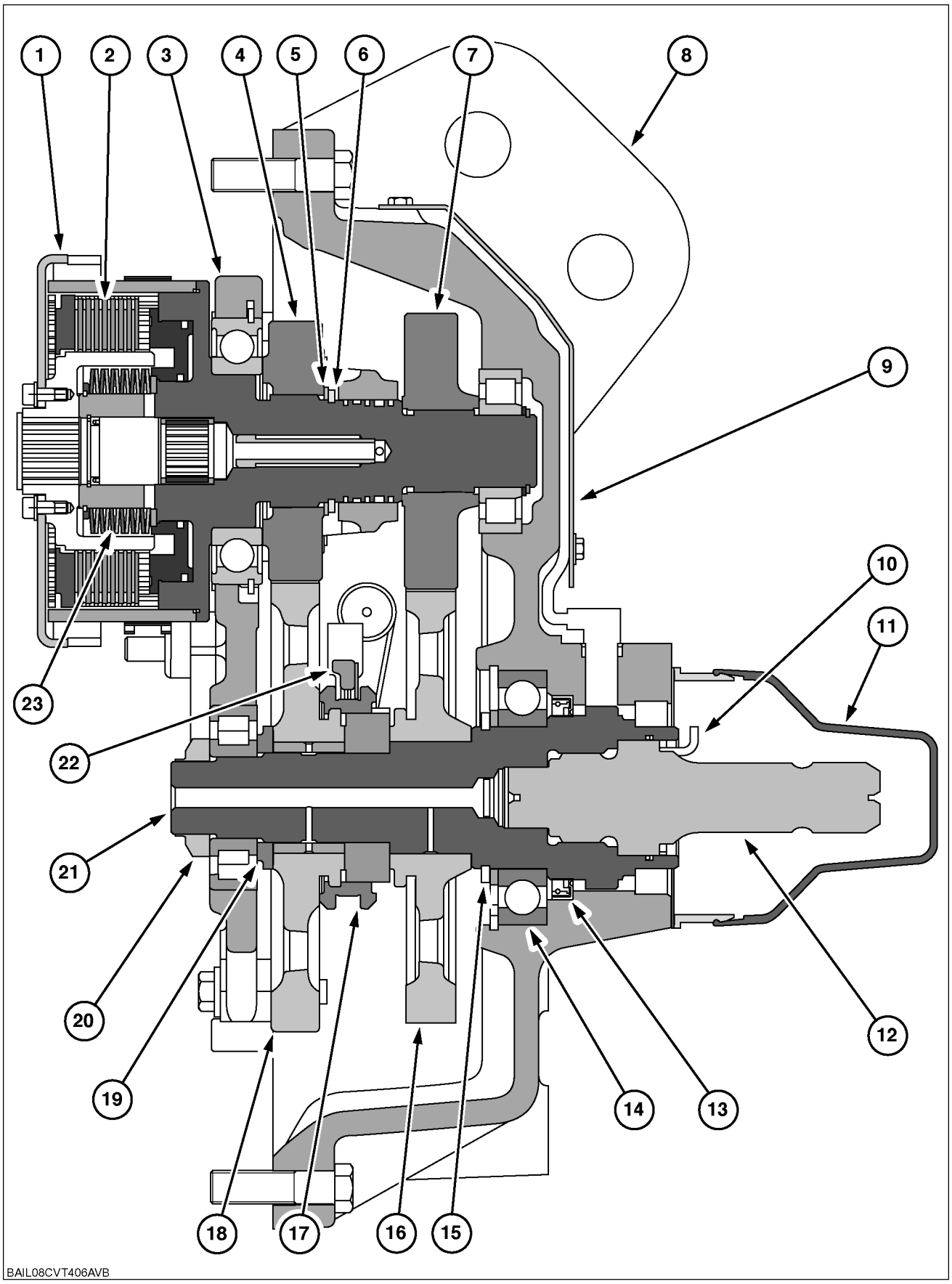
All Models		
1000E/1000 rpm PTO: Type		Two speed fully independent of tractor ground speed
540E/1000 rpm PTO: Type		Two speed fully independent of tractor ground speed
Engagement and Control		Fully automatic softstart through an electro-hydraulic multi plate wet clutch pack
Rotation (looking from tractor rear end)		Clockwise
Mechanical speed Selection		By hand lever located at the operator's RH side
Electronic speed selection		By rotary control switch located at the operators R.H. side
Engine Speed at **1000E rpm** PTO Speed	rpm	1700
Engine Speed at **1000 rpm** PTO Speed	rpm	1893
Engine Speed at **540E rpm** PTO Speed	rpm	1569

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All Models		
Engine Speed at **1000 rpm** PTO Speed	rpm	1893
Splined Output Shaft Diameter: – 540 rpm – 1000 rpm		 1 3/8” (6 splines) 1 3/8” (21 splines) or 1 3/4” (20 splines) (optional)
Driven Gear Bush OD **REAR PTO Hydraulic - Sectional view (C.40.C)**) Driven Gear ID Gears to Bushes Free Play	mm mm mm	54.910 to 54.940 55.060 to 55.106 0.120 to 0.196
Driven Shaft Diameter. **REAR PTO Hydraulic - Sectional view (C.40.C)**) Bush ID Shaft to Bushes Free Play	mm mm mm	44.366 to 44.391 44.400 to 44.425 0.009 to 0.059
PTO Engagement Clutch Type		Electro hydraulically actuated multi plate wet clutch pack
Number of Clutch Discs: – Drive Discs Drive Disc Thickness – Driven Discs Driven Disc Thickness Brake	 mm mm 	 8 1.45 to 1.55 8 2.35 to 2.40 Hydraulically controlled brake band acting on the clutch bell housing
Control Oil Pump		Vane pump low pressure circuit
Oil Filter Oil Filter Location		Replaceable screw on type At pump inlet under right hand side of cab floor

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REAR PTO Hydraulic - Sectional view



BAIL08CVT406HVB 1

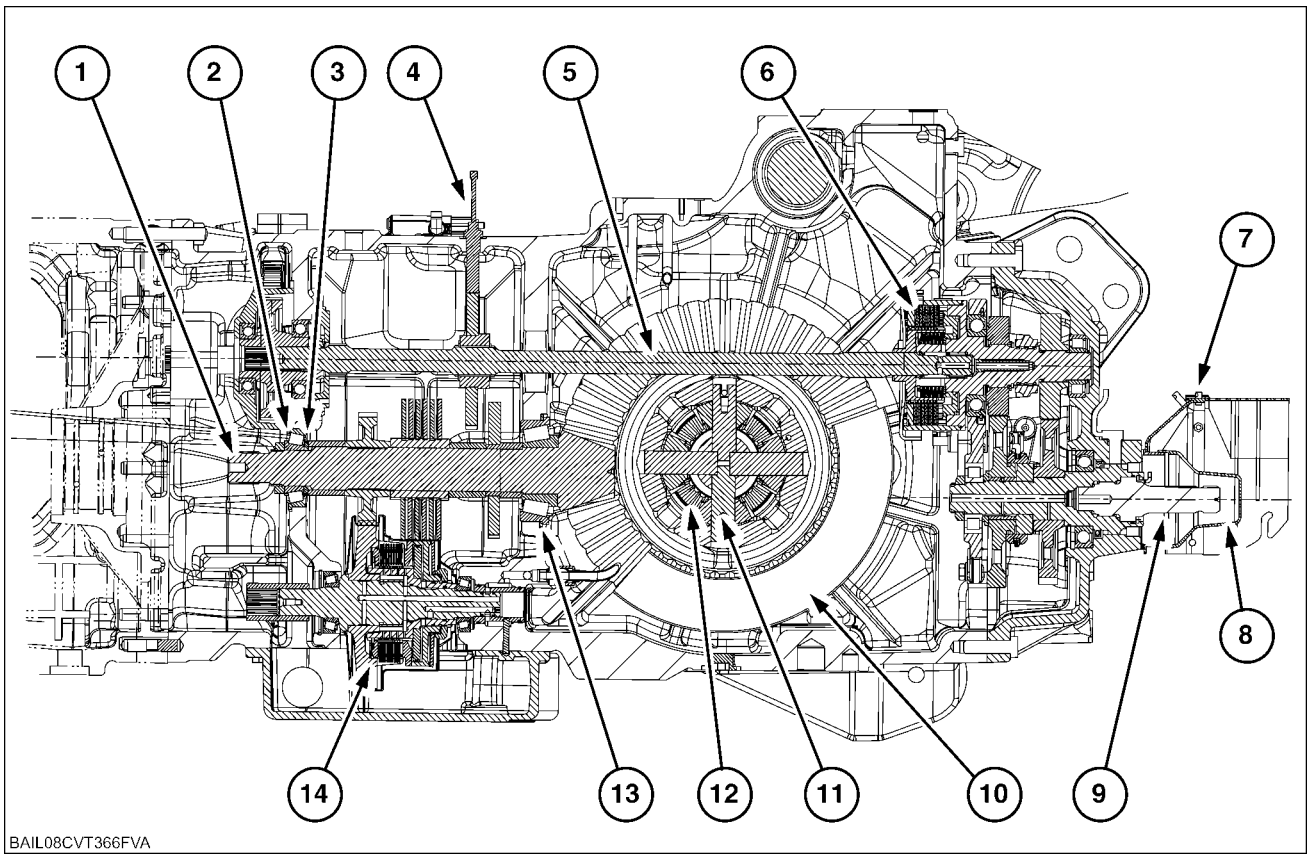
PTO Sectional View

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1. Tone Wheel
2. Clutch Plates
3. Support Plate
4. 1000 rpm Driving Gear
5. Thrust Washer
6. Circlip
7. 1000E rpm Driving Gear
8. PTO Housing
9. Plate
10. PTO Output Shaft Retaining Ring
11. PTO Guard
12. 540 rpm PTO Shaft
13. Oil Seal
14. Bearing
15. Circlip
16. 1000E rpm Driven Gear
17. Selector Collar
18. 1000 rpm Driven Gear
19. Collar
20. Shaft Retaining Nut
21. PTO Driven Shaft
22. Selector Fork
23. Belleville Washers

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REAR PTO Hydraulic - Static description



BAIL08CVT366FVA 1

1 Bevel Pinion Shaft
2 Tapered Roller Bearing
3 Bevel Pinion Bearing Adjusting Shim
4 Hydrostat Input Speed Sensor
5 PTO Drive Shaft
6 PTO Clutch
7 PTO Shield
8 PTO Shaft Guard
9 PTO Output Shaft
10 Crown Wheel
11 Differential Gear Hub
11 Differential Gear Hub
13 Tapered Bearing
14 Four Wheel Drive Clutch

DESCRIPTION AND OPERATION

The power take-off (PTO) transfers engine power directly to mounted, semi-mounted or trailed equipment via a splined shaft at the rear of the tractor.

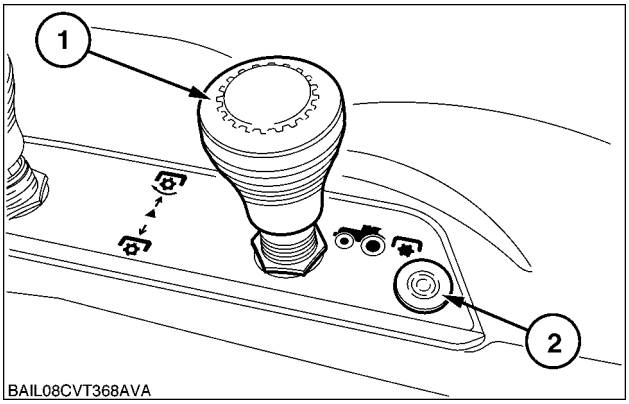
Drive to the PTO is achieved via a splined shaft which runs from the engine flywheel through the transmission upper shafts to the main PTO drive shaft **(5)** and through to the PTO clutch **(6)**, located at the rear of the transmission. When the PTO clutch is engaged drive to the PTO output shaft **(9)** is engaged via the relevant gears.

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The PTO is engaged and disengaged by means of a switch **(1)** on the armrest console. Lift the knob and move the switch forward to engage PTO drive. The switch will lock in the engaged position and the adjacent warning light **(2)** will illuminate when the PTO is engaged.

To disengage PTO drive move the switch rearwards to the off (central) position. It is not necessary to lift the knob when disengaging the PTO.

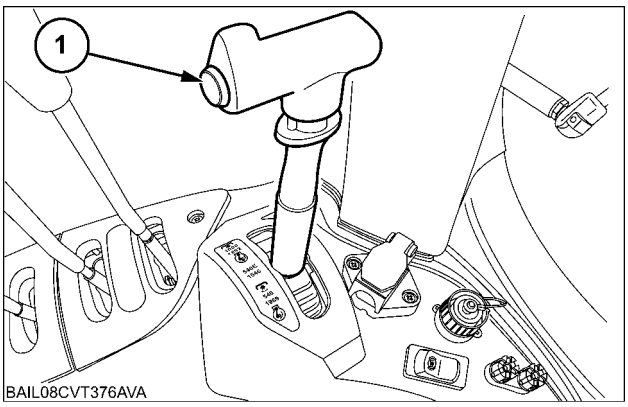
Two types of rear PTO system are available, dependent upon vehicle model and country of destination. These two types of PTO system are available in either a mechanical lever or an electronic shiftable version:
a) 1000 / 1000E Two-speed shiftable PTO with inter-changeable output shafts and the option of fender mounted switches.
b) 540E / 1000 Two-speed, shiftable PTO with inter-changeable output shafts and the option of fender mounted switches.



BAIL08CVT368AVA 2

On models fitted with mechanical lever mounted shiftable PTO, a range lever is provided. The lever **(1)** is used to select one of two PTO speed ranges and is located at the rear of the right-hand console.

With the tractor stationary and the PTO control knob in the disengaged position, select the required speed by means of the range lever. Depress button **(1)** and move the lever to engage the required PTO speed.
Deppresing button **(1)** automatically releases the PTO brake providing a smoother engagement of the PTO ratio.

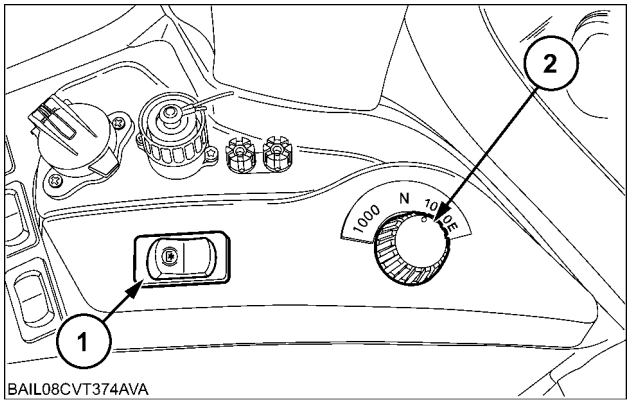


BAIL08CVT376AVA 3

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On tractors fitted with electronic shiftable PTO speed selection the electronic shift system replaces the PTO speed selecting lever with a rotary three position switch **(2)** to select the required PTO speed. The speed change switch is located near the right hand side C pillar of the tractor cab. The electric speed selecting system replaces the control lever in the cab with a switch and motor coupled via a gearbox and worm drive system. The worm drive moves a carriage that has the Bowden cable attached to it, the motor can be driven in either direction using a H configuration relay drive system, so the PTO speed may be changed from low speed to N to high speed or vice versa as required. The motor drive system senses the current through the motor and has a Hall effect position sensor that is connected to the moving carriage within the electric shift unit.

With the tractor stationary and the PTO control switch in the disengaged position, select the required speed by means of the rotary control **(2)**. When the PTO is subsequently engaged the shift will automatically be made. The shift will be confirmed in the PTO display. When selecting neutral from 540 or 1000 speeds, the shift will be immediate as the control is rotated.



BAIL08CVT374AVA 4

IMPORTANT: *Attempting to shift between speeds or from neutral to a speed position while the PTO is engaged will disable the system. Disconnect the PTO drive by moving the switch to neutral then re-select the required PTO speed.*

⚠ **DANGER** ⚠

To avoid inadvertent movement of the implement, disengage the PTO after each use. Failure to comply could result in death or serious injury.

B014

IMPORTANT: *An automatic PTO brake is installed to stop shaft rotation quickly when the PTO is disengaged. To avoid overstressing the PTO brake, slow down the implement by reducing engine speed before disengaging the PTO. This is particularly important with implements having a high inertia. Such implements should, ideally, be fitted with an overrun clutch. To avoid damage to the brake when operating high inertia implements, hold down the switch* ***(1)****, to disengage the brake and allow the implement to come to rest naturally.*

EXTERNAL PTO CONTROLS
(Where Fitted)

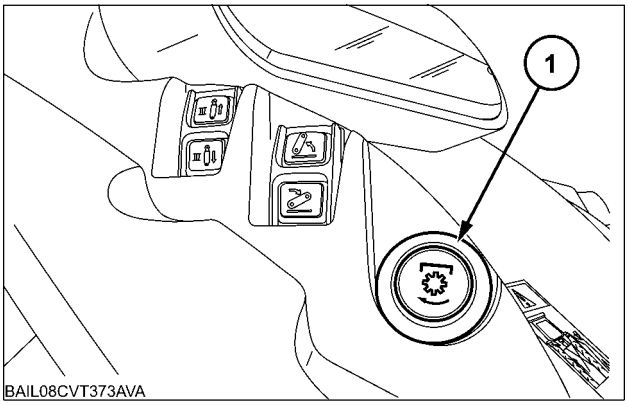
An optional, fender-mounted PTO switch **(1)**, may be installed on the outer surface of both rear fenders to aid alignment of the PTO shaft splines with equipment and facilitate stationary PTO operations.
With the engine running, touch the switch momentarily to cause the PTO shaft to index round to align the shaft splines. If the switch is pressed for less than **5 seconds**, the shaft will stop turning when the switch is released.
Press and hold in the switch for more than **5 seconds** and the PTO will operate continuously. Press the switch again to stop the PTO. Alternatively, the PTO may be stopped by means of the in-cab controls, as previously described.

NOTE: *The warning light, on the armrest, will illuminate when the PTO is engaged, momentarily or permanently.*

NOTE: *The PTO may be engaged or disengaged from the fender switch, whether the in-cab control is in the on or off position.*

NOTE: *Simultaneous operation, within two seconds, of in-cab and external PTO controls will result in an error code showing. A* ***10 second*** *delay will also occur before PTO control operation will recommence.*

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BAIL08CVT373AVA 5

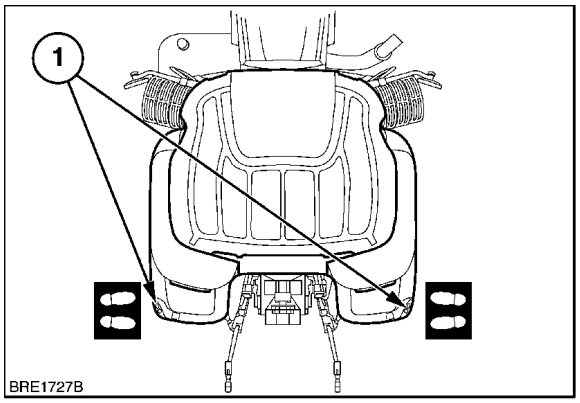
⚠ CAUTION ⚠

Before leaving the vehicle to operate the external PTO switches:- Move the gearshift levers to neutral.- Disengage the PTO- Apply the parking brake. With the engine running, move the hand throttle lever to the low idle position (fully rearwards).

B001

The operator must only activate the external PTO switches **(1)** while standing to the side of the vehicle (outboard of the rear tyres). To avoid damage to implement or vehicle, operation of the in-cab and external PTO switches should not be carried out simultaneously.

NOTE: *Before using the external PTO switches, make sure that no person or object is in the area of the implement, 3-point linkage or PTO shaft.*
Never operate the external switches while standing:
- Directly behind the tractor or tyres.
- Between the lower links.
- On or near the implement.
- Never extend arms, legs, any part of the body or any object into the area near the 3-point linkage, PTO shaft or implement while operating the external switch.
- Never have an assistant working the opposite set of controls.
- When moving to the opposite set of controls, move around the vehicle or implement.
- Do not cross between the implement and the vehicle.

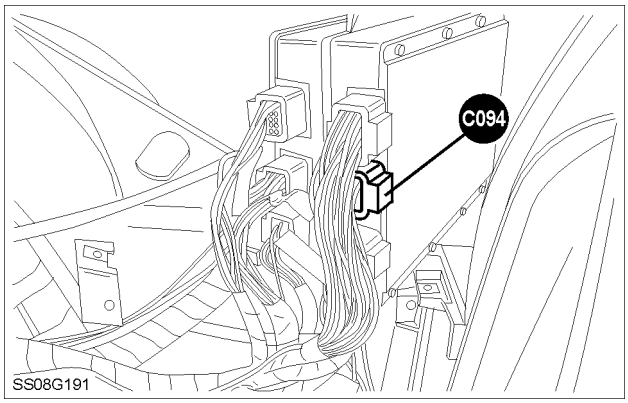


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(Where Fitted)

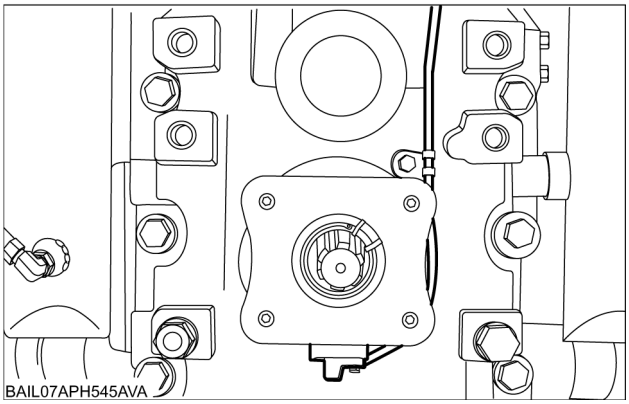
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The rear PTO is controlled by the Central Controller - (XCM) located behind the seat.



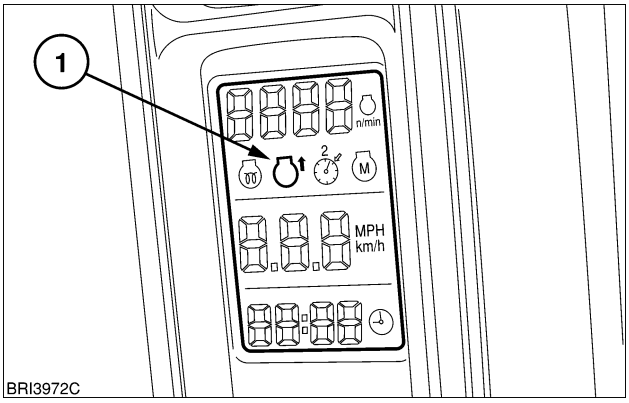
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The processor receives input from the PTO ON/OFF switches, (in-cab and fender), PTO speed sensor, brake, soft start and engine controller. These signals are then used to provide the output signals to the PTO clutch engagement solenoid, PTO brake solenoid and the PTO ON/OFF overspeed warning lamp.
If the correct conditions are met, i.e., speed parameters and switch engagements then the PTO is allowed to start.
The PTO speed sensor is located below the PTO output shaft



BAIL07APH545AVA 8

The ‘soft start’ facility provides easy start up of heavy, high inertia, PTO driven equipment. Soft start is a fully automatic system controlled by electronic sensors on the engine and within the PTO driveline.
Soft start ‘feathers’ the PTO clutch engagement to provide a slower, gradual take up of the drive over the first **5 seconds**.
The engines are equipped with a power management system that monitors and boosts engine power when using the PTO under certain load conditions or using the vehicle in high road gears providing certain criteria are met. As load on the engine increases the engine power management will provide up to 35 additional horsepower to maintain vehicle performance by electronically changing the characteristics of the engine power curve which is programmed into the vehicle and engine control modules.
The indicator light on the instrument panel will illuminate when power management is activated during PTO Operations.



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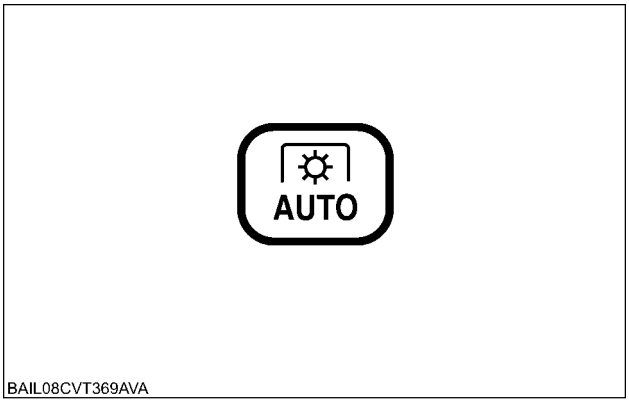
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Auto PTO

This facility provides an automatic starting and stopping of the PTO in relation to the raising or lowering of the lift arms. The height at which this occurs is pre-programmed by the operator.
To activate the Auto function, engage the PTO as previously described and then depress and hold the switch **(1)**, for more than one second. The Auto PTO lamp on the switch will illuminate to confirm activation. With the 3 point hitch in the lowered position and the PTO engaged, the Auto lamp will remain on. Raising the implement will disconnect PTO drive and cause both PTO and Auto lamps to flash. Lowering the implement will re-engage PTO drive, both lamps will cease to flash and will remain illuminated. Depressing the Auto PTO switch again will de-activate the function and the Auto lamp will extinguish.

IMPORTANT: *If the PTO is operating when the Auto function is de-activated, the PTO will continue to rotate until switched off using the main PTO control.*

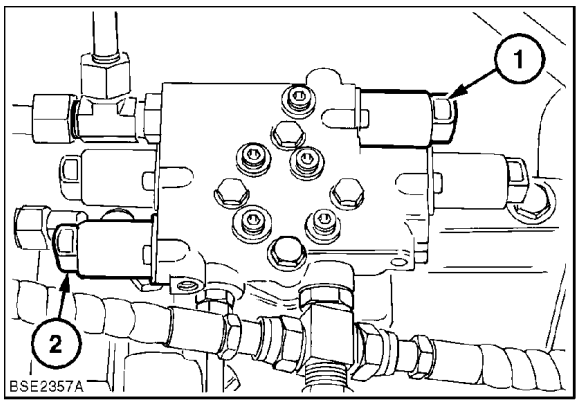
NOTE: *The Auto PTO function is de-activated every time the key start is switched off but the current programmed on/off values will be stored in the memory.*



BAIL08CVT369AVA 10

To configure the Auto PTO refer to **REAR PTO Hydraulic - Calibrate (C.40.C)**

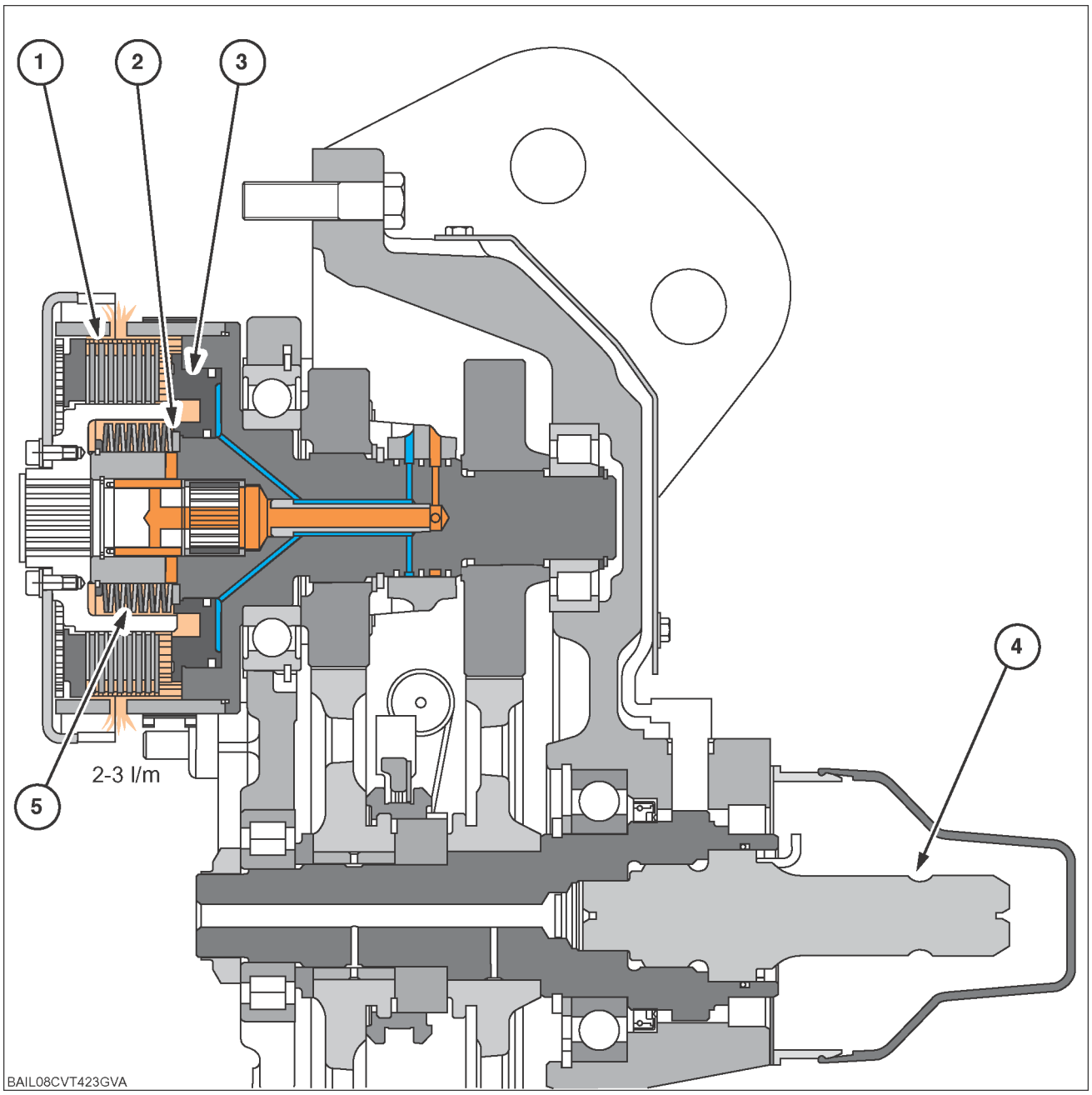
The PTO brake **(1)** and engagement solenoid **(2)**, Figure **11** are housed in the low pressure distribution block on top of the rear axle.
When the PTO is not in use the PTO brake solenoid is energised and the PTO engagement solenoid is de-energised.



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REAR PTO Hydraulic - Dynamic description



BAIL08CVT423GVA 1

PTO CONTROL CLUTCH-DISENGAGED

Lubrication Circuit Oil

Reduced Flow Lubrication Circuit Oil

Return to Reservoir

1 Clutch Plates
2 Washer
3 Piston
4 PTO Output Shaft
5 Belleville Springs

PTO Engaged (initial engagement)

Engagement of the PTO is considered as a two phase operation.
When the PTO is operated the engagement solenoid is energised and the brake solenoid disengaged.

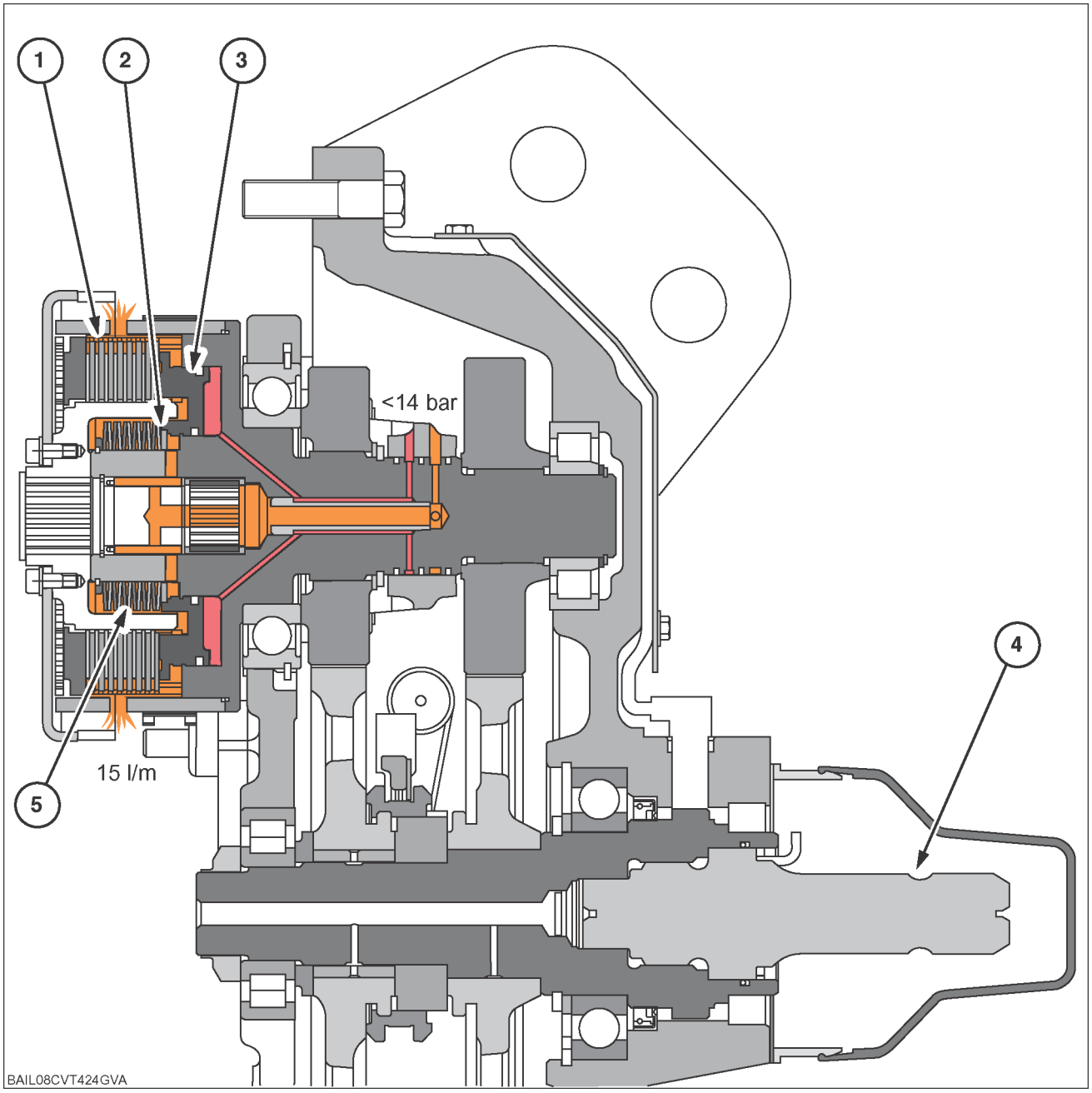
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Low pressure hydraulic circuit oil flows from the solenoid and past the end of the lubrication valve to the rear of the clutch piston. As pressure increases the PTO clutch piston moves forward against the washer **(2)** and Belleville springs **(5)** to compress the clutch plates **(1)**. The action of the piston moving forward increases the gap between the rear of the washer and the clutch piston housing allowing an increased flow of lubricating oil to the clutch plates. This increased flow of up to **15 l/min** (**3.96 US gpm**) makes sure that the clutch plates are adequately lubricated during the initial stages of engagement.

PTO Soft Start

The automatic PTO clutch softstart system ensures the load applied to the PTO is controlled in a predictable manner without putting undue stresses on the tractor engine, the PTO shaft and the connecting implement. The soft start feedback system senses engine deceleration and PTO shaft acceleration. Limits for these two parameters are set in the XCM central controller and if the system detects that either parameter is going above the set threshold limits, the rise in PTO clutch pressure is held until they return within the preset limit at which time the clutch pressure again increases to continue engaging the PTO. If the soft start parameters are again exceeded the pressure held process is repeated until full engagement is achieved. If engagement is not achieved after **5 seconds** the clutch pressure is released and the PTO system is turned off.

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BAIL08CVT424GVA 2

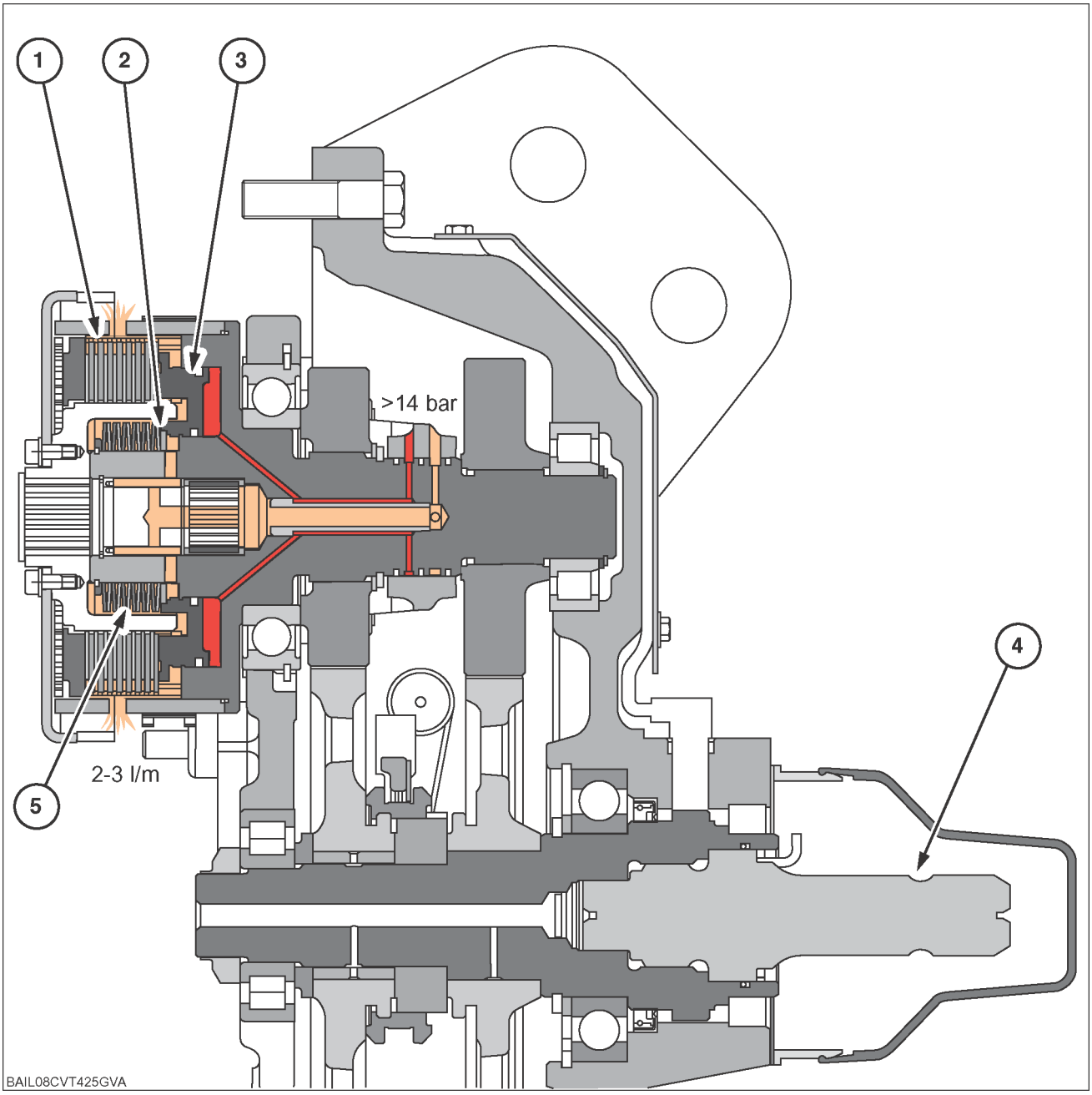
PTO CONTROL CLUTCH-INITIAL ENGAGEMENT

Low Pressure Clutch Engagement Oil < **14 bar** (**203.00 psi**)

Lubrication Circuit Oil

1 Clutch Plates
2 Washer
3 Piston
4 PTO Output Shaft
5 Belleville Springs

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BAIL08CVT425GVA 3

PTO CONTROL CLUTCH-FINAL ENGAGEMENT

Low Pressure Clutch Engagement Oil > **14 bar** (**203.00 psi**)

Reduced Flow Lubrication Circuit Oil

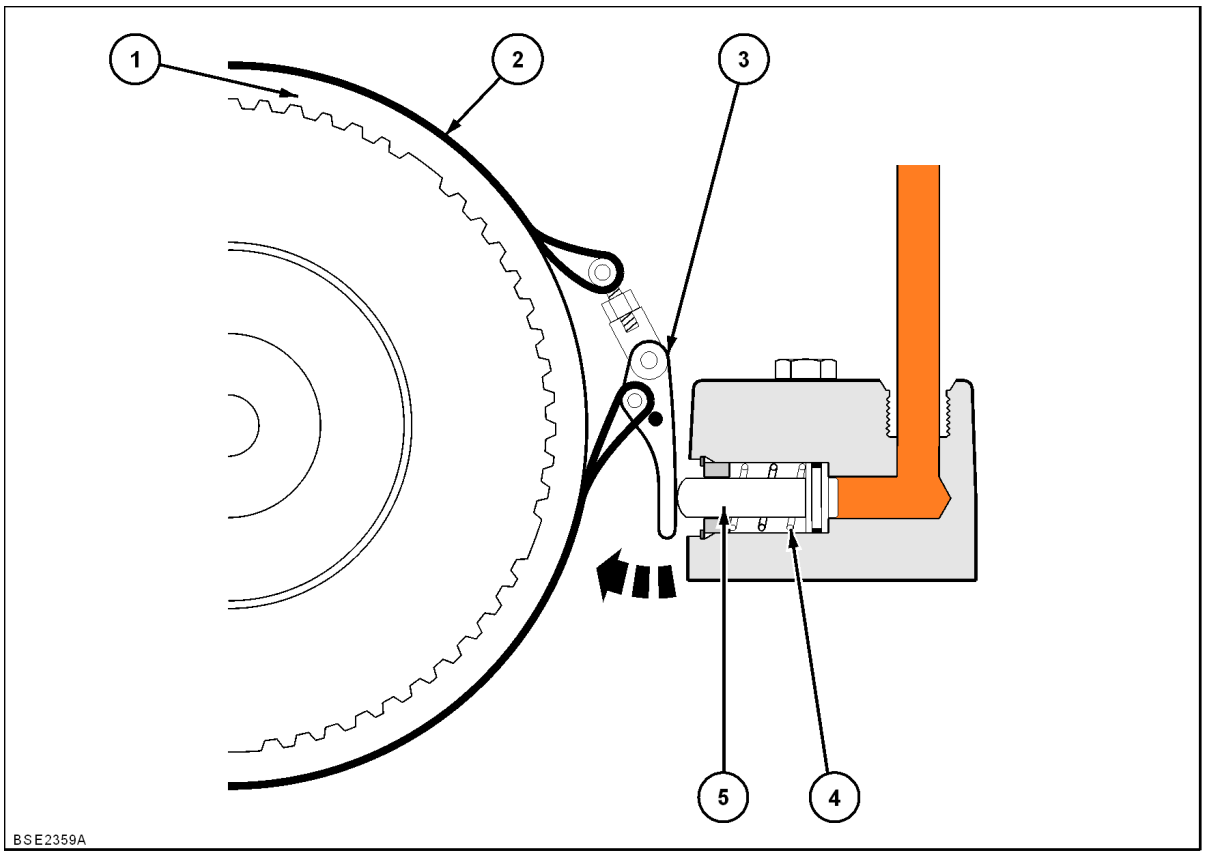
1 Clutch Plates
2 Washer
3 Piston
4 Lubrication Valve
5 PTO Output Shaft
6 Belleville Springs

PTO Engaged (final engagement)

When the pressure applied to the piston approaches **14 bar** (**203.00 psi**) the pressure applied to the end face of the lubrication valve moves the valve against the spring and reduces the flow of lubricating oil across the valve to the clutch plates to **2 - 3 l/min** (**0.53 - 0.79 US gpm**).
Less lubrication of the clutch plates is necessary after the initial stage of engagement and this process limits the demand of the PTO on the lubrication circuit oil which is also used for other circuits on the tractor. The pressure

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applied to the rear of the piston will now continue to increases towards **26 bar** (**377.00 psi**) in order to maintain adequate clutch plate clamping pressure and drive through the clutch to the PTO output shaft.



BSE2359A 4

Low Pressure Circuit Oil

PTO CLUTCH BRAKE

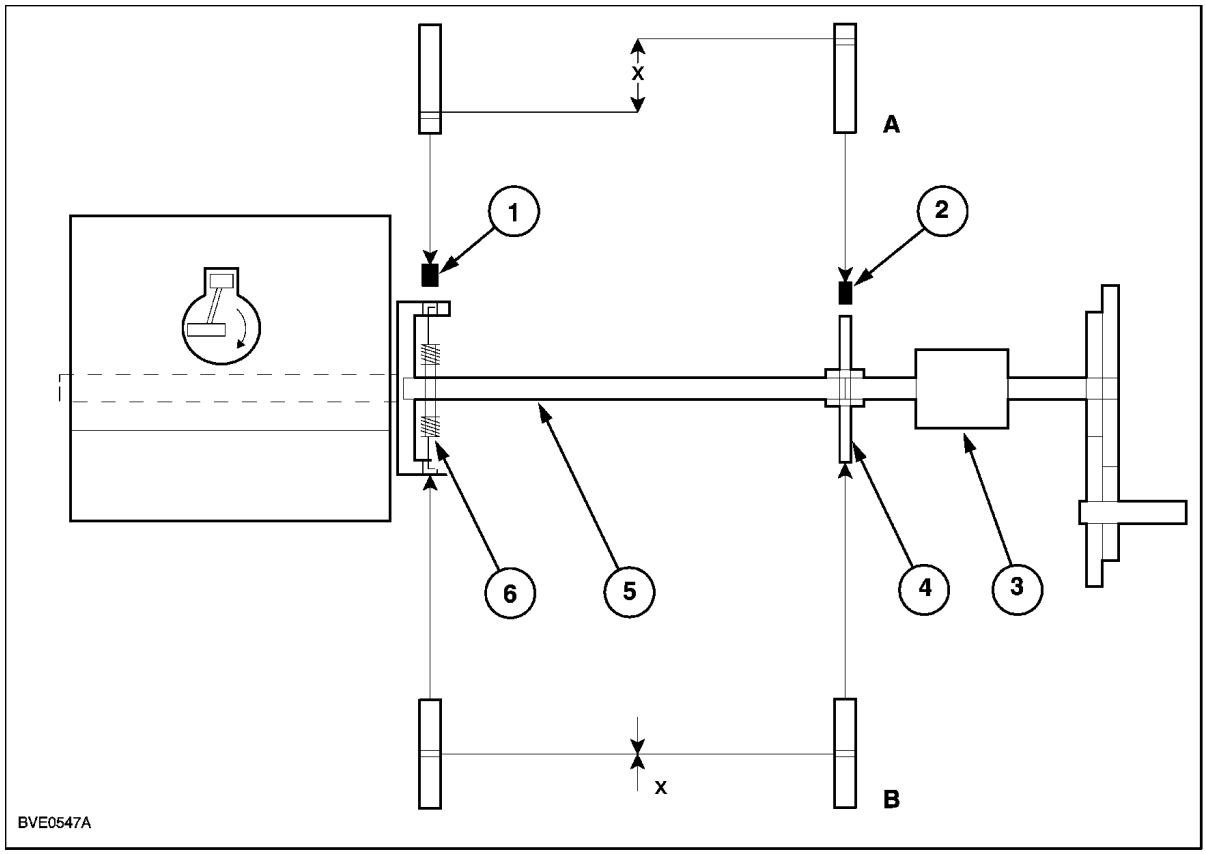
The band type clutch brake operates automatically. It applies when the PTO clutch is being disengaged (braking start) and stops braking when the clutch is completely engaged.

When working with high inertia implements it is possible to keep the brake disengaged by pressing the switch located on the right hand console near the PTO control handle. When the PTO clutch is engaged, the brake control oil is returned to reservoir as the solenoid valve is in the discharge position (de-energised) and consequently there is no operation of the actuation piston **(5)** onto the band operating lever **(2)**, the piston **(5)** being returned by the spring **(4)**.

When the PTO control clutch is being disengaged, the solenoid valve is energised and opens, diverting oil from the low pressure circuit onto the piston **(5)**. The piston contacts the lever **(3)** and band **(2)** is tightened against the housing **(1)** to brake the assembly.

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PTO Torque Sensor (Engine Power Management)



BVE0547A 5

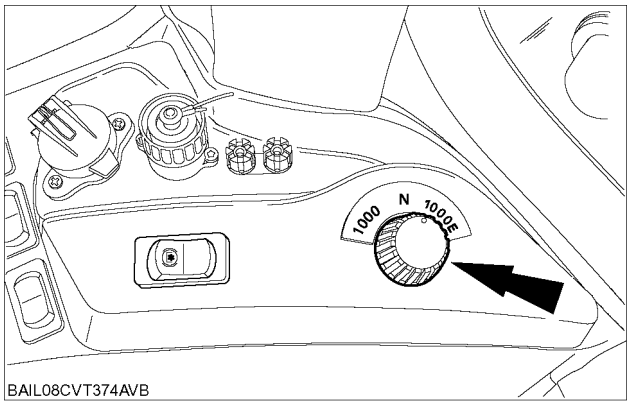
PTO Torque Sensor (Engine Power Management)

A PTO under load
B PTO without load
1 Engine flywheel torque sensor
2 PTO torque sensor
3 PTO clutch
4 PTO torque sensor tone wheel
5 PTO input shaft
6 Engine flywheel damper

The PTO power management system records the amount of torque being transmitted through the PTO shaft **(5)** using two hall effect sensors **(1)** and **(2)**. One hall effect sensor is located at the engine flywheel damper **(6)** and the other is located at the PTO torque sensor tone wheel **(4)**.
The PTO shaft is engineered from high torsional steel and is designed to twist when a load is applied. Under no load **(B)** there is no difference **(x)** between the two sensor positions. Under load **(A)** the PTO management system detects the amount of twist by comparing the difference **(x)** between the two sensor positions. The PTO management system knows the torque required to twist the PTO shaft a given amount and uses the difference **(x)** to calculate the torque produced at the PTO shaft. The PTO management system can then detect an increase in torque and electronically modify the power curves of the engine management system to provide an increase of up to 25 additional horsepower to maintain the PTO performance.

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Electric PTO Speed Shift



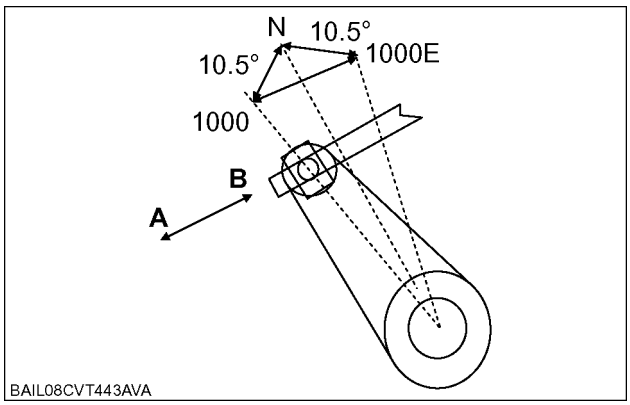
BAIL08CVT374AVB 6

The electric shift system replaces the PTO speed selecting lever with a rotary three position switch to select the required PTO speed. The speed change switch is located near the right hand side C pillar of the tractor cab. The electric speed selecting system replaces the control lever in the cab with a switch and motor coupled via a gearbox and worm drive system. The worm drive moves a carriage that has the Bowden cable attached to it, the motor can be driven in either direction using a H configuration relay drive system, so the PTO speed may be changed from low speed to N to high speed or vice versa as required. The motor drive system senses the current through the motor and has a Hall effect position sensor that is connected to the moving carriage within the electric shift unit.

To select the high PTO speed the motor is driven to a position approximately 200 A to D counts (0.97v or 19%) greater than the fully retracted position, acquired during the PTO shift mechanism calibration process; the drive current is also checked to ensure that it is lower than a preset level which occurs when the selector mechanism is in the detented position for the required speed.

To select the low PTO speed the cable is driven to a position approximately 200 A to D counts (0.97v or 19%) less than the fully extended position limit, acquired during the PTO shift mechanism calibration process, the drive current is checked to ensure that it is at or lower than a preset level which occurs when the selector mechanism is in the selected gear detented position.

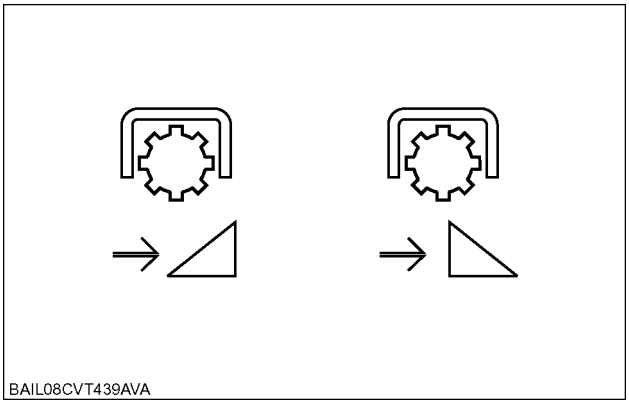
Mechanical layout of the PTO speed change lever on the transmission case (1000/1000E shown as an example).



BAIL08CVT443AVA 7

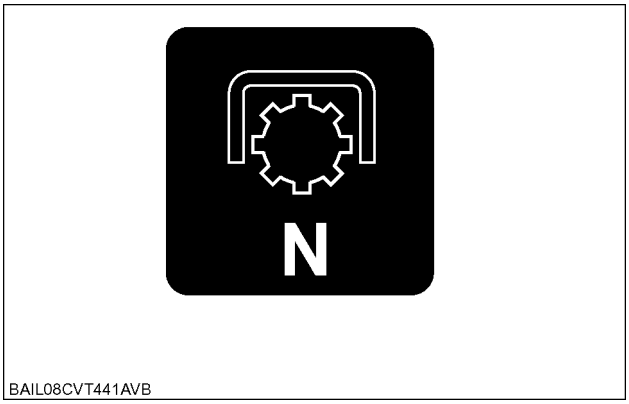
A Bowden cable extends in the direction of **(A)** and retracts in the direction of **(B)** and is connected to the speed change motor.
In order to facilitate a PTO speed change the PTO brake is released and the PTO shaft is allowed to turn to enable the PTO gears to mesh correctly at the selected PTO speed. Therefore to prevent unpredictable operation of the PTO shaft, a PTO speed change is initiated when the PTO is started. The PTO clutch is not energised until the PTO speed change operation is completed although the PTO lamp is illuminated to indicate the PTO is started. When a speed change occurs the PTO may not start turning for up to 3 seconds after the PTO switch has been switched on, either one of the following icons, (depending on the change from Hi to Lo or vice versa) will be displayed in the instrument cluster to indicate that the PTO speed change process is in operation.

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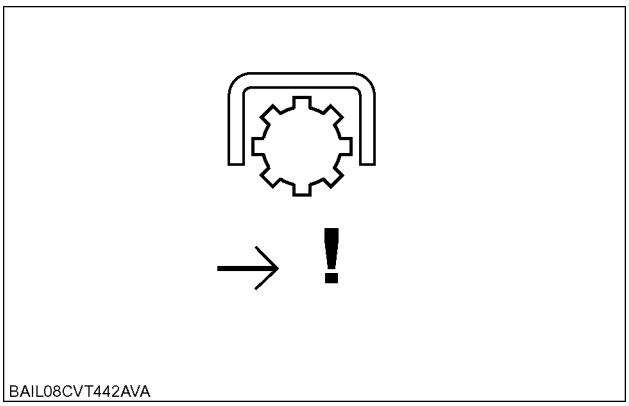
BAIL08CVT439AVA 8

If the PTO speed select mechanism stalls and cannot successfully complete the PTO speed change to the required speed, the system displays the following symbol to prompt the operator to return the PTO speed select system to the Neutral position.



BAIL08CVT441AVB 10

The PTO speed cannot be changed while the PTO is started. If the speed change switch is operated when the PTO is operating the speed change will occur at the next cycling of the PTO switch with no further operator action. The icon shown below will be momentarily displayed in the instrument cluster.



BAIL08CVT442AVA 11

If the fender switch is operated in a momentary manner to provide an inching function, the PTO speed operation will be completed before the PTO is activated although there may be some rotation of the PTO shaft when the PTO brake is released. If the fender switch is not held for long enough to complete the operation the PTO speed selector mechanism is returned to Neutral.

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REAR PTO Hydraulic - Assemble

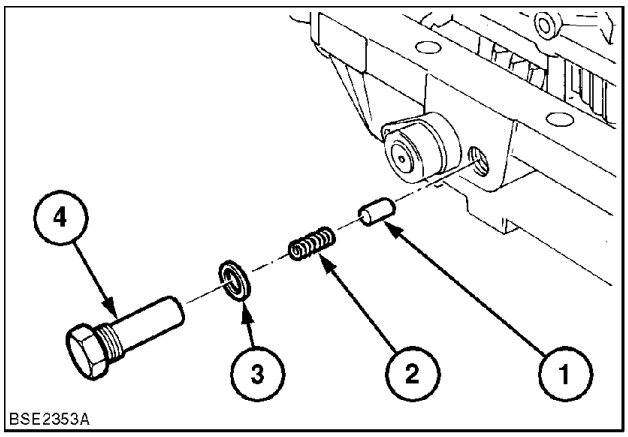
Prior operation:
Disassemble the PTO, for further information refer to **REAR PTO Hydraulic - Disassemble (C.40.C)**

⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

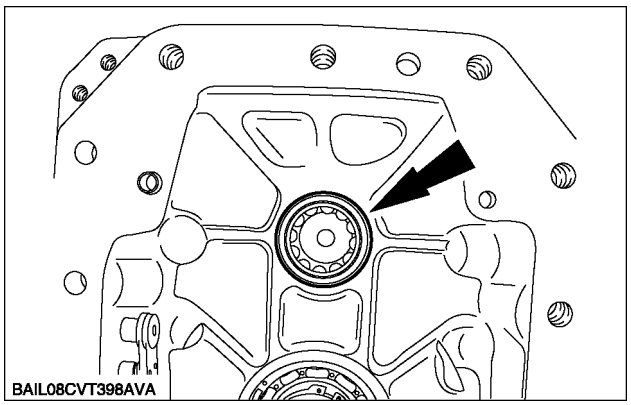
B026

1. Install the selector mechanism and detent assembly as required. Detent mechanism comprises of plunger **(1)**, spring **(2)**, washer **(3)** and retainer housing **(4)**.



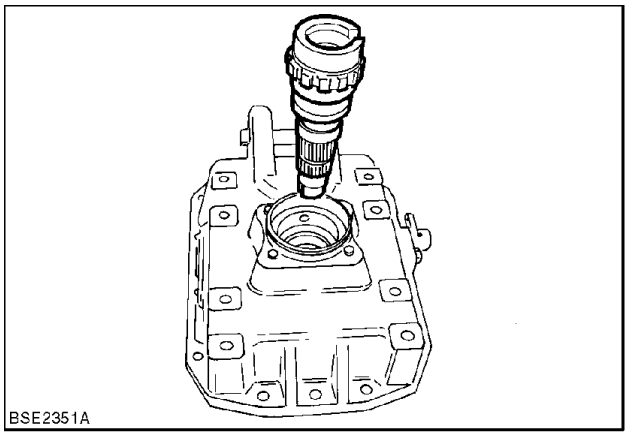
BSE2353A 1

2. Install the upper bearing.



BAIL08CVT398AVA 2

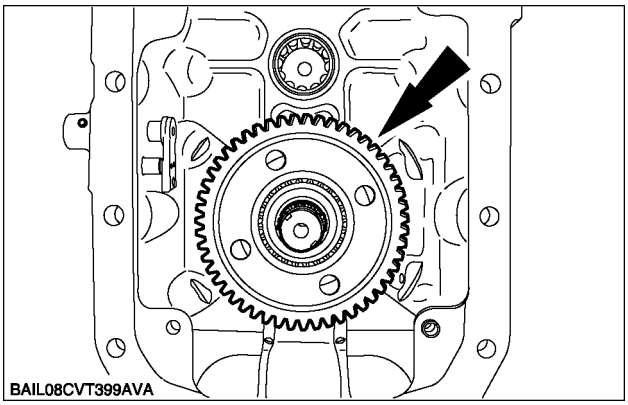
3. Install the shaft.



BSE2351A 3

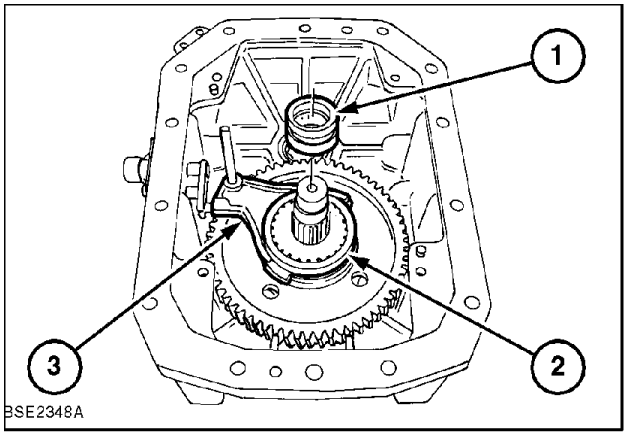
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4. Install lower gear.



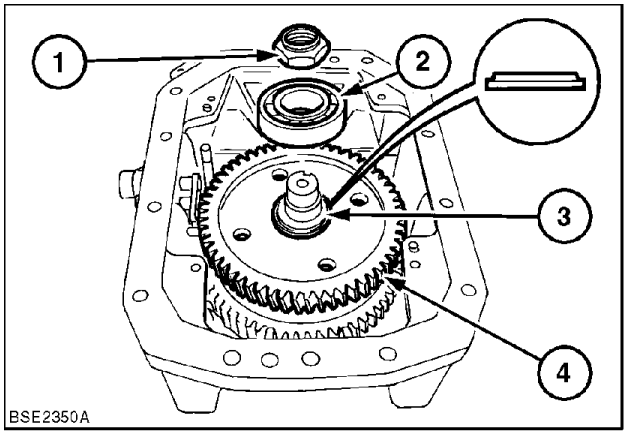
BAIL08CVT399AVA 4

5. Install the coupler assembly **(2)**, selector fork **(3)** and the sleeve **(1)**.



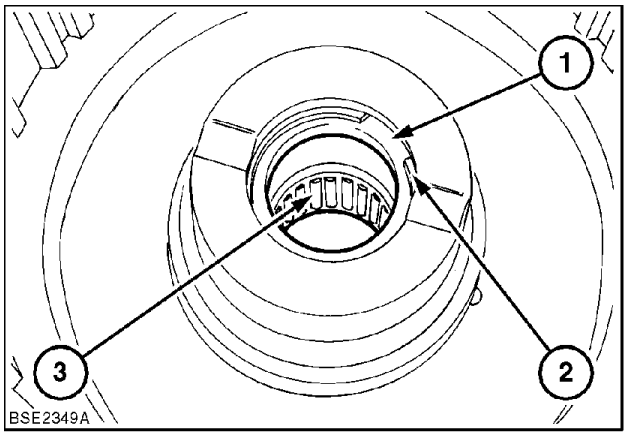
BSE2348A 5

6. Install the gear **(4)**
Install the spacer **(3)**
Install the bearing **(2)** and install the retaining nut **(1)**.



BSE2350A 6

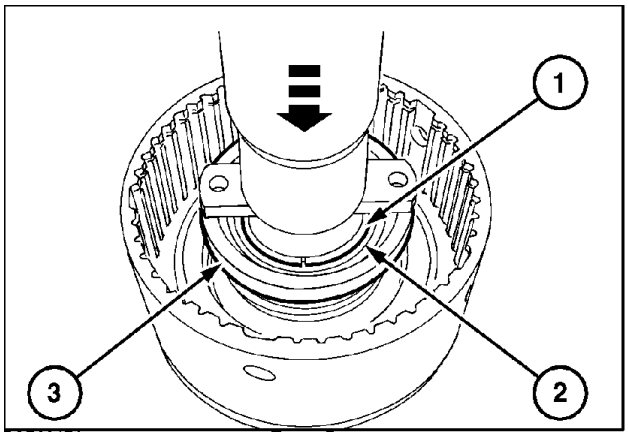
7. Using a suitable drift install the roller bearing **(3)** the oil seal **(2)** and the retaining ring **(1)**.
Tighten to **294 Nm** (**217 lb ft**)



BSE2349A 7

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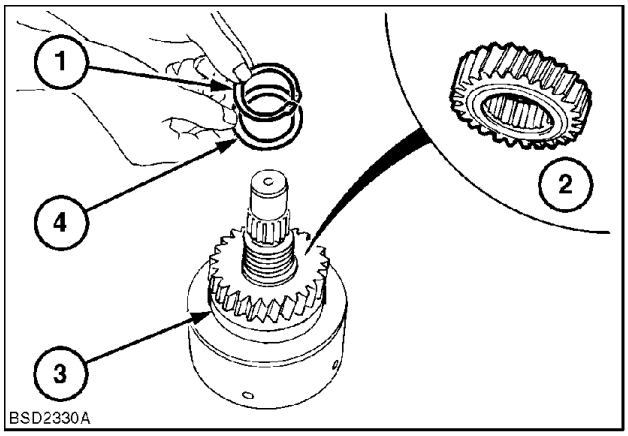
8. Position the clutch in a press and using a suitable piece of tube **(3)** compress the Belleville washers and install the retainer **(2)** and retaining ring **(1)**.



1b0o2004106219 8

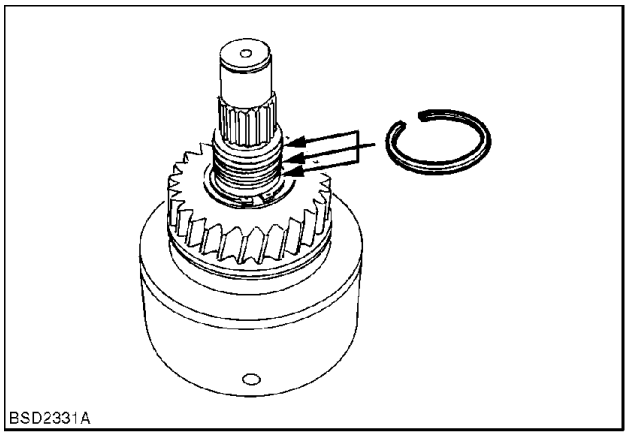
9. Install the bearing **(3)**, gear **(2)**, washer **(4)** and the circlip **(1)**.

NOTE: *Ensure the raised edge of the gear faces the bearing*



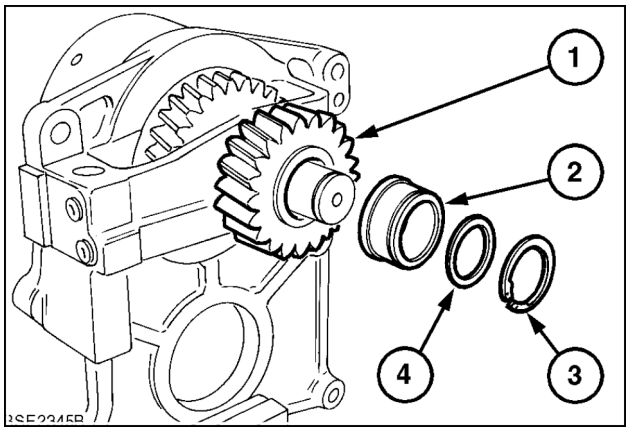
BSD2330A 9

10. Install the sealing rings.



BSD2331A 10

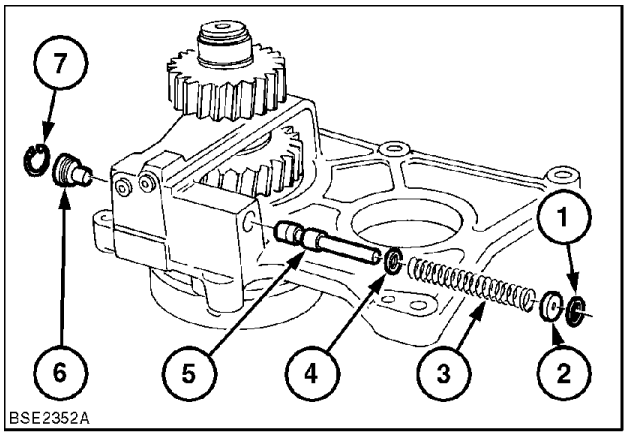
11. Install the gear **(1)**, sleeve **(2)**, ring **(4)**, and the circlip **(3)**.



BSE2345B 11

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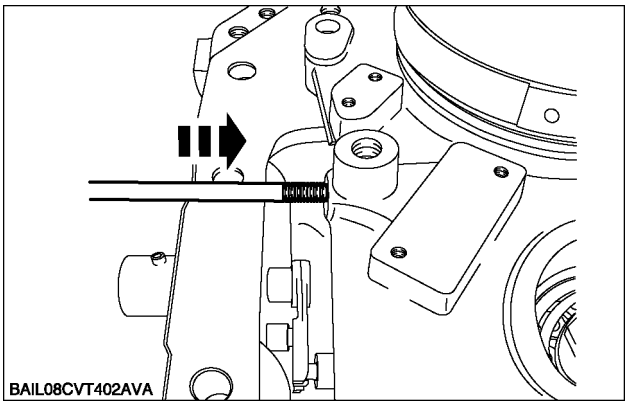
12. Install the lubrication valve.
    1. Circlip
    2. Seat
    3. Spring
    4. Seat
    5. Spool
    6. Plug
    7. Circlip



BSE2352A 12

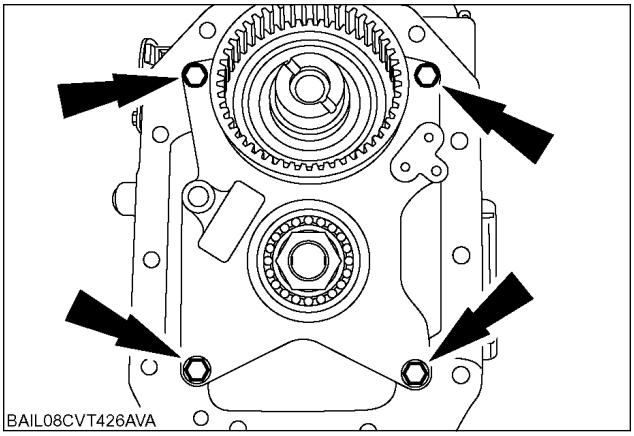
13. Install the support plate using a suitable drift push the spring and ball to insert the selector shaft.

NOTE: *Assistance may be required to complete this process*



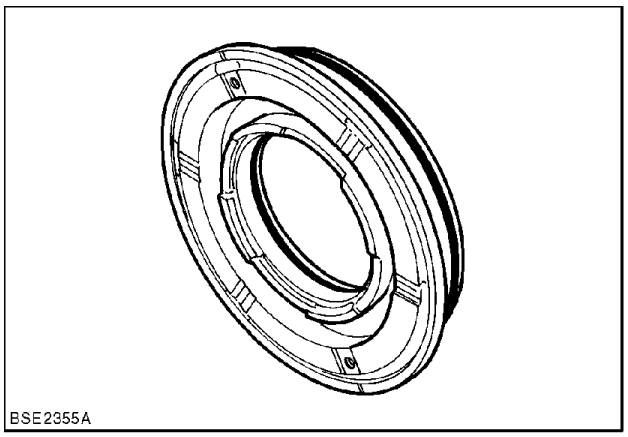
BAIL08CVT402AVA 13

14. Install the support plate retaining bolts. Tighten to **88 Nm** (**65 lb ft**).



BAIL08CVT426AVA 14

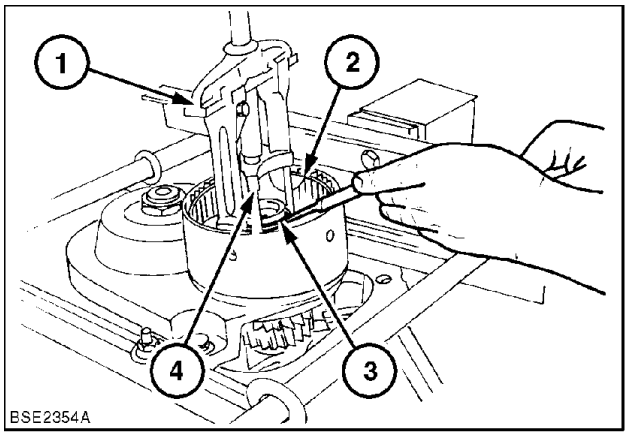
15. Install new piston seals if required and install the piston.



BSE2355A 15

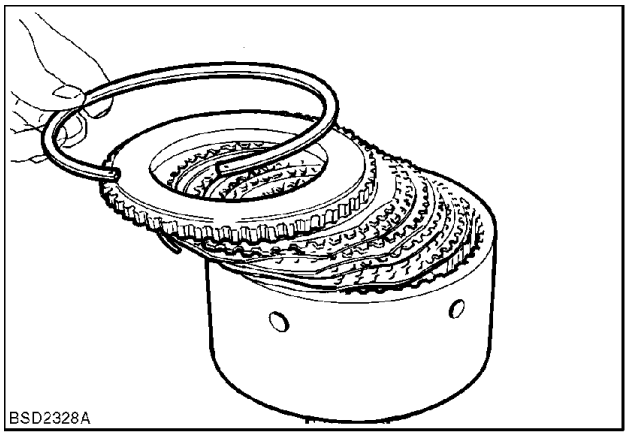
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16. Install the Belleville washers install the snap ring **(2)** using a puller **(1)** and special tool 50063. Carefully screw in the puller until the groove for the retaining ring is visable install the retaining ring. Remove the snap ring.



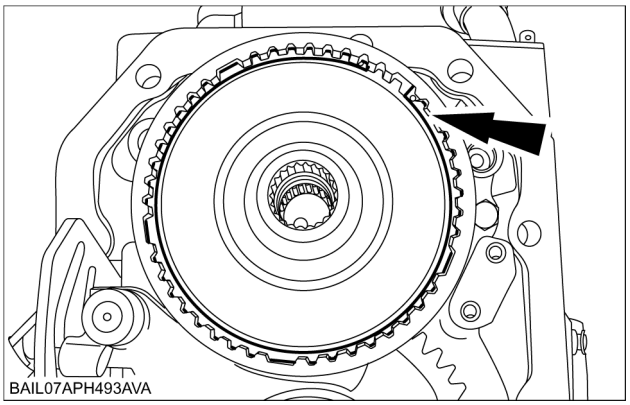
BSE2354A 16

17. Install the clutch plates and snap ring.



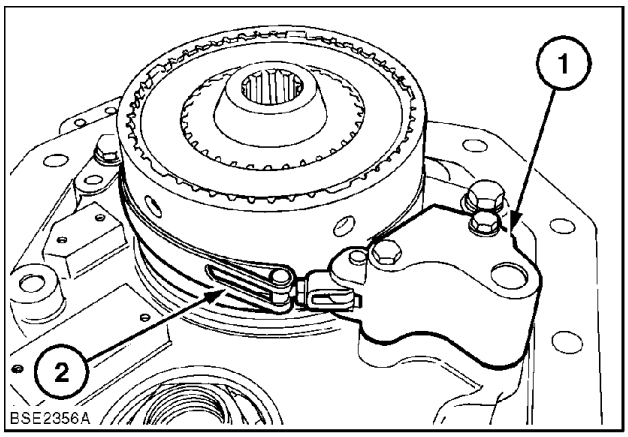
BSD2328A 17

18. Install the PTO end plate circlip.



BAIL07APH493AVA 18

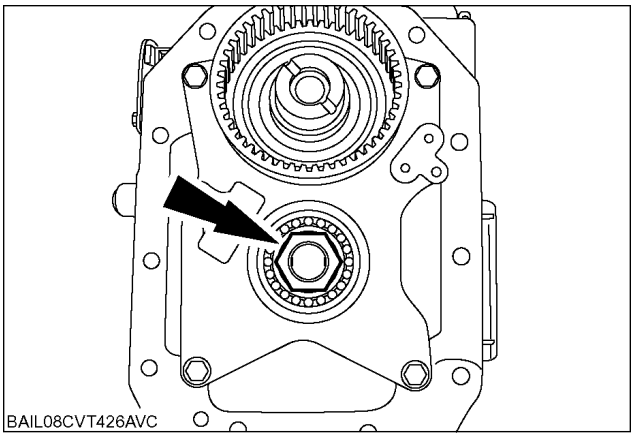
19. Install the brake band **(2)** and the brake piston housing **(1)**.



BSE2356A 19

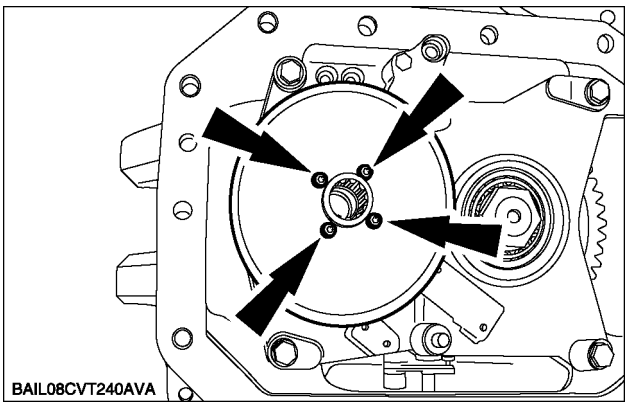
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20. Using a suitable bar **(1)** to lock the PTO output shaft. Install a new PTO output shaft gear retaining nut. Tighten to **294 Nm** (**217 lb ft**). Stake the retaining nut.



BAIL08CVT426AVC 20

21. Install the tone wheel.



BAIL08CVT240AVA 21

PTO Brake Band Adjustment

22. Adjust the PTO brake band, for further information, refer to **PTO brake - Adjust (C.40.C)**

Next operation:
Install the PTO housing, for further information refer to **Housing - Install (C.40.C)**.

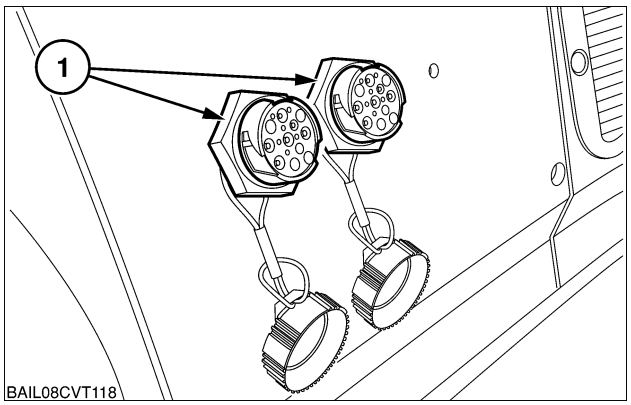
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REAR PTO Hydraulic - Calibrate Electronically Shiftable P.T.O.

NOTE: *The travel position sensor for the Electronically shiftable PTO needs to be calibrated. During the procedure the system is functional.*

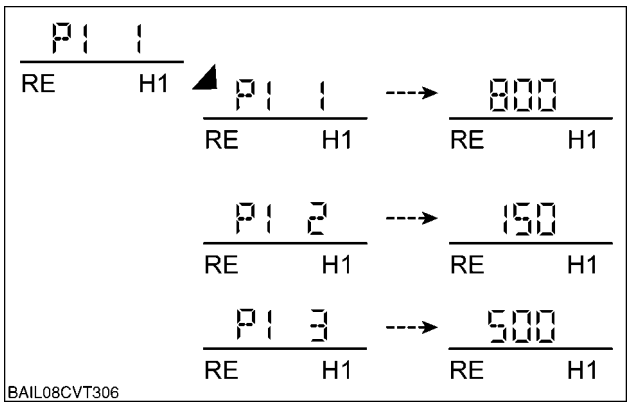
NOTE: *This procedure is only available if the 'Electronic Shiftable PTO' option has been enabled in the H3 menu mode.*

1. Park the vehicle on a flat surface, unhitch all mounted implements from the rear PTO and ensure that the tractor is stationary and the parking brake is applied.
2. Connect the diagnostics plug **380000843** to the diagnostics socket **(1)**. Start the tractor and navigate to the RE module, H1 menu and select PTO. The engine speed will automatically be set to **1200 RPM**.



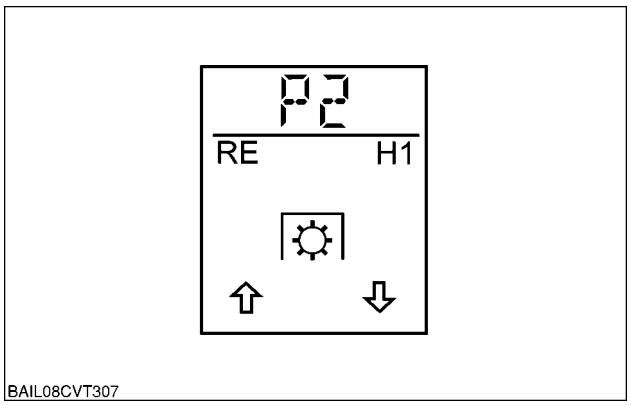
BAIL08CVT118 1

3. The display will show 'P11' to indicate that the calibration procedure has started. This indicates that part 1.x of the calibration is in progress.
4. The procedure will automatically run through the following items:-
   P1.1 - calibrates the fully extended position of the mechanism. After the fully extended calibration is complete the display will show the calibration value (700-900) for approximately 2 seconds.
   P1.2 - calibrates the fully retracted position of the mechanism. After the fully retracted calibration is complete the display will show the calibration value (100-300) for approximately 2 seconds.
   P1.3 - calibrates the neutral position of the mechanism. After the neutral position calibration is completed the display will show the calibration value (450-600) for approximately 2 seconds.



BAIL08CVT306 2

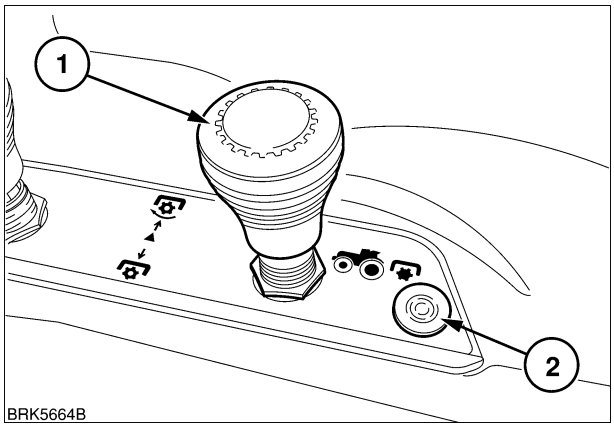
5. After the 'P1.x' calibrations are complete the display will then show 'P2'. Part 2 of the calibrations will then proceed to determine the optional PTO speed value, ie, 540, 540E, 1000E.



BAIL08CVT307 3

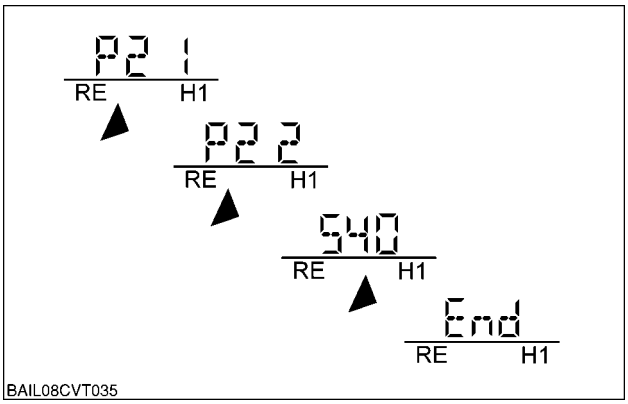
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6. Start the PTO using the cab switch. **(1)**.



BRK5664B 4

7. 'P2.1' is displayed.
'P2.1' continues to be displayed while the PTO is selecting the optional speed position (retracted position).
'P2.2 is displayed after the speed is selected and the PTO is started while the PTO ratio is checked.
After the ratio has been calculated the optional speed value is displayed for 5 seconds followed by 'End.
Calibration is now complete.



BAIL08CVT308 5

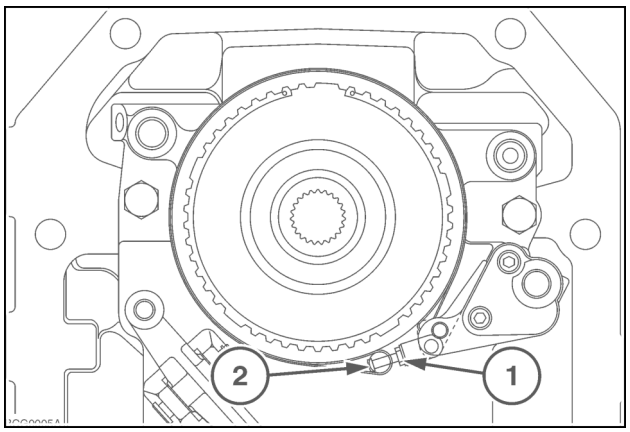
8. Turn the keystart to the 'off' position to store the calibration values.

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PTO brake - Adjust

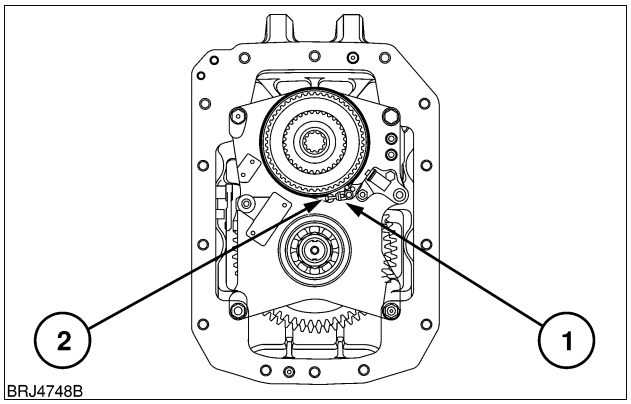
PTO Brake Band Adjustment

1. Loosen the locknut **(1)**, tighten the screw **(2)** to **3 Nm** (**2.21 lbft**), in order to close the brake band.
2. Loosen the screw **(2)** and check the brake band alignment. Adjust if required.
3. Tighten the screw **(2)** to **1.1 Nm** (**0.81 lbft**)
4. Loosen the screw **(2)** by two turns and tighten the locknut **(1)**.
5. Check the brake band alignment and repeat the procedure if required.



BCG0005A 1

6. See Figure **2** for the North American version.



BAIL07CCM307ASA 2

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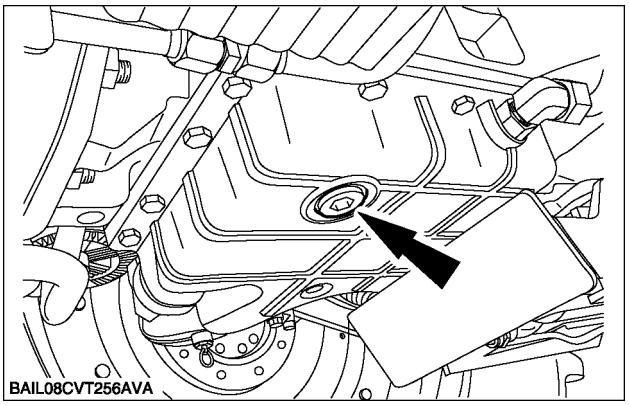
Housing - Remove

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

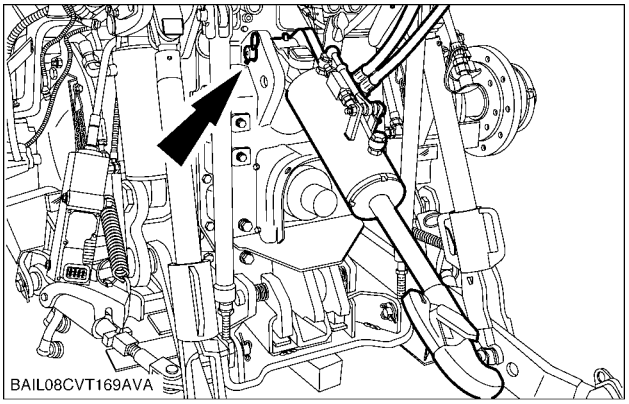
B026

1. Remove the transmission housing drain plug and drain the transmission oil into a suitable container. Install the drain plug and tighten to **68 - 82 Nm** (**50 - 60 lbft**).



BAIL08CVT256AVA 1

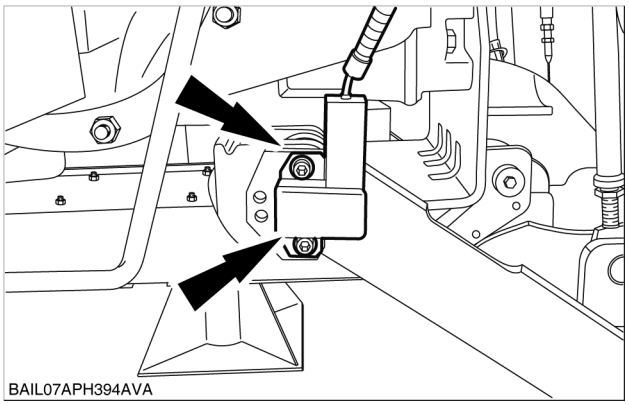
2. Remove top lift arm.



BAIL08CVT169AVA 2

3. Remove the electronic draft control (EDC) sensor retaining bolts.

NOTE: *Repeat this step for the right-hand side.*

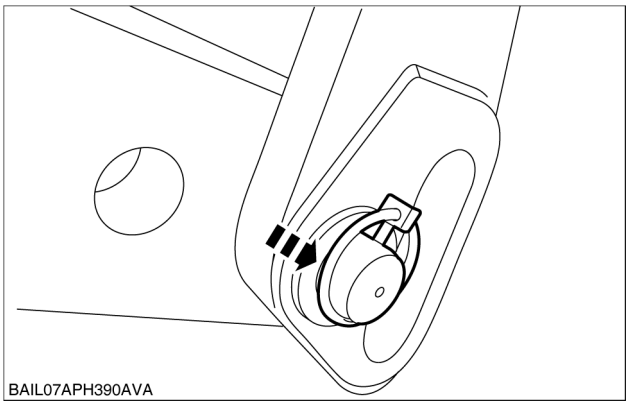


BAIL07APH394AVA 3

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4. Remove the lift link lower retaining pin and slide out the hinge pin.

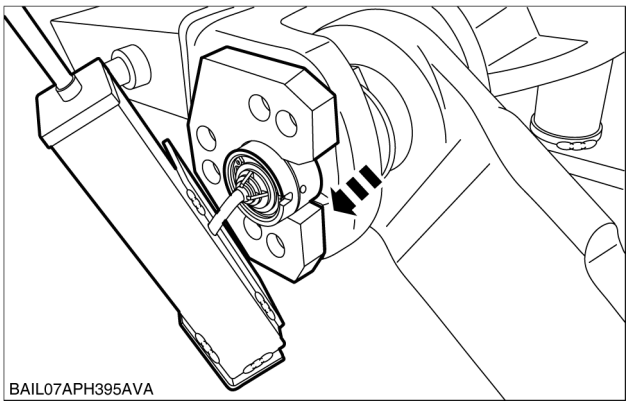
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH390AVA 4

5. Remove the hinge pin with the EDC sensor and remove the lower lift arm.

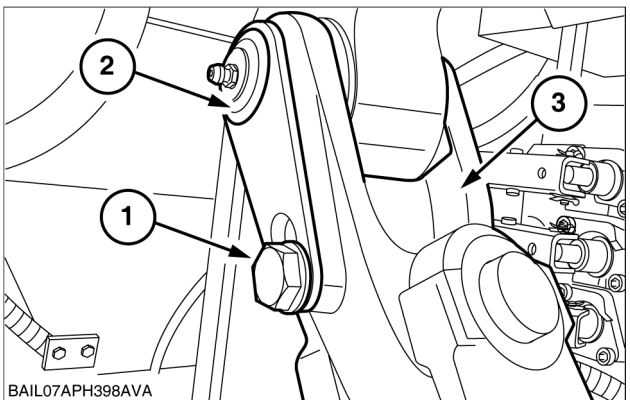
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH395AVA 5

6. Remove the retaining bolt **(1)**, remove the hinge pin **(2)** and remove the lift link **(3)**.

NOTE: *Repeat this step for the right-hand side.*

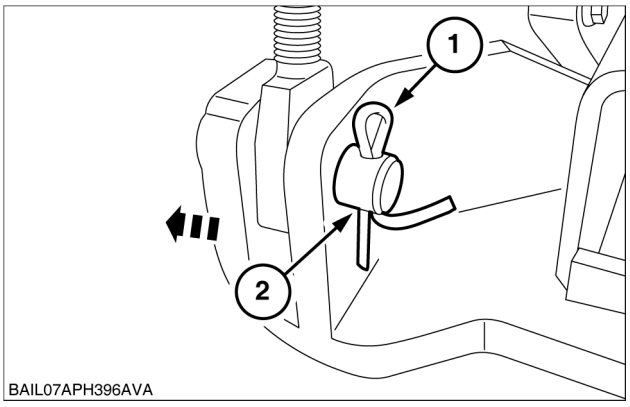


BAIL07APH398AVA 6

Vehicles with extending drawbar

7. Remove the split pin **(1)** and remove the lift rod lower retaining pin **(2)**.

NOTE: *Repeat this step for the right-hand side.*

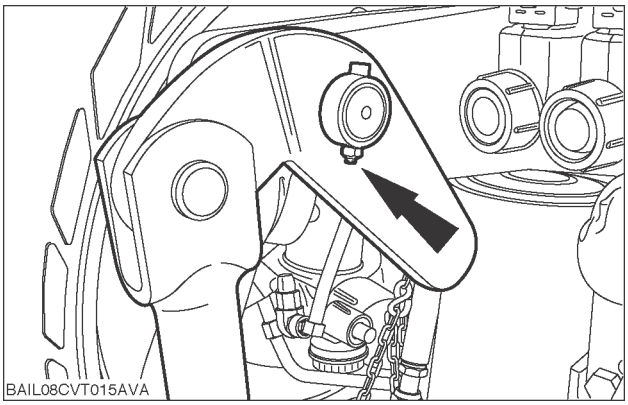


BAIL07APH396AVA 7

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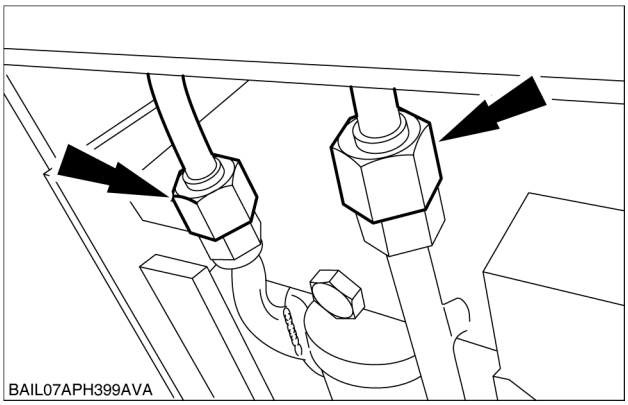
8. Remove the retaining bolt, and remove the extending drawbar lift rod.

NOTE: *Repeat this step for the right-hand side.*



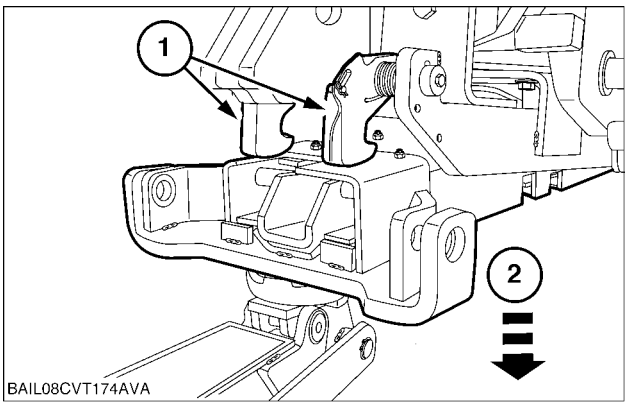
BAIL08CVT015AVA 8

9. Disconnect the extending drawbar hydraulic supply and return pipes.



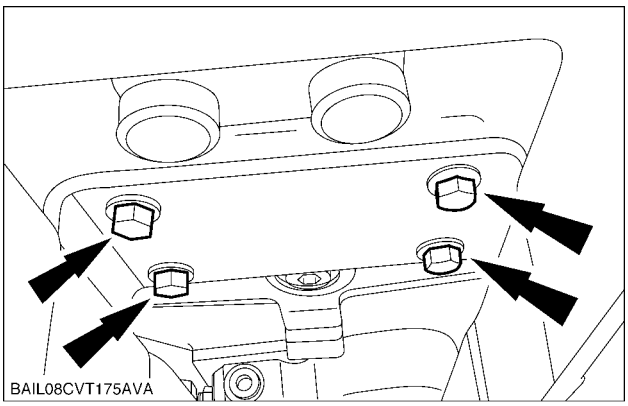
BAIL07APH399AVA 9

10. Unlatch the extending drawbar **(1)** and lower on a suitable jack **(2)**.



BAIL08CVT174AVA 10

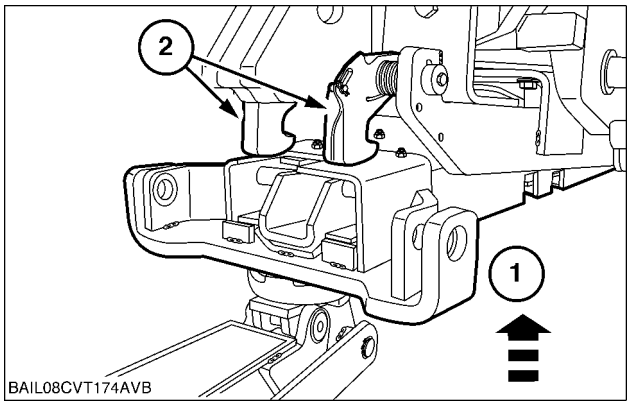
11. Remove the extending drawbar retaining bolts.



BAIL08CVT175AVA 11

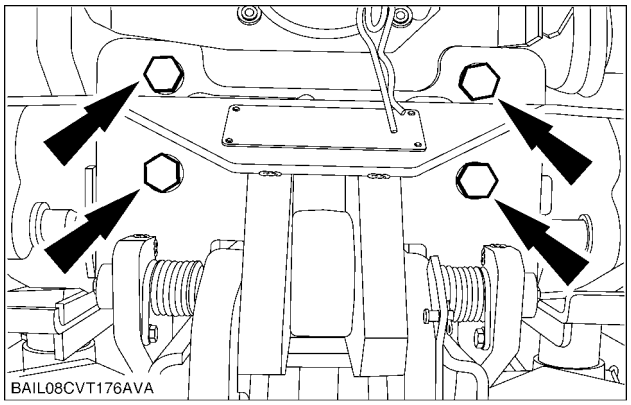
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12. Raise the extending drawbar assembly **(1)** and re-latch the extending drawbar **(2)**.



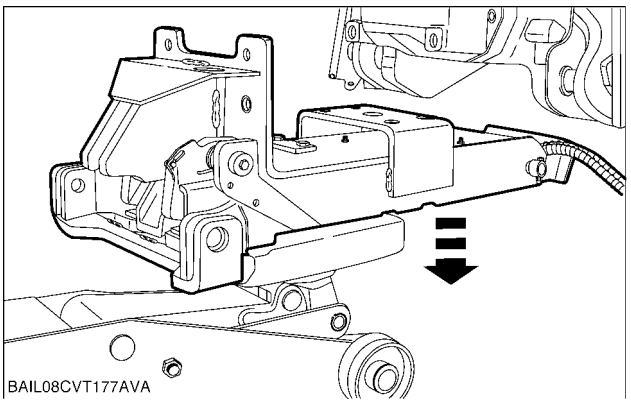
BAIL08CVT174AVB 12

13. Remove the extending drawbar retaining bolts.



BAIL08CVT176AVA 13

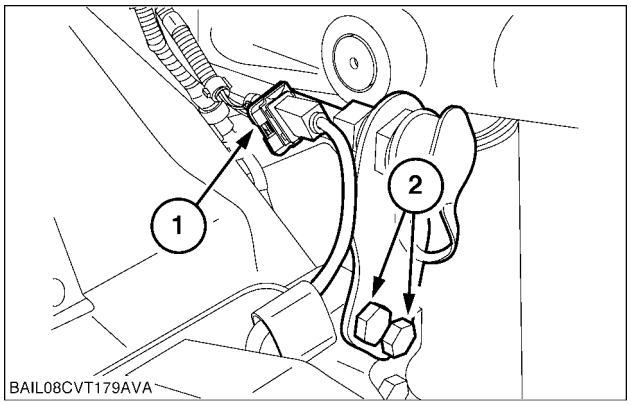
14. Remove the extending drawbar assembly.



BAIL08CVT177AVA 14

All Vehicles.

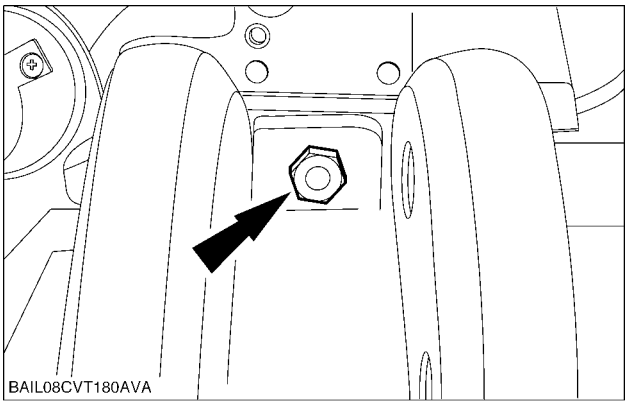
15. Disconnect the power take off (PTO) speed sensor electrical connector **(1)** and the hydraulic trailer brake coupling bracket **(2)**.



BAIL08CVT179AVA 15

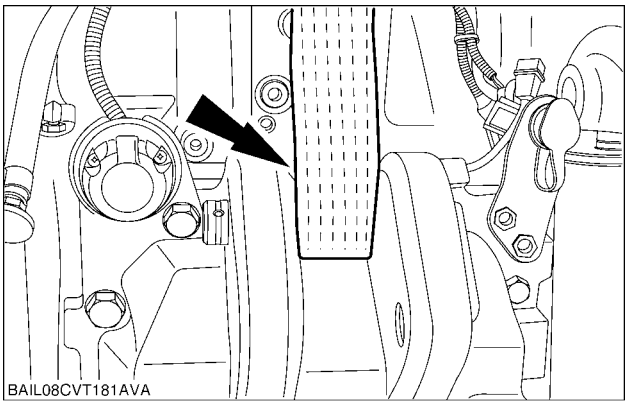
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16. Remove the top central PTO housing retaining bolt.



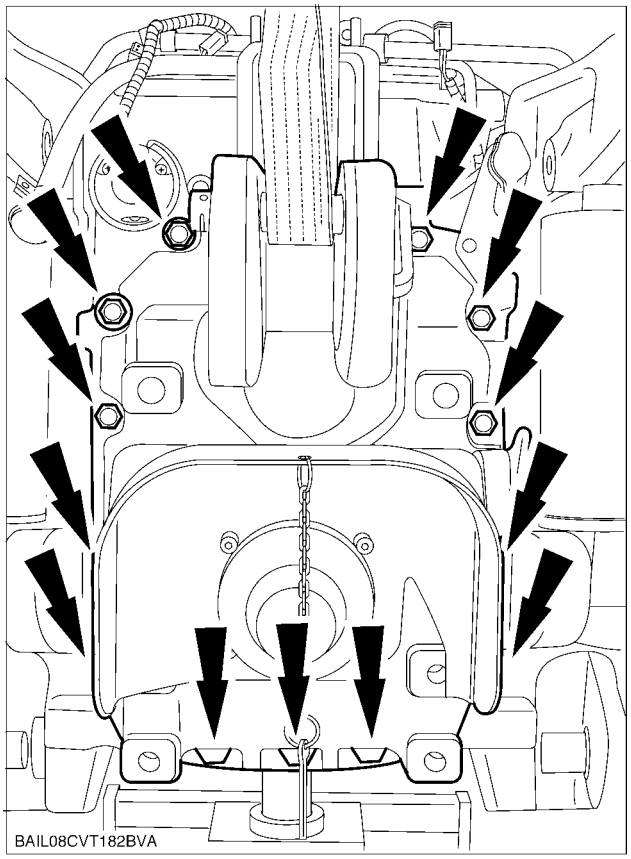
BAIL08CVT180AVA 16

17. Using suitable lifting equipment support the PTO housing.



BAIL08CVT181AVA 17

18. Remove the PTO housing.

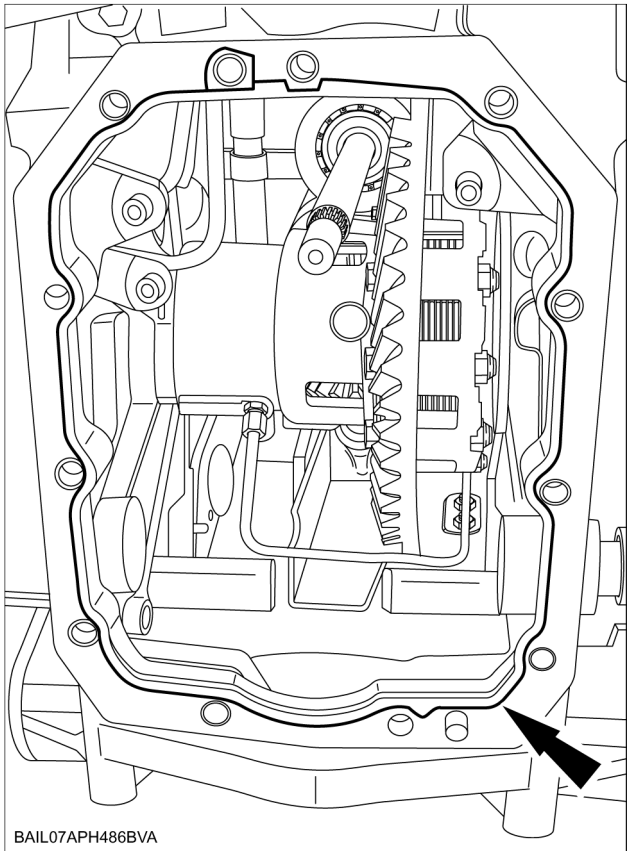


BAIL08CVT182BVA 18

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Housing - Install

1. Thoroughly clean and degrease the mating surfaces and apply a bead of sealant.



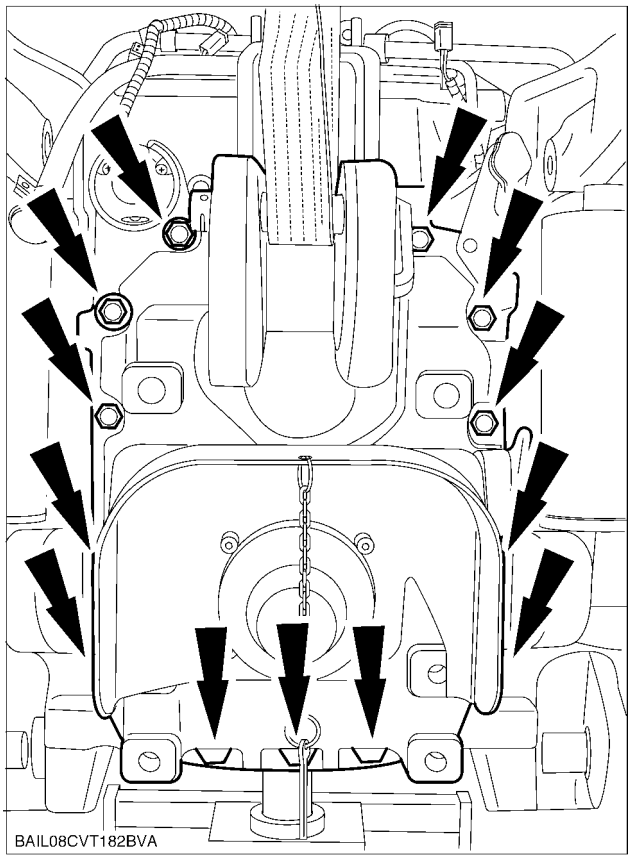
BAIL07APH486BVA 1

2. Install the power take off (PTO) housing.
   Tighten to the retaining bolts to **211 Nm** (**155 lb ft**).

⚠ WARNING ⚠

Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

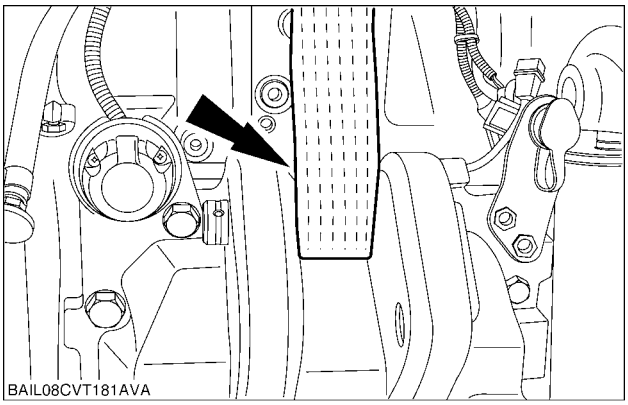
B020



BAIL08CVT182BVA 2

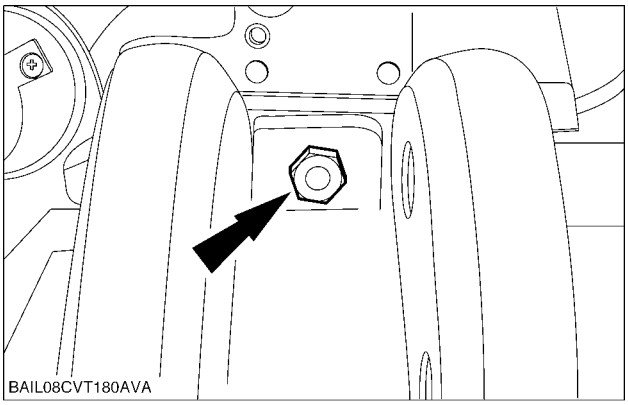
www.truck-freeworkshop.com

3. Remove the support from the PTO housing.



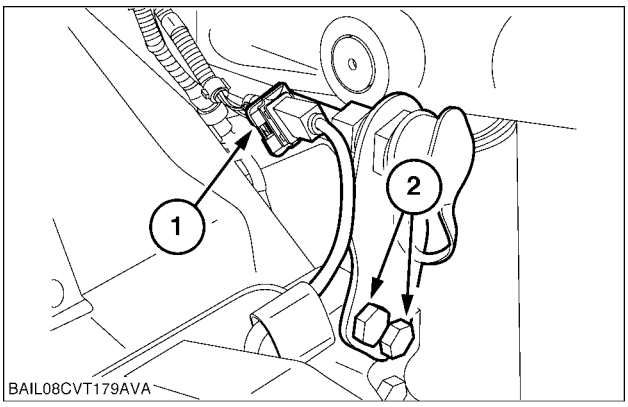
BAIL08CVT181AVA 3

4. Install the top central PTO housing retaining bolt. Tighten to **211 Nm** (**155 lb ft**).



BAIL08CVT180AVA 4

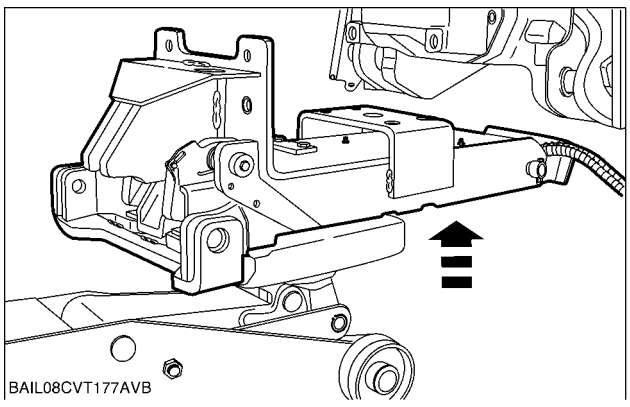
5. Connect the power take off (PTO) speed sensor electrical connector **(1)** and install the hydraulic trailer brake coupling bracket **(2)**.



BAIL08CVT179AVA 5

Vehicles with extending drawbar

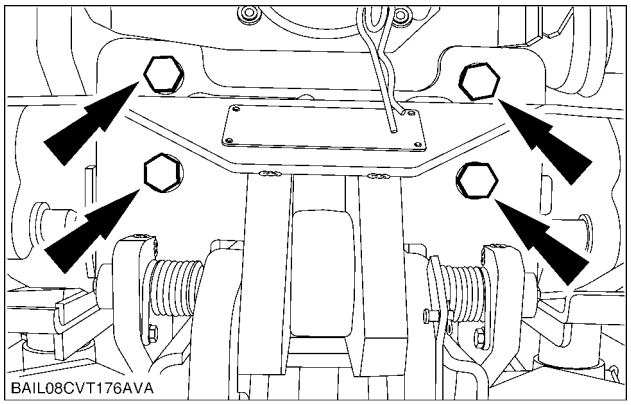
6. Install the extending drawbar assembly.



BAIL08CVT177AVB 6

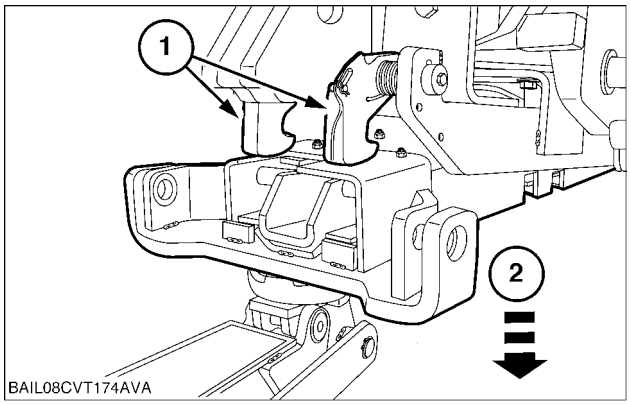
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7. Install the extending drawbar retaining bolts. Tighten to **211 Nm** (**155 lb ft**).



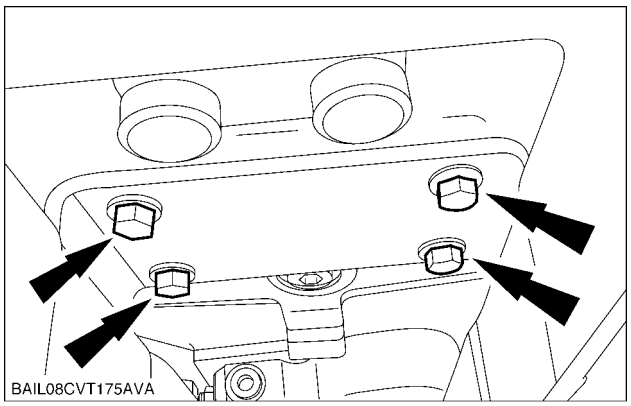
BAIL08CVT176AVA 7

8. Unlatch the extending drawbar **(1)** and lower on a suitable jack **(2)**.



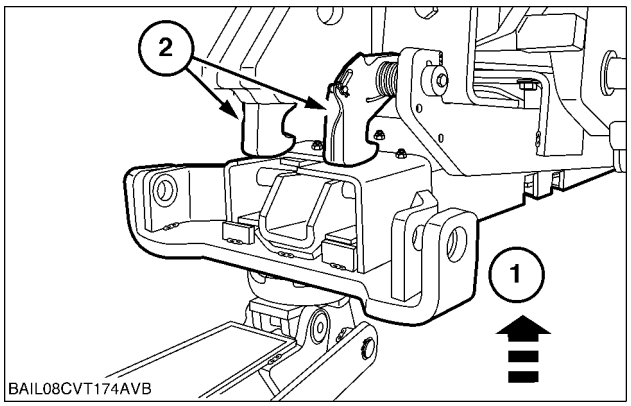
BAIL08CVT174AVA 8

9. Install the extending drawbar retaining bolts. Tighten to **211 Nm** (**155 lb ft**).



BAIL08CVT175AVA 9

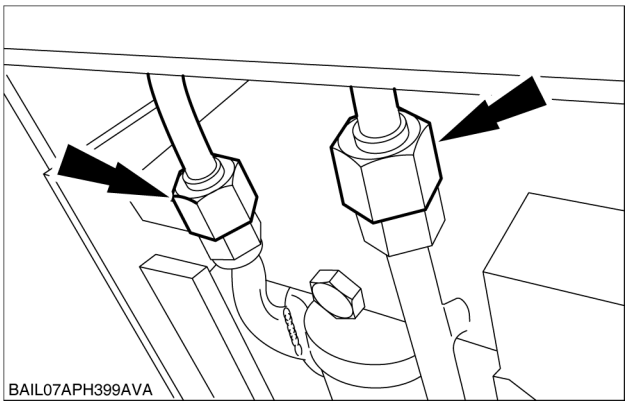
10. Raise the extending drawbar assembly **(1)** and re-latch the extending drawbar **(2)**.



BAIL08CVT174AVB 10

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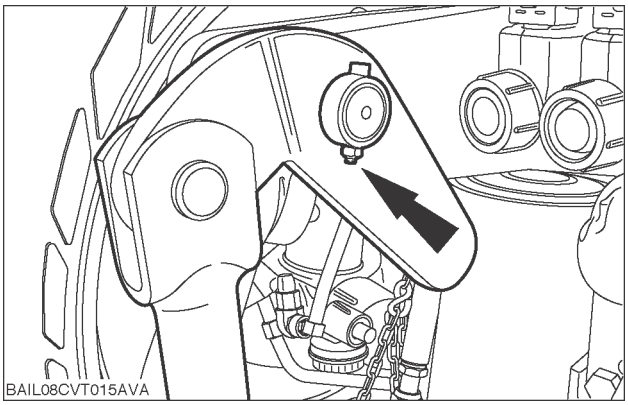
11. Connect the extending drawbar hydraulic supply and return pipes.



BAIL07APH399AVA 11

12. Install the extending drawbar lift rod and install the retaining bolt.

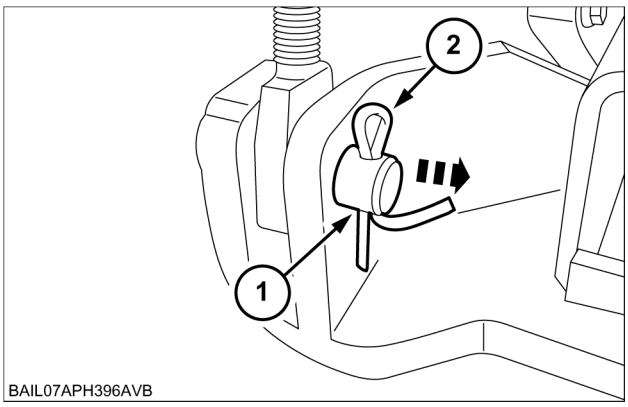
NOTE: *Repeat this step for the right-hand side.*



BAIL08CVT015AVA 12

13. Install the lower retaining pin **(1)** and install the split pin **(2)**.

NOTE: *Repeat this step for the right-hand side.*

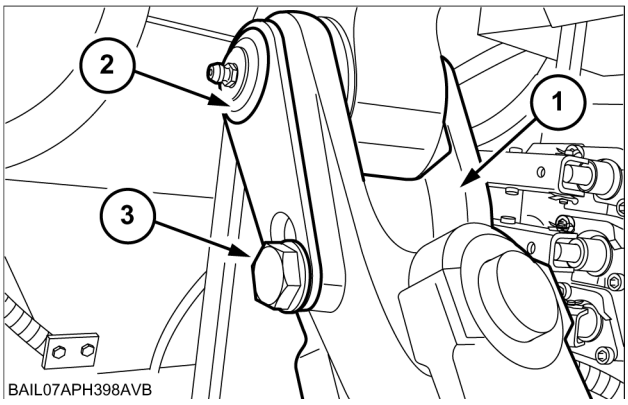


BAIL07APH396AVB 13

All vehicles

14. Install the lift link **(1)**, install the hinge pin **(2)** and install the retaining bolt **(3)**.

NOTE: *Repeat this step for the right-hand side.*

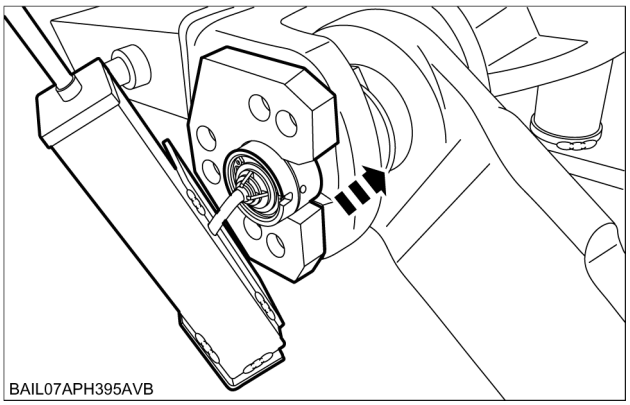


BAIL07APH398AVB 14

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15. Install the hinge pin with the EDC sensor into the lift arm.

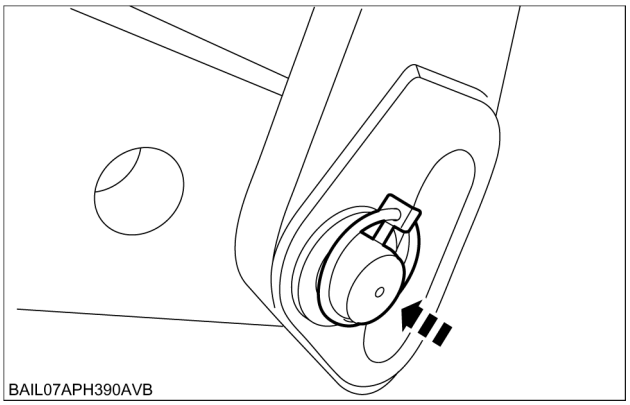
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH395AVB 15

16. Install the lift link lower hinge pin and install the retaining pin.

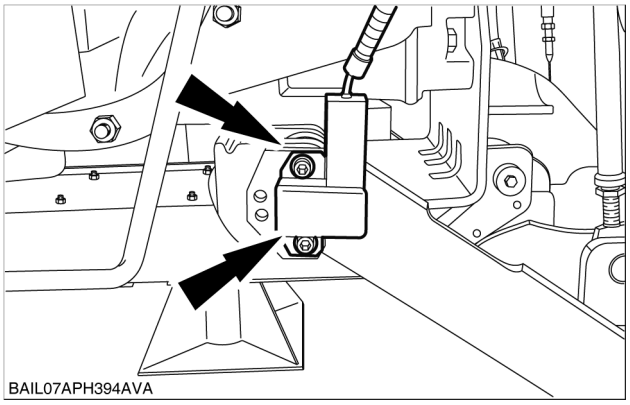
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH390AVB 16

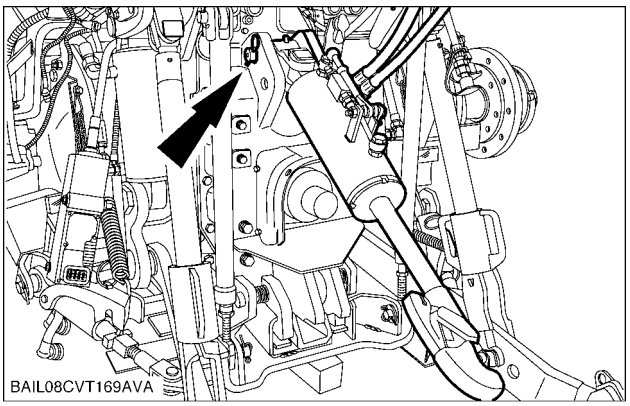
17. Install the EDC sensor retaining bolts.

NOTE: *Repeat this step for the right-hand side.*



BAIL07APH394AVA 17

18. Install the top lift arm.



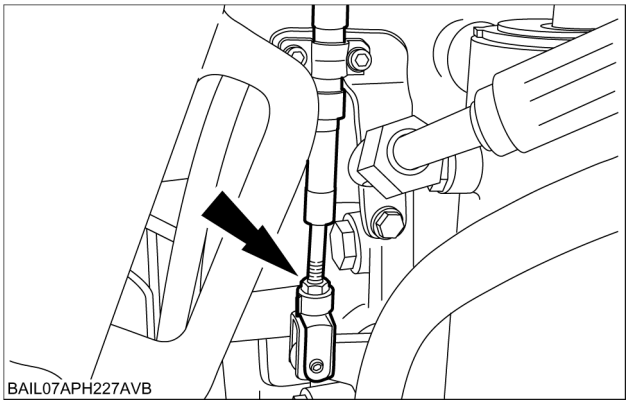
BAIL08CVT169AVA 18

19. Fill the transmission with oil.

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Synchroniser command - Adjust

ATTENTION: *The synchroniser command cable comes pre adjusted from the manufacturer and no adjustment should be necessary. However after overhaul slight adjustment can be made at the clevis.*



BAIL07APH227AVB 1

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REAR PTO Hydraulic - Troubleshooting

NOTE: *The table below details some possible mechanical/hydraulic faults. The controller will also generate error codes related to the PTO system. The error codes are prefixed with the number (5) and displayed on the instrument cluster. For further information refer to* ***Control module - Fault code index (A.50.A)***

Problem	Possible Cause	Correction
The PTO does not operate	Low transmission oil level.	Refill the transmission to the correct oil level.
	Blocked oil filter.	Replace the oil filter. - For further information refer to **Filter - Replace (A.10.A)**
	Faulty hydraulic pump.	Repair or replace the hydraulic pump. - For further information refer to **Hydraulic pump Variable displacement pump - Overhaul (A.10.A)**
	Faulty PTO engagement switch	Replace the PTO engagement switch.
	Lack of power supply to the solenoid valve: detached or damaged connectors, faulty remote switch.	Reset electrical connections and replace any faulty parts.
	PTO control solenoid valve stuck open.	Repair or replace the solenoid valve.
	Oil leakage through the oil seals with consequent pressure drop: manifold or control plunger seals	Replace any damaged oil seals.
The PTO does not operate	Low transmission oil level.	Refill the transmission to the correct oil level.
	Blocked oil filter.	Replace the oil filter. - For further information refer to **Filter - Replace (A.10.A)**
	Faulty hydraulic pump.	Repair or replace the hydraulic pump. - For further information refer to **Hydraulic pump Variable displacement pump - Overhaul (A.10.A)**
	Faulty PTO engagement switch	Replace the PTO engagement switch.
	Lack of power supply to the solenoid valve: detached or damaged connectors, faulty remote switch.	Reset electrical connections and replace any faulty parts.
	PTO control solenoid valve stuck open.	Repair or replace the solenoid valve.
	Oil leakage through the oil seals with consequent pressure drop: manifold or control plunger seals	Replace any damaged oil seals.
The PTO control clutch drags.	Faulty brake engagement switch	Replace the brake engagement switch.
	Lack of power supply to the solenoid valve: detached or damaged connectors or faulty remote switch.	Reset electrical connections and replace any faulty parts.
	Brake control valve stuck closed.	Repair or replace the brake control valve.
	Worn PTO brake	Adjust or replace the PTO brake. - For further information refer to **PTO brake - Adjust (C.40.C)**
Difficult to engage ground speed PTO	Tractor is not stationary.	Apply the parking brake and foot brake pedals before selecting the ground speed PTO.
	Incorrect selector cable adjustment.	Adjust the selector cable.
	Damaged selector cable.	Replace the selector cable.
	Selector shaft lever spring broken.	Replace the selector shaft lever spring.
	Worn selector fork.	Replace the selector fork.
	Worn sliding engagement coupler.	Replace the sliding engagement coupler.
	Sliding engagement coupler is a tight fit on the shaft splines.	Clean the splines or replace the shaft and the sliding engagement coupler.
	Engagement teeth worn on the ground speed PTO drive shaft.	Replace the ground speed PTO drive shaft.
	Shift rail seized in the axle housing.	Remove the shift rail and repair or replace as necessary.

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Problem	Possible Cause	Correction
	Rear PTO output shaft rotating.	PTO brake not being applied, repair or replace as necessary
	PTO clutch oil supply cut off valve.	Replace PTO clutch oil supply cut off valve.
Ground speed PTO will not remain in the engaged position	Incorrect selector cable adjustment.	Adjust the selector cable.
	Selector shaft lever spring broken.	Replace the selector shaft lever spring.
	Sliding engagement coupler loose on the shaft splines.	Replace the sliding engagement coupler and/or the shaft.
	Ground speed PTO shaft support bearings worn.	Replace the shaft support bearings.
Ground speed PTO (Gpto) is displayed on the instrument cluster when ground speed PTO is disengaged or not fitted and engine driven rear PTO is engaged	Cab selector lever switch open circuit.	Replace the cab selector lever switch.
	Cab selector lever switch electrical circuit faulty.	Repair or replace the electrical harness.
	Incorrect ground speed PTO switch adjustment.	Adjust the ground speed PTO switch.
	Link wire electrical connector faulty.	Repair or replace the link wire electrical connector.

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POWER TRAIN - C

FRONT PTO Hydraulic - 42.C

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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FRONT PTO Hydraulic - Troubleshooting

Problem	Possible Cause	Correction
Front PTO not engaging	Front PTO is not turned on in machine configurations.	Turn the front PTO on in machine configurations.
	Front PTO solenoid valve not energizing.	Check the electrical circuit.
	Solenoid valve sticking.	Replace the solenoid valve.
Front PTO permanently engaged	Piston spring broken.	Replace the piston spring.
	Solenoid valve sticking.	Replace the solenoid valve.
Low power from the front PTO output shaft	Fault in the low pressure circuit.	Pressure test the low pressure circuit.
	Front PTO piston oil seals leaking.	Overhaul the front PTO control housing.
	Front PTO multi-dry plate clutch plates worn.	Overhaul the front PTO multi-dry plate clutch.
Front PTO output shaft oil seal leak	Worn oil seal.	Replace the oil seal and check the level of oil in the reduction gearbox.
	Excessive oil level in the front PTO reduction gearbox.	Check the oil level.
Front PTO bearings overheated/worn	Lack of oil in front PTO reduction gearbox.	Check the oil level. If low examine the front PTO reduction gearbox for leaks.
	Incorrect specification oil or old oil in the front PTO reduction gearbox.	Replace with the correct specification of oil.

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POWER TRAIN - C

FRONT PTO Hydraulic - 42.C

FRONT PTO Hydraulic - Troubleshooting 3

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PRINTED IN FRANCE

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SERVICE MANUAL

TRAVELLING



Puma 165 CVX
Puma 180 CVX
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Puma 210 CVX
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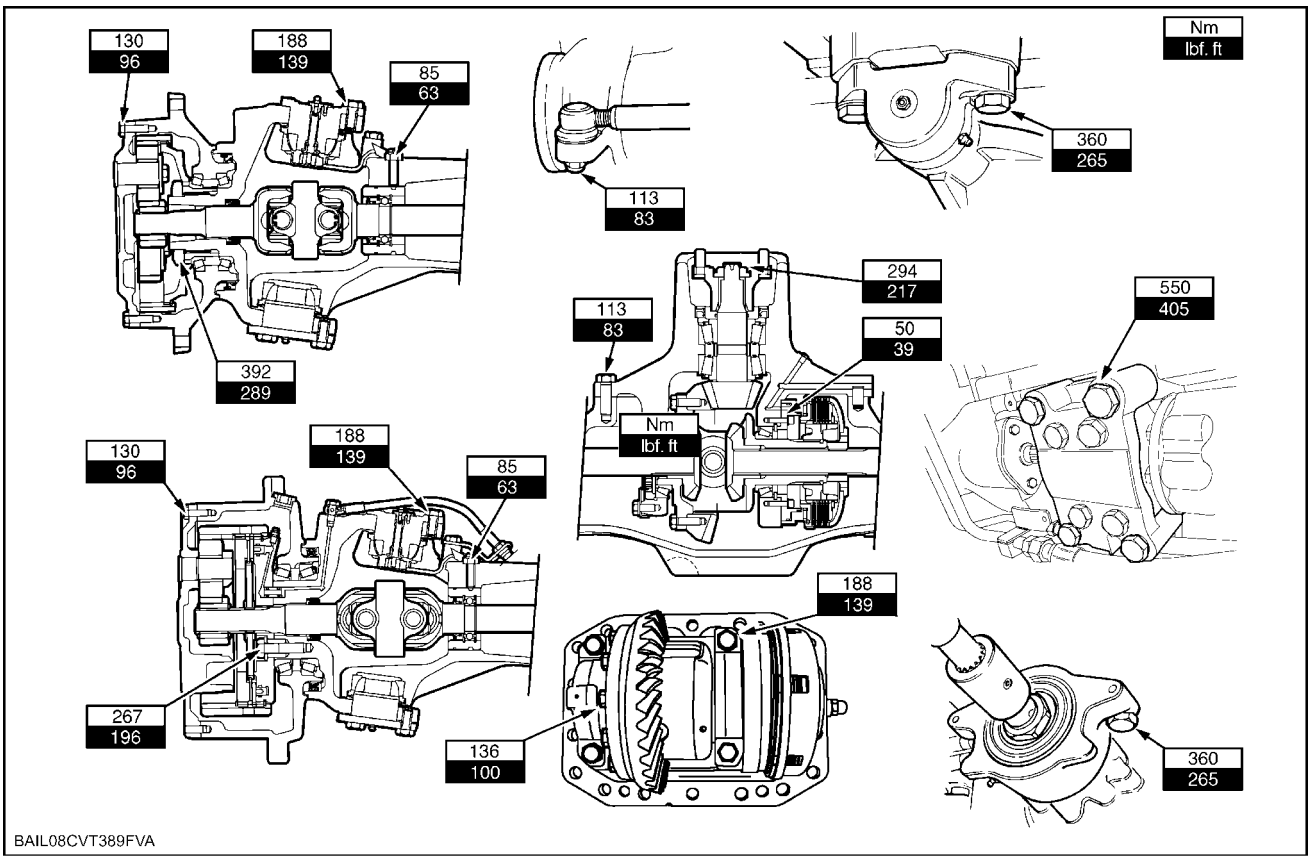
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FRONT AXLE - Torque



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Front axle torque settings

FRONT AXLE - Special tools

⚠ CAUTION ⚠

The operations described in this section can only be carried out with the ESSENTIAL tools indicated by an (X). To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

B008

List of special tools necessary to carry out the different operations described in this Section.

380000251	Front axle overhaul stand
X **380000227**	Front differential casing removal - installation hook
380000255	Front axle differential casing overhaul fixture
380000255	Front Axle - 55 mm nut socket
X **380200102**	Front Axle - 60mm nut socket
X **380200103**	Front Axle - Pinion holding socket (40 mm pinion)
X **380000248**	Pinion Bearing Preload adjusting tool
X **380000463**	Drive pinion bearing adjustment tool
380001000	Front axle drive pinion retaining tool
X **380000249**	Front axle drive pinion cone point adjustment gauge
380000270	Front axle hub bearing pulling aids (two)
380000548	Front axle planetary reduction hub alignment pins (M12 x 1.25)
380000265	Front axle swivel pin puller
380000234	Front axle swivel pin bearing outer race puller
380000235	Front axle bearing rolling torque test tool

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380001143	Front axle-shaft to swivel housing mounting guide
380000240	Front axle differential engagement oil pressure test kit
X **380000600**	Front axle drive pinion shimming measurement tool
X **380000269**	Front wheel hub bearing ring nut spanner
X **380000253**	Front axle differential casing bearing ring nut spanner
X **380200092**	Suspended axle pinion seal installer (101 x 42 x 27)
X **380200093**	Suspended axle seal protector installer (101 x 42)
X **380200094**	Standard axle pinion seal installer (85 x 37 x 15)
X **380200095**	Standard axle pinion seal protector installer (85 x 37)
X **380001115**	Suspended axle differential pinion bearing spacer (use with 380000463)

FRONT AXLE - General specification

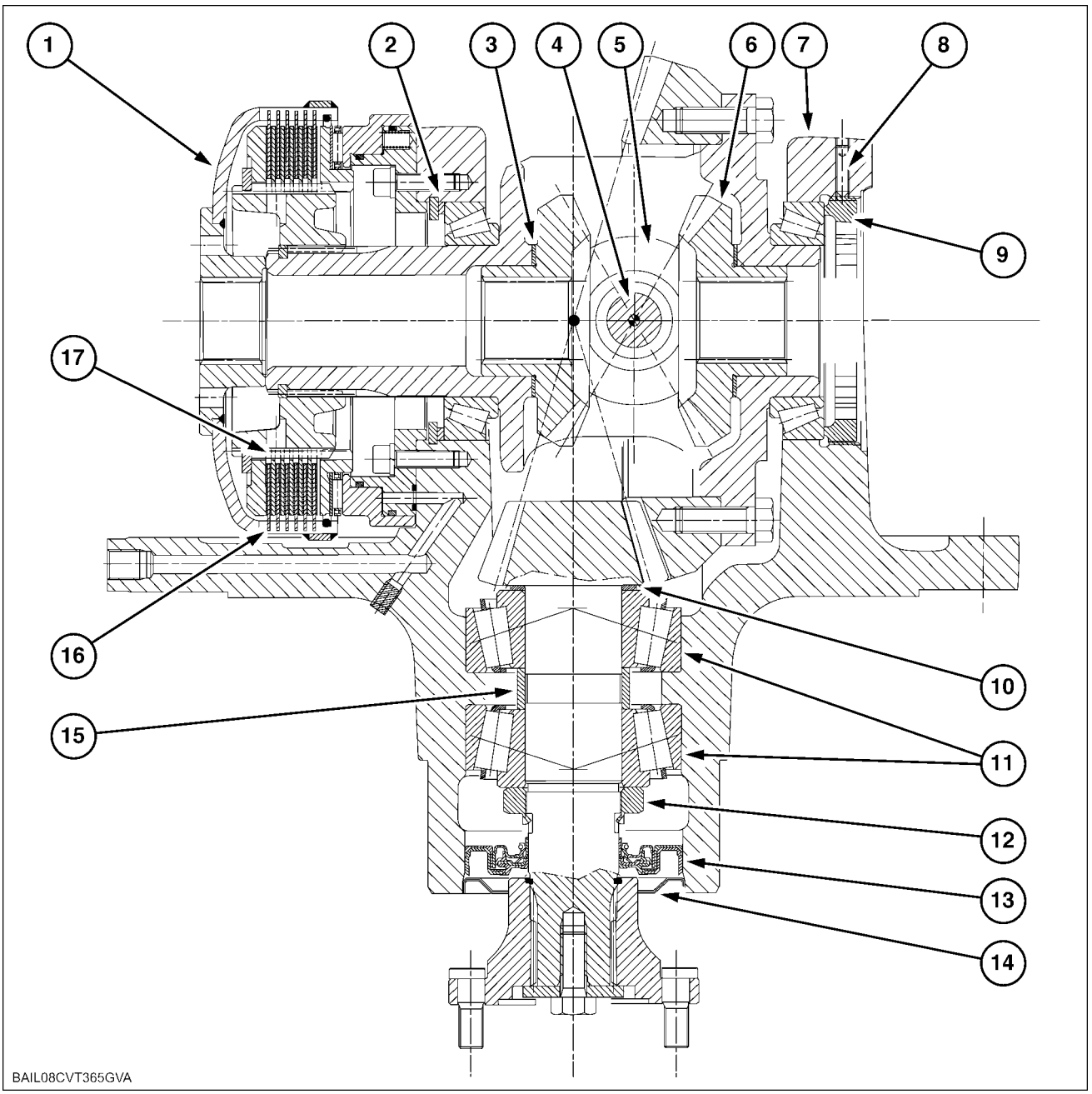
Type Class 1V Axle		Steering, stress-supporting, centrally pivoted
Pinion and Crown Wheel - Differential		
Pinion to crown wheel reduction ratio		10/34 = 1:3.4
Pinion to crown wheel backlash	mm	0.18 - 0.23
Cone point adjustment shims (**FRONT AXLE - Sectional view (D.10.A)**)	mm	2.3 - 2.4 - 2.5 - 2.6 - 2.7 - 2.8 - 2.9 - 3.0 - 3.1 - 3.2 - 3.3 - 3.4 - 3.5
Pinion bearing adjustment shims	mm	2.2-2.25-2.3-2.35-2.4-2.45-2.5-2.55-2.6-2.65-2.7-2.75-2.8-2.85-2.9-2.95-3.00-3.05-3.10-3.15-3.20-3.25-3.3- 3.35-3.4-3.45
Crown wheel point adjustment shims	mm	1 - 1.1 - 1.2 - 1.3 - 1.4 - 1.5- 1.6 - 1.7 - 1.8 - 1.9 - 2
Side gear to differential gear backlash	mm	0.18
Differential gear thrust washer thickness	mm	1.470 - 1.530
Side gear thrust washer thickness	mm	1.4-1.5-1.6-1.7-1.8
Differential gear pin diameter	mm	24.939 - 24.960
Pin bore diameter on differential gears	mm	25.040 - 25.061
Pins to seats mounting clearance	mm	0.080 - 0.122
Side gear hub diameter	mm	50.954 - 51.000
Hub bore diameter on differential casing	mm	51.100 - 51.146
Side gears to seats mounting clearance	mm	0.100 - 0.192
Differential Lock Assembly (Multi Wet Plate Clutch)		
Drive discs	mm	1.75 - 1.855
Drive discs quantity		5
Driven discs	mm	2.35 - 2.45
Driven discs quantity		6
Axle-Shafts and Swivel Assemblies		
Outer axle-shaft (**FRONT AXLE - Sectional view (D.10.A)**) dia. at the bushings **(8)**	mm	44.975 - 45.000
Press-fit bushing inner diameter	mm	45.100 - 45.175
Axle-shafts to bushings mounting clearance	mm	0.100 - 0.200
Bushings to seats fitting interference	mm	0.064 - 0.129
Swivel pin bearing adjust shims	mm	0.10-0.15-0.20-0.25-0.30
Planetary Reduction Hubs		
Reduction ratio		16:(16+68) = 1:5.25
Planet gear thrust washer thickness	mm	0.77 - 0.83
Front Axle Support Pillars		
Axle housing to support pillars end play	mm	0.3 - 1.1
Max. wear end play	mm	2
Front support pillar diameter	mm	62.720 - 62.740
Press-fit front bush inner diameter	mm	62.80 - 62.884

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Pillar to bush mounting clearance	mm	0.060 - 0.164
Rear bush outer diameter (press-fit into pinion support)	mm	115.527 - 115.585
Rear bush inner diameter (press-fit into support pillar)	mm	115.636 -115.711
Bush to bush mounting clearance	mm	0.051 - 0.184

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FRONT AXLE - Sectional view

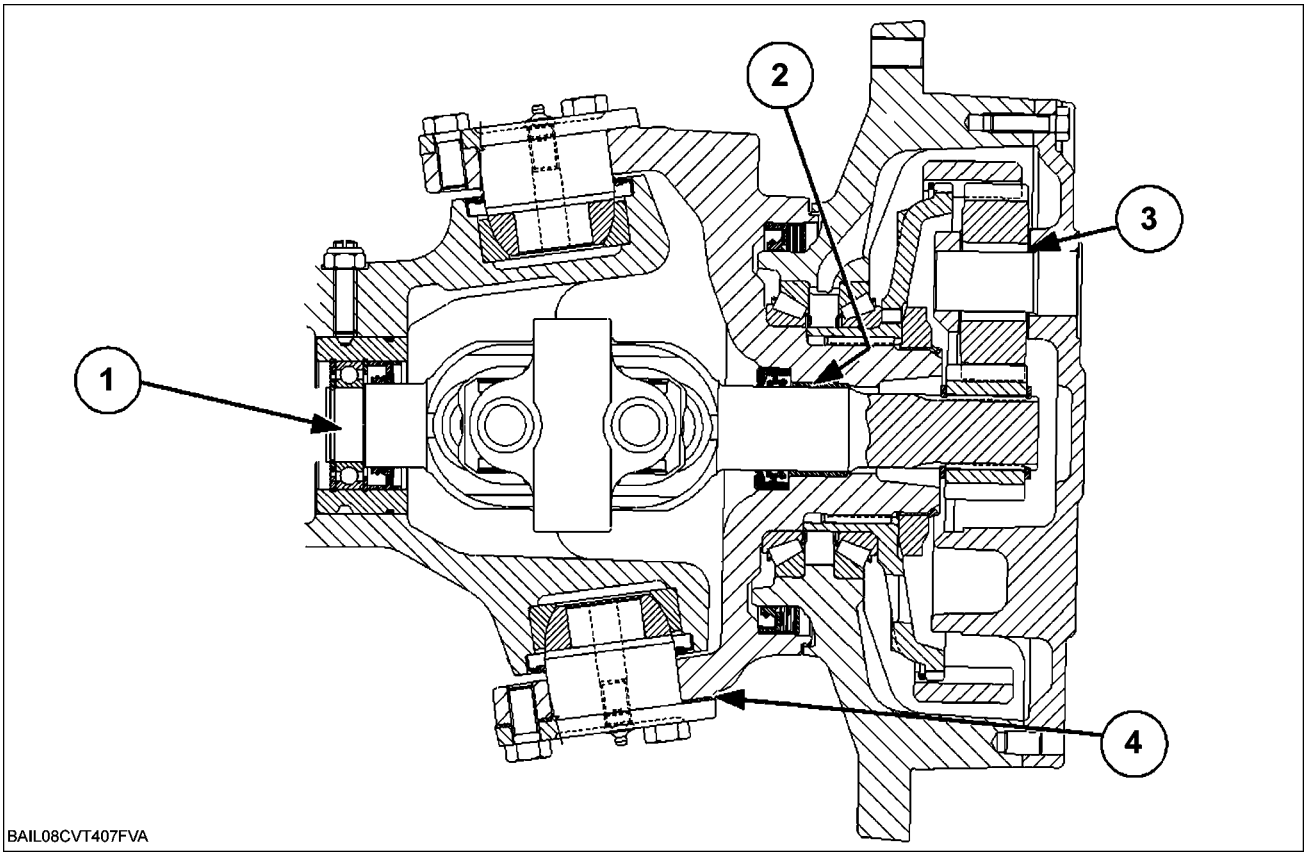


BAIL08CVT365GVA 1

Class IV Front Axle Cross-Sections

1. Multi wet plate clutch assembly
2. Crown wheel bearing adjustment shims
3. Side gear thrust washer shims
4. Differential gear pin
5. Differential gears
6. Side gears
7 End caps
8. Grub screw
9. Locking ring
10. Pinion cone adjustment shims
11. Pinion bearings
12. Pinion retaining nut
13. Oil seal
14. Dust seal
15. Pinion spacer
16. Driven discs
17. Drive discs

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BAIL08CVT407FVA 2

Support Pillars and Planetary Reduction Hub Cross-Sections

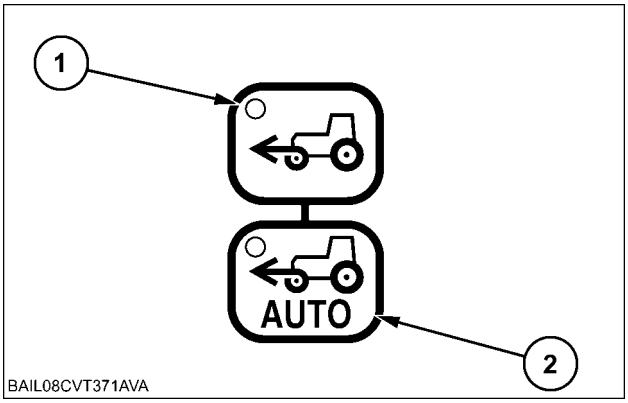
1. Outer axle-shafts
2. Bushings
3. Driven gear thrust washers
4. Swivel pin adjustment shims

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FRONT AXLE - Static description

The tractors are fitted with a centrally pivoted front axle with support pillars and propshaft parallel to the tractor centre line.
The differential assembly includes two planet gears. Drive is transferred to the epicyclic reduction gear hubs by means of maintenance-free universal joints.
The four wheel drive is actuated by switches **(1)** for manual and **(2)** for auto which are included in the electronic controls located on the arm rest unit. The drive for the axle is provided via a clutch unit from the rear axle which is activated by oil from the low pressure circuit. When the four wheel drive is engaged, a solenoid is activated to prevent oil flow to the clutch unit which is then free to engage under spring pressure. When the four wheel drive is disengaged, low pressure circuit oil is used to release the clutch pack. For further information refer to **2WD-4WD SYSTEM Hydraulic - Static description (D.14.C)**.

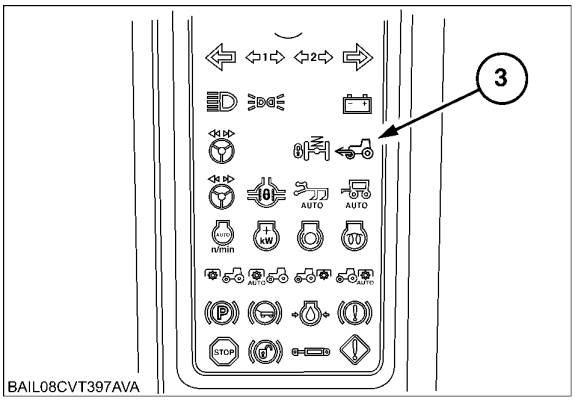
Switches



BAIL08CVT371AVA 1

In manual mode **(1)** the warning light in the switch and the indicator light **(3)** on the instrument panel will illuminate. In auto mode **(2)** the warning light in the switch will illuminate but the indicator light **(3)** in the instrument panel will only remain illuminated when four wheel drive is engaged.

Instrument Panel

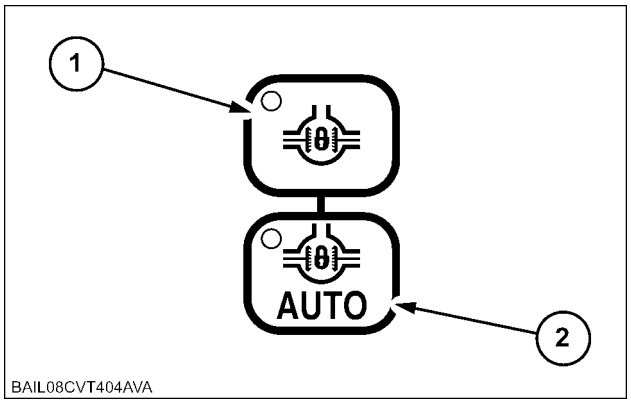


BAIL08CVT397AVA 2

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Four wheel drive tractors have a differential lock installed in the front and rear axles. The wet multi-plate clutch differential lock is controlled by switches **(1)** for manual and **(2)** for auto which are included in the electronic controls located on the arm rest unit. When either switch is activated low pressure oil is diverted, via a solenoid valve, to the front and rear axles and locks all four wheels together for conditions where wheel slip may occur, for further information refer **Differential lock Multi plate clutch - Dynamic description (D.10.A)**.

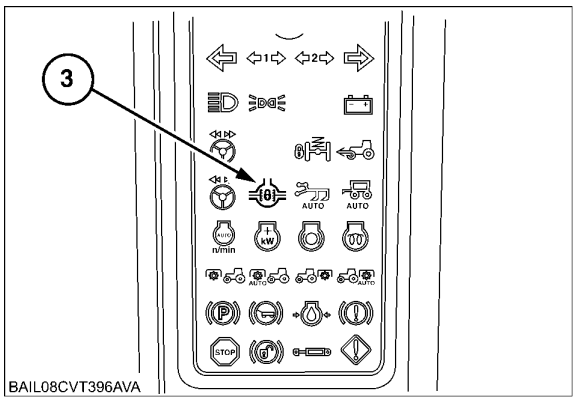
Switches



BAIL08CVT404AVA 3

The four wheel drive and differential lock engagement can be operated in manual mode or auto mode. The auto mode will automatically engage and disengage the systems depending on operating conditions, such as, wheel speed, steering angles and hydraulic lift operations (differential lock). In manual mode **(1)** the warning light in the switch and the indicator light **(3)** on the instrument panel will illuminate. In auto mode **(2)** the warning light in the switch will operate and the indicator light **(3)** will illuminate but will only remain lit while four wheel drive is engaged. The auto mode parameters are set up in the H3 H-Menu of the RM module, for further information refer to **Control module - Configure (A.50.A)**.

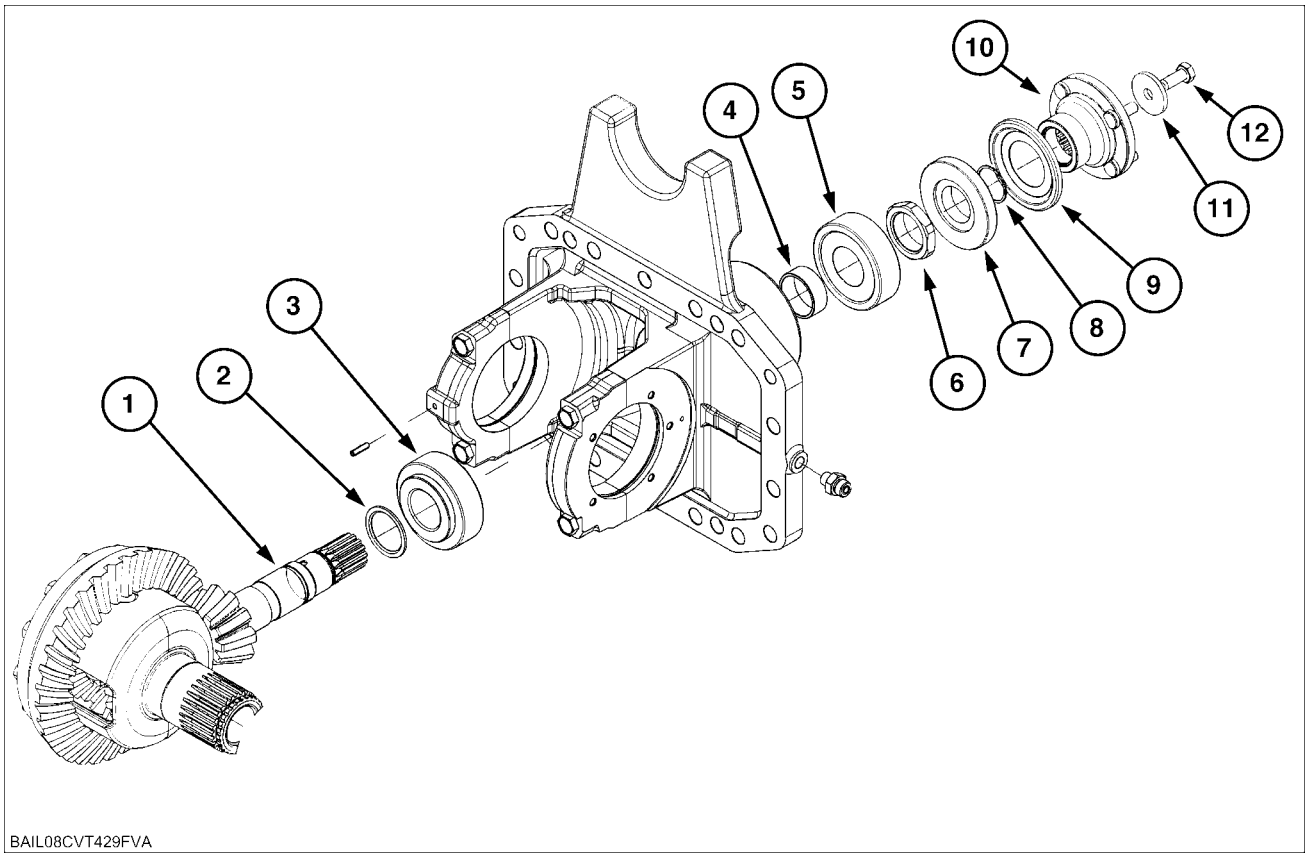
Instrument panel



BAIL08CVT396AVA 4

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Bevel gear - Exploded view

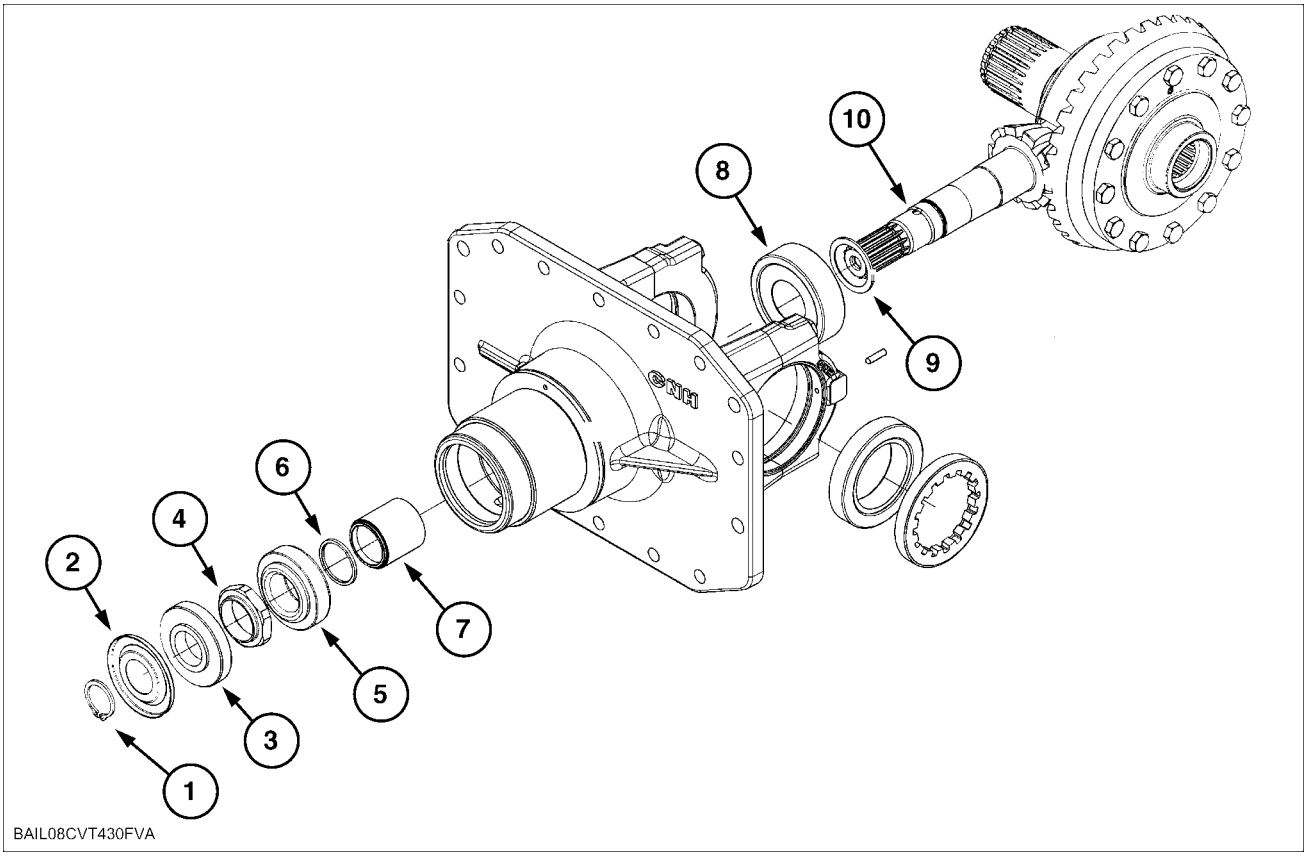


BAIL08CVT429FVA 1

Suspended front Axle Components

1. Pinion
2. Spacer
3. Bearing
4. Spacer
5. Bearing
6. Pinion Nut
7. Seal
8. Washer
9. Seal Protector
10. Pinion flange
11. Washer
12. Flange Bolt

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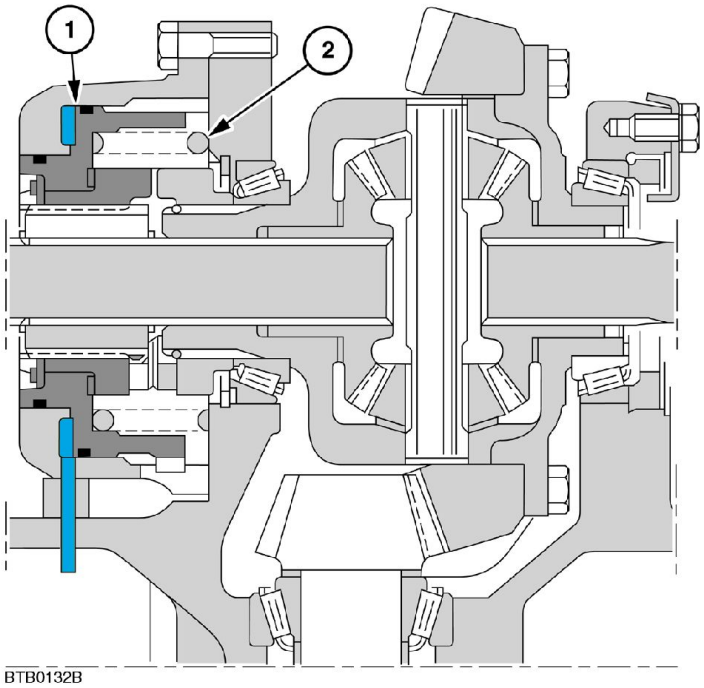
BAIL08CVT430FVA 2

Standard Front Axle Components

1. Circlip
2. Seal Protector
3. Seal
4. Pinion Nut
5. Bearing
6. Shim
7. Spacer
8. Bearing
9. Shim
10. Pinion

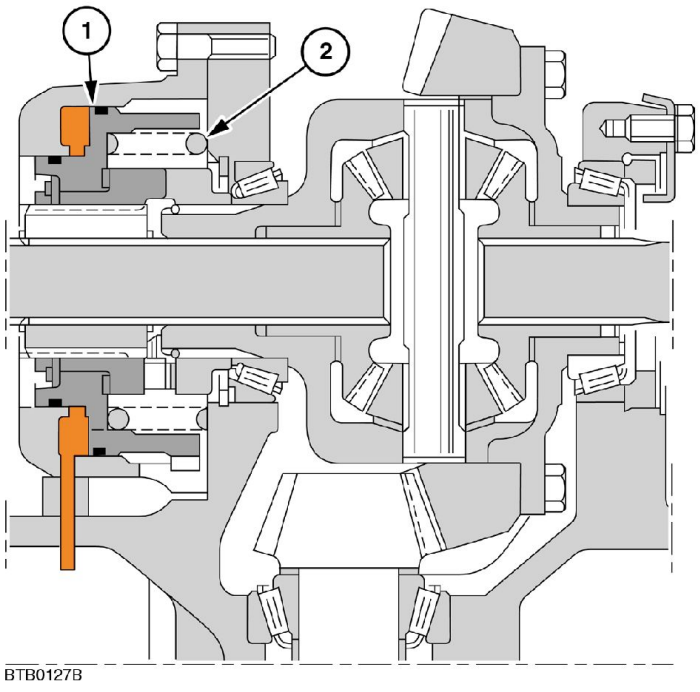
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Differential lock Multi plate clutch - Dynamic description



Front differential lock disengaged

Front differential lock engaged



BTB0127B 1

Front differential lock disengaged

Trapped oil

Pressure oil

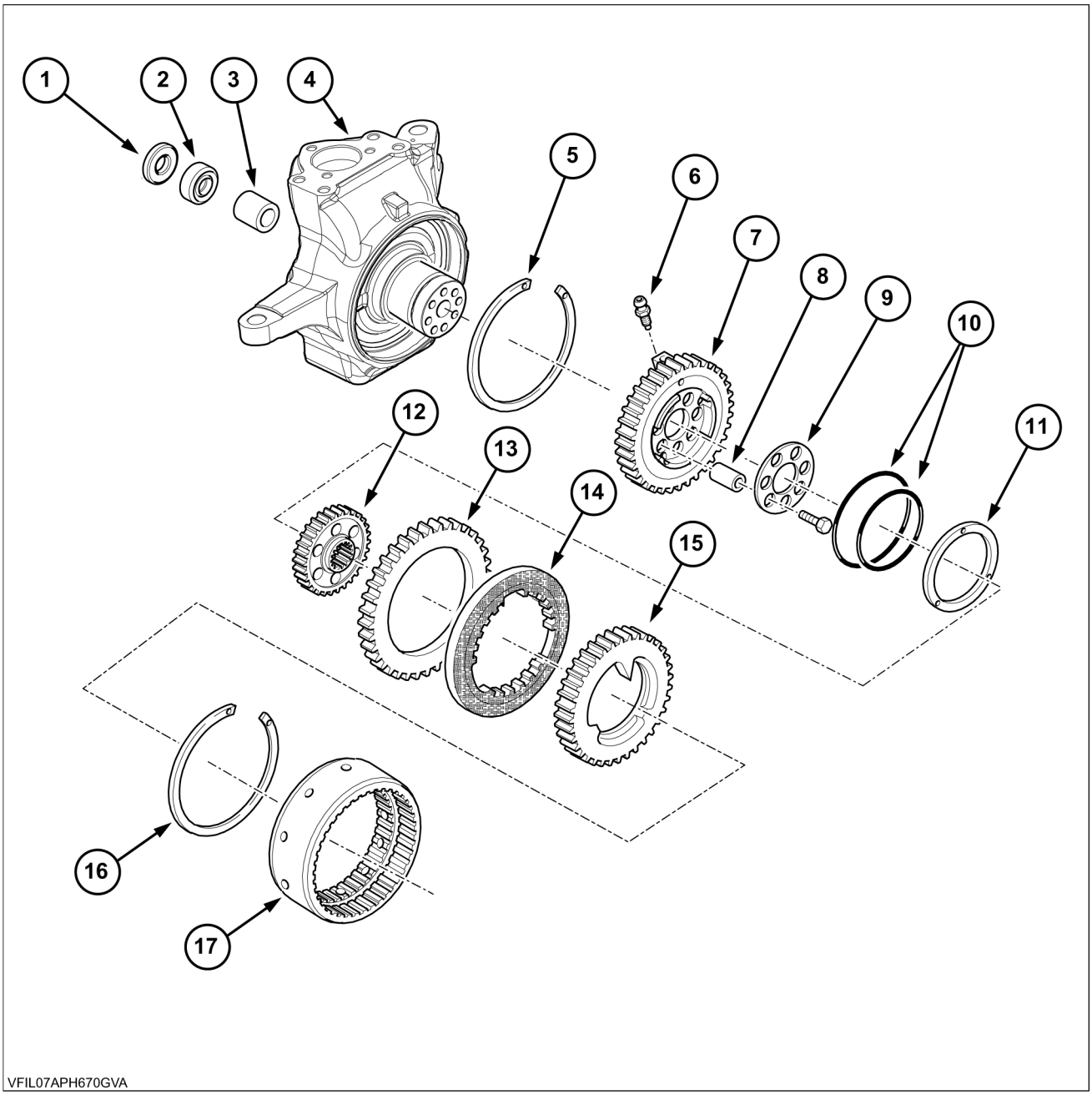
When the differential lock is disengaged, the solenoid valve is in the discharge position (not energised) and therefore the oil is free to return to sump.

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Under these conditions, the helix spring **(2)** keeps the differential lock dog clutch teeth apart.
When the differential lock switch is activated, the solenoid valve opens and directs oil from the low pressure circuit into the drive piston **(1)**, where it creates a pressure greater than the spring **(2)** force and moves the piston, locking the differential.

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Hub - Exploded view



BAIL07APH670GVA 1

1 Spacer
2 Cassette seal
3 Bushing
4 Hub carrier
5 Circlip
6 Bleed nipple
7 Drive gear
8 Sleeve
9 Plate
10 Seals
11 Piston
12 Drive gear
13 Plate
14 Brake disc
15 Drive gear
16 Circlip
17 Carrier

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FRONT AXLE - Remove (Suspended Axle)

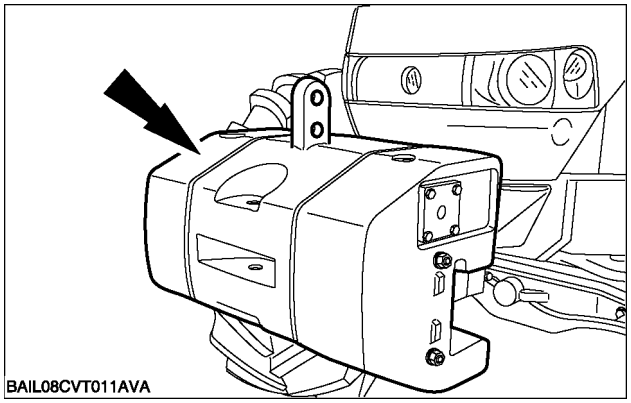
Prior operation:
Disconnect the battery, for further information refer to **Battery - Disconnect (A.30.A)**

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

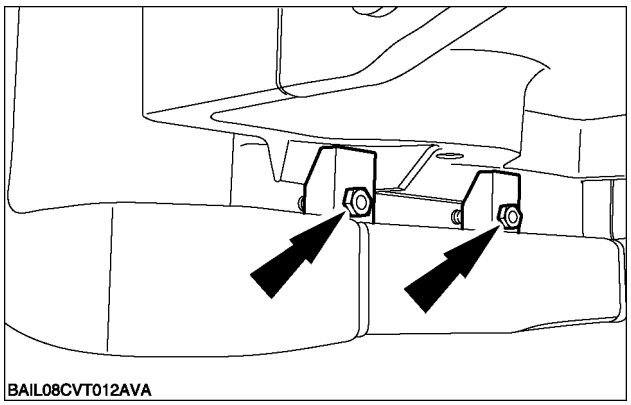
B012

1. Using suitable lifting equipment support the front weights.



BAIL08CVT011AVA 1

2. Disconnect and remove the front weights from the weight carrier.



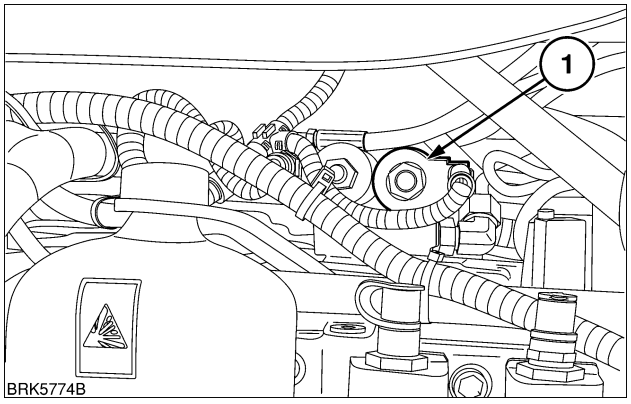
BAIL08CVT012AVA 2

⚠ DANGER ⚠

Exercise extreme caution when performing tasks on the front suspension system. ALWAYS ensure that the system is depressurised and that the axle is at rest on the support stops.

B011

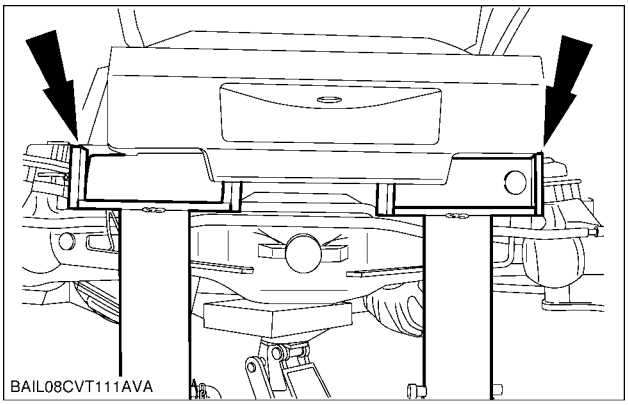
3. Depressurise the suspension system, by rotating knurled knob on the lower solenoid **(1)** counterclockwise, and allow the tractor to lower completely onto the axle stops then rotate the screw clockwise to close the valve.



BAIL08CVT029ASA 3

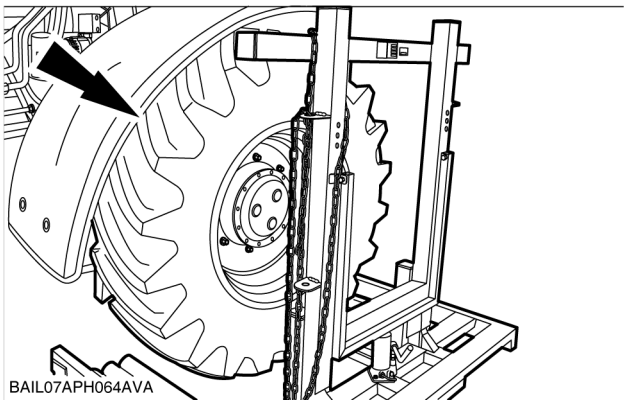
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4. Raise and support the front of the vehicle under the front weight carrier.



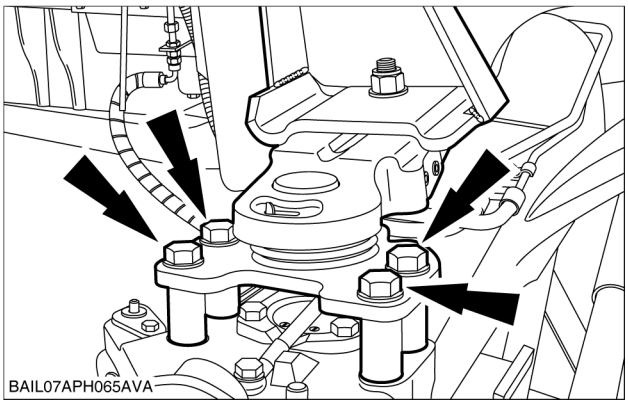
BAIL08CVT111AVA 4

5. Remove both front wheels.



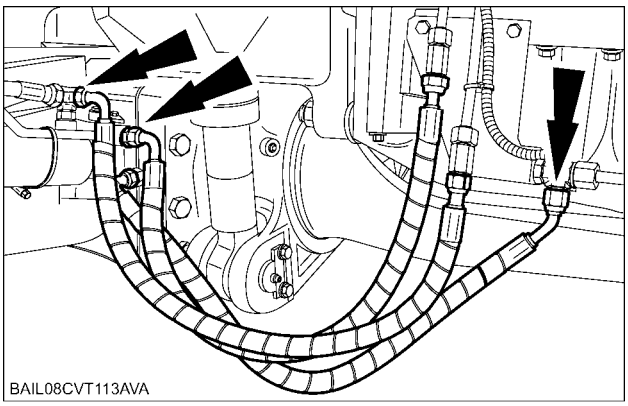
BAIL07APH064AVA 5

6. Remove both dynamic front fenders (if equipped).



BAIL07APH065AVA 6

7. Disconnect the steering supply and return hoses and the differential lock hose.



BAIL08CVT113AVA 7

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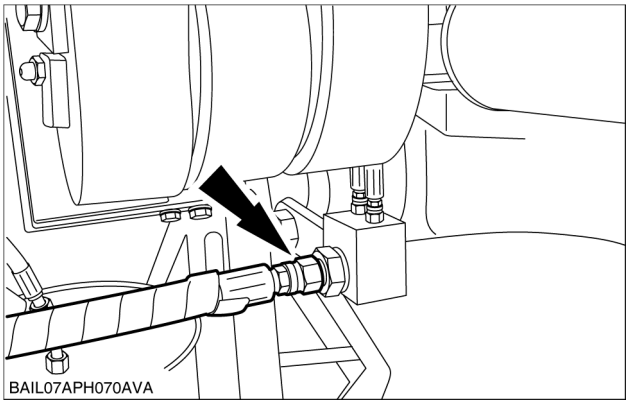
⚠ CAUTION ⚠

The brake accumulator can have a maximum charge pressure of 850 psi. Check for pressure in the accumulator. Remove the pressure in the accumulator before accumulator line is disconnected. Apply the brakes with the pedal approximately 40 times when the engine is off. Loosen the special fitting for removing air from the brakes and push on the brake pedal. If oil flow does not flow from the special fitting, the accumulator is not charged.

M670

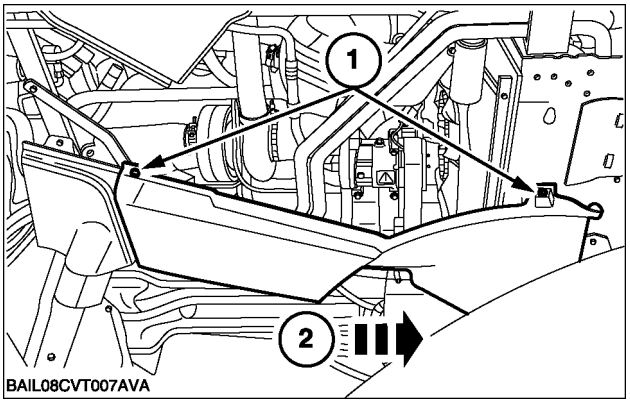
8. Depressurise the front brake accumulator as described above.

9. Disconnect the brake hose from the front axle.



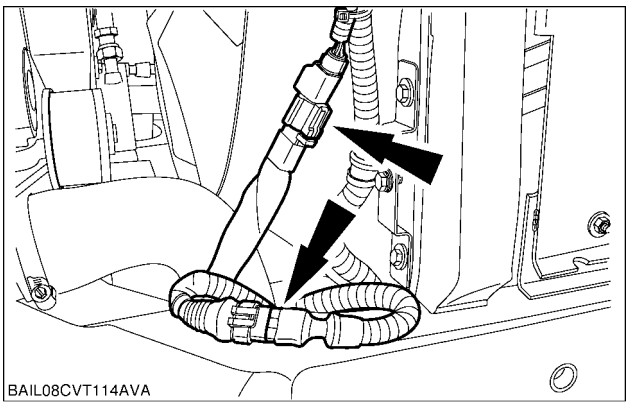
BAIL07APH070AVA 8

10. Remove the right-hand engine shield.



BAIL08CVT007AVA 9

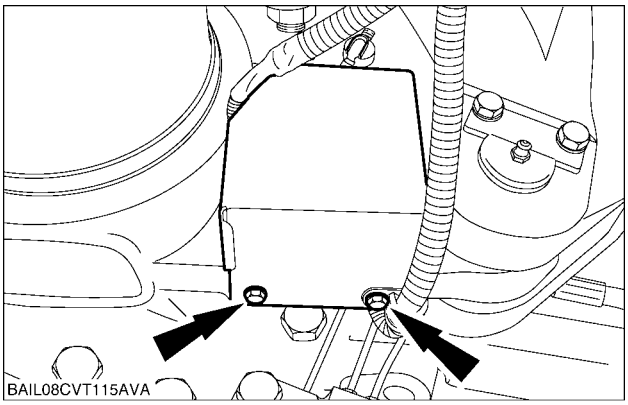
11. Disconnect the steering angle sensor and front axle potentiometer electrical connectors.



BAIL08CVT114AVA 10

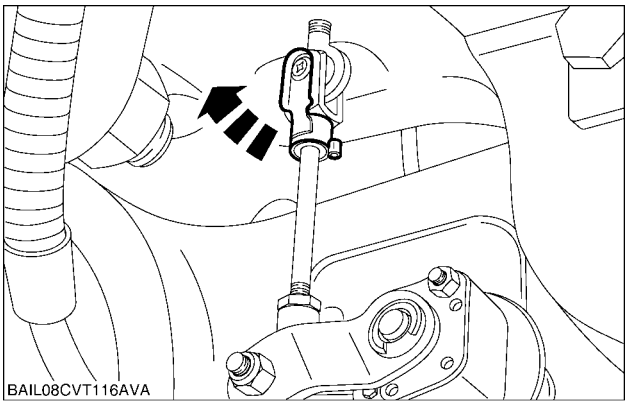
www.truck-freeworkshop.com

12. Remove the front axle potentiometer cover.



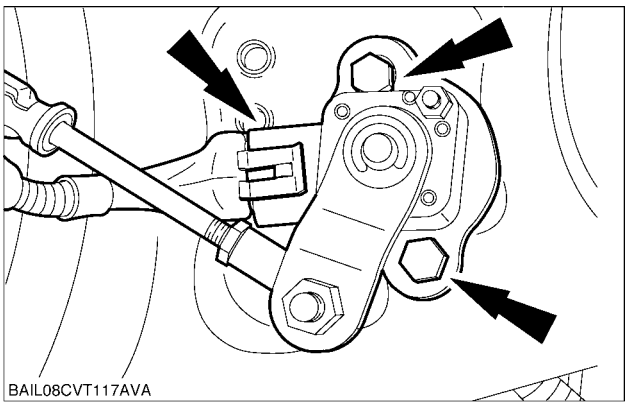
BAIL08CVT115AVA 11

13. Disconnect the front axle potentiometer quick release clip.



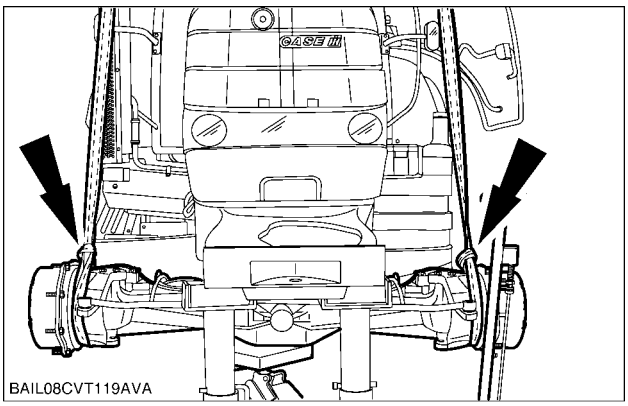
BAIL08CVT116AVA 12

14. Disconnect the potentiometer electrical connector, and remove the potentiometer.
Feed the wiring loom through the tombstone.



BAIL08CVT117AVA 13

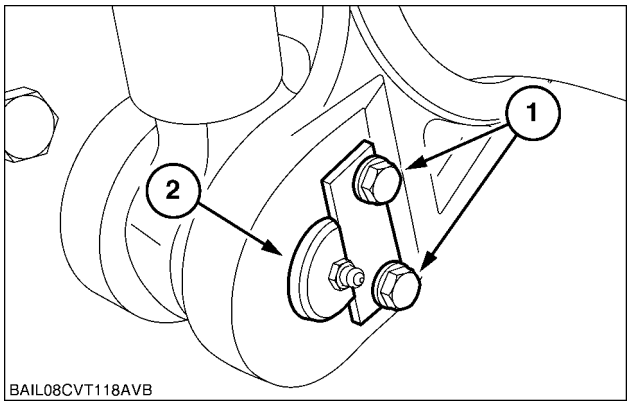
15. Support the front axle with a suitable hoist, and remove the jack from under the front axle.



BAIL08CVT119AVA 14

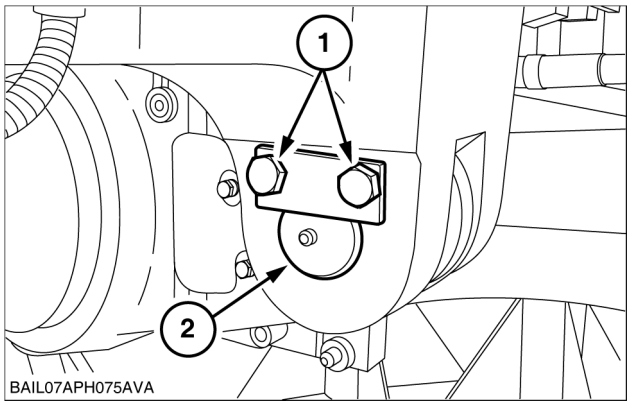
www.truck-freeworkshop.com

16. Remove the left-hand pivot pin retaining plate **(1)** and remove the pivot pin **(2)**.



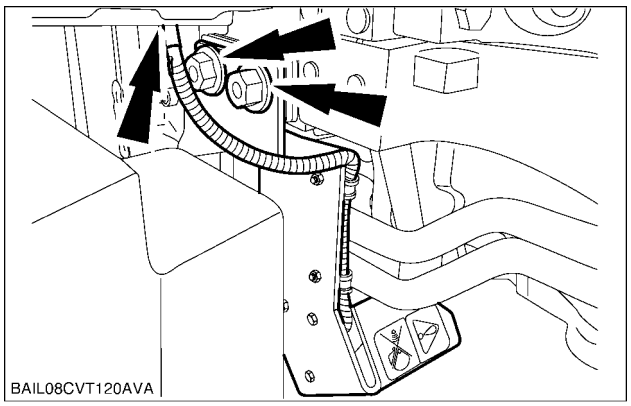
BAIL08CVT118AVB 15

17. Remove the right-hand pivot pin retaining plate **(1)** and remove the pivot pin **(2)**.



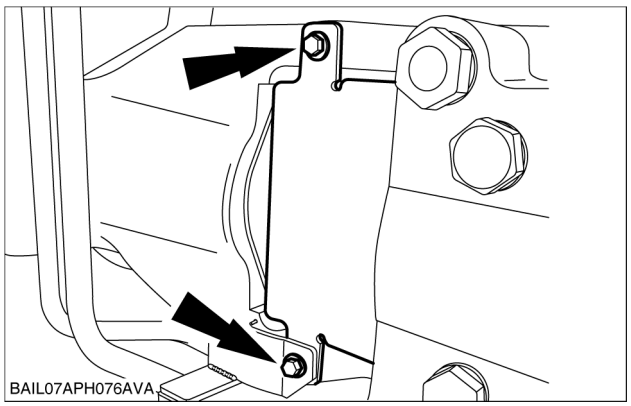
BAIL07APH075AVA 16

18. Disconnect the radar electrical connector and remove the radar.



BAIL08CVT120AVA 17

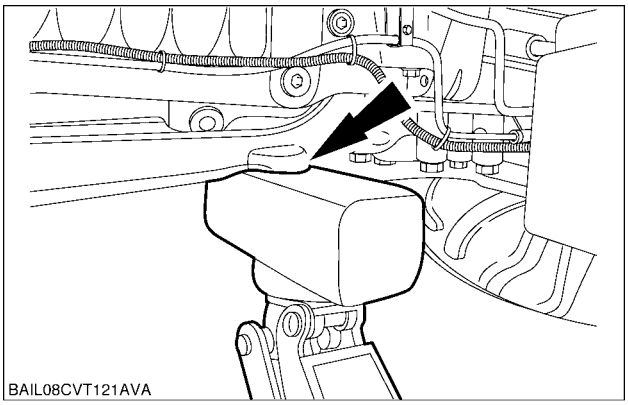
19. Remove the drive shaft cover plate.



BAIL07APH076AVA 18

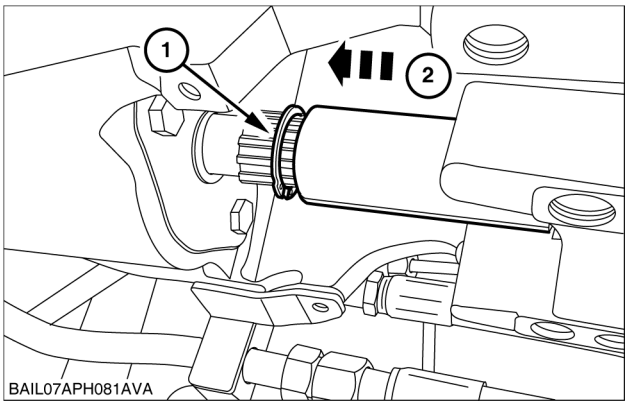
www.truck-freeworkshop.com

20. Support the rear of the front axle suspension arm.



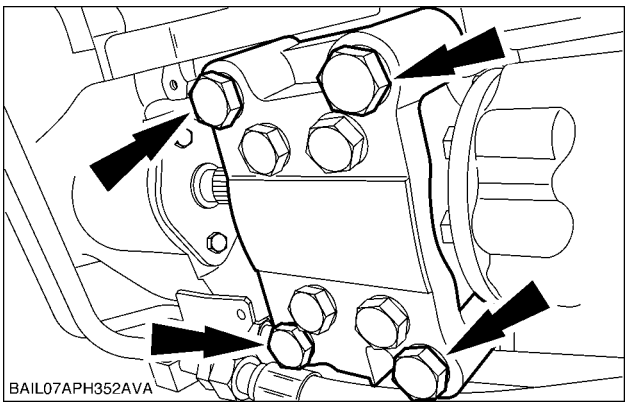
BAIL08CVT121AVA 19

21. Release the circlip (1) and drift the sleeve (2) backwards.



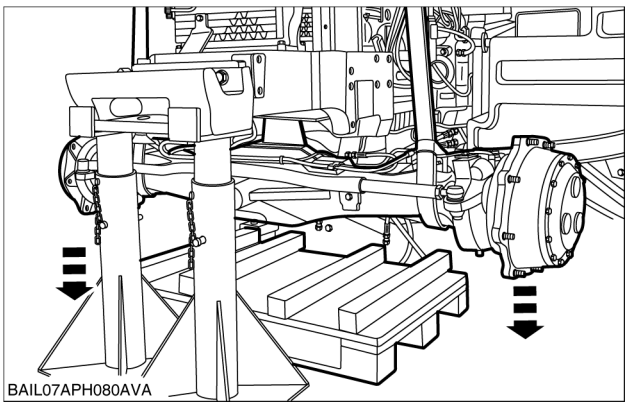
BAIL07APH081AVA 20

22. Remove the drive shaft bearing carrier.



BAIL08CVT352AVA 21

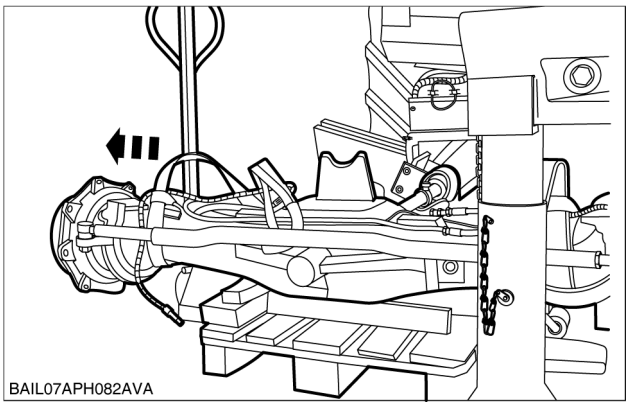
23. Lower the front axle, while supporting the drive shaft and suspension arm.



BAIL07APH080AVA 22

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24. Remove the front axle from below the vehicle.



BAIL07APH082AVA 23

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FRONT AXLE - Remove Standard Axle

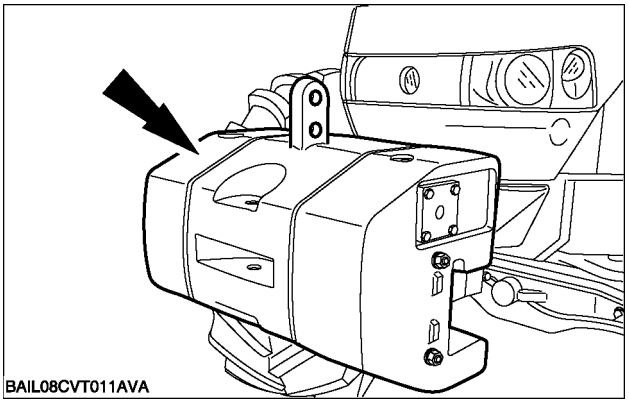
Prior operation:
Disconnect the battery, for further information refer to **Battery - Disconnect (A.30.A)**

⚠ **DANGER** ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

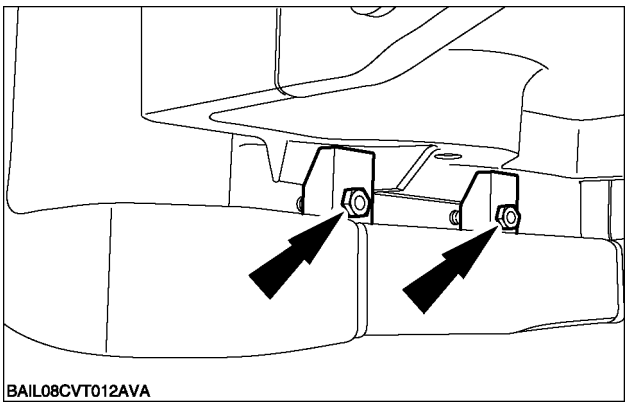
B012

1. Using suitable lifting equipment support the front weights.



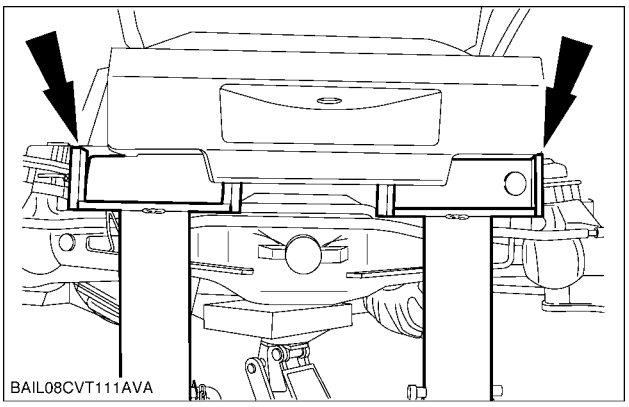
BAIL08CVT011AVA 1

2. Disconnect and remove the front weights from the weight carrier.



BAIL08CVT012AVA 2

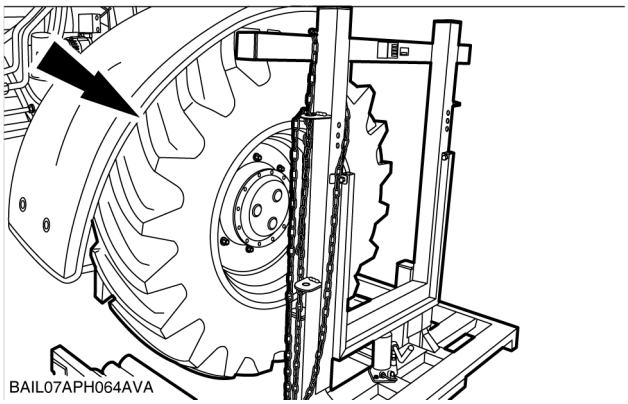
3. Raise and support the front of the vehicle under the front weight carrier.



BAIL08CVT111AVA 3

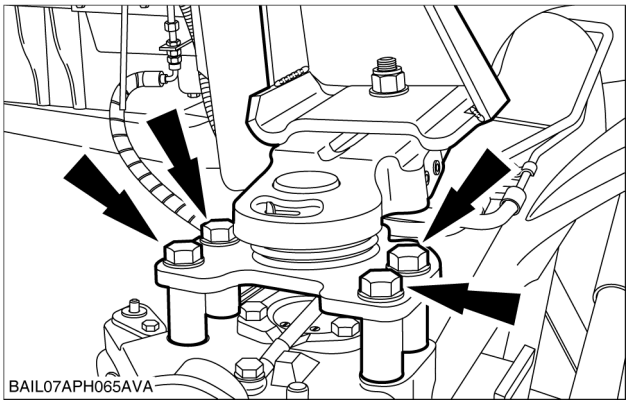
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4. Remove both front wheels.



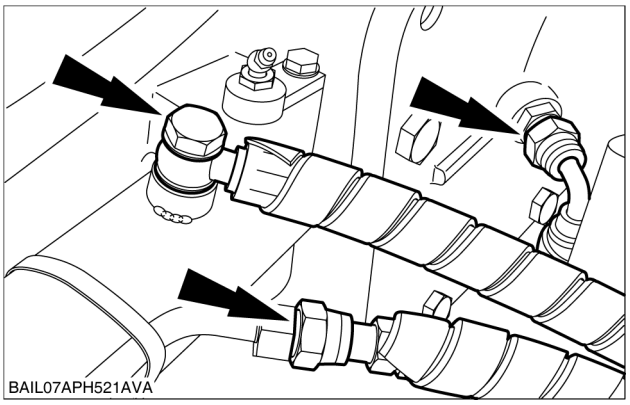
BAIL07APH064AVA 4

5. Remove both dynamic front fenders (if equipped).



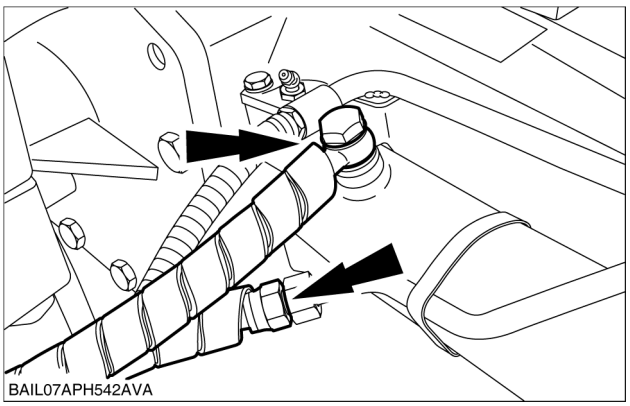
BAIL07APH065AVA 5

6. Disconnect the left-hand steering cylinder supply and return hoses and the differential lock supply hose.



BAIL07APH521AVA 6

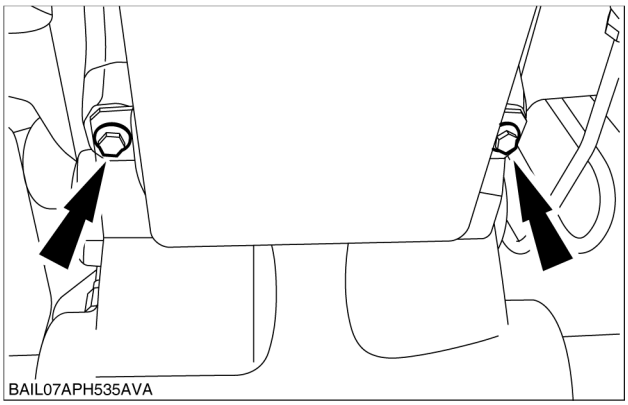
7. Disconnect the right-hand steering cylinder supply and return hoses.



BAIL07APH542AVA 7

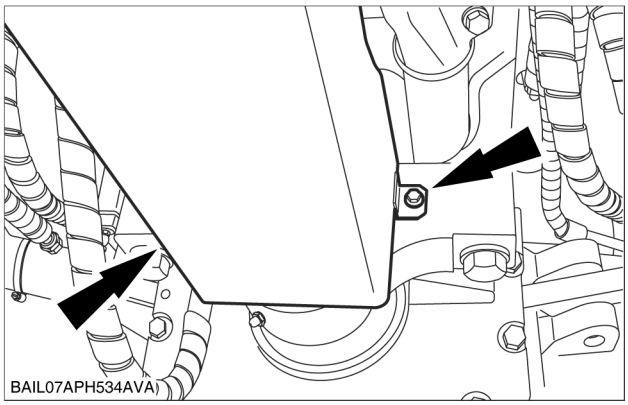
www.truck-freeworkshop.com

8. Remove the drive shaft guard rear retaining bolts.



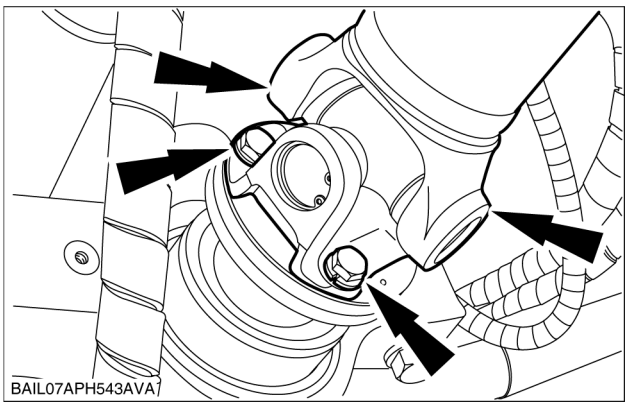
BAIL07APH535AVA 8

9. Remove the drive shaft guard front retaining bolts and remove the drive shaft guard.



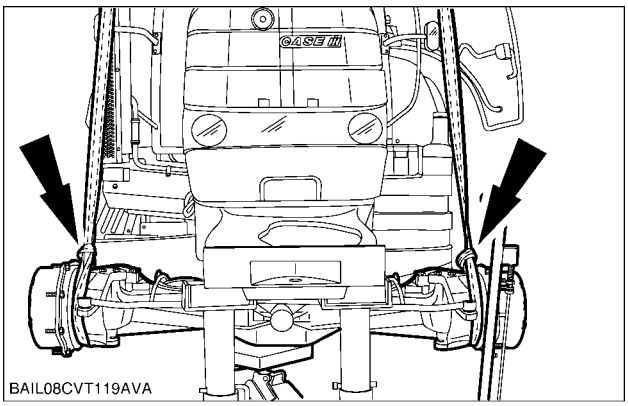
BAIL07APH534AVA 9

10. Disconnect the drive shaft from the front axle.



BAIL07APH543AVA 10

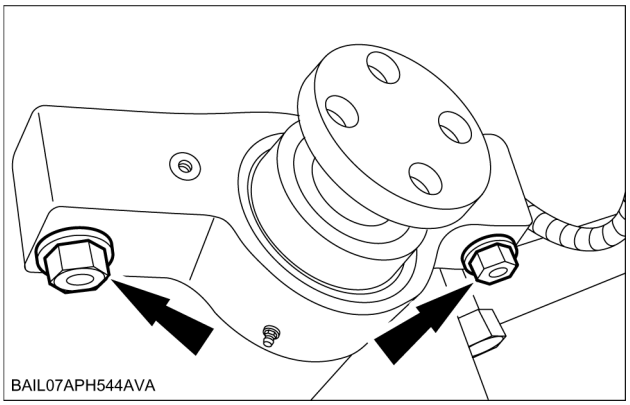
11. Support the front axle with a suitable hoist, and remove the jack from under the front axle.



BAIL08CVT119AVA 11

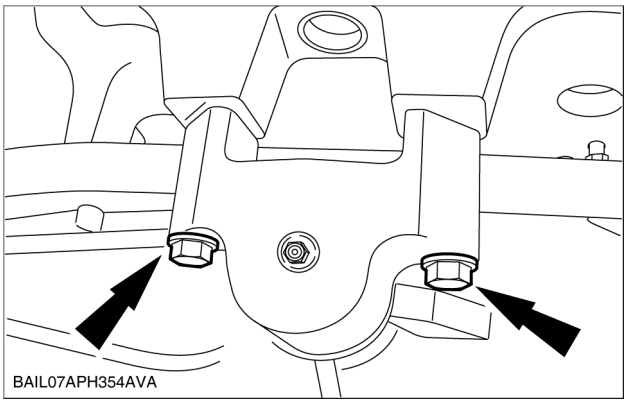
www.truck-freeworkshop.com

12. Remove the front axle rear carrier retaining bolts.



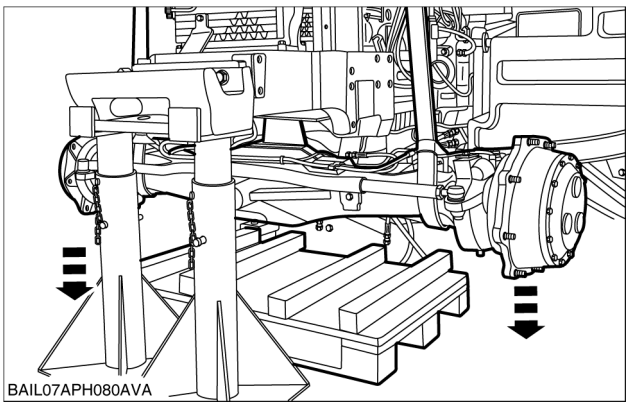
BAIL07APH544AVA 12

13. Remove the front axle front carrier retaining bolts.



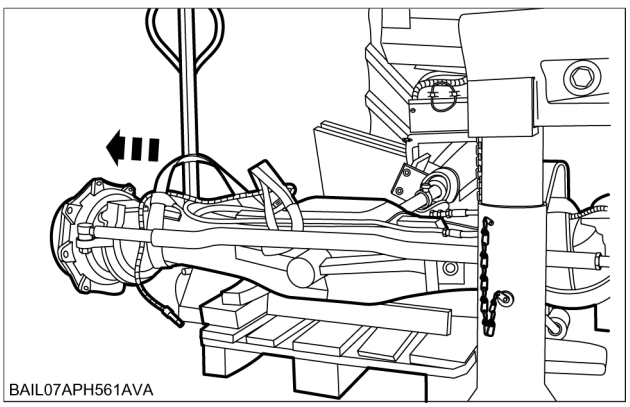
BAIL07APH354AVA 13

14. Lower the front axle.



BAIL07APH080AVA 14

15. Remove the front axle from below the vehicle.



BAIL07APH561AVA 15

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FRONT AXLE - Install Suspended Axle

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

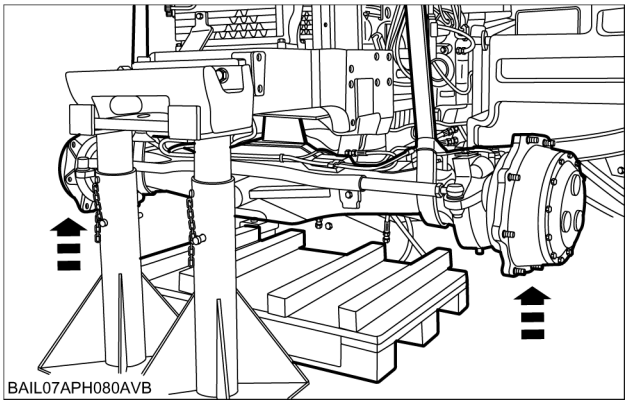
B012

⚠ WARNING ⚠

Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

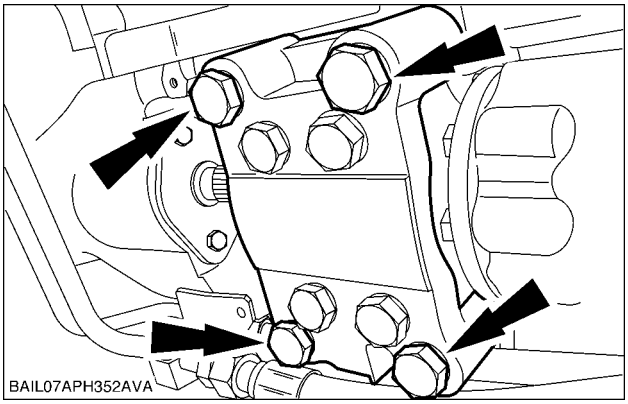
B020

1. Locate the front axle while supporting the drive shaft and suspension arm.



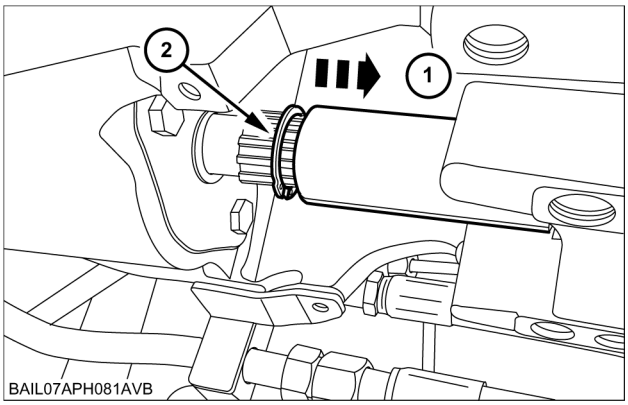
BAIL07APH080AVB 1

2. Install the drive shaft bearing carrier. Tighten to **550 Nm** (**405 lb ft**).



BAIL08CVT352AVA 2

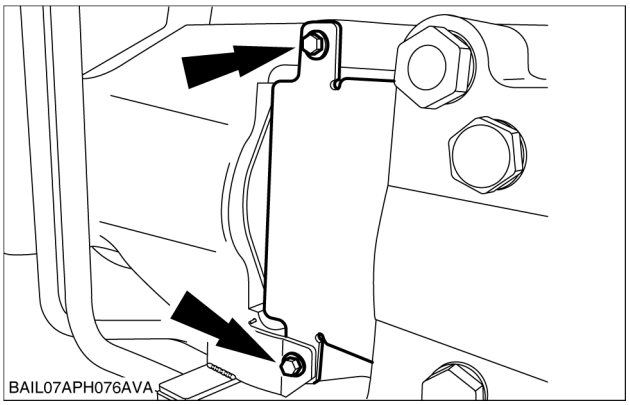
3. Drift the sleeve back onto the drive shaft **(1)** and install the circlip **(2)** .



BAIL07APH081AVB 3

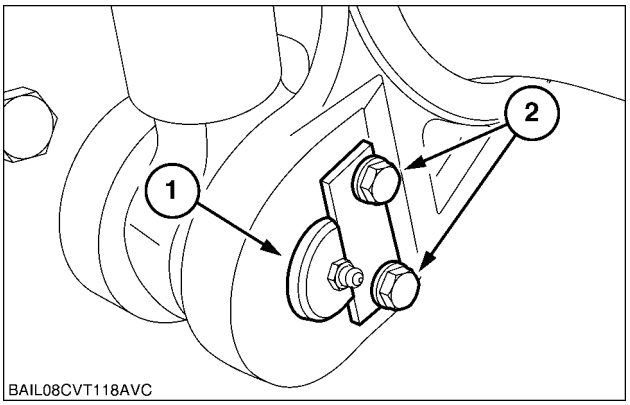
www.truck-freeworkshop.com

4. Install the drive shaft cover plate.



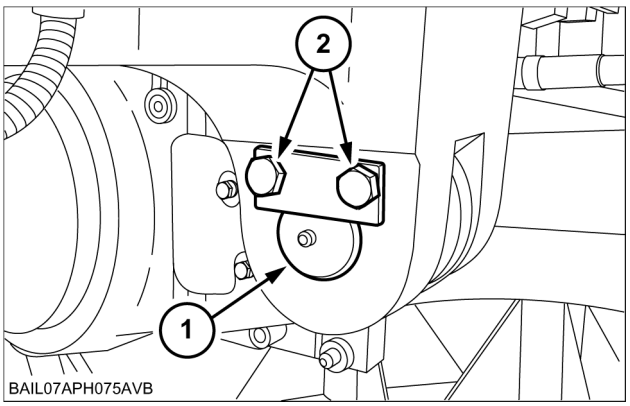
BAIL07APH076AVA 4

5. Install the left-hand pivot pin **(1)** and install the pivot pin retaining plate **(2)**.



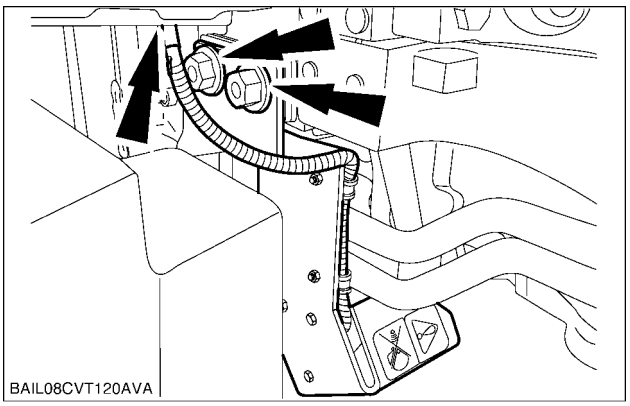
BAIL08CVT118AVC 5

6. Install the right-hand pivot pin **(1)** and install the pivot pin retaining plate **(2)**.



BAIL07APH075AVB 6

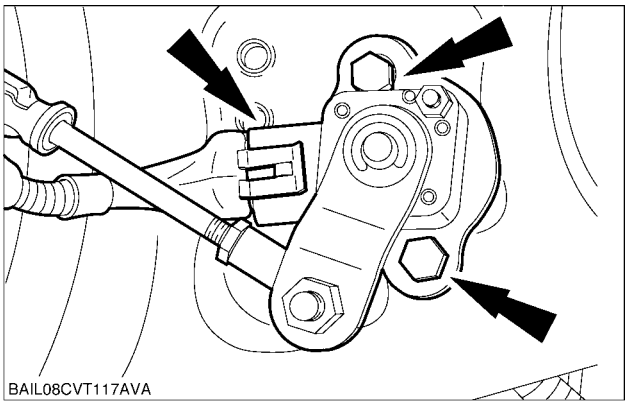
7. Install the radar and connect the radar electrical connector.



BAIL08CVT120AVA 7

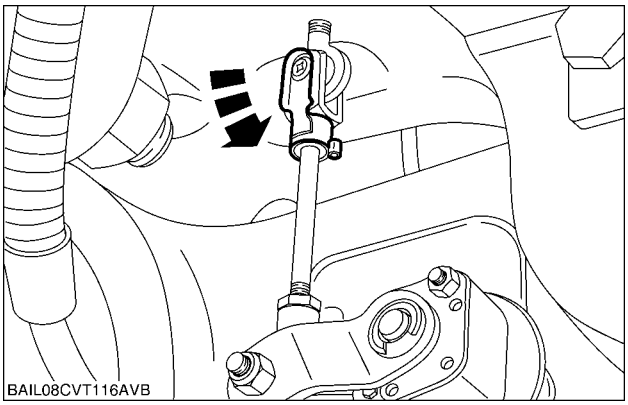
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8. Feed the front axle potentiometer wiring loom through the tombstone.
Connect the front axle potentiometer electrical connector.
Install the potentiometer retaining bolts.



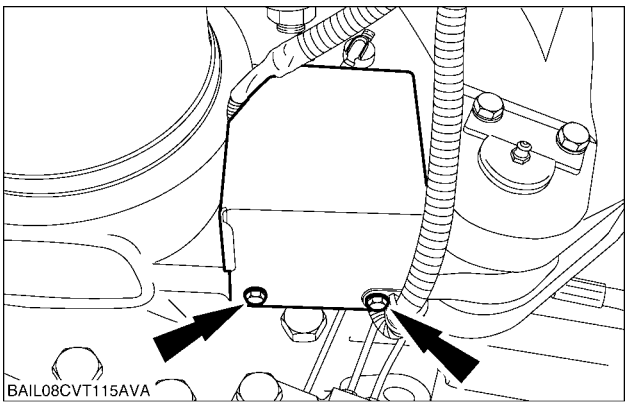
BAIL08CVT117AVA 8

9. Connect the front axle potentiometer quick release clip.



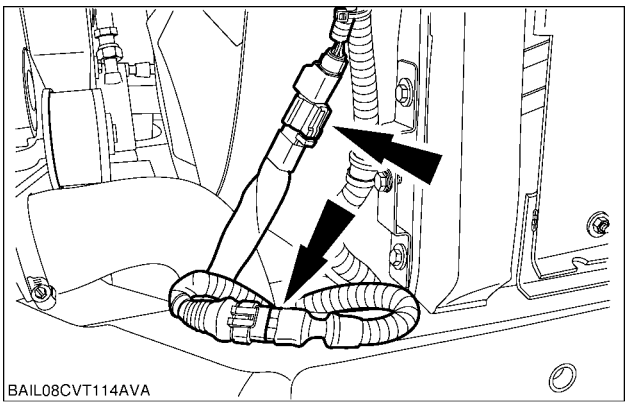
BAIL08CVT116AVB 9

10. Install the front axle potentiometer cover.



BAIL08CVT115AVA 10

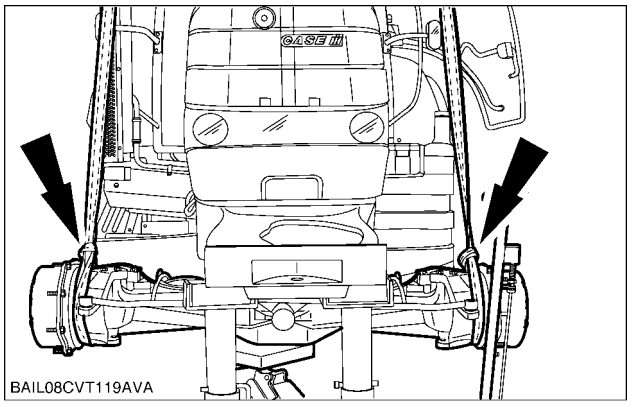
11. Connect the steering angle sensor and front axle potentiometer electrical connectors.



BAIL08CVT114AVA 11

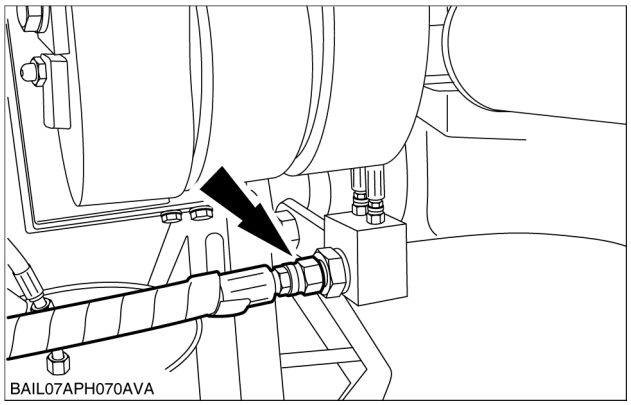
www.truck-freeworkshop.com

12. Support under the front axle with a suitable jack and remove the hoist.



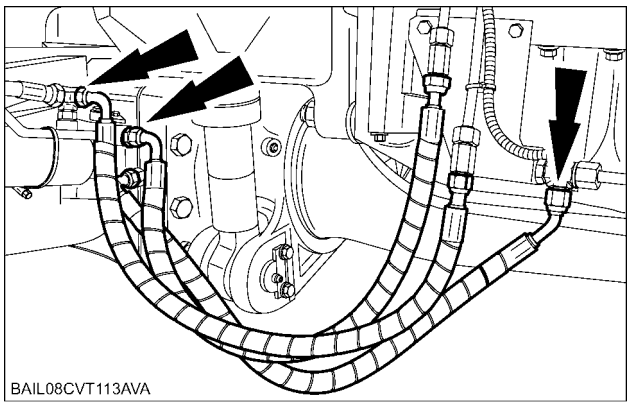
BAIL08CVT119AVA 12

13. Connect the brake hose to the front axle.



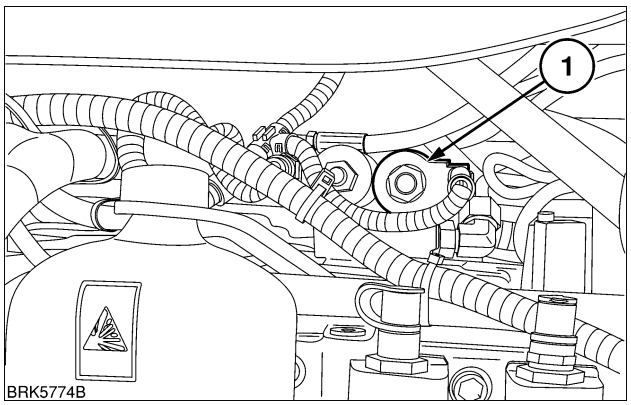
BAIL07APH070AVA 13

14. Connect the steering supply and return hoses and the diff lock hose.



BAIL08CVT113AVA 14

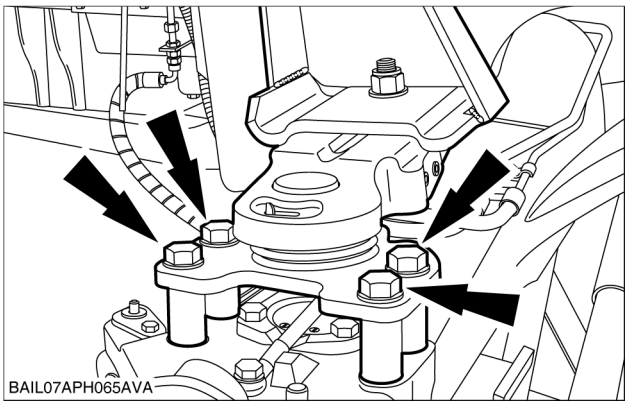
15. Make sure the knurled knob on the suspension lower solenoid **(1)** is fully closed.



BAIL08CVT029ASA 15

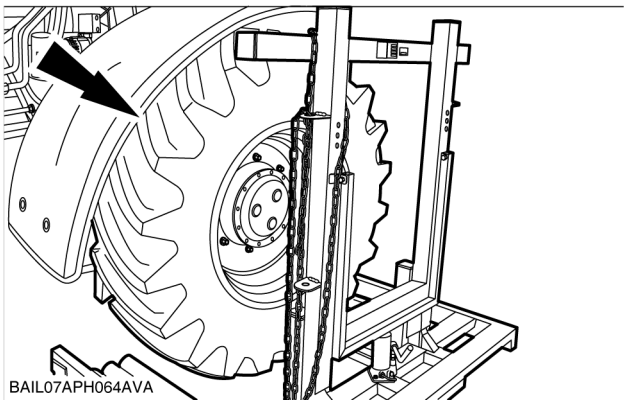
www.truck-freeworkshop.com

16. Install both dynamic front fenders (if equipped).



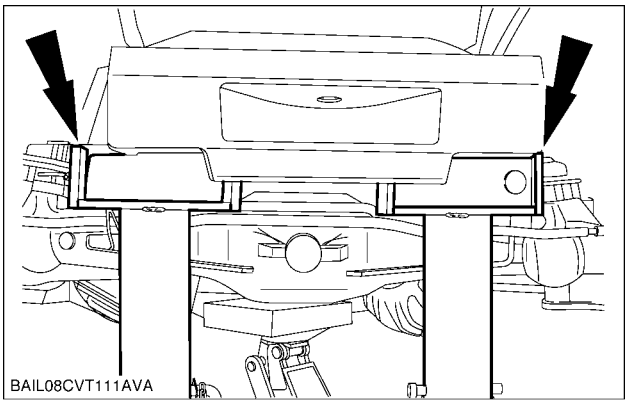
BAIL07APH065AVA 16

17. Install both front wheels.
Tighten to the specified torque, for further information refer to **Front wheel - Torque (D.50.C)**.



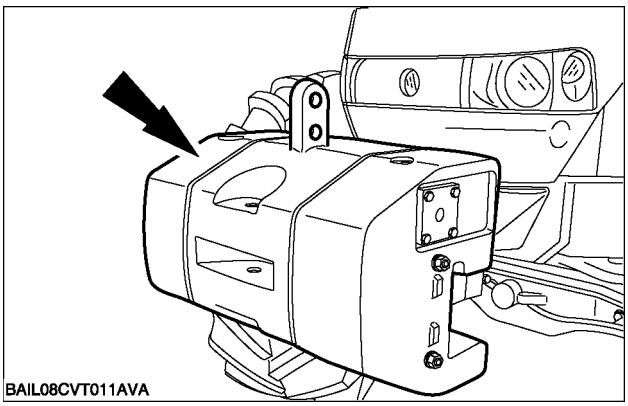
BAIL07APH064AVA 17

18. Raise the front of the vehicle and remove the supports from under the weight carrier.
Lower the vehicle.



BAIL08CVT111AVA 18

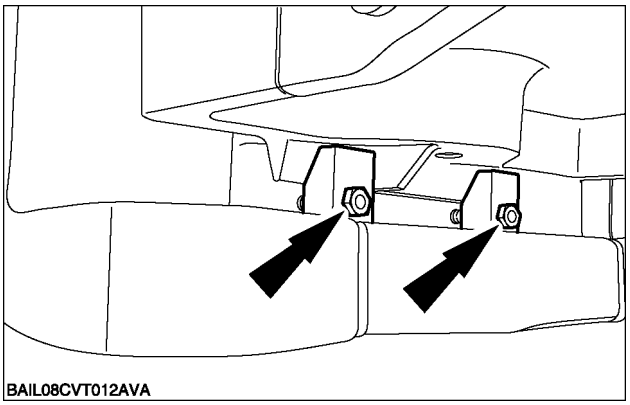
19. Using suitable lifting equipment install the front weights onto the weight carrier.



BAIL08CVT011AVA 19

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20. Secure the front weights to the weight carrier.



BAIL08CVT012AVA 20

Next operation:
Connect the battery, for further information refer to **Battery - Connect (A.30.A)**.

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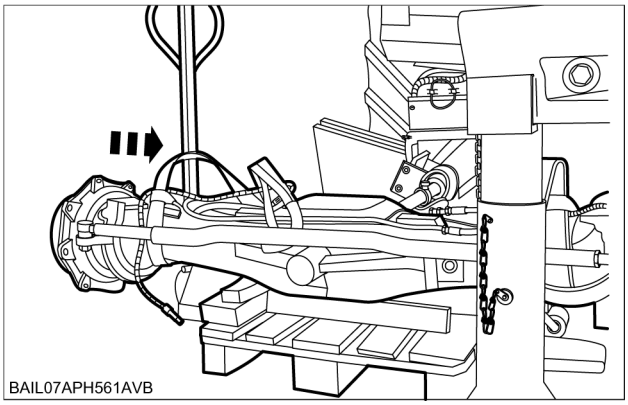
FRONT AXLE - Install Standard Axle

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

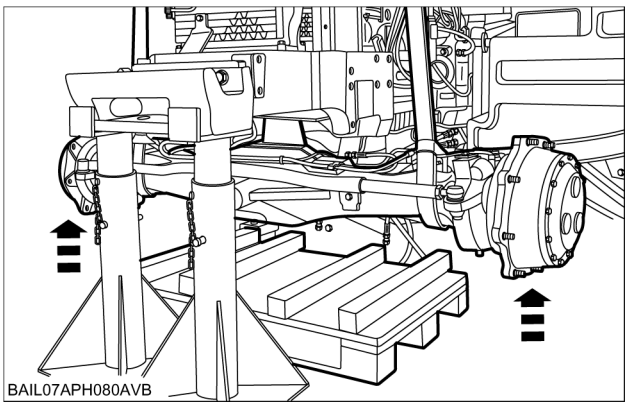
B012

1. Position the front axle below the vehicle.



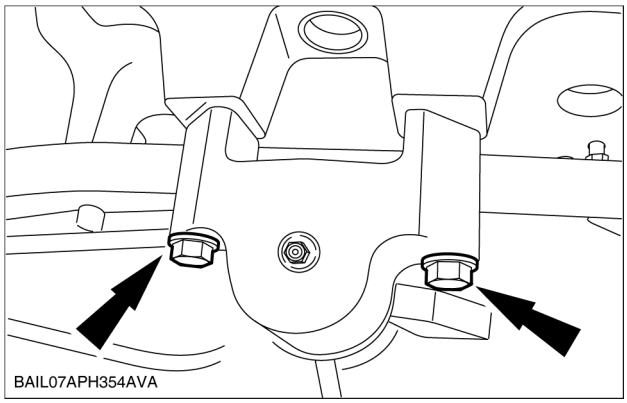
BAIL07APH561AVB 1

2. Raise the front axle into position.



BAIL07APH080AVB 2

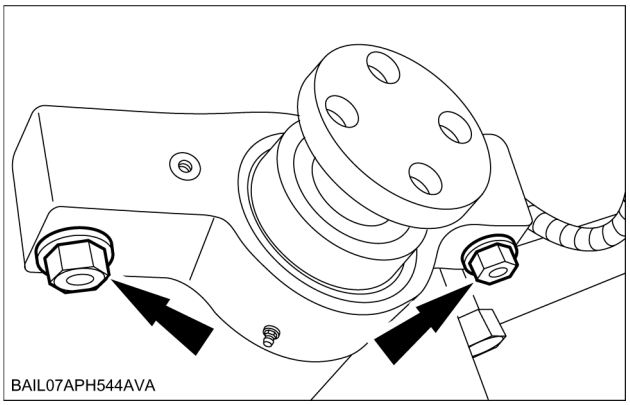
3. Install the front axle front carrier retaining bolts. Tighten to **360 Nm** (**265 lb ft**).



BAIL07APH354AVA 3

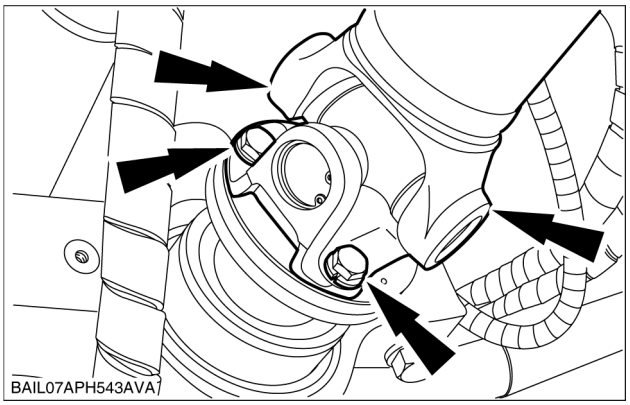
www.truck-freeworkshop.com

4. Install the front axle rear carrier retaining bolts. Tighten to **360 Nm** (**265 lb ft**).



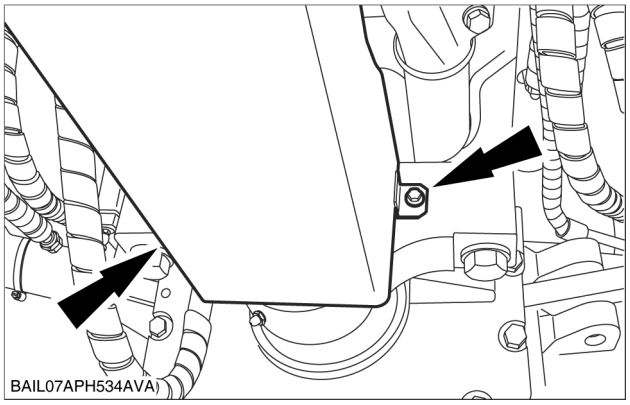
BAIL07APH544AVA 4

5. Install the drive shaft to the front axle retaining bolts. Tighten to **65 - 86 Nm** (**48 - 63 lbft**).



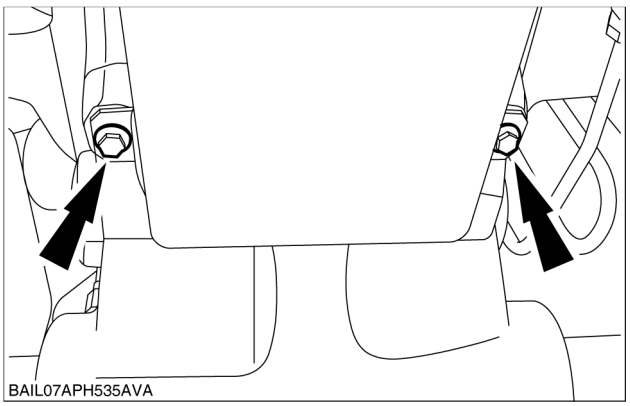
BAIL07APH543AVA 5

6. Install the drive shaft guard.



BAIL07APH534AVA 6

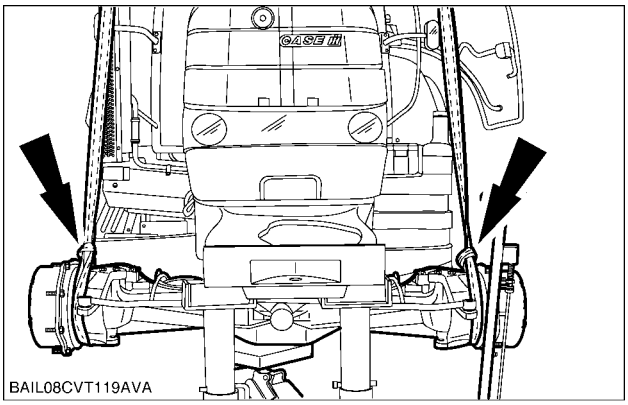
7. Install the drive shaft guard rear retaining bolts.



BAIL07APH535AVA 7

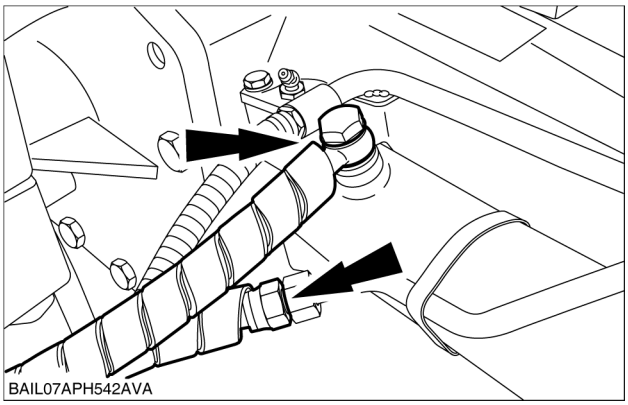
www.truck-freeworkshop.com

8. Support under the front axle with a jack and remove the hoist.



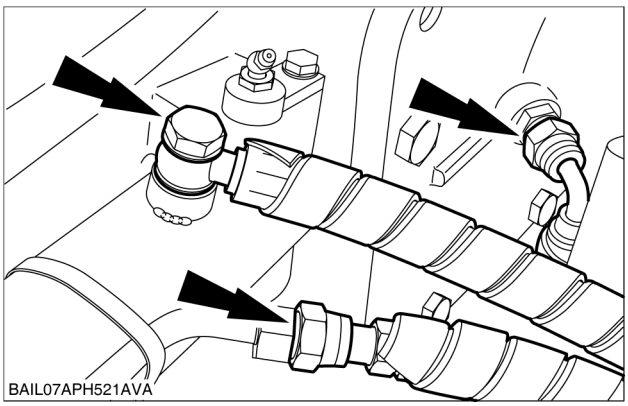
BAIL08CVT119AVA 8

9. Connect the right-hand steering cylinder supply and return hoses.



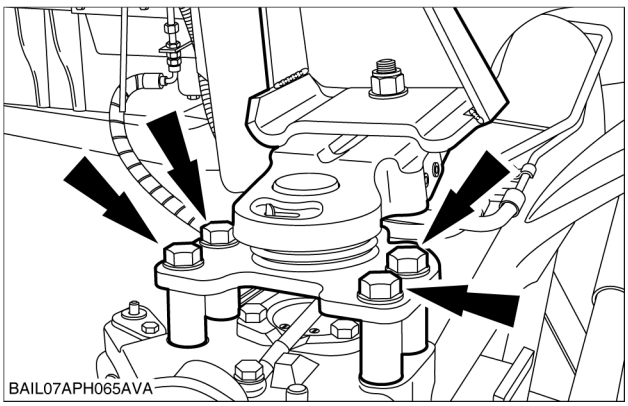
BAIL07APH542AVA 9

10. Connect the left-hand steering cylinder supply and return hoses and the differential lock supply hose.



BAIL07APH521AVA 10

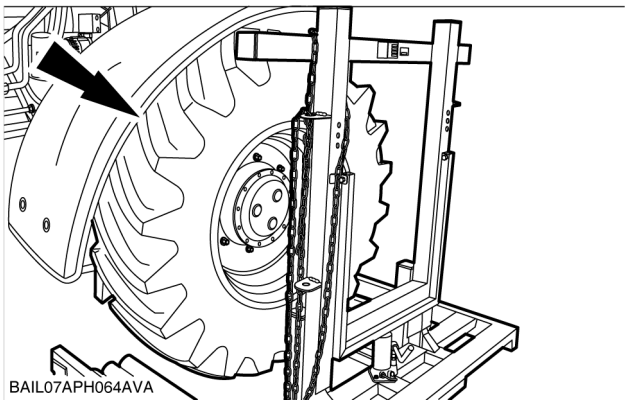
11. Install both dynamic front fenders (if equipped).



BAIL07APH065AVA 11

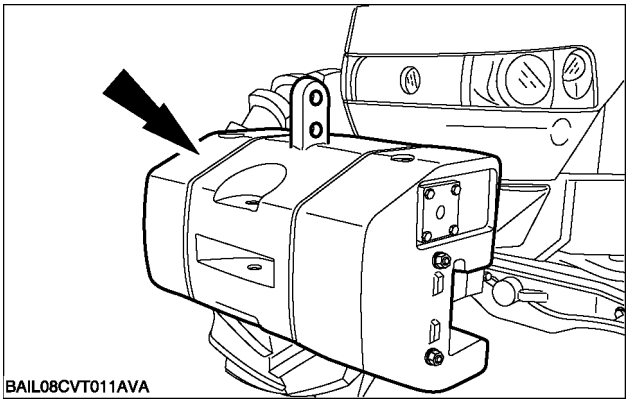
www.truck-freeworkshop.com

12. Install both front wheels.
Tighten the wheel nuts to the specified torque, for further information refer to **Front wheel - Torque (D.50.C)**.



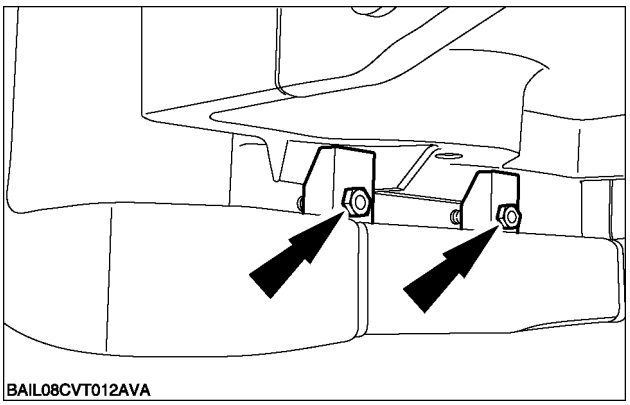
BAIL07APH064AVA 12

13. Using suitable lifting equipment install the front weights onto the front weight carrier..



BAIL08CVT011AVA 13

14. Secure the front weights to the front weight carrier.



BAIL08CVT012AVA 14

Next operation:
Connect the battery, for further information refer to **Battery - Connect (A.30.A)**.

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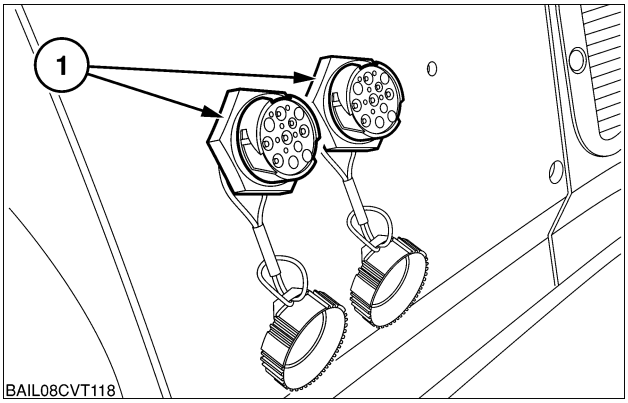
FRONT AXLE - Calibrate

Steering Angle Sensor

NOTE: *The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the rear wheels. Check that the Ground speed display is Zero before commencing.*

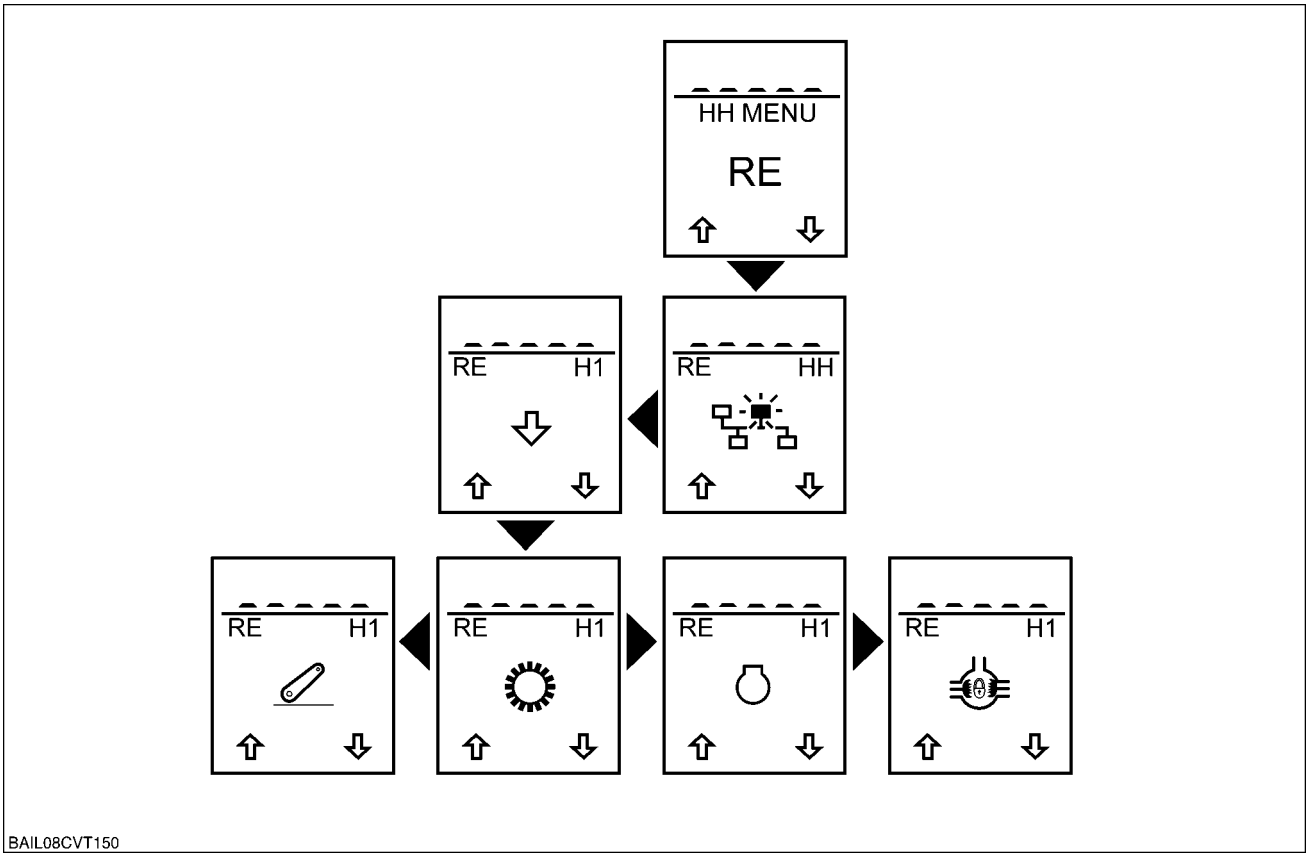
NOTE: *If the vehicle is fitted with AFS AccuGuide™ensure that the steering angle sensor is connected to the main engine wiring harness rather than the AutoGuidance wiring harness during the calibration procedure. When calibration is complete the steering angle sensor should be reconnected to the AutoGuidance harness.*

1. Install the diagnostic connector **380000843** into the diagnostic socket **(1)**.



BAIL08CVT118A 1

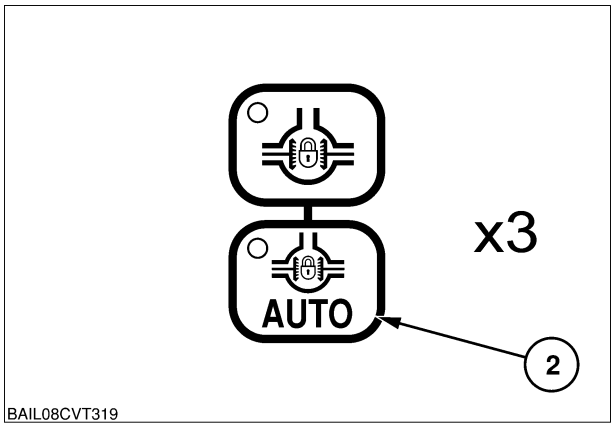
2. Use the "up", "down" and "menu" keys on the ICU3 to navigate the HH menu's to H1 and the Difflock symbol on the RE module.
   The top section of the display will show "CAL".



BAIL08CVT150 2

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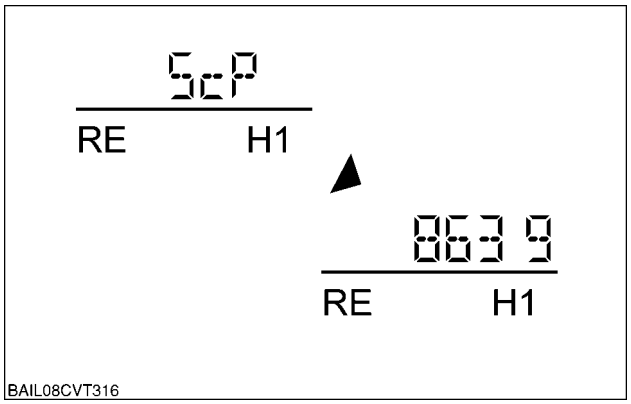
3. Depress the Auto Difflock switch, **(2)**, three times.



BAIL08CVT319 3

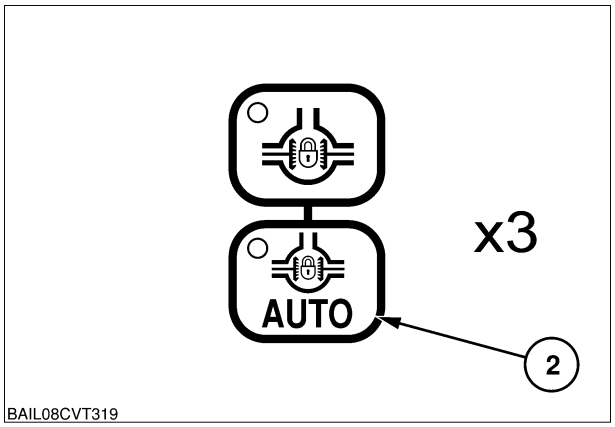
4. The top section of the display will display "ScP" followed by the current steering sensor reading.

NOTE: *If the display shows "-1" then the steering sensor option needs to be enabled using the H3 menu before the steering sensor can be calibrated.*



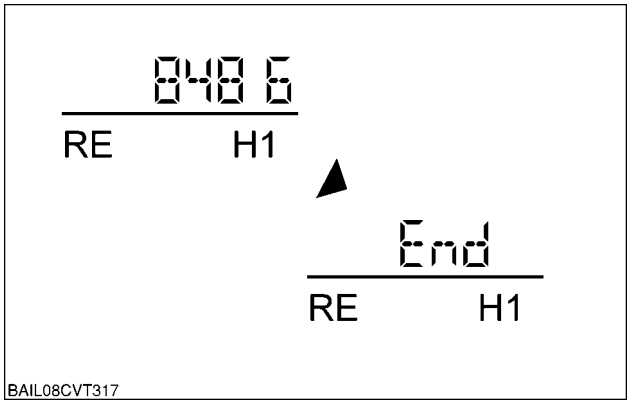
BAIL08CVT316 4

5. Turn the steering wheel so that the front wheels are in line with the drive line.
6. Depress the Auto Difflock switch, **(2)**, three times.



BAIL08CVT319 5

7. The top section of the display will display the calibrated steering sensor reading and then "End" to indicate the calibration procedure has been completed.



BAIL08CVT317 6

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8. Key OFF to store the calibration values.

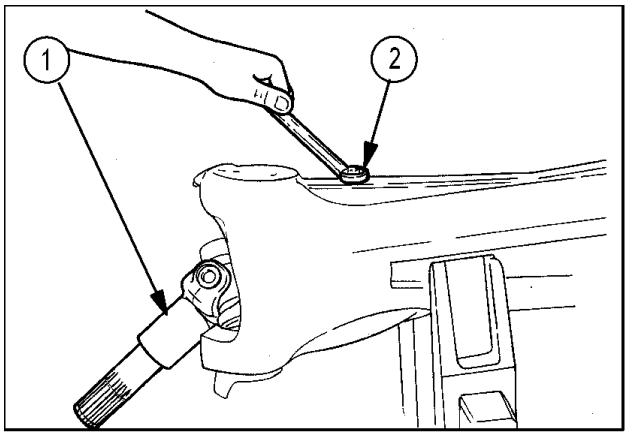
NOTE: *There are no 'U' codes available for this calibration procedure.*

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Axle shaft - Remove

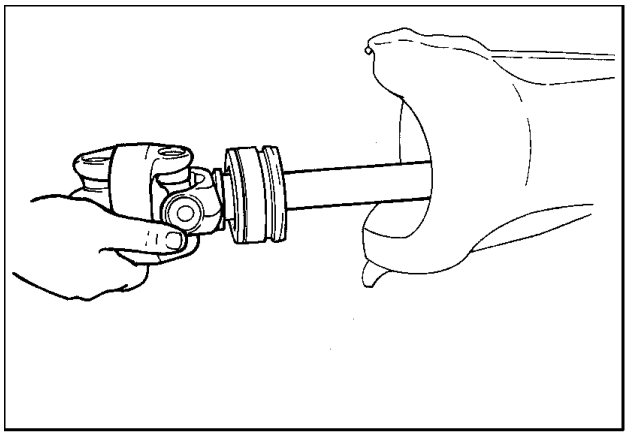
Prior operation:
Remove the hub, for further information refer to **Hub - Remove (D.10.A)**

1. Release the locking nut and loosen the retaining screw **(2)** support the axle shaft **(1)**.



1b0o2004061017 1

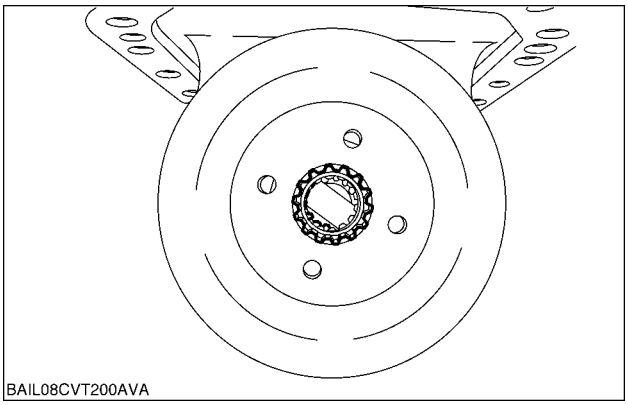
2. Remove the axle shaft from the axle housing.


1b0o2004061018 2

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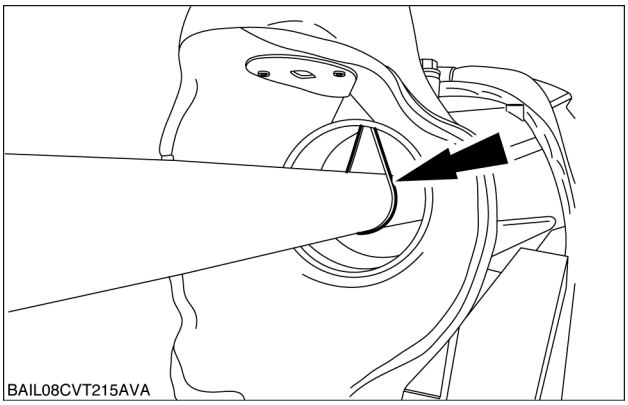
Axle shaft - Install

1. Make sure the clutch cover splines and the differential splines are aligned.



BAIL08CVT200AVA 1

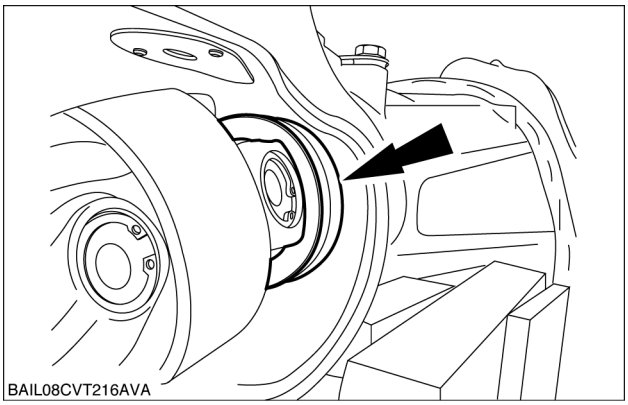
2. Using a cable tie support the axle shaft.



BAIL08CVT215AVA 2

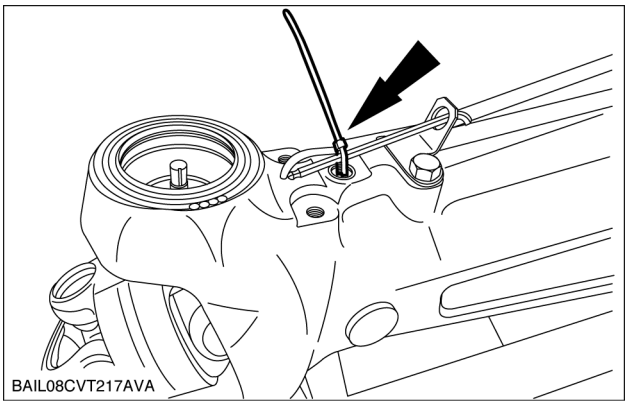
3. Install the axle shaft into the differential.

NOTE: *Do not to fully install the shaft.*



BAIL08CVT216AVA 3

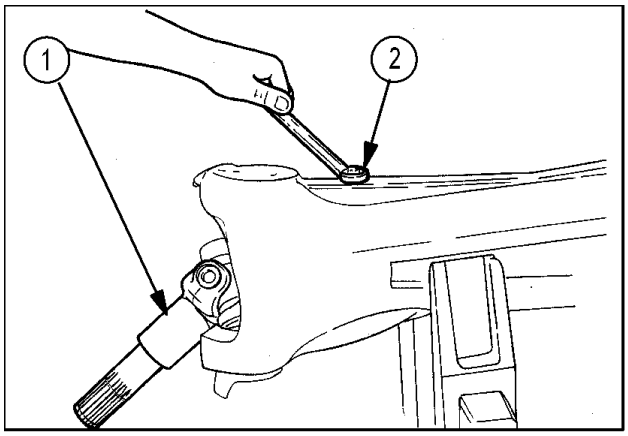
4. Remove the cable tie and fully install the axle shaft into the differential.



BAIL08CVT217AVA 4

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5. With the axle shaft installed **(1)**, tighten the securing screw and locking nut **(2)**.



1b0o2004061017 5

Next operation:
Install the hub, for further information refer to **Hub - Install (D.10.A)**

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Differential - Remove

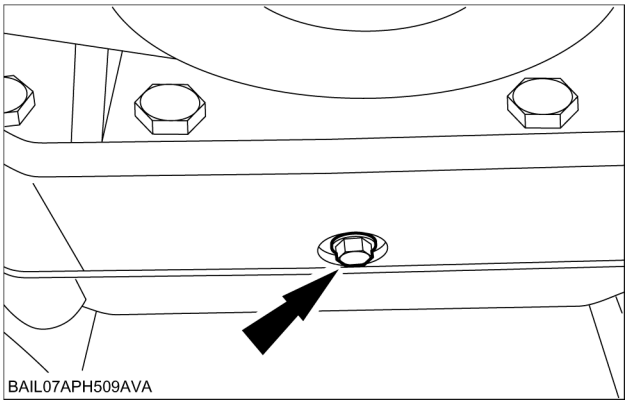
Prior operation:
Remove the front axle, for further information refer to **FRONT AXLE - Remove (D.10.A)** (suspended axle), , **FRONT AXLE - Remove (D.10.A)** (standard axle).

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

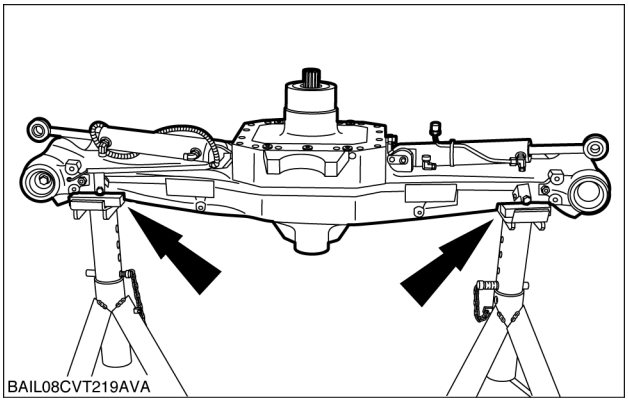
B012

1. Support the front axle on suitable axle stands.
   Remove the drain plug **(1)** and drain the oil into a suitable container.
   Reinstall the drain plug and tighten to **74 Nm** (**55 lb ft**).



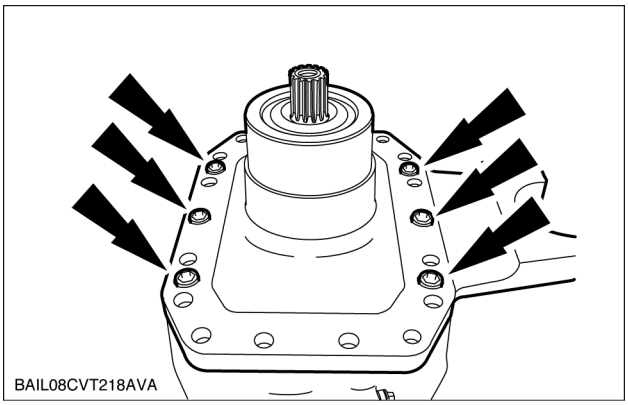
BAIL07APH509AVA 1

2. Using suitable lifting equipment turn the front axle so the differential housing is upright.



BAIL08CVT219AVA 2

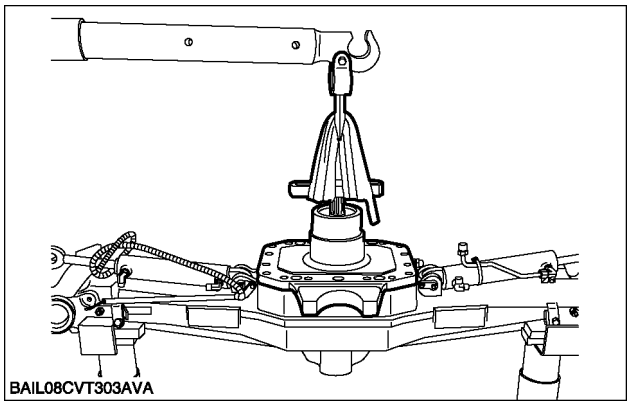
3. Remove the differential housing retaining bolts.



BAIL08CVT218AVA 3

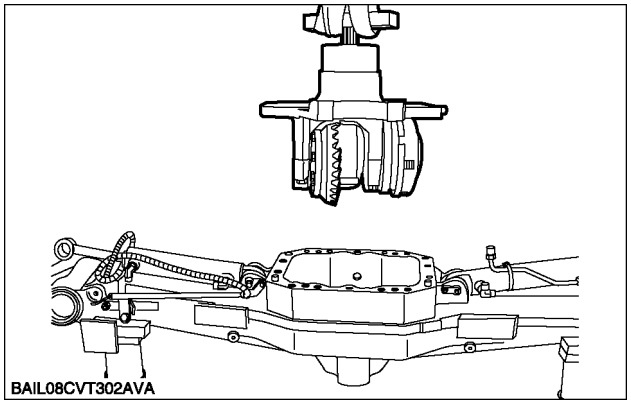
www.truck-freeworkshop.com

4. Attach suitable lifting equipment to the pinion shaft.



BAIL08CVT303AVA 4

5. Remove the differential.



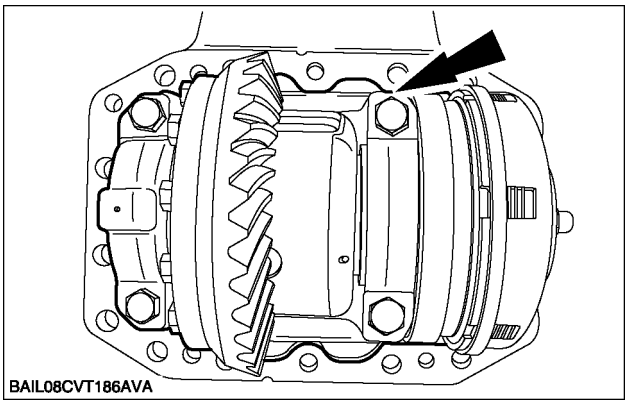
BAIL08CVT302AVA 5

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Differential - Install

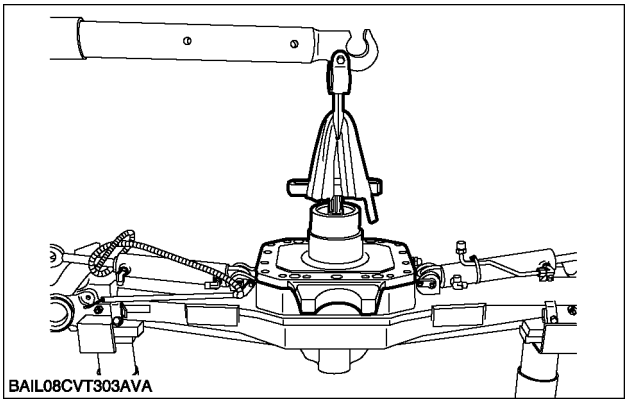
Prior operation:
Assemble the differential, for further information refer to **Differential - Assemble (D.10.A)**

1. Clean and degrease the mating surfaces and apply a bead of gasket sealer approximately **2 mm** wide along the mating surface as indicated.



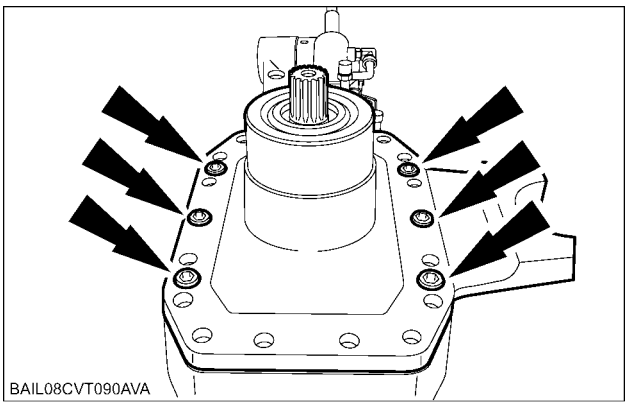
BAIL08CVT186AVA 1

2. Attach suitable lifting equipment to the pinion shaft, and install the differential housing.



BAIL08CVT303AVA 2

3. Install the differential housing securing bolts and tighten to **113 Nm** (**83 lb ft**).



BAIL08CVT090AVA 3

Next operation:
Install the axle shafts, for further information refer to **Axle shaft - Install (D.10.A)**

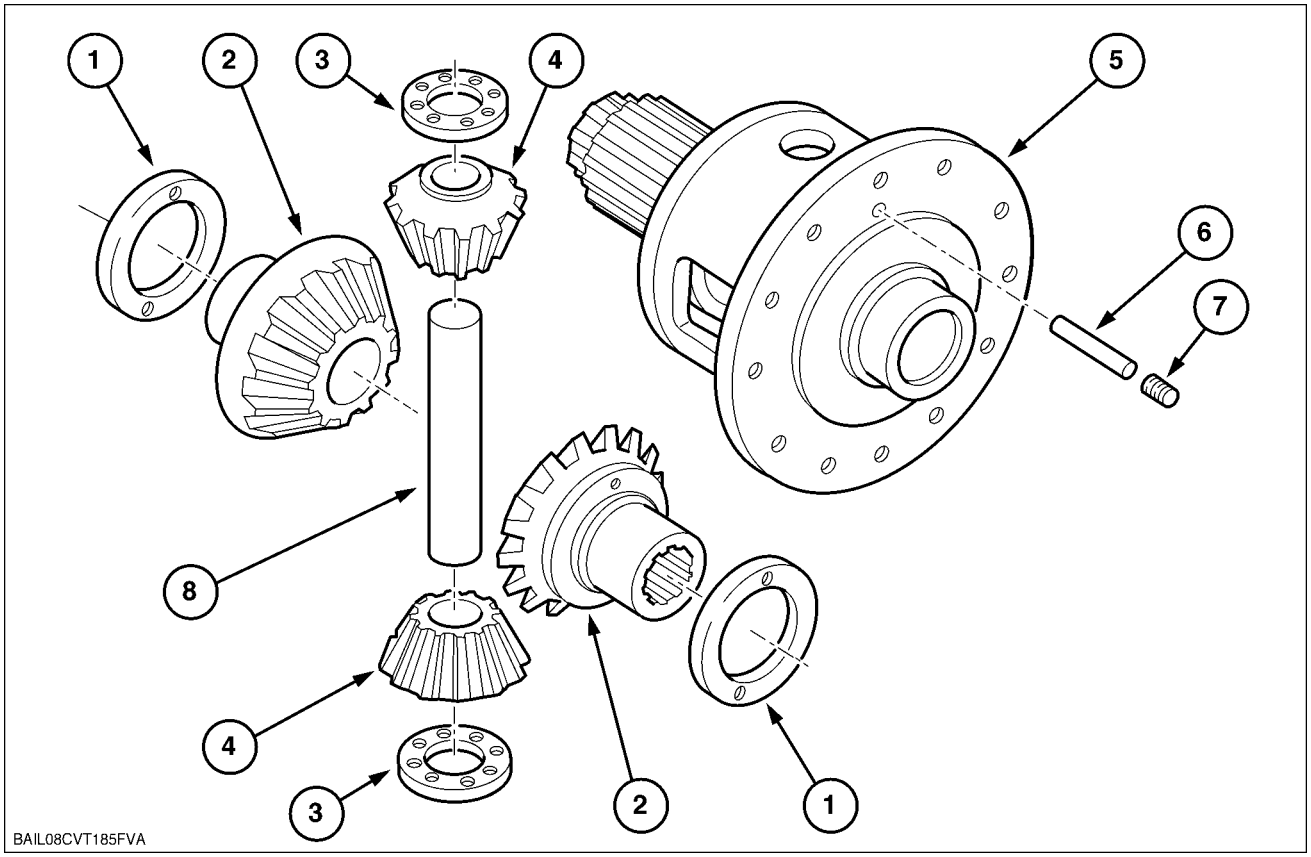
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Differential - Assemble (Class 4.0Axle)

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026

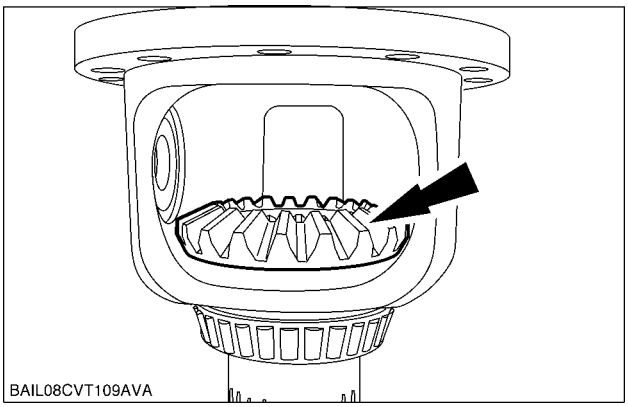


BAIL08CVT185FVA 1

Reference	Quantity	Description
1	2	Washer Thrust
2	2	Sun Gear
3	As Required	Thrust Washer 1.5 mm Thick
3	As Required	Thrust Washer 1.6 mm Thick
3	As Required	Thrust Washer 1.7 mm Thick
3	As Required	Thrust Washer 1.8 mm Thick
3	As Required	Thrust Washer 1.9 mm Thick
3	As Required	Thrust Washer 2.0 mm Thick
3	As Required	Thrust Washer 2.1 mm Thick
3	As Required	Thrust Washer 2.2mm Thick
4	2	Planetary Gear
5	1	Housing Differential Gear
6	1	Pin
7	1	Set Screw
8	1	Shaft

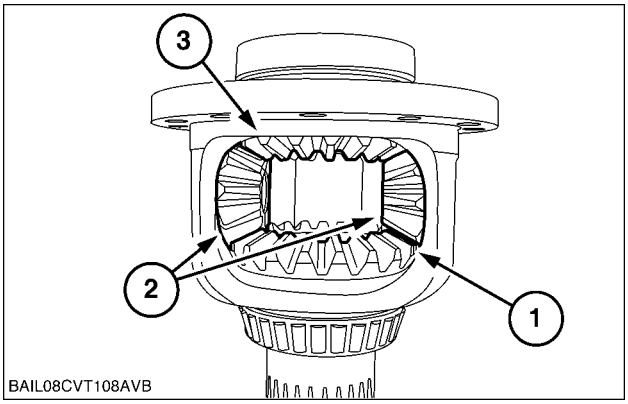
www.truck-freeworkshop.com

1. Install the lower sun gear.



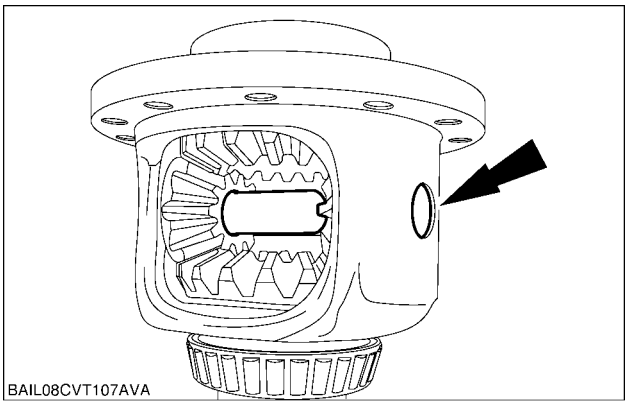
BAIL08CVT109AVB 2

2. Install the upper sun gear **(3)**.
Install the planet gears and thrust washers **(2)**.
Rotate the lower sun gear **(1)** in order to align the planet gears with the shaft.



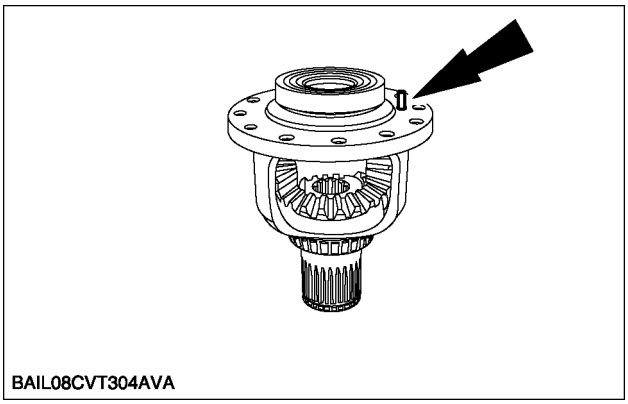
BAIL08CVT108AVB 3

3. Install the planet gear shaft.



BAIL08CVT107AVA 4

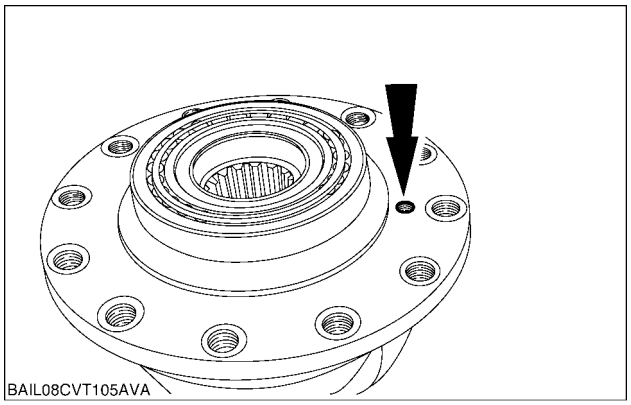
4. Install the planet gear shaft locating pin through the in the differential cage.



BAIL08CVT304AVA 5

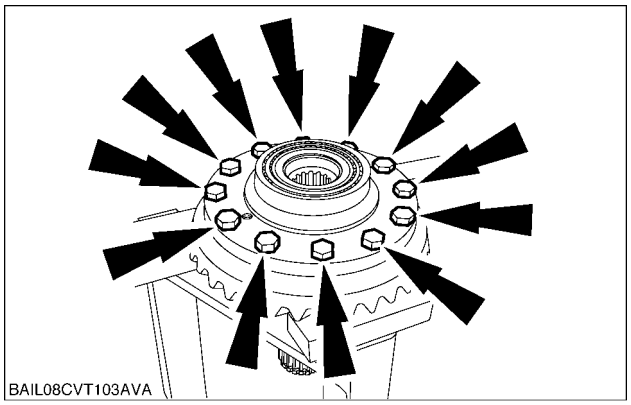
www.truck-freeworkshop.com

5. Install the shaft locating pin grub screw.



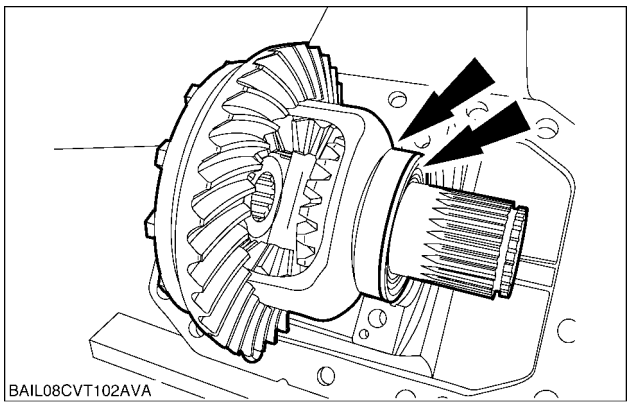
BAIL08CVT105AVA 6

6. Install the crown wheel onto the differential housing. Tighten to **136 Nm** (**100 lb ft**).



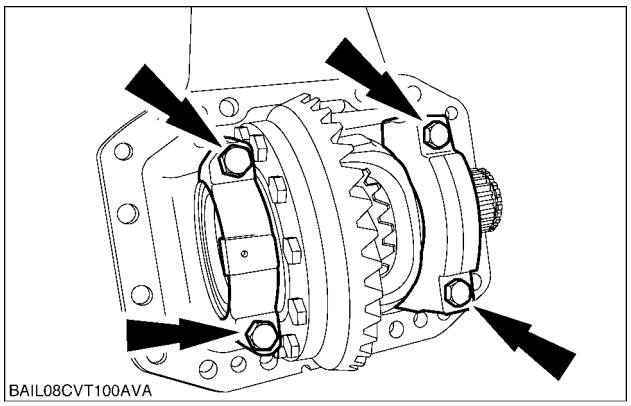
BAIL08CVT103AVA 7

7. Install the differential assembly and bearing into the housing .



BAIL08CVT102AVA 8

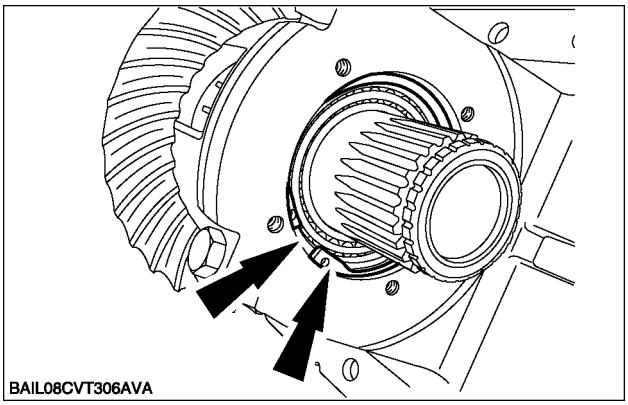
8. Install the support caps and retaining bolts and tighten to **46 Nm** (**34 lb ft**) on the lock nut side. Tighten the retaining bolts to **188 Nm** (**139 lb ft**)on the bearing side.



BAIL08CVT100AVA 9

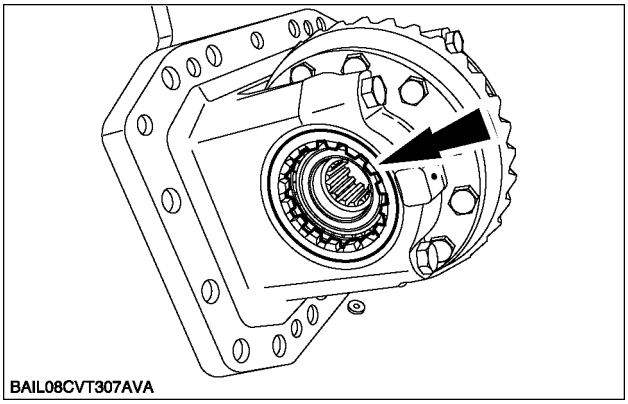
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9. Install the shims and the circlip.



BAIL08CVT306AVA 10

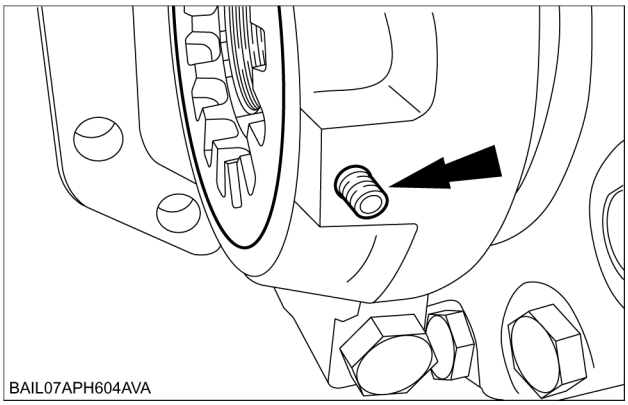
10. Using special tool **380000253** install the adjuster ring.



BAIL08CVT307AVA 11

11. Adjust the backlash.
For further information refer to **Bevel gear - Backlash (D.10.A)**.

12. Tighten the adjuster ring locking grub screw.



BAIL07APH604AVA 12

Next operation:
Assemble the differential lock multi-plate clutch, for further information refer to **Differential lock Multi plate clutch - Assemble (D.10.A)**

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Differential - Disassemble

Prior operation:
Remove the differential, for further information refer to **Differential - Remove (D.10.A)**

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

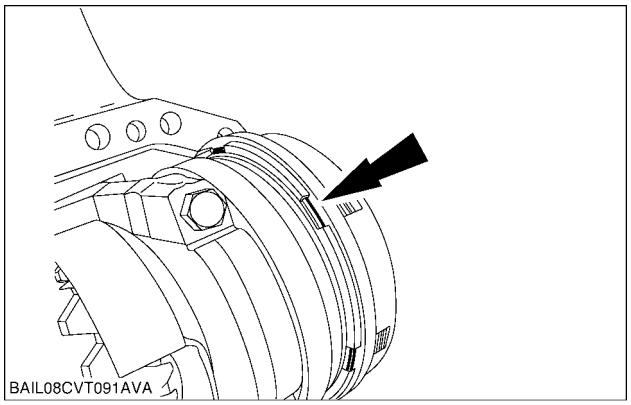
B012

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

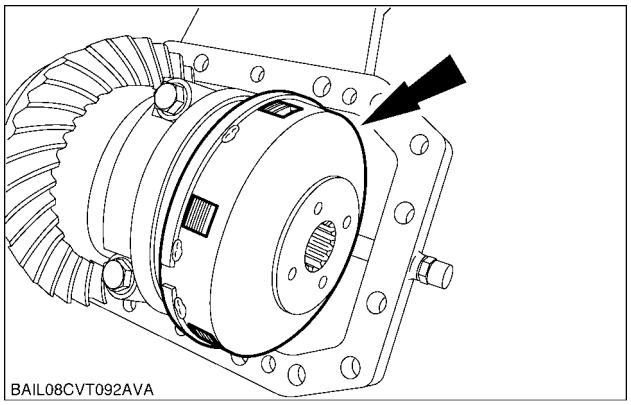
B026

1. Remove the snap ring.



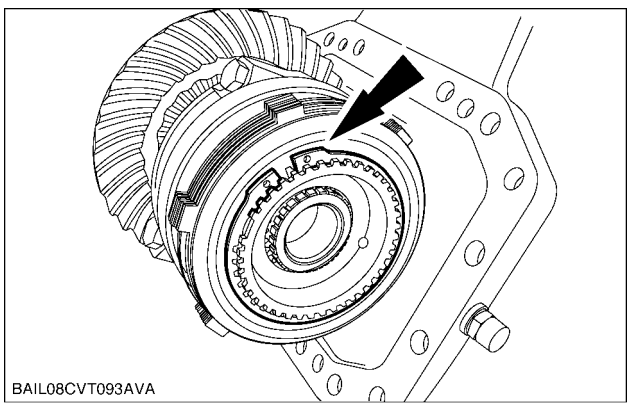
BAIL08CVT091AVA 1

2. Remove the clutch cover.



BAIL08CVT092AVA 2

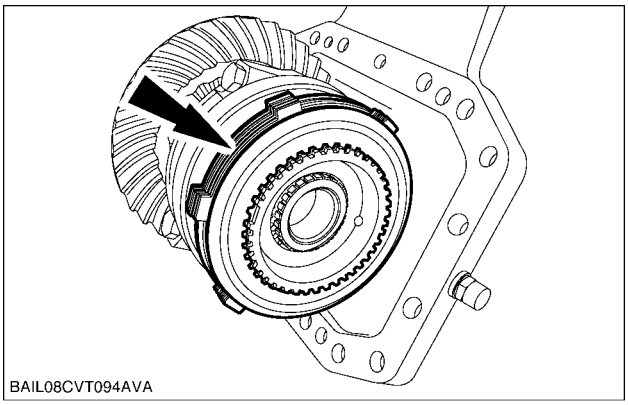
3. Remove the circlip.



BAIL08CVT093AVA 3

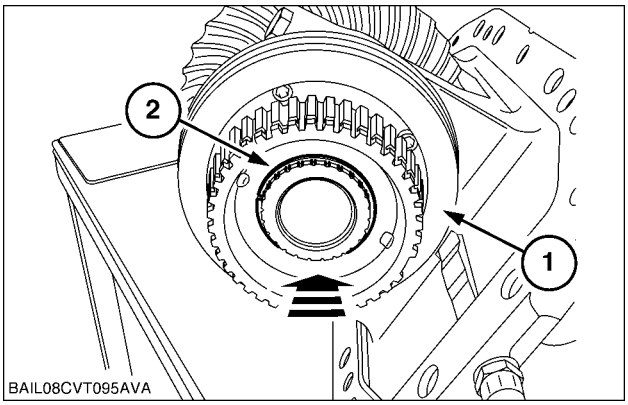
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4. Remove the differential lock clutch pack.



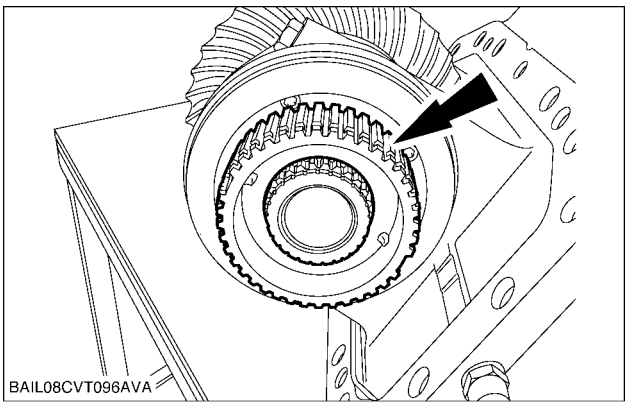
BAIL08CVT094AVA 4

5. Push the drive gear backwards **(1)** and remove the split collets **(2)**.



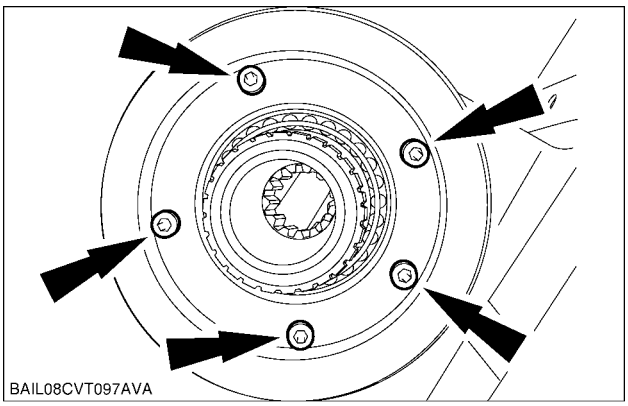
BAIL08CVT095AVB 5

6. Remove the drive gear.



BAIL08CVT096AVA 6

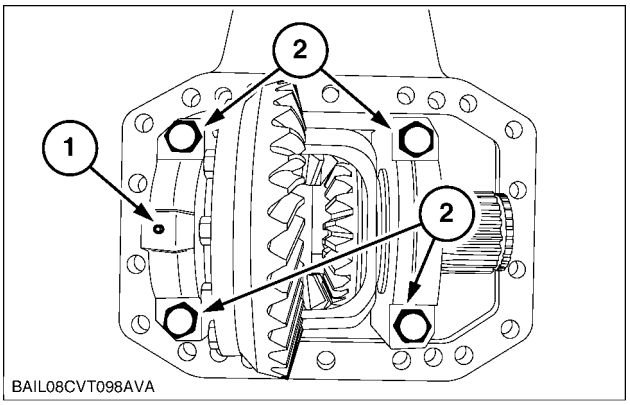
7. Remove the clutch piston housing.



BAIL08CVT097AVA 7

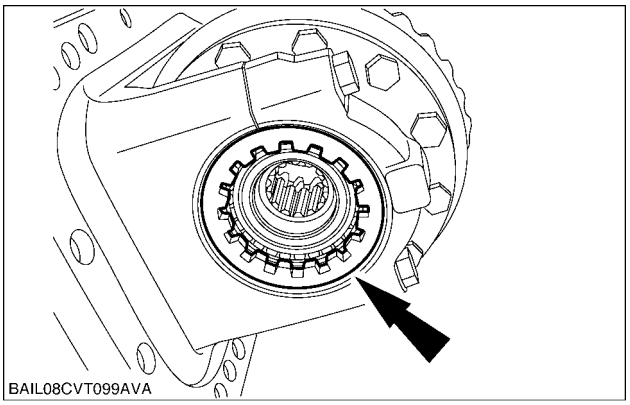
www.truck-freeworkshop.com

8. Remove the adjuster ring locking grub screw **(1)**. Loosen the support cap retaining bolts **(2)**.



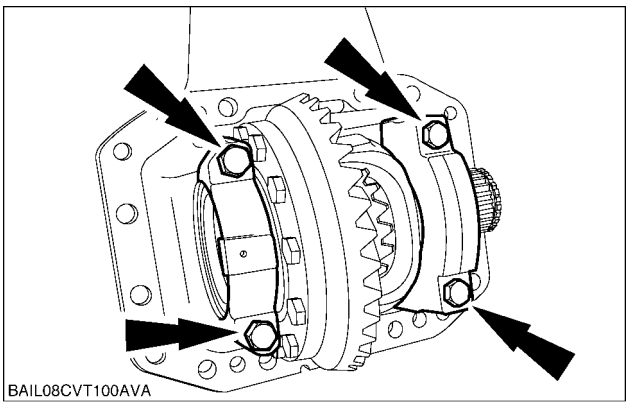
BAIL08CVT098AVA 8

9. Remove the adjuster ring.



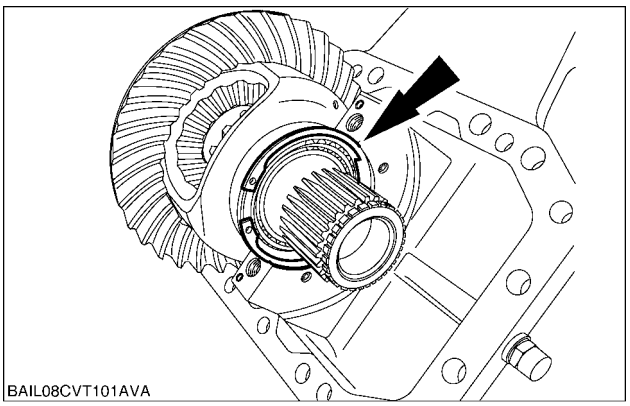
BAIL08CVT099AVA 9

10. Remove the support cap retaining bolts and the support caps.



BAIL08CVT100AVA 10

11. Remove the circlip.

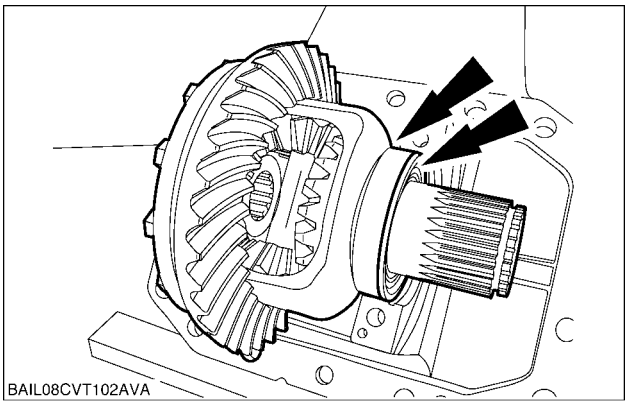


BAIL08CVT101AVA 11

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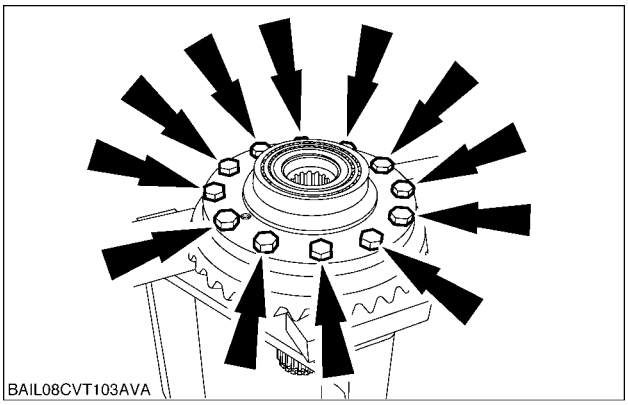
12. Remove the differential housing assembly.

NOTE: *Collect the shims*



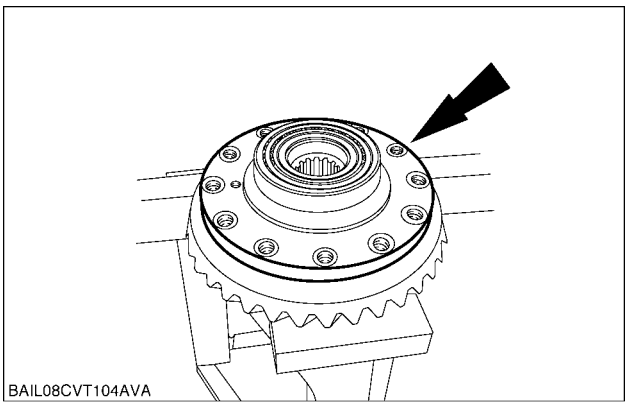
BAIL08CVT102AVA 12

13. Place the differential housing on a suitable stand. Remove the crown wheel retaining bolts.



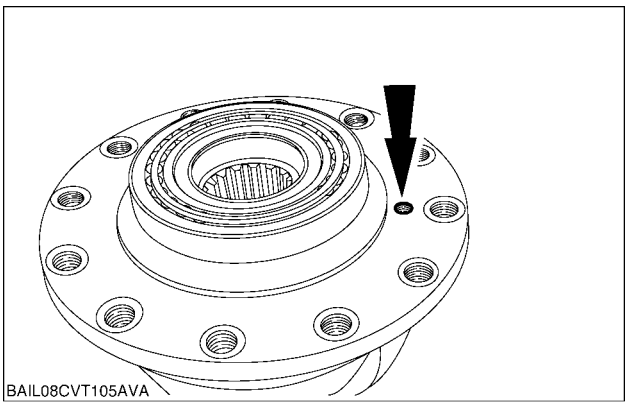
BAIL08CVT103AVA 13

14. Remove the differential housing from the crown wheel.



BAIL08CVT104AVA 14

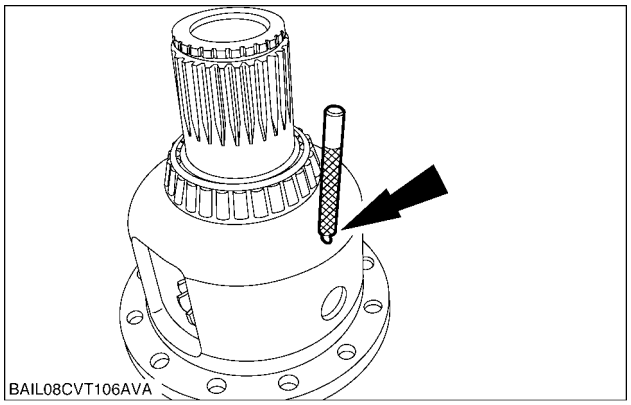
15. Remove the planet gear shaft locating pin grub screw.



BAIL08CVT105AVA 15

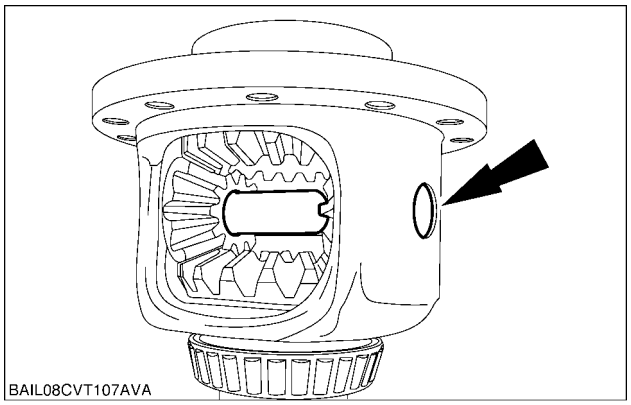
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16. Using a pin punch remove the planet gear shaft retaining pin.



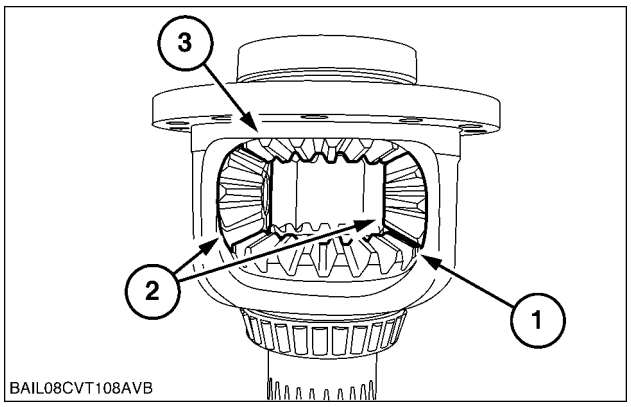
BAIL08CVT106AVA 16

17. Remove the planet gear shaft.



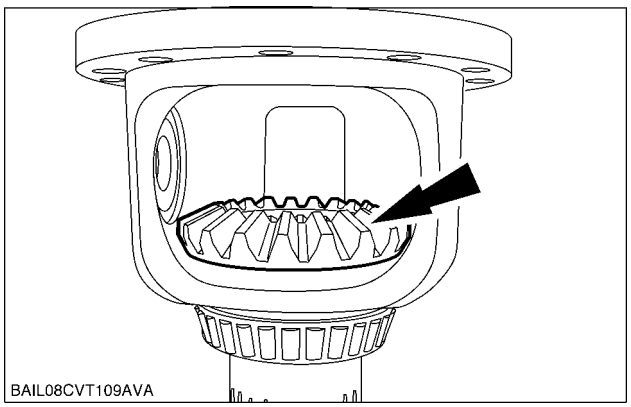
BAIL08CVT107AVA 17

18. Rotate the sun gears **(1)**.
Remove the planet gears and thrust washers **(2)**.
Remove the upper sun gear **(3)**.



BAIL08CVT108AVB 18

19. Remove the lower sun gear.



BAIL08CVT109AVB 19

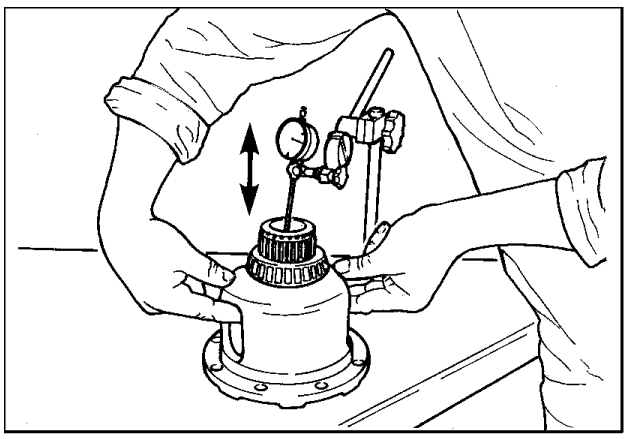
Next operation:
Differential - Backlash (D.10.A).

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Differential - Backlash (Class 4 Axle)

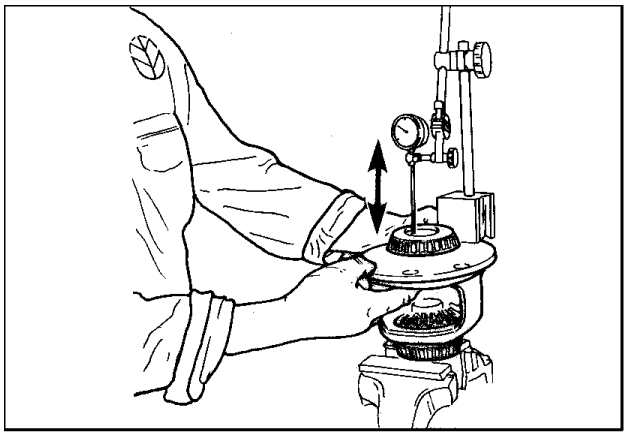
NOTE: *In case of differential assembly overhaul it is necessary to adjust the backlash between the teeth of the planet pinions and side gears. Proceed as follows:*

1. Thoroughly clean the components of the differential to remove any traces of oil which would otherwise prevent accurate backlash measurement.
   Install the two side gears without thrust washers.
   Fit the planet gears complete with thrust washers and shaft.
   Position a dial gauge on the differential housing.
   Move the left-hand side gear to bring it into full contact with the planet pinion and then push it up against the differential housing, reading the end float (Gs) on the dial gauge.



1b0o2004061023 1

2. Repeat the above operations to measure the end float on the right-hand side gear (Gd).
   Therefore the shims to be inserted in the differential housing are given by:
   S (L.H). = Gs - **0.25 mm** for the left-hand side gear;
   S (L.H). = Gd - **0.25 mm** for the right-hand side gear.
   Install shims as near as possible to the calculated value, and, using a dial gauge and following the procedure described above, check that the end float of the left and right-hand side gears is approximately **0.25 mm**.



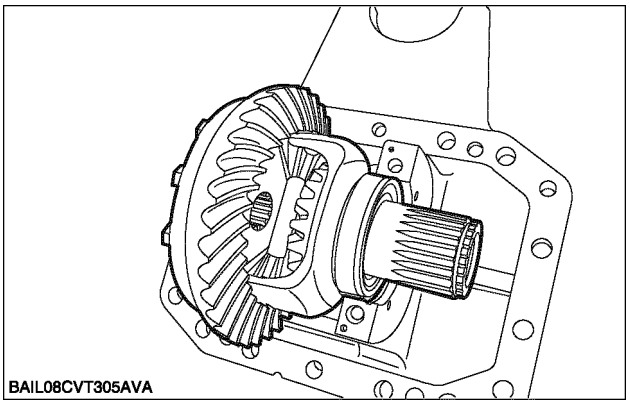
1b0o2004061024 2

Next operation:
Bevel gear - Remove (D.10.A).

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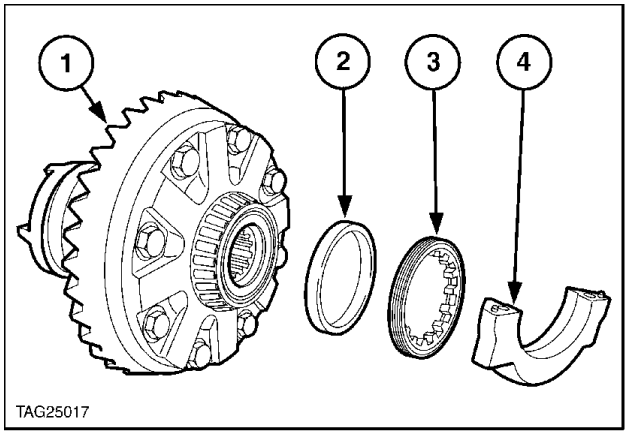
Bevel gear - Backlash Crown Wheel (Class 4 Axle)

1. Install the differential assembly complete with crown wheel into the differential housing.



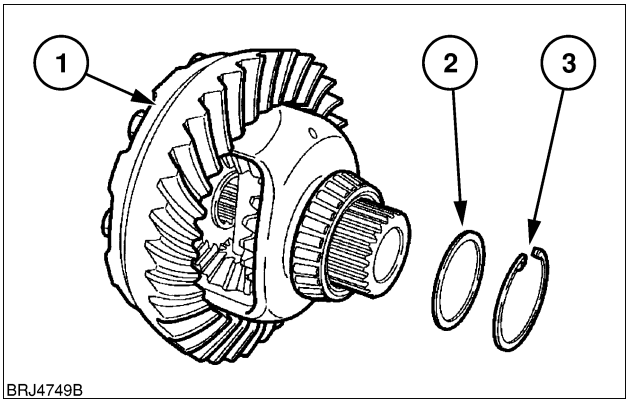
BAIL08CVT305AVA 1

2. Insert the outer bearing rings **(2)** into the differential housing.
   Install the differential support caps, **(4)** making sure that the threaded adjustment ring **(3)** smooth edge faces outwards.
   Tighten the support cap retaining bolts to a torque of **59 Nm** (**43.5 lb in**), then slacken them off and retighten to a torque of **20 Nm** (**14.8 lb ft**).



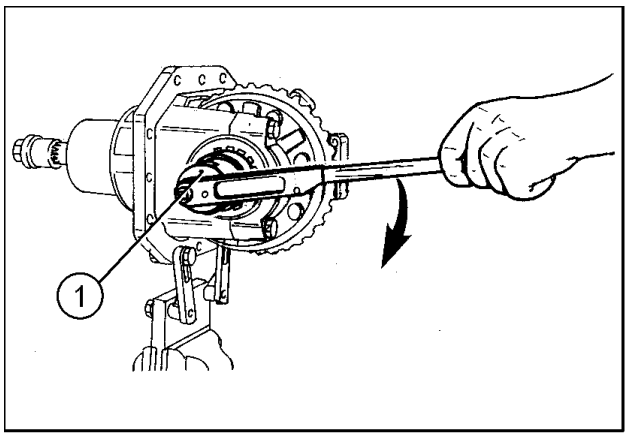
TAG25017_123 2

3. Measure the thickness of the adjustment shim **(2)** which was previously removed during the differential overhaul procedure. Install the shim **(2)** and circlip **(3)**.



BRJ4749B 3

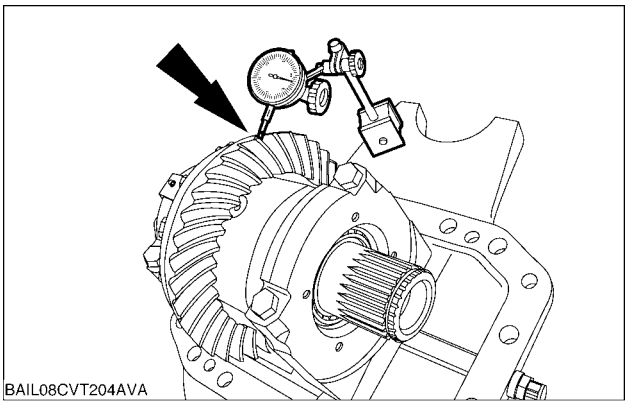
4. With the bearings lubricated, rotate the crown wheel and at the same time tighten the threaded adjustment ring using special tool **380000253** to a torque of **39 - 59 Nm** (**28.8 - 43.5 lb ft**) to take up the axial play between the crown wheel and pinion.



1b0o2004105963 4

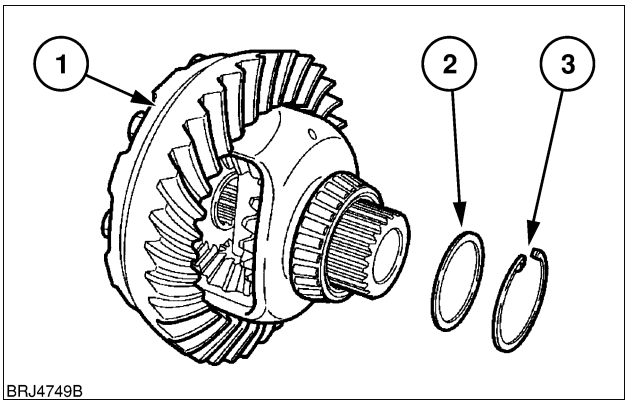
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5. Measure the backlash between the crown wheel and pinion using a dial test gauge perpendicular to the outer edge of the tooth on the crown wheel.
Repeat the measurement in a further two positions **120 °** apart and compare the average of the three values with the backlash specification: **0.15 - 0.20 mm** with an average of **0.18 mm**.
Using special tool **293665** , adjust the locking ring until the backlash is between **0.10 mm** - **0.50 mm**.
Rotate the crown wheel **360 °** and repeat the measurement.



BAIL08CVT204AVA 5

6. If the measured backlash exceeds the prescribed value, fit a thicker or thinner adjustment shim **(2)**.
The thickness of the adjustment shim to be fitted in the differential housing is given by :
Shim S = Sp - {(Gm - 0.18) x 1.35 }
where :
Sp = thickness of test shim installed in the differential housing . ie. original shim used as a test shim.
Gm = average backlash measured between the pinion and the crown wheel .
If the backlash measured is less than the prescribed value, fit a thicker adjustment shim, the value being given by :
Shim S = Sp + {(0.18 - Gm) x 1.35 }
Recheck the backlash and adjust shim if necessary



BRJ4749B 6

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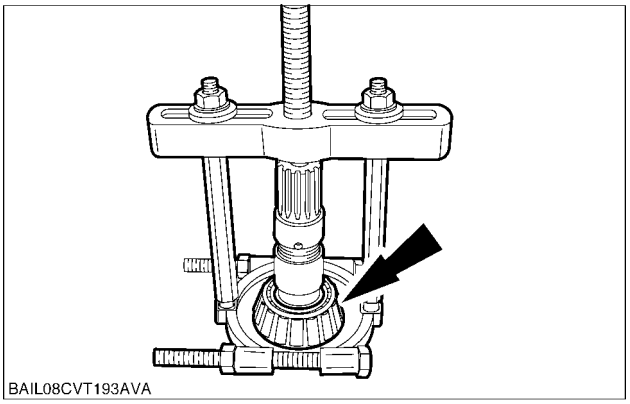
Bevel gear - Preload (Class 4 Axle)

⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

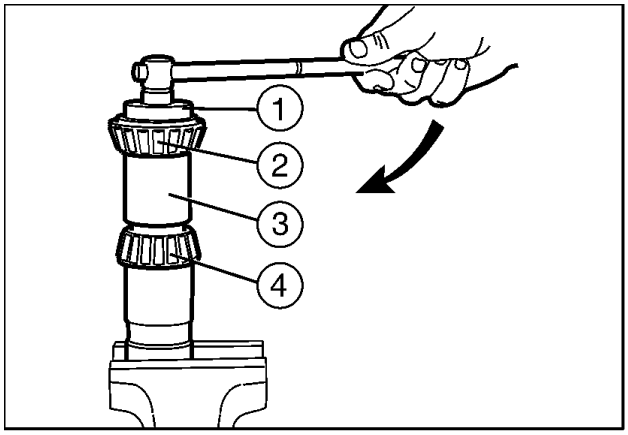
B026

1. Using a suitable puller or hydraulic press, remove the pinion bearing from the pinion shaft.



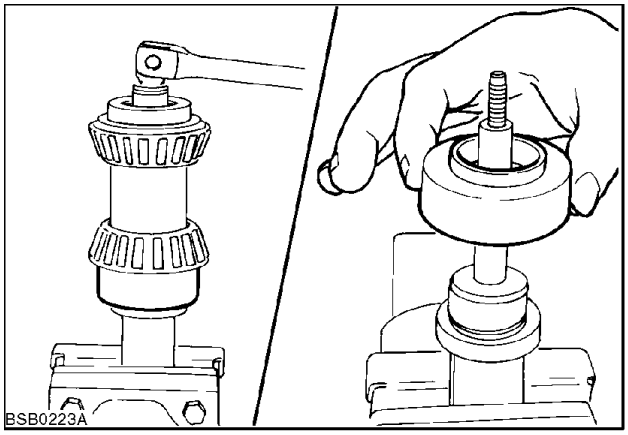
BAIL08CVT193AVA 1

2. Clamp special tool **380000463 (1)** in a vice, fit the inner races of the pinion bearings **(2)** and **(4)**, the spacer **(3)** and secure the nut on the special tool.



1b0o2004105938 2

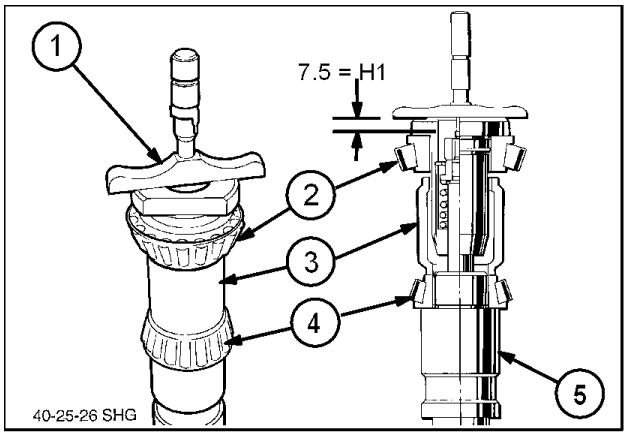
NOTE: *The pinion of the suspended axle assembly is shorter and special tool* ***380000463*** *requires a spacer* ***3800001115*** *to be inserted under the lower bearing* ***(4)****. The spacer can be manufactured locally using the dimensions shown in* ***FRONT AXLE - SPECIAL TOOLS (D.10.A)****.*



BSB0223A 3

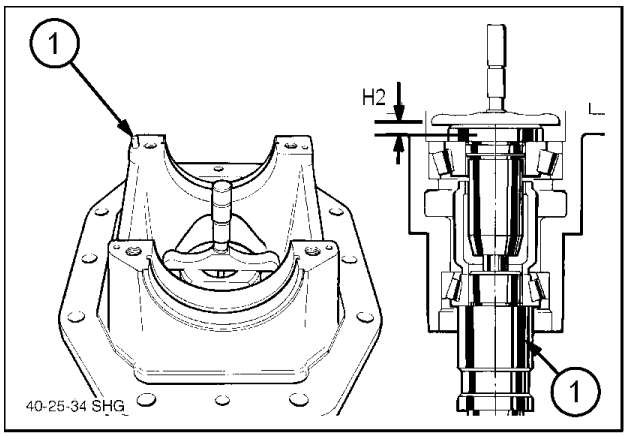
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3. Using a depth micrometer **(1)**, measure the distance **(H1)** between the upper surface of the special tool **380000463** and the central threaded pin of the special tool **380000463** .
Disassemble the above parts, and lubricate the bearings **(2)** and **(4)** with oil and then reassemble the parts, excluding the spacer **(3)**, in the differential housing.
Tighten the nut of special tool **380000463** while turning the special tool to make sure that the bearings **(2)** and **(4)** are seated correctly.
Using a depth micrometer **(1)**, measure the distance (H2).
The thickness of the adjustment shim required is calculated by :
Shim S1 = H2 - H1 + **0.05 MM**
If necessary round the value obtained up to the nearest **0.05 MM** refit bearings and tool check correct preload.
Leave the special tool and bearings in the differential housing for the pinion depth measurement.



40-25-26 SHG 4

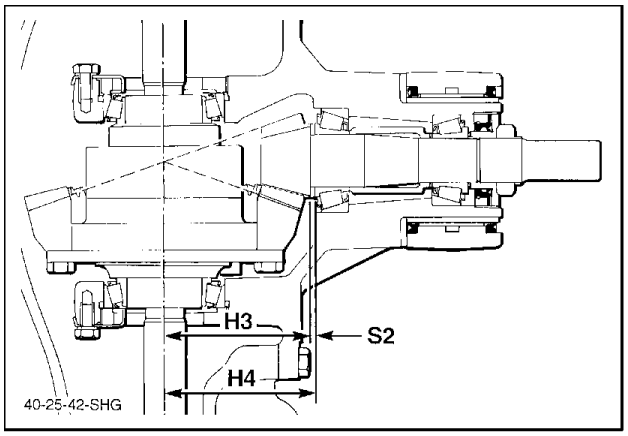
4. Tighten the nut of special tool **380000463 (1)**,
while turning the special tool to make sure that the bearings are seated correctly.
Using a depth micrometer, measure the distance **(H2)**.
The thickness of the adjustment shim required is calculated by :
Shim S1 = H2 - H1 + **0.05 MM**
Leave the special tool in the differential housing for the pinion depth measurement



40-25-34 SHG 5

Pinion to Crown Wheel Shimming Procedure

5. The pinion to crown wheel shimming procedure calculates the thickness of the shim S2, This is positioned between the shoulder of the pinion gear and the bottom bearing to make sure that the theoretical conical point of the pinion gear aligns with the centre of the differential crown wheel.
Pinion shimming dimensions.
H4 Dimension from the pinion bearing to the centre line of the differential housing.
Differential housing.
H3 **122.5 MM +/-** Manufacturers Pinion Dimension "C (Correction Factor).
S2 Shim Thickness.
The dimension H4 necessary in the calculation of the shim thickness can be determined using either pinion adjustment tool **380000249** or **380000600**.
Both procedures are explained as follows.

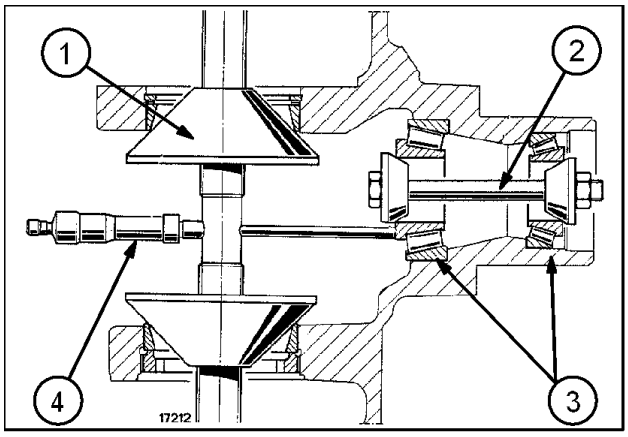


40-25-42 SHG 6

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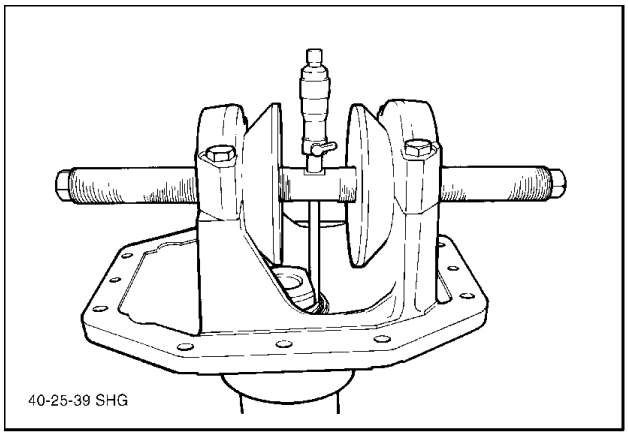
Pinion Shimming using Pinion Adjustment Tool 293400 380000249

6. Install the circlip and adjustment nut into the differential housing, Install the outer bearing rings and clamp into position using special tool **380000249** as used when determining the thickness of shims for the bearing preload.
   1. Pinion measuring gauge special tool **380000463**.
   2. Pinion bearing clamp. Use special tool **380000463** as shown.
   3. Pinion Bearings.
   4. Depth micrometer (Part of special tool **380000249**).



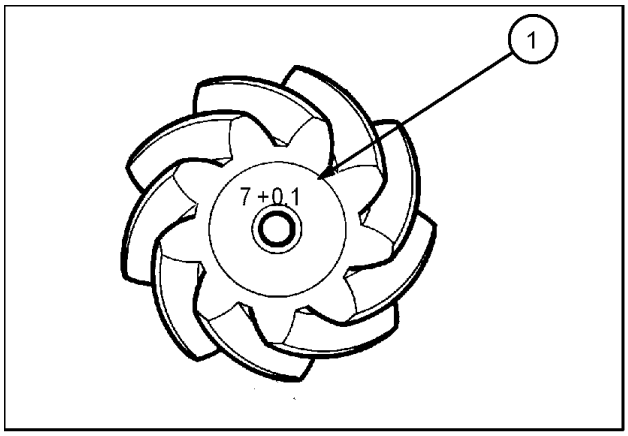
17212 7

7. Install the Pinion Setting Tool No **380000249** complete with the bearing cups and adjusting ring.
   Tighten the bearing caps to **113 Nm** (**83 lb ft**)
   Adjust the cones of the special tool so that the depth micrometer tip touches the inner race of the pinion bearing and measure the dimension **H4**.



40-25-39 SHG 8

8. Determine the thickness of the shims to be installed beneath the pinion gear is as follows
   Shim thickness S2 = H4 - H3
   Where :-
   H4 = Dimension measured using the pinion micrometer tool.
   H3 = **122.5 MM +/- C**
   122.5 MM is the nominal manufacturing dimension from the rear face of the pinion gear to the conical point of the pinion.
   (Supplied by the Manufacturer)
   C = Manufacturing correction factor stamped on the face of the pinion.
   Example
   H4 = 125.77
   C = +0.1 mm
   H3 = 122.5 + 0.1 = 122.6 mm
   S2 = H4 - H3 = 125.77 - 122.6
   Shim thickness S2 **3.17 MM**.

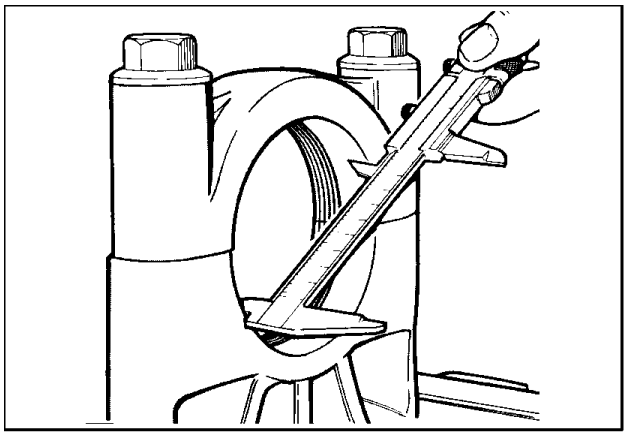


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Pinion Shimming using Tool 297132 380000600

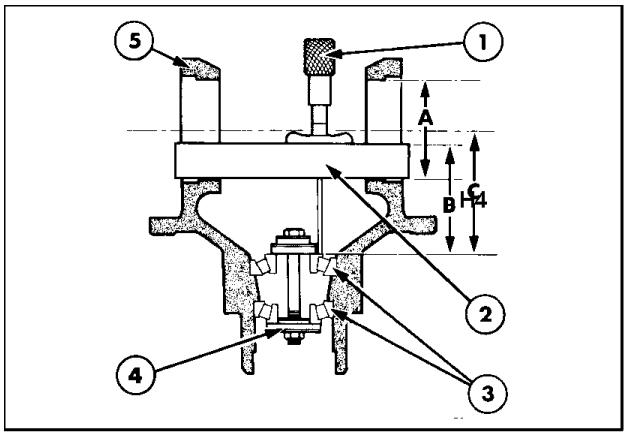
9. Install the bearing caps (less bearing cups) and tighten to a torque of **113 Nm** (**83 lb ft**).
Measure the internal dimension of the bearing bore and call this dimension ‘A‘.
.



1b0o2004105946 10

10. Install the bearings in the differential support housing and clamp in position with special tool **380000600**.
Locate the bar gauge, part of special tool **380000600**, across the bearing bore and measure dimension ‘B‘.
1. Depth micrometer.
2. Bar gauge - part of special tool **380000600**.
3. Pinion shaft bearings.
4. Pinion shaft bearings.
5. Differential support casing.

NOTE: *Tighten the clamp so that the bearing cones can just be turned by hand*



1b0o2004105947 11

11. Calculate dimension ‘H4‘using formula
H4 = B - 25* + (A2)

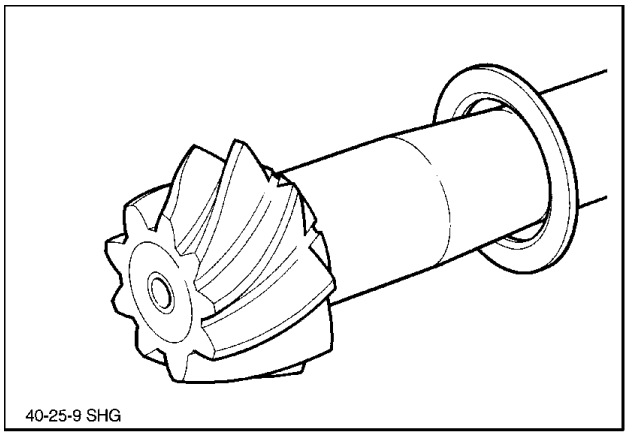
NOTE: 380000600 *Bar Gauge is 25 mm diameter.*

12. Determine the thickness of shims S2 to be installed beneath the pinion gear as follows :
S2 = H4 - H3
Where :-
H4 = Dimension calculated in 12 above.
H3 = 122.5 mm +/-
122.5 mm is the nominal manufacturing dimension from the rear face of the pinion gear to the conical point of the pinion
(Supplied by the manufacturer)
C = Manufacturing correction factor stamped on the face of the pinion.
Example
A = 100 mm
B = 100.77 mm
H4 = B-25* + (A/2)
H4 = 100.77 - 25* + (100/2)
H4 = 125.77
C = 0.1 mm
H3 = 122.5 + 0.1 = 122.6
Shim thickness S2 = 125.77 - 122.6 = 3.17 mm

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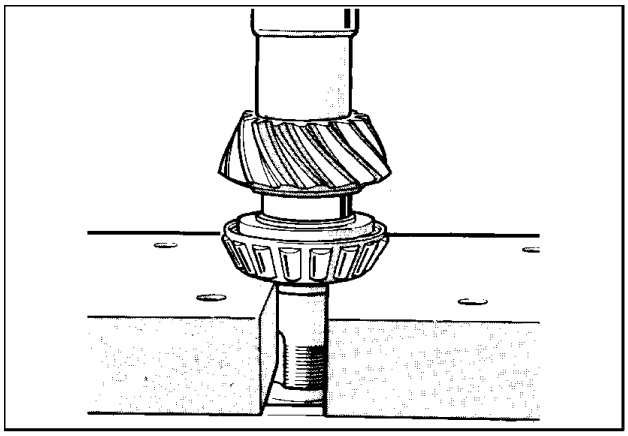
Pinion Shim and Bearing Installation

13. Install the shim selected in the pinion to crown wheel shimming procedure between the pinion gear and bearing. Make sure that the chamfer on the shim faces towards the pinion gear.



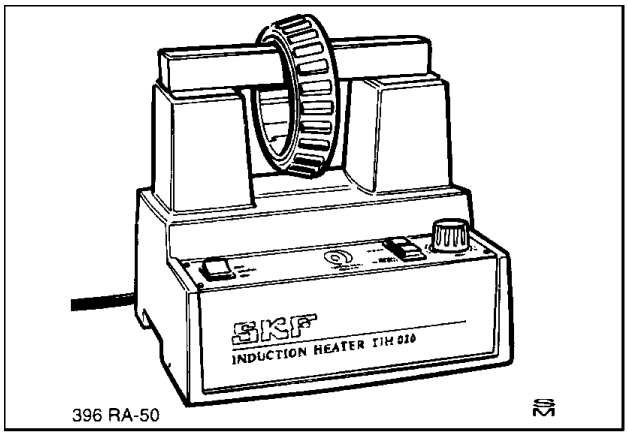
40-25-9 SHG 12

14. Install the bearing onto the pinion.



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NOTE: *The use of an electronic induction heater will assist in the installation of the bearing without the need for a hydraulic press.*



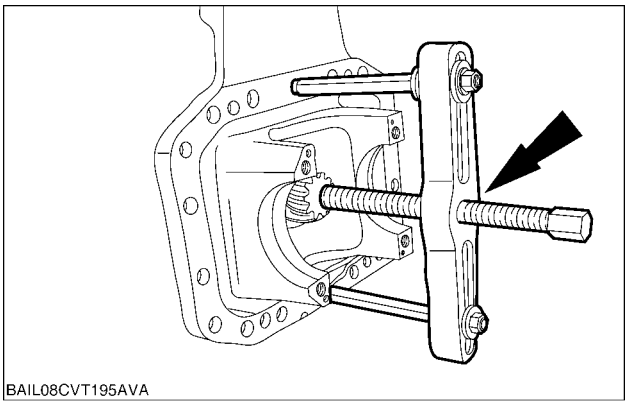
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Pinion Bearing Preload Rolling Torque

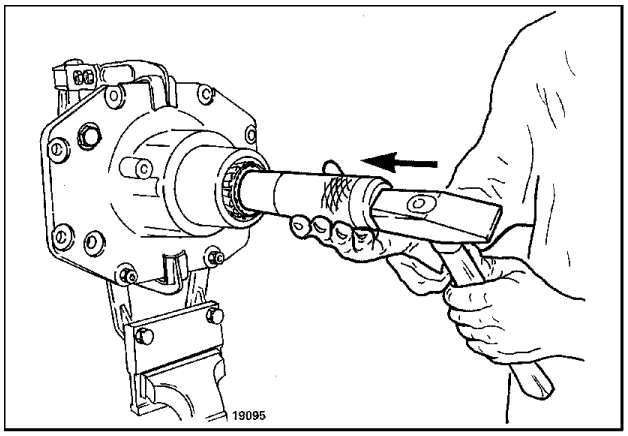
15. The pinion bearing preload is measured as the torque or force required to rotate the pinion. The shim selected in the pinion bearing preload shim adjustment procedure previously described makes sure that the correct preload is achieved when the pinion nut is tightened to a torque of **294 Nm** (**217 lb ft**). Install the pinion inner bearing onto the pinion and locate the pinion into the differential carrier. Hold the pinion in position with a suitable puller.

NOTE: *If the special tool required to determine the thickness of the preload shim is not available install the same shim that was removed during disassembly.*



BAIL08CVT195AVA 15

16. Install the spacer and shim onto the pinion shaft. Lubricate and install the pinion outer bearing.

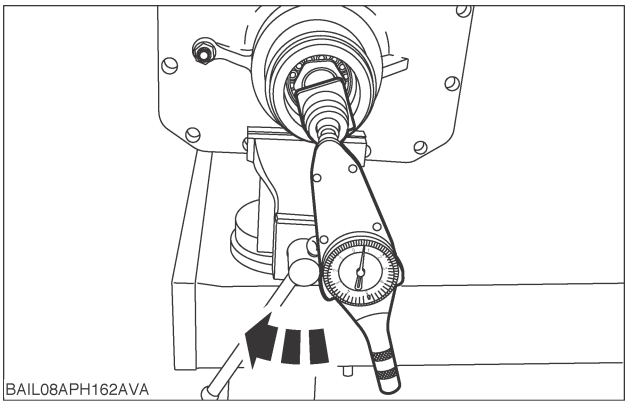


19095 16

17. Install the pinion nut and tighten to **294 Nm** (**217 lb ft**). Do not install the oil seal and dust cover at this stage

NOTE: *Make sure that the bearings are seated correctly by turning the pinion shaft during tightening. If the rolling torque figure is lower than the specified value, tighten the pinion nut. If the rolling torque figure is higher than the specified value, loosen the pinion nut.*

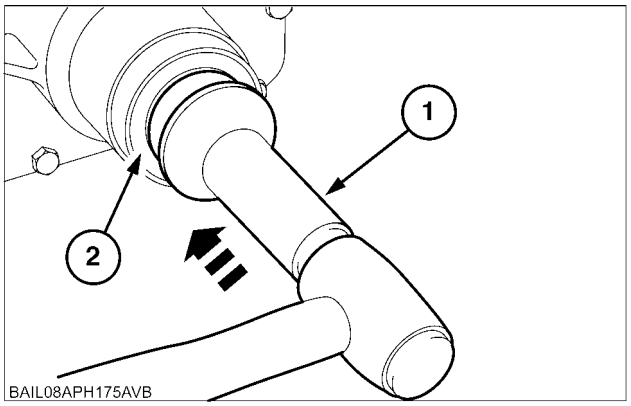
18. Tighten the pinion nut gradually, until the rolling torque of the pinion shaft bearings reach a figure between **0.49 - 0.98 Nm**.



BAIL08APH162AVA 17

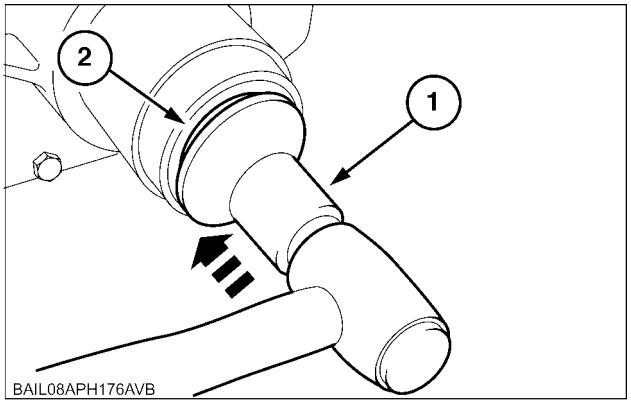
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19. Using special tool **380200092** suspended axle or **380200094**, standard axle, **(1)**, install the pinion shaft seal **(2)**.



BAIL08APH175AVB 18

20. Using special tool **380200093** suspended axle or **380200095** standard axle, **(1)**, install the pinion shaft seal protector **(2)**.



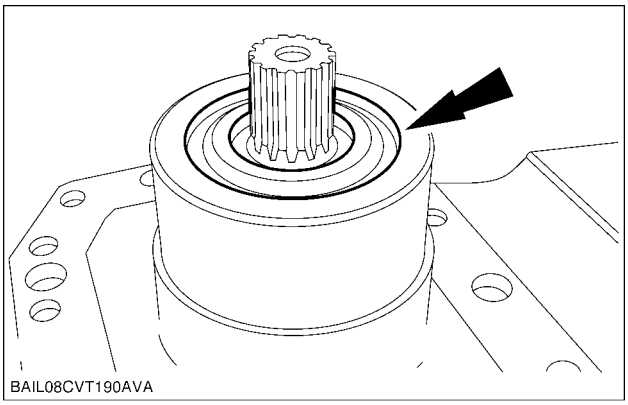
BAIL08APH176AVB 19

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Bevel gear - Remove Pinion Gear

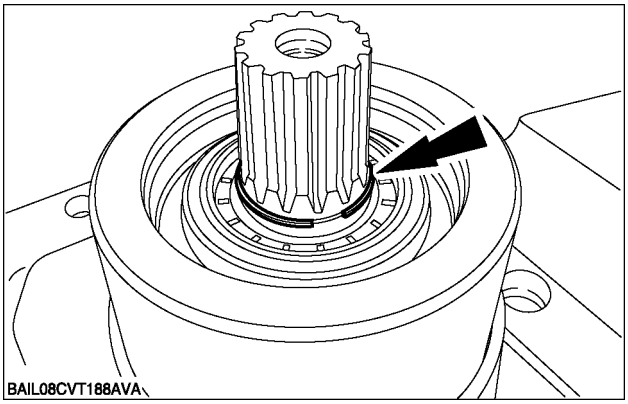
Prior operation:
Differential Disassemble, For Further Information Refer To **Differential - Disassemble (D.10.A)**

1. Remove the dust cover.



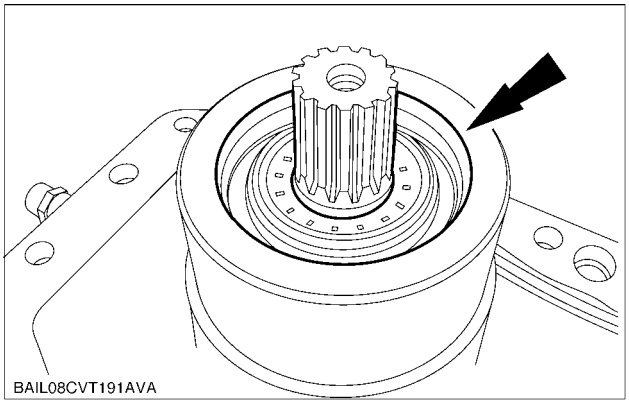
BAIL08CVT190AVA 1

2. Remove the circlip.



BAIL08CVT188AVA 2

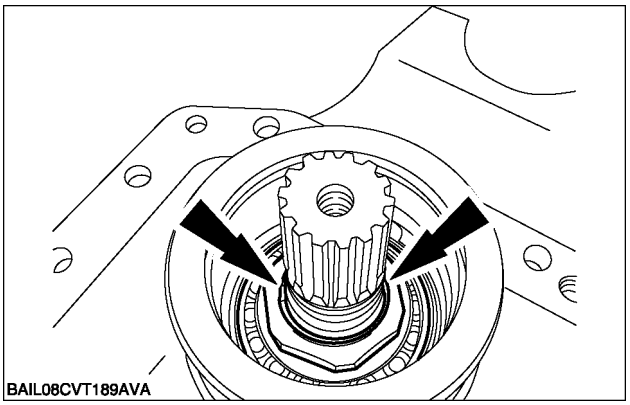
3. Remove the oil seal.



BAIL08CVT191AVA 3

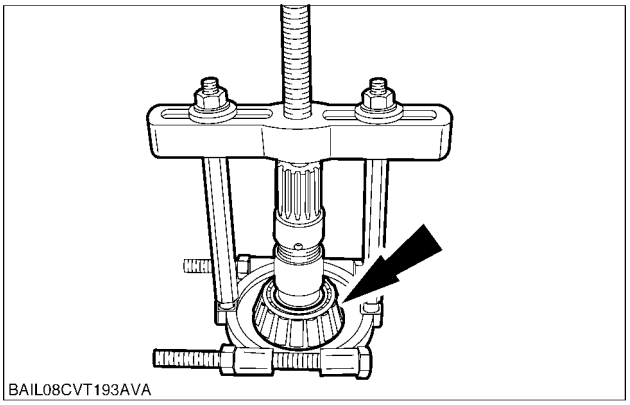
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4. Unstake the locknut remove the locknut and the bearing.



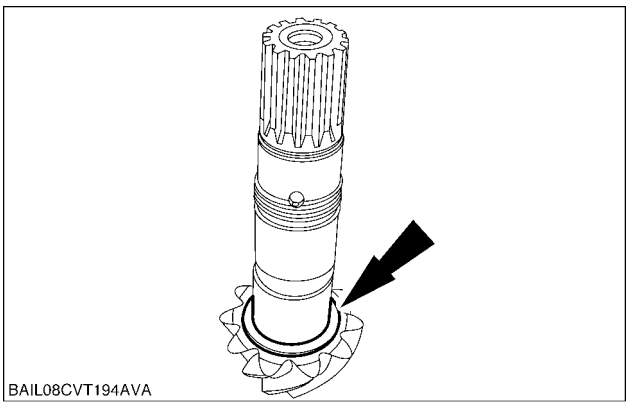
BAIL08CVT189AVA 4

5. Remove the bearing using a suitable puller.



BAIL08CVT193AVA 5

6. Remove the pinion to crown wheel shim.



BAIL08CVT194AVA 6

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Differential lock Multi plate clutch - Assemble (Class 4 Axle)

Prior operation:
Disassemble the Differential Lock Clutch, for Further Information refer to **Differential - Disassemble (D.10.A)**

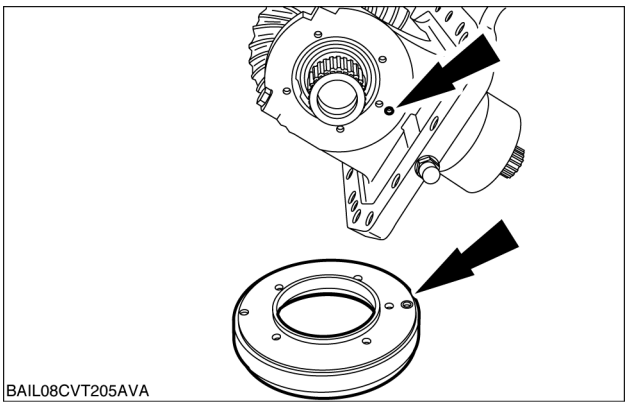
⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026

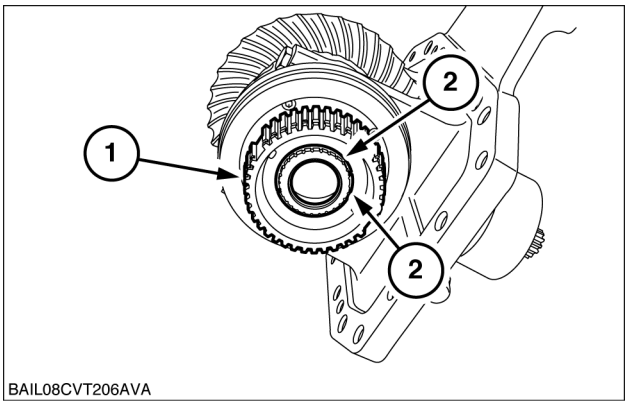
1. Install the differential lock piston assembly. Make sure the oil feed apertures are correctly aligned.

IMPORTANT: *Make sure the O-ring seal is in position.*



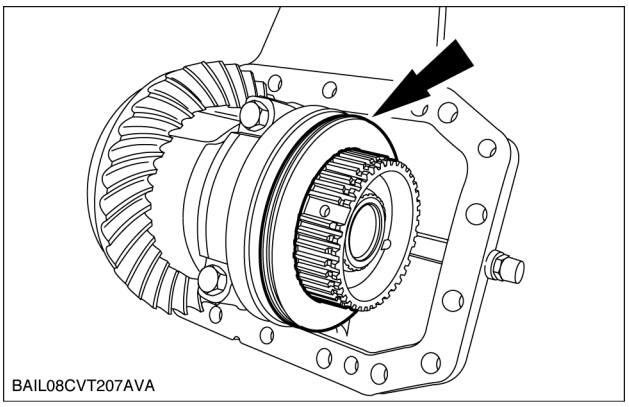
BAIL08CVT205AVA 1

2. Install the drive gear **(1)** and the split collets **(2)**.



BAIL08CVT206AVA 2

3. Install the thrust washer.

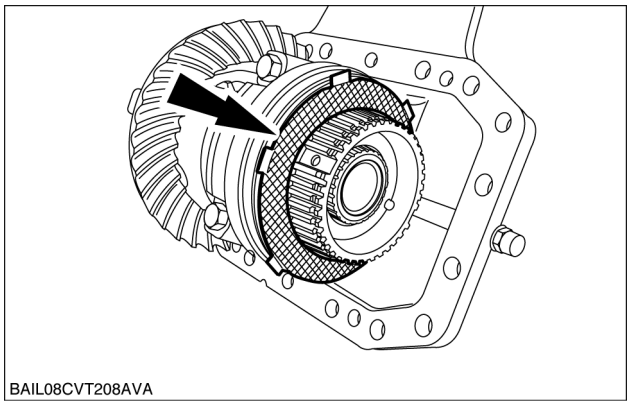


BAIL08CVT207AVA 3

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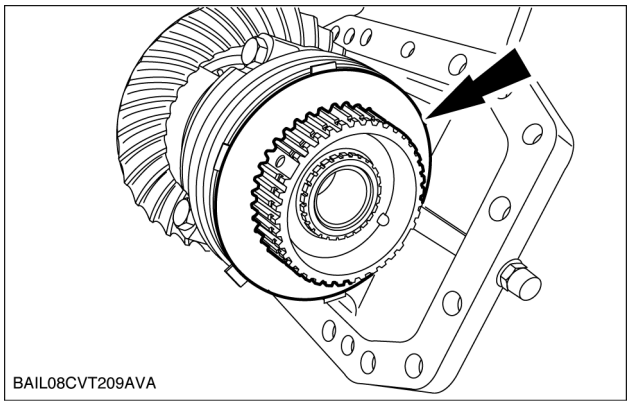
4. Install a friction plate.

NOTE: *If new plates are to be used they must be soaked in the correct axle oil.*



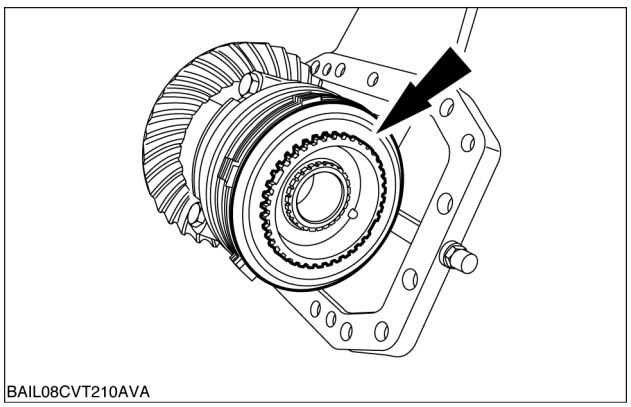
BAIL08CVT208AVA 4

5. Install a steel drive plate.



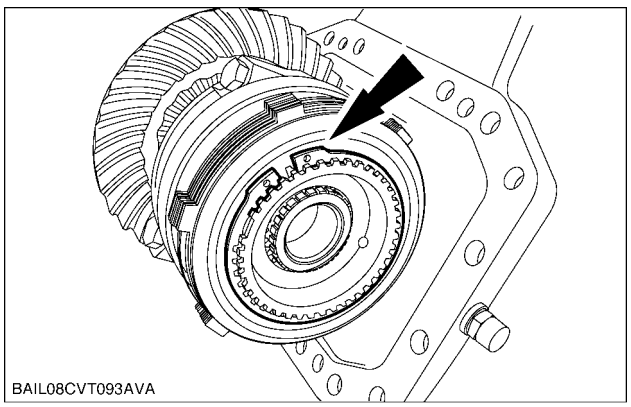
BAIL08CVT209AVA 5

6. Repeat instructions 4 and 5 until the clutch pack is complete (5 steel plates and 6 friction plates).
7. Install the clutch pack retaining ring.



BAIL08CVT210AVA 6

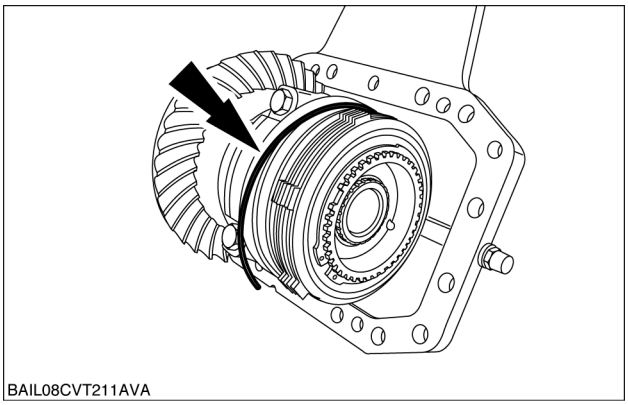
8. Install the clutch pack retaining circlip.



BAIL08CVT093AVA 7

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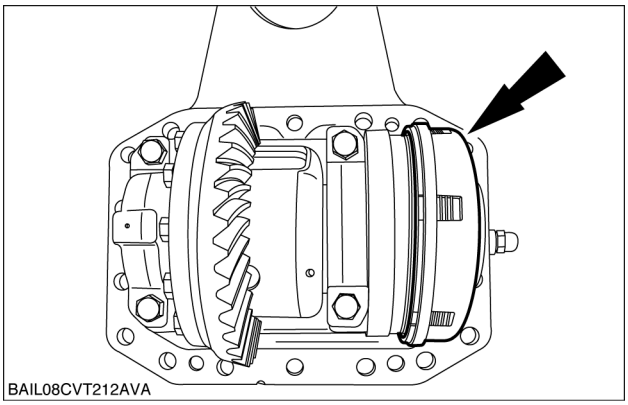
9. Place the snap ring onto the clutch pack.



BAIL08CVT211AVA 8

10. Install the Clutch cover.

NOTE: *Align the splines in the clutch cover and the sun gear to aid installation of the axle shaft into the casing.*



BAIL08CVT212AVA 9

Next operation:
Differential - Install (D.10.A)

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Differential lock Multi plate clutch - Disassemble Class 4

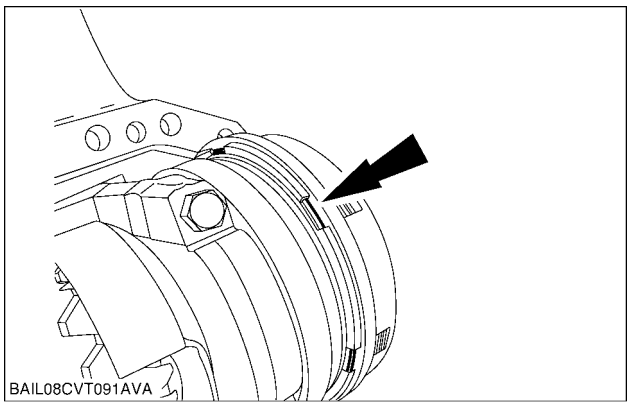
Prior operation:
Remove the Differential, for Further Information Refer to **Differential - Remove (D.10.A)**

⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

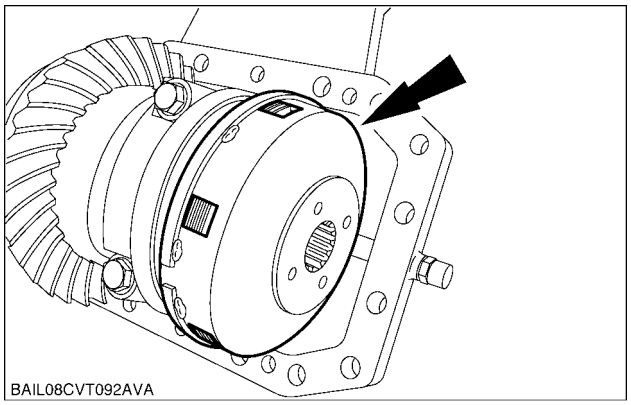
B026

1. Remove the clutch cover snap ring.



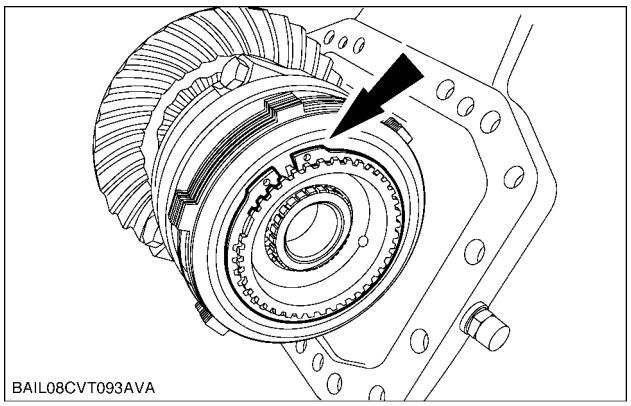
BAIL08CVT091AVA 1

2. Remove the clutch cover.



BAIL08CVT092AVA 2

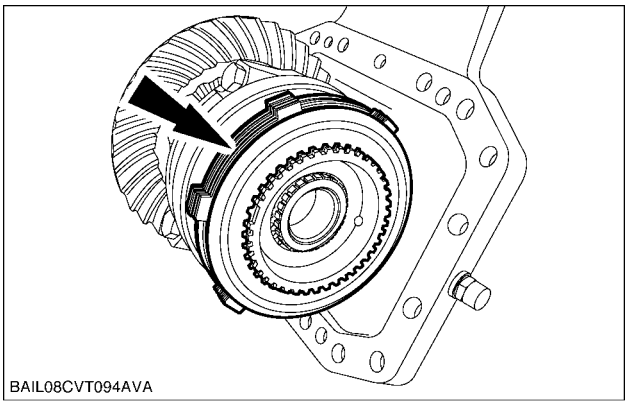
3. Remove the circlip.



BAIL08CVT093AVA 3

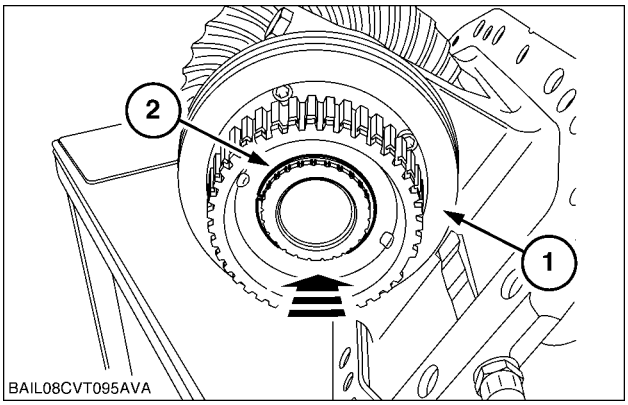
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4. Remove the multi-plate clutch pack.



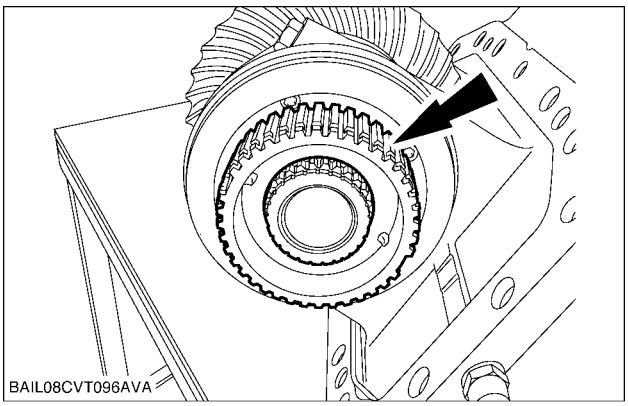
BAIL08CVT094AVA 4

5. Push the gear backwards **(1)** and remove the split collets **(2)**.



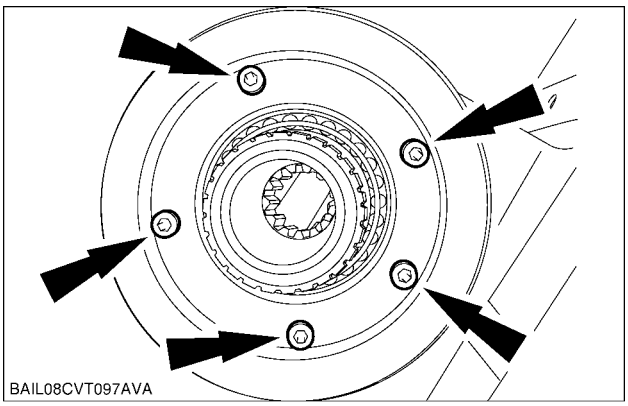
BAIL08CVT095AVB 5

6. Remove the drive gear.



BAIL08CVT096AVA 6

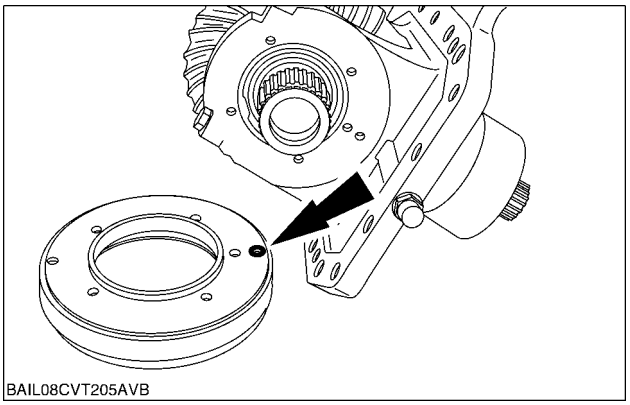
7. Remove the clutch piston.



BAIL08CVT097AVA 7

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8. Retrieve the O-ring seal.



BAIL08CVT205AVB 8

Next operation:
Differential - Disassemble (D.10.A).

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Housing - Assemble

Prior operation:
Install the differential housing, for further information refer to **Differential - Install (D.10.A)**
Prior operation:
Install the axle shafts, for further information refer to **Axle shaft - Install (D.10.A)**
Prior operation:
Install the hubs, for further information refer to **Hub - Install (D.10.A)**
Prior operation:
Install the steering cylinders, for further information refer to **Steering cylinder - Install (D.20.C)**
Prior operation:
Install the front axle, for further information refer to **FRONT AXLE - Install (D.10.A)**

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Housing - Disassemble

Prior operation:
Remove the front axle, for further information refer to **FRONT AXLE - Remove (D.10.A)**
Prior operation:
Remove the steering cylinders, for further information refer to **Steering cylinder - Remove (D.20.C)**
Prior operation:
Remove the hubs, for further information refer to **Hub - Remove (D.10.A)**
Prior operation:
Remove the axle shafts, for further information refer to **Axle shaft - Remove (D.10.A)**
Prior operation:
Remove the differential housing, for further information refer to **Differential - Remove (D.10.A)**

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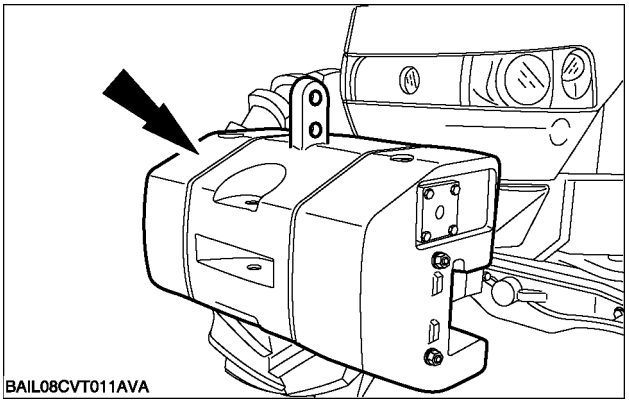
Hub - Remove Four Wheel Drive Axle With Brakes

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

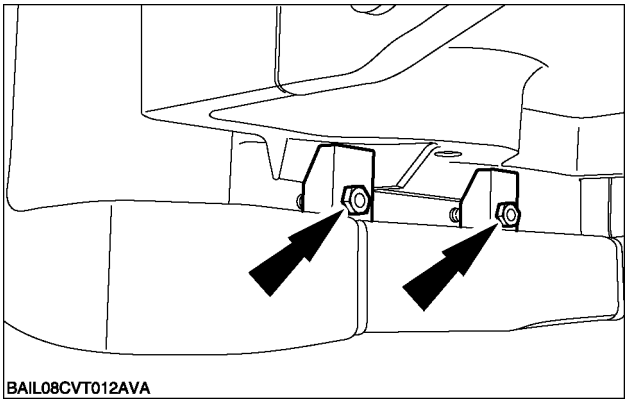
B012

1. Using suitable lifting equipment support the front weights.



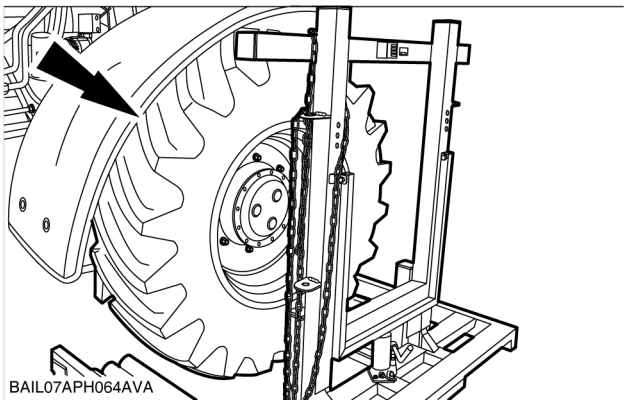
BAIL08CVT011AVA 1

2. Disconnect and remove the front weights from the weight carrier.



BAIL08CVT012AVA 2

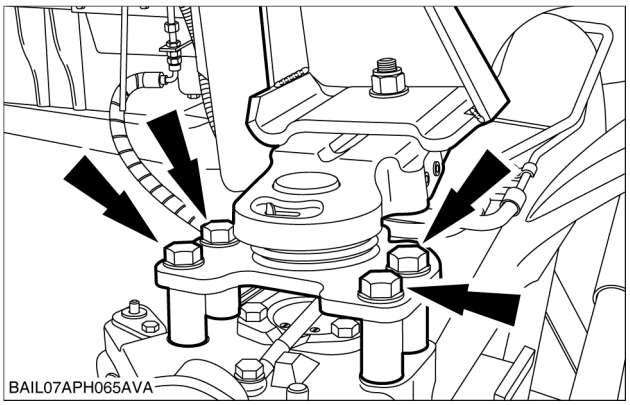
3. Raise the front of the vehicle and support with suitable axle stands under the front weight carrier. Remove the front wheel.



BAIL07APH064AVA 3

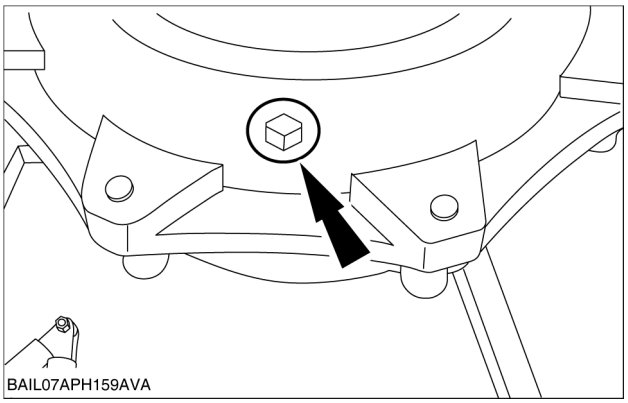
www.truck-freeworkshop.com

4. Remove the dynamic front fender (if equipped).



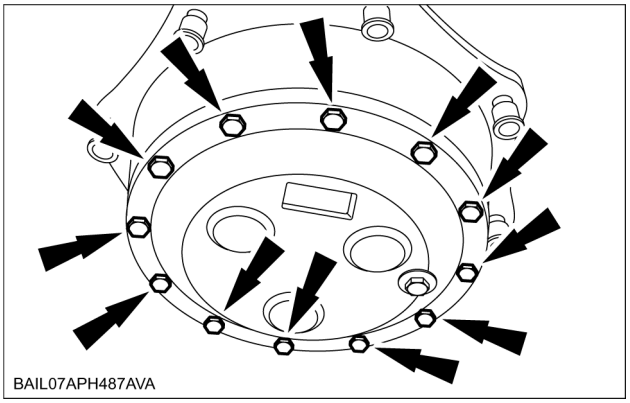
BAIL07APH065AVA 4

5. Rotate the hub until the drain plug is at the lowest point. Remove the axle hub drain plug and drain the hub oil into a suitable container.
Reinstall the drain plug and tighten to **75 Nm** (**55 lb ft**).



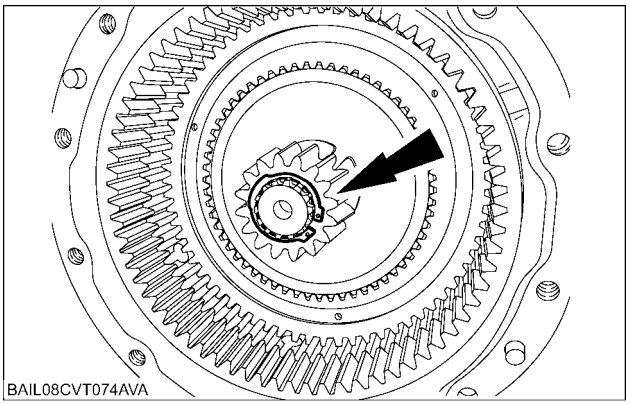
BAIL07APH159AVA 5

6. Remove the hub end plate and the planetary gears assembly.



BAIL07APH487AVA 6

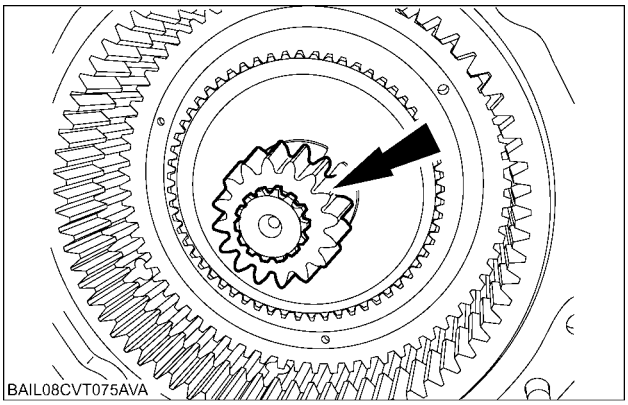
7. Remove the planetary drive gear retaining circlip.



BAIL08CVT074AVA 7

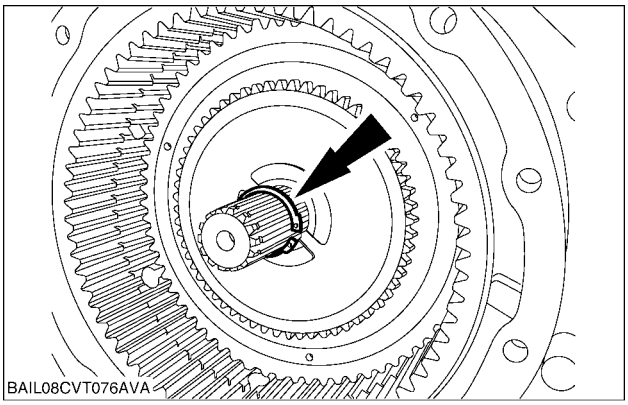
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8. Remove the planetary drive gear.



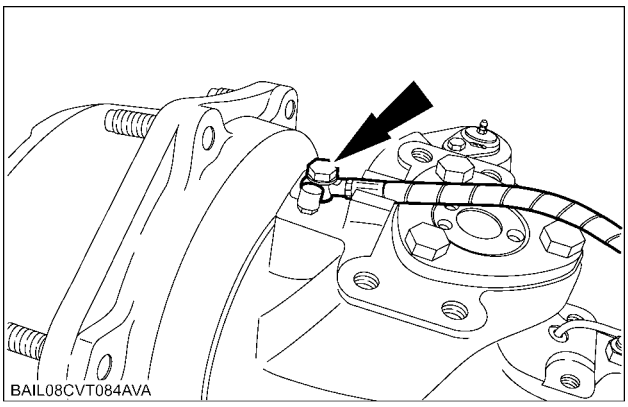
BAIL08CVT075AVA 8

9. Remove the inner circlip.



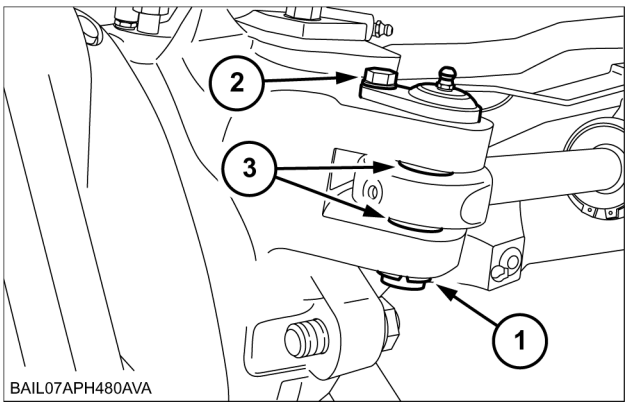
BAIL08CVT076AVA 9

10. Disconnect the brake hose.



BAIL08CVT084AVA 10

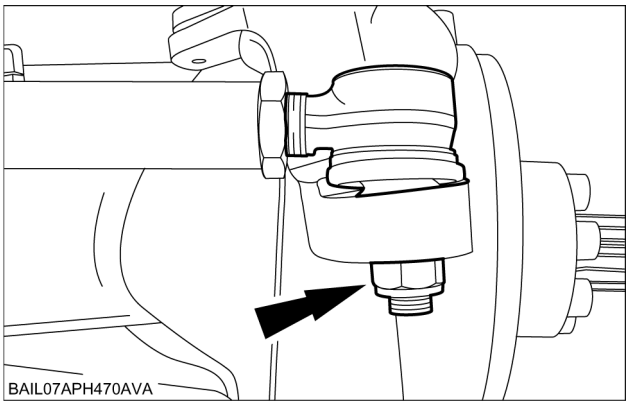
11. Remove the circlip **(1)**.
Remove the steering cylinder pivot pin retaining bolt **(2)**.
Support the steering cylinder.
Remove the pivot pin and retrieve the spacers **(3)**.



BAIL07APH480AVA 11

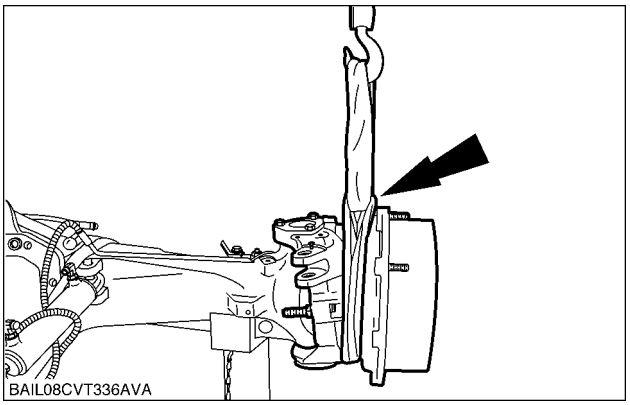
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12. Disconnect the track rod end from the hub.



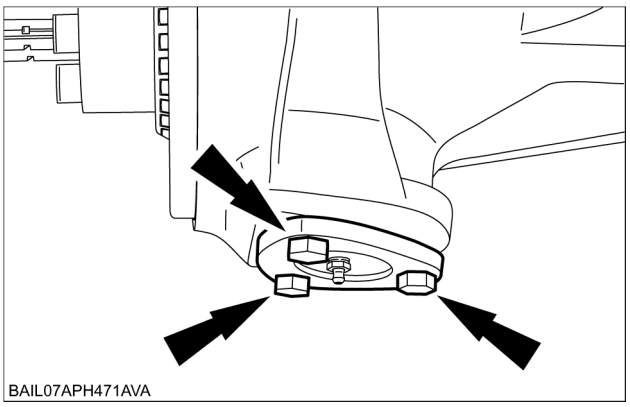
BAIL07APH470AVA 12

13. Using suitable lifting equipment support the hub assembly.



BAIL08CVT336AVA 13

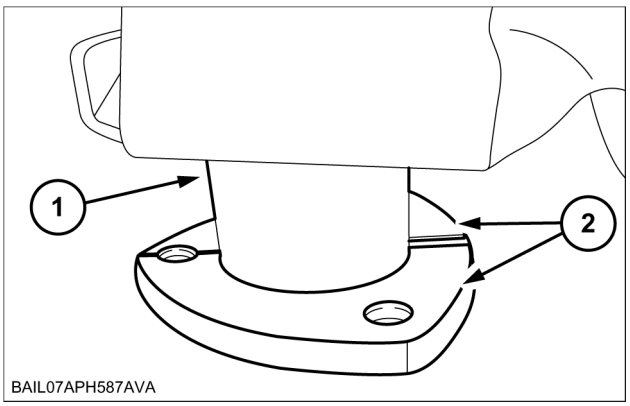
14. Remove the lower swivel pin retaining bolts.



BAIL07APH471AVA 14

15. Remove the lower swivel pin.

NOTE: *Note the number of shims removed.*

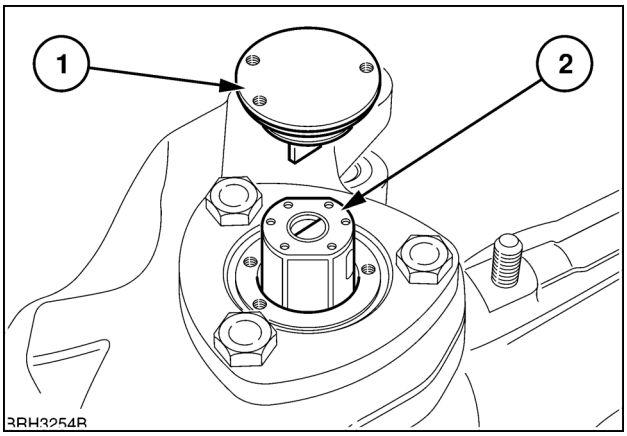


BAIL07APH587AVA 15

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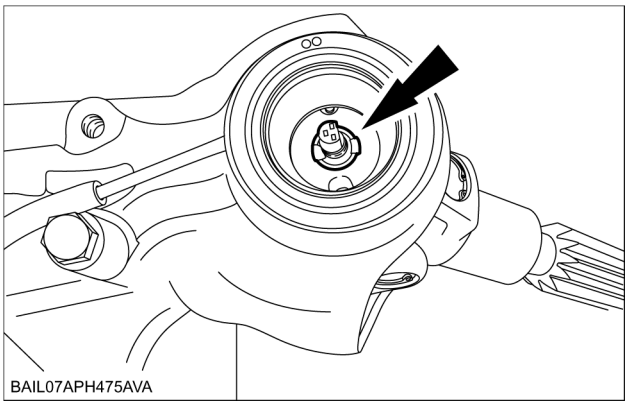
16. Remove the potentiometer cover plate **(1)**.
Remove the potentiometer **(2)**.

NOTE: *This step only applies to the right-hand hub.*



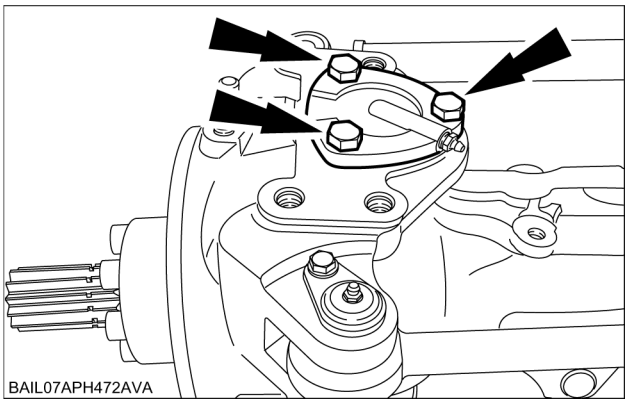
BRH3254B 16

NOTE: *When removing the right-hand side upper swivel pin assembly, take care to avoid damaging the steering sensor located within the housing.*



BAIL07APH475AVA 17

17. Remove the upper swivel pin retaining bolts. .



BAIL07APH472AVA 18

18. Remove the hub assembly.

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Hub - Install Four Wheel Drive Axle With Brakes

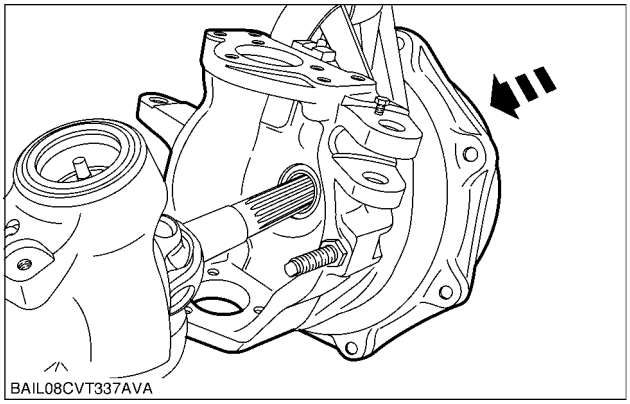
⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

1. Using suitable lifting equipment carefully install the drive shaft through the hub assembly.

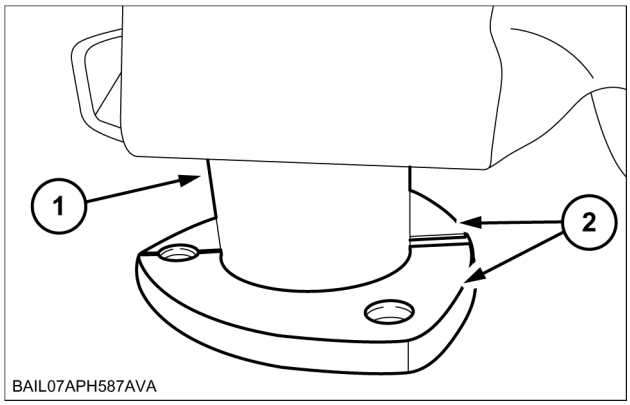
NOTE: *Care should be taken not to damage the oil seal.*



BAIL08CVT337AVA 1

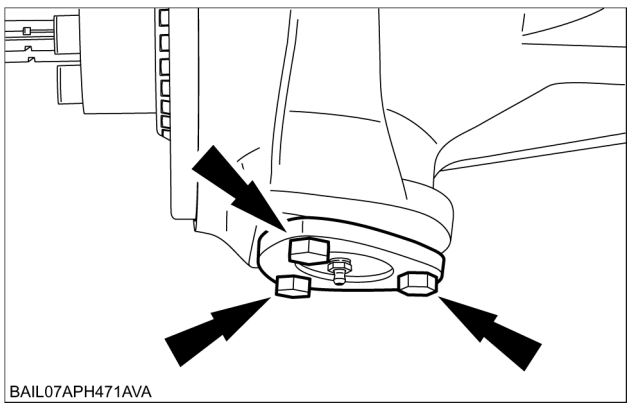
2. Partially install the lower swivel pin **(1)** and install the shims **(2)** as removed.

NOTE: *The swivel pin bearing pre-load should be checked after assembly of the swivel pins. Refer to* ***Hub Swivel pin and bearing - Preload (D.10.A)****.*



BAIL07APH587AVA 2

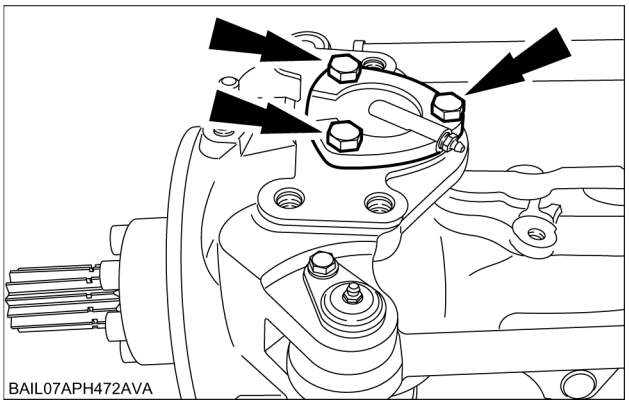
3. Install the lower swivel pin.
   Tighten to **188 Nm** (**139 lb ft**).



BAIL07APH471AVA 3

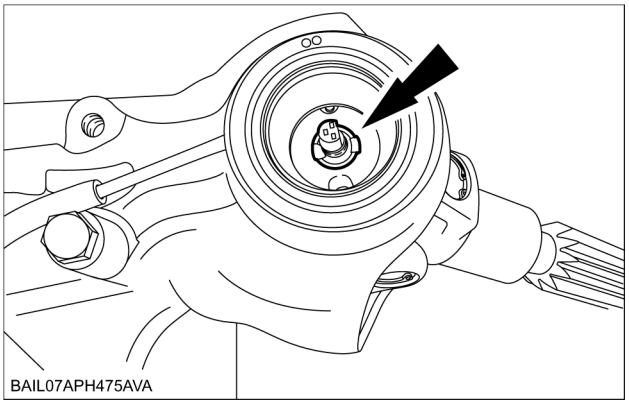
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4. Install the upper swivel pin.
Tighten to **188 Nm** (**139 lb ft**).



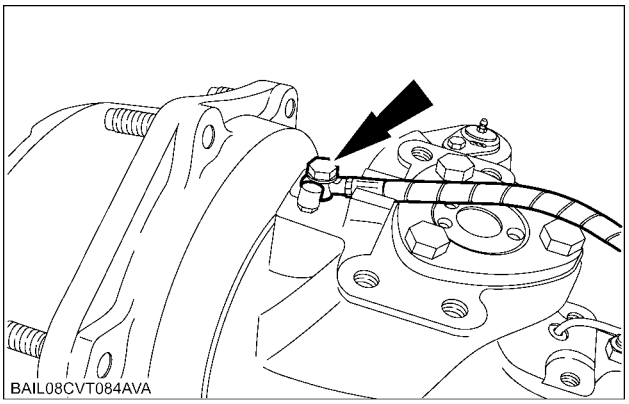
BAIL07APH472AVA 4

NOTE: *When installing the right-hand upper swivel pin assembly, take care to avoid damaging the steering sensor located within the housing.*



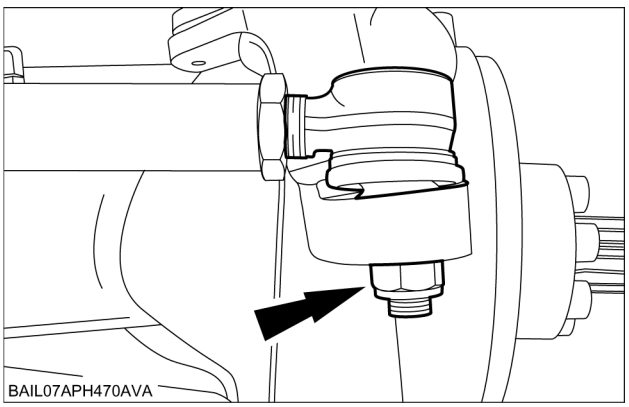
BAIL07APH475AVA 5

5. Connect the brake hose.



BAIL08CVT084AVA 6

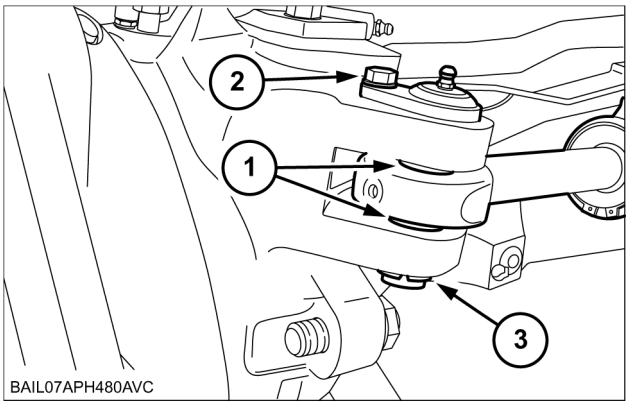
6. Connect the track rod end to the hub.
Tighten to **113 Nm** (**83 lb ft**).



BAIL07APH470AVA 7

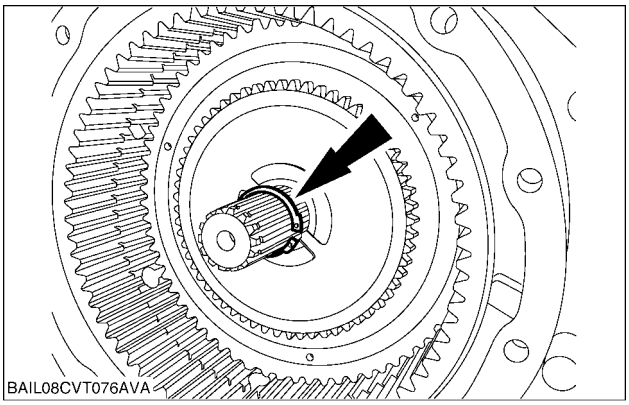
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7. Install the steering cylinder pivot pin, making sure that the spacers **(1)** are installed as removed.
Install the steering cylinder pivot pin retaining bolt **(2)**.
Install the circlip **(3)**.



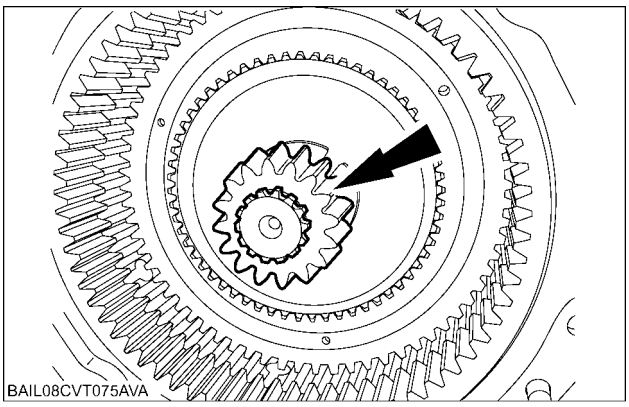
BAIL07APH480AVC 8

8. Install the inner circlip.



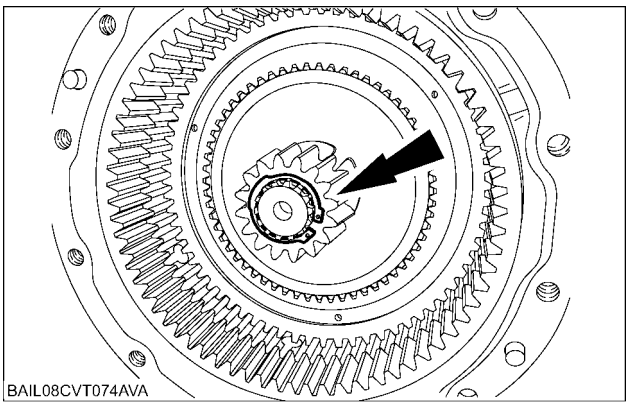
BAIL08CVT076AVA 9

9. Install the planetary drive gear.



BAIL08CVT075AVA 10

10. Install the planetary drive gear retaining circlip.

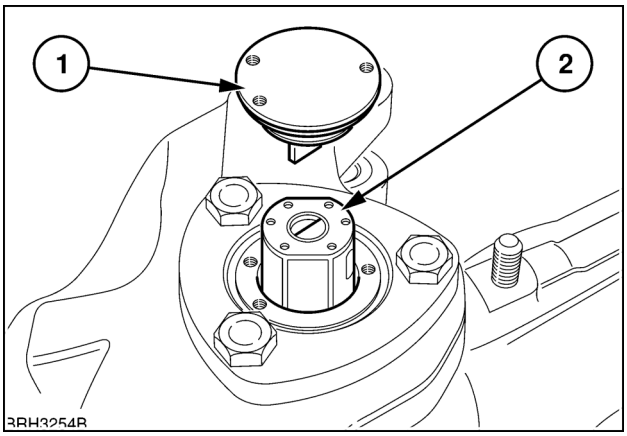


BAIL08CVT074AVA 11

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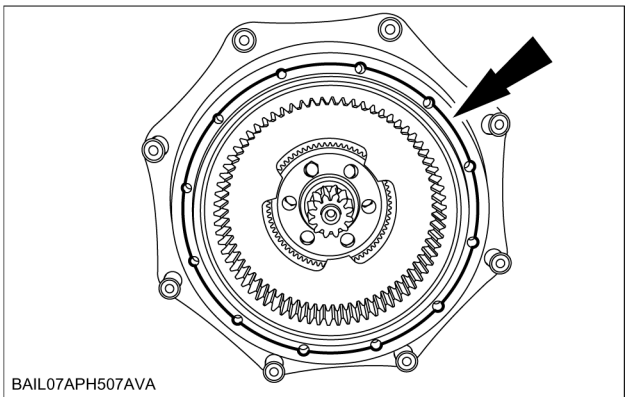
11. Install the potentiometer **(2)**.
Install the potentiometer cover plate **(1)**.

NOTE: *This step is for the right-hand side only.*



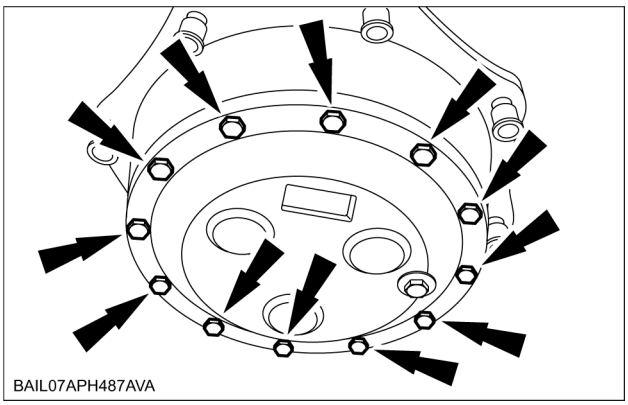
BRH3254B 12

12. Prior to installation of the planetary cover, thoroughly clean and degrease the mating surfaces and apply a **2 mm** bead of flexible sealing gasket.



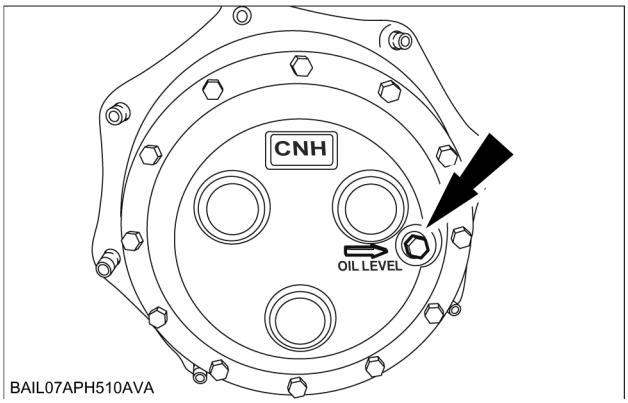
BAIL07APH507AVA 13

13. Install the hub end plate and the planetary gears assembly.
Tighten to **130 Nm** (**96 lb ft**).



BAIL07APH487AVA 14

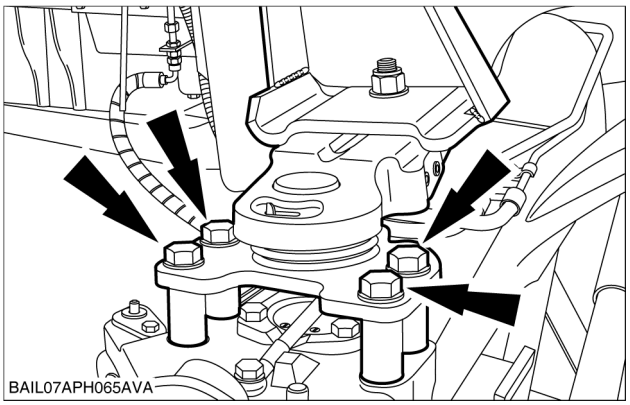
14. Rotate the hub so that the filler/level plug is in the horizontal position.
Remove the plug and refill the hub to the level with oil to the correct specification.
Reinstall the filler/level plug and tighten to **74 Nm** (**55 lb ft**).



BAIL07APH510AVA 15

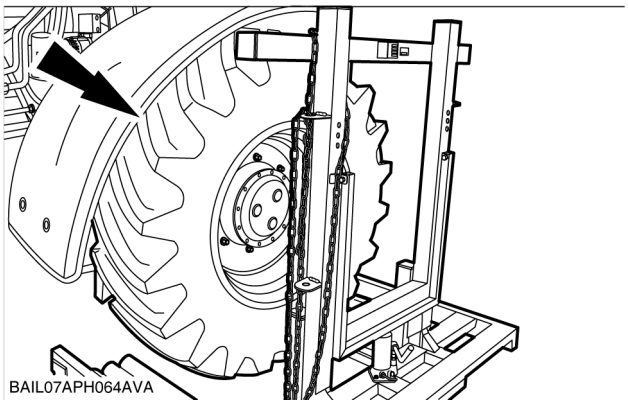
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15. Install the dynamic front fender (if equipped).



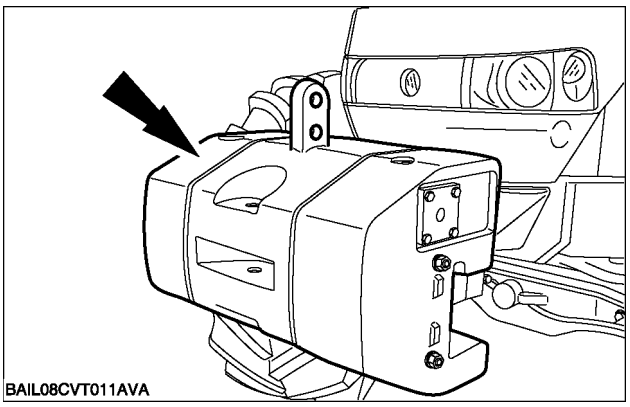
BAIL07APH065AVA 16

16. Install the front wheel.
Tighten the wheel nuts to the specified torque, for further information refer to **Front wheel - Torque (D.50.C)**.



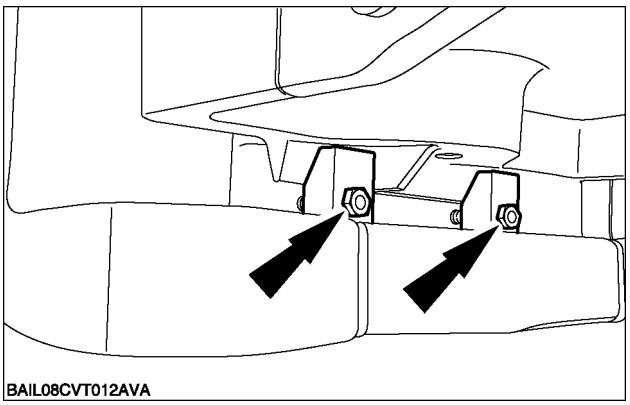
BAIL07APH064AVA 17

17. Using suitable lifting equipment install the front weights onto the weight carrier..



BAIL08CVT011AVA 18

18. Secure the front weights to the weight carrier.



BAIL08CVT012AVA 19

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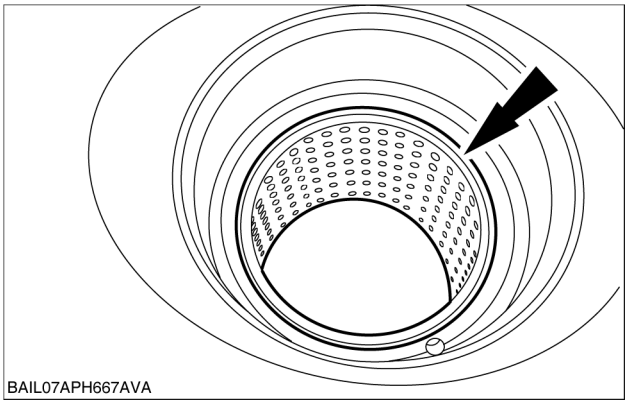
Hub - Assemble

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

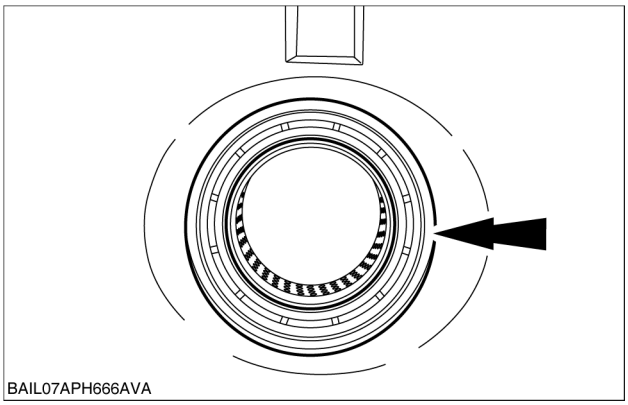
B012

1. Using a suitable tool, install the brass lubricating bushing into hub carrier.



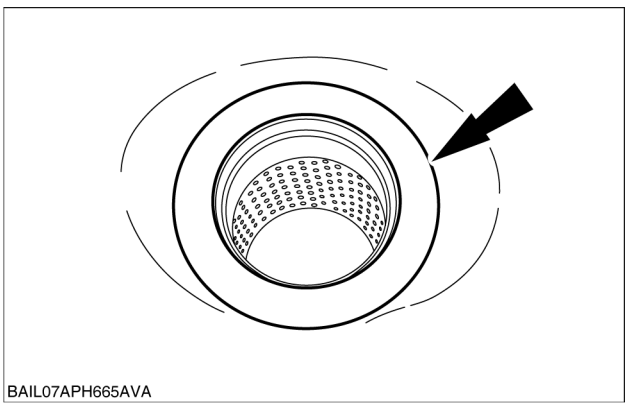
BAIL07APH667AVA 1

2. Using a suitable tool, install the cassette seal.



BAIL07APH666AVA 2

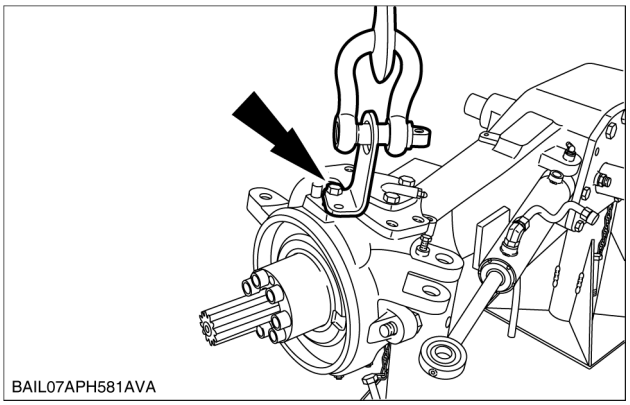
3. Using a suitable tool, install the brass protection washer.



BAIL07APH665AVA 3

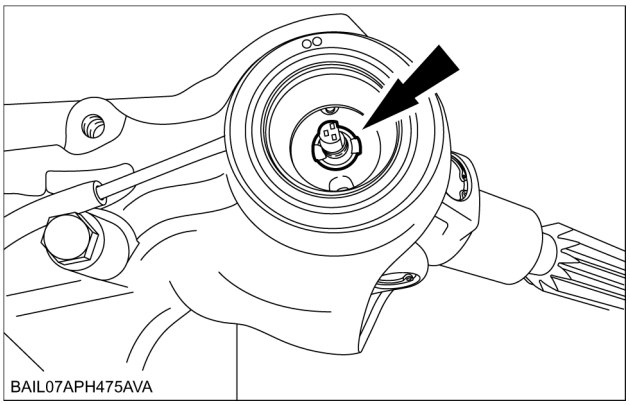
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4. Using suitable lifting equipment, support the hub carrier.
Install the hub carrier assembly.



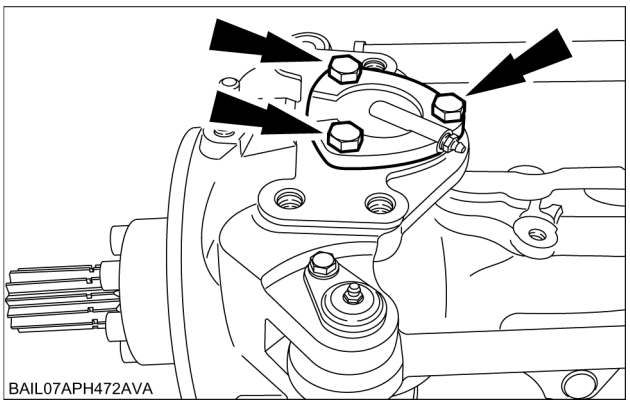
BAIL07APH581AVA 4

NOTE: *When installing the right-hand side upper swivel pin assembly, take care to avoid damaging the steering sensor located within the housing.*



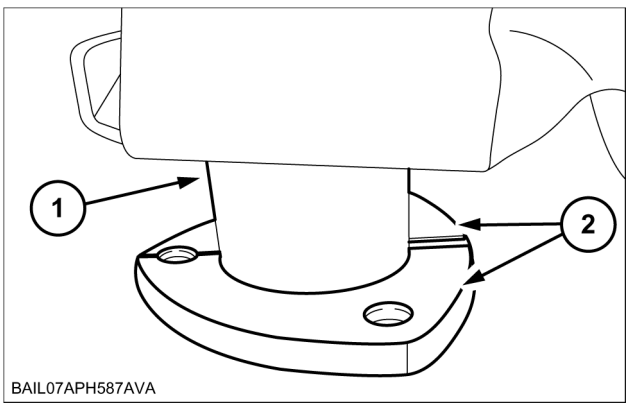
BAIL07APH475AVA 5

5. Install the upper swivel pin.
Install the upper swivel pin retaining bolts.



BAIL07APH472AVA 6

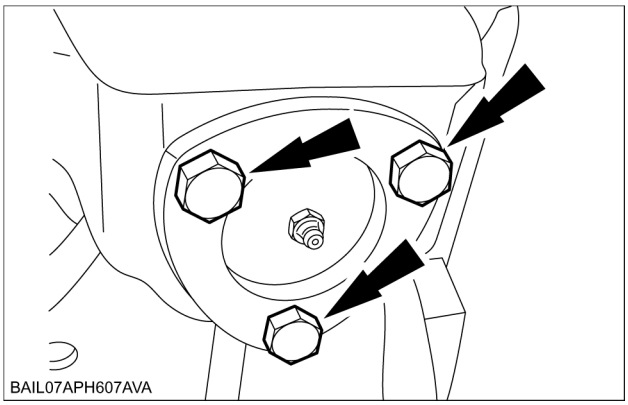
6. Install the lower swivel pin **(1)** and the shims **(2)** as removed.



BAIL07APH587AVA 7

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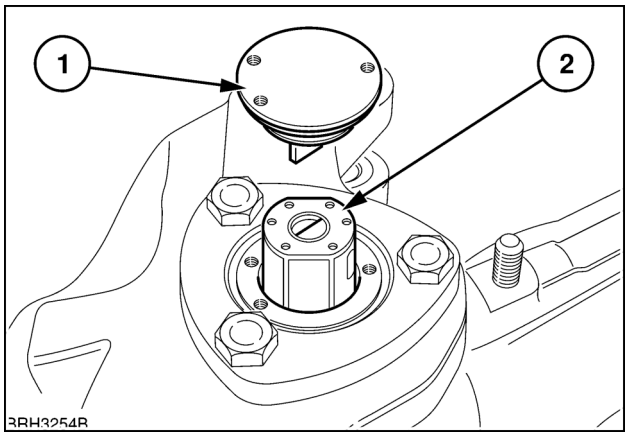
7. Install the lower swivel pin retaining bolts.



BAIL07APH607AVA 8

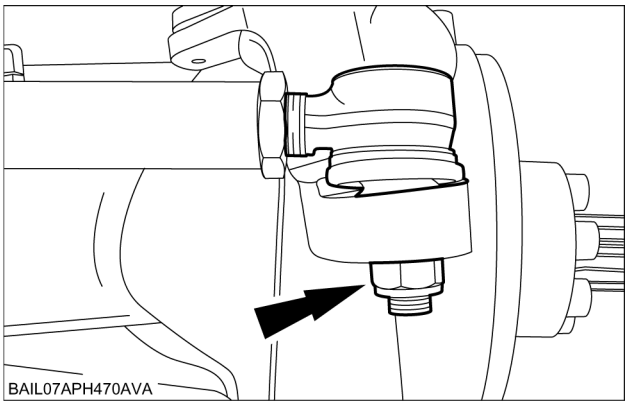
8. Install the potentiometer **(2)**.
Install the potentiometer cover plate **(1)**.

NOTE: *This step is for the right-hand side only.*



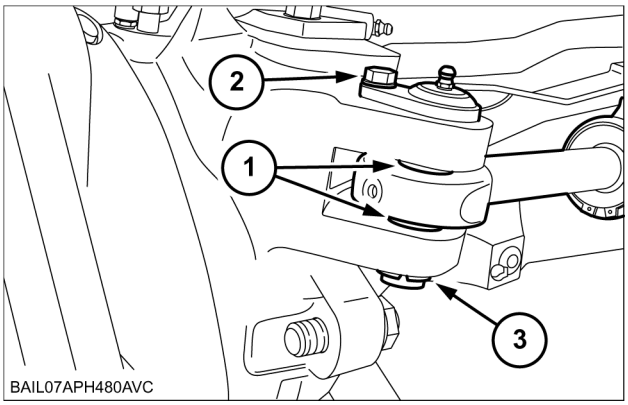
BRH3254B 9

9. Connect the track rod end to the hub.
Tighten to **113 Nm** (**83 lb ft**).



BAIL07APH470AVA 10

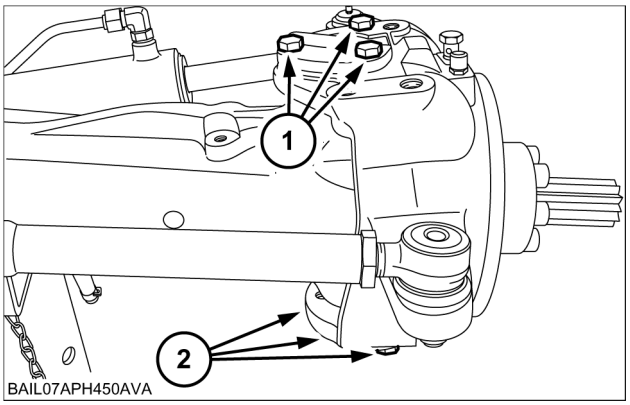
10. Install the steering cylinder pivot pin, making sure that the spacers **(1)** are installed as removed.
Install the steering cylinder pivot pin retaining bolt **(2)**.
Install the circlip **(3)**.



BAIL07APH480AVC 11

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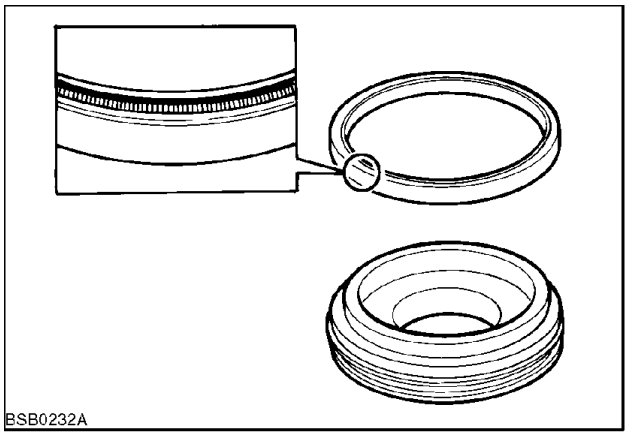
11. Tighten the upper **(1)** and lower **(2)** swivel pin retaining bolts to **130 Nm** (**96 lb ft**).



BAIL07APH450AVA 12

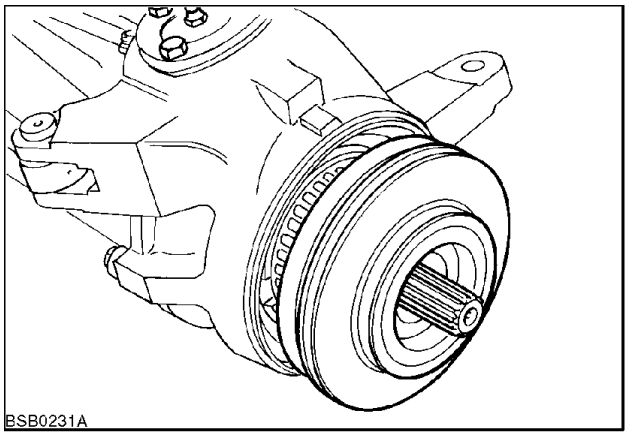
12. Position the new cassette oil seal onto the special tool **380002719**.

NOTE: *Make sure that the oil seal is positioned onto the special tool with the spiral ring visible.*



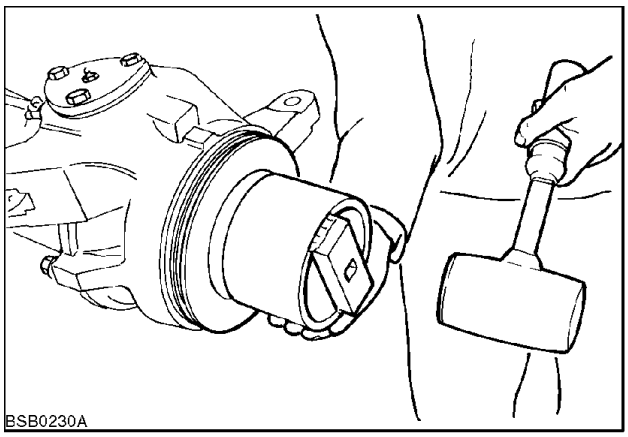
BSB0232A 13

13. Position the special tool **380200020** around the hub centre. With the cassette seal on the special tool **380002719**, slide the assembly forward over the splines until the oil seal locates in the housing.



BSB0231A 14

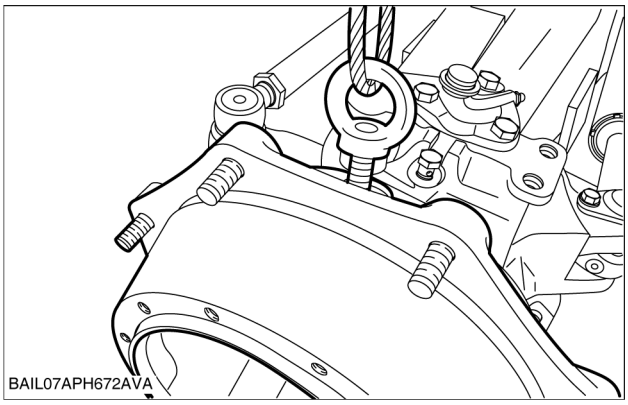
14. Using a suitable soft faced hammer and special tool **380200020**, install the oil seal into the housing.



BSB0230A 15

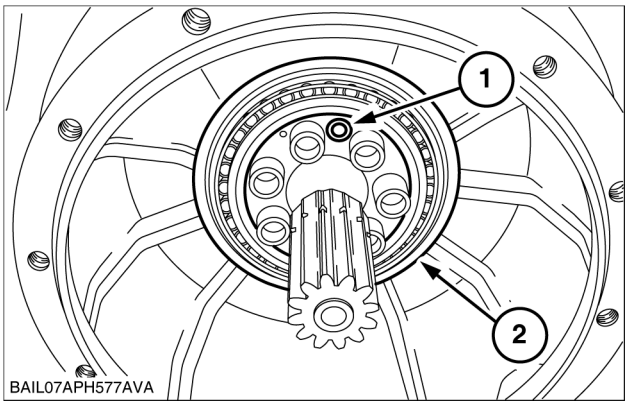
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15. Using suitable lifting equipment, support the hub.
Install the hub.



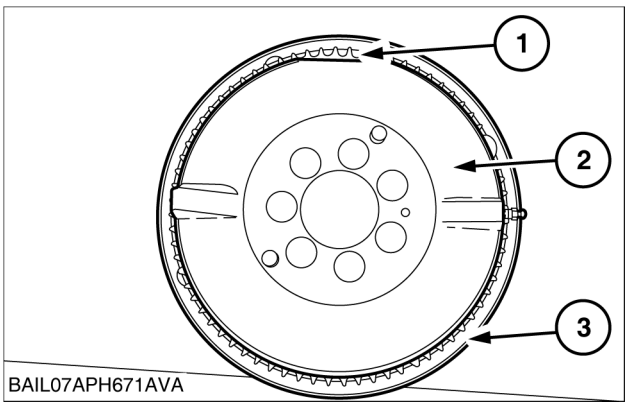
BAIL07APH672AVA 16

16. Install the oil seal **(1)**.
Using a suitable tool, install the bearing assembly **(2)**.



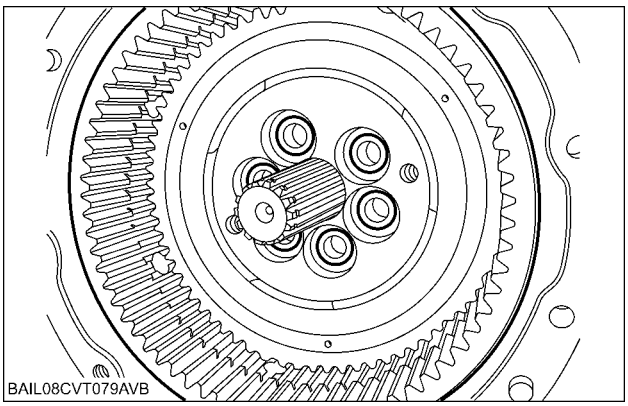
BAIL07APH577AVA 17

17. Install the brake piston **(1)** into the brake carrier **(2)** with new seals.
Install the snap ring **(3)**.



BAIL07APH671AVA 18

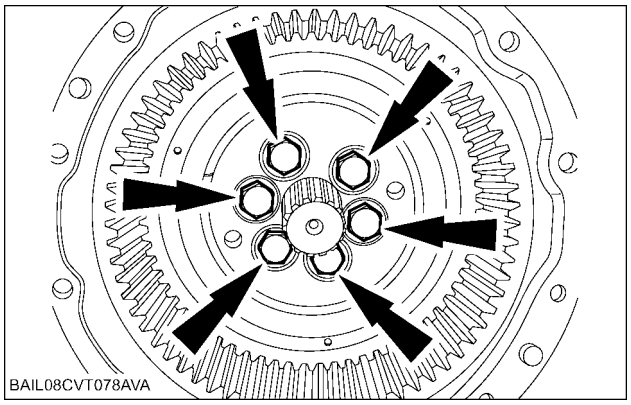
18. Install the brake carrier.



BAIL08CVT079AVB 19

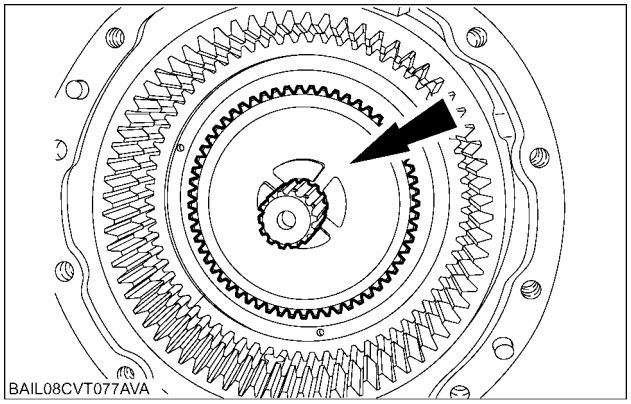
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19. Install the retaining bolts into the brake carrier and hub. Tighten to **267 Nm** (**196 lb ft**)



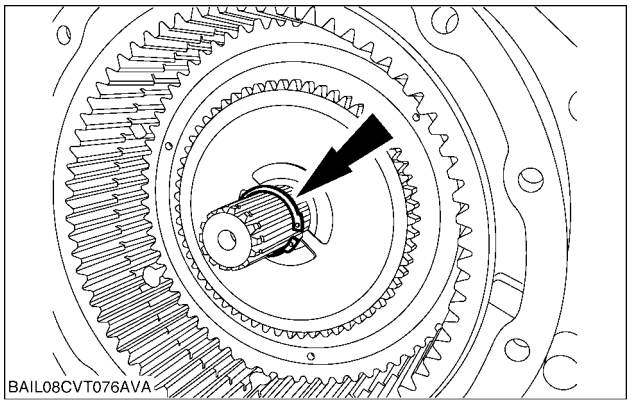
BAIL08CVT078AVA 20

20. Install the drive gear onto the drive shaft.



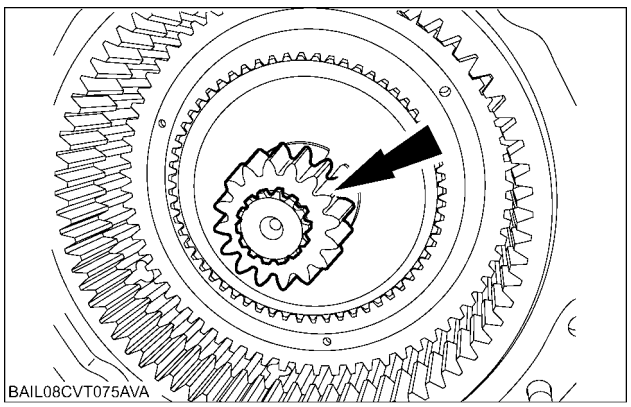
BAIL08CVT077AVA 21

21. Install the inner circlip



BAIL08CVT076AVA 22

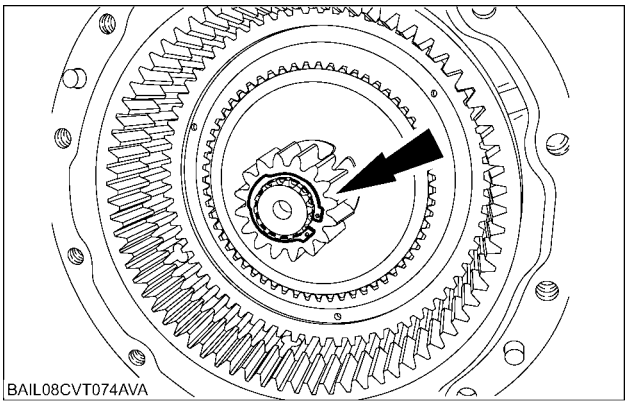
22. Install the planetary drive gear.



BAIL08CVT075AVA 23

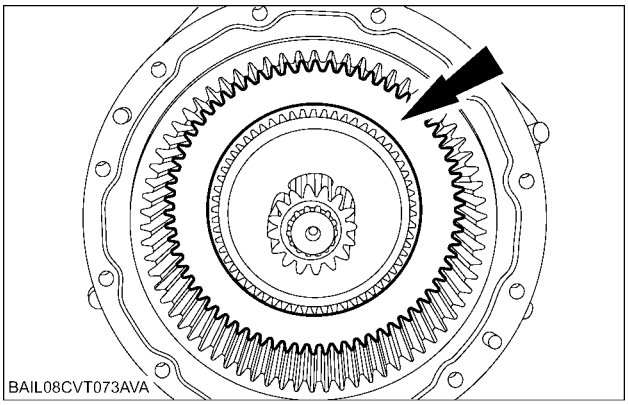
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23. Install the planetary drive gear retaining circlip.



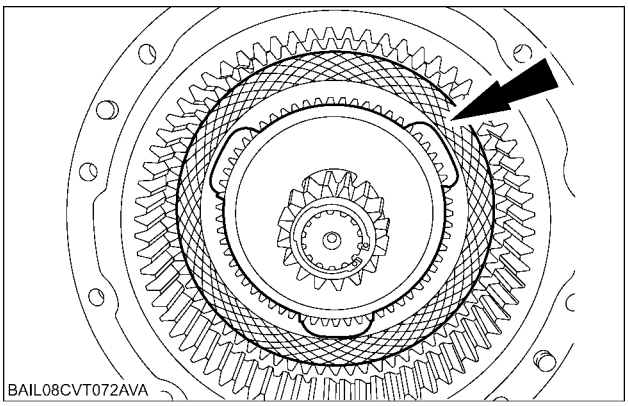
BAIL08CVT074AVA 24

24. Install the inboard steel brake disc.



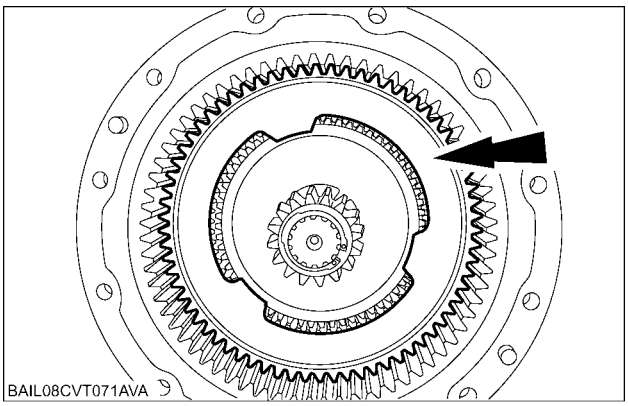
BAIL08CVT073AVA 25

25. Install the friction disc.



BAIL08CVT072AVA 26

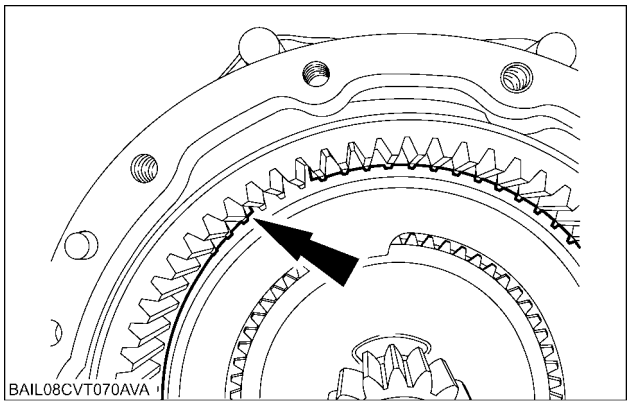
26. Install the outboard steel brake disc.



BAIL08CVT071AVA 27

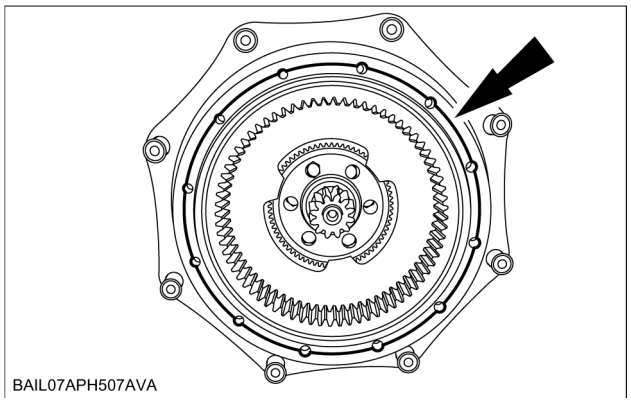
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27. Install the snap ring.



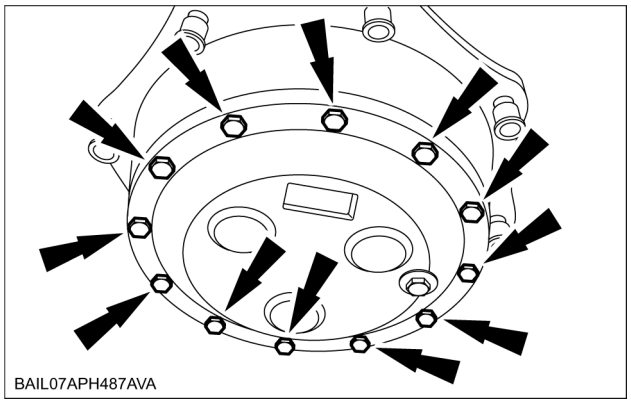
BAIL08CVT070AVA 28

28. Prior to installation of the planetary cover, thoroughly clean and degrease the mating surfaces and apply a **2 mm** bead of flexible sealing gasket.



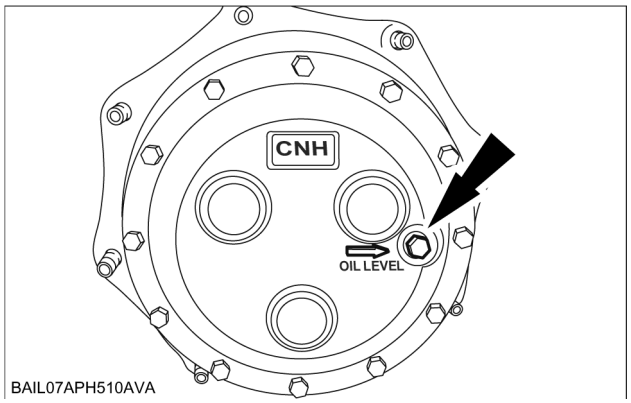
BAIL07APH507AVA 29

29. Install the hub end plate and the planetary gears assembly.
Tighten the retaining bolts to **74 Nm** (**55 lb ft**).



BAIL07APH487AVA 30

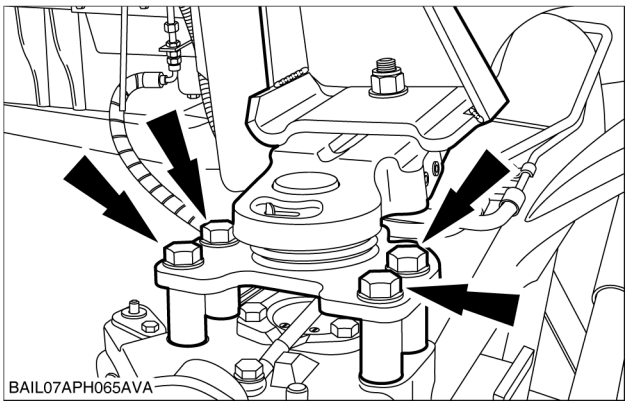
30. Rotate the hub so that the filler/level plug is in the horizontal position.
Remove the plug and refill the hub to the level with oil to the correct specification.
Reinstall the filler-level plug and tighten to **74 Nm** (**55 lb ft**).



BAIL07APH510AVA 31

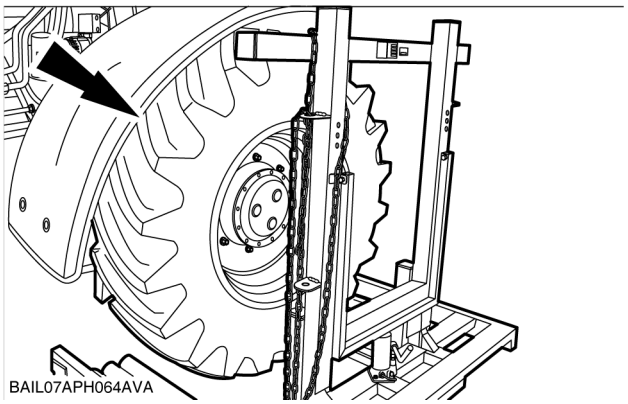
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31. Install the dynamic front fender (if equipped).



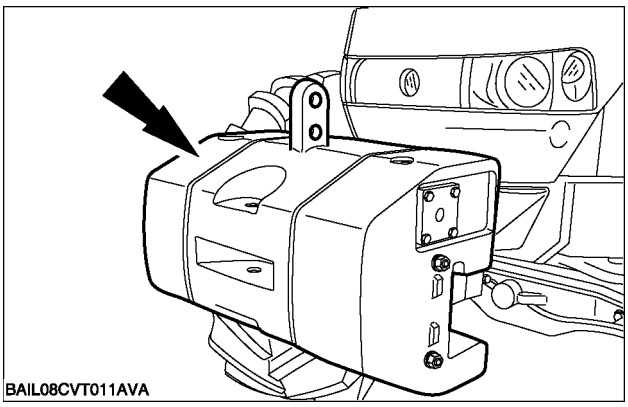
BAIL07APH065AVA 32

32. Install the front wheel.
Tighten the wheel nuts to the specified torque, for further information refer to **Front wheel - Torque (D.50.C)**.



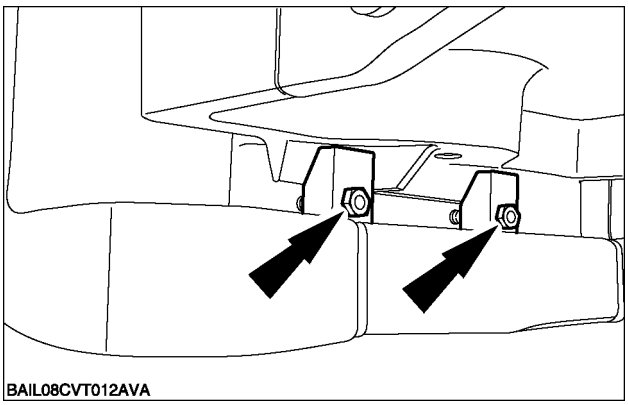
BAIL07APH064AVA 33

33. Using suitable lifting equipment, install the front weights.



BAIL08CVT011AVA 34

34. Secure the front weights to the front weight carrier.



BAIL08CVT012AVA 35

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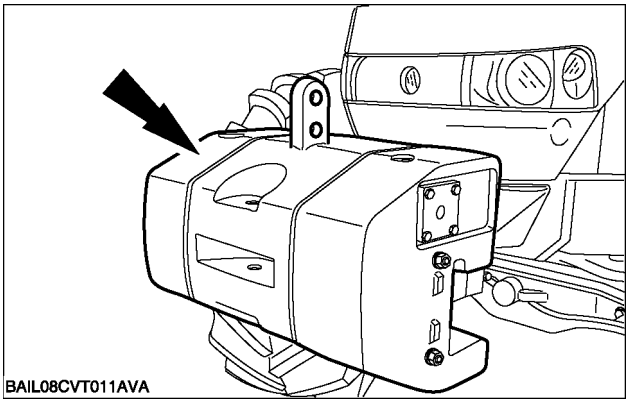
Hub - Disassemble

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

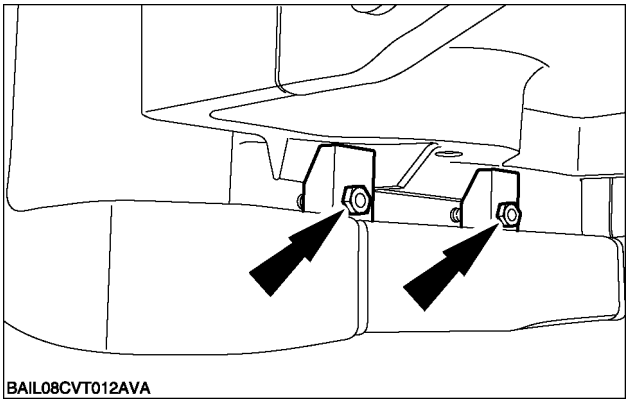
B012

1. Using suitable lifting equipment, support the front weights.



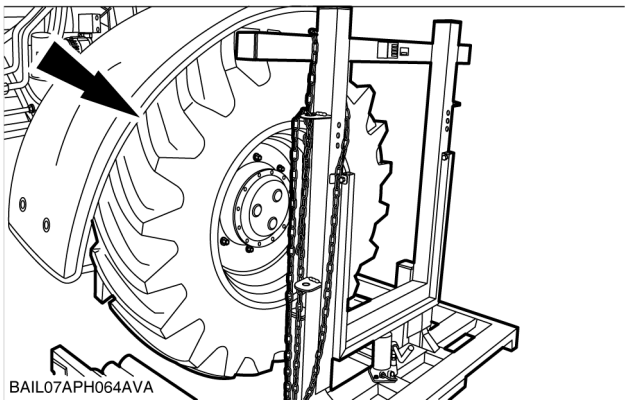
BAIL08CVT011AVA 1

2. Disconnect and remove the front weights from the weight carrier.



BAIL08CVT012AVA 2

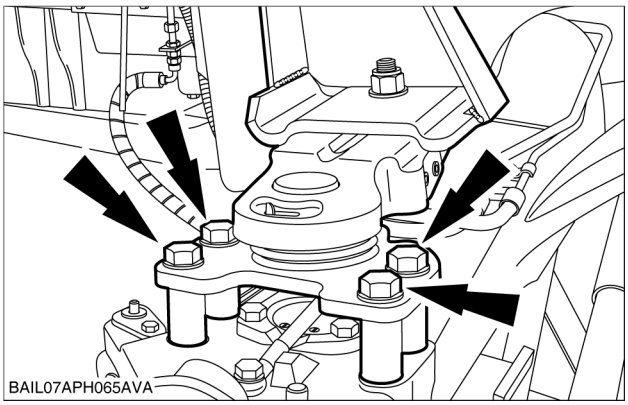
3. Raise the front of the vehicle and support with suitable axle stands under the front weight carrier. Remove the front wheel.



BAIL07APH064AVA 3

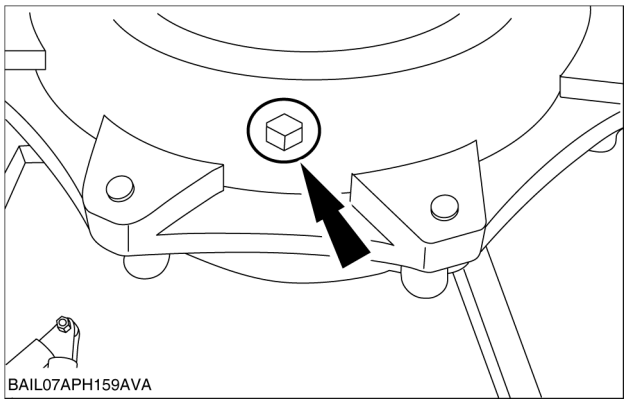
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4. Remove the dynamic front fender (if equipped).



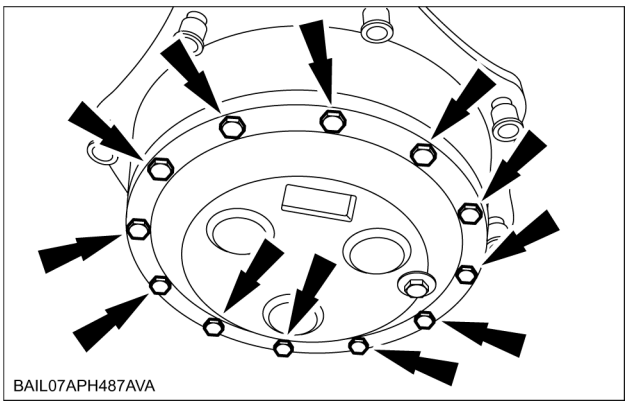
BAIL07APH065AVA 4

5. Rotate the hub until the drain plug is at the lowest point. Remove the axle hub drain plug and drain the hub oil into a suitable container.
Reinstall the drain plug and tighten to **75 Nm** (**55 lb ft**).



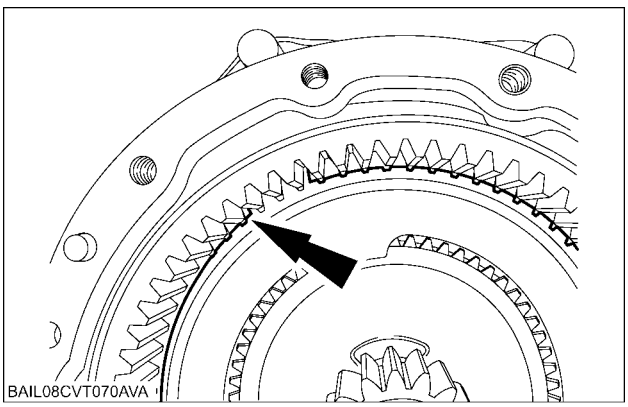
BAIL07APH159AVA 5

6. Remove the hub end plate and the planetary gears assembly.



BAIL07APH487AVA 6

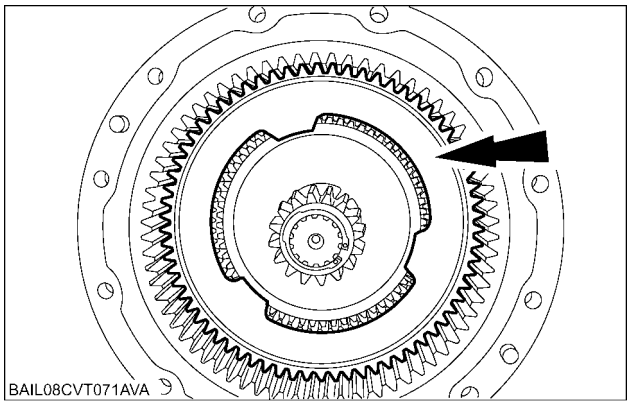
7. Remove the snap ring.



BAIL08CVT070AVA 7

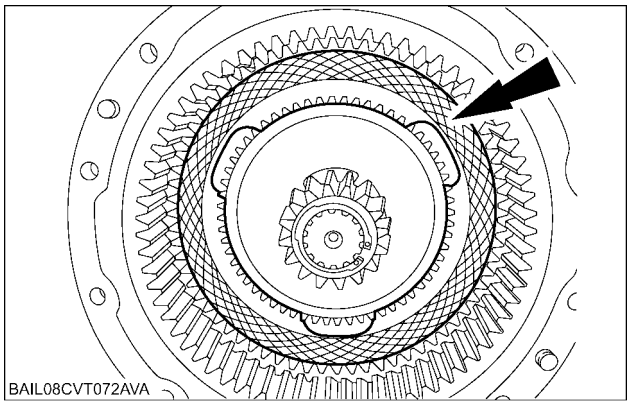
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8. Remove the outboard steel brake disc.



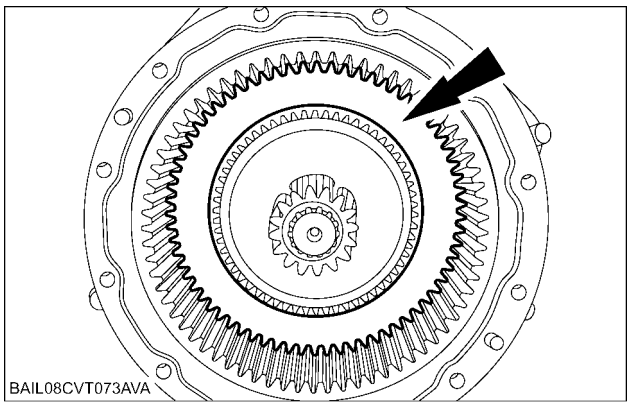
BAIL08CVT071AVA 8

9. Remove the friction disc.



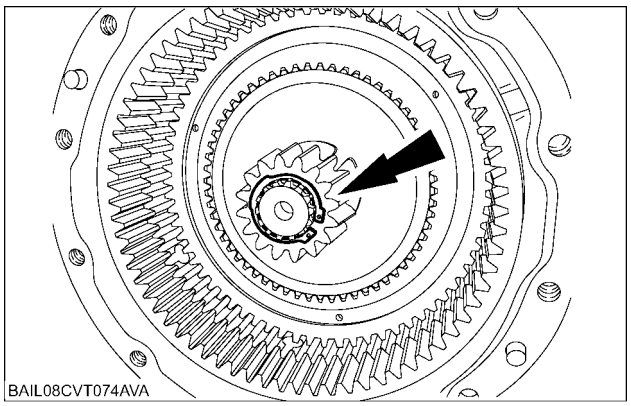
BAIL08CVT072AVA 9

10. Remove the inboard steel brake disc.



BAIL08CVT073AVA 10

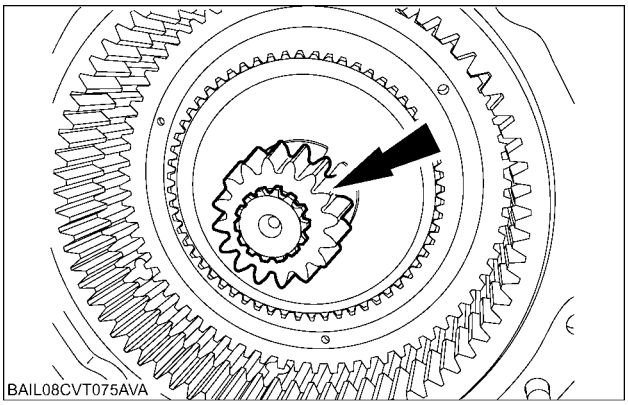
11. Remove the outer drive gear retaining circlip.



BAIL08CVT074AVA 11

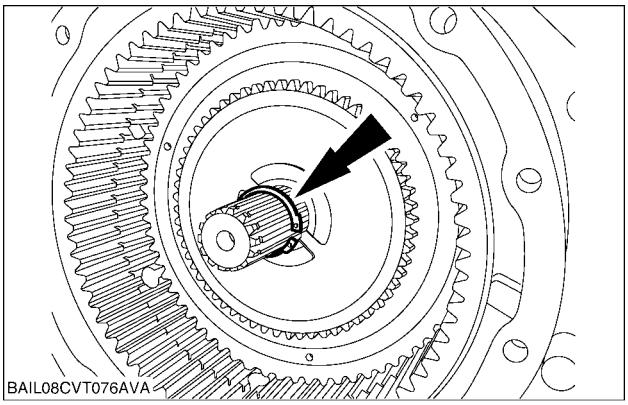
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12. Remove the planetary drive gear.



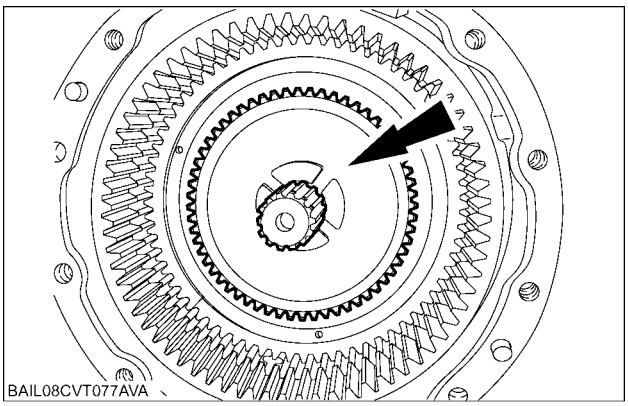
BAIL08CVT075AVA 12

13. Remove the inner circlip.



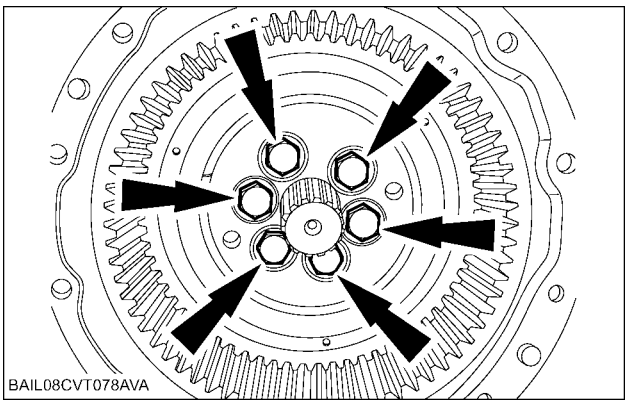
BAIL08CVT076AVA 13

14. Remove the drive gear.



BAIL08CVT077AVA 14

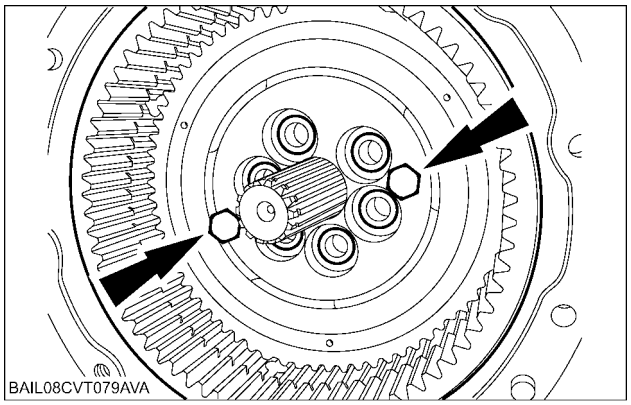
15. Remove the brake carrier retaining bolts.



BAIL08CVT078AVA 15

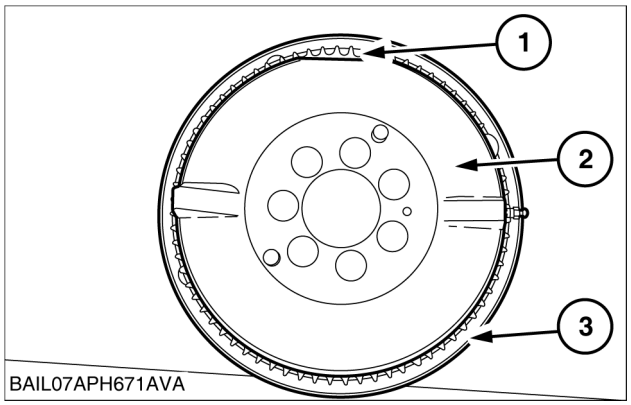
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16. Install 2 bolts, 12 mm x 1.5 x 50 mm long into the threaded holes in the back plate.
Tighten the bolts and remove the brake carrier.



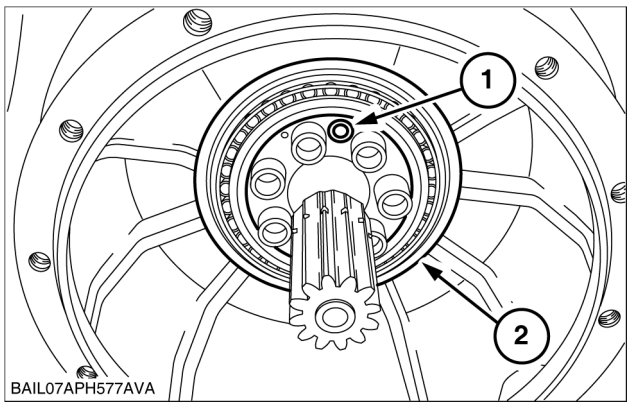
BAIL08CVT079AVA 16

17. Remove the snap ring **(1)**.
Remove the brake piston **(2)** from the brake disc carrier **(3)**.



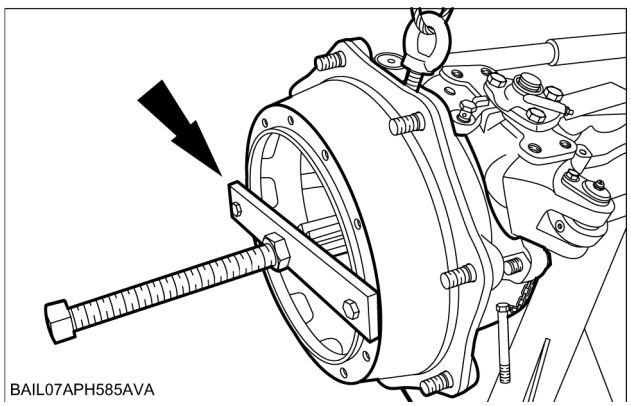
BAIL07APH671AVA 17

18. Remove the oil seal **(1)**.
Remove the bearing assembly **(2)**.



BAIL07APH577AVA 18

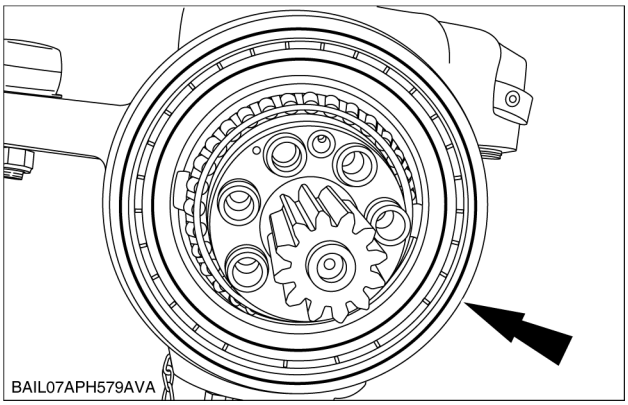
19. Using suitable lifting equipment, support the hub.
Using a suitable puller, remove the hub.



BAIL07APH585AVA 19

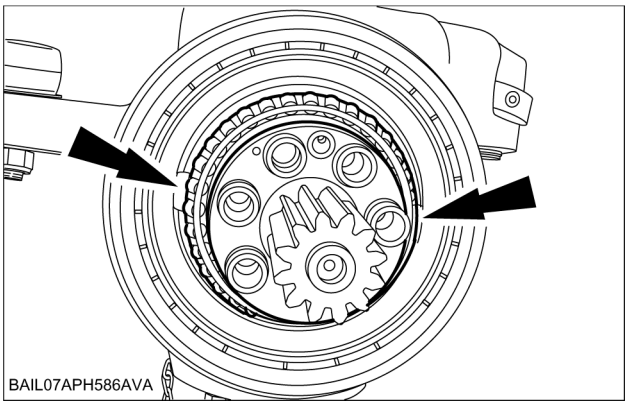
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20. Remove the cassette seal.



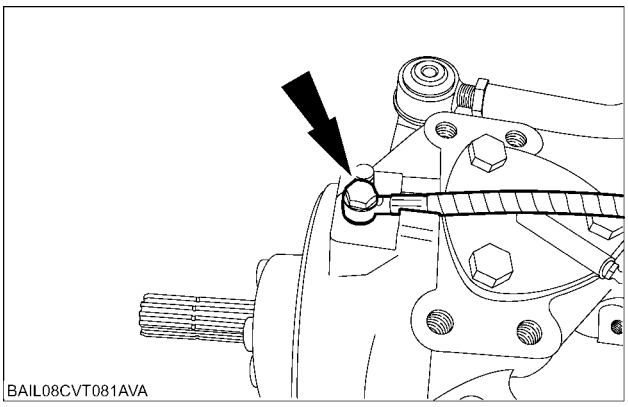
BAIL07APH579AVA 20

21. Using a suitable puller, remove the bearing.



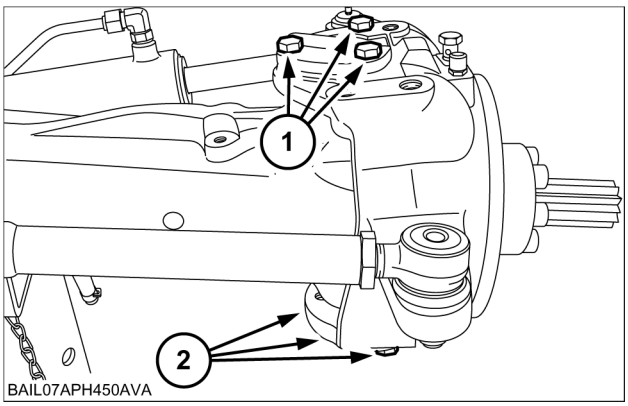
BAIL07APH586AVA 21

22. Disconnect the brake hose.



BAIL08CVT081AVA 22

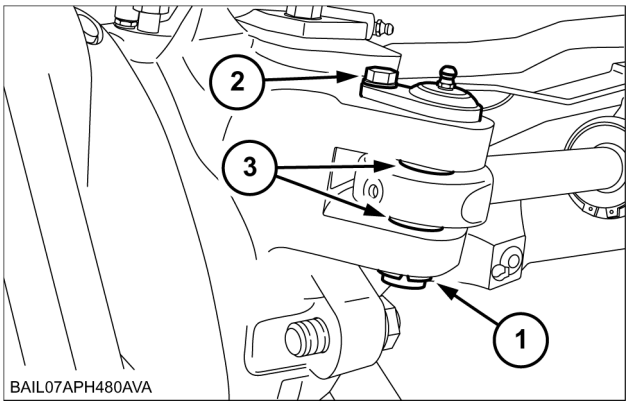
23. Loosen the upper **(1)** and lower **(2)** swivel pin retaining bolts.



BAIL07APH450AVA 23

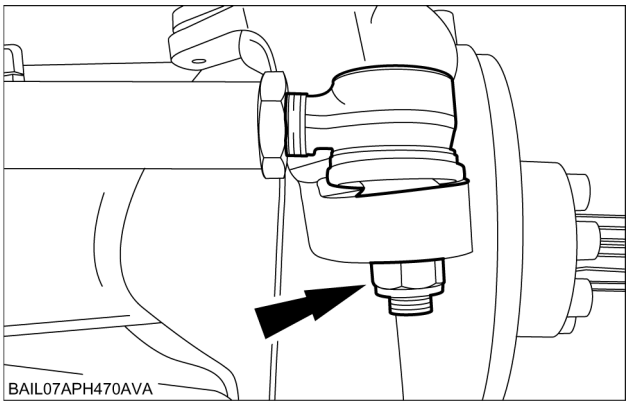
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24. Remove the circlip **(1)**.
Remove the steering cylinder pivot pin retaining bolt **(2)**.
Support the steering cylinder.
Remove the pivot pin and retrieve the spacers **(3)**.



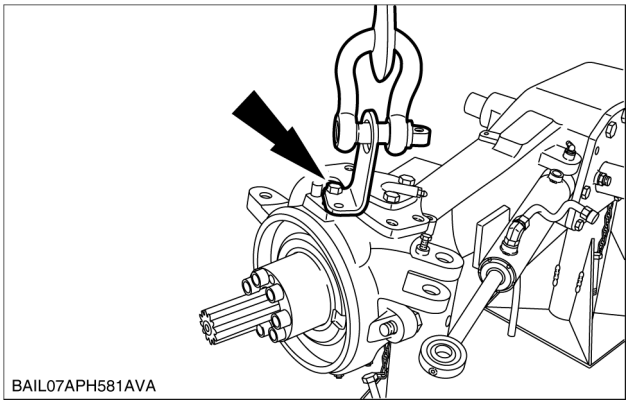
BAIL07APH480AVA 24

25. Disconnect the track rod from the hub carrier.



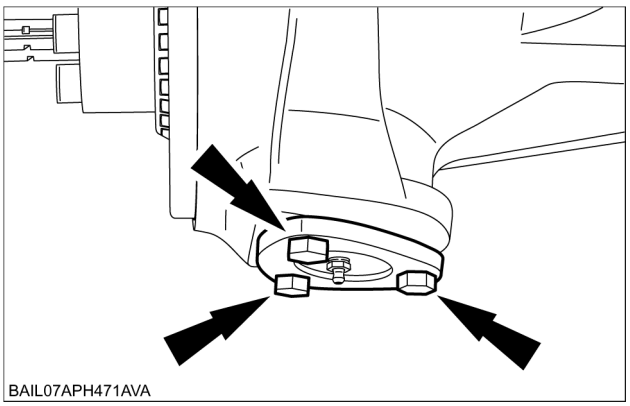
BAIL07APH470AVA 25

26. Using suitable lifting equipment support the hub carrier.



BAIL07APH581AVA 26

27. Remove the lower swivel pin retaining bolts.

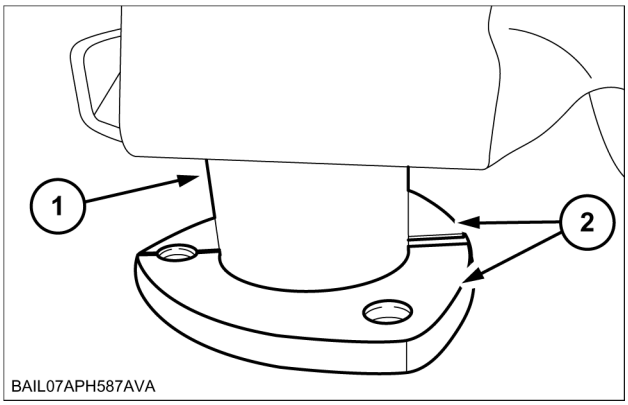


BAIL07APH471AVA 27

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28. Remove the lower swivel pin **(1)**.

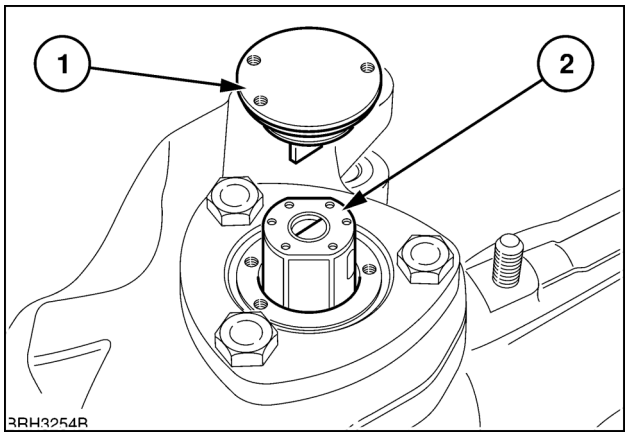
NOTE: *Note the number of shims removed* ***(2)****.*



BAIL07APH587AVA 28

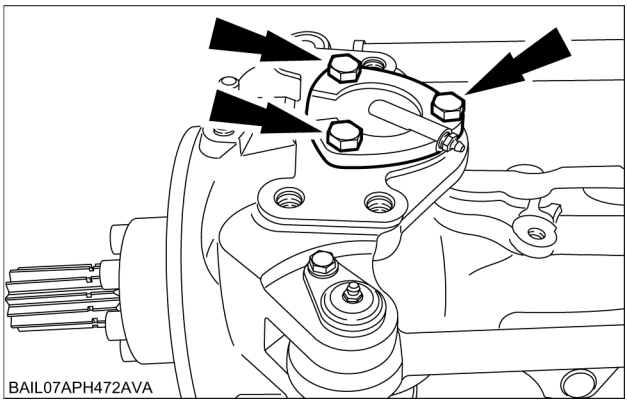
29. Remove the potentiometer cover plate **(1)**.
Remove the potentiometer **(2)**.

NOTE: *This step is for the right-hand side only.*



BRH3254B 29

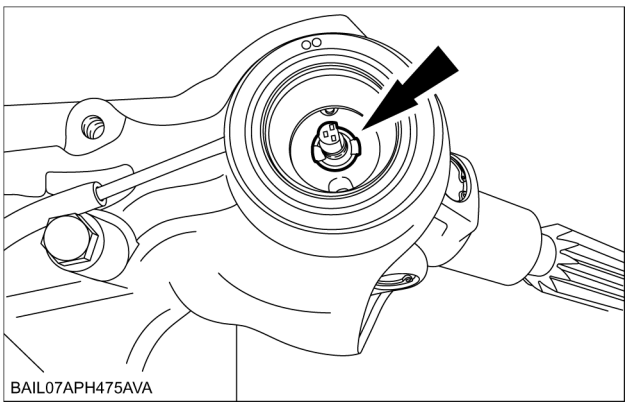
30. Remove the upper swivel pin retaining bolts.
Remove the upper swivel pin.



BAIL07APH472AVA 30

31. When removing the right-hand upper swivel pin assembly take care to avoid damaging the steering sensor located in this housing.

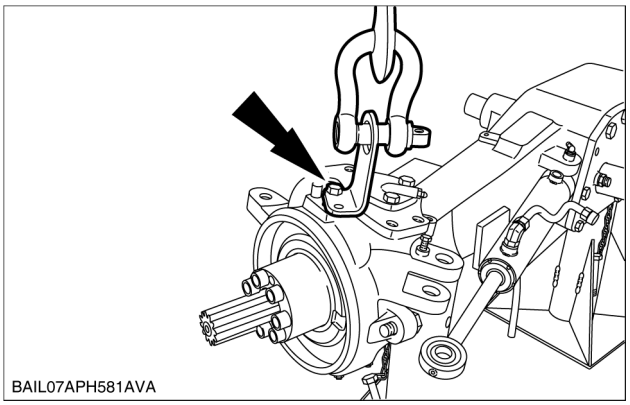
NOTE: *This step is for the right-hand side only.*



BAIL07APH475AVA 31

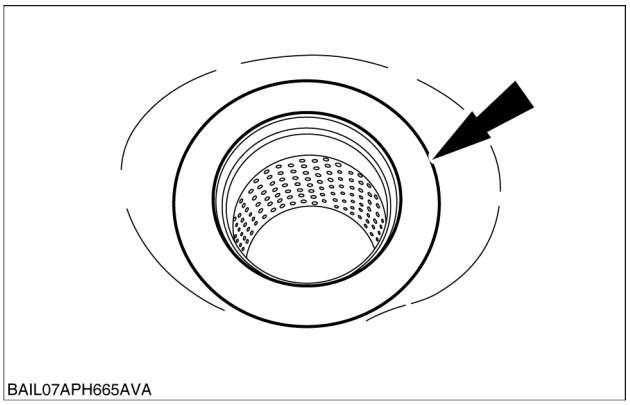
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32. Remove the hub carrier assembly.



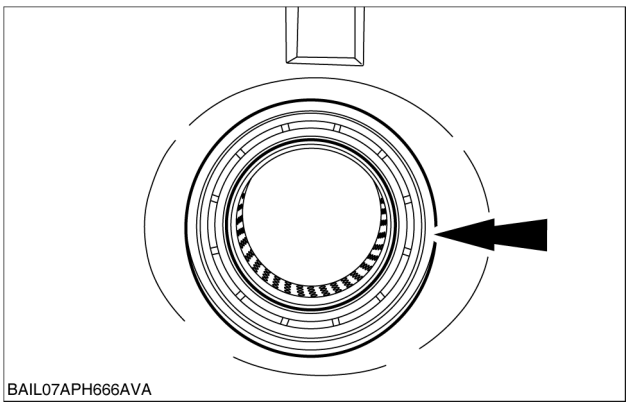
BAIL07APH581AVA 32

33. Remove the brass protection washer from the hub carrier.



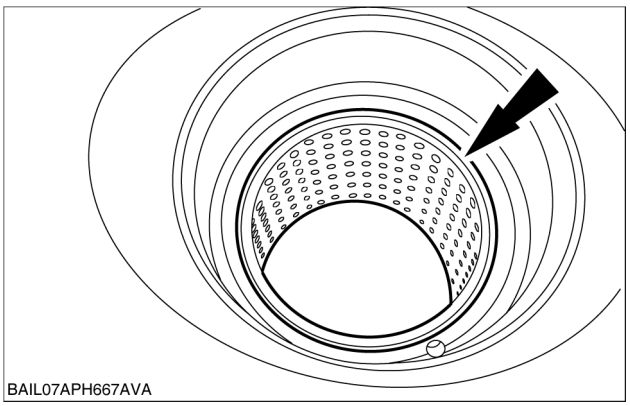
BAIL07APH665AVA 33

34. Remove the cassette seal.



BAIL07APH666AVA 34

35. Remove the brass lubricating bushing.



BAIL07APH667AVA 35

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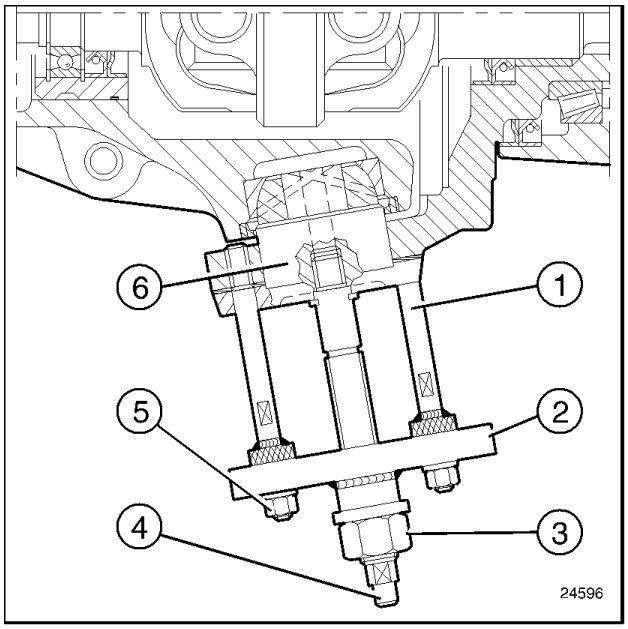
Hub Swivel pin and bearing - Overhaul Four Wheel Drive Axle

STEERING SWIVEL PINS AND BEARINGS - Less Steering Angle Potentiometer

Replacement

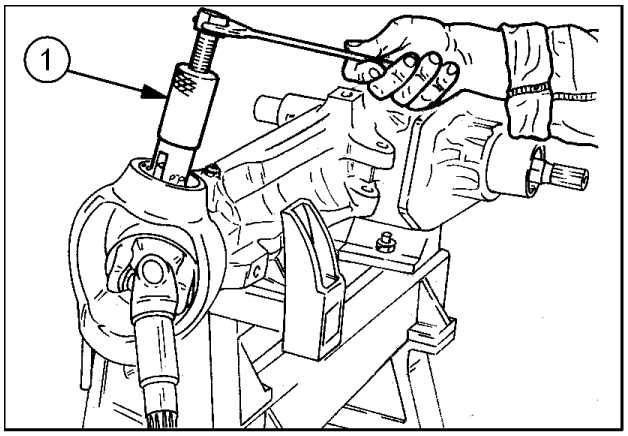
Prior operation:
Hub - Remove (D.10.A).

1. In the event that the steering swivel pins prove difficult to remove, proceed as follows.
   Remove the grease nipples and the steering swivel pin retaining bolts.
   Fit the bolts **(1)** of the special tool **380000265** .
   Fit the plate **(2)** of the special tool and fix it to the three bolts with nuts **(5)**.
   Fit the central tie bolt **(4)** screwing it fully into the grease nipple bore on the pin **(6)**.
   Screw in the nut **(3)** to drive the pin out of its bore.



24596 1

2. Using the extractor special tool **380000234 (1)** remove the steering swivel bearings.
   Reinstall the steering swivel bearings using a suitable drift.



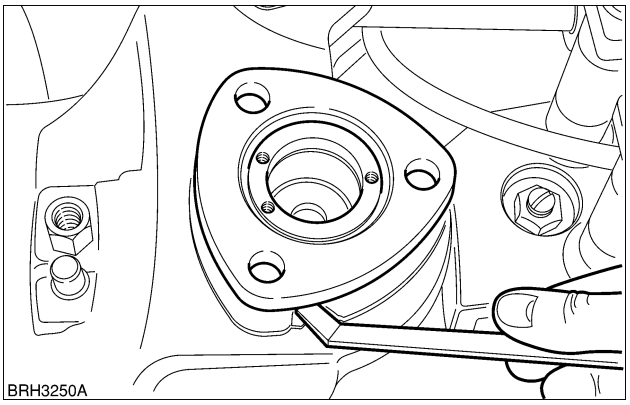
1b0o2004061038 2

Steering Swivel Pins and Bearings - With steering angle potentiometer

3. Remove the steering angle potentiometer, refer to **Sensing system - Replace (D.10.A)**.

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4. In the event that the steering swivel pins prove difficult to remove, remove the 3 steering swivel retaining bolts. Using suitable pry bars located in the swivel housing casting slots, carefully lever the swivel pin from the housing.

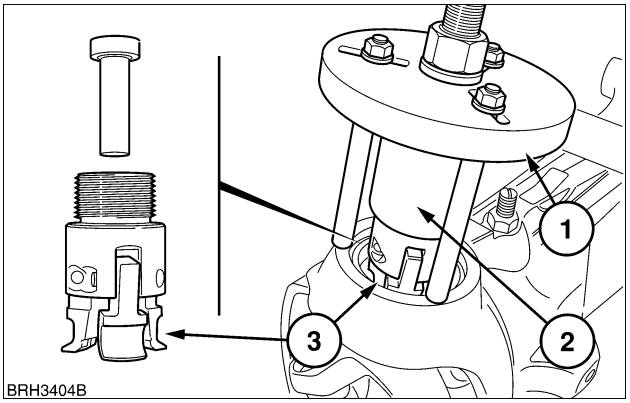


BRH3250A 3

5. Remove the swivel housing. For further information, refer to **Hub - Remove (D.10.A)**.

6. Remove the steering angle potentiometer shaft from the axle housing. For further information, refer to **Sensing system - Replace (D.10.A)**.

7. Using the bearing puller attachment of extractor, special tool **380000234 (3)** with adaptor tool, **380002489 (2)** couple these to special tool **380000265 (1)** and remove the steering swivel bearings.



BRH3404BB 4

8. Install the new steering swivel bearings using a suitable drift.

NOTE: *Take care when installing the bearings not to damage the special bearing coating.*

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Hub Swivel pin and bearing - Preload

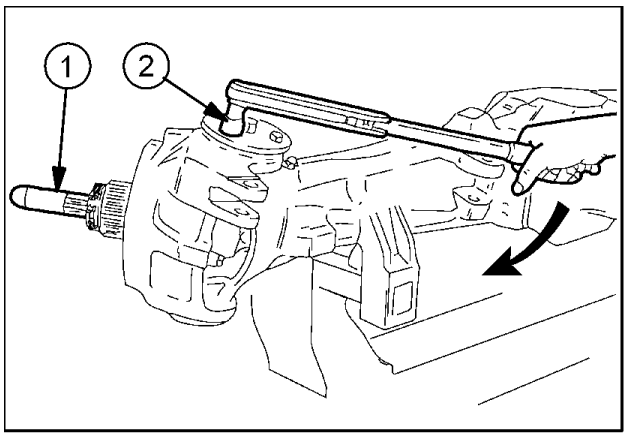
⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026

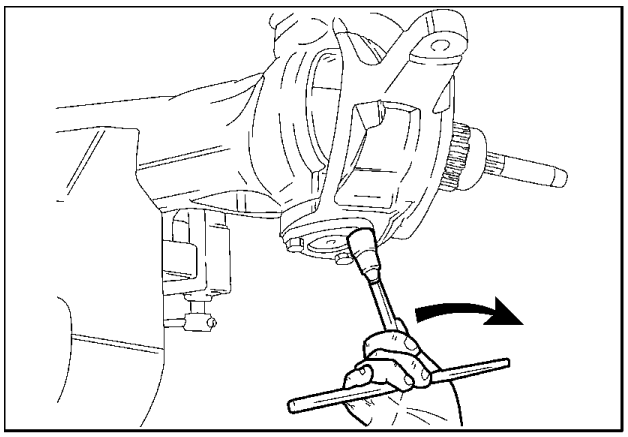
1. Apply grease **CASE AKCELA MOLY GREASE** on the outer races of the bearings and fit the upper cover, without the shims, and with special tool **380000235 (2)** attached. Torque the retaining bolts to the specified torque value of **130 Nm**.

NOTE: *To aid installation of the swivel pin, is is recommend that guide* ***380001143 (1)*** *is installed on the axle shaft.*



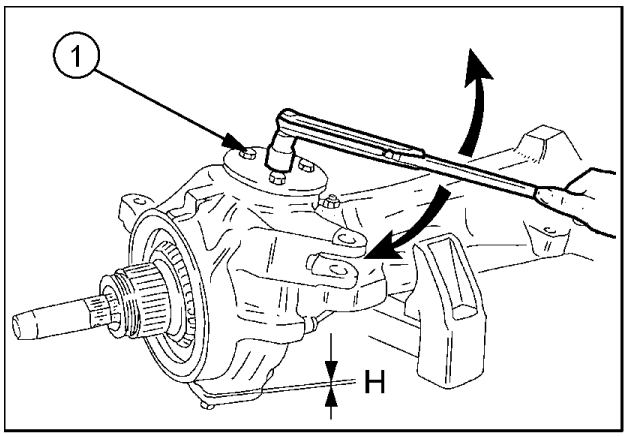
1b0o2004061039 1

2. Fit the lower cover without shims, lubricate the three retaining bolts with engine oil.
Gradually, tighten the lower cover bolts equally while rotating the casing to allow the excess grease to escape.



1b0o2004061040 2

3. Using a torque wrench and special tool **380000235 (1)**, check that the torque required to rotate the casing is **15 - 20 Nm**. Adjust the three lower bolts until the correct torque is achieved.
Measure the gap (H) created between the lower cover and the casing in three places.



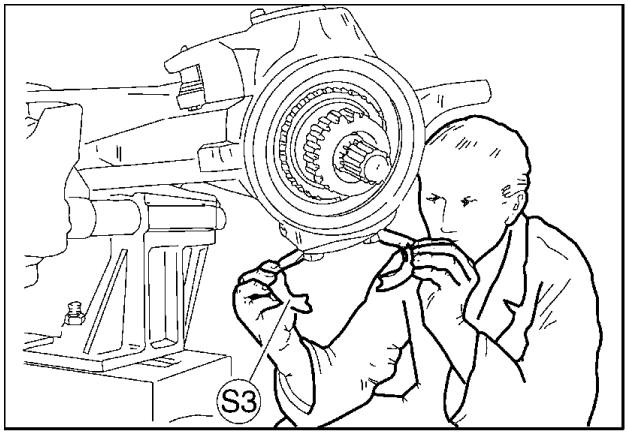
1b0o2004061041 3

4. Calculate the average of the three values measured. The total thickness of the adjustment shims to be fitted under the lower cover is Shim S3= H - **0.20 mm**
.
If necessary, round up the value to the next **0.05 mm**.

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5. Insert shims under lower swivel cover. Tighten the retaining bolts to the specified torque value of **113 Nm**.

6. After having rotated the casing a few times to allow the components to bed down, check that the torque necessary to rotate the casing is **118 - 147 Nm**.
If the torque value measured is greater than the specified value, increase the thickness of the shims, if it is less than the specified value, reduce the thickness of the shims.
Remove the special tool **380000235** , fit the grease nipples in the upper and lower covers and grease the assembly.



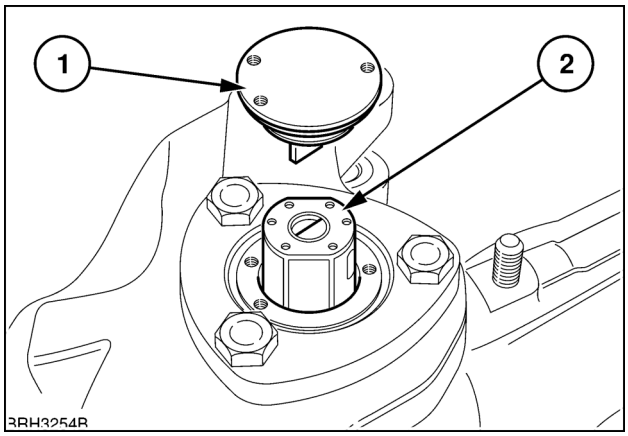
1b0o2004061042 4

Next operation:
Tie rod - Toe in adjust (D.20.C)

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Sensing system - Replace

1. To replace the potentiometer sensor unit only, remove the potentiometer retaining plate **(1)** and withdraw the potentiometer **(2)** from the axle swivel housing.



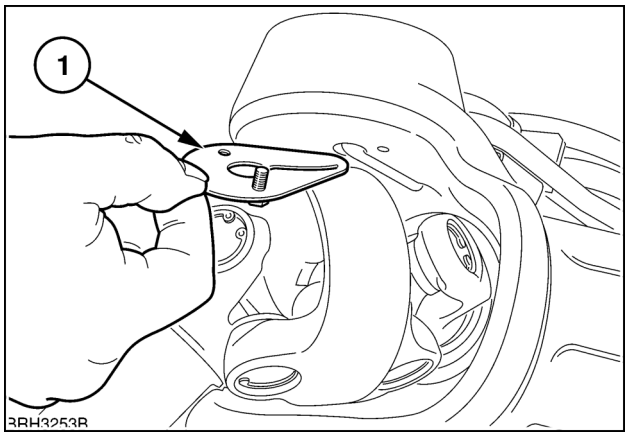
BRH3254B 1

2. Refit the potentiometer ensuring that the 'D' drive of the shaft and potentiometer are correctly aligned.
3. Check the sealing ring of the retaining plate is in good condition and refit the retaining plate

NOTE: *Calibration of the steering angle sensor must then be carried out. Refer to* ***FRONT AXLE - Calibrate (D.10.A)****.*

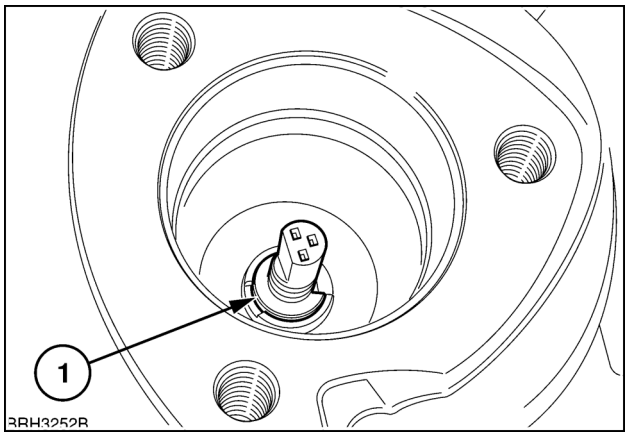
Potentiometer shaft and wiring replacement

4. With the swivel housing and axle shaft removed, refer to **Hub - Remove (D.10.A)**, carefully remove the electrical connector from the potentiometer wiring. Remove the wire retaining plate **(1)** and pull the potentiometer shaft and wiring up through the top of the axle housing.



BRH3253B 2

5. Install the new potentiometer shaft (1) and wiring through the axle hole and locate as shown in Figure **3**. Refit the wire retaining plate and ensure the rubber grommet for the wiring is correctly installed into the housing. Reconnect the wiring to the connector.

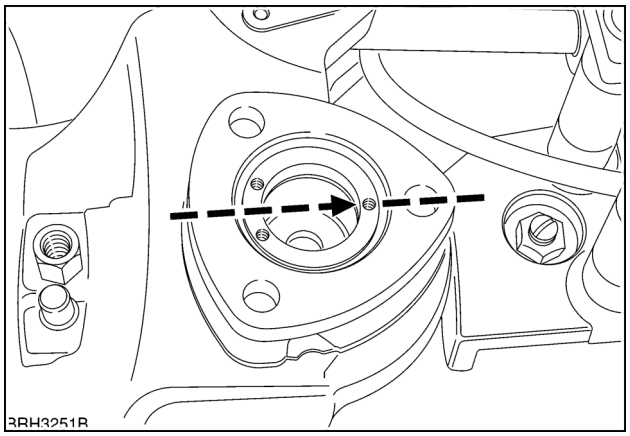


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6. Fit the swivel housing, the adjustment shims, the upper and lower pivot pins, ensuring that the upper pin flange is correctly positioned as shown in Figure **4**, refer to **Hub - Remove (D.10.A)**.

NOTE: *Calibration of the steering angle sensor must then be carried out. Refer to* ***FRONT AXLE - Calibrate (D.10.A)****.*



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FRONT AXLE - Troubleshooting

Problem	Possible Cause	Correction
Premature tyre wear	Incorrect tyre inflation pressure.	Inflate the tyres to the correct pressure, refer to values suggested in the Operator's Manual. Always comply with values specified by the tyre manufacturer.
	Incorrect front wheel toe-in.	Adjust the front wheel toe-in.
Poor tractor stability	Wrong inflation pressure.	Inflate tyres to correct pressure

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Differential lock - Troubleshooting

Problem	Possible Cause	Correction
Differential lock not engaging.	Rear axle oil level low.	Top up to the correct oil level.
	Blocked oil filter.	Replace the oil filter.
	Faulty hydraulic pump.	Overhaul or replace the hydraulic pump.
	Faulty differential lock switch.	Replace the differential lock switch.
	Power supply not reaching the solenoid valve: detached or damaged electrical connectors.	Restore electrical connections and replace any faulty parts.
	Differential lock solenoid valve stuck on discharge.	Repair or replace the differential lock solenoid valve.
	Oil leaks through the seals with consequent pressure drop (piston or supply line seals). Multi wet-plate clutch only.	Replace any faulty seals.
	Worn friction plates (multi wet-plate clutch).	Replace the friction plates.
With differential lock engaged in auto function, the differential lock does not disengage when raising lift arms using the FAST RAISE switch.	Faulty controller.	Remove and replace the controller.
With differential lock engaged, the differential lock does not disengage when brake pedals are pressed.	Faulty brake pedal switch.	Replace the brake pedal switch.
Differential lock not disengaging.	Differential lock solenoid valve stuck on delivery.	Repair or replace the differential lock solenoid valve.
	Differential unlock spring broken (dog clutch).	Replace the differential unlock spring.

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TRAVELLING - D

REAR AXLE - 12.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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REAR AXLE - General specification

Pinion and crown wheel ratio: Puma CVT Models 165 180 195 210 225	Teeth / Ratio	9 / 47 = 1:5.222
Pinion to crown wheel backlash	mm	0. 25 to 0. 33
Epyciclic reduction	Ratio	12 / 27 / 69 : 1 6.750
Differential		4-pinion
Differential lock control: - Multi-plate clutch		Acting through a hydraulically controlled multi-pack clutch in oil bath
Number of clutch discs:		
- Driven discs.	Quantity	4
- Drive discs.	Quantity	4
- Driven disc thickness (each)	mm	3. 45 to 3. 55
- Drive disc thickness (each)	mm	1. 95 to 2. 05
Differential pinion bore dia. (Refer to **REAR AXLE - Sectional view (D.12.A)**)	mm	30. 04 to 30. 061
Differential pinion journal dia.	»	29. 939 to 29. 960
Differential pinion running clearance	»	0. 080 to 0. 122
Side gear hub seat in differential Casing dia. (Refer to **REAR AXLE - Sectional view (D.12.A)**)	mm	70. 0
Side gear hub dia.	»	68. 0

Pinion shaft position adjustment (Refer to **REAR AXLE - Sectional view (D.12.A)**)		Refer to **REAR AXLE - Adjust (D.12.A)**
- shims available	mm	3. 0-3. 1-3.2-3.3-3.4-3.5-3.6 3.7-3.8-3.9-4.0
Pinion bearing adjustment		Refer to **REAR AXLE - Adjust (D.12.A)**
Pinion bearing shimming (Refer to **REAR AXLE - Sectional view (D.12.A)**)	mm	4. 40-4. 50-4. 60-4. 70-4. 80-4. 85-4. 90-4. 95-5. 00-5. 05-5. 10-5. 15-5. 20-5. 25-5. 30-5. 35-5. 40-5. 45-5. 50-5. 55-5. 60-5. 65-5. 70-5. 75-5. 80-5. 85-5. 90-5. 95-6. 00-6. 05-6. 10-6. 15-6. 20-6. 30-6. 40-6. 50-6. 60

Crown wheel bearing and backlash		Refer to **REAR AXLE - Adjust (D.12.A)**
shims available (Refer to **REAR AXLE - Adjust (D.12.A)**)	mm	0. 15-0. 20-0. 50
Differential gear and pinion backlash	mm	0. 20
Differential gear thrust washer thickness (Refer to **REAR AXLE - Adjust (D.12.A)** and **REAR AXLE - Sectional view (D.12.A)**)	mm	2.70-2.75-2.80-2.85-2.90 2.95-3.00-3.05-3.10-3.153. 20-3. 25-3. 30
Differential gear end play (each)	mm	0. 226 +/-0.302
Differential gear end play adjustment		Refer to **Differential - Overhaul (D.12.A)**

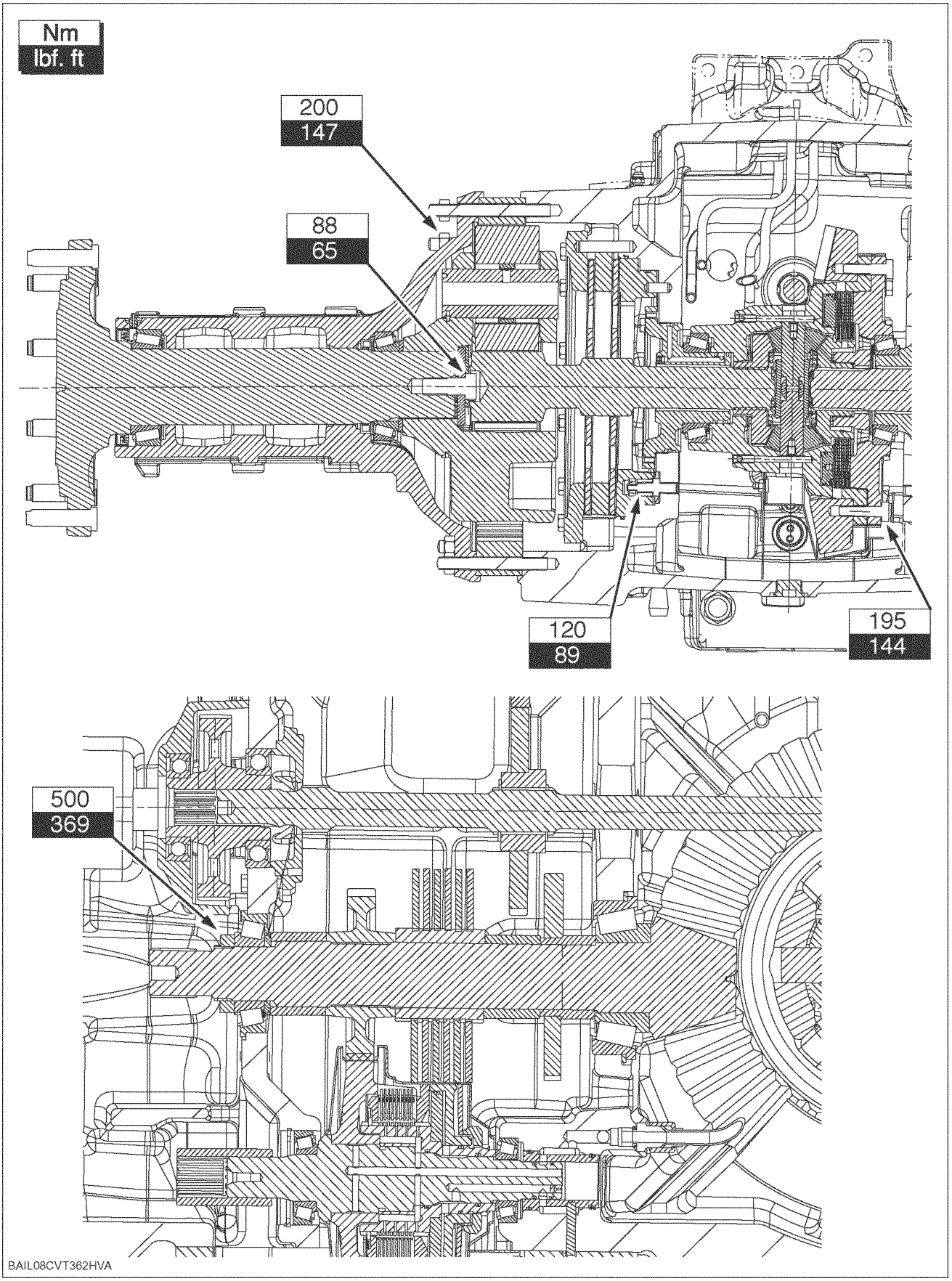
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REAR AXLE - Torque

DESCRIPTION	Thread size	Torque	
		Nm	lb/ft
Nut, bevel pinion shaft	M45 x 1. 5	500	369
Nut, final drive case	M14 x 1. 5	200	148
Nut, wheel disc to wheel rim	M16 x 1.5	250	184
Nut, steel wheel disc to wheel hub	M18 x 1.5	255	188
Capscrew, wheel hub on dual wheel axle shaft	M16 x 1.5	294	217
Capscrew, RAIL disc on dual wheel axle shaft	M16 x 1.5	294	217
Capscrew, drive wheel shaft	M18 x 1.5	88 (*)	65 (*)
Capscrew, crown wheel and differential caps	M10 x 1.25	54	40
Capscrew, crown wheel	M14 x 1.5	195	144
Nut, RAIL disc block	M20 x 2.5	245	181
Nut, RAIL disc to wheel hub	M18 x 1.5	314	232
Nut, weight screw to steel wheel disc	M16 x 1.5	294	217
Attaching screws, wheel weights	M16 x 1.5	211	156
Allen screw, wheel weights to cast iron disc	M16 x 1.5	186	137

(*) see adjustment procedure, for further information, refer to **Final drive Shaft - Install (D.12.A)**

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BAIL08CVT362HVA 1

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REAR AXLE - Special tools

⚠ CAUTION ⚠

The operations described in this section can only be carried out with the ESSENTIAL tools indicated by an (X). To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

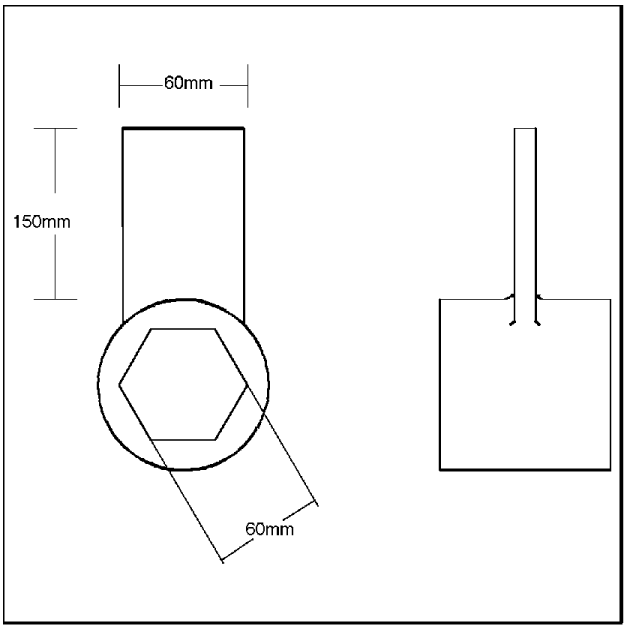
B008

List of special tools necessary to carry out the different operations described in this Section.

380000301	Rotary stand
380000272	Front bracket for rear axle overhaul (to be used with **380000301**)
380000273	Rear bracket for rear axle overhaul (to be used with **380000301**)
X **380000459**	Nut wrench for checking pinion rolling torque
380001783	Transfer box shaft puller
X **380000470**	Pinion bearing adjustment tool
X **380200088**	Pinion bearing adjustment tool extension (to be used with **380000470**
380000249	Universal pinion installer
X **380200104**	Crown wheel-differential lifting tool
380000240	Universal differential lock pressure test kit
X **380000475**	Differential planetary gear adjustment tool
380000462	Differential overhaul stand.
380000549	Slide hammer.
X **380000486**	Spacer and bushing (to be used with **380000470**).
MS2700C	Tractor splitting kit

Tool to be fabricated to disassemble-assemble the Bevel Pinion Shaft

- Make from **60 mm** socket (remove square drive end).
- Weld suitable rectangular piece of metal to socket (See Fig. **1**).
- Use in conjunction with pinion drive coupler and **3/4 in** drive socket. (Refer to **Housing - Overhaul (D.12.A)**).



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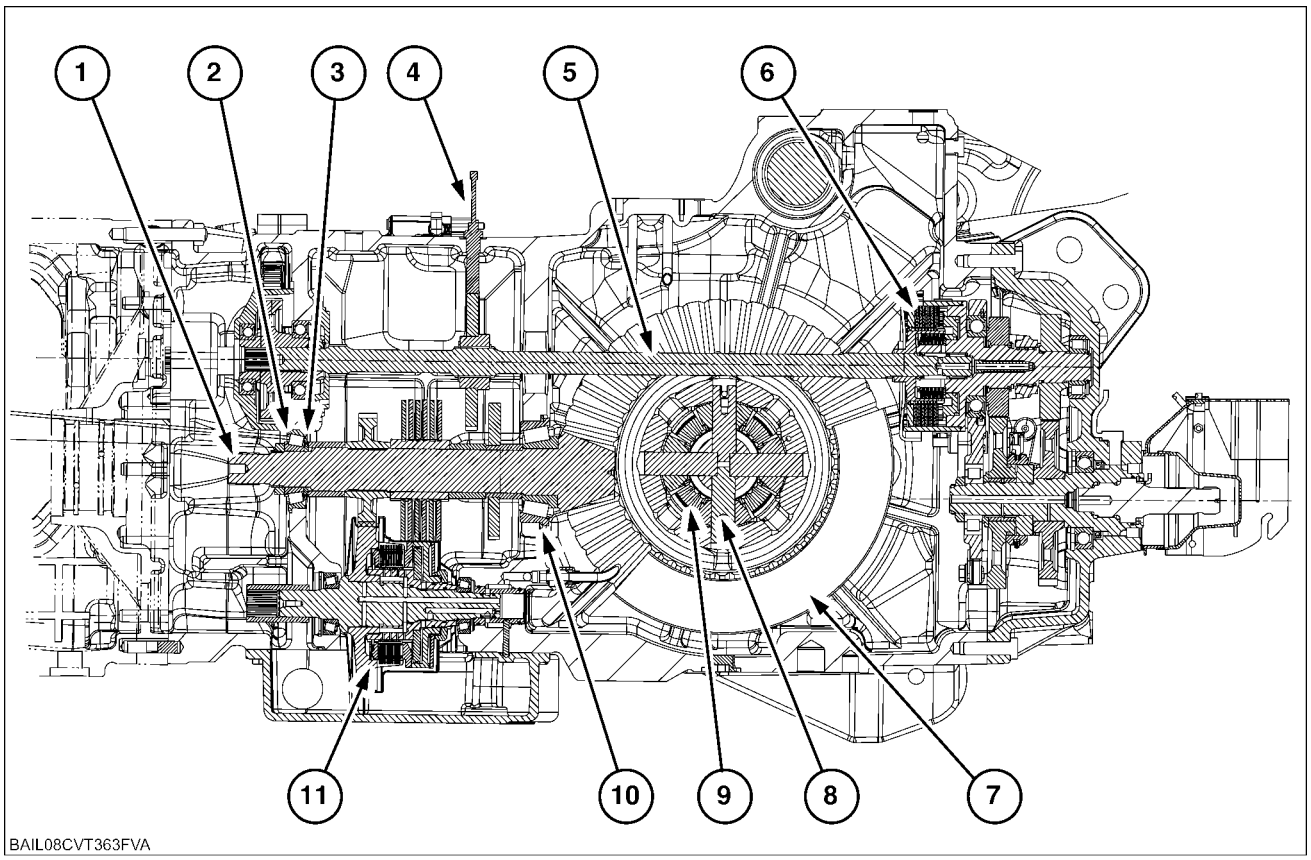
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Final drive - General specification

Type Reduction ratios: Puma CVT Models 176 180 195 210		Epicyclic, with three planetary spur gears 69 / 12 = 1.675 to 1
Puma CVT Model 225 Thickness of planetary gear thrust washers (Refer to **REAR AXLE - Sectional view (D.12.A)**) Thickness of planetary gear roller bearing spacer (Refer to **REAR AXLE - Sectional view (D.12.A)**)	 mm »	Epicyclic, with four planetary spur gears 1 4.90 to 4.95
Adjustment of drive wheel shaft tapered roller bearings		Refer to **Final drive Shaft - Install (D.12.A)**

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REAR AXLE - Sectional view

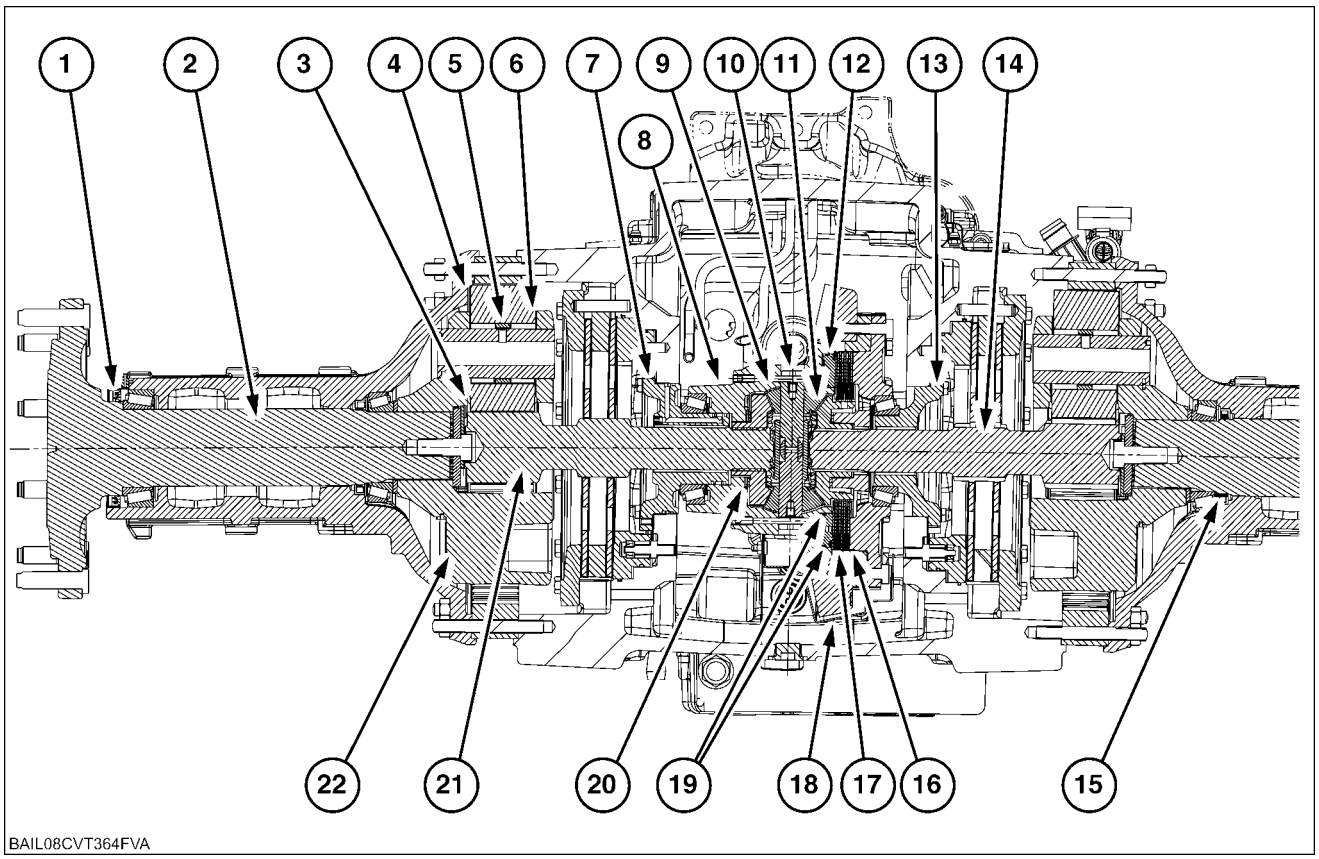


BAIL08CVT363FVA 1

Rear Axle Longitudinal Sectional View

1 Bevel pinion shaft
2 Tapered roller bearing
3 Bevel pinion bearing adjusting shim
4 Hydrostat input speed sensor
5 PTO Drive Shaft
6 PTO Clutch
7 Crown Wheel
8 Differential gear hub
9 Differential gear
10 Pinion shaft position shim
11 Four Wheel Drive Clutch

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BAIL08CVT364FVA 2

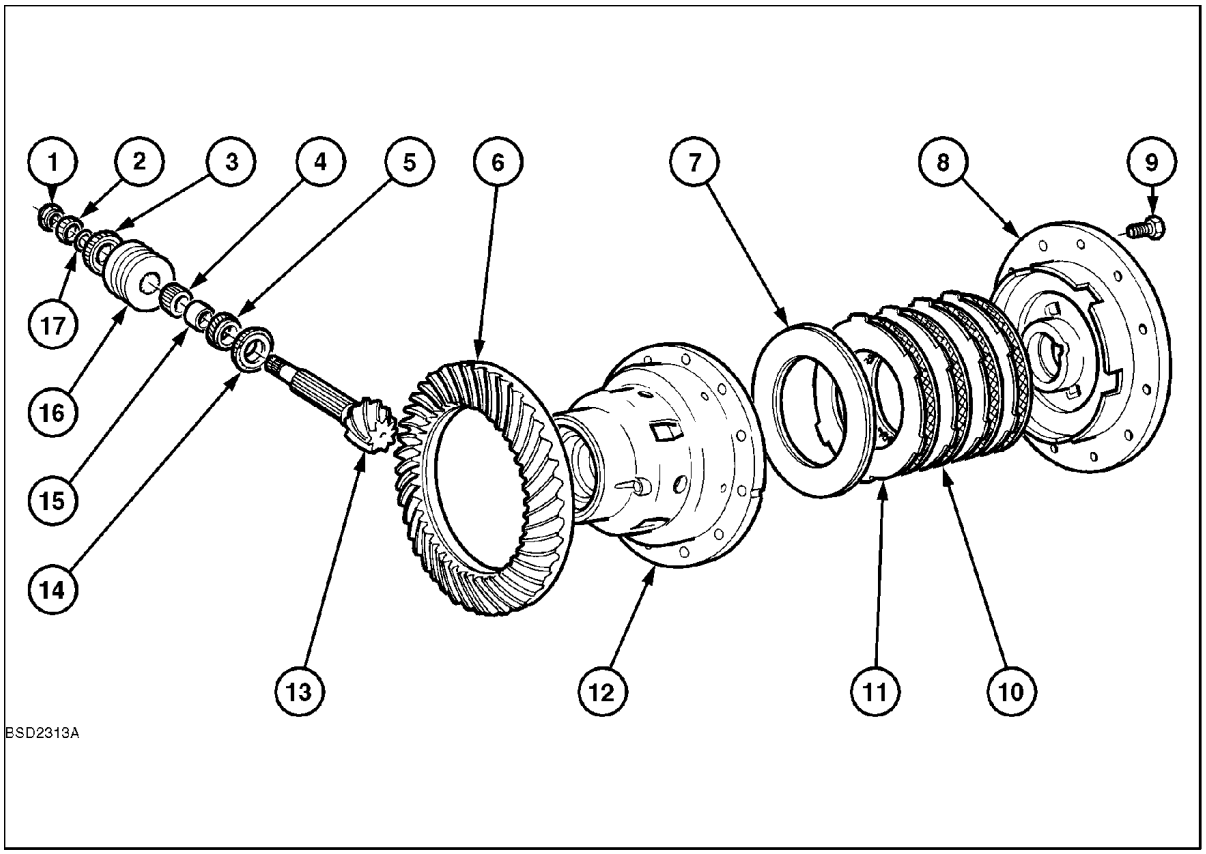
Rear Axle Cross-Section (with multi-plate clutch differential lock)

1 Seal
2 Differential output half shaft
3 Planetary final reduction gears
4 Thrust washer
5 Planetary gear bearing spacer
6 Thrust washer
7 Bearing cap support
8 Planetary carrier
9 Differential pinion
10 Differential gear hub
11 Side gears
12 Differential lock control piston
13 Bearing cap support
14 Output shaft
15 Seal
16 Drive discs
17 Driven discs
18 Crown Wheel Guard
19 Inner and outer seals
20 Side Gear End Play Adjuster Rings
21 Output shaft
22 Planetary reduction gear carrier

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REAR AXLE - Static description

The rear axle assembly transfers drive from the transmission to the epicyclic final drives through a bevel pinion and crown wheel coupling. The bevel gears are spiral type and are supported by tapered roller bearings.
The differential is fitted with four planetary gears and hydraulic differential lock, the differential lock being of a multi-plate type.
The epicyclic final reduction gear sets are controlled by the bevel pinion and hypoid crown wheel and output the drive through the final drive-shafts.



BSD2313A 1

Crown Wheel and Pinion Components

1 Pinion Nut
2 Bearing
3 Four Wheel Drive Gear
4 Parking Brake Disc Hub
5 Sensing Gear
6 Crown Wheel
7 Piston
8 Cover
9 Bolt
10 Driven Disc
11 Lock Plate
12 Differential Casing
13 Shaft and Bevel Pinion
14 Bearing
15 Spacer
16 Brake Discs
17 Shim

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REAR AXLE - Remove

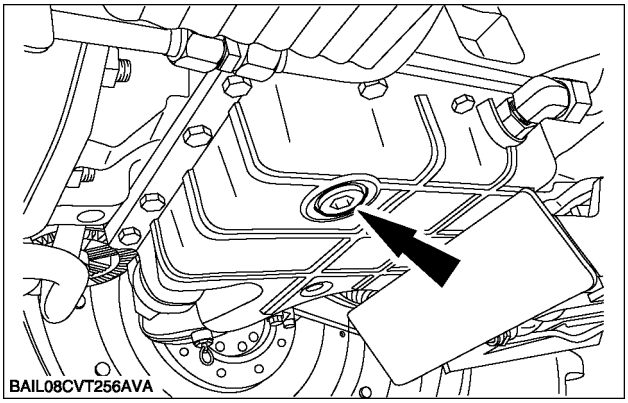
Prior operation:
Disconnect the rear axle from the transmission housing, for further information refer to **Housing - Disconnect (C.20.G)**

⚠ **DANGER** ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

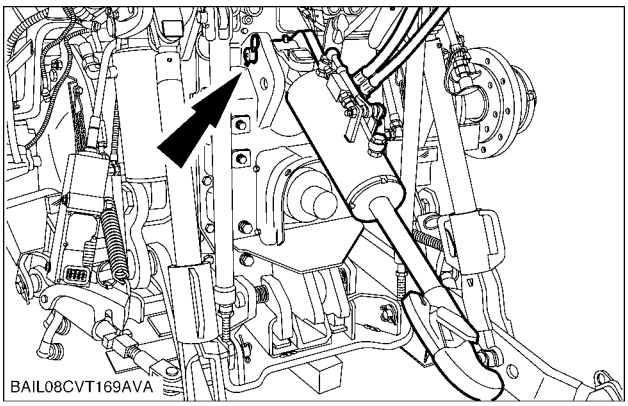
B012

1. Remove the transmission housing drain plug and drain the transmission oil into a suitable container. Install the drain plug and tighten to **68 - 82 Nm** (**50 - 60 lbft**).



BAIL08CVT256AVA 1

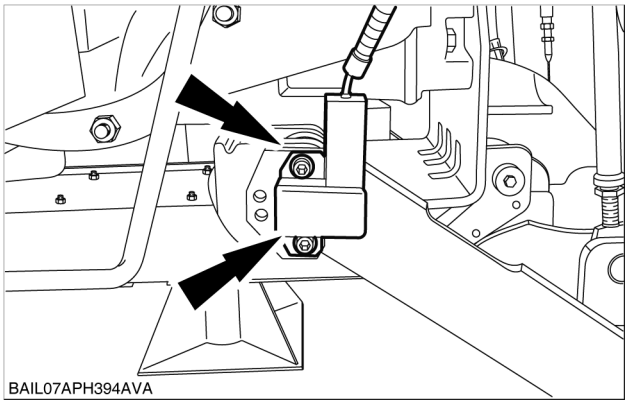
2. Remove top lift arm.



BAIL08CVT169AVA 2

3. Remove the electronic draft control (EDC) sensor retaining bolts.

NOTE: *Repeat this step for the right-hand side.*

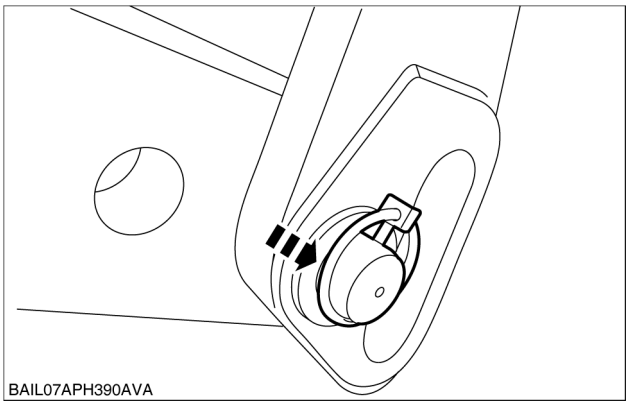


BAIL07APH394AVA 3

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4. Remove the lift link lower retaining pin and slide out the hinge pin.

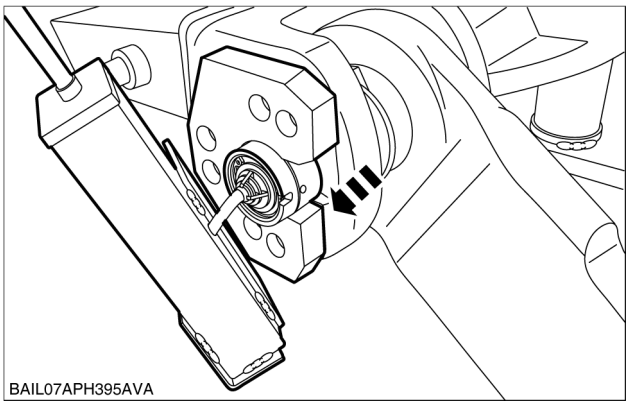
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH390AVA 4

5. Remove the hinge pin with the EDC sensor and remove the lower lift arm.

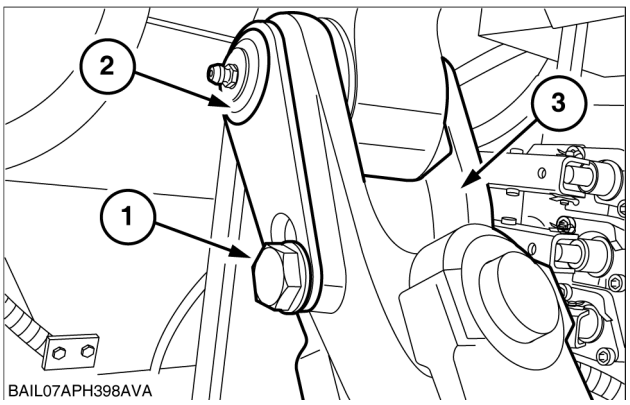
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH395AVA 5

6. Remove the retaining bolt **(1)**, remove the hinge pin **(2)** and remove the lift link **(3)**.

NOTE: *Repeat this step for the right-hand side.*

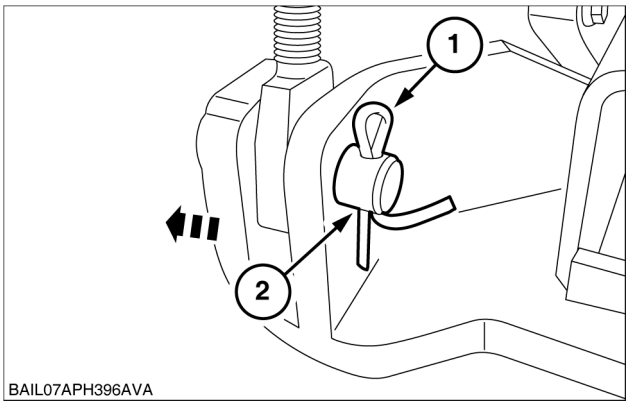


BAIL07APH398AVA 6

Vehicles with extending drawbar

7. Remove the split pin **(1)** and remove the lift rod lower retaining pin **(2)**.

NOTE: *Repeat this step for the right-hand side.*

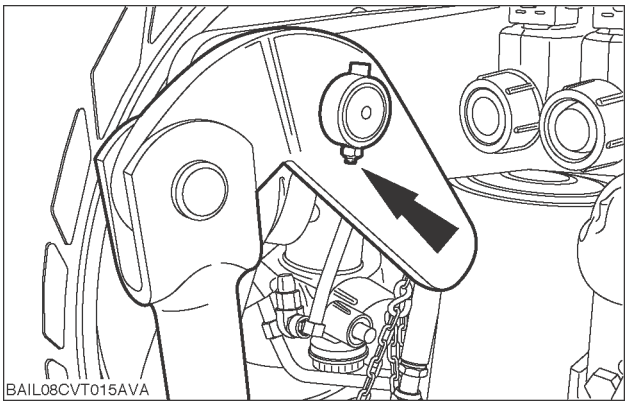


BAIL07APH396AVA 7

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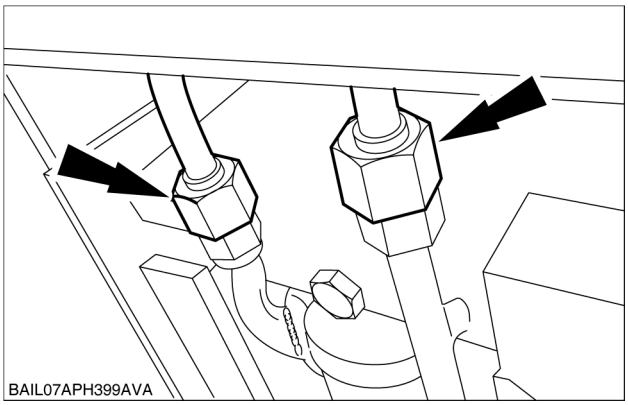
8. Remove the retaining bolt, and remove the extending drawbar lift rod.

NOTE: *Repeat this step for the right-hand side.*



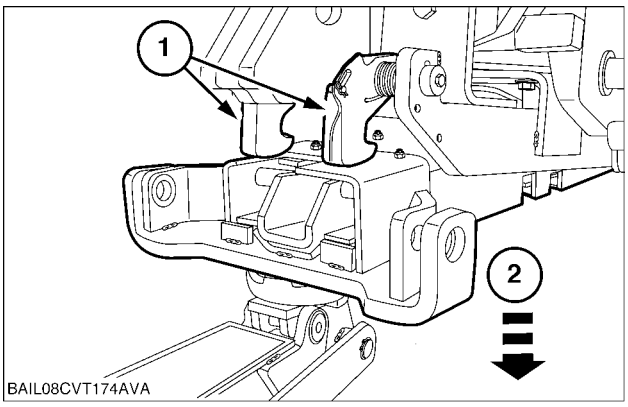
BAIL08CVT015AVA 8

9. Disconnect the extending drawbar hydraulic supply and return pipes.



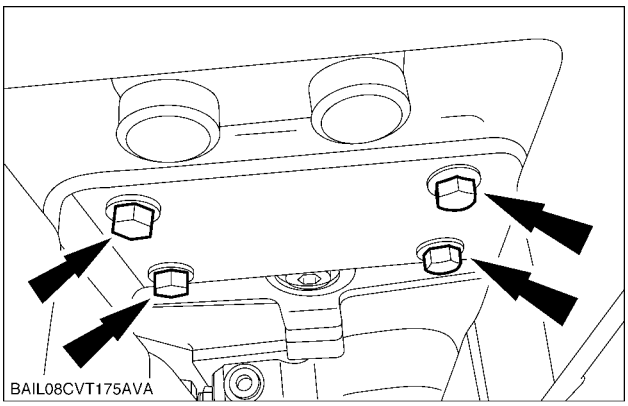
BAIL07APH399AVA 9

10. Unlatch the extending drawbar **(1)** and lower on a suitable jack **(2)**.



BAIL08CVT174AVA 10

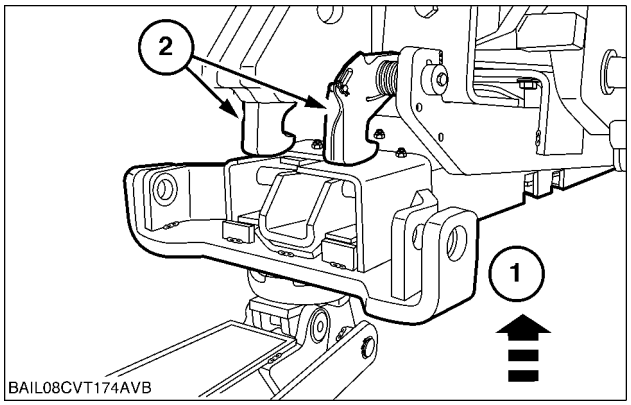
11. Remove the extending drawbar retaining bolts.



BAIL08CVT175AVA 11

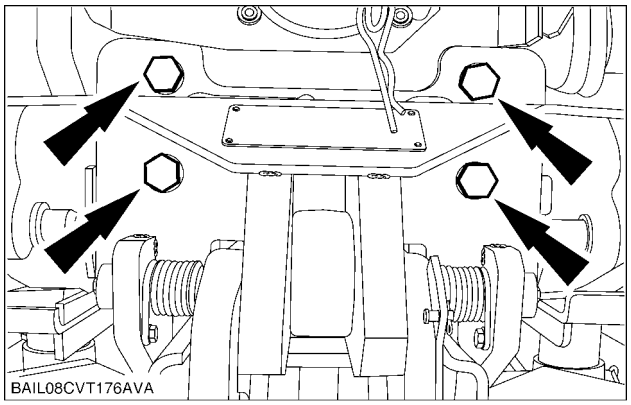
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12. Raise the extending drawbar assembly **(1)** and re-latch the extending drawbar **(2)**.



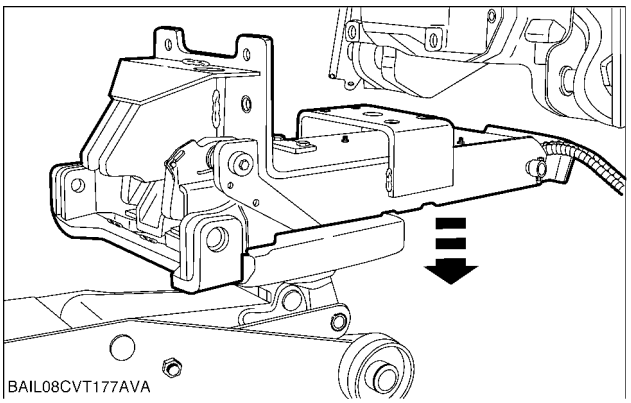
BAIL08CVT174AVB 12

13. Remove the extending drawbar retaining bolts.



BAIL08CVT176AVA 13

14. Remove the extending drawbar assembly.



BAIL08CVT177AVA 14

Next operation:
Remove the rear PTO, for further information refer to **Housing - Remove (C.40.C)**
Next operation:
Remove the stack valve, for further information refer to **Stack valve - Remove (A.10.C)**
Next operation:
Remove the final drive housing, for further information refer to **Final drive - Remove (D.12.A)**

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REAR AXLE - Install

Prior operation:
Install the final drive housing, for further information refer to **Final drive - Install (D.12.A)**
Prior operation:
Install the stack valve, for further information refer to **Stack valve - Install (A.10.C)**
Prior operation:
Install the rear PTO, for further information refer to **Housing - Install (C.40.C)**

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

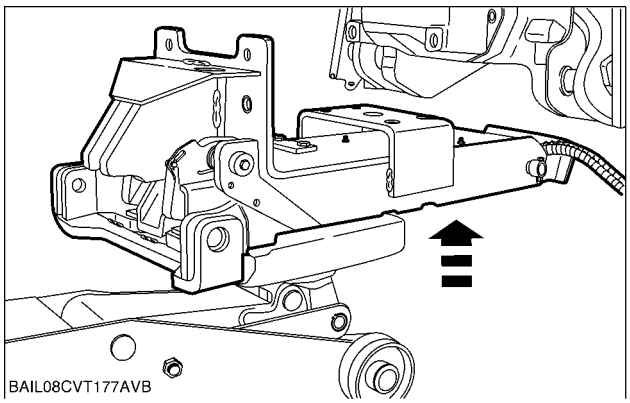
⚠ WARNING ⚠

Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

B020

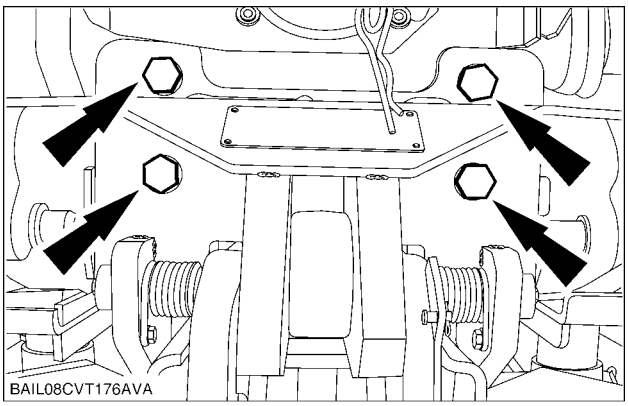
Vehicles with extending drawbar

1. Install the extending drawbar assembly.



BAIL08CVT177AVB 1

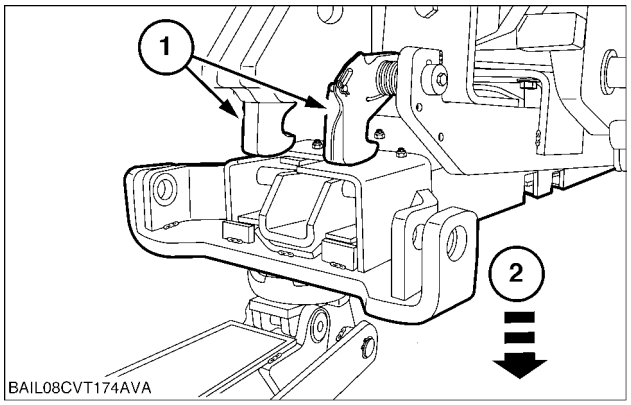
2. Install the extending drawbar retaining bolts. Tighten to **211 Nm** (**155 lb ft**).



BAIL08CVT176AVA 2

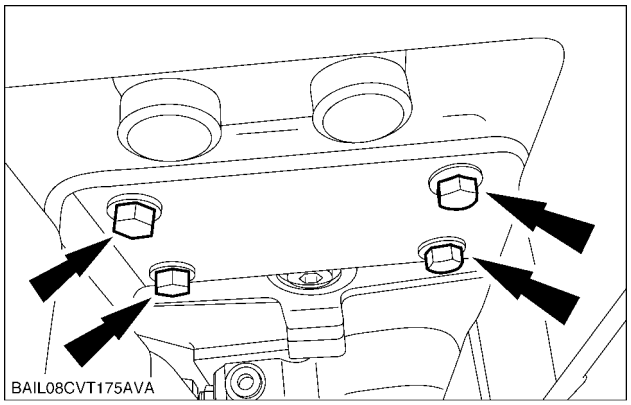
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3. Unlatch the extending drawbar **(1)** and lower on a suitable jack **(2)**.



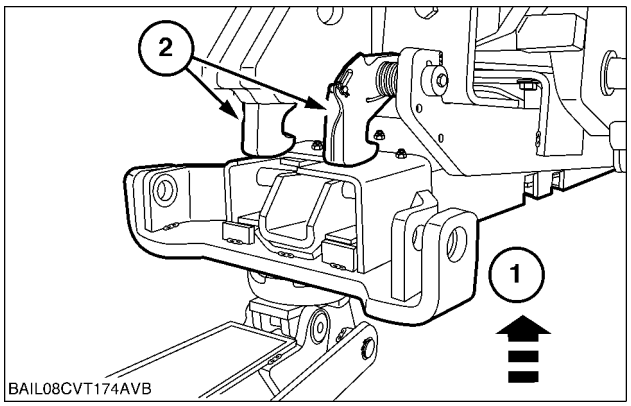
BAIL08CVT174AVA 3

4. Install the extending drawbar retaining bolts. Tighten to **211 Nm** (**155 lb ft**).



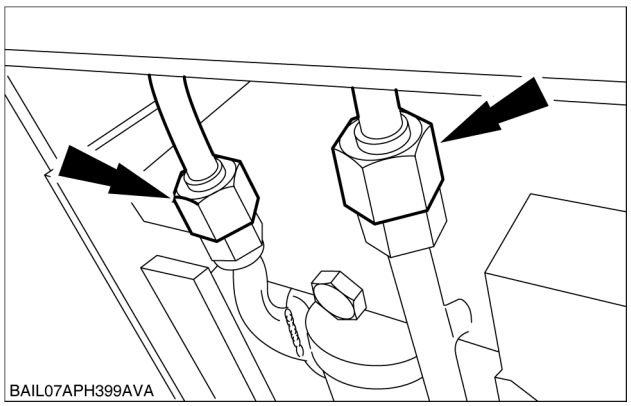
BAIL08CVT175AVA 4

5. Raise the extending drawbar assembly **(1)** and re-latch the extending drawbar **(2)**.



BAIL08CVT174AVB 5

6. Connect the extending drawbar hydraulic supply and return pipes.

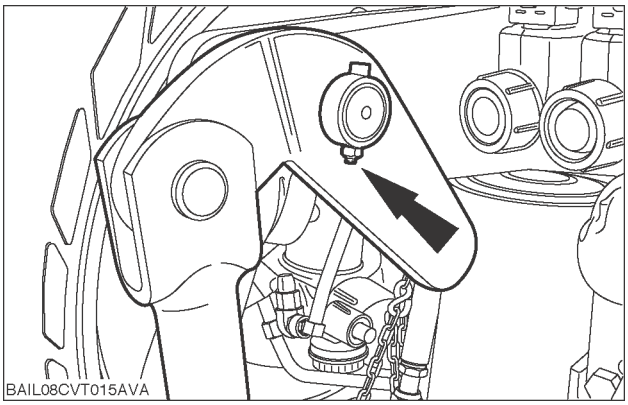


BAIL07APH399AVA 6

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7. Install the extending drawbar lift rod and install the retaining bolt.

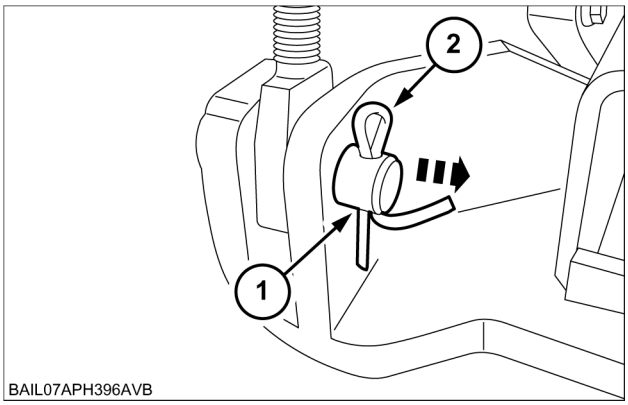
NOTE: *Repeat this step for the right-hand side.*



BAIL08CVT015AVA 7

8. Install the lower retaining pin **(1)** and install the split pin **(2)**.

NOTE: *Repeat this step for the right-hand side.*

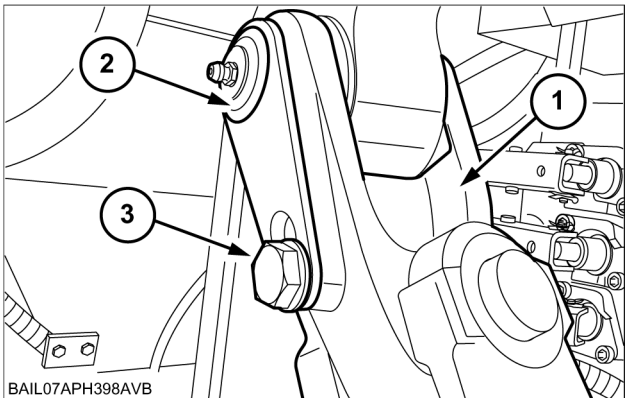


BAIL07APH396AVB 8

All vehicles

9. Install the lift link **(1)**, install the hinge pin **(2)** and install the retaining bolt **(3)**.

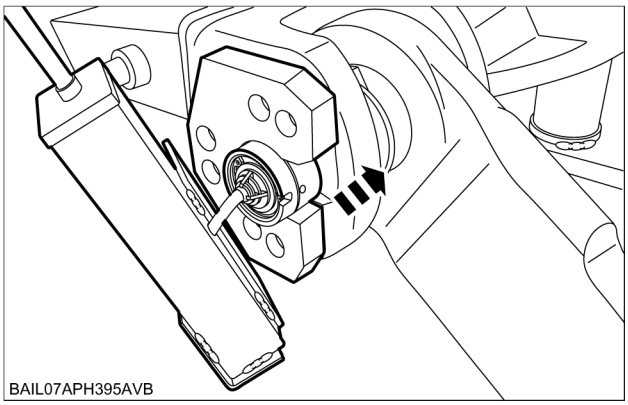
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH398AVB 9

10. Install the hinge pin with the EDC sensor into the lift arm.

NOTE: *Repeat this step for the right-hand side.*

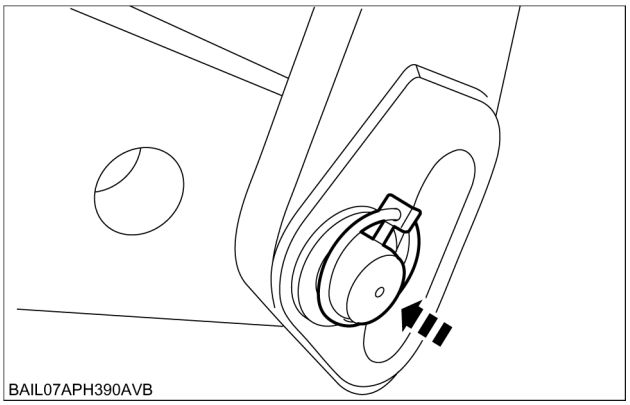


BAIL07APH395AVB 10

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11. Install the lift link lower hinge pin and install the retaining pin.

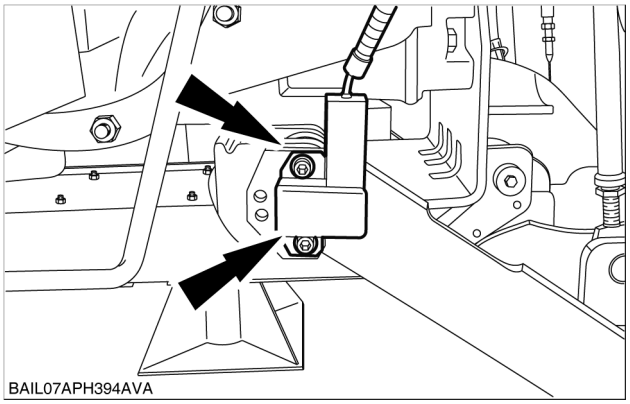
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH390AVB 11

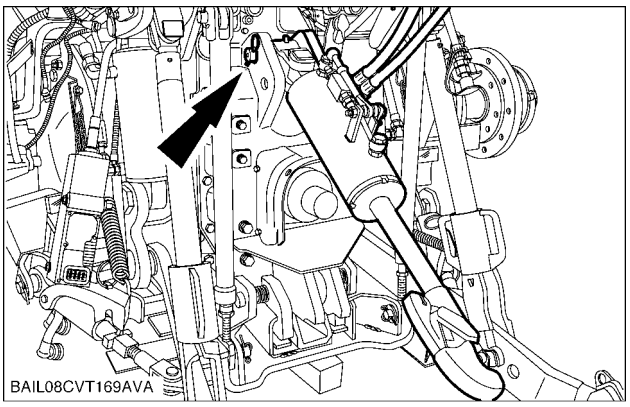
12. Install the EDC sensor retaining bolts.

NOTE: *Repeat this step for the right-hand side.*



BAIL07APH394AVA 12

13. Install the top lift arm.

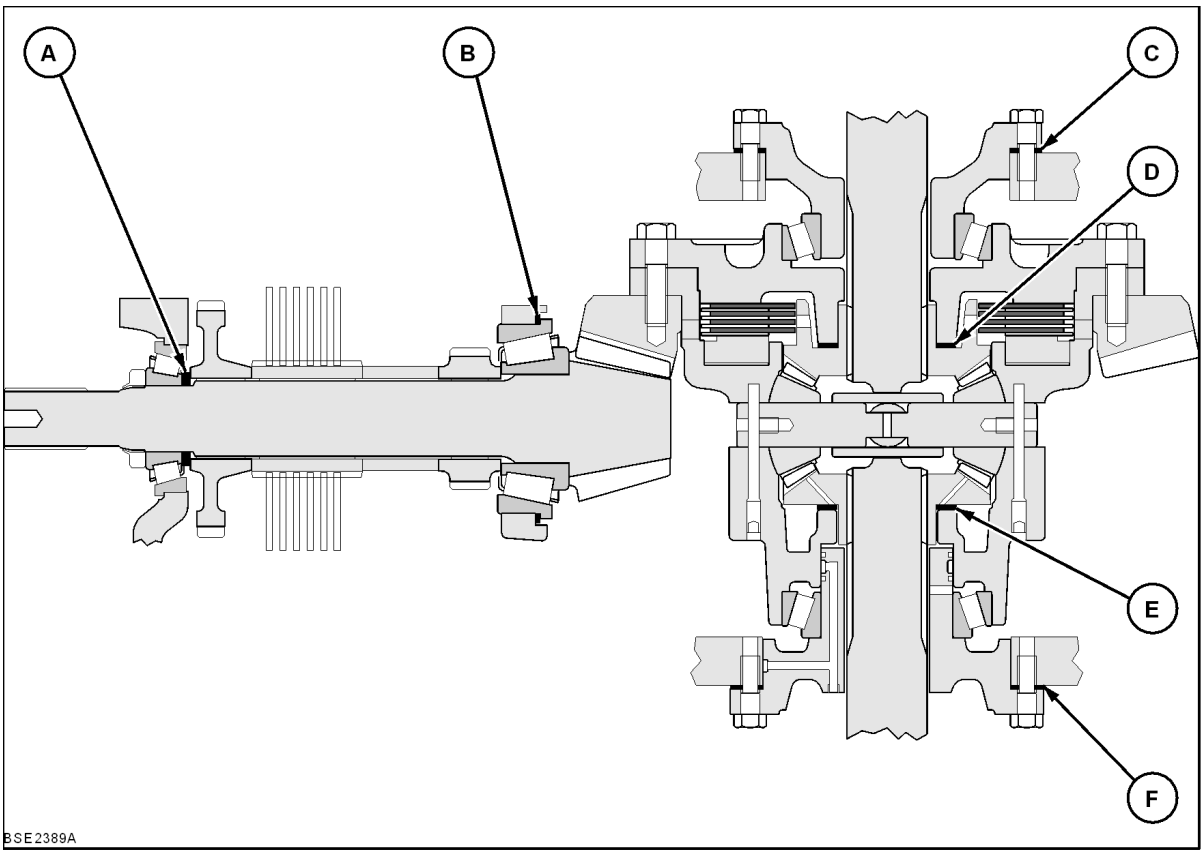


BAIL08CVT169AVA 13

Next operation:
Connect the rear axle to the transmission housing, for further information refer to **Housing - Connect (C.20.G)**
Next operation:

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REAR AXLE - Adjust



BSE2389A_140 1

Rear axle adjustment procedures

(A) - Pinion shaft pre-load shim. Adjusts the pre-load on the pinion shaft bearings and components.

(B) - Pinion shaft position shim. Adjusts the position of the pinion relative to the crown wheel.

(C) and **(F)**) - Left and right hand crown wheel backlash and differential support bearing pre-load shims. Adjusts the horizontal position of the crown wheel relative to the pinion gear. This affects the backlash depending on which side the shims are fitted. Also affects the pre-load on the differential support bearings, affected by the total shims, **(C+F)**.

(**(D)** and **(E)**- Left and right differential side gear shims. Adjusts pre-load on differential gear assembly.

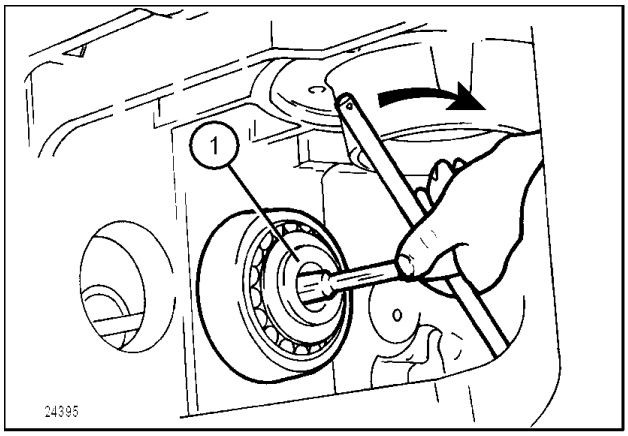
NOTE: *The pinion and differential should be set up in the following order:*

1. (D and E) For further information refer to: **Differential lock - Overhaul (D.12.A)**
2. (B)
3. (A)
4. (C and F)

1. Determining pinion shaft position shim thickness (Shim **(B)** figure **1**) using special tool number **380000470** with adaptor **380200088**.
   Proceed as follows:
   Place pinion rear bearing outer cup into the rear axle housing less shim.

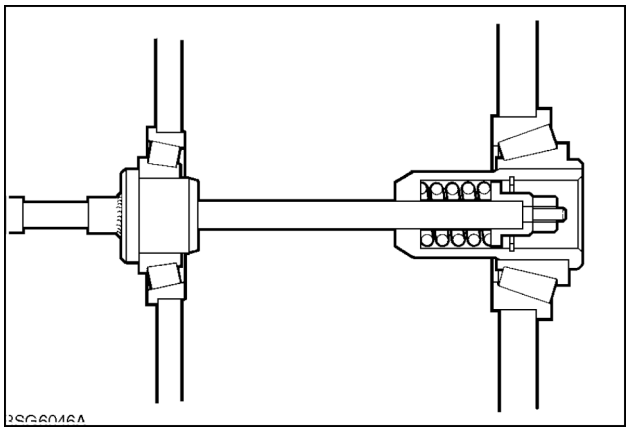
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2. Assemble special tool number **380000470** with extension adaptor **380200088 (1)** complete with the bearings into the rear axle housing. Lock the nut while turning the bearings.



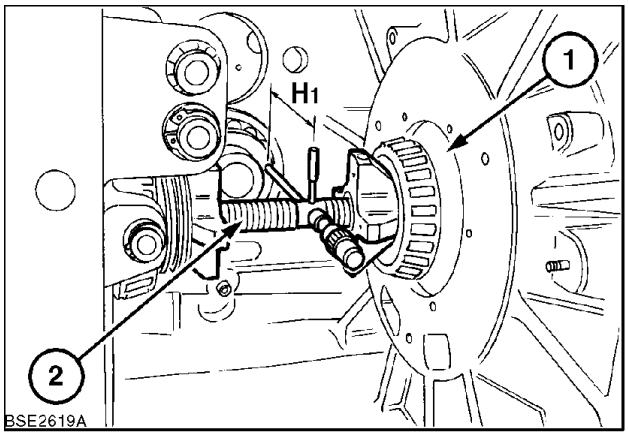
24395 2

3.



BSG6046A 3

4. Assemble universal tool number **380000249 (2)** on crown wheel caps **(1)** complete with the bearing outer cups.
Bring the rod of tool number **380000249** (H) to contact bearing inner cup and measure dimension (H1).
Determine correct nominal dimension, H2 **(2)** between the crown wheel centre line and pinion base:
H2 = H3 ± C
where:
H3 = **212 mm**. Nominal dimension between the crown wheel centre line and pinion base.
C = Correction factor stamped on the pinion, expressed in mm and prefixed by + or - if other than 0, to be added to or subtracted from the nominal dimension (H3), depending on the sign.



BSE2619A 4

NOTE: *The crownwheel is a hypoid type, whereby the pinion engages with the crownwheel* ***12 mm*** *below centreline of the crownwheel. When taking measurement H1 in the previous step the measurement must be taken perfectly perpendicular to the bearing face.*

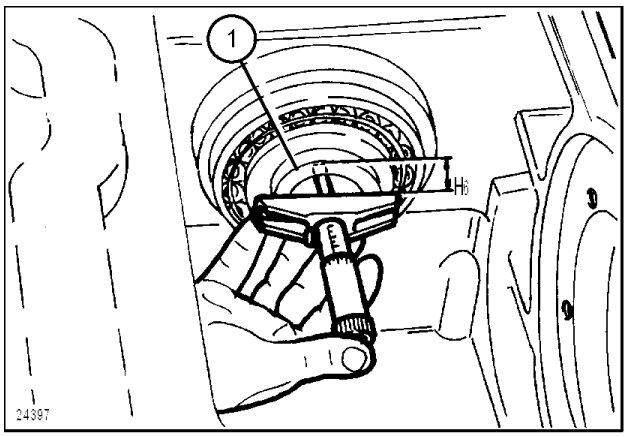
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5. Adjuster shim thickness (S1) is given by:
S1 = H1 - H2
where:
H1 = Depth gauge reading

H2 = Correct nominal dimension between crown wheel centre line and pinion base.
If necessary, round up the value (S1) to the next **0.05 mm**.
Examples:
- Depth gauge reading: H1 = **215.4 mm**
- Nominal dimension between crown wheel centre line and pinion base: H3 = **212 mm**
Example 1:
- Correction factor: C = + **0.1 mm**
- Correct nominal dimension: H2 = 212 + 0.1 = **212.1 mm**
- Adjuster shim thickness
- S1 = 215.4 - 212.1 = **3.3 mm**
Example 2:
- Correction factor: C = - **0.1 mm**
- Correct nominal dimension: H2 = 212 - 0.1 = **211.9 mm**
- Adjuster shim thickness:
- S1 = 215.4 - 211.9 = **3.5 mm**
Example 3:
- Correction factor C = **0 mm**
- Correct nominal dimension: H2 = H3 = **212 mm**
- S1 Adjuster shim thickness:
- S1 = 215.4 - 212 = **3.4 mm**

6. Remove universal tool number **380000249** .

7. Determining pinion shaft pre-load shim thickness (Shim **(A)** figure **1**) of the pinion shaft tapered roller bearings using special tool number **380000470** with extension adaptor **380200088**.
Proceed as follows:
1. Using a depth gauge, measure dimension (H6) between the end of tool number **380000470 (1)** and the end of the inner screw.
2. Remove tool number **380000470**. from the rear axle housing.

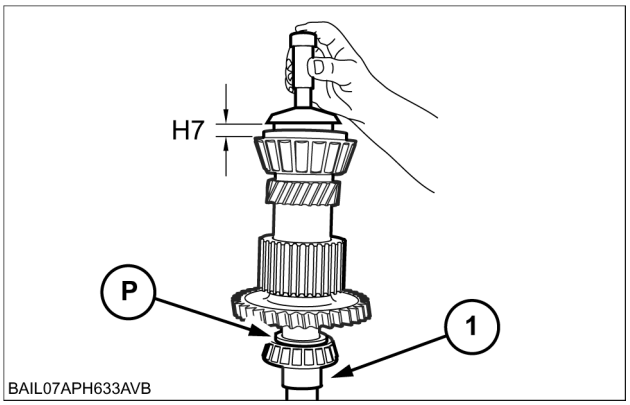


24397 5

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8. Fix tool number **380000470** into a vice, assemble all parts onto it including a test shim **(P)** .
Screw in the tool nut to lock the tool and using a depth gauge measure dimension (H7) between the tool end and end of the inner screw.
Adjuster shim thickness (S2) is given by:
S2 = H6 + P + S1 - H7 +0.2
where:
P = Test shim
S1 = Pinion shaft position adjustment shim, as found in the previous paragraph.
0.2 mm = Increase necessary to compensate for bearing increased preload deriving from tightening of the pinion shaft locknut
If necessary, round up the value (S2) to the next **0.05 mm**

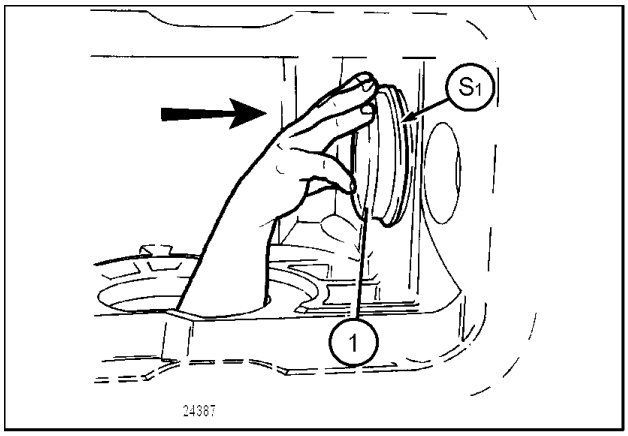
Example
- Pinion shaft position adjustment shim, found in the previous paragraph: S1 = **1.8 mm**
- Depth gauge reading: H6 = **13.60 mm**
Test shim P = **2 mm**
Depth gauge reading H7 = **12.10 mm**
Adjuster shim thickness.
S2 = 13.60+2+1.8-12.1+0.2 = **5.5 mm**



BAIL07APH633AVB 6

9. Adjustment of crown wheel bearing pre-load and crown wheel to pinion backlash, shims **(C+F)**, Figure **1**

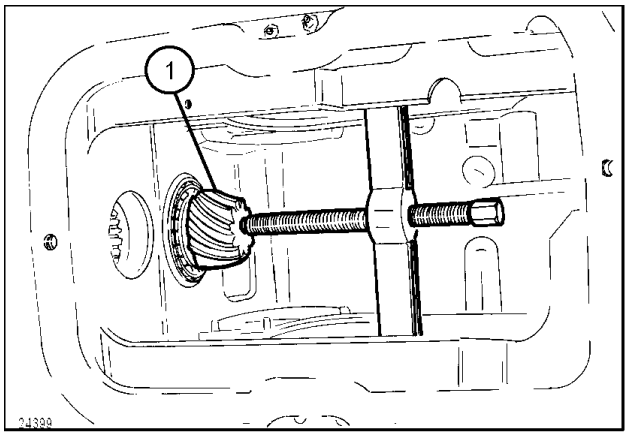
Proceed as follows:
1. Assemble the rear bearing outer cup **(1)** and shim **(S1)** as in previous adjustments. .



24387_141 7

10. Assemble pinion **(1)** complete with all components and respective bearing adjuster shims as found during previous adjustments. If necessary, hold the pinion in place using a suitable tool.

NOTE: *Pinion bearing shims are listed in* ***REAR AXLE - General specification (D.12.A)****.*

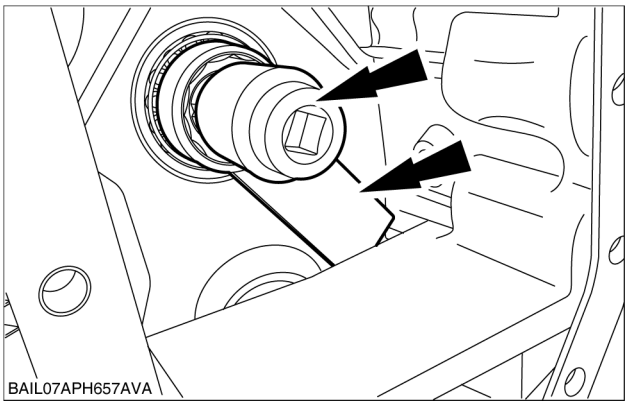


24399 8

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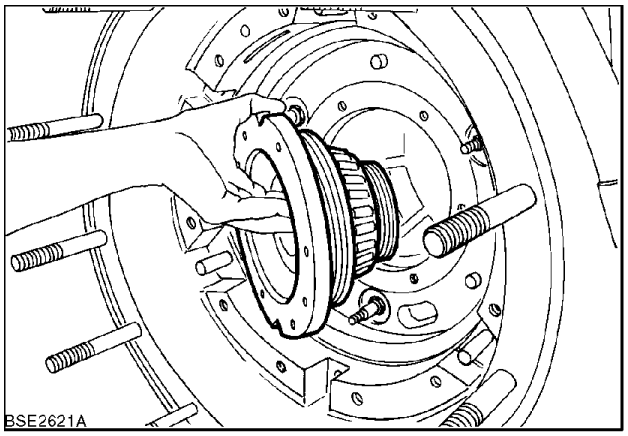
11. Using a suitable tool, hold the pinion nut steady.
Using a suitable tool and **3/4 in** drive socket, rotate the pinion counterclockwise to install the nut.
Tighten the pinion nut to **500 Nm** (**369 lb ft**), while turning the pinion shaft to settle the bearings. Remove the pinion tool.
Check if the rolling torque necessary to turn the pinion shaft is **1.0 - 2.0 Nm** (**0.7 - 1.5 lb ft**) by measuring it at the end of the shaft using the suitable tool **(1)** and torque wrench tool number **380000506**
Stake the new pinion nut.

NOTE: *Decrease the bearing adjustment shim pack if the rolling torque is lower than specified, or increase it if higher.*



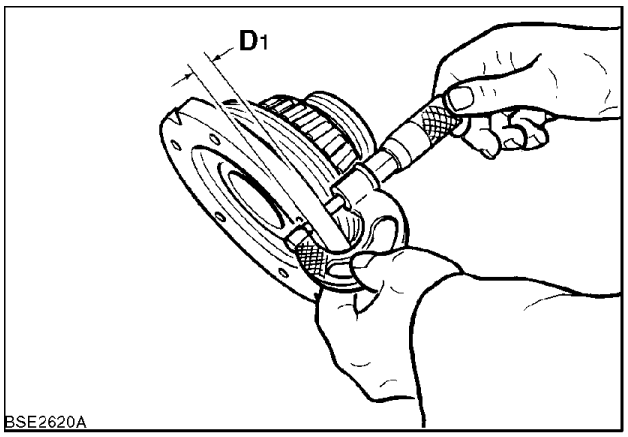
BAIL07APH657AVA 9

12. Assemble the crown wheel and differential assembly to the rear axle housing, insert the right-hand cap complete with a test shim and secure with three bolts. Tighten the bolts to **54 Nm** (**40 lb ft**).



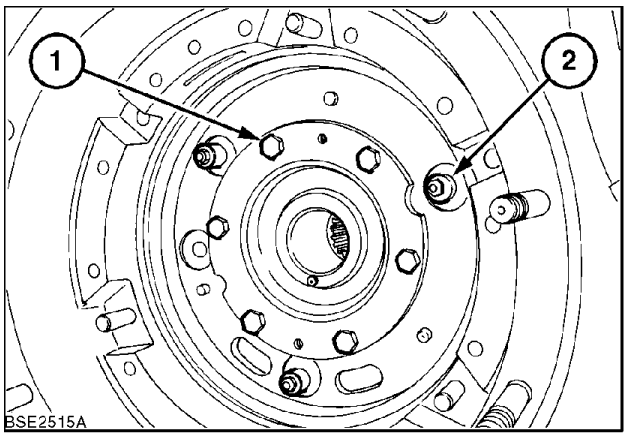
BSE2621A 10

13. Measure left-hand cap thickness (D1).



BSE2620A 11

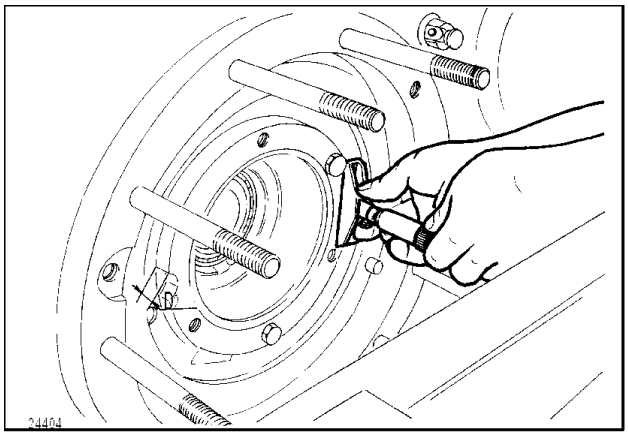
14. Assemble the left-hand cap without adjuster shims using three lubricated bolts **(1)** arranged at **120 °**.
Tighten alternatively and gradually the three bolts **(1)** to **6 - 9 Nm** (**4 - 7 lb ft**) while turning the crown wheel to settle the bearings.



BSE2515A_143 12

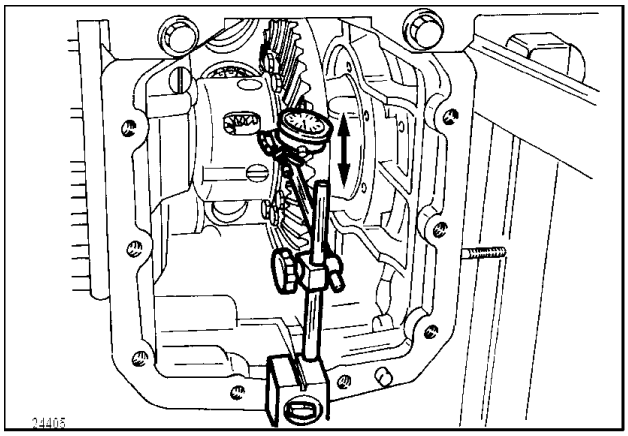
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15. Using a depth gauge, measure dimension (D) at the two recesses in the left-hand cap. Calculate the average of the two readings.
The total shim pack **(S)** to be inserted beneath the right-hand and left-hand caps is given by:
S = D2-D1+A+0.3
where:
A = Test shim = **1.5 mm**
D1 = left-hand cap thickness, in mm.
D2 = Dimension measured at **18**, in mm.
0.3 mm = Increase necessary to diminish the bearing preload deriving from the bolts.
If necessary, round up the value (S) to the next **0.05 mm**.



24404 13

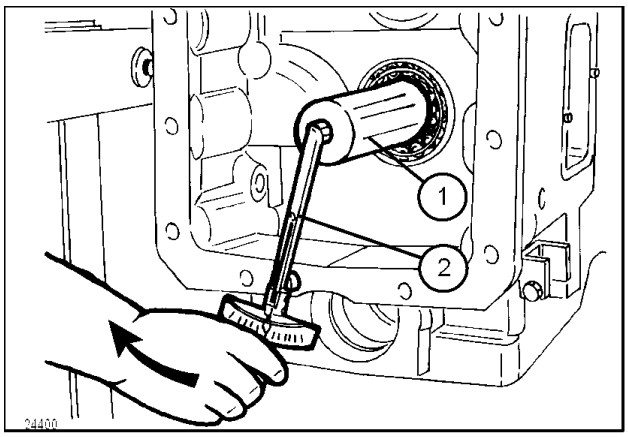
16. Using a dial gauge, measure the backlash (G) between the crown wheel and pinion teeth (take three measurements at **120 °** and take the average of the readings).
Normal crown wheel to pinion backlash is **0.20 - 0.28 mm**, with an average of **0.24 mm**
To compensate for possible backlash values higher or lower than specified, consider the 1:1.34 ratio existing between normal backlash and corresponding crown wheel end displacement.
Therefore, the end displacement (Z) necessary to restore specified backlash is:
Z = (G - 0.24) x 1.34
Adjustment shim packs (Sd and Ss) to be inserted on the right-hand and left-hand caps are given by:
Sd = A Z
Ss = S - Sd
where:
S = Total shim pack value
Z = Crown wheel end displacement, found above.
A = Test shim = **1.5 mm**



24405 14

17. Assemble the shim packs determined above on the caps and tighten the bolts to the specified torque.

18. Check if the rolling torque necessary to turn the crown wheel and pinion assembly is:
Rp + (**1.25 - 2.0 Nm** (**11.1 - 17.7 lb in**) by measuring it at the end of the pinion shaft using the wrench tool number **380000459 (1)** and torque wrench tool number **380000506 (2)**.
where:
Rp = Rolling torque measured for the pinion only
Example:
- Measurement of left-hand cap thickness (D1) = **14.00 mm**
- Test shim A = **1.5 mm**
- Measurement of clearance of D2 between left-hand cap and its seat on the rear axle housing **14.15 mm**; **14.25 mm**.
D2 = Mean value (14.15 + 14.25):2 = **14.20 mm**
- Total adjuster shim thickness
S = 14.20-14.00 + 1.5 + 0.3 = **2.00 mm**
- Measured backlash: **0.13 mm**; **0.12 mm**; **0.14 mm**
G = Mean value = (0.13 + 0.12 + 0.14): 3 = **0.13 mm**



24400 15

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- End displacement (Z) necessary to restore specified backlash.
Z = (0.13 - 0.24) x 1.34= - 0.11 x 1.34 = - 0.15
- Adjuster shim thickness to be inserted on the right-hand cap is:
Sd = 1.5 - 0.15 = **1.35 mm**
- Adjuster shim thickness to be inserted on left-hand cap is: Ss = 2.00 - 135 = **0.65 mm**

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Final drive - Remove

Prior operation:
Disconnect the battery , for further information refer to **Battery - Disconnect (A.30.A)**
Prior operation:
Vehicles with pneumatic trailer brakes, remove the relevant air tank, for further information refer to **Air tank - Remove (A.20.A)**.
Prior operation:
Vehicles with pneumatic trailer brakes, remove the relief valve (if required), for further information refer to **Relief valve - Remove (A.20.A)**.

⚠ **WARNING** ⚠

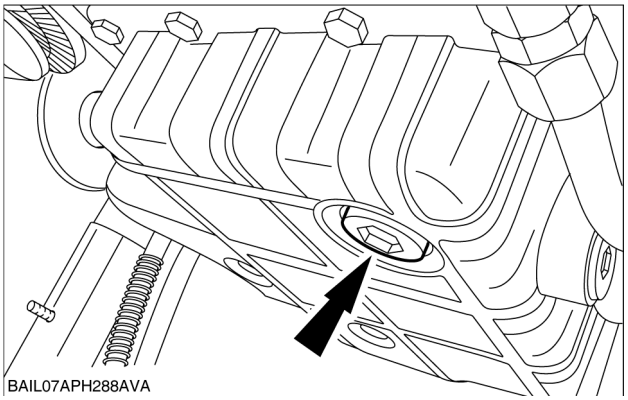
Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

NOTE: *This procedure details removal of the left-hand final drive housing, removal for the right-hand is similar.*

All Vehicles

1. Remove the transmission housing drain plug and drain the transmission oil into a suitable container. Install the drain plug and tighten to **68 - 82 Nm** (**50 - 60 lbft**).



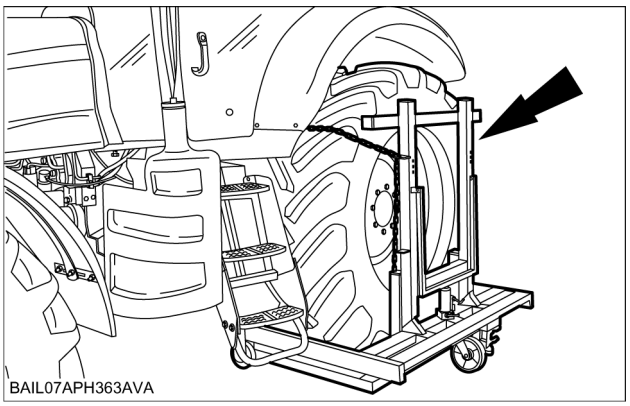
BAIL07APH288AVA 1

2. Raise and support the rear of the vehicle. Remove the left-hand rear wheel.

⚠ **WARNING** ⚠

Tractor wheels are very heavy. Handle with care and ensure, when stored, that they cannot fall and cause injury. Never operate the tractor with a loose wheel rim or disc. Always tighten nuts to the specified torque and at the recommended intervals.

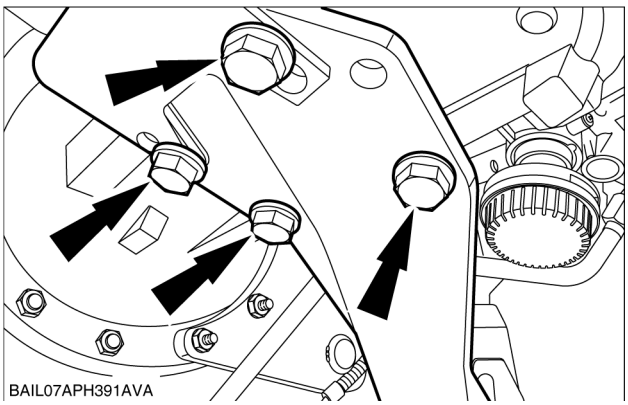
B105



BAIL07APH363AVA 2

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3. Remove the lower arm sway limiter bracket.

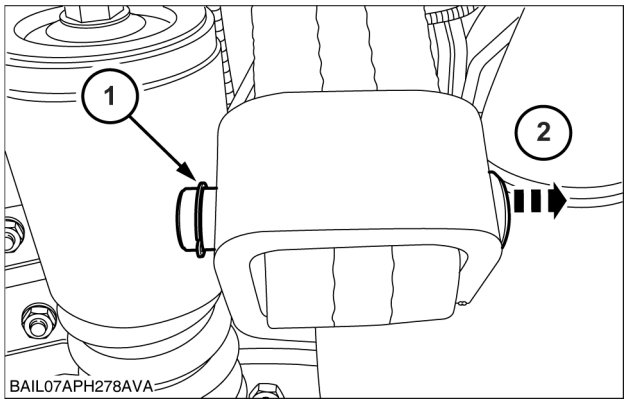


BAIL07APH391AVA 3

4. Raise and support the cab, for additional information refer to **USER PLATFORM - Remove (E.34.A)**.

Vehicles with Cab Suspension

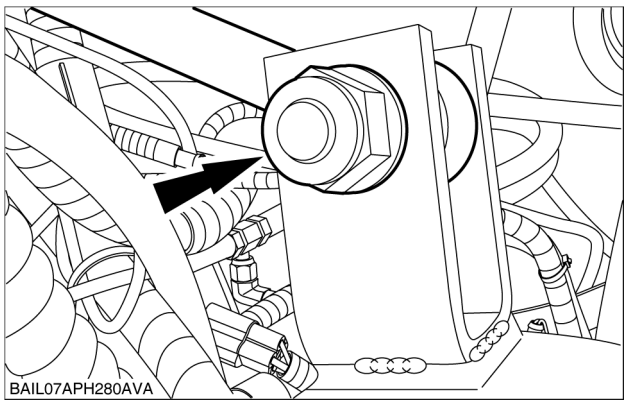
5. Disconnect the cab suspension check strap. Remove the circlip **(1)** and remove the cab suspension check strap retaining pin **(2)**.



BAIL07APH278AVA 4

6. Remove the right-hand side retaining nut and bolt from the panhard rod.

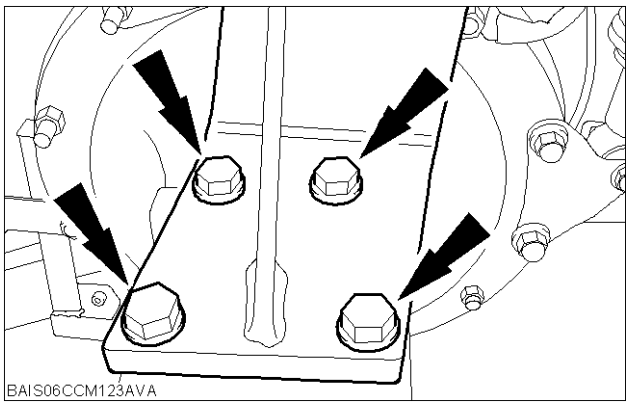
NOTE: *This step is only necessary when removing the right-hand final drive housing.*



BAIL07APH280AVA 5

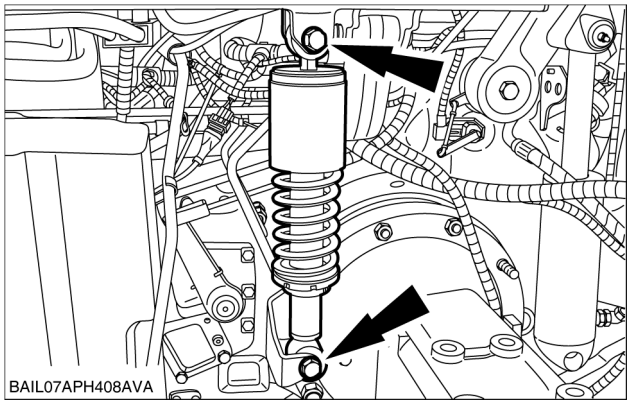
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7. Remove the cab support from the final drive housing.



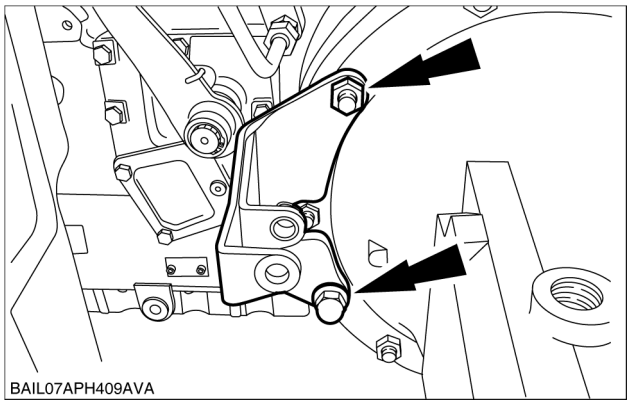
BAIS06CCM123AVA 6

8. Remove the cab suspension damper.



BAIL07APH408AVA 7

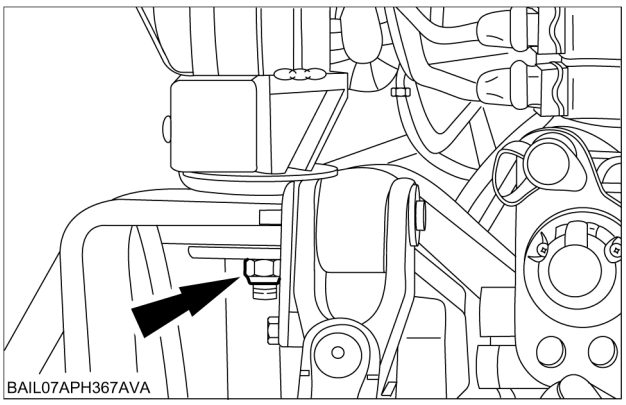
9. Remove the cab damper mounting bracket.



BAIL07APH409AVA 8

Vehicles with Standard Cab

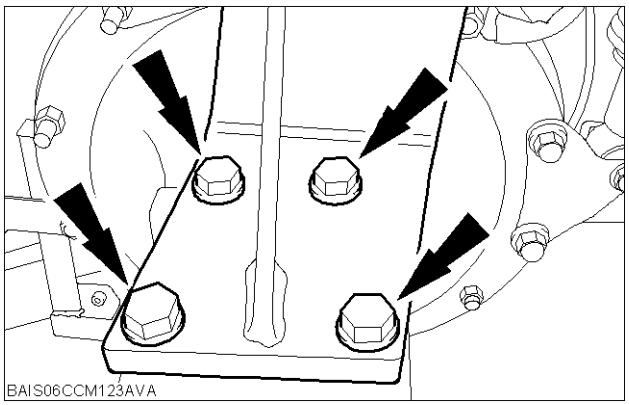
10. Remove the cab retaining nut.



BAIL07APH367AVA 9

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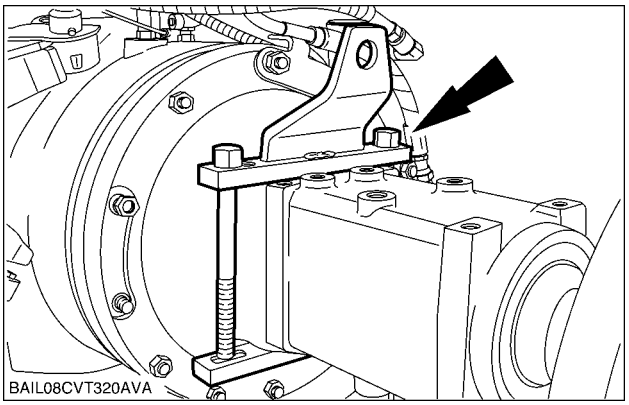
11. Remove the cab support from the final drive housing.



BAIS06CCM123AVA 10

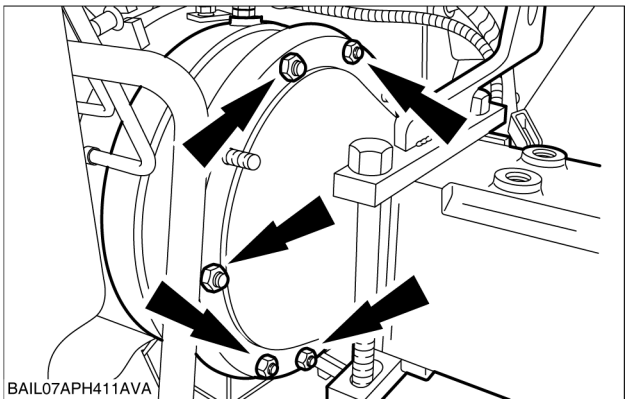
All Vehicles

12. Install special tools, lifting bracket **380001113** with adaptor studs **380200096** and attach to suitable lifting equipment.



BAIL08CVT320AVA 11

13. Remove the remaining final drive housing retaining nuts.
Remove the final drive assembly together with the half shaft



BAIL07APH411AVA 12

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Final drive - Install

⚠ WARNING ⚠

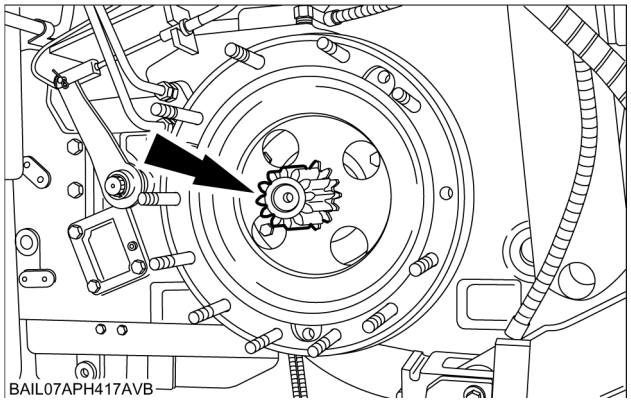
Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

NOTE: *This procedure details installation of the left-hand final drive housing, installation for the right-hand is similar.*

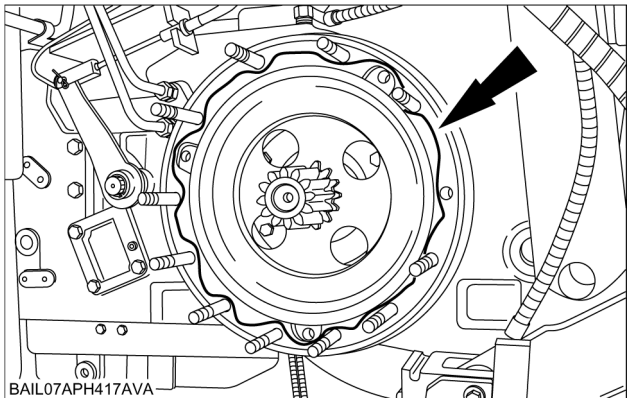
All Vehicles

1. To aid installation of the housing install the drive shaft.



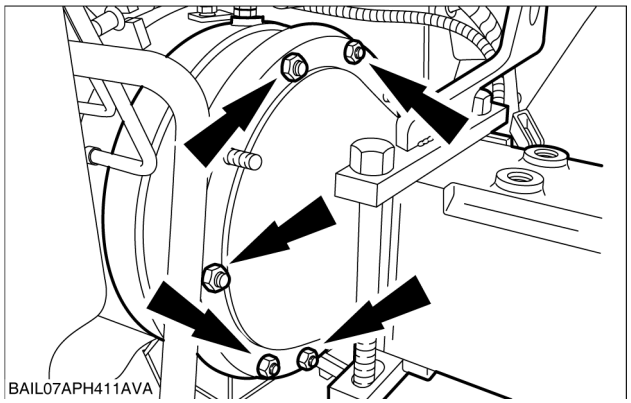
BAIL07APH417AVB 1

2. Thoroughly clean the mating surfaces and apply a bead of sealant.



BAIL07APH417AVA 2

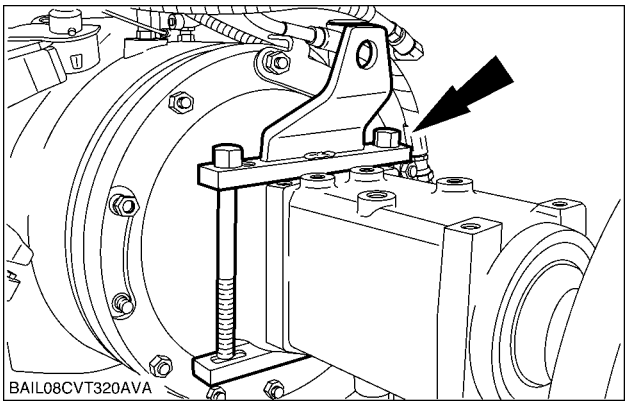
3. Install the final drive housing.



BAIL07APH411AVA 3

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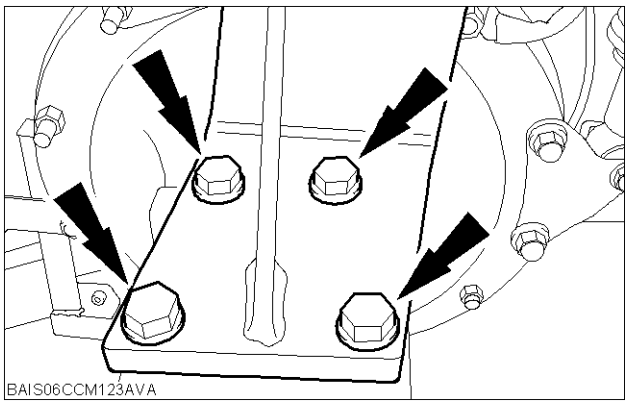
4. Remove the special tools.



BAIL08CVT320AVA 4

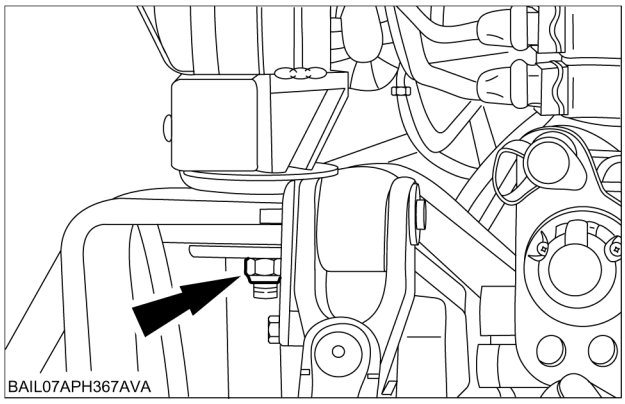
Vehicles with Standard Cab

5. Install the cab support to the final drive housing.
   Tighten to **300 Nm** (**221 lb ft**).



BAIS06CCM123AVA 5

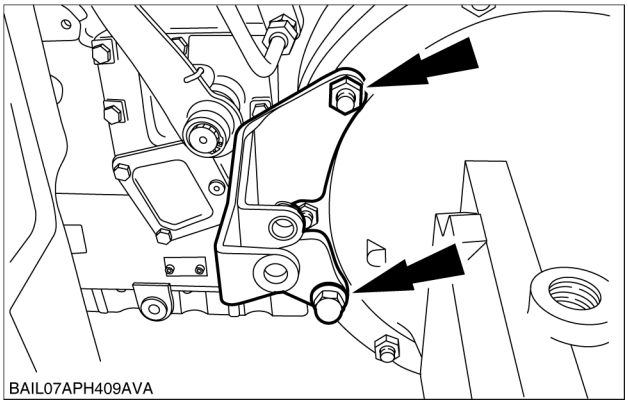
6. Install the cab retaining nut.
   Tighten to **380 Nm** (**280 lb ft**).



BAIL07APH367AVA 6

Vehicles with Cab Suspension

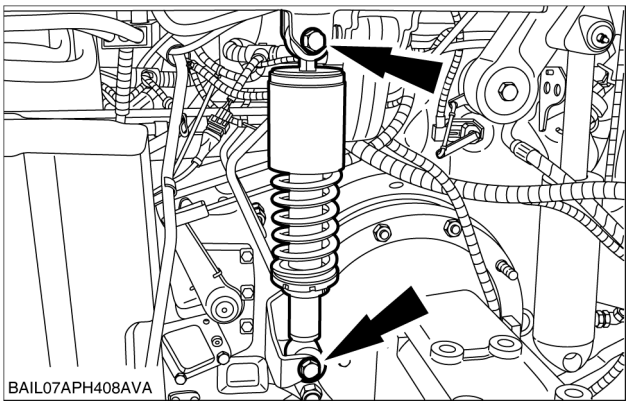
7. Install the cab damper mounting bracket.



BAIL07APH409AVA 7

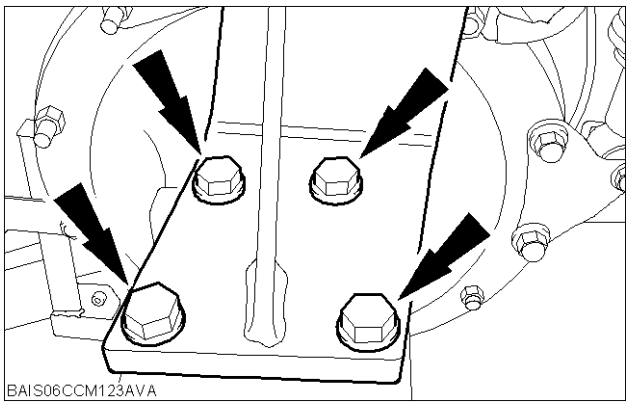
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8. Install the cab suspension damper.
Tighten to **81 Nm** (**60 lb ft**).



BAIL07APH408AVA 8

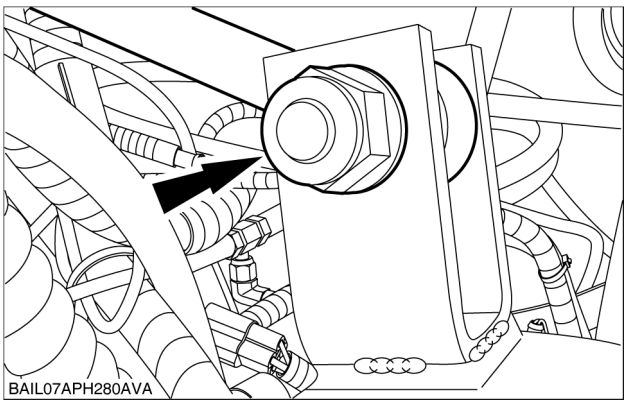
9. Install the cab support to the final drive housing.
Tighten to **300 Nm** (**221 lb ft**).



BAIS06CCM123AVA 9

10. Install the right-hand side retaining nut and bolt to the panhard rod.
Tighten to **294 Nm** (**217 lb ft**).

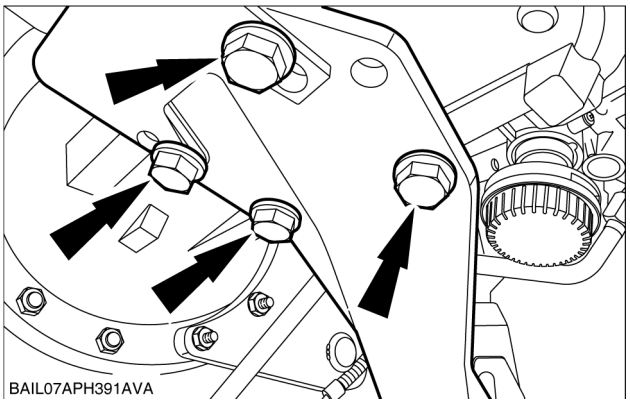
NOTE: *This step is only necessary when installing the right-hand final drive housing.*



BAIL07APH280AVA 10

All Vehicles

11. Install the lower arm sway limiter bracket.



BAIL07APH391AVA 11

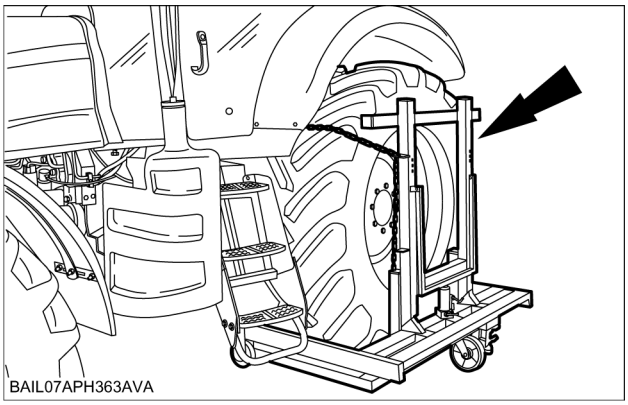
www.truck-freeworkshop.com

12. Install the left-hand rear wheel.
Tighten to **250 Nm** (**184 lb ft**).

⚠ WARNING ⚠

Tractor wheels are very heavy. Handle with care and ensure, when stored, that they cannot fall and cause injury. Never operate the tractor with a loose wheel rim or disc. Always tighten nuts to the specified torque and at the recommended intervals.

B105



BAIL07APH363AVA 12

13. Fill the transmission with oil.

Next operation:
Vehicles with pneumatic trailer brakes install the relief valve (if required), for further information refer to **Relief valve - Install (A.20.A)**.
Next operation:
Vehicles with pneumatic trailer brakes install the relevant air tank, for further information refer to **Air tank - Install (A.20.A)**.
Next operation:
Connect the battery, for further information, refer to **Battery - Connect (A.30.A)**.

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Final drive Shaft - Remove

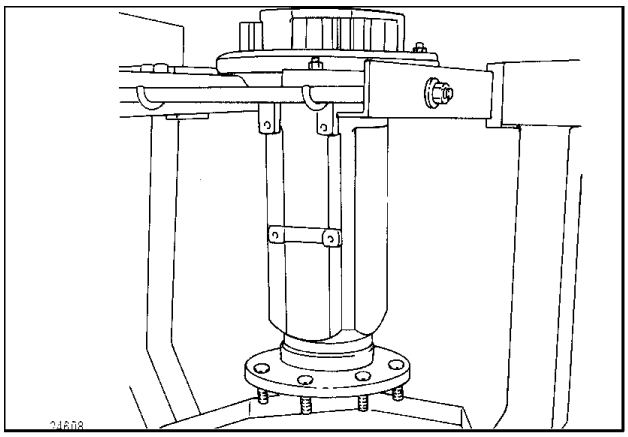
Prior operation:
Remove the final drive housing, for further information refer to **Final drive - Remove (D.12.A)**

⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

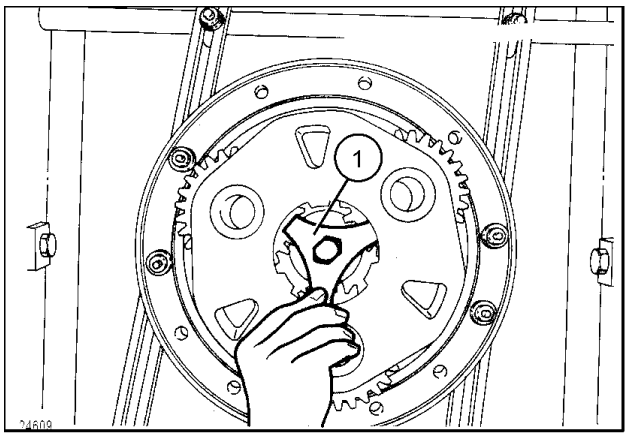
B026

1. Position the final drive housing on a rotary stand.



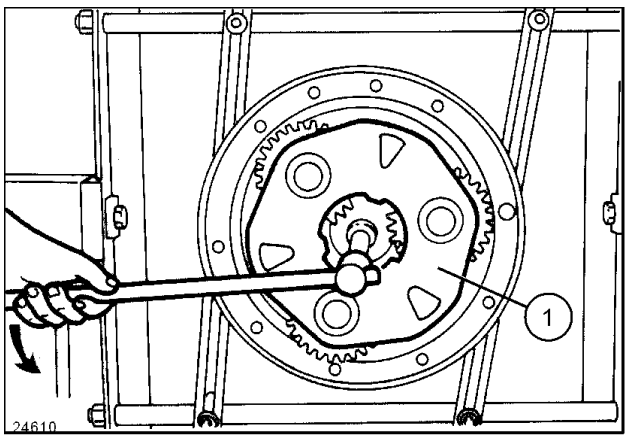
24608_544 1

2. Remove the locking plate **(1)** by slightly turning it if necessary.



24609_545 2

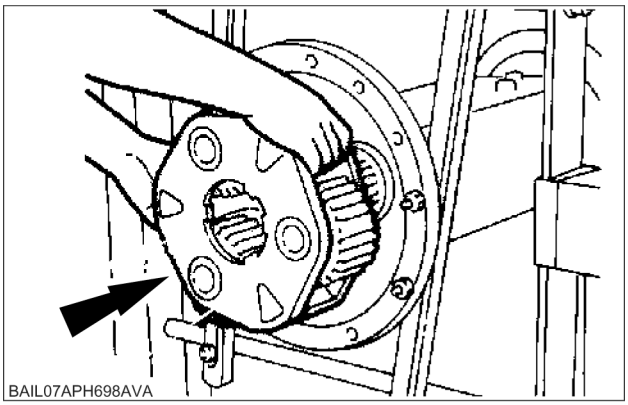
3. Loosen the bolt attaching the planetary carrier **(1)** to the drive shaft.



24610_546 3

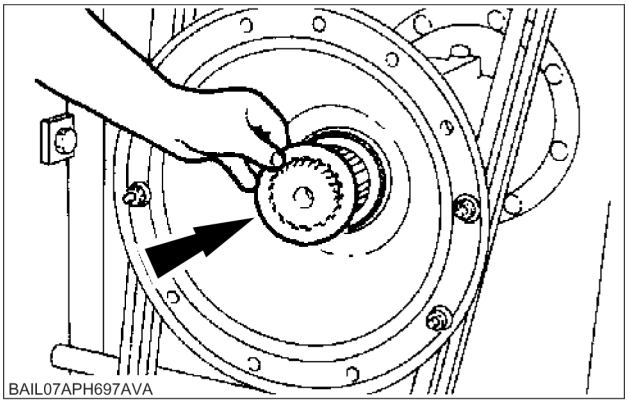
www.truck-freeworkshop.com

4. Remove the planetary gear carrier.



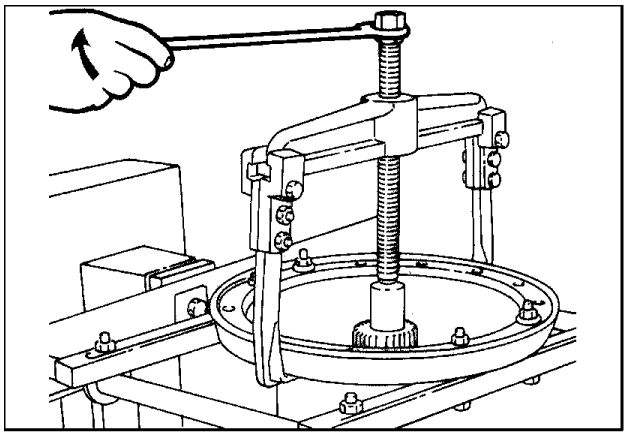
BAIL07APH698AVA 4

5. Remove the thrust washer.



BAIL07APH697AVA 5

6. Using a suitable puller, remove the drive shaft.



1b0o2004108874 6

Next operation:
Install the final drive shaft, for further information refer to **Final drive Shaft - Install (D.12.A)**

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Final drive Shaft - Install

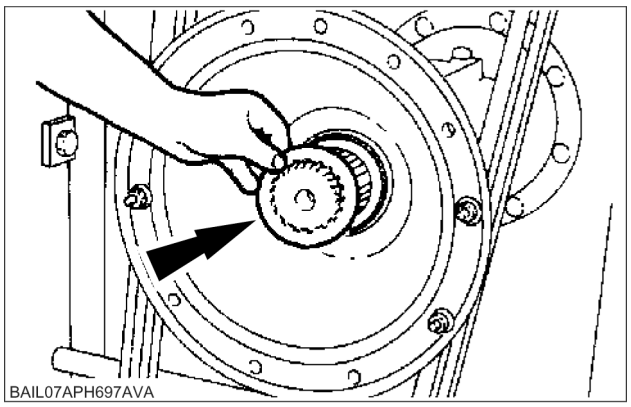
Prior operation:
Remove the final drive shaft, for further information refer to **Final drive Shaft - Remove (D.12.A)**

⚠ **WARNING** ⚠

Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

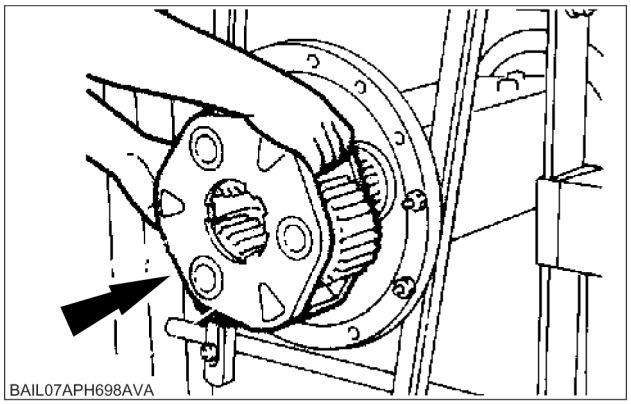
B020

1. Install the drive shaft into the final drive housing.
2. Install the thrust washer.



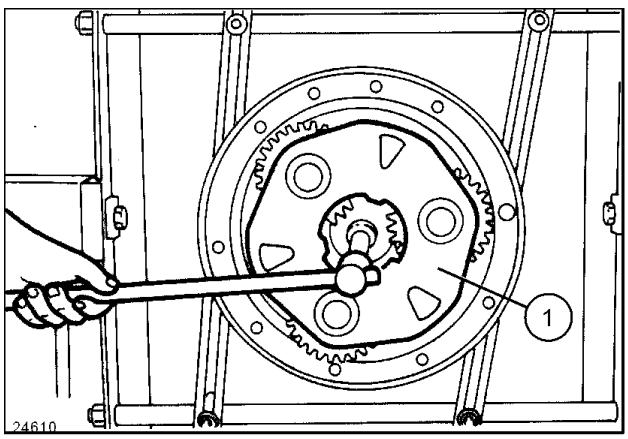
BAIL07APH697AVA 1

3. Install the planetary gear carrier.



BAIL07APH698AVA 2

4. Turn the drive shaft by hand and check that it turns freely.
   Tighten the drive shaft bolt to **196 Nm** (**145 lb ft**) while turning the drive shaft to settle the assembly.
   Loosen the drive shaft bolt and then tighten it again to **88 Nm** (**65 lb ft**) while turning the drive shaft to settle the bearings correctly.

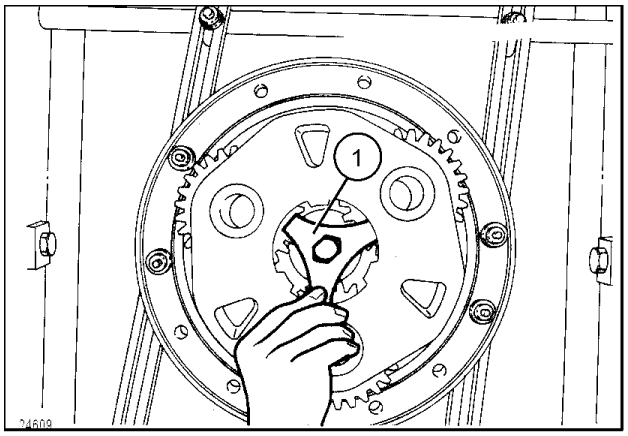


24610_553 3

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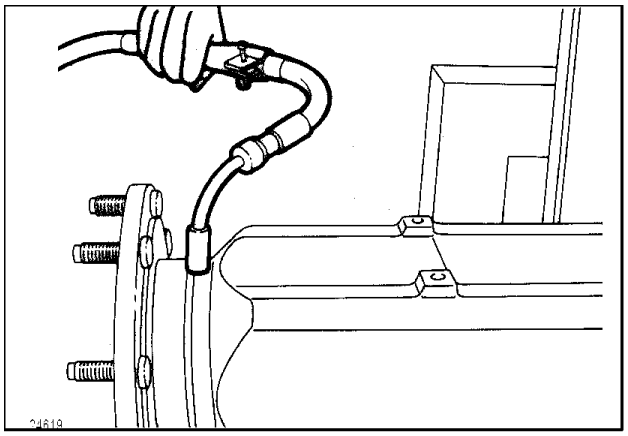
5. Install the locking plate **(1)** and lock it by screwing the bolt in or out until reaching the next notch.

NOTE: *Screw the bolt in or out to a maximum angular variation of* ***15 °****.*



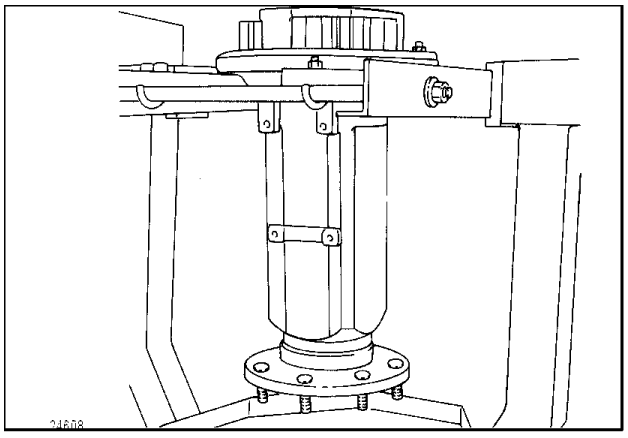
24609_545 4

6. Using the grease nipple, fill the inner recess with grease **CASE AKCELA 251H EP MULTI-PURPOSE GREASE** (several grease gun strokes are needed).



24619 5

7. Remove the final drive housing from the rotary stand.



24608_544 6

Next operation:
Install the final drive housing, for further information refer to **Final drive - Install (D.12.A)**

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Final drive Reducer, spur gear - Overhaul

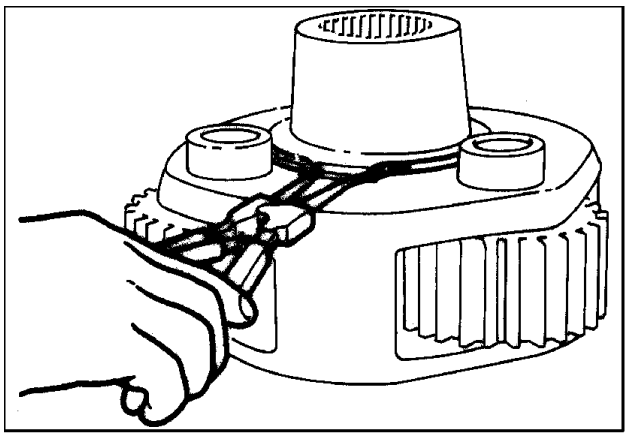
Prior operation:
Remove the final drive shaft, for further information refer to **Final drive Shaft - Remove (D.12.A)**

⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

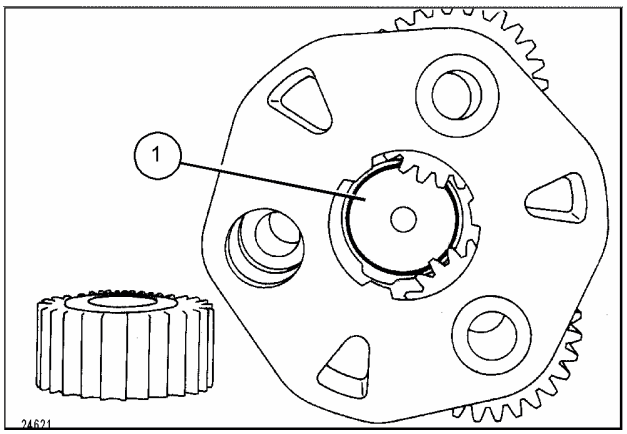
B026

1. Remove the retaining ring.



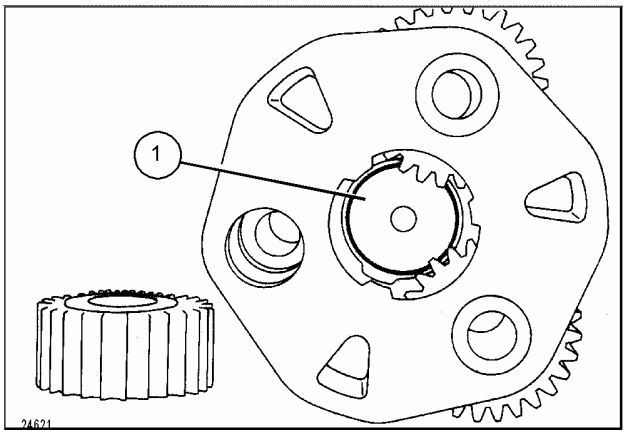
1b0o2004106106 1

2. Slide out the pivot pins and recover the gears complete with the needle bearings.
Remove the thrust washer **(1)**.



24621 2

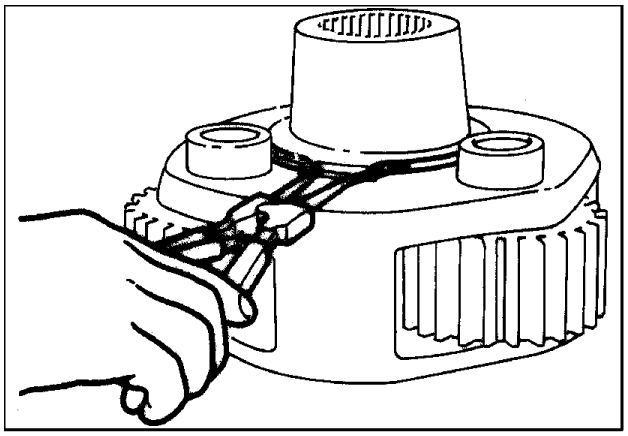
3. Check all components for wear.
4. Install a new thrust washer **(1)** on the driven gear holder.
Install new gears and needle bearings where necessary.
Install the gears complete with the needle bearings and slide in the pivot pins.



24621 3

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5. Install the retaining ring.



1b0o2004106106 4

Next operation:
Install the final drive shaft, for further information refer to **Final drive Shaft - Install (D.12.A)**

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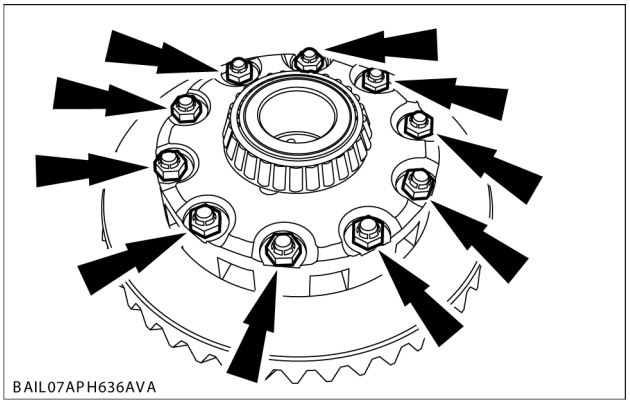
Differential - Overhaul

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

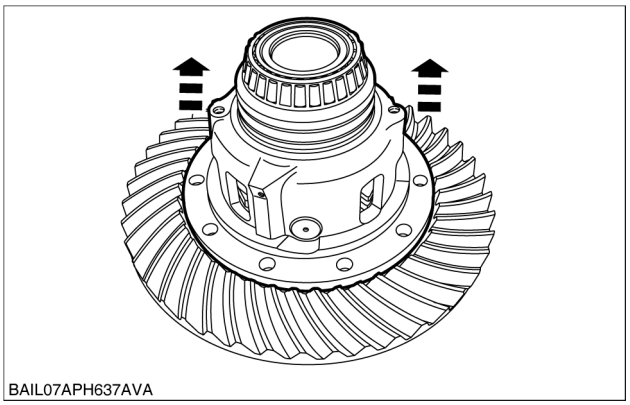
B026

1. Remove the crown wheel retaining nuts and bolts.



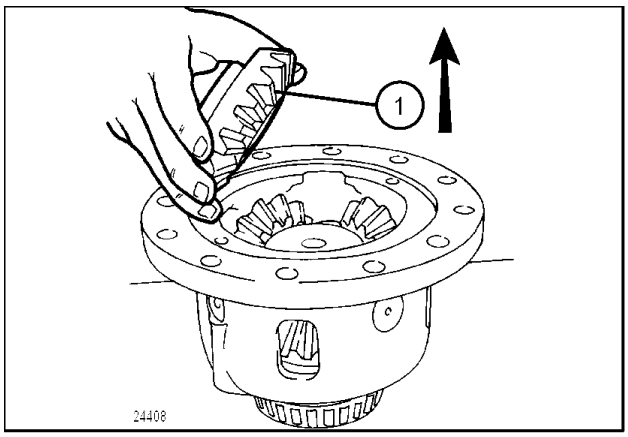
BAIL07APH636AVA 1

2. Remove the differential housing from the crown wheel.



BAIL07APH637AVA 2

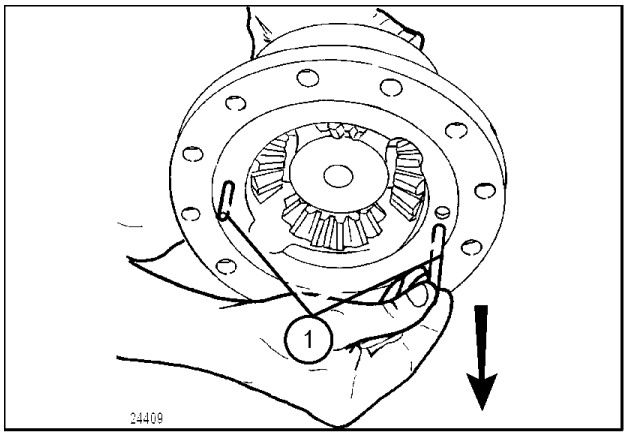
3. Remove the side gear **(1)** from the differential housing.



24408 3

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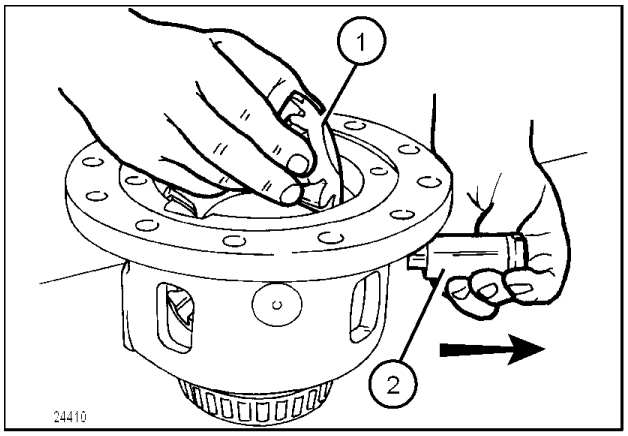
4. Remove the locking pins **(1)** of the differential gear pivot pins.



24409 4

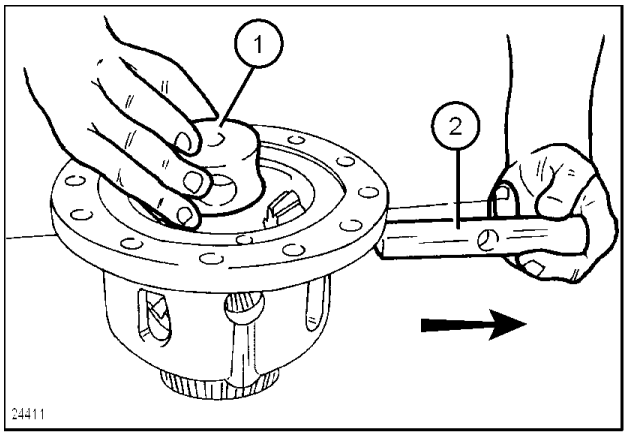
5. Slide out the pivot pins **(2)** and recover the differential gears **(1)** from both sides.

NOTE: *Keep the pivot pin and side gear matched as they are removed.*



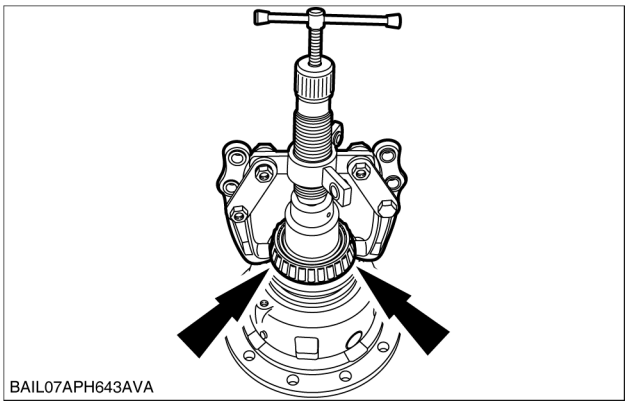
24410 5

6. Withdraw the pivot pin **(2)**, and recover the pivot pin holder **(1)** and side gears.



24411 6

7. Using a suitable puller, remove the differential housing bearing.



BAIL07APH643AVA 7

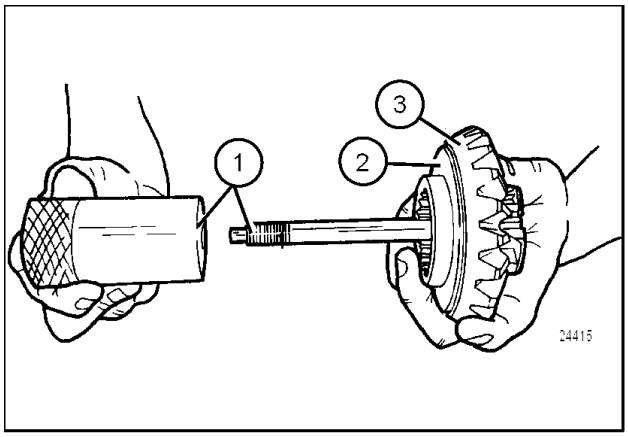
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8. Using a suitable tool, install the differential housing bearing.

9. Side gear end float adjustment (Shims A and B Refer to **REAR AXLE - Adjust (D.12.A)**
Assemble side gears, pivot pins and retaining pins.

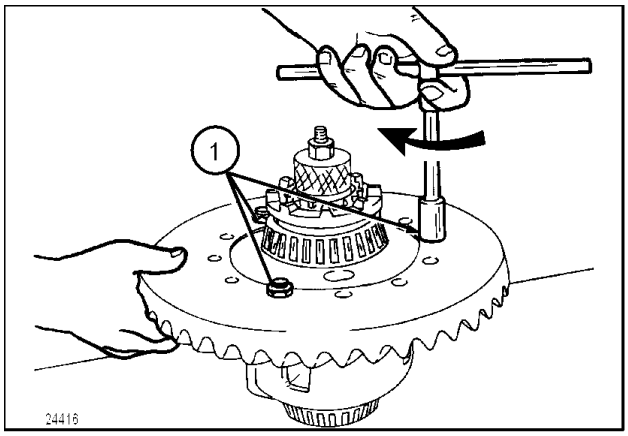
10. Place the side gear **(3)** complete with a test shim **(2)** on tool number **380000475 (1)**

NOTE: *Adjust the left-hand side carrier end float as indicated for the right-hand side gear.*



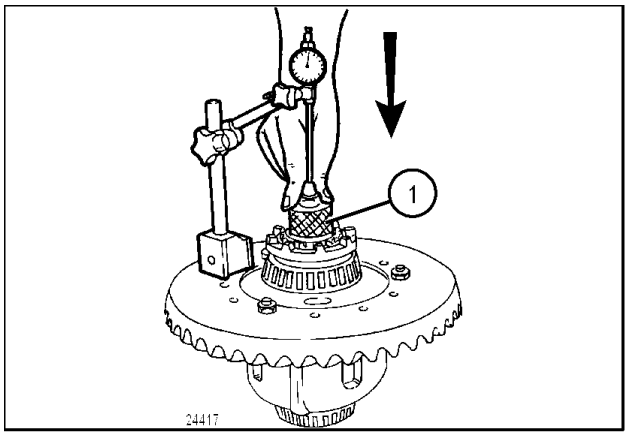
24415_530 8

11. Assemble the side gear and attached tool number **380000475** on the differential casing, place the crown wheel above it and fix the crown wheel with three bolts **(1)**. Turn the assembly to settle.



24416_531 9

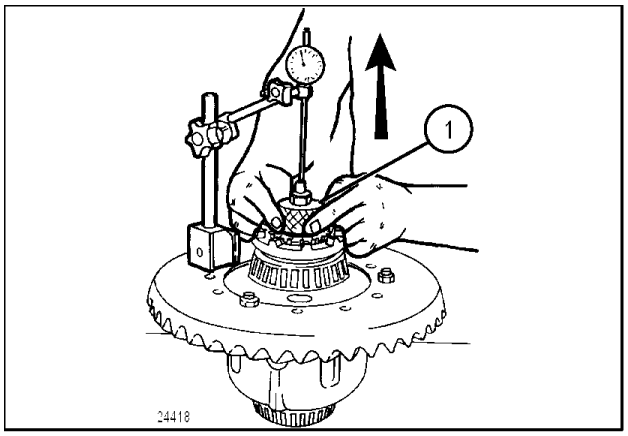
12. Place a dial test indicator gauge with the stylus on the tool screw **(1)**, press the tool and set gauge to zero.



24417_532 10

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13. Pull the tool **(1)** upwards and read the travel **(H)** on the gauge.
Adjuster ring thickness to be inserted on the right-hand side gear is given by:
Rd = (B + H) - 0,05 - 0.30
where:
Rd = Adjustment shim to be inserted on the right-hand side gear.
B = Test shim = **3.00 mm**
H = Travel measured using the gauge
0.05 mm = Half end play of differential gears in relation to their pivot pins
0.30 mm = Specified side gear end play.

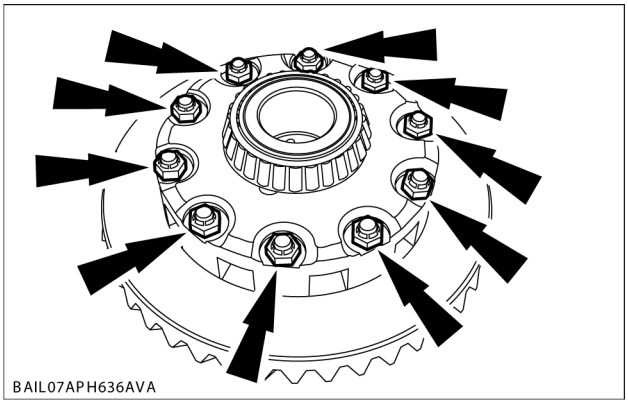


24418 11

14. Example:
- Travel measured using the gauge H = **0.50 mm**
- Test shim B = **3.00 mm**
- Thickness of the ring to be inserted on the right-hand side gear is
Rd = (3.00 + 0.50) - 0.05 - 0.30 = **3.15 mm**

15. Once determined the shim packs for the left-hand and right-hand side gears, reassemble the whole unit.

16. Install the crown wheel retaining nuts and bolts and tighten to **137 Nm** (**101 lb ft**).



BAIL07APH636AVA 12

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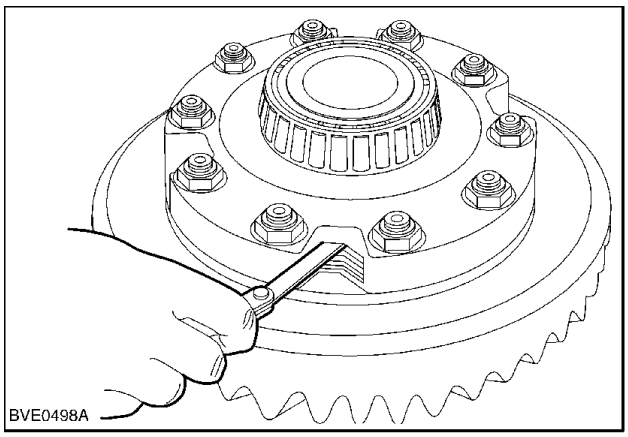
Differential lock - Overhaul

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

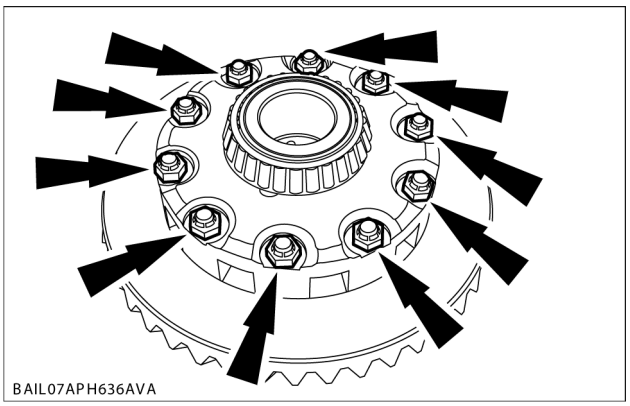
B026

1. Using suitable feeler gauges, check the clearance between the multi-wet plate clutch friction and steel discs. If the clearance is not between **1.35 - 3.1 mm** (**0.05 - 0.12 in**), install new multi-wet plate clutch friction and steel discs.



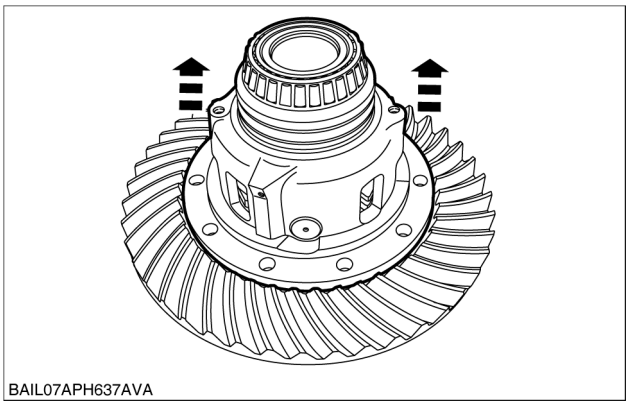
BVE0498A 1

2. Remove the crown wheel retaining nuts and bolts.



BAIL07APH636AVA 2

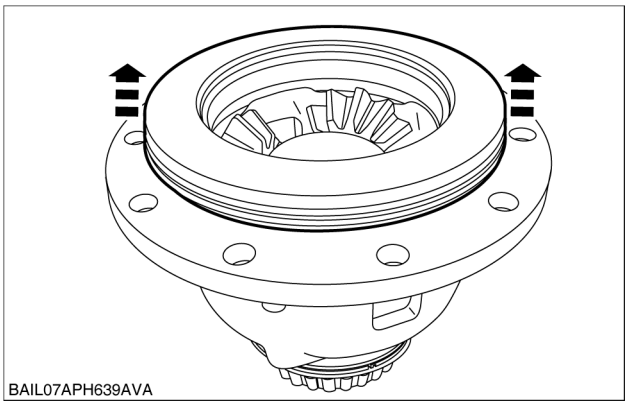
3. Remove the differential housing from the crown wheel.



BAIL07APH637AVA 3

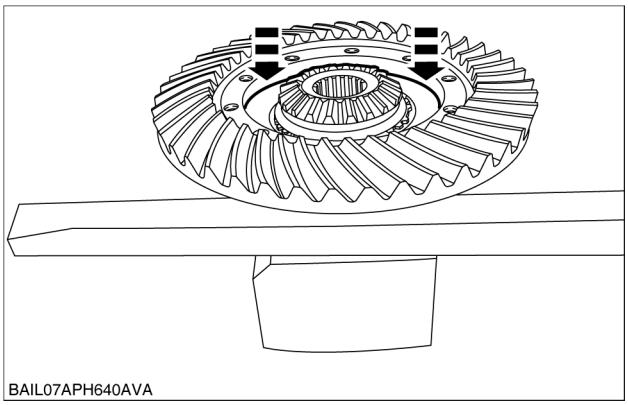
www.truck-freeworkshop.com

4. Remove the differential lock piston.



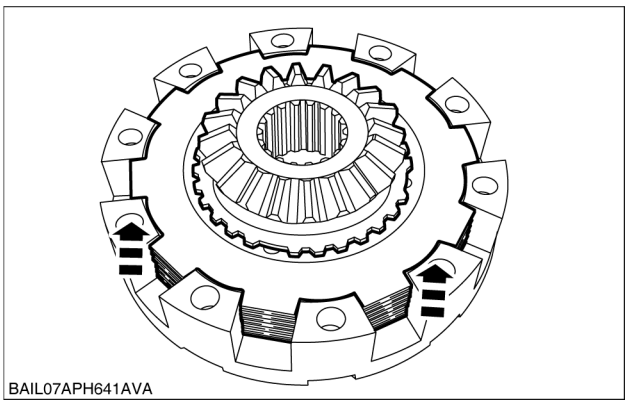
BAIL07APH639AVA 4

5. Remove the crown wheel by pushing the clutch housing downwards.



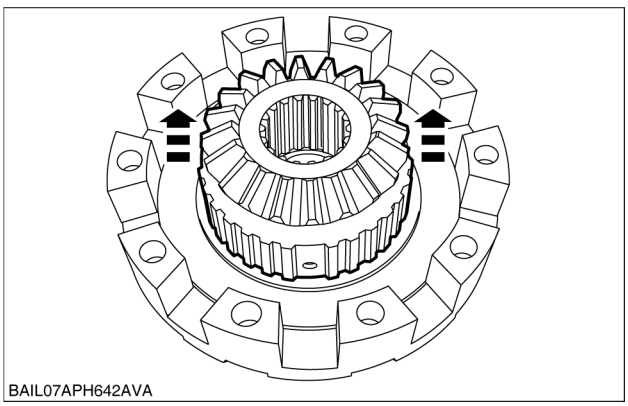
BAIL07APH640AVA 5

6. Remove the clutch discs.



BAIL07APH641AVA 6

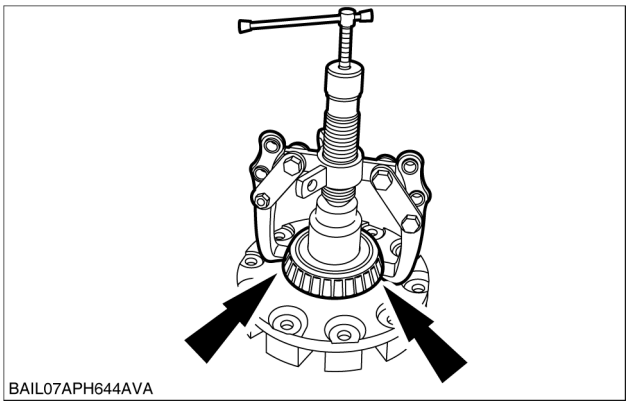
7. Remove the hub.



BAIL07APH642AVA 7

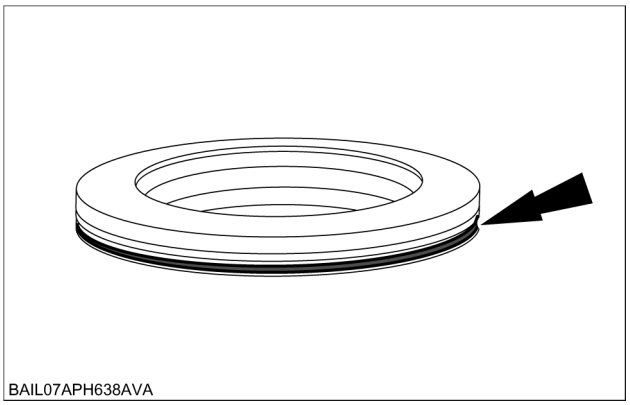
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8. Using a suitable puller, remove the clutch housing bearing.



BAIL07APH644AVA 8

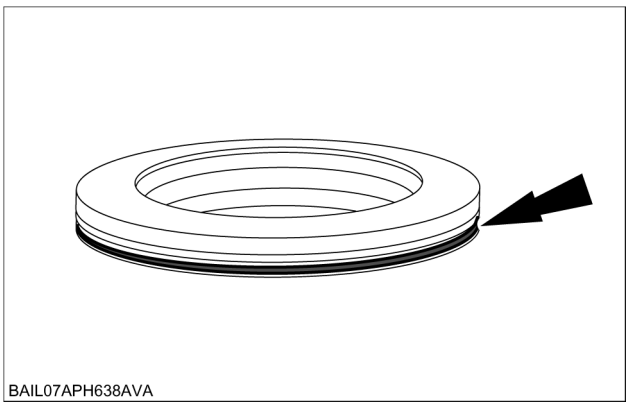
9. Remove the differential lock piston oil seal.



BAIL07APH638AVA 9

10. Lubricate all components with **CASE AKCELA HY-TRAN ULTRA** oil.

11. Install the differential lock piston oil seal.

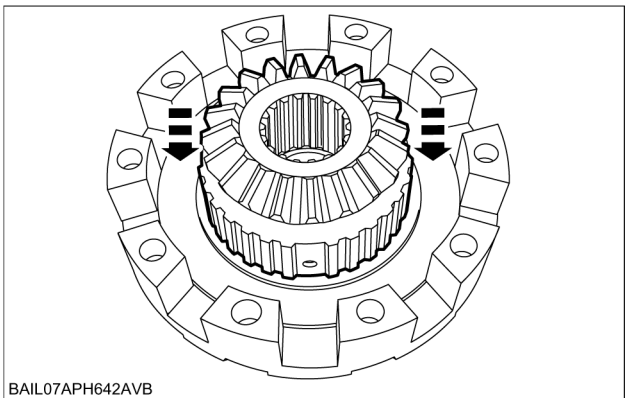


BAIL07APH638AVA 10

12. Using a suitable tool, install the clutch housing bearing.

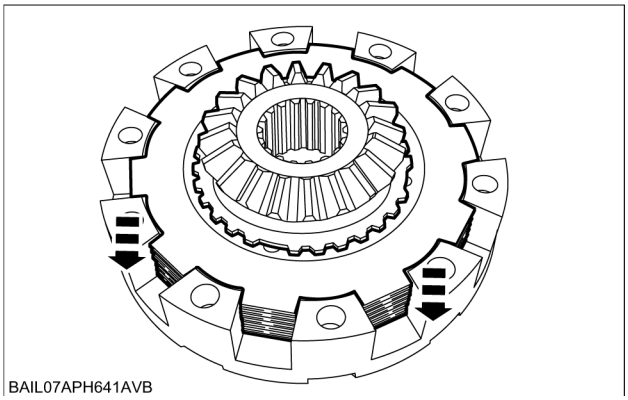
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13. Install the hub.



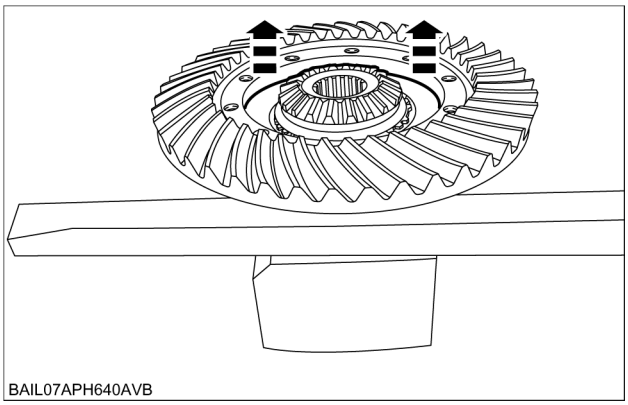
BAIL07APH642AVB 11

14. Install the clutch discs.



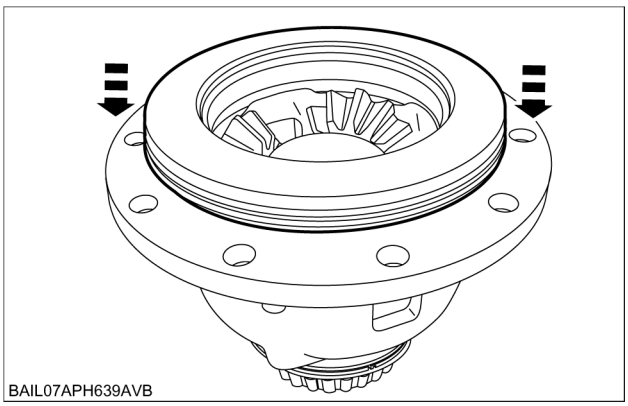
BAIL07APH641AVB 12

15. Install the crown wheel by pulling the clutch housing upwards.



BAIL07APH640AVB 13

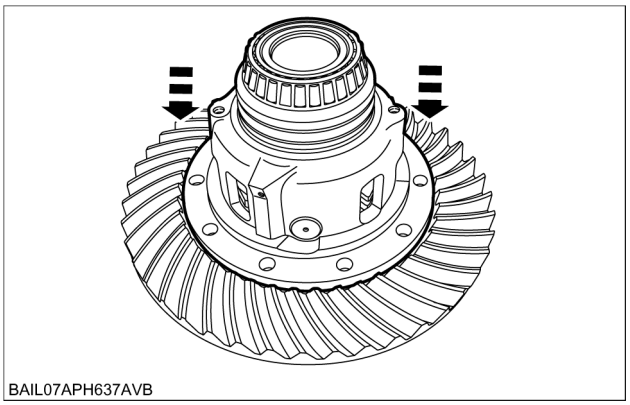
16. Install the differential lock piston.



BAIL07APH639AVB 14

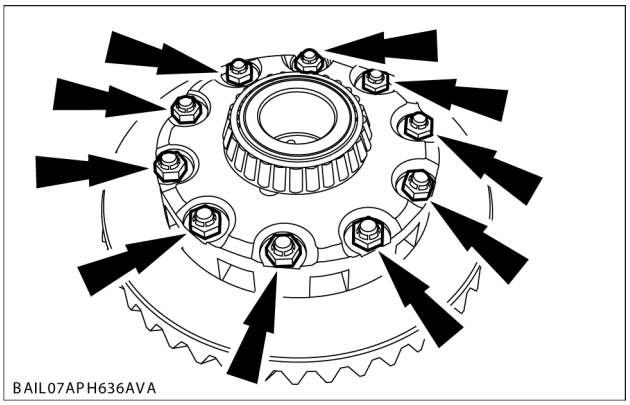
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17. Install the differential housing to the crown wheel.



BAIL07APH637AVB 15

18. Install the crown wheel retaining nuts and bolts and tighten to **137 Nm** (**101 lb ft**).



BAIL07APH636AVA 16

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Housing - Overhaul

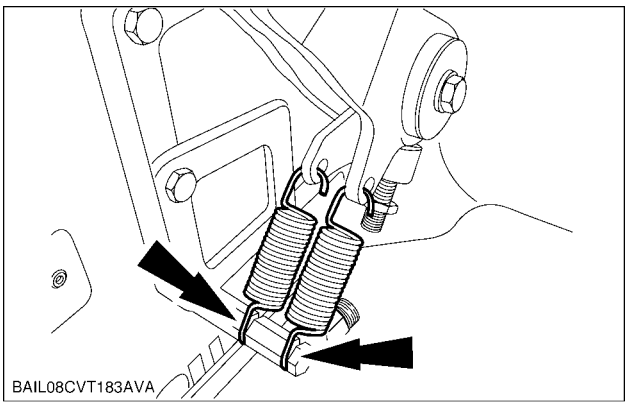
Prior operation:
Remove the rear axle, for further information, refer to **REAR AXLE - Remove (D.12.A)**.
Prior operation:
Remove the four-wheel drive clutch, for further information, refer to **Clutch - Remove (D.14.C)**.

⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

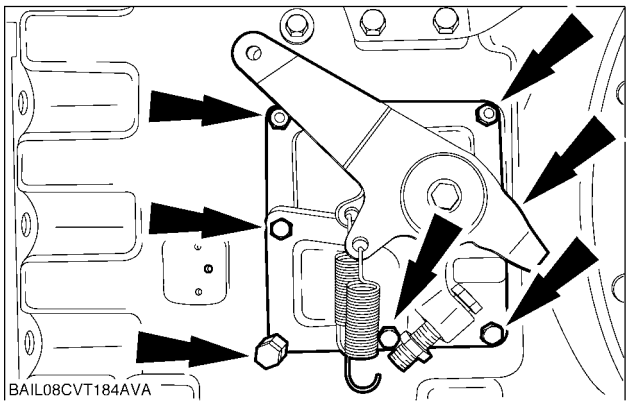
B026

1. Detach the return springs.



BAIL08CVT183AVA 1

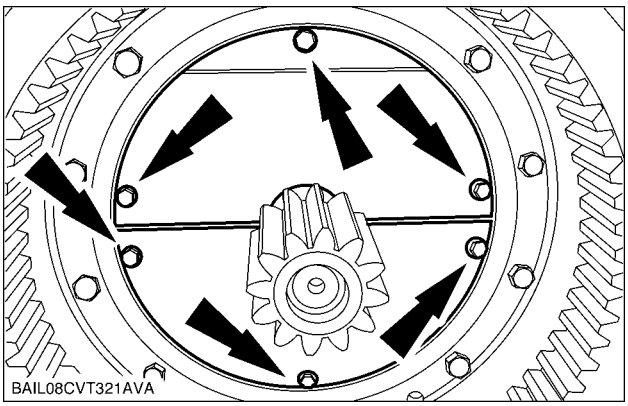
2. Remove the parking brake control assembly.



BAIL08CVT184AVA 2

Rear brakes

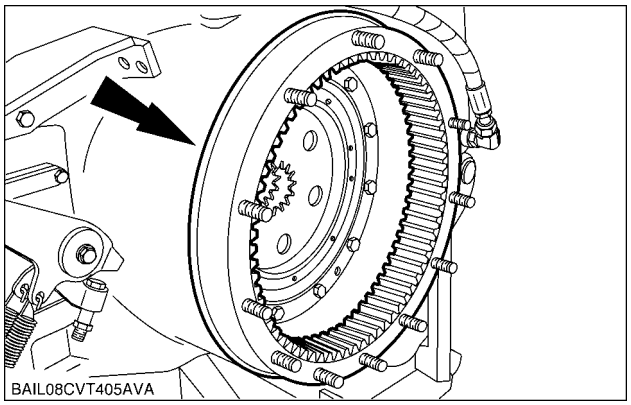
3. Remove the brake lubrication oil retention plates.



BAIL08CVT321AVA 3

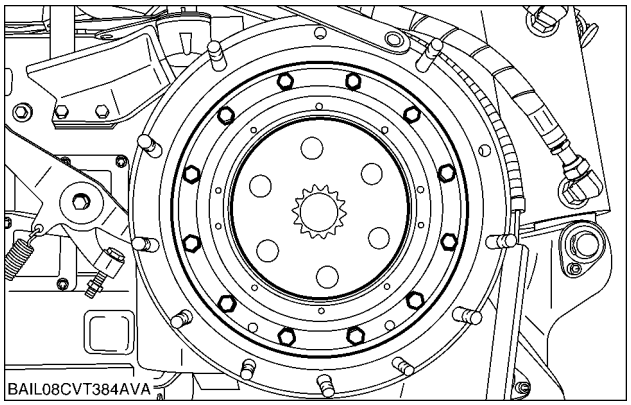
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4. Remove the ring gear.



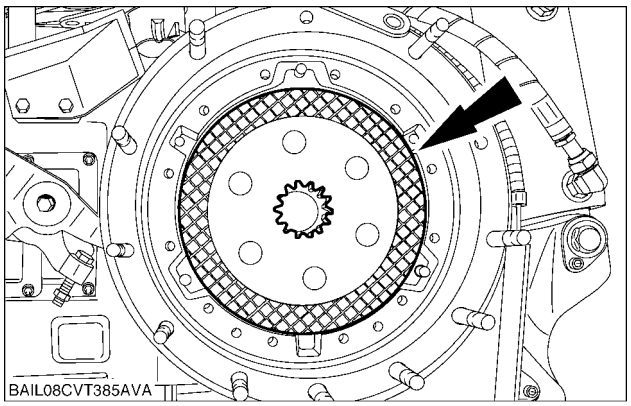
BAIL08CVT405AVA 4

5. Remove the rear brake retaining plate.



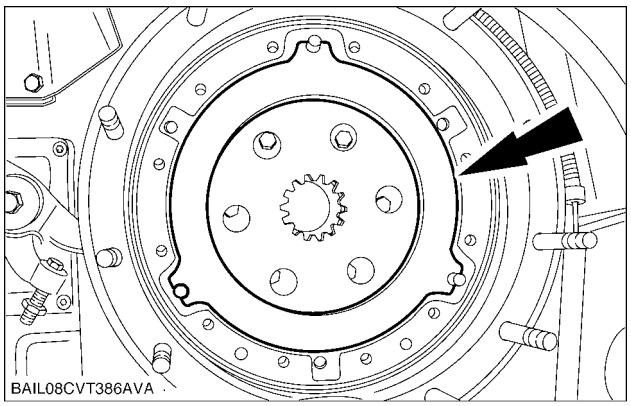
BAIL08CVT384AVA 5

6. Remove the outer friction brake disc.



BAIL08CVT385AVA 6

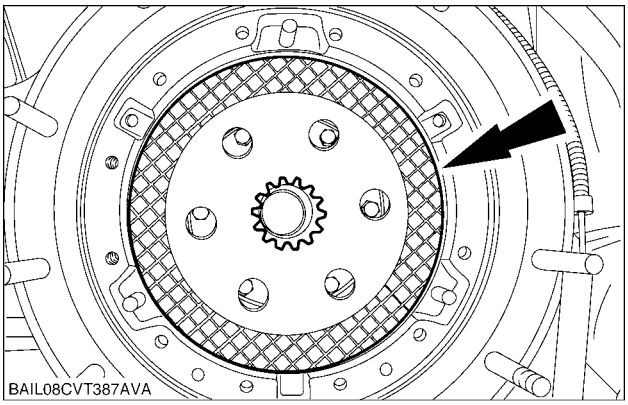
7. Remove the intermediate steel brake disc.



BAIL08CVT386AVA 7

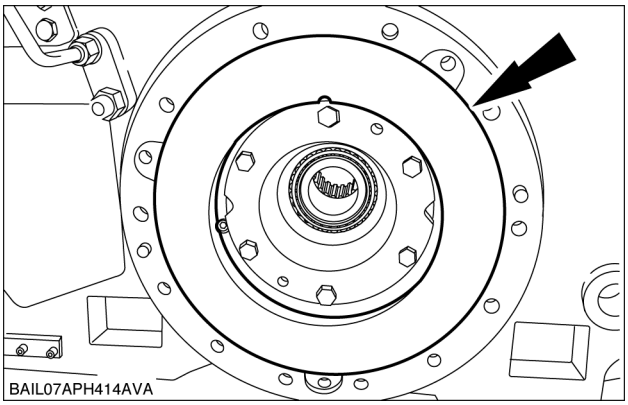
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8. Remove the inner friction brake disc.



BAIL08CVT387AVA 8

9. Remove the brake piston.

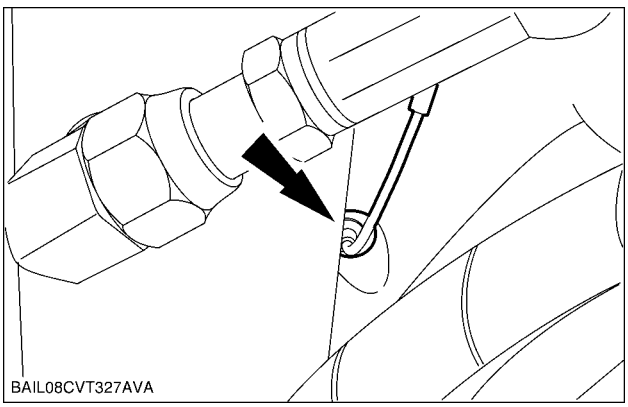


BAIL07APH414AVA 9

Crown wheel

NOTE: *If only the crown wheel and NOT the pinion is to be removed the rear axle does not need to be disconnected from the transmission.*

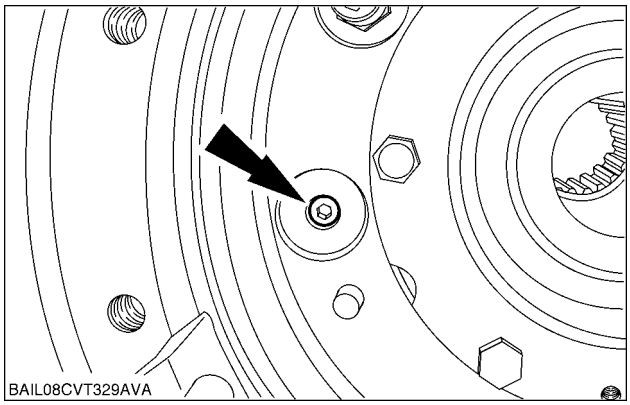
10. Using a suitable socket remove the PTO twist sensor.



BAIL08CVT327AVA 10

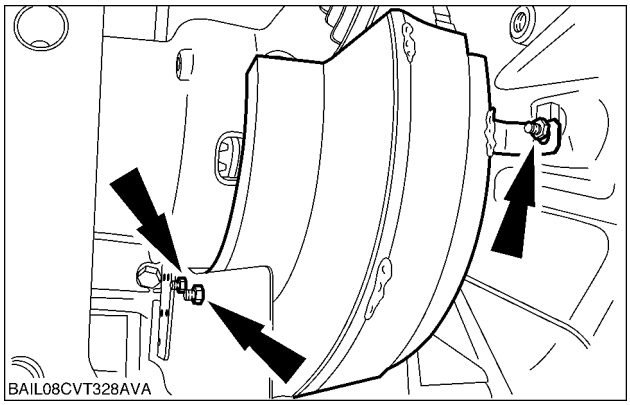
www.truck-freeworkshop.com

11. Remove the crown wheel baffle plate retaining bolt.



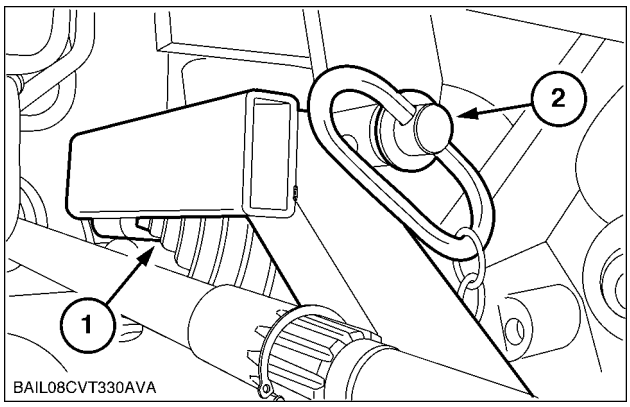
BAIL08CVT329AVA 11

12. Remove the crown wheel baffle plate.



BAIL08CVT328AVA 12

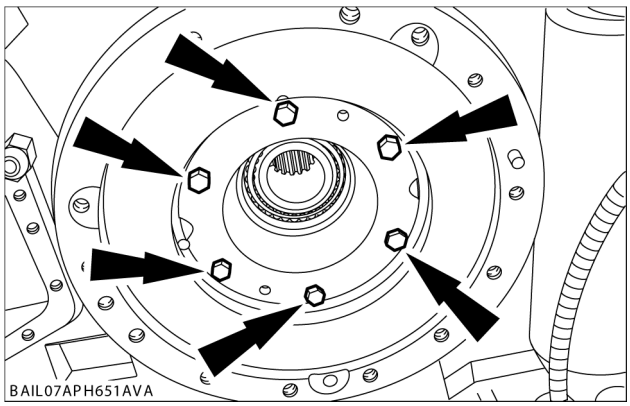
13. Locate special tool **380200104** under the crown wheel teeth **(1)** and lock in position **(2)**.



BAIL08CVT330AVA 13

14. Support the weight of the crown wheel with the special tool.
Remove the crown wheel support cap retaining bolts.

NOTE: *Repeat this step for the right-hand side.*

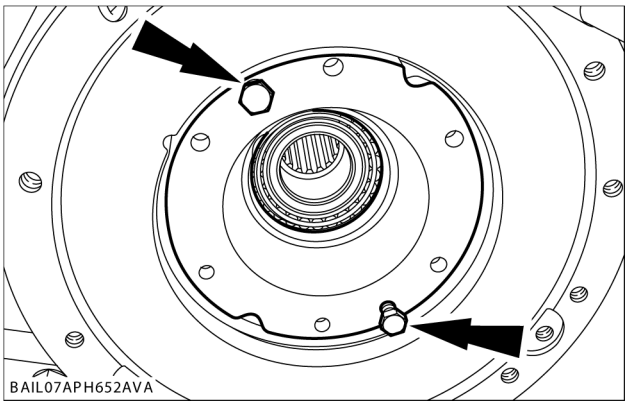


BAIL07APH651AVA 14

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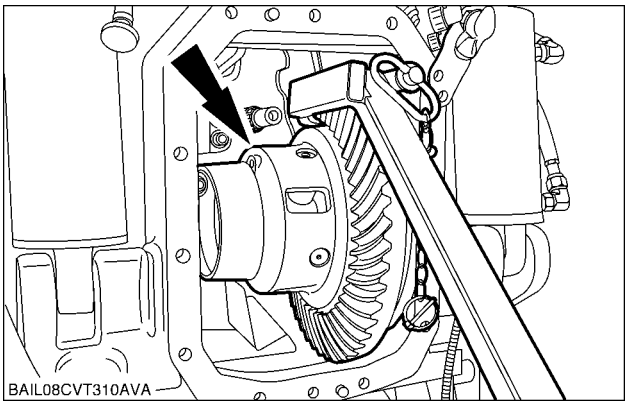
15. Install two of the retaining bolts into the blind holes and tighten until the support cap and shims are removed.

NOTE: *Repeat this step for the right-hand side.*



BAIL07APH652AVA 15

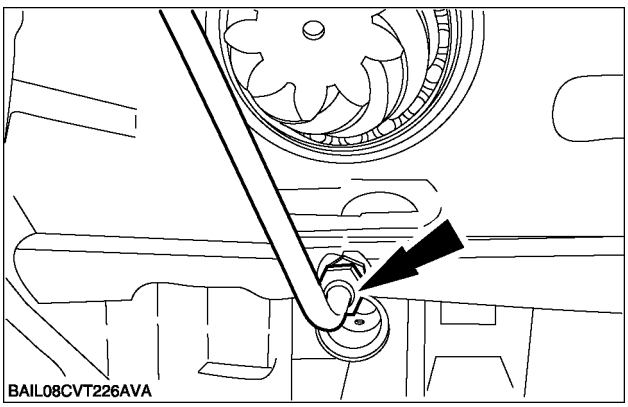
16. Using the suitable support under the special tool, remove the crown wheel and differential assembly.



BAIL08CVT310AVA 16

Pinion

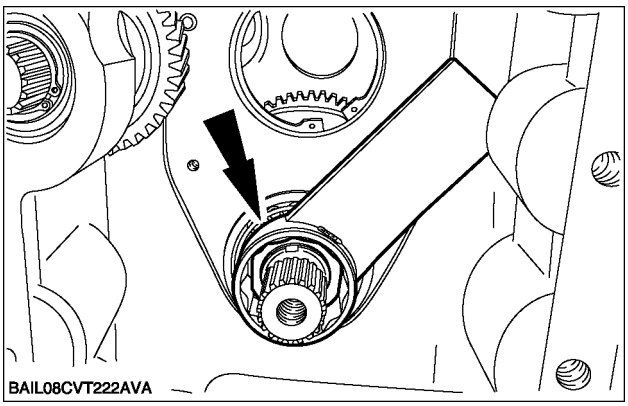
17. Disconnect the hydraulic pipe.



BAIL08CVT226AVA 17

18. Unstake the pinion retaining nut.
Using a suitable tool lock the pinion nut.

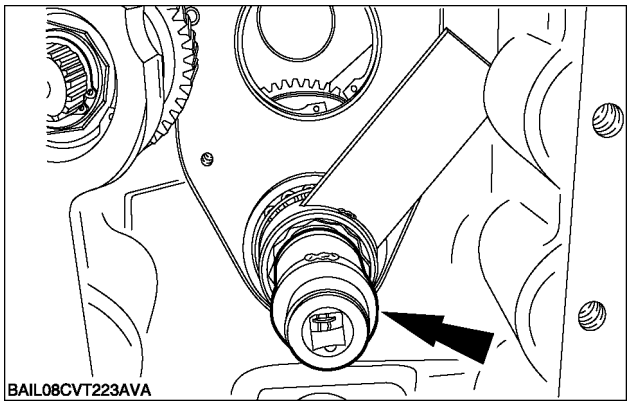
NOTE: *For further information, refer to* ***REAR AXLE - Special tools (D.12.A)****.*



BAIL08CVT222AVA 18

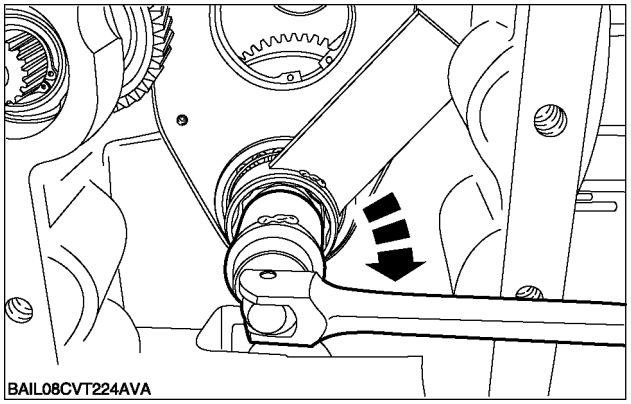
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19. Install a suitable splined socket onto the pinion shaft.



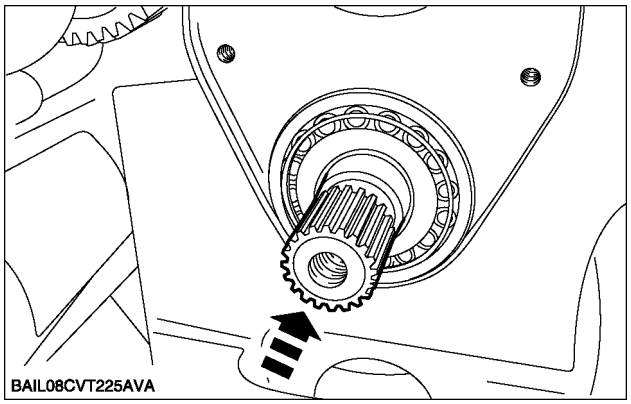
BAIL08CVT223AVA 19

20. Turn the pinion shaft clockwise to remove the pinion nut.



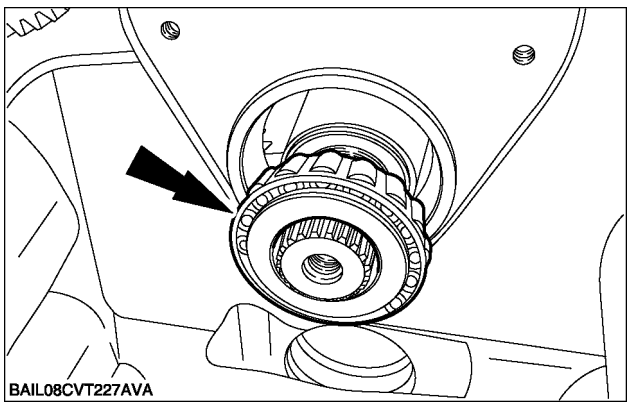
BAIL08CVT224AVA 20

21. Partially remove the pinion shaft.



BAIL08CVT225AVA 21

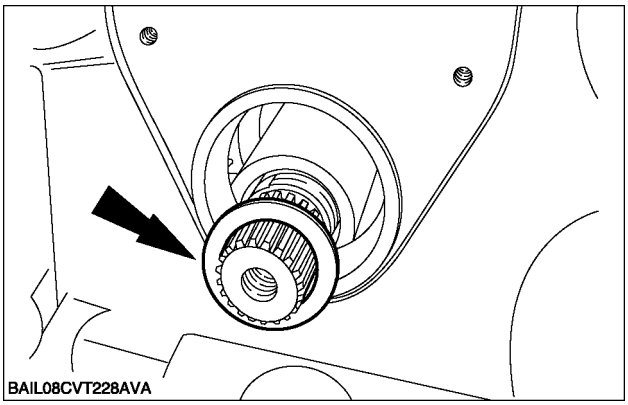
22. Remove the bearing.



BAIL08CVT227AVA 22

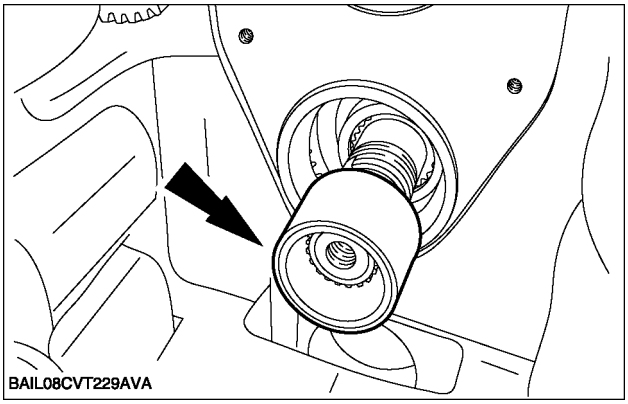
www.truck-freeworkshop.com

23. Remove the bearing adjustment shim.



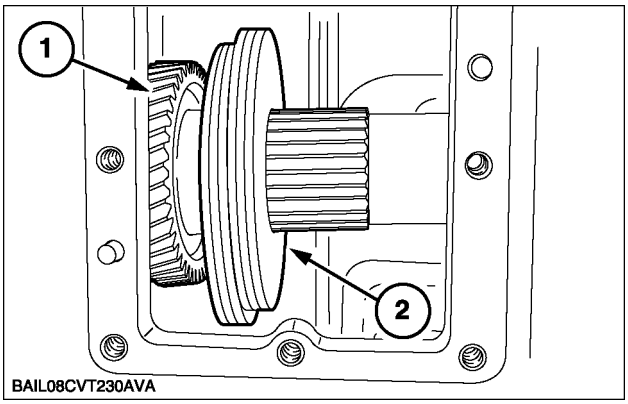
BAIL08CVT228AVA 23

24. Remove the spacer.



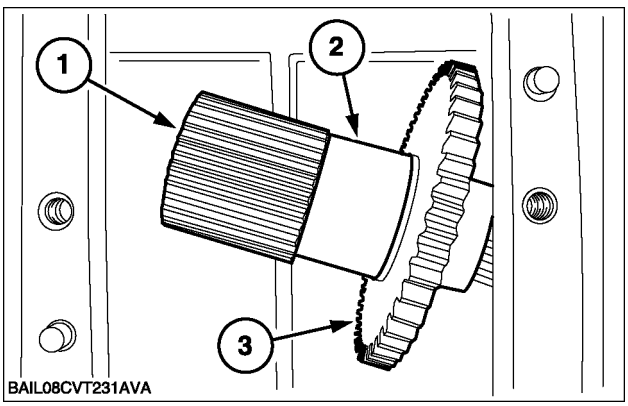
BAIL08CVT229AVA 24

25. Remove the 4WD clutch drive gear **(1)** and the park brake discs **(2)**.
Remove the pinion shaft.



BAIL08CVT230AVA 25

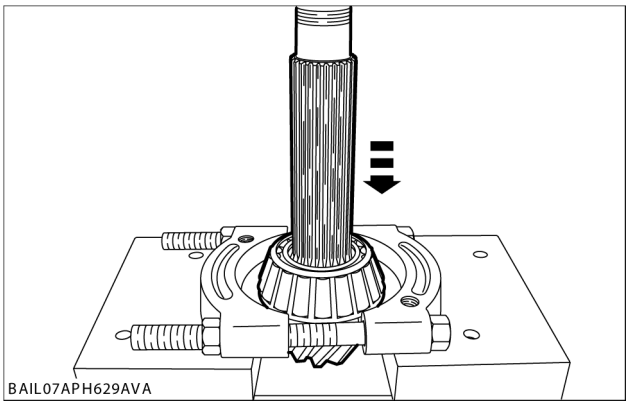
26. Remove the splined brake disc carrier **(1)**, spacer **(2)** and sensing gear **(3)**.



BAIL08CVT231AVA 26

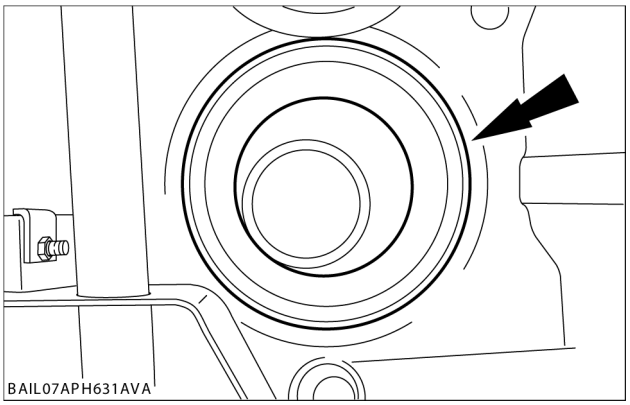
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27. Using a suitable hydraulic press, remove the pinion bearing.



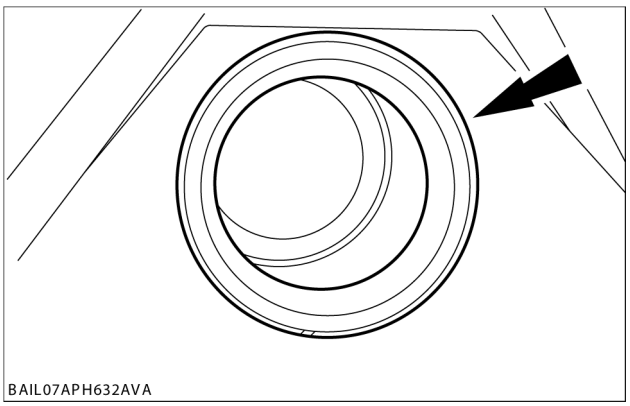
BAIL07APH629AVA 27

28. Using a suitable driver tool, remove the pinion rear bearing cup from the rear axle housing, and recover the adjustment shim (if equipped).



BAIL07APH631AVA 28

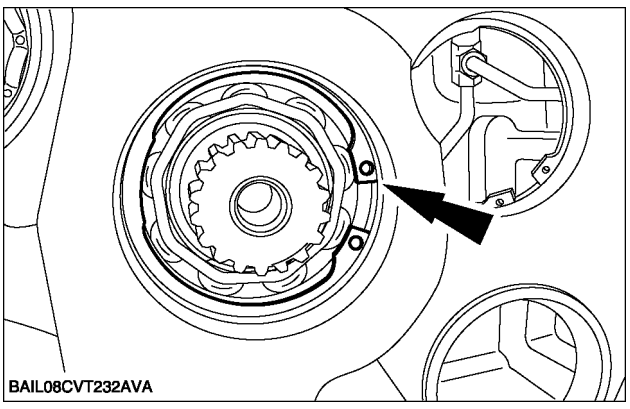
29. Using a suitable driver tool, remove the pinion front bearing cup from the rear axle housing, and recover the adjustment shim (if equipped).



BAIL07APH632AVA 29

Hydraulic pump idler gear

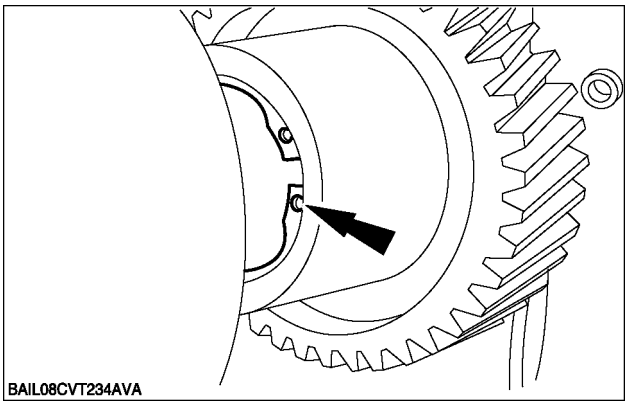
30. Remove the idler shaft bearing retaining circlip.



BAIL08CVT232AVA 30

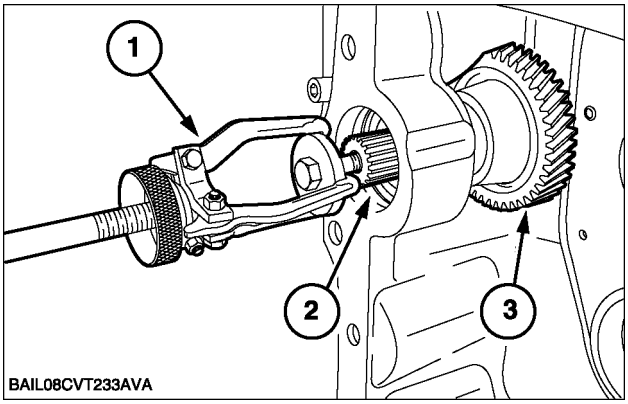
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31. Remove the drive gear retaining circlip.



BAIL08CVT234AVA 31

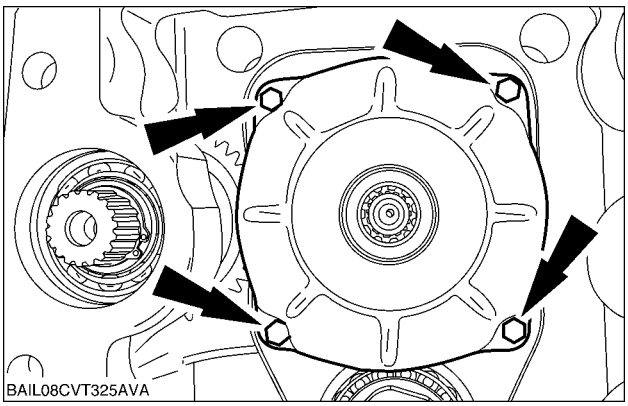
32. Using a slide hammer **(1)**, drift out the shaft. Retrieve the bearing **(2)**, and drive gear **(3)**.



BAIL08CVT233AVA 32

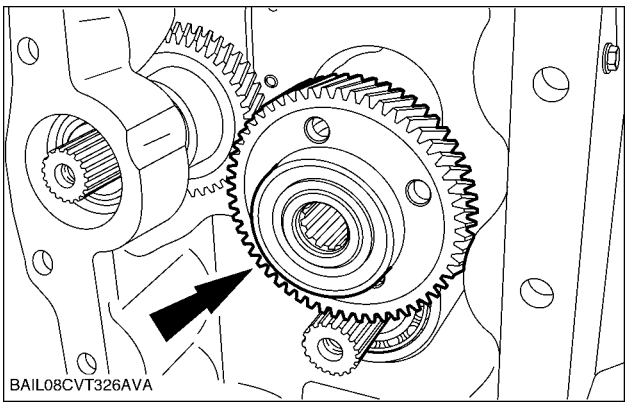
PTO shaft

33. Remove the PTO shaft bearing carrier.



BAIL08CVT325AVA 33

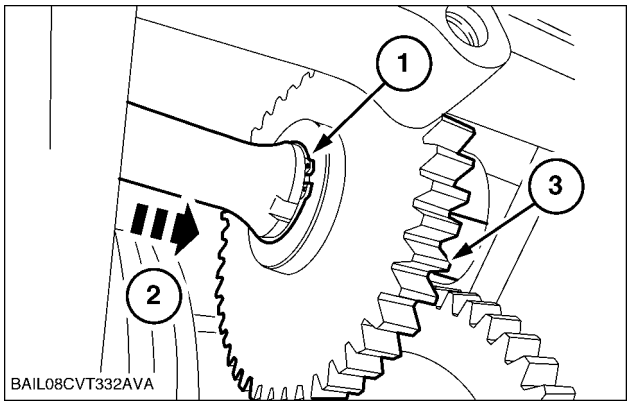
34. Remove the hydraulic pump drive gear and PTO bearing.



BAIL08CVT326AVA 34

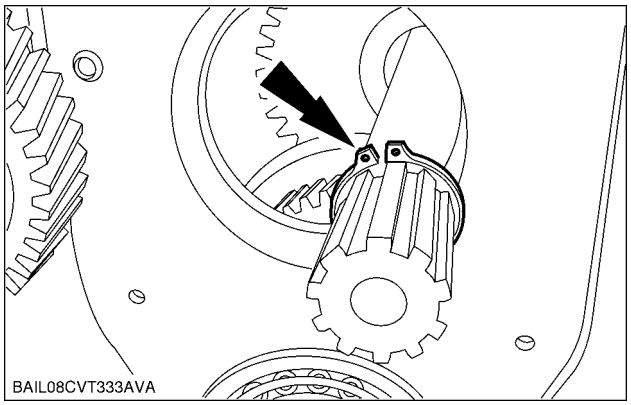
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35. Remove the circlip **(1)** remove the PTO shaft **(2)** remove the gear **(3)**.



BAIL08CVT332AVA 35

36. Remove the circlip from the PTO shaft.



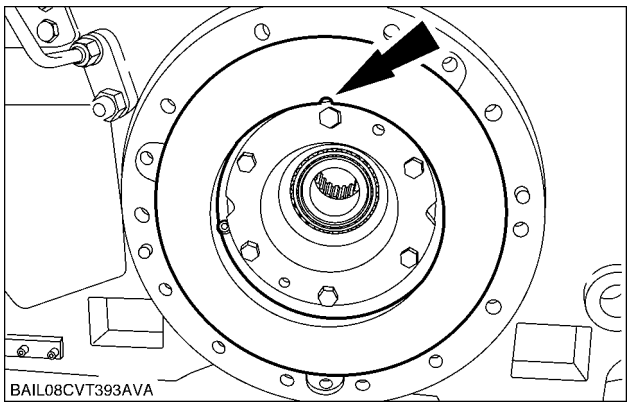
BAIL08CVT333AVA 36

37. Install the pinion and bearing cups, carry out the procedures and adjustments as detailed in: **REAR AXLE - Adjust (D.12.A)**.

38. Install the crown wheel and differential assembly, carry out the procedures adjustments as detailed in: **REAR AXLE - Adjust (D.12.A)**.

39. Install the brake piston.

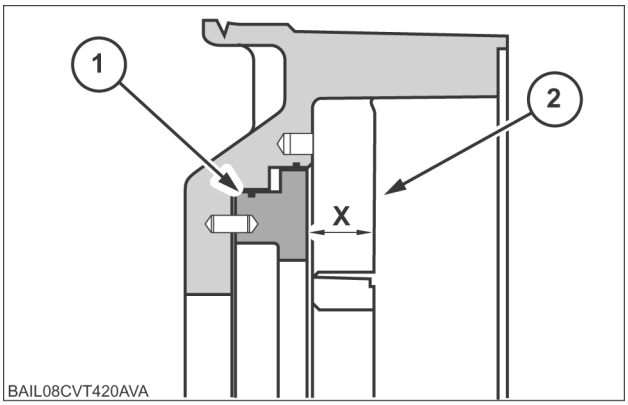
IMPORTANT: *Make sure the notch on the piston is at the top of the housing*



BAIL08CVT393AVA 37

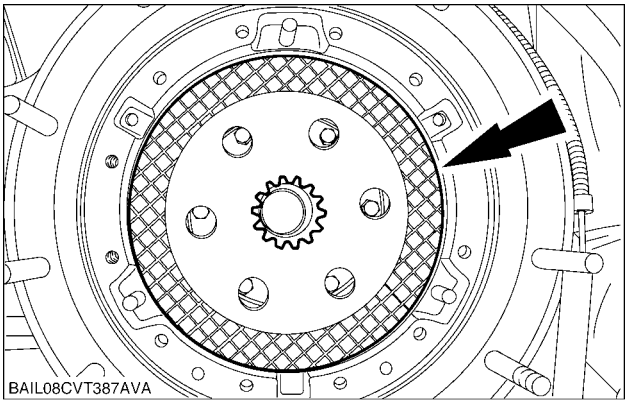
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40. When the piston is installed, the measurement **(X)** between the outer face of the piston **(1)** and the mating surface of the rear brake retaining plate **(2)** must read a minimum of **43.5 mm**.



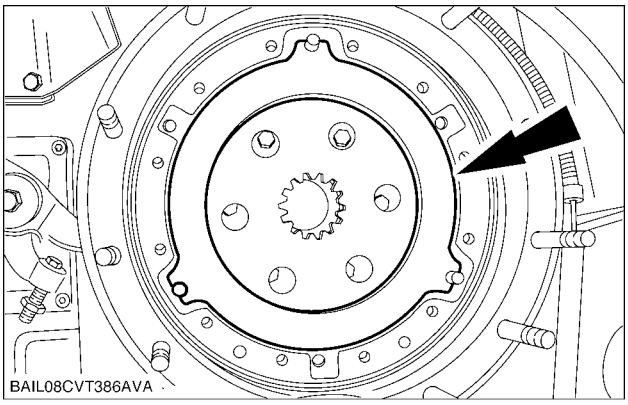
BAIL08CVT420AVA 38

41. Install the inner friction disc.



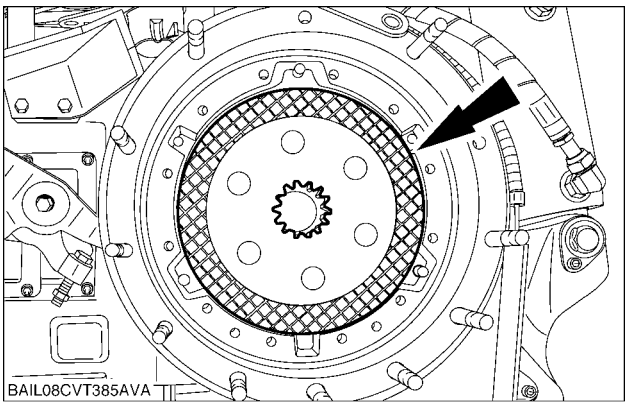
BAIL08CVT387AVA 39

42. Install the intermediate steel brake disc.



BAIL08CVT386AVA 40

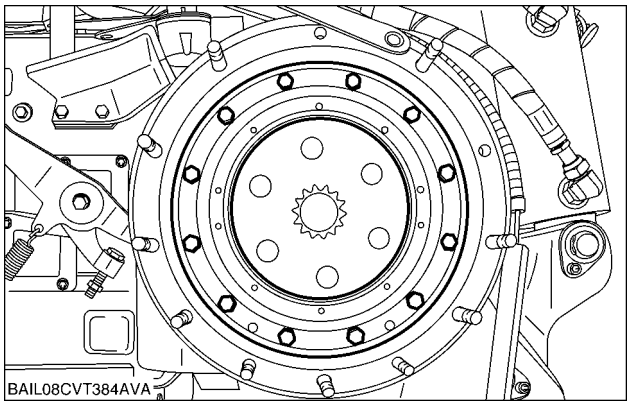
43. Install the outer brake friction disc.



BAIL08CVT385AVA 41

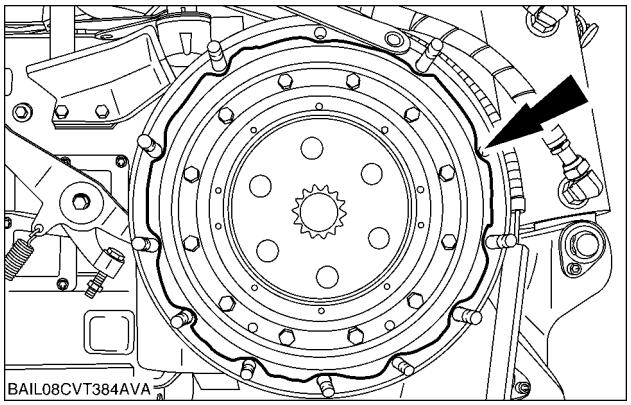
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44. Install the rear brake retaining plate.



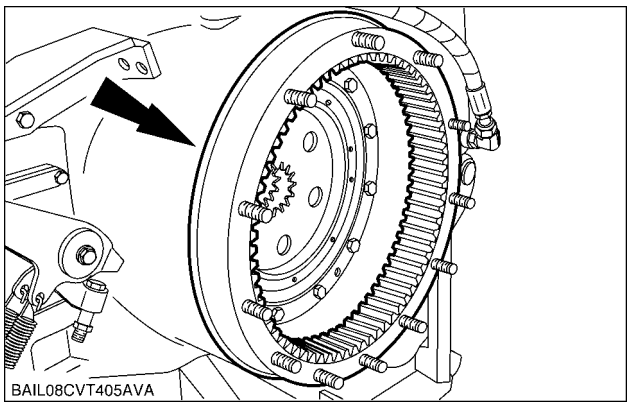
BAIL08CVT384AVA 42

45. Thoroughly clean and degrease the mating surfaces and apply a bead of sealant.



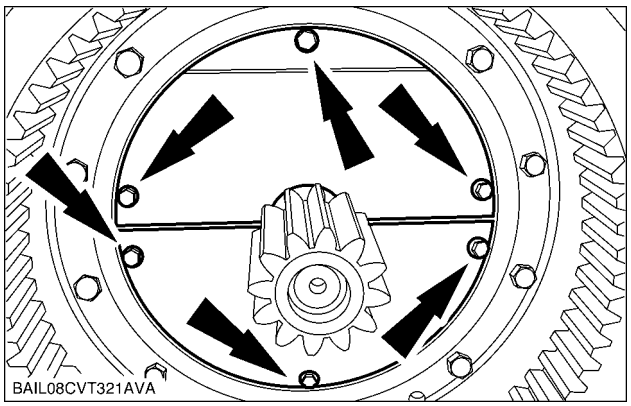
BAIL08CVT384AVB 43

46. Install the ring gear.



BAIL08CVT405AVA 44

47. Install the brake lubrication oil retention plates.



BAIL08CVT321AVA 45

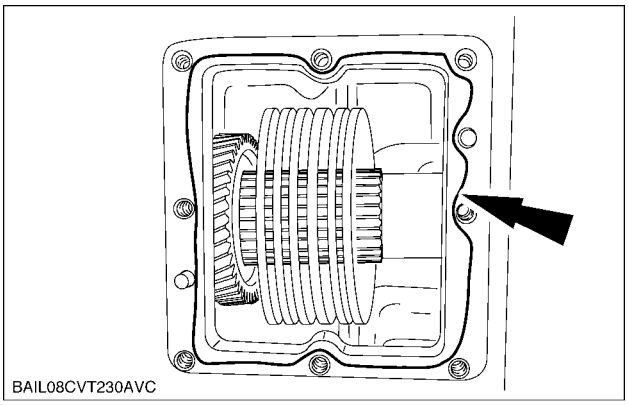
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48. Before installing the parking brake control assembly unit to the rear axle housing, thoroughly clean and degrease mating surfaces and apply a bead of sealant approximately **2 mm** of diameter following pattern shown.

⚠ WARNING ⚠

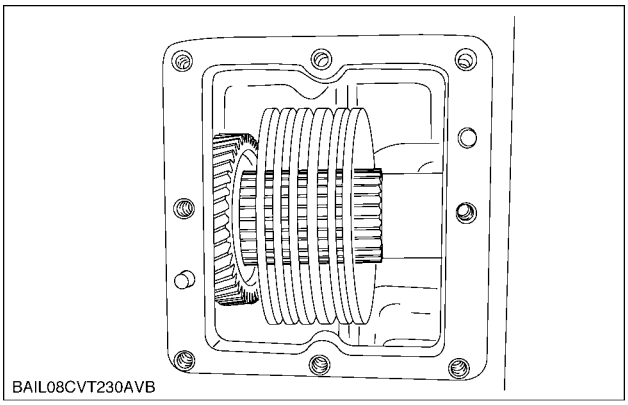
Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

B020



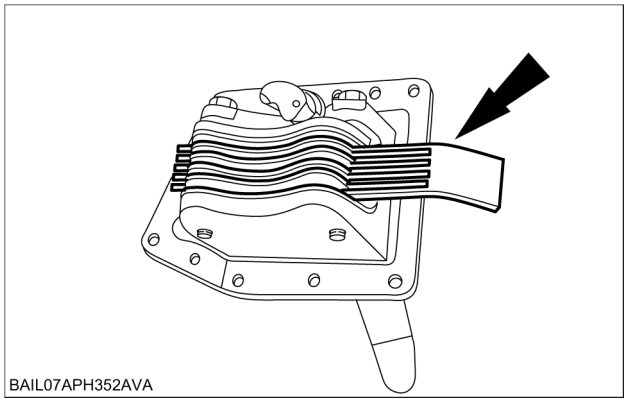
BAIL08CVT230AVC 46

49. Using special tool **380200014**, align the brake discs on the pinion shaft.



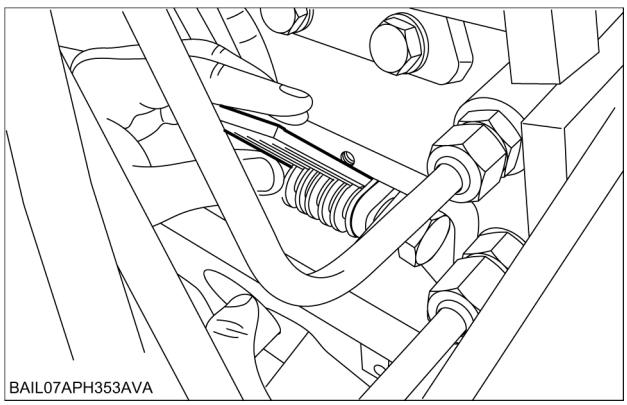
BAIL08CVT230AVB 47

50. Install the special tool **380200014**, between the friction pads.



BAIL07APH352AVA 48

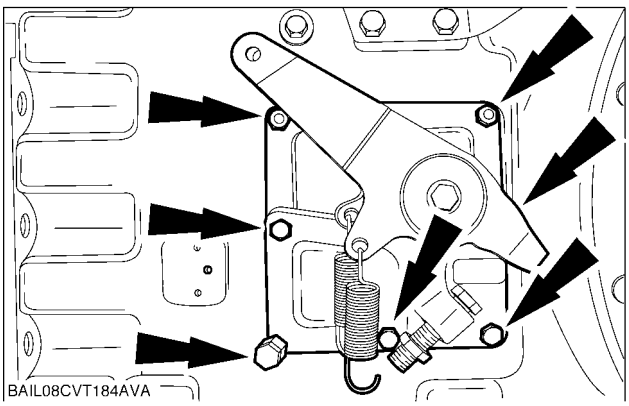
51. Position the parking brake control assembly complete with the special tool **380200014**, between the brake discs on the pinion shaft. Remove the special tool while installing the parking brake control assembly.



BAIL07APH353AVA 49

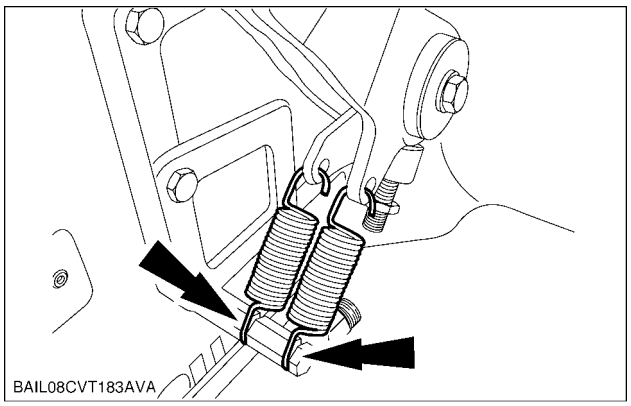
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52. Tighten the parking brake control assembly retaining bolts to **49 Nm** (**36 lb ft**).



BAIL08CVT184AVA 50

53. Attach the return springs.



BAIL08CVT183AVA 51

Next operation:
Install the four-wheel drive clutch, for further information, refer to **Clutch - Install (D.14.C)**.
Next operation:
Install the rear axle, for further information, refer to **REAR AXLE - Install (D.12.A)**.

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REAR AXLE - Troubleshooting

Problem	Possible Cause	Correction
Noisy rear axle when the vehicle is moving, and also with the transmission in neutral (not originating from final drives)	Pinion and/or crown wheel bearing incorrect adjustment	Remove the rear axle housing and adjust the pinion and crown wheel bearings correctly
	Excessive wear or incorrectly adjusted sun and planetary gears	Remove the differential, install new parts where necessary and adjust the differential gear backlash
	Excess differential side gears to half-shaft spline backlash	Remove the differential, install new parts where necessary and adjust the differential gear backlash
Noisy rear axle with the vehicle under load and upon release	Excessive pinion to crown wheel backlash	Remove the rear axle housing and adjust the pinion and crown wheel bearings correctly
	Defective internal rear axle component(s)	Remove the rear axle housing, install new parts where necessary and adjust the differential gear backlash
Noisy rear axle and overheating	Low rear axle oil level	Top up to the correct level
	Insufficient pinion and/or crown wheel backlash	Remove the rear axle housing and adjust the pinion and crown wheel bearings correctly
Noisy final drive(s) when the vehicle is moving and also with the transmission in neutral	Final drive shaft bearing incorrectly adjusted	Remove the final drive housing and adjust the bearing(s)
	Defective internal final drive component(s)	Remove the final drive housing and install new parts where necessary
	Excess final drive shaft to final drive spline backlash	Remove the final drive housing and install new parts where necessary
Differential lock not engaging.	Low rear axle oil level	Top up to the correct level
	Blocked oil filter	Install a new oil filter
	Defective hydraulic pump	Overhaul or install a new hydraulic pump
	Faulty differential lock switch	Install a new switch
	Power supply not reaching the solenoid valve: detached or damaged connectors, defective solenoid valve or remote switch	Repair the electrical connection. Overhaul or install a new solenoid valve or remote switch
	Differential lock control solenoid valve stuck on discharge	Overhaul or install a new solenoid valve
	Oil leaks through the seals with consequent pressure drop: cylinder piston oil supply line seal(s)	Install new seal(s) where necessary
Differential lock not disengaging	Faulty differential lock/unlock switch	Install a new switch
	Power supply not reaching the solenoid valve: detached or damaged connectors, defective solenoid valve or remote switch	Repair the electrical connection. Overhaul or install a new solenoid valve or remote switch
	Differential lock control solenoid valve stuck on delivery.	Overhaul or install a new solenoid valve

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Problem	Possible Cause	Correction
With the differential lock engaged and the control switch on automatic mode, the differential lock does not disengage when raising the lift arms using the Fast Raise switch.	Faulty differential lock switch (connected to the Fast Raise switch).	Install a new differential lock switch.
With differential lock engaged, the differential lock does not disengage when the brake pedals are pressed.	Faulty differential lock switch (connected to the brake pressure switches/brake pedal switches).	Install a new differential lock switch.

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TRAVELLING - D

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TRAVELLING - D

2WD-4WD SYSTEM Hydraulic - 14.C

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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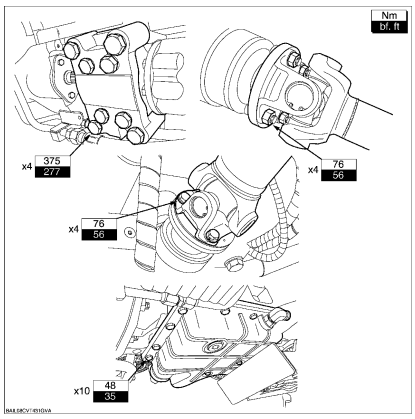
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2WD-4WD SYSTEM Hydraulic - Torque



BAIL08CVT431GVA 1

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Shaft - General specification

Front Sleeve Positioning Adjust Ring Shims (**2WD-4WD SYSTEM Hydraulic - Sectional view (D.14.C)**)	mm	1.0, 1.2, 1.5, 1.8, 2.0, 2.2, 2.5, 3.0, 3.3, 3.7, 4.0, 4.3
Front Sleeve End-Play **(L)**	mm	1.2÷1.7

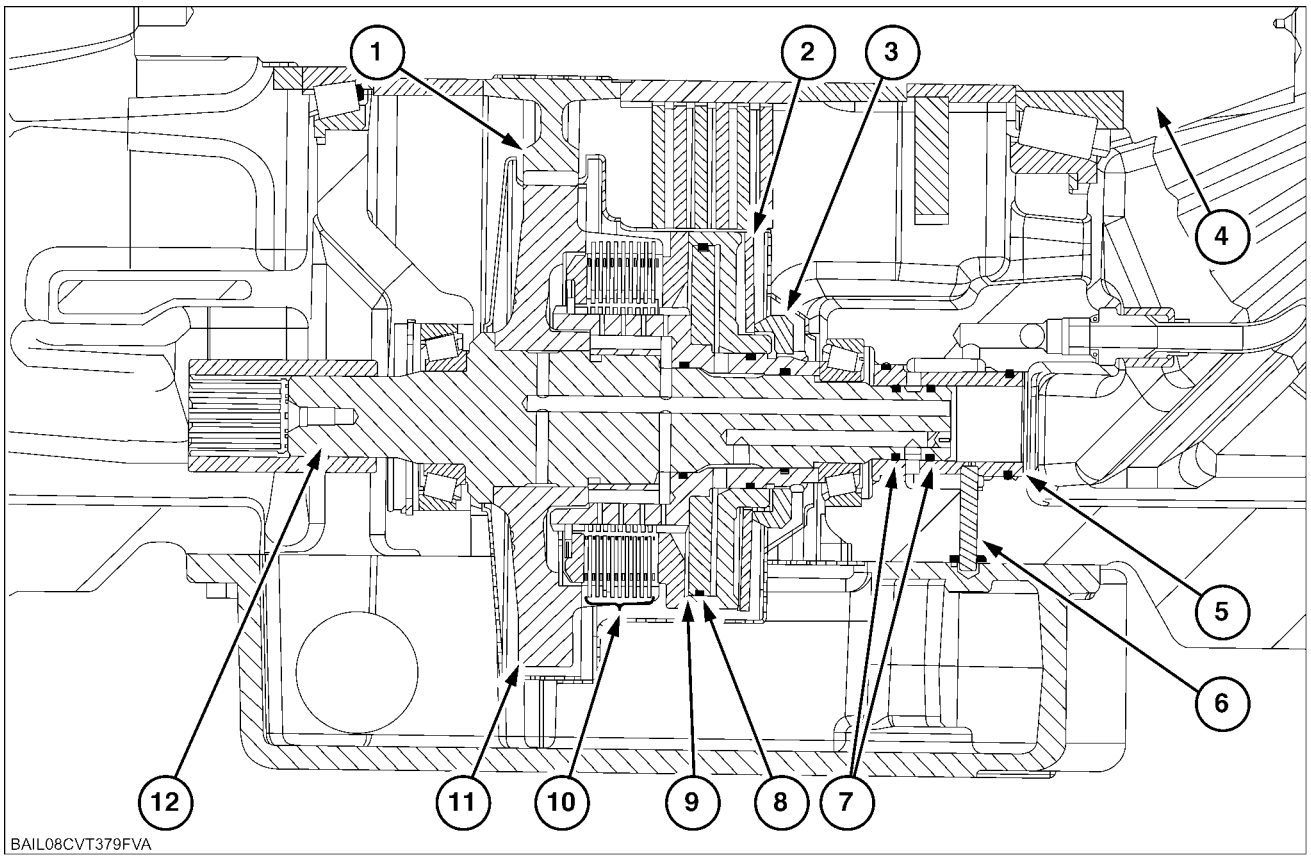
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Clutch - General specification

MFD ELECTRO-HYDRAULIC CLUTCH SPECIFICATIONS		
Clutch Friction Discs		9
Clutch Steel Discs		8
Clutch Driven Disc Thickness	mm	1.7 - 1.8
Clutch Drive Disc Thickness	mm	1.5 - 1.55
Free Belleville Spring Height (one)	mm	9.35 - 9.8

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2WD-4WD SYSTEM Hydraulic - Sectional view



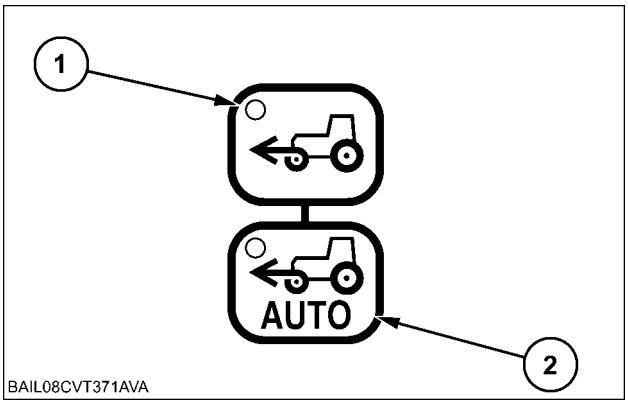
BAIL08CVT379AVA 1

1. Drive Gear
2. Belleville Washer
3. Retaining Nut
4. Pinion Shaft
5. Supply Manifold
6. Supply Manifold Retaining Pin
7. Seals
8. Piston Seals
9. Piston
10. Clutch Plates
11. Driven Gear
12. Drive Shaft

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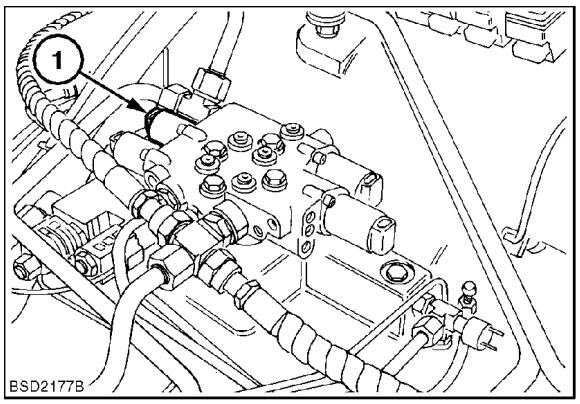
2WD-4WD SYSTEM Hydraulic - Static description

The front wheel drive is engaged by means of the switch located on the EMU panel.



BAIL08CVT371AVA 1

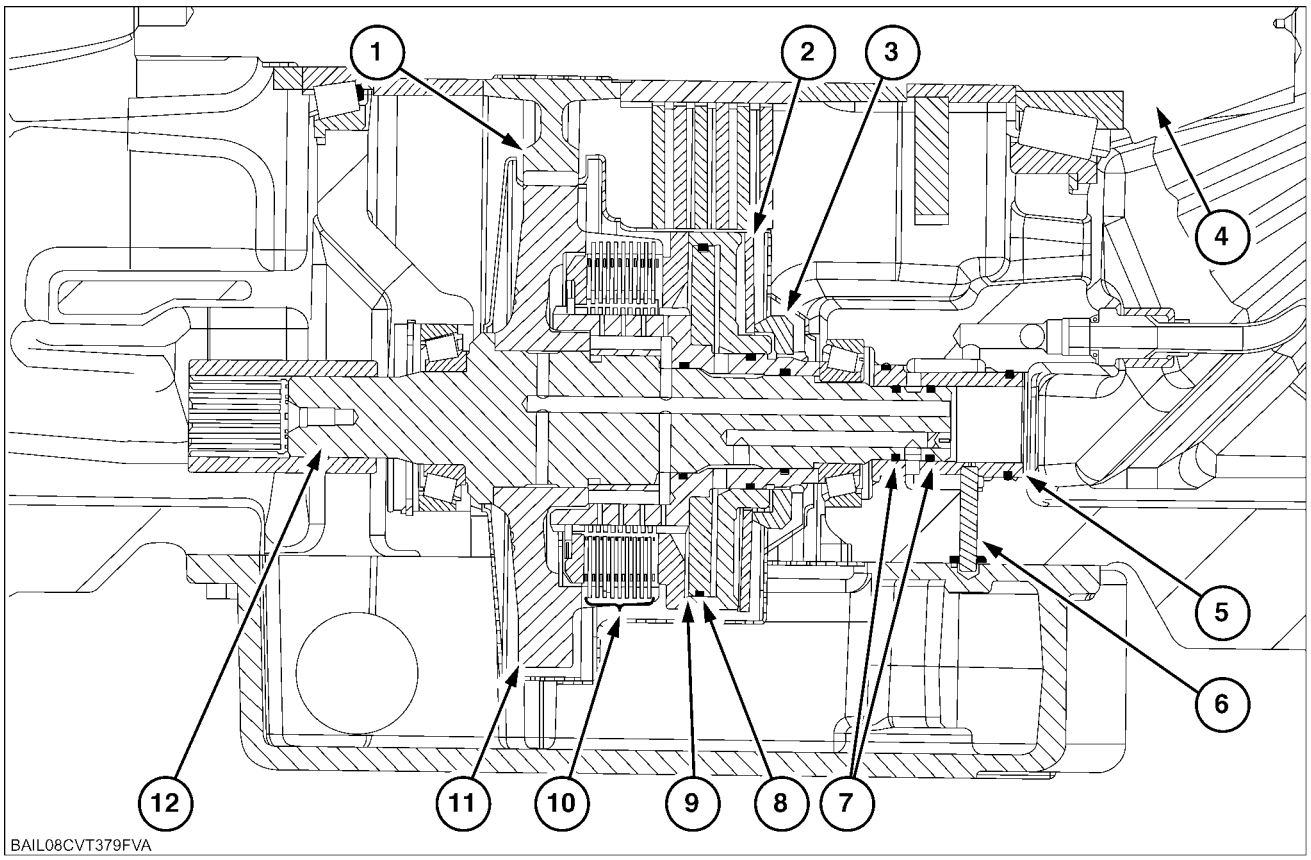
When front wheel drive is selected the FWD solenoid valve **(1)** in the low pressure distributor valve block on top of the rear axle is in the discharge position (de-energised).
The oil within the control piston is open to sump through the FWD solenoid valve **(1)**.



BSD2177B 2

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Clutch - Sectional view



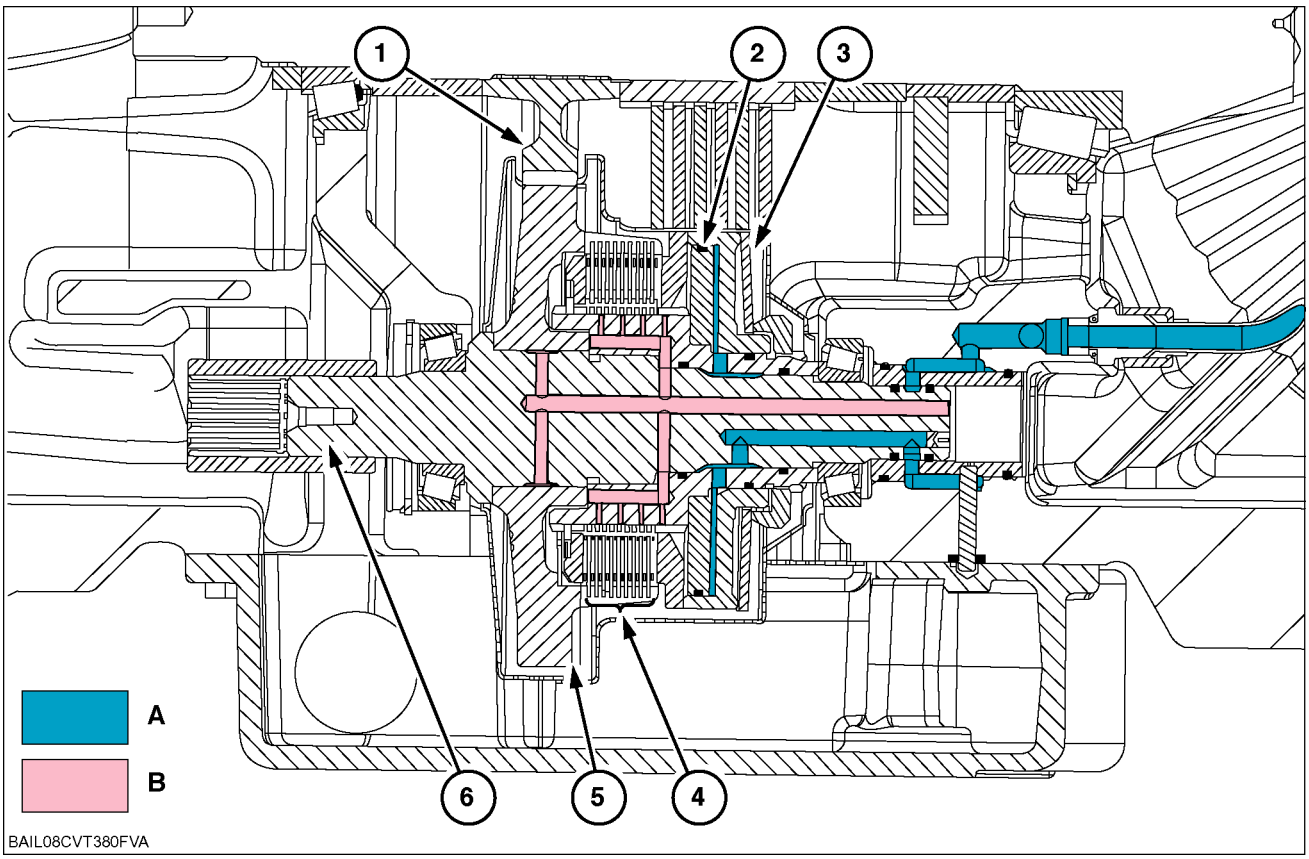
BAIL08CVT379AVA 1

Four Wheel Drive Multi-Wet Plate Clutch Sectional View

1. Drive Gear
2. Belleville Washer
3. Retaining Nut
4. Pinion Shaft
5. Oil Supply Manifold
6. Oil Supply Manifold Retaining Pin
7. Annular Sealing Rings
8. Piston Seal
9. Control Piston
10. Friction and Steel Plates
11. Driven Gear
12. Drive Shaft

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Clutch - Dynamic description



BAIL08CVT380FVA 1

Four Wheel Drive Multi-Wet Plate Clutch (Engaged)

1. Drive Gear
2. Control Piston
3. Belleville Washer
4. Clutch Plates
5. Driven Gear
6. Drive shaft

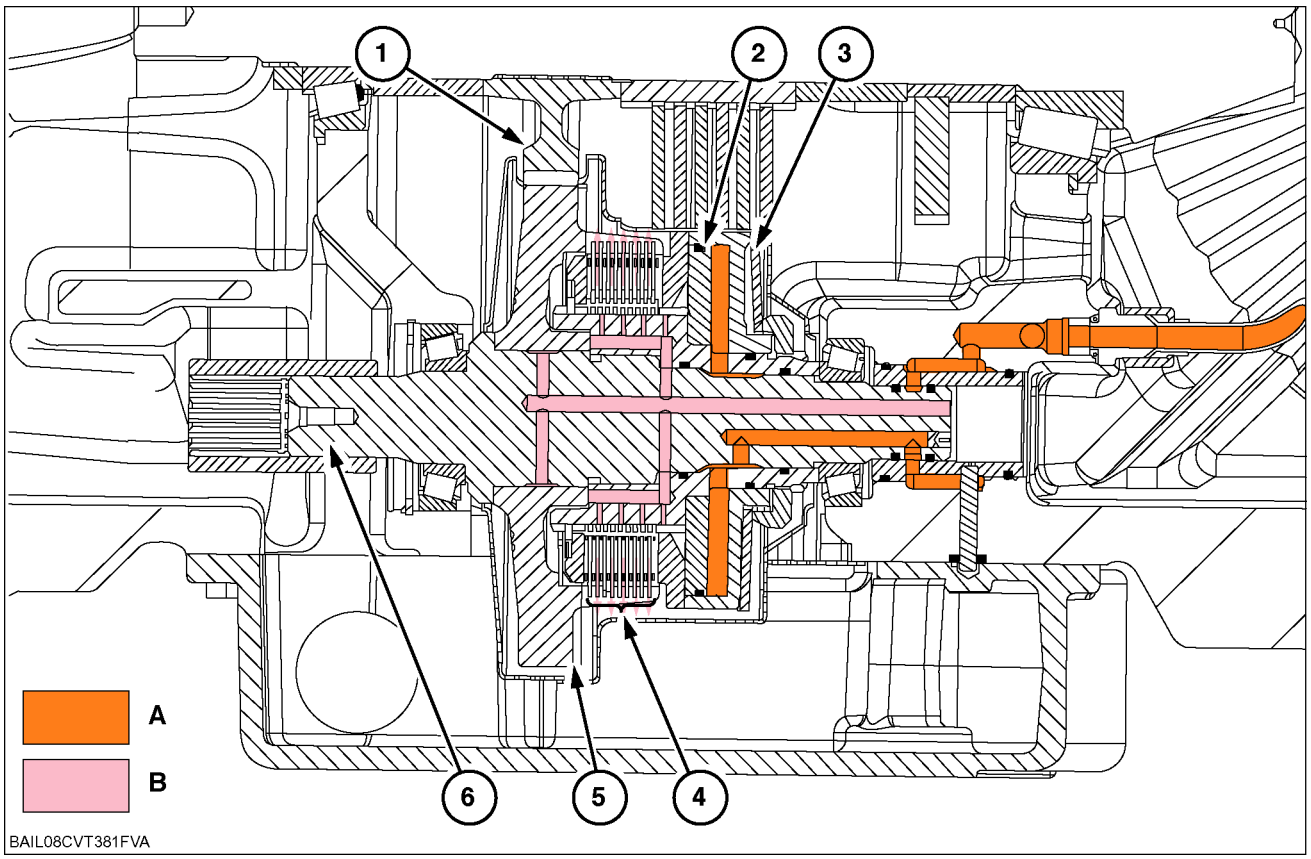
Figure Colour Key

A. Return to reservoir

B. Lubrication

When the four wheel drive clutch solenoid is de-energized and the Belleville washer **(3)** applies a force to the control piston **(2)** which compresses the friction and steel clutch plates **(4)**. Drive is transferred from the drive gear **(1)** mounted on the rear axle pinion to the driven gear **(5)** and through the clutch to the front axle via the drive shaft **(6)**.

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BAIL08CVT381FVA 2

Four Wheel Drive Multi-Wet Plate Clutch (Disengaged)

1. Drive Gear
2. Control Piston
3. Belleville Washer
4. Clutch Plates
5. Driven Gear
6. Drive shaft

Figure Colour Key

A. Lubrication

B. Low pressure circuit

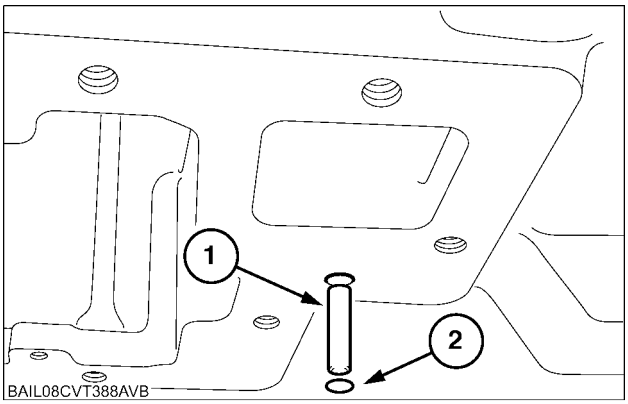
When the four wheel drive clutch solenoid is energized, low pressure circuit oil is supplied to the face of the control piston **(2)**.
The oil pressure on the piston face moves the piston **(2)** back against the force applied by the Belleville washer **(3)**, releasing the pressure on the clutch plates **(4)**.
The driven gear **(5)** can now rotate freely without transferring the drive through the clutch to the drive shaft **(6)**. Lubrication oil now flows freely between the friction and steel plates **(4)**.

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Hydraulic line - Remove

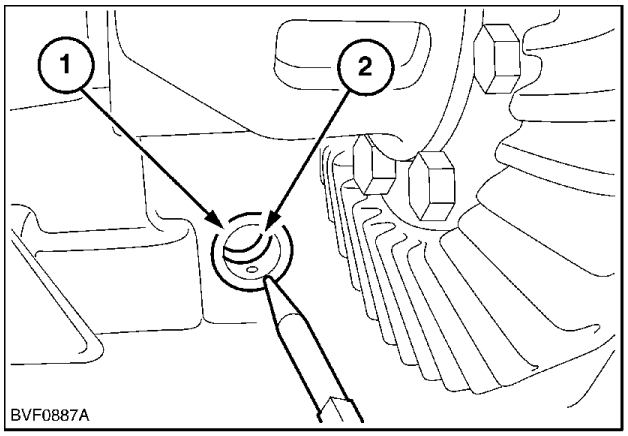
Prior operation:
Remove the four wheel drive clutch, for further information, refer to **Clutch - Remove (D.14.C)**
Remove the power take-off (PTO) housing, for further information refer to **Housing - Remove (C.40.C)**

1. Remove the oil supply manifold retaining pin **(1)** and the O-ring **(2)**.



BAIL08CVT388AVB 1

2. Using a suitable punch, remove the oil supply manifold **(1)** and the bearing **(2)**.



BVF0887A 2

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Shaft - Overhaul

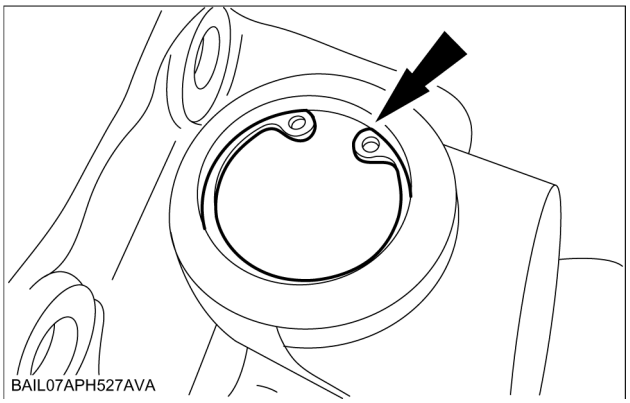
Prior operation:
Remove the drive shaft, for further information refer to **Shaft - Remove (D.14.C)** (suspended axle). **Shaft - Remove (D.14.C)** (standard axle).

⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

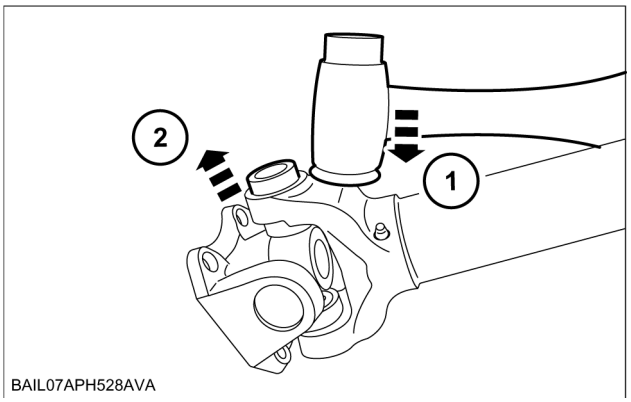
B026

1. Using suitable circlip pliers, remove the circlips.



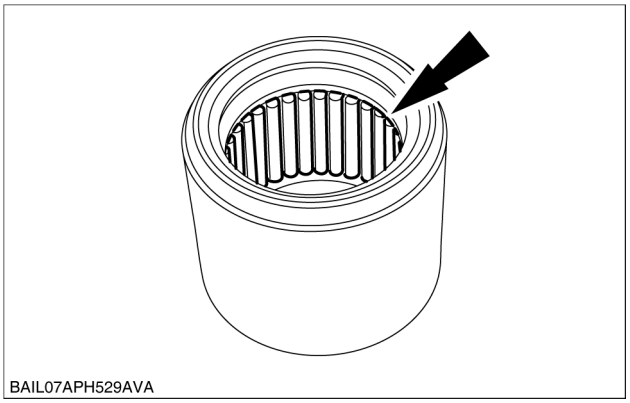
BAIL07APH527AVA 1

2. Using a suitable copper mallet, repeatedly strike down on the yoke carrier until the cup moves upwards.



BAIL07APH528AVA 2

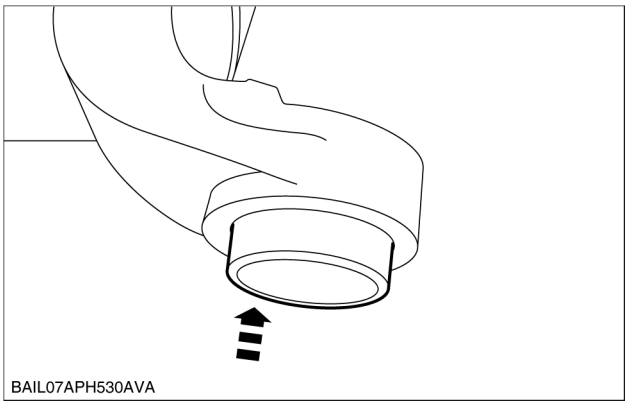
3. Rotate the drive shaft **180 °** and repeat the previous step.
4. Remove the yoke from the drive shaft.
5. Repeat the procedure to remove the yoke from the flange.
6. Install the needle roller bearings and seals into the new cups.



BAIL07APH529AVA 3

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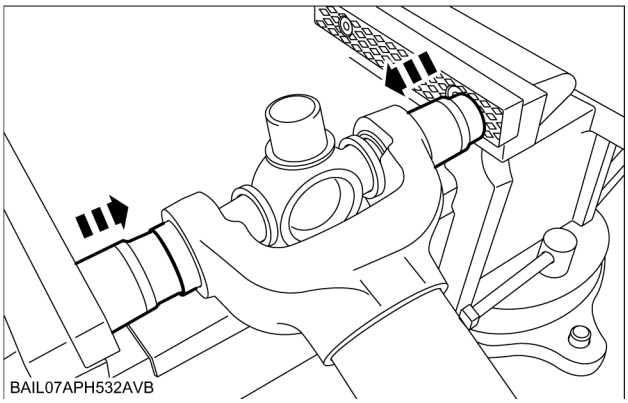
7. Partially slide the new cups into both sides of the yoke carrier.



BAIL07APH530AVA 4

NOTE: *Make sure that the needle roller bearings do not become displaced when the yoke is inserted.*

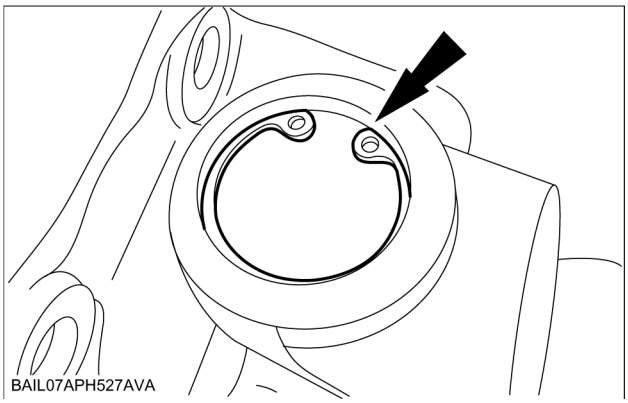
8. Insert the yoke into the yoke carrier.
Using suitable spacers and a vice (or a suitable hydraulic press), push the cups into the yoke carrier until the circlip groove is visible.



BAIL07APH532AVB 5

9. Repeat the procedure to install the flange to the yoke.

10. Using suitable circlip pliers, install the circlips.



BAIL07APH527AVA 6

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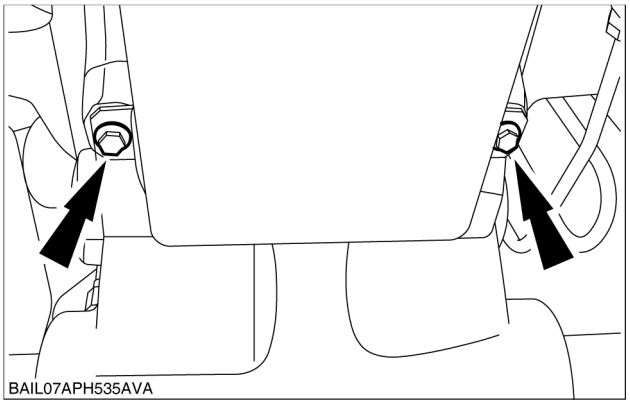
Shaft - Remove Standard Axle

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

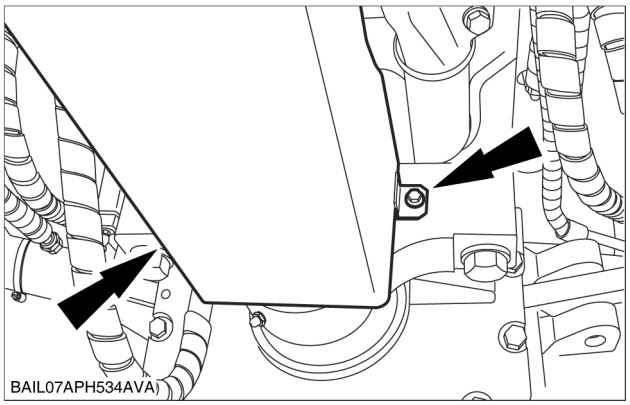
B026

1. Remove the drive shaft guard rear retaining bolts.



BAIL07APH535AVA 1

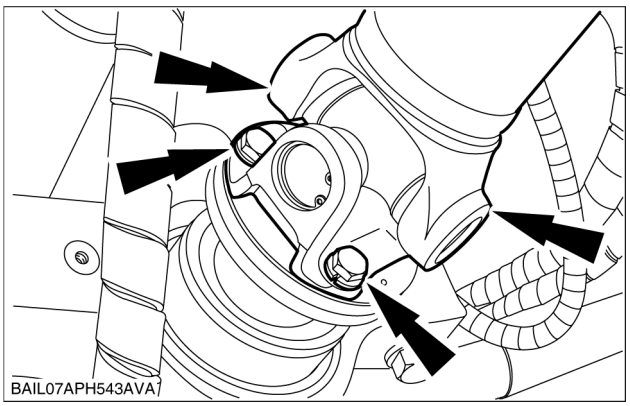
2. Remove the drive shaft guard front retaining bolts and remove the drive shaft guard.



BAIL07APH534AVA 2

3. Disconnect the drive shaft from the front axle.

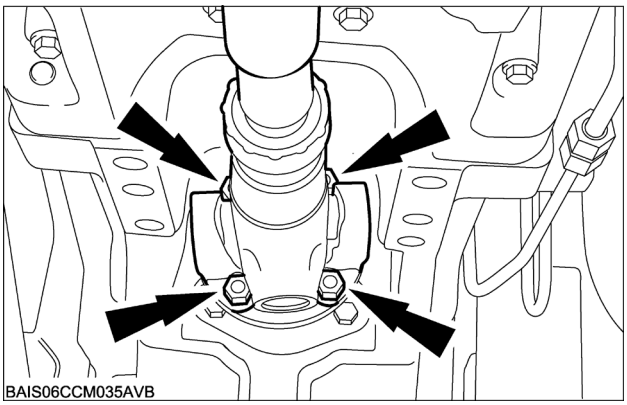
NOTE: *Support the drive shaft.*



BAIL07APH543AVA 3

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4. Remove the drive shaft rear retaining nuts. Remove the drive shaft.



BAIS06CCM035AVB 4

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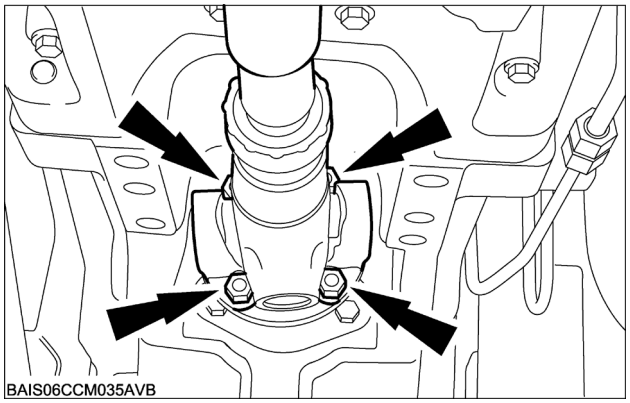
Shaft - Install Standard Axle

⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

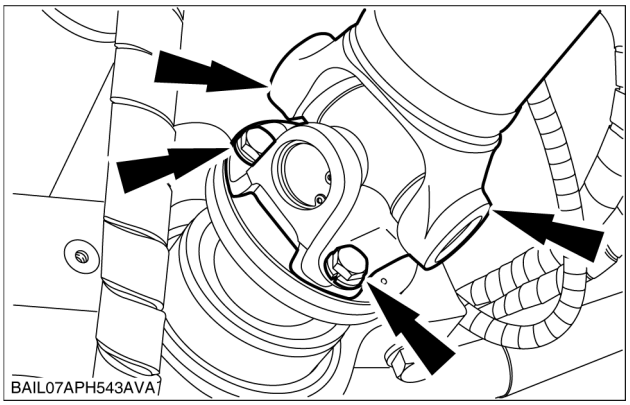
B026

1. Install the drive shaft to the transmission. Tighten to **65 - 86 Nm** (**48 - 63 lbft**).



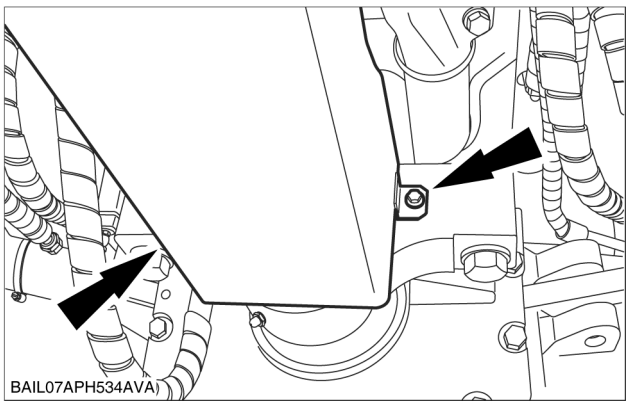
BAIS06CCM035AVB 1

2. Connect the drive shaft to the front axle. Tighten to **65 - 86 Nm** (**48 - 63 lbft**).



BAIL07APH543AVA 2

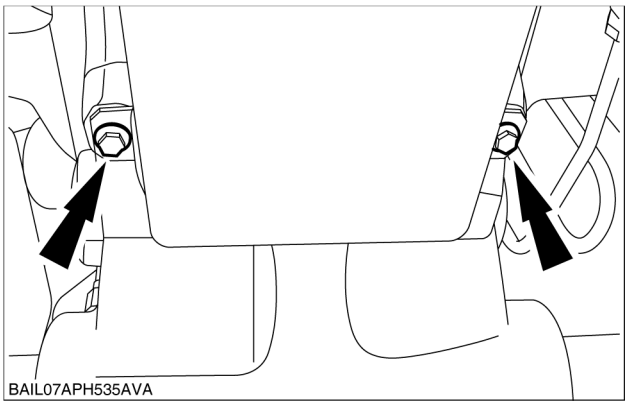
3. Install the drive shaft guard and drive shaft guard front retaining bolts.



BAIL07APH534AVA 3

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4. Install the drive shaft guard rear retaining bolts.



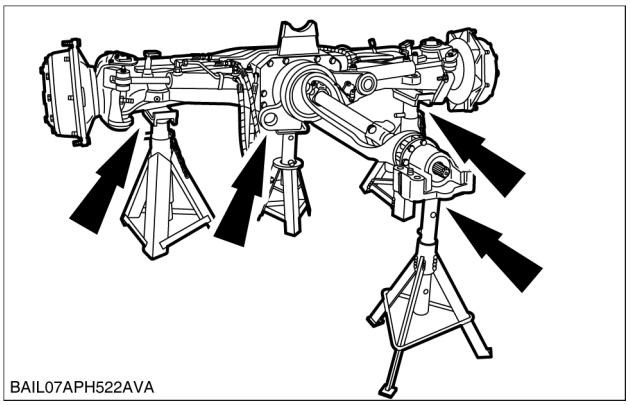
BAIL07APH535AVA 4

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Shaft - Remove (suspended axle)

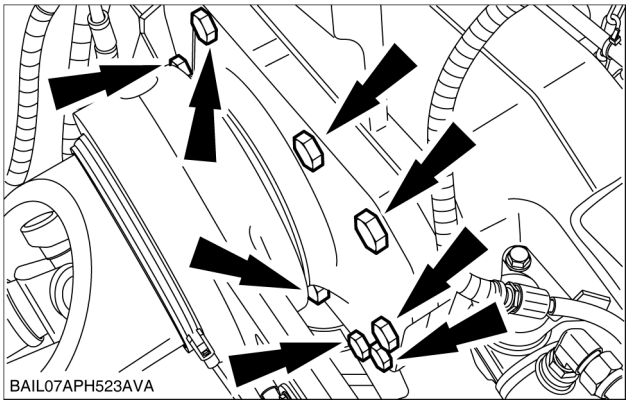
Prior operation:
Remove the front axle, for further information refer to **FRONT AXLE - Remove (D.10.A)**

1. Support the front axle on suitable axle stands.



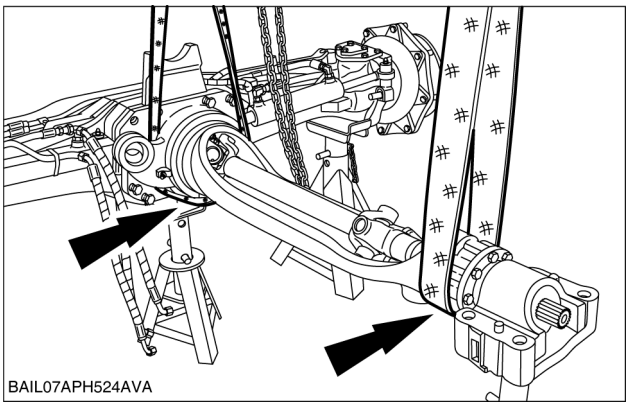
BAIL07APH522AVA 1

2. Remove the suspension arm retaining bolts.



BAIL07APH523AVA 2

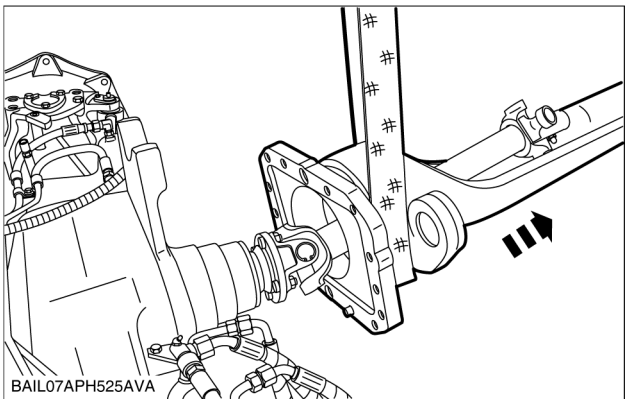
3. Using suitable lifting equipment, support the suspension arm.



BAIL07APH524AVA 3

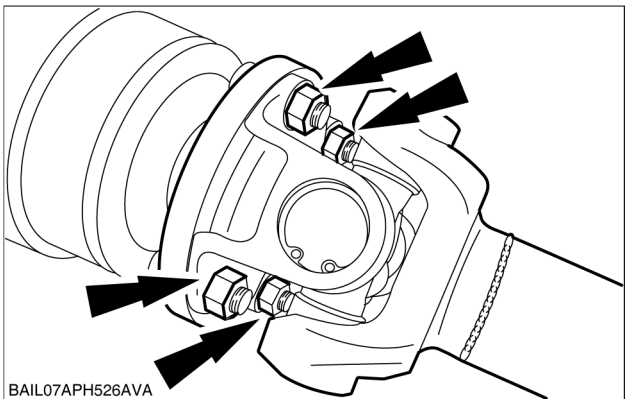
www.truck-freeworkshop.com

4. Remove the suspension arm.



BAIL07APH525AVA 4

5. Remove the drive shaft retaining bolts and remove the drive shaft.

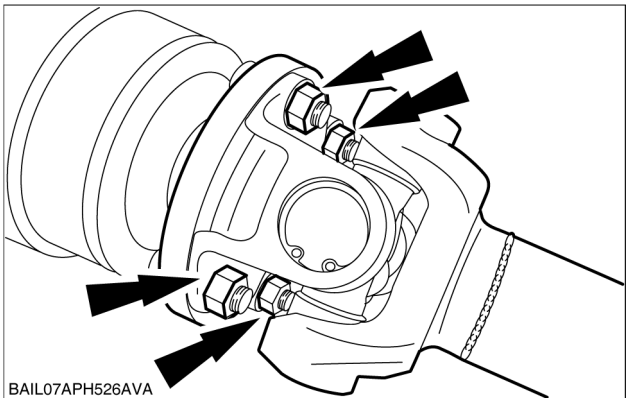


BAIL07APH526AVA 5

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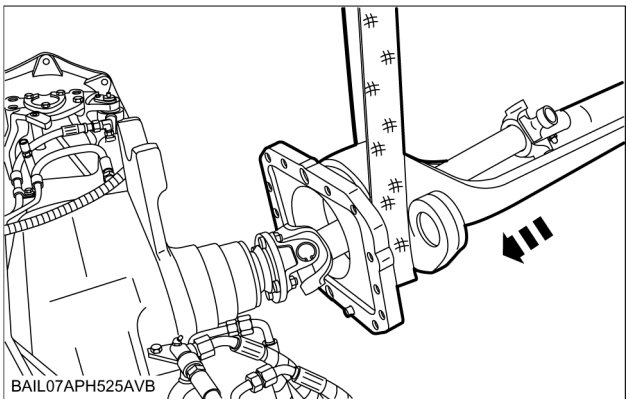
Shaft - Install (suspended axle)

1. Install the drive shaft to the front axle.
   Tighten to **65 - 86 Nm** (**48 - 63 lbft**).



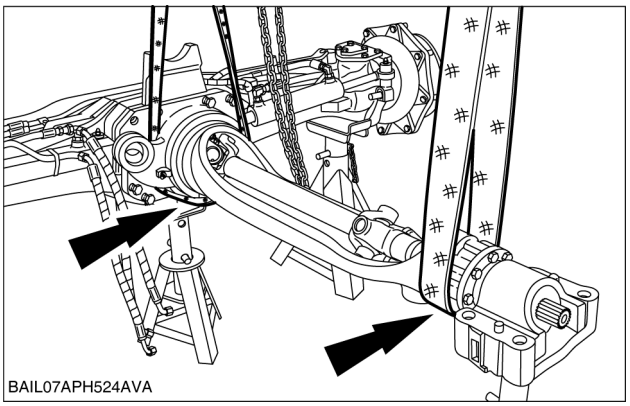
BAIL07APH526AVA 1

2. Install the suspension arm.



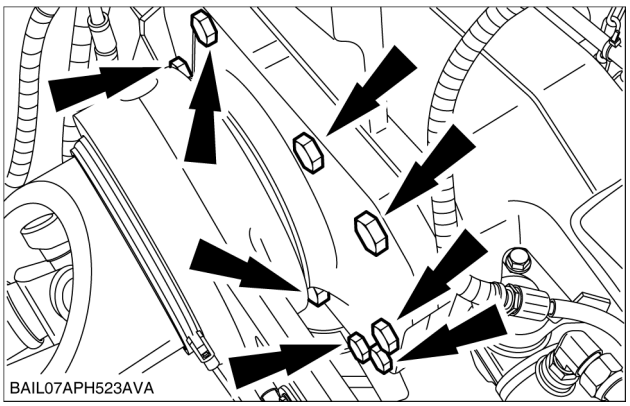
BAIL07APH525AVB 2

3. Support the suspension arm on suitable axle stands and remove the lifting equipment from the suspension arm.



BAIL07APH524AVA 3

4. Install the suspension arm retaining bolts.
   Tighten to **275 Nm** (**203 lb ft**).



BAIL07APH523AVA 4

Next operation:

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Install the front axle, for further information refer to **FRONT AXLE - Install (D.10.A)**

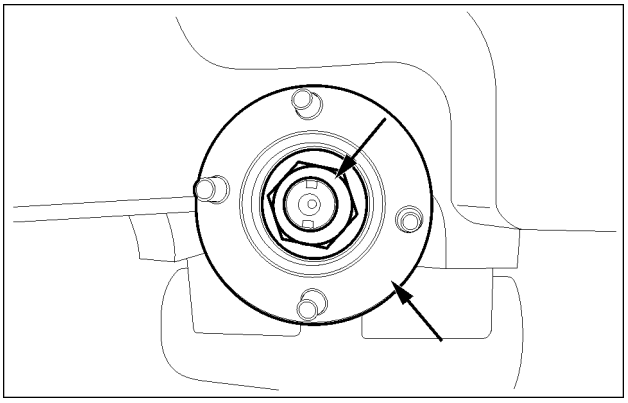
www.truck-freeworkshop.com

Shaft - Remove (drive shaft, transmission casing)

Prior operation:
Shaft - Remove Standard Axle (D.14.C)
Shaft - Remove SuperSteer™ Axle (D.14.C)
Shaft - Remove (suspended axle) (D.14.C)

Vehicles with standard axle or Super Steer™ axle

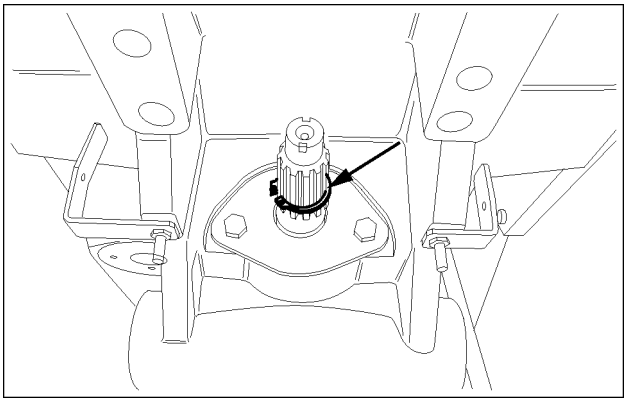
1. Unlock and remove the nut. Pull off the flange together with the spacer.



SS08H174 1

Vehicles with suspended front axle

2. Pull off the connecting sleeve and remove the snap ring.

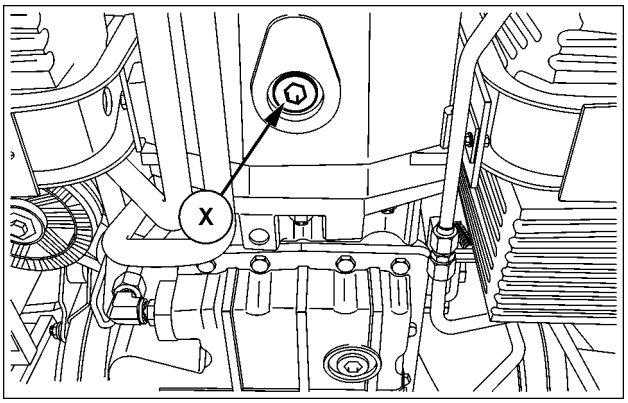


SS08G107 2

All vehicles

3. Remove the drain plug **(X)** and drain the transmission oil.

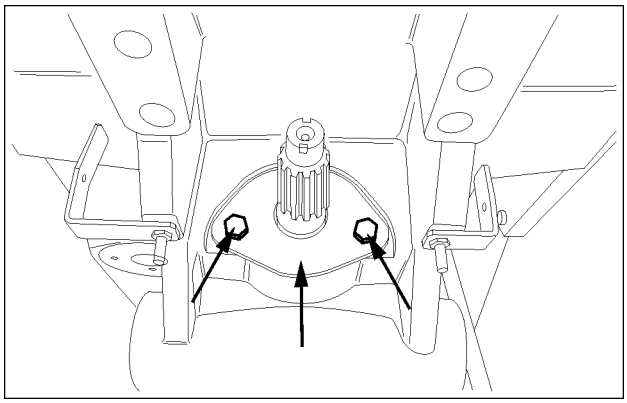
NOTE: *The container must hold at least **84 l** (**22.2 US gal**).*



SS08H175 3

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4. Remove the screws and take off the cover.

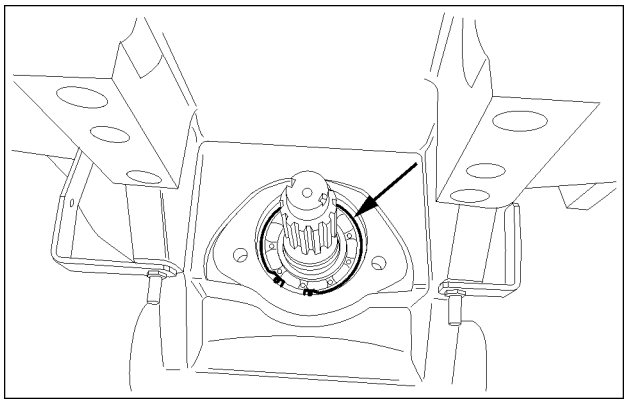


SS08G322 4

5. Remove the cassette seal ring.

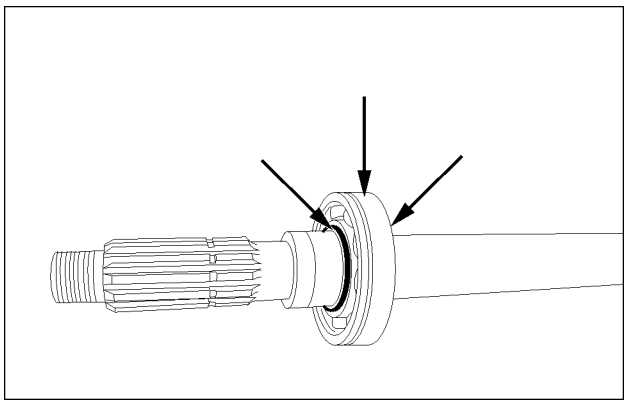
NOTE: *The cassette seal ring is destroyed during removal.*

6. Remove the outer snap ring and pull out the shaft together with the bearing in a forwards direction.



SS08G118 5

7. Remove the snap rings and remove the bearing from the shaft.



SS08H016 6

NOTE: *Thoroughly clean and inspect all parts for wear or damage and replace if necessary.*

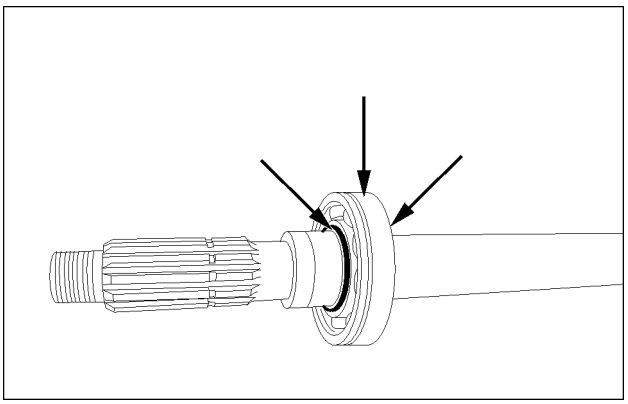
Next operation:
Fit the all-wheel drive shaft - see **Shaft - Install (drive shaft, transmission casing) (D.14.C)**.

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Shaft - Install (drive shaft, transmission casing)

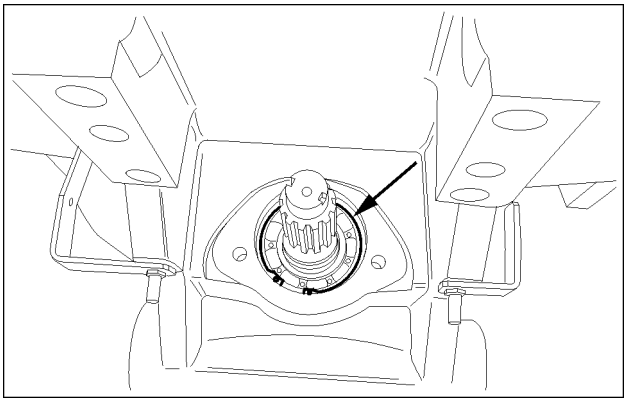
Prior operation:
Remove the all-wheel drive shaft - see **Shaft - Remove (drive shaft, transmission casing) (D.14.C)**.

1. Fit the snap rings and the bearing onto the shaft.



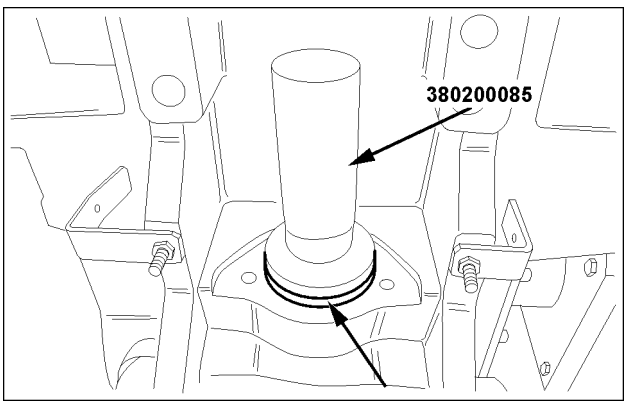
SS08H016 1

2. Fit the shaft together with the bearing into the casing and insert the outer snap ring.



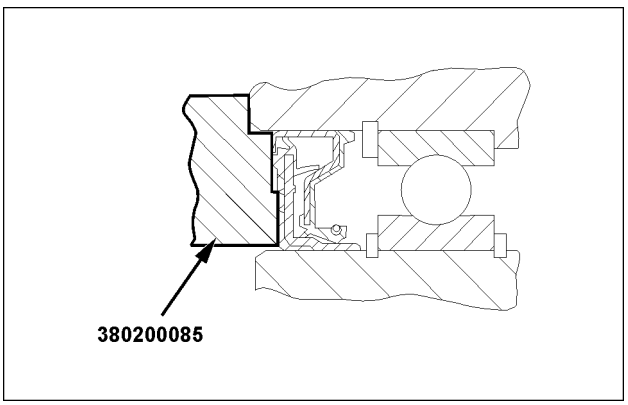
SS08G118 2

3. Insert the new cassette seal ring using the drift **380200085** until the drift is at the stop - see figure **4**.



SS08H030 3

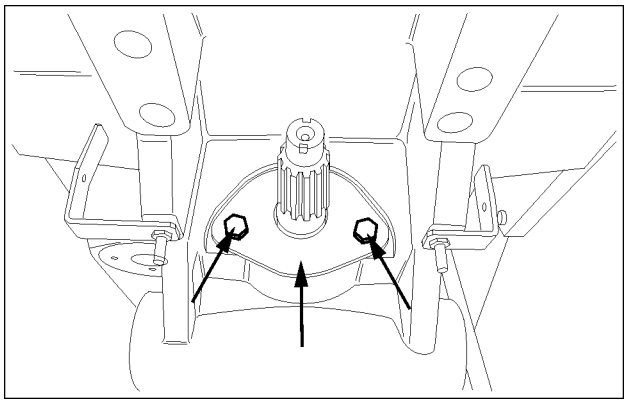
NOTE: *The cassette seal ring may only be fitted using drift 380200085, otherwise the cassette seal ring can be destroyed.*



SS08J128 4

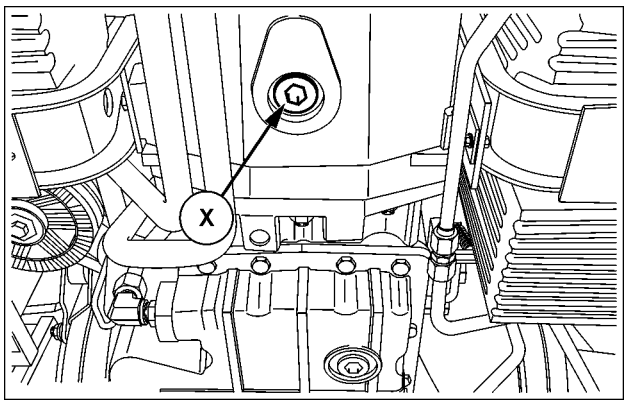
www.truck-freeworkshop.com

4. Fit the cover, insert the screws and tighten to **48.5 Nm** (**35.8 lb ft**).



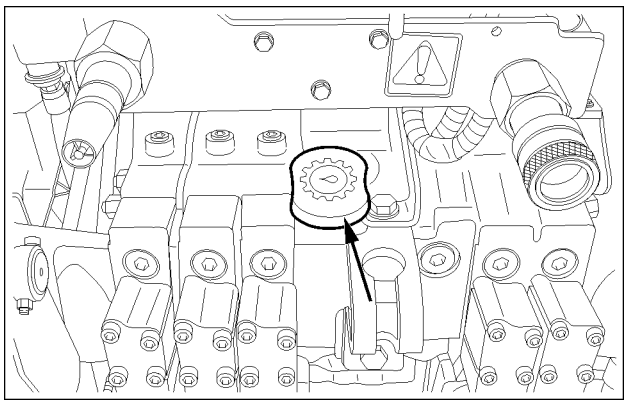
SS08G322 5

5. Fit a new seal ring to the drain plug **(X)** and tighten.



SS08H175 6

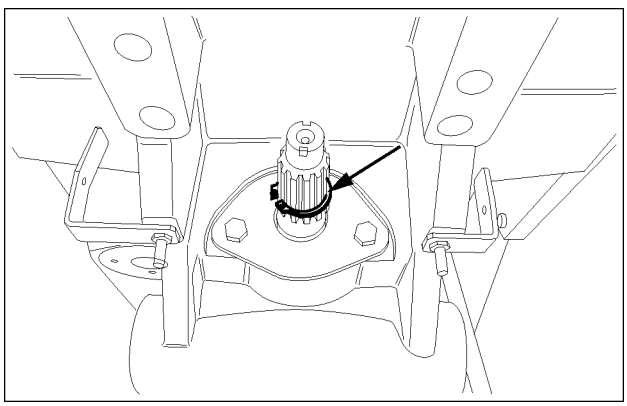
6. Top up transmission oil. The specifications and the oil quantity can be found in the operating instructions.



SS08J127 7

Vehicles with suspended front axle

7. Fir the snap ring and slide the connecting sleeve onto the shaft.

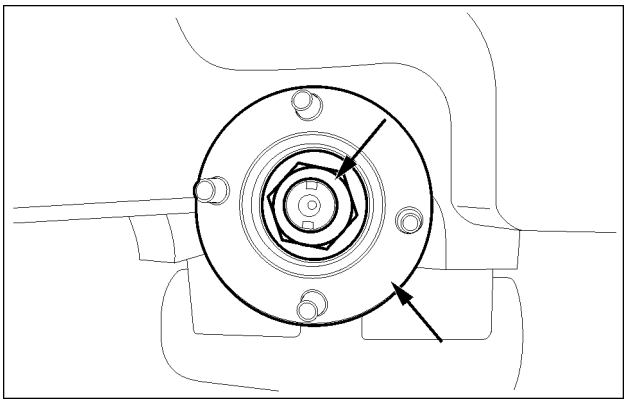


SS08G107 8

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Vehicles with standard axle or Super Steer™ axle

8. Push the spacer and the flange onto the shaft. Tighten and lock the nut.



SS08H174 9

Next operation:
Shaft - Install (suspended axle) (D.14.C)
Shaft - Install SuperSteer™ Axle (D.14.C)
Shaft - Install Standard Axle (D.14.C)

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Clutch - Remove 4WD Clutch

Prior operation:
Disconnect the transmission from the rear axle, for further information refer to **Housing - Disconnect (C.20.G)**

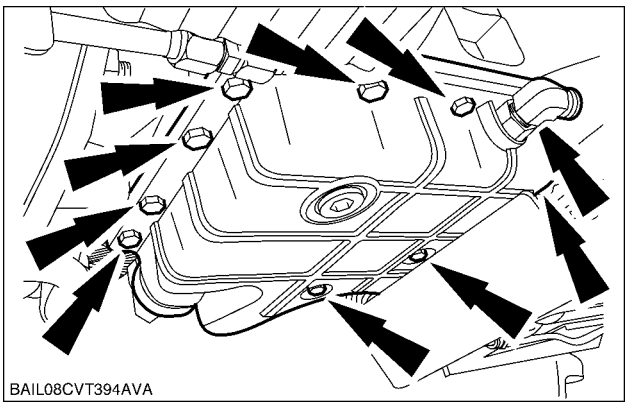
⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026

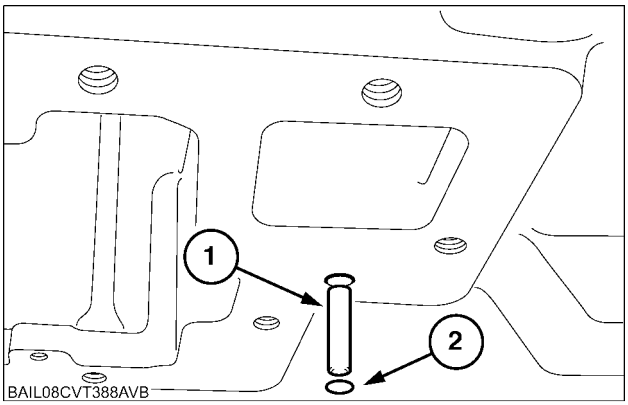
1. Remove the rear axle sump.

NOTE: *Prepare for some oil loss when the sump is removed.*



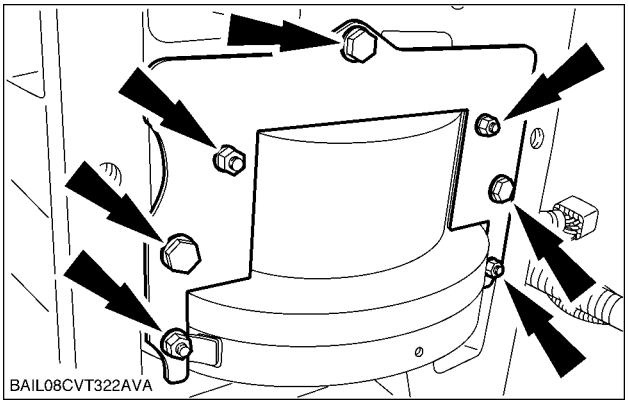
BAIL08CVT394AVA 1

2. Retrieve the oil supply manifold retaining pin **(1)** and O-ring seal **(2)**.



BAIL08CVT388AVB 2

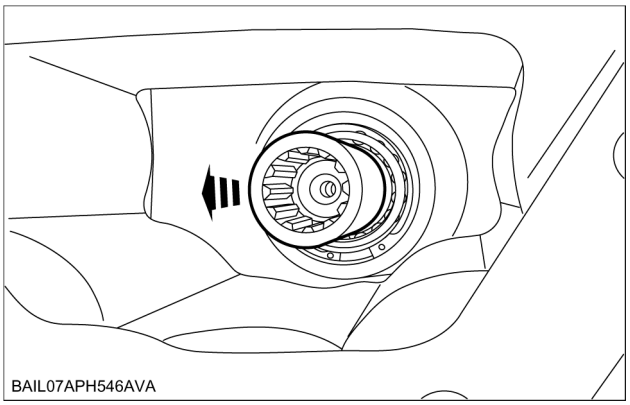
3. Remove the inner clutch guard.



BAIL08CVT322AVA 3

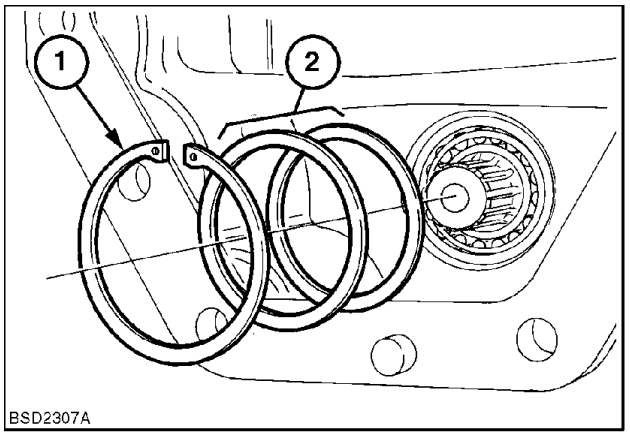
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4. Remove the sliding sleeve from the 4WD clutch drive shaft.



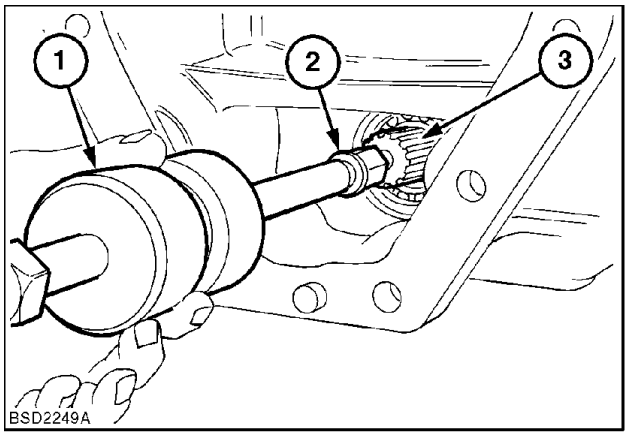
BAIL07APH546AVA 4

5. Remove the 4WD clutch drive shaft retaining circlip **(1)** and shims **(2)**.



BSD2307A 5

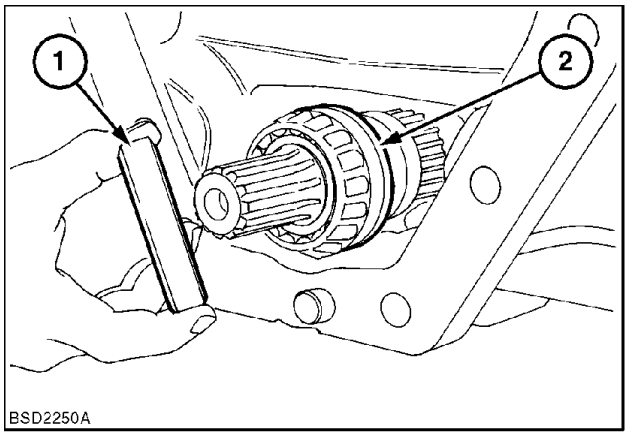
6. Using a slide hammer **(1) 380000549** and an adaptor **(2) 380000479** partially withdraw the 4WD clutch drive shaft **(3)**.



BSD2249A 6

ATTENTION: *When the drive shaft is moved forward the 4WD clutch will need to be supported.*

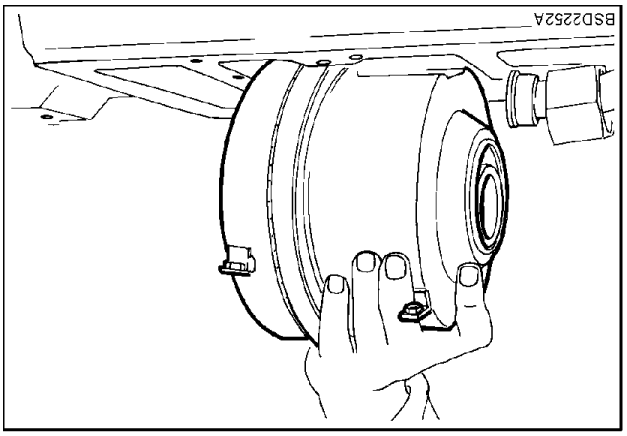
7. Retrieve the bearing cap **(1)** and whilst supporting the 4WD clutch housing. Completely remove the 4WD clutch drive shaft **(2)**.



BSD2250A 7

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8. Remove the 4WD clutch.



BSD2252A 8

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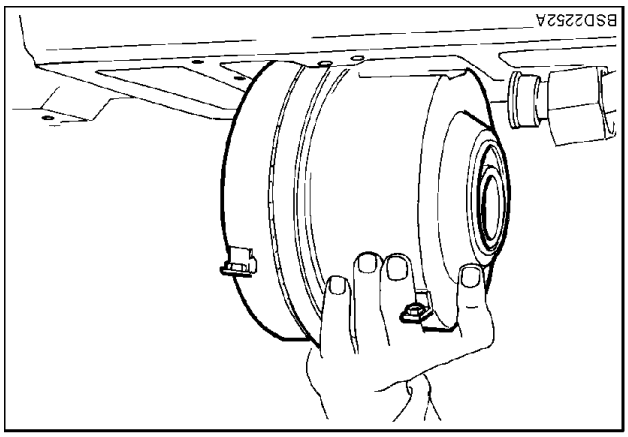
Clutch - Install 4WD Clutch

⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

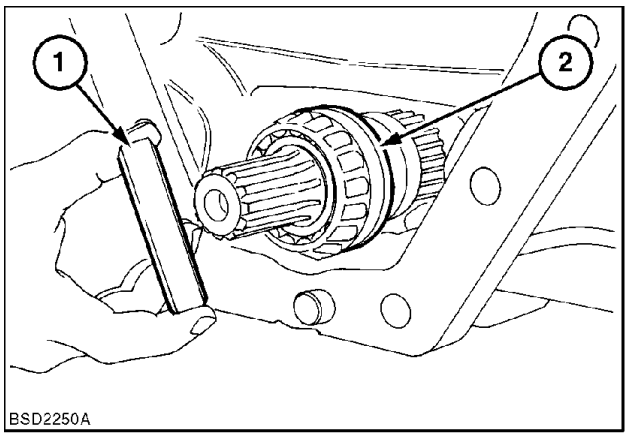
B026

1. Position the 4WD clutch assembly.



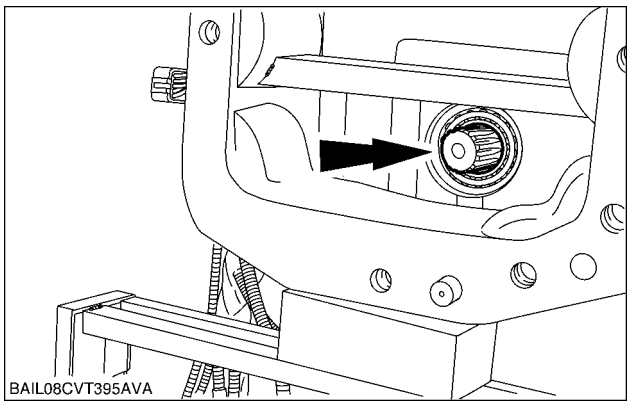
BSD2252A_139 1

2. Partially install the 4WD clutch drive shaft **(2)**, install the bearing cap **(1)**,



BSD2250A 2

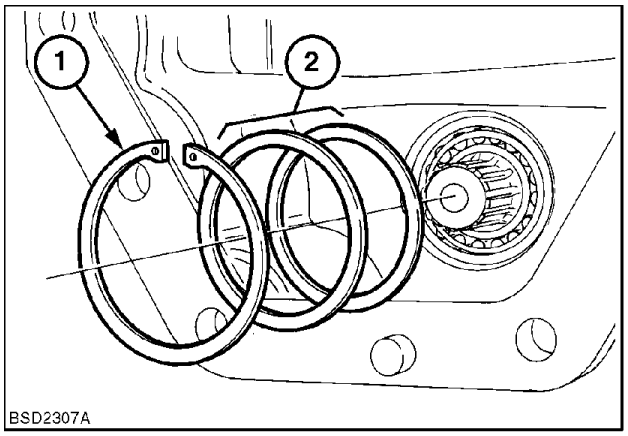
3. Fully install the 4WD clutch shaft.



BAIL08CVT395AVA 3

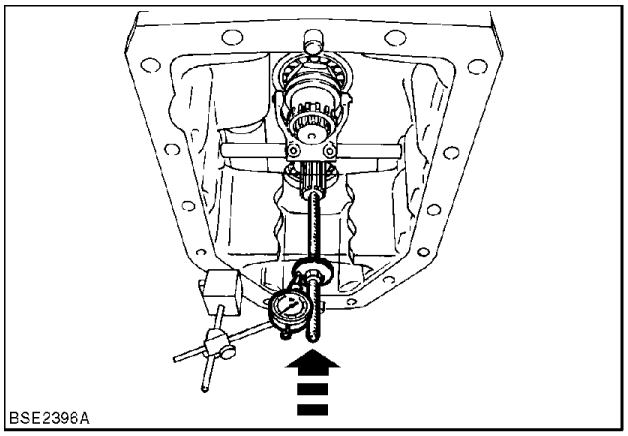
www.truck-freeworkshop.com

4. Install the shims **(2)** and the 4WD clutch drive shaft retaining circlip **(1)**.



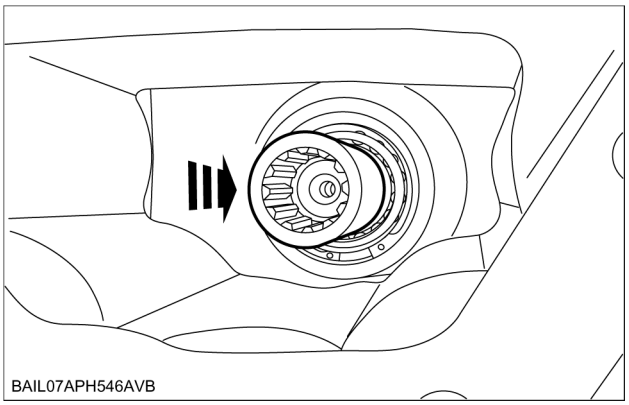
BSD2307A 4

5. Using a dial test indicator gauge and a suitable M8 x 1.25 threaded adaptor screwed into the end of the 4WD drive shaft, push and pull the shaft to measure the end float.
The end float should be **0.05 mm**. If away from specification, add or remove shims accordingly as per the previous step.



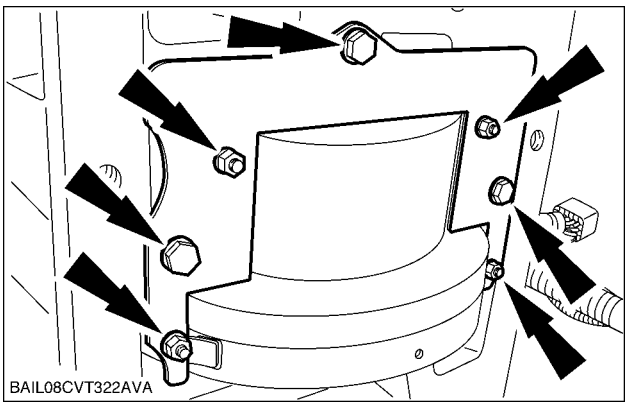
BSE2396A 5

6. Install the sliding sleeve onto the 4WD clutch drive shaft.



BAIL07APH546AVB 6

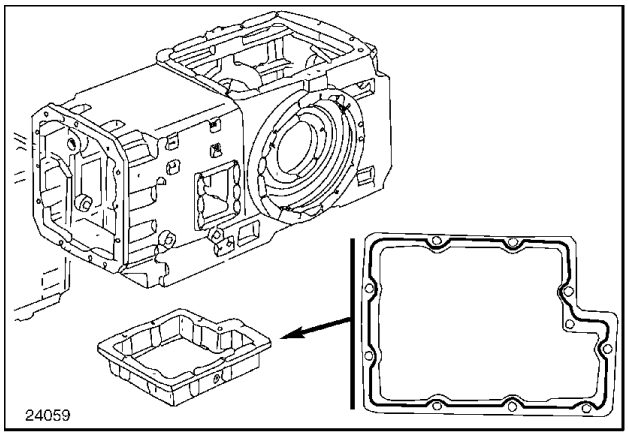
7. Install the 4WD clutch inner guard



BAIL08CVT322AVA 7

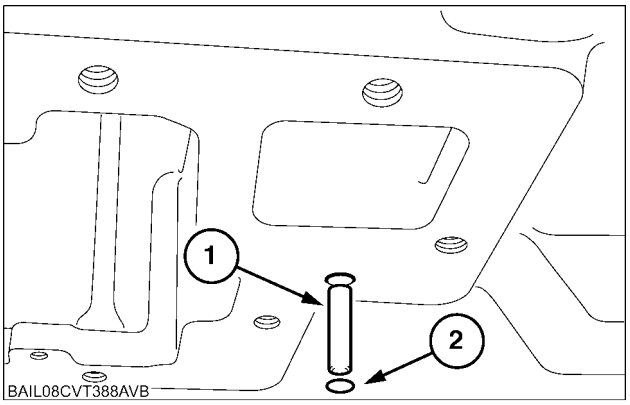
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8. Thoroughly clean and degrease the rear axle housing and the rear axle sump mating surfaces. Apply gasket sealant Loctite 574 to the pattern shown.



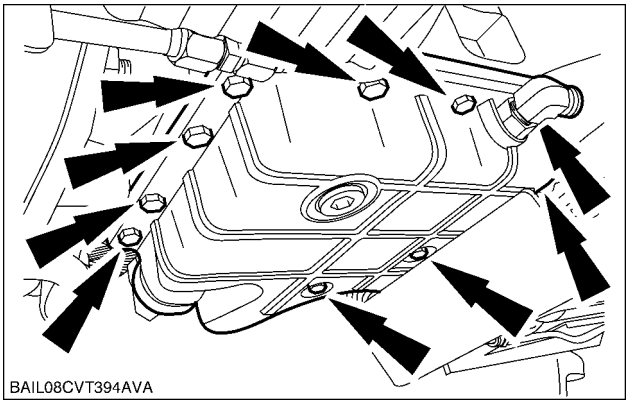
24059_115 8

9. Install the oil supply manifold retaining pin **(1)** and O-ring seal **(2)**.



BAIL08CVT388AVB 9

10. Install the rear axle sump.
Tighten the bolts to **47 Nm** (**35 lb ft**).



BAIL08CVT394AVA 10

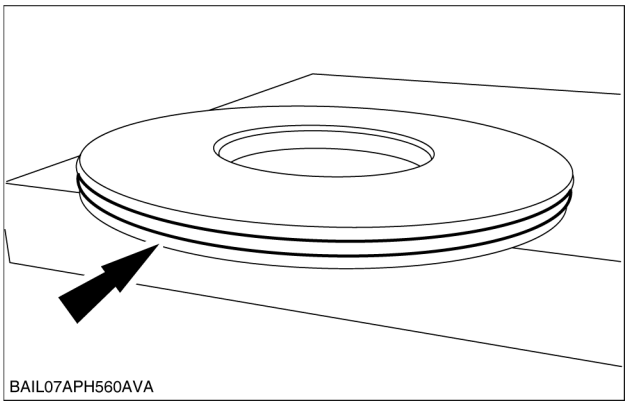
Next operation:
Connect the transmission to the rear axle, for further information refer to **Housing - Connect (C.20.G)**

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Clutch - Assemble

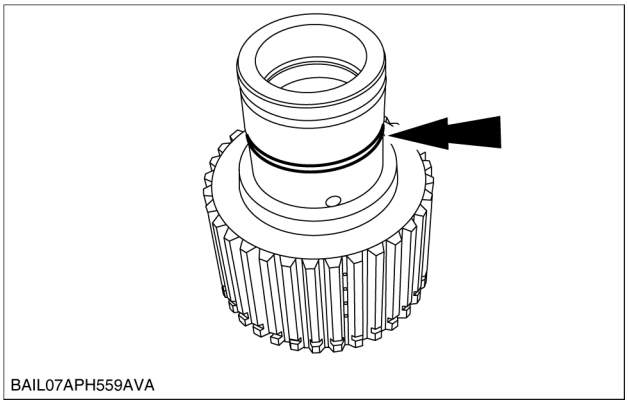
Prior operation:
Disassemble the clutch, for further information refer to **Clutch - Disassemble (D.14.C)**

1. Install a new oil seal onto the carrier.



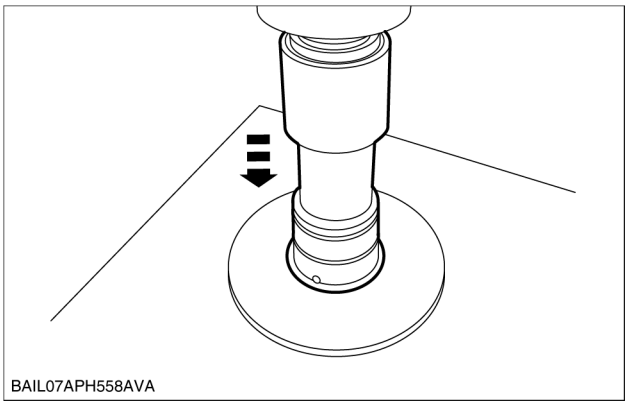
BAIL07APH560AVA 1

2. Install a new oil seal onto the shaft.



BAIL07APH559AVA 2

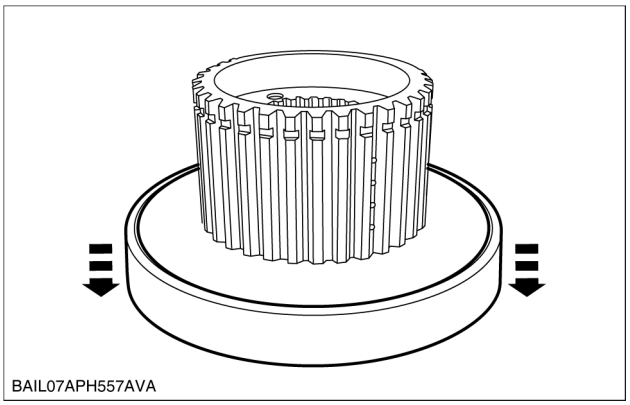
3. Using a suitable hydraulic press, install the oil seal carrier onto the shaft.



BAIL07APH558AVA 3

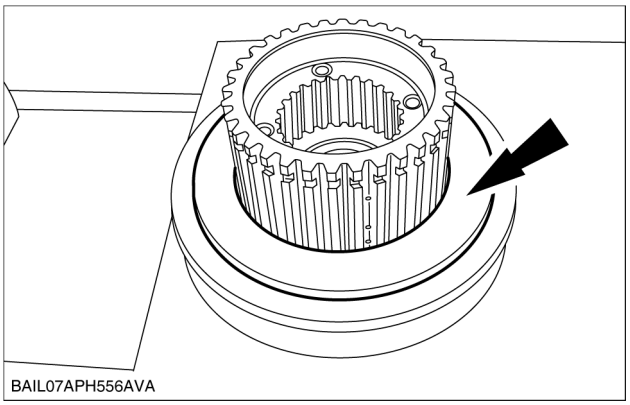
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4. Install the oil seal carrier into the piston.



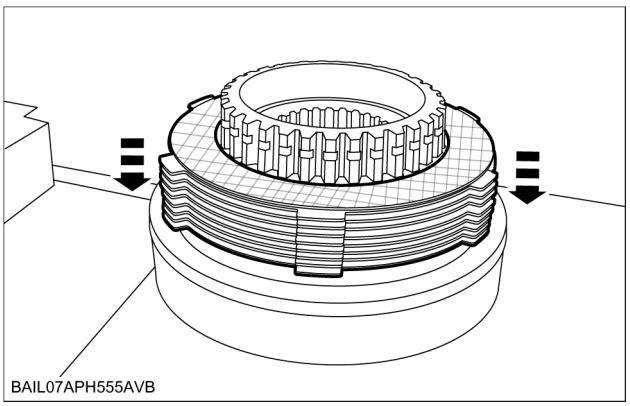
BAIL07APH557AVA 4

5. Install the pressure plate.



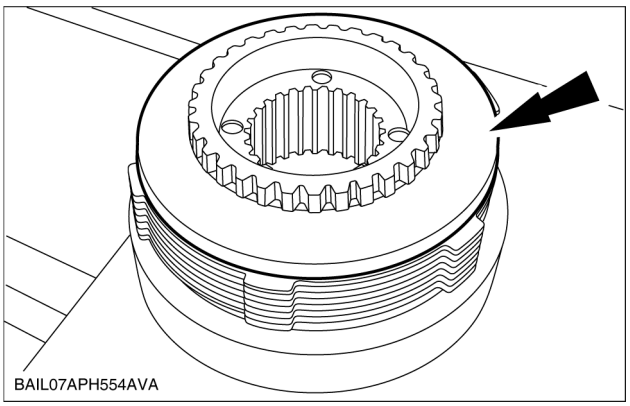
BAIL07APH556AVA 5

6. Install the clutch friction and steel plates.



BAIL07APH555AVB 6

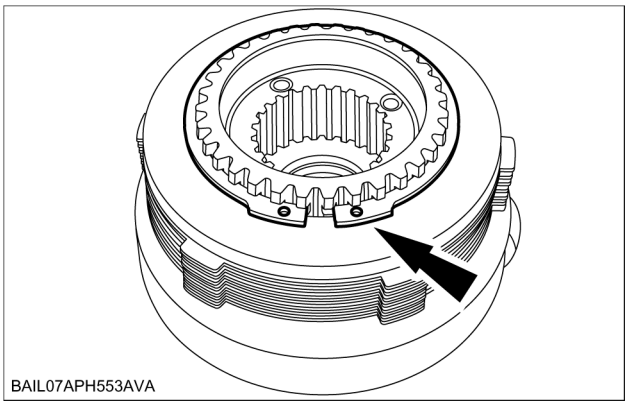
7. Install the end plate.



BAIL07APH554AVA 7

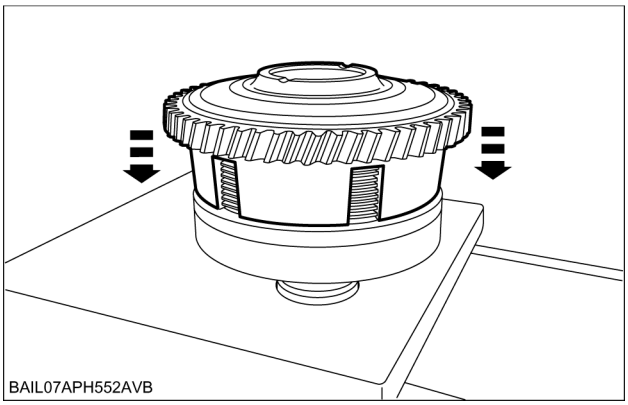
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8. Install the circlip.



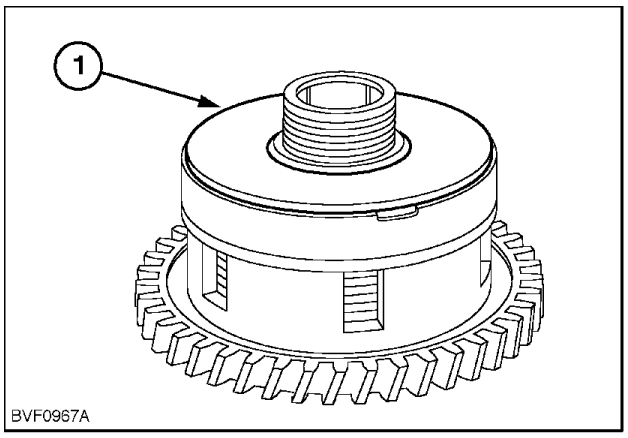
BAIL07APH553AVA 8

9. Install the driven gear.



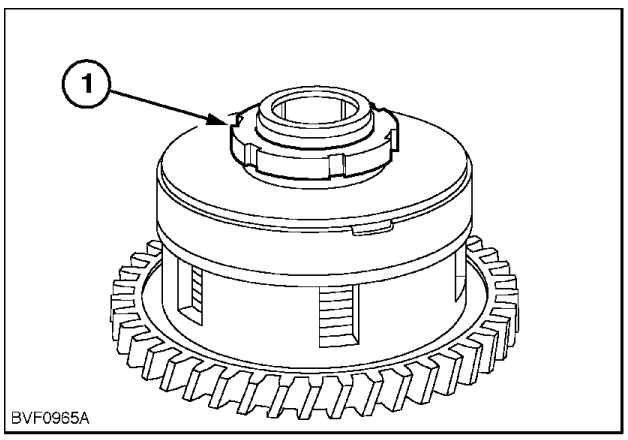
BAIL07APH552AVB 9

10. Install the Belleville washer **(1)**.



BVF0967A 10

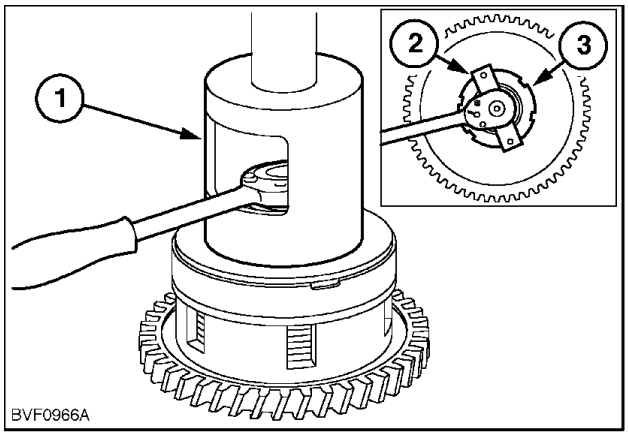
11. Loosely install the retaining nut **(1)**.



BVF0965A 11

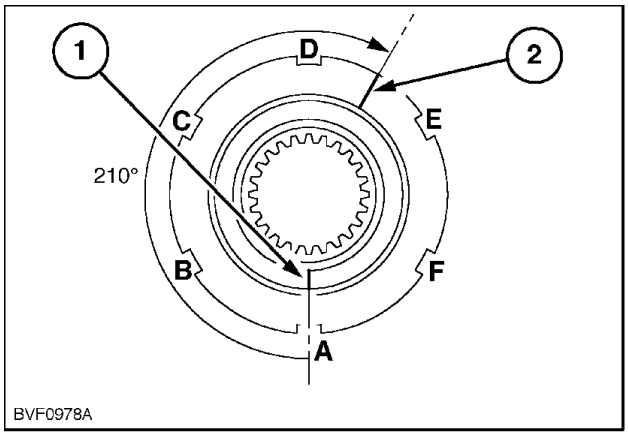
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12. Using special tool **380000984**. **(1)** and a suitable hydraulic press, compress the Belleville washer with a force of **2000 - 2200 Kg** (**4410 - 4850 lbs**). Using special tool **380000984 (2)**, tighten the retaining nut **(3)** to the specified torque value of **15 - 25 Nm** (**11 - 18 lbf. ft**).



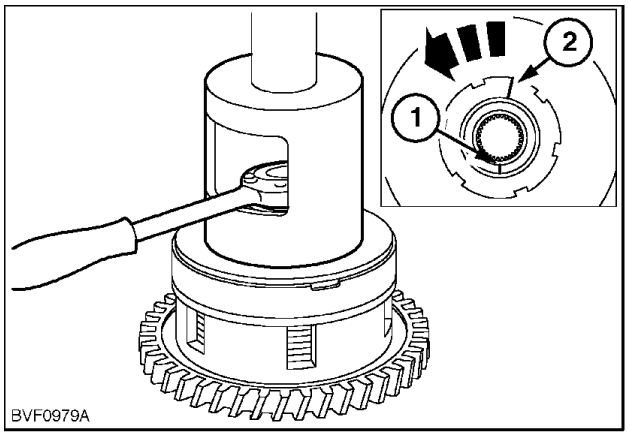
BVF0966A 12

13. Remove the special tools.
Make a reference mark **(1)** on the shaft opposite the cut out **(A)**.
Make an alignment mark **(2)** on the retaining nut which is **210 °** (3.5 flats) clockwise from the reference mark **(1)** midway between the cut outs **(D)** and **(E)**.



BVF0978A 13

14. Using special tool **380000984** and a suitable hydraulic press, compress the Belleville washer with a force of **2000 - 2200 Kg** (**4410 - 4850 lbs**).
Using special tool **380000984**, rotate the retaining nut counterclockwise until the alignment mark **(2)** is aligned with the reference mark **(1)**.

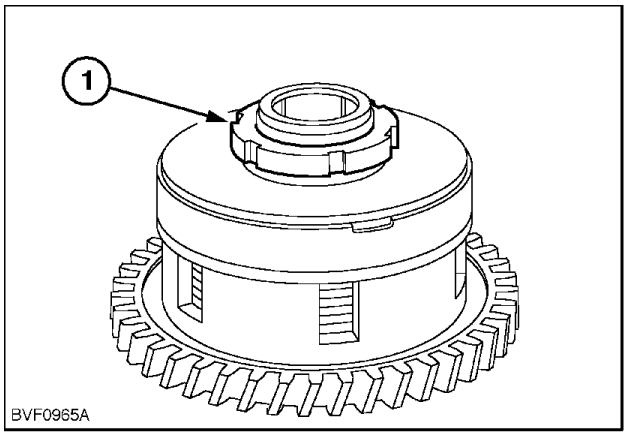


BVF0979A 14

15. Release the pressure in the hydraulic press and remove the special tools.

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16. Stake the retaining nut **(1)**.



BVF0965A 15

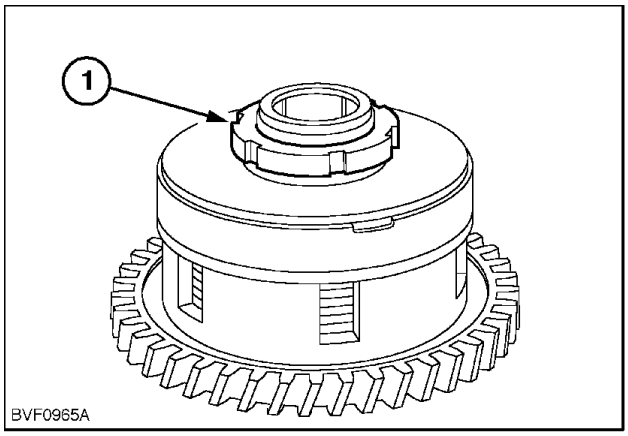
Next operation:
Install the clutch, for further information refer to **Clutch - Install (D.14.C)**

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Clutch - Disassemble 4WD Clutch

Prior operation:
Remove the 4WD Clutch, for further information refer to **Clutch - Remove (D.14.C)**

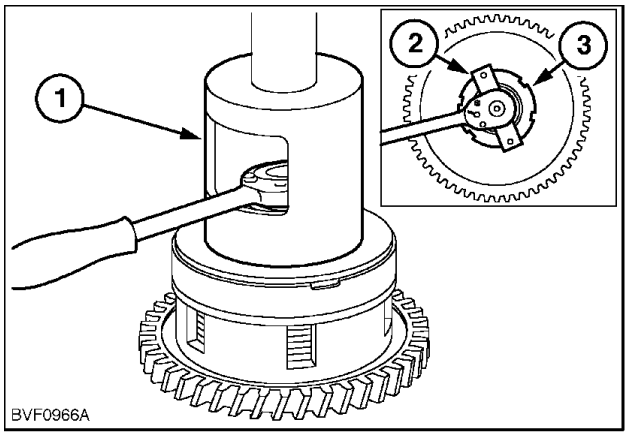
1. Unstake the retaining nut **(1)**.



BVF0965A 1

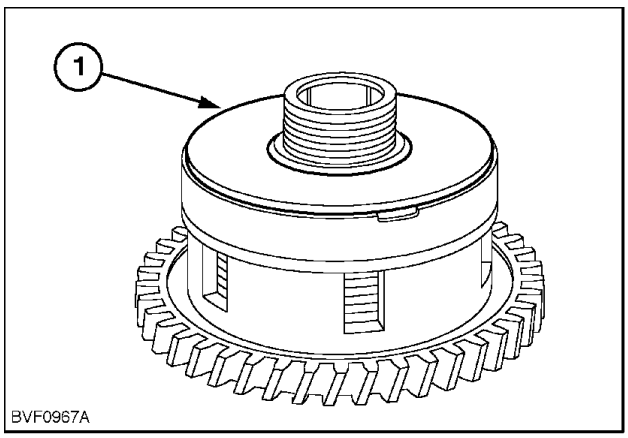
2. Using special tool **380000984 (1)** and a suitable hydraulic press, compress the Belleville washer. Using special tool **380000984 (2)**, remove the retaining nut **(3)**.

NOTE: *Make sure the retaining nut is fully unstaked or damage to the threads may occur.*



BVF0966A 2

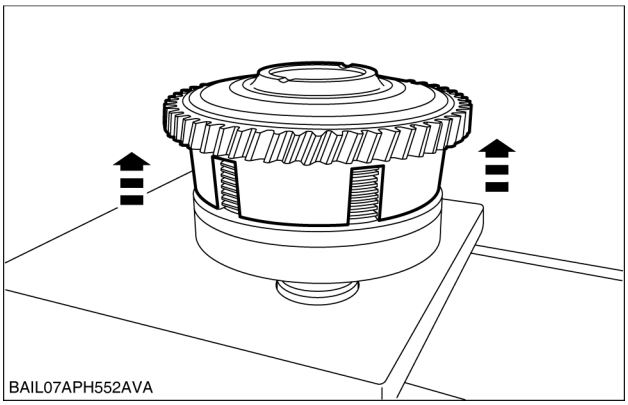
3. Remove the special tools and the belleville washer **(1)**.



BVF0967A 3

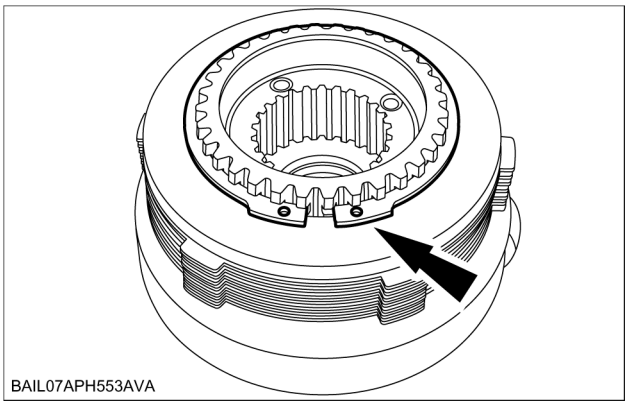
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4. Turn the clutch assembly over.
Remove the driven gear.



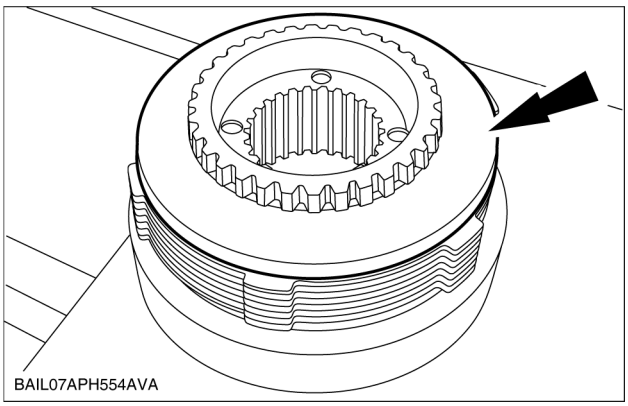
BAIL07APH552AVA 4

5. Remove the clutch plate retaining circlip.



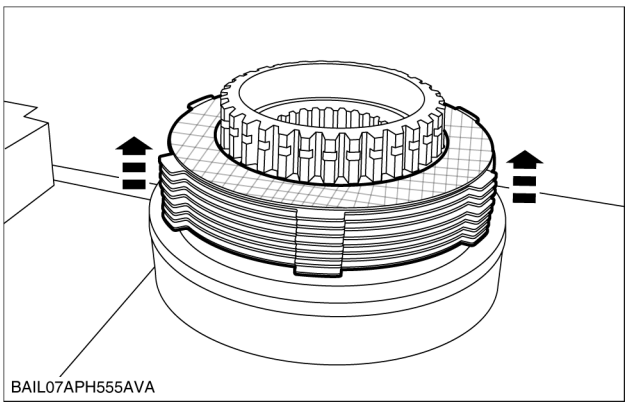
BAIL07APH553AVA 5

6. Remove the end plate.



BAIL07APH554AVA 6

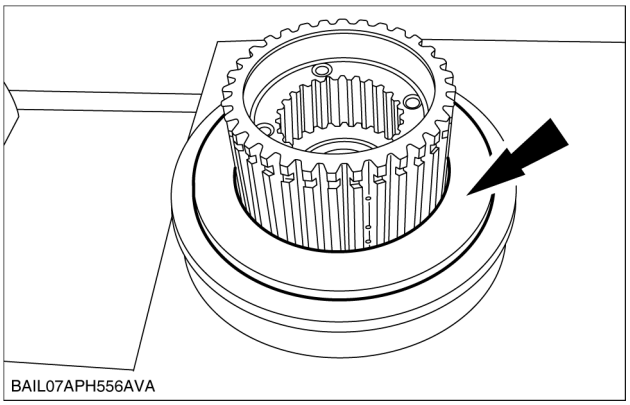
7. Remove the clutch friction discs and steel plates.



BAIL07APH555AVA 7

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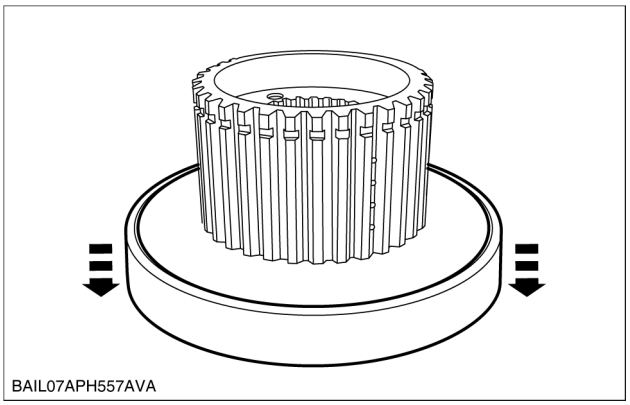
8. Remove the pressure plate.



BAIL07APH556AVA 8

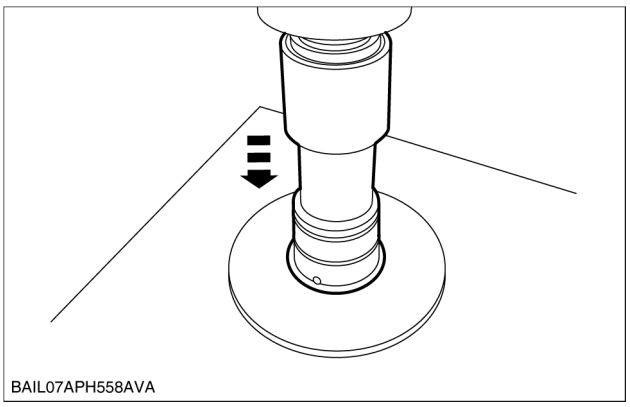
9. Remove the piston from the oil seal carrier.

NOTE: *Apply pressure evenly to the piston.*



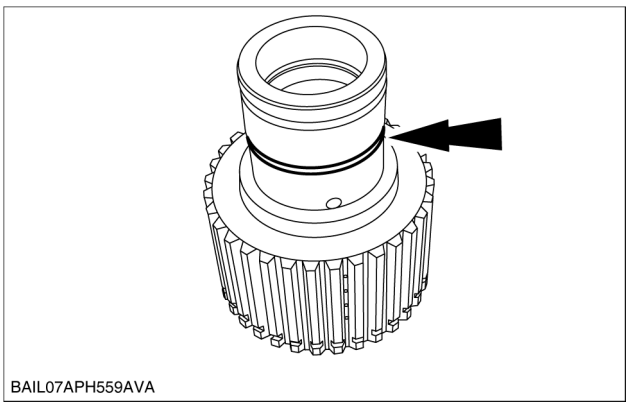
BAIL07APH557AVA 9

10. Using a suitable hydraulic press, remove the shaft from the oil seal carrier.



BAIL07APH558AVA 10

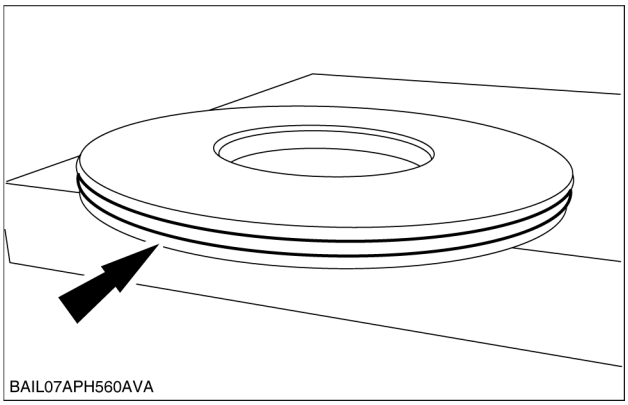
11. Remove the oil seal from the shaft.



BAIL07APH559AVA 11

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12. Remove the oil seal from the carrier.

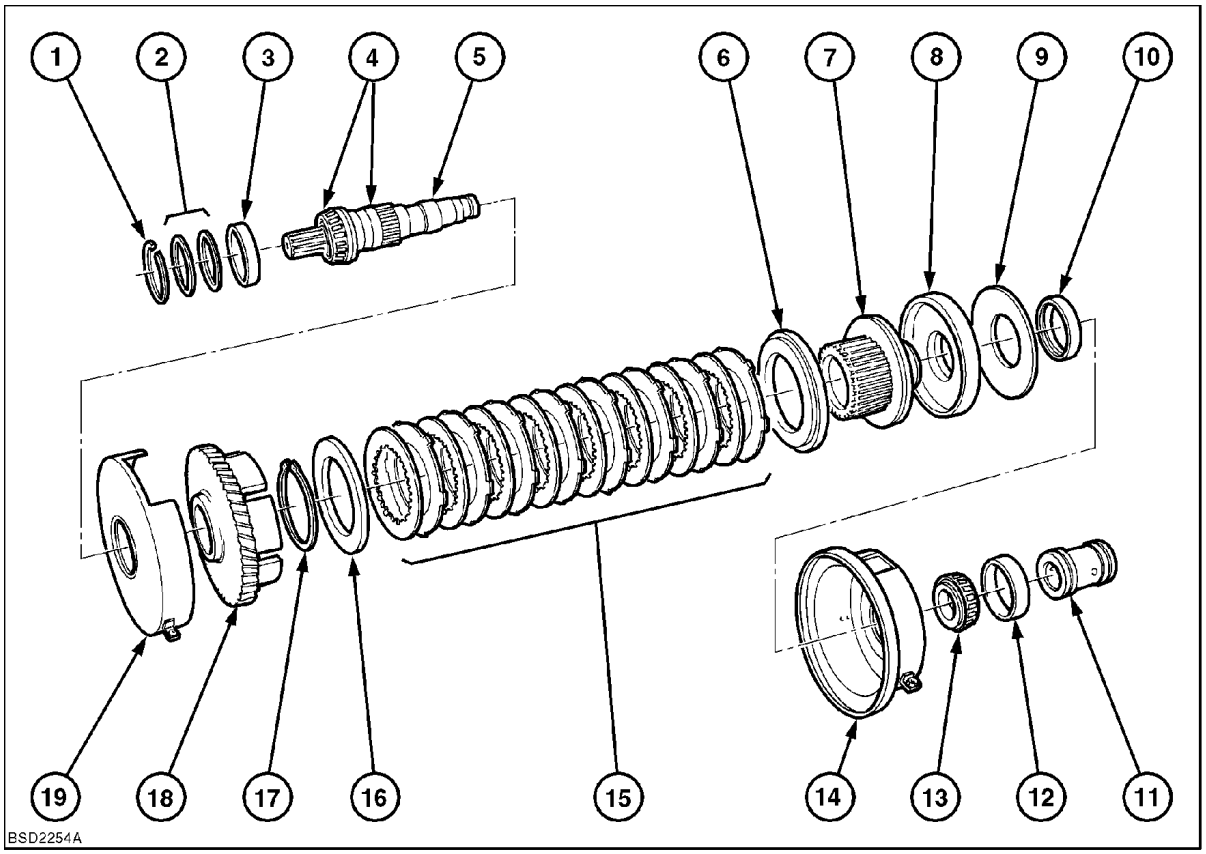


BAIL07APH560AVA 12

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Clutch - Overhaul

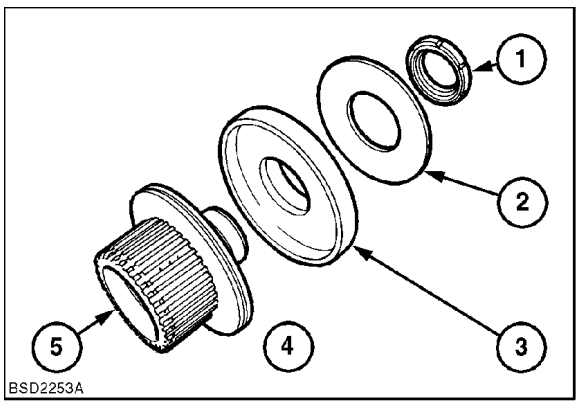
1. Separate and inspect all components.



BSD2254A 1

Electro Hydraulic Transfer Clutch

1.	Retaining Ring	11.	Sleeve
2.	Shims	12.	Bearing Cup
3.	Bearing Cup	13.	Bearing
4.	Bearing	14.	Cover
5.	Shaft	15.	Clutch Plates and Separators (8 off each)
6.	Spacer	16.	Spacer
7.	Piston	17.	Retaining Ring
8.	Piston Housing	18.	Drive Gear
9.	Belleville Spring	19.	Cover
10.	Nut		



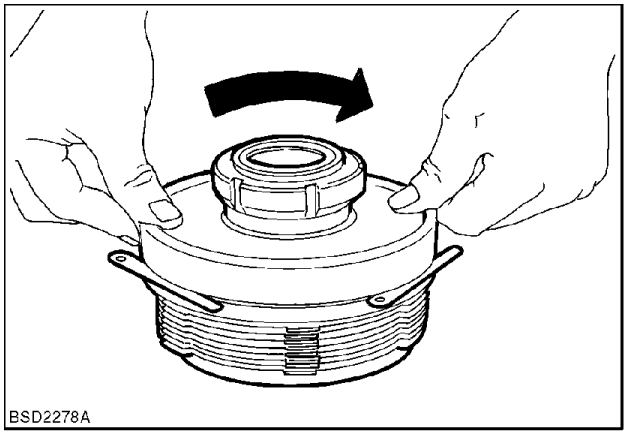
BSD2253A 2

Piston Assembly

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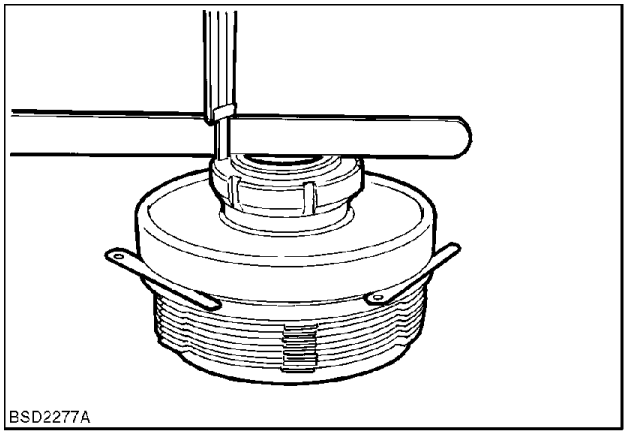
1.	Nut	4.	Seal
2.	Belleville spring	5.	Piston
3.	Piston Housing		

2. Reassemble piston assembly and clutch plates (Items 6, 7, 8, 10, 15, 16, 17 Figure **1**) Do not install Belleville spring (item 9) at this stage.
Equally space three feeler gages set to **1.2 mm** between piston housing and spacer.
Press piston housing against clutch plates and screw down nut until it touches the piston housing



BSD2278A 3

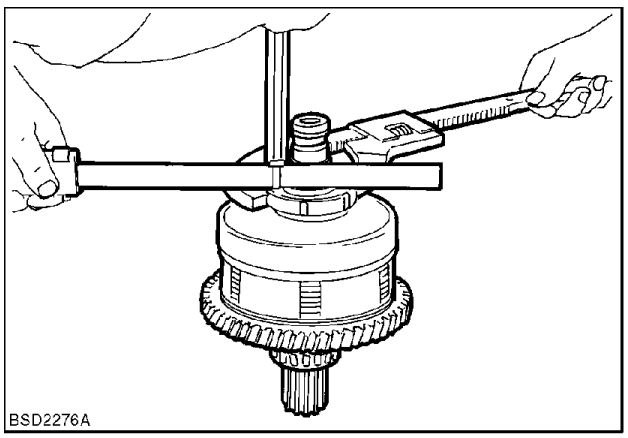
3. Using a vernier measure the position of the face of the nut to the top of the assembly and scribe an alignment mark on nut and housing.



BSD2277A 4

4. Reassemble clutch complete with Belleville spring and screw down the nut to the same dimension measured in step **3**. Realign the marks on the nut and housing. The marks made in step **3** ensure that the nut is positioned in exactly the same place.

NOTE: *To assist in tightening the nut the splined shaft can be held in a vice with soft jaws.*



BSD2276A 5

Next operation:
Clutch - Install (D.14.C)

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2WD-4WD SYSTEM Hydraulic - Troubleshooting

NOTE: *If the front wheel drive is not functioning correctly, check for any electronic error codes which may be stored. These are defined by the error code range of 6001 to 7000. To retrieve error codes and review appropriate fault finding diagnostic charts refer to the relevant chapter in the electrical systems section .*

Problem	Possible Cause	Correction
	Four wheel drive engagement switch faulty.	Replace the four wheel drive engagement switch.
	Four wheel drive control solenoid valve stuck open.	Repair or replace the solenoid valve.
	Worn clutch discs.	Replace the clutch discs.
	Incorrectly set multi wet-plate clutch release travel.	Adjust the release travel.
Four wheel drive does not disengage	Low transmission oil.	Refill the transmission to the correct oil level.
	Faulty low pressure circuit.	Pressure test the low pressure circuit, for further information refer to pressure testing in the hydraulic systems section **Priority valve - Pressure test (A.12.A)**).
	Faulty four wheel drive engagement circuit.	Check the circuit.
	Four wheel drive control solenoid valve stuck closed.	Repair or replace the solenoid valve.
	Oil leaks through the oil seals with consequent pressure drop: hub, piston, and transfer box shaft oil seals.	Replace any faulty oil seals.

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TRAVELLING - D

STEERING Hydraulic - 20.C

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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STEERING Hydraulic - Torque

Steering General	
Steering cylinder tube connections	**34 Nm** (**25.1 lb ft**)
Steering motor to cab frame bolts	**73 Nm** (**53.8 lb ft**)
Steering motor hose connections	**73 Nm** (**53.8 lb ft**)
Steering pump tube connections	**50 Nm** (**36.9 lb ft**)
Steering wheel retaining nut	**23 Nm** (**17.0 lb ft**)
Front wheel nut	**210 Nm** (**154.9 lb ft**)
Motor end cover	**23 Nm** (**17.0 lb ft**)
Cylinder, tube end pin retaining bolt (4WD)	**24 Nm** (**17.7 lb ft**)
Column to Frame Bolt	**23 Nm** (**17.0 lb ft**)

STEERING Hydraulic - Special tools

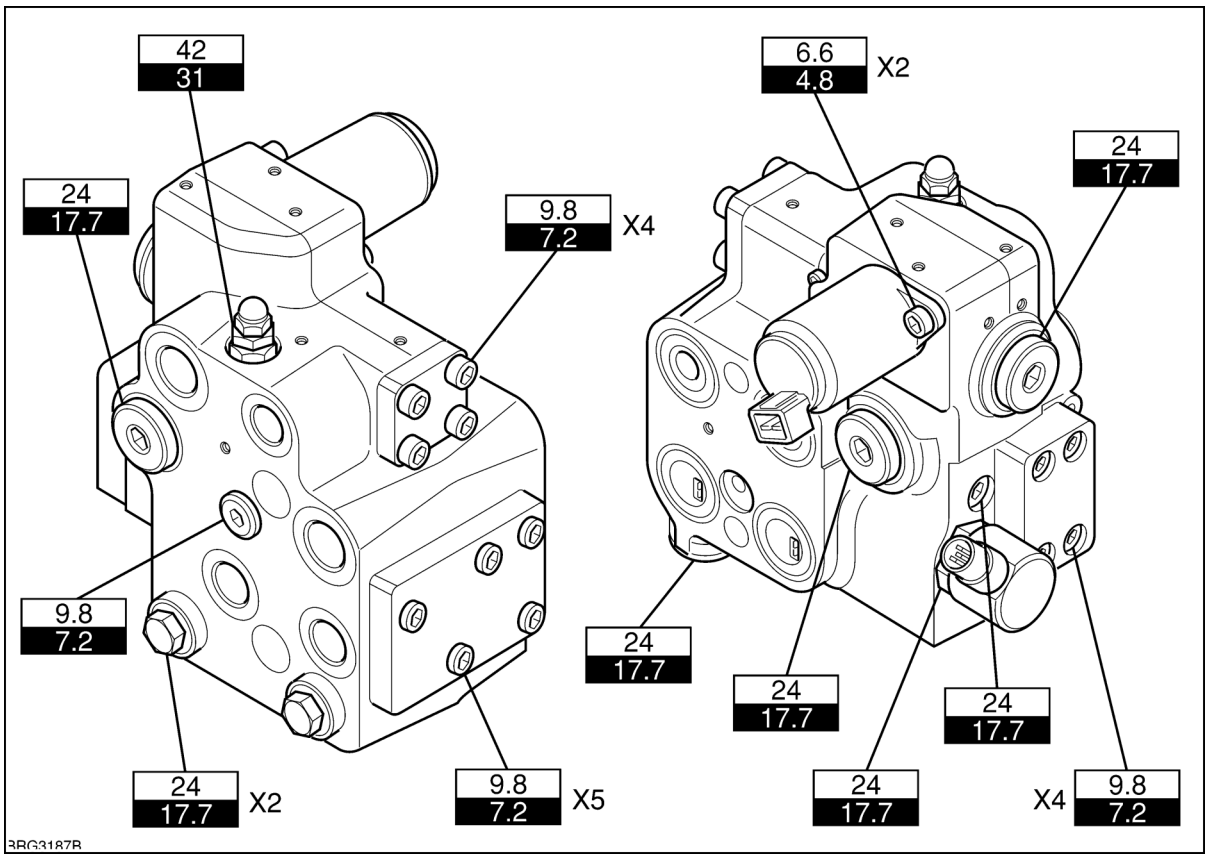
DESCRIPTION	Tool Number
Pressure gauge (**0 - 250 bar** (**0.0 - 3625.0 psi**))	**380000553**
Roto-glyd seal installer	**380000281**
Test hose	**380000545**
Quick release coupler	**380000543**
Hydraulic hose Tee adaptor	**380000570**
Quick release fitting (7/16 UNF male fitting)	**380000492**

STEERING Hydraulic - General specification

Steering Pressure	Supplied from main variable displacement pump via a priority valve
Maximum output @ rated engine speed from priority valve port to orbital motor	**25 - 30 l/min** (**6.6 - 7.9 US gpm**)
Steering type	Dual gereotor - reactive (Standard/Turn assist)
	Dual gereotor -non reactive (Autoguidance)
Steering rams	Balanced
Maximum steering angle (standard and suspended)	**55 °**

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Fast steer system Control valve - Torque



BAIL06CCM069FSA 1

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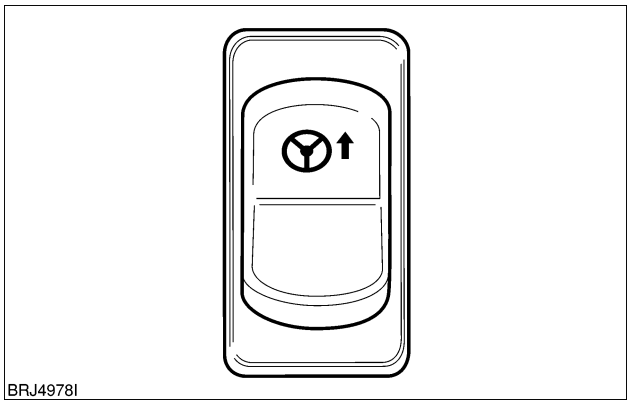
STEERING Hydraulic - Static description

All models have fitted as standard, hydrostatic steering systems that are powered when the engine is running, by a hydraulic pump mounted on the rear axle.
The hydraulic system incorporates a priority valve as part of the hydraulic pump assembly and this ensures the steering circuit receives the correct pressure and flow before the other hydraulic components.
The pump, driven by a gear straight from the P.T.O. shaft, pressurises the steering column operated steering motor.
The pressurised oil from the steering motor drives the axle mounted twin cylinders (4WD).
The steering motor is a reactive type on standard and Turn assist models and non reactive on Auto guidance models.
It is bolted to a bracket within the steering console and connected to the steering column by a splined shaft.
The steering column is adjustable for varying angles of tilt on all models.
On four wheel drive units two steering cylinders are used, one for each wheel. The cylinders are fixed at one end to the axle casing and the piston end to steering arms from the swivel housings.
The pressure relief valve for the system is contained within the steering motor itself.

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Fast steer system - Static description

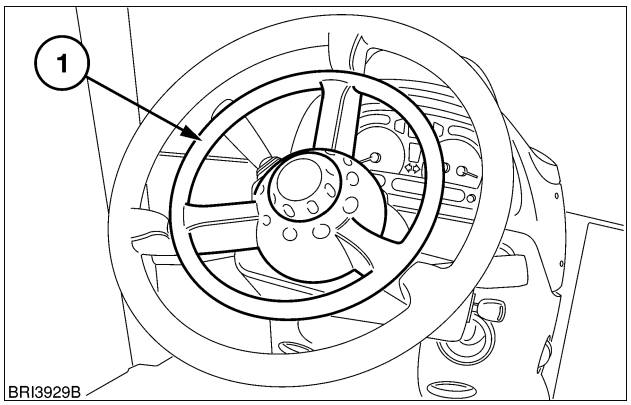
The optional Turn Assist system is designed to provide fast steering response when required i.e. when operating with a front loader.
From the straight ahead position, Turn Assist will provide full right or left hand steering lock with plus or minus **8 °** movement of the steering wheel.
To activate Turn Assist , depress the isolator switch **(1)** Figure . **1**
The green warning light on the instrument panel **(1)** Figure **3** will illuminate indicating that the system is active.



BAIL08CVT106ASA 1

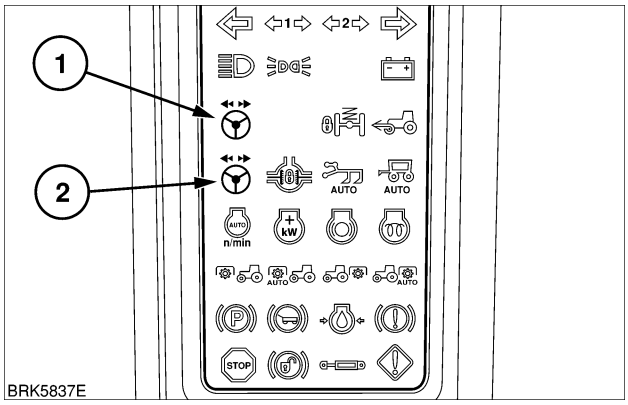
NOTE: *For Turn Assist function the tractor speed must not exceed* ***10 km/h 6.2 mph***

To operate Turn Assist, depress and hold the centre ring **(1)** Figure **2** on the steering wheel, to disengage, release the ring. .



BAIL06CCM072ASA 2

With the Turn Assist centre ring depressed, the yellow warning light **(2)**, Figure **3** will illuminate on the instrument panel. It will extinguish when the centre ring is released.



BAIL08CVT107ASA 3

Turn Assist will only function if all the following conditions are met:

- The isolator switch is in the ON position
- The speed of the tractor does not exceed **10 km/h 6.2 mph**

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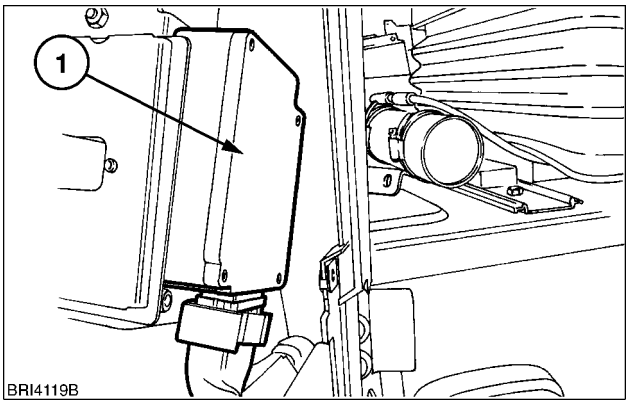
- The Centre ring **(1)** Figure **2** is held down.
- The warning light on the instrument panel is illuminated **(1)** Figure **3** .

Turn Assist will automatically disengage if a fault occurs or one of the above conditions are not applied. Should automatically disengage, an audible warning will sound and an error code will be appear in the Dot Matrix Display. To reactivate the Turn Assist function, turn off the isolator switch **(1)** Figure . **1**, ensure the tractor speed is below **10 km/h 6.2 mph**, and turn the switch on again.

IMPORTANT: *To promote safe operation of Turn Assist , it is advised that the operator become familiar with the system before operating in the field.*

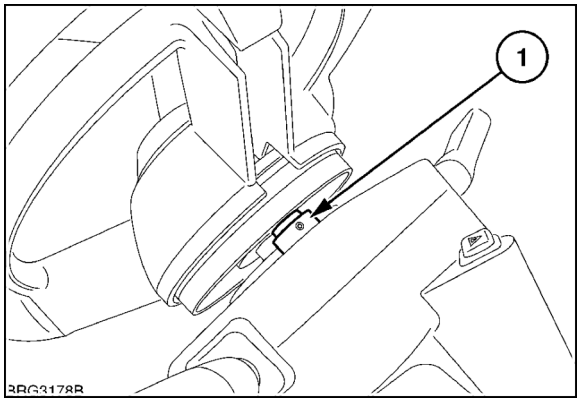
NOTE: *In cold oil temperature conditions it is advisable to turn steering from lock to lock before engaging the Turn Assist System.*

The Turn Assist controller is located on the right hand side underneath the instrument console. The module **(2)** is connected to the Turn Assist valve via a harness **(1)** See Figure **4**.



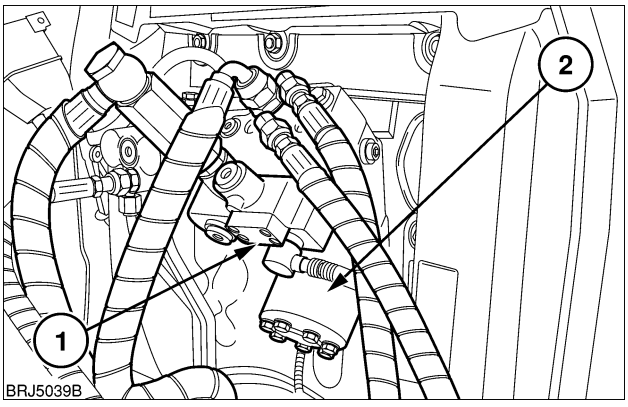
BAIL06CCM123ASA 4

A proximity sensor **(1)** is located on the steering column. This senses the magnetic field strength change as the metal in the plate of the inner steering wheel ring moves away or closer to the sensor.



BAIL06CCM075ASA 5

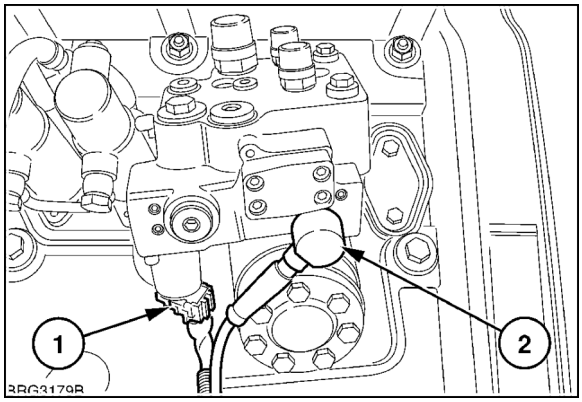
The Turn Assist valve **(1)** is coupled to the steering motor **(2)**.



BAIL07APH352ASA 6

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The Turn Assist valve is connected electronically to the controller by a harness . When the system is enabled the controller powers a pilot valve solenoid **(1)** . The position of the split valve spool is checked by the sensor (LVDT - linear variable differential transformer) **(2)** to verify that the spool is not stuck in such a manner that would allow the Fast steer to be active or operate in an unsafe condition.
The construction of the LVDT consists of three coils which make up the static transformer and a movable inner iron core. One of the coils is the primary coil and the other two are secondary coils. When the iron core slides through the transformer, a certain number of coils are affected by the proximity of the sliding core and thus generate a unique output to the controller.



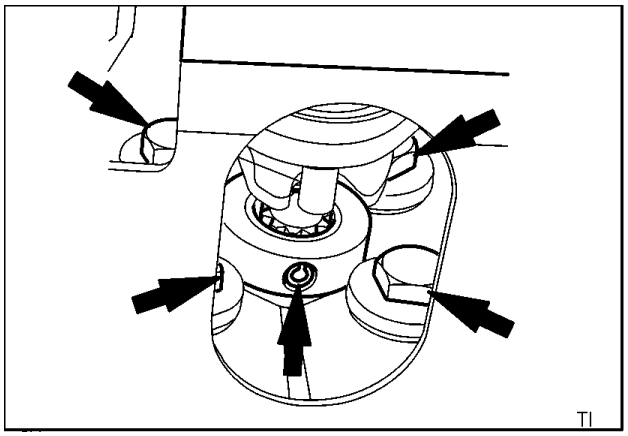
BAIL06CCM076ASA 7

After the operator has enabled Turn Assist operation and the diagnostic program has not encountered any faults , the Turn Assist controller powers a pilot valve solenoid attached to a change valve on the Turn Assist valve. this directs the oil flow from the steering motor directly to the distributor spool and split valve. When the steering wheel is turned the trapped oil in the steering motor now acts as pilot pressure to move the distributor valve, connecting the pump directly to the steering cylinders. The increased flow of oil to the steering cylinders provides an accelerated steering action. When the steering ring is released the Turn Assist controller disengages the solenoid and the oil flow reverts to the conventional steering motor operation.

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Control valve - Remove

1. Position the tractor on a hard level surface and apply the parking brake. To gain access to the steering motor :-
   Raise the engine hood
   Remove the steering column console
   Remove left hand engine side cover
   Disconnect the four supply/return tubes and O ring seals from the steering motor and cap the ends of the tubes.
   Remove the roll pin from the drive collar to separate the steering shaft, Figure **1**.
   Remove the four bolts at the base of the steering column and slide the steering motor from the upper section of the steering column, Figure **1**.
   Remove the steering motor from the front of the cab through the engine compartment.



60-41-018 1

Next operation:
Control valve - Disassemble (D.20.C)

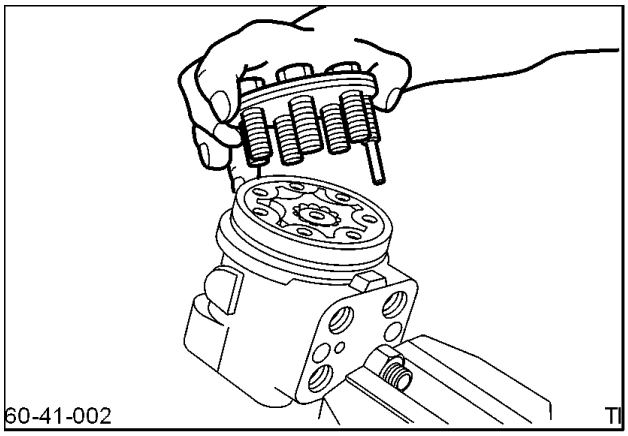
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Control valve - Disassemble

Prior operation:
Control valve - Remove (D.20.C)

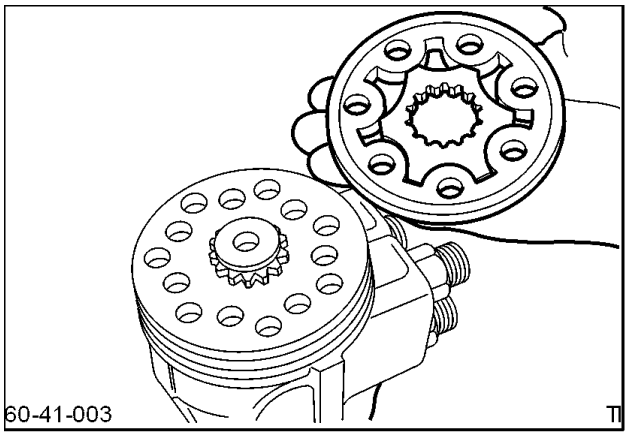
1. With the steering motor connectors removed note position of the non return valve.
   Hold the steering motor securely in a vice using a tube connector as shown in, Figure **1**.
   Remove the end plate bolts, end plate and O ring, Figure **1**.

NOTE: *The position of the pin bolt must remain the same on re-assembly.*



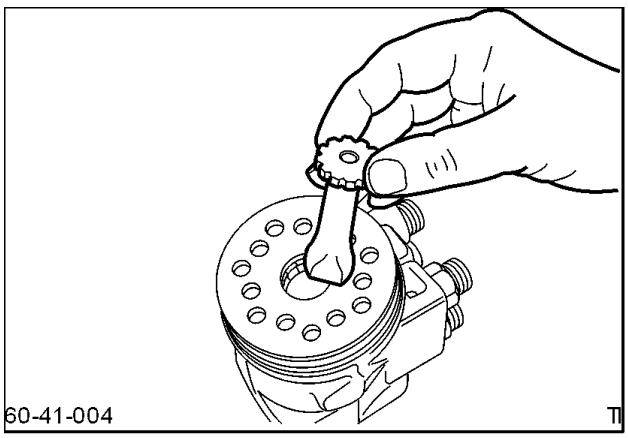
60-41-002 1

2. Remove metering unit, valve plate and O ring seals, note mating surfaces for correct reassembly, Figure **2**.



60-41-003 2

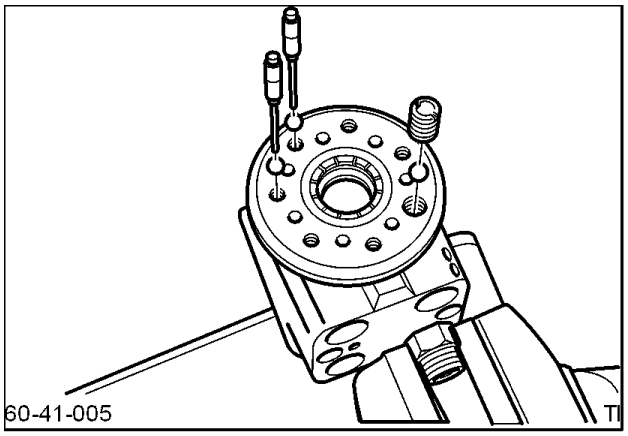
3. Lift out rotor drive-shaft, Figure **3**.



60-41-004 3

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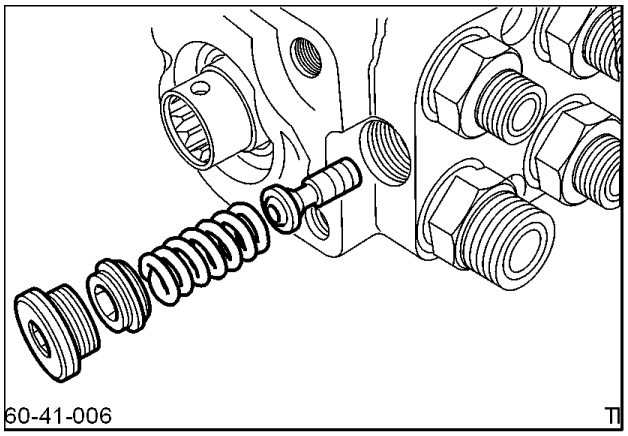
4. Unscrew the check valve retainer, Figure **4** and shake out the check and suction valves.



60-41-005 4

5. Remove the relief valve assembly, Figure **5**.

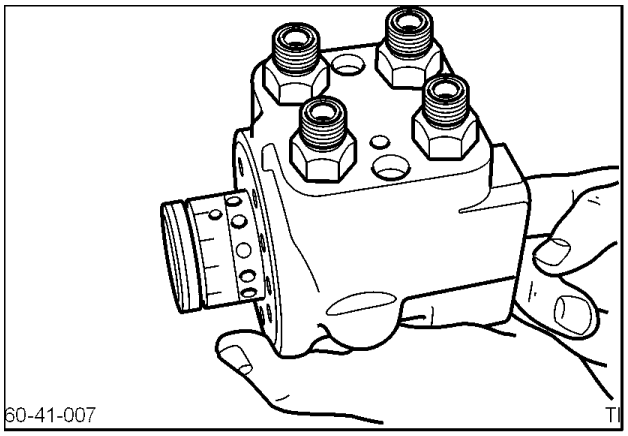
IMPORTANT: *The relief valve must be set to the correct pressure setting on reassembly. Refer to* ***Relief valve - Pressure setting (D.20.C)****.*



60-41-006 5

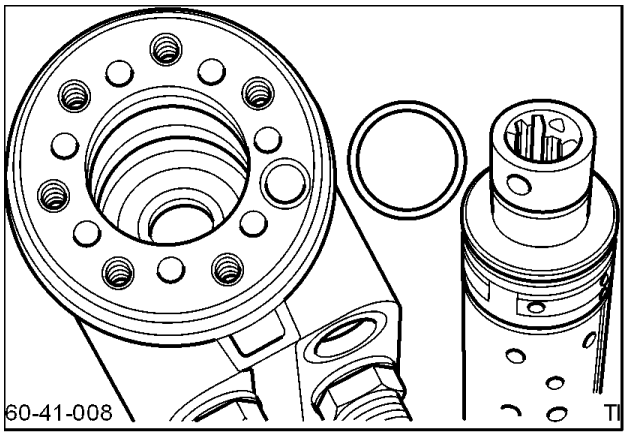
6. Remove the inner and outer valve sleeves, bearings and thrust washer, Figure **6**.

NOTE: *When removing spool and sleeve ensure drive pin is in a horizontal position so that it cannot fall into an internal gallery and make removal difficult.*



60-41-007 6

7. Once spool is disassembled from the body ensure oil seal is removed, Figure **7**.

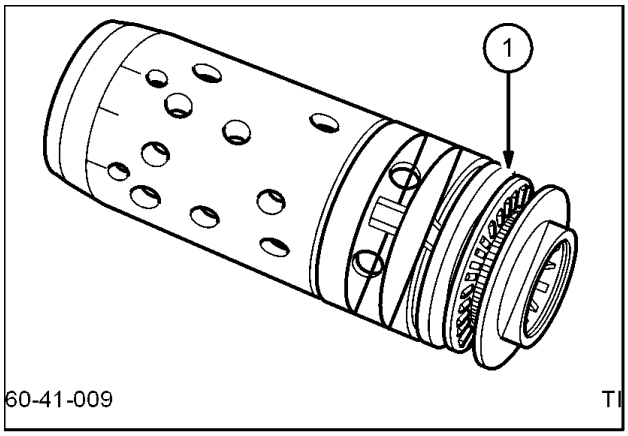


60-41-008 7

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8. Remove the control valve spool and sleeve, Figure **8**.

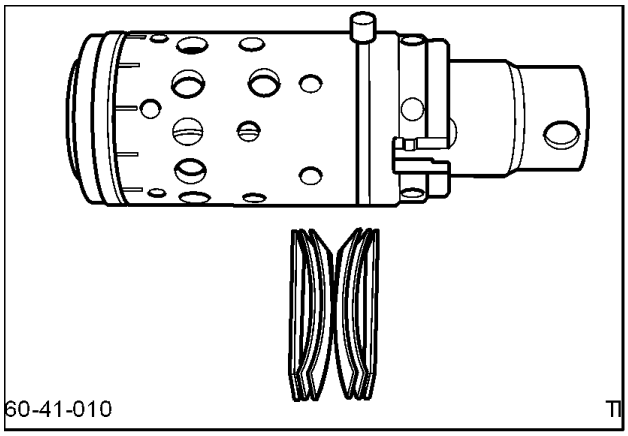
IMPORTANT: *Upon re–assembly ensure washer, item* ***(1)****, Figure* ***8*** *is installed with chamfer towards the valve sleeve.*



60-41-009 8

9. Remove centering springs, Figure **9**.
Remove drive pin, Figure **9**.
Push inner sleeve from outer sleeve.
Remove ‘O’ ring and back-up ring.

NOTE: *Arrangement of the leaves must remain the same upon re-assembly.*



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Next operation:
Control valve - Overhaul (D.20.C)

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Control valve - Overhaul

Prior operation:
Control valve - Disassemble (D.20.C)

1. Wash all parts in a suitable solvent to remove any foreign particles and dry with a clean lint free cloth or compressed air.
2. Inspect valve sleeves for, damage or wear. Minor burrs or scratches can be removed with a fine abrasive. Ensure all parts are thoroughly cleaned prior to reassembly.
3. Check leaf springs for damage. Replace if necessary.
4. Discard all O ring seals and replace with new seals on reassembly.

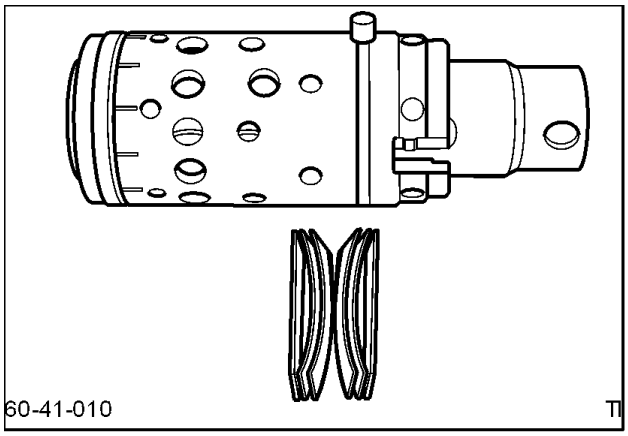
Next operation:
Control valve - Assemble (D.20.C)

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Control valve - Assemble

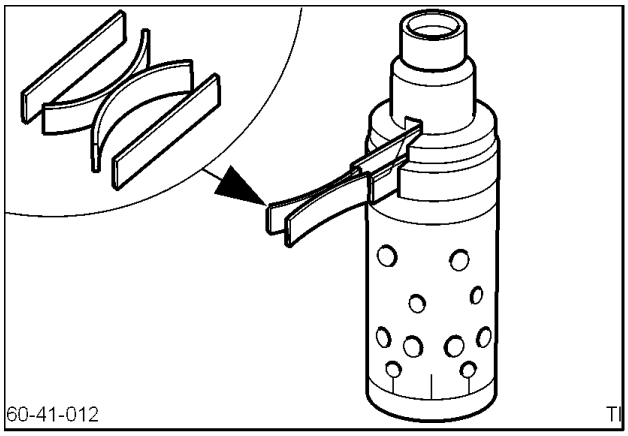
Prior operation:
Control valve - Overhaul (D.20.C)

1. Assemble inner and outer sleeves so that the leaf spring slots align.
   Install the drive pin, Figure **1**.



60-41-010_666 1

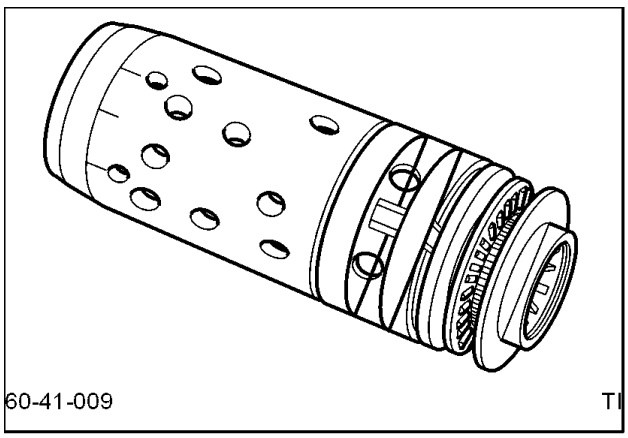
2. Install the leaf springs and push fully into position, Figure **2**.



60-41-012 2

3. Install leaf spring retainer, and bearing, Figure **3**.

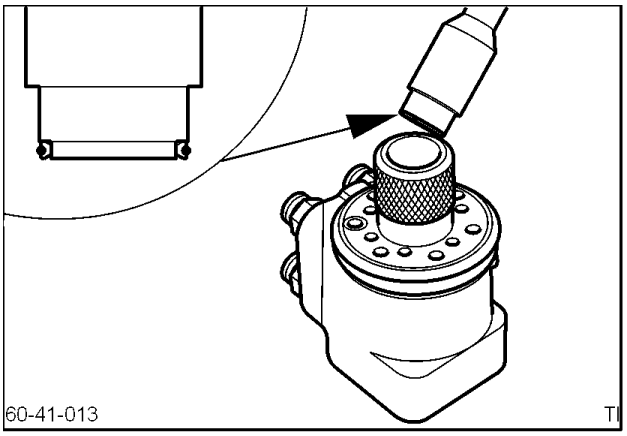
NOTE: *The inner bearing race must be positioned with the chamfer side facing the spool, **3**.*



60-41-009_667 3

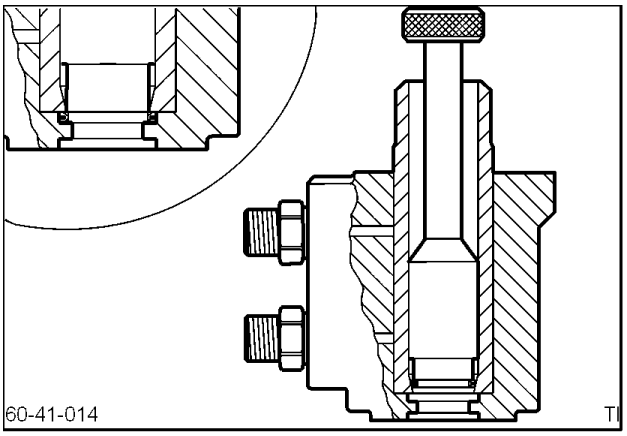
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4. Apply a light coating of hydraulic oil onto the sleeve item **(2)** and insert into the steering motor body, item **(3)**, Figure **4**.
Coat the O ring and back up ring, item **(4)**, Figure **4**, with hydraulic fluid and position them onto the seal installer guide.
Use tool No. **380000305** to install oil seal type kin-ring.
Use tool No. **380000281** to install oil seal type roto-glyd.



60-41-013 4

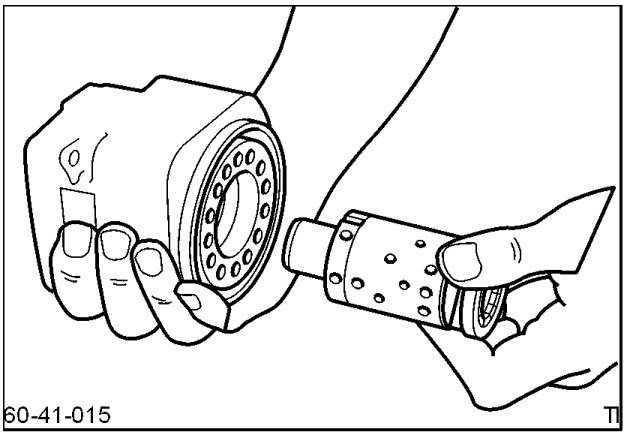
5. Position the seal guide tool into the sleeve and push down with a twisting action, Figure **5**.
Remove tools once the seal has seated.



60-41-014 5

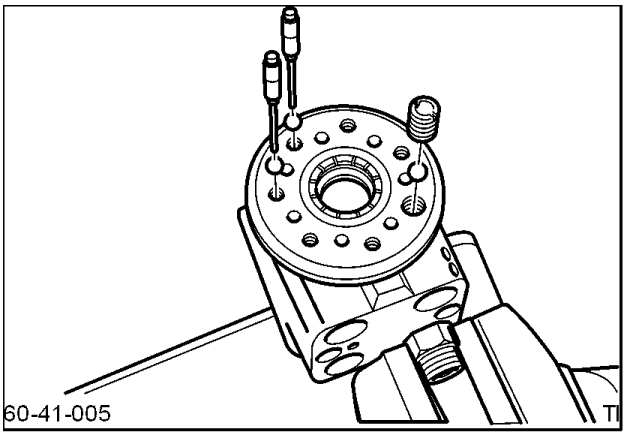
6. With the seal installed in the motor body refit control valve, Figure **6**.

NOTE: *Ensure that the drive is in a horizontal position to aid reassembly.*



60-41-015 6

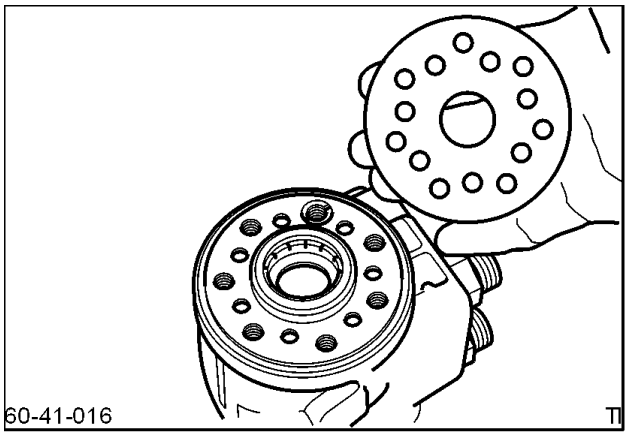
7. Once the control valve is seated correctly refit the check and suction valves, Figure **7**.
Screw the check valve down to just below the surface of the housing.



60-41-005_668 7

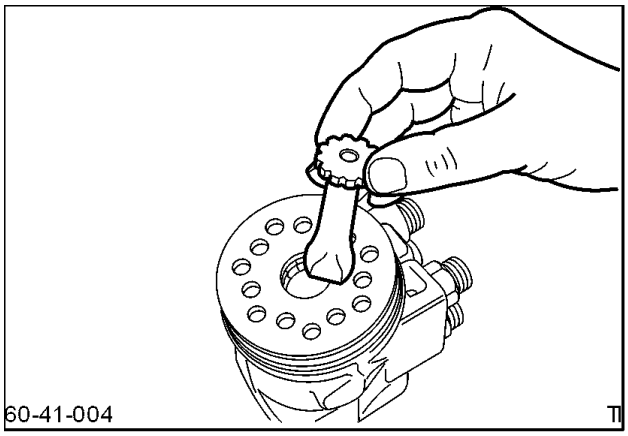
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8. Refit the O Ring and place the end plate in position.



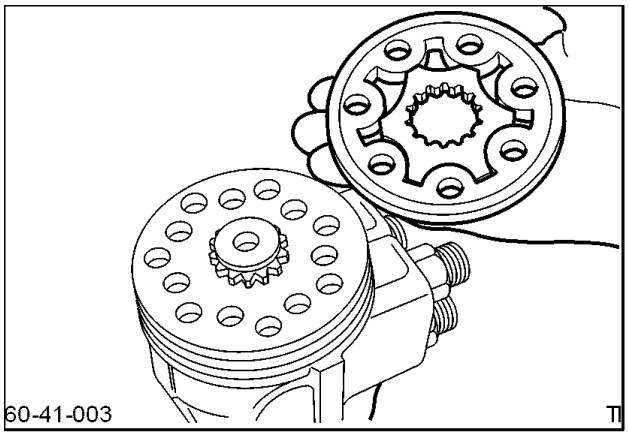
60-41-016 8

9. Metering Unit Reassembly
To aid reassembly install the control valve into the housing so that the drive pin is perpendicular to the front face of the housing.
Install drive link into the steering motor body, Figure **9**, ensuring that the link engages correctly over the drive pin.



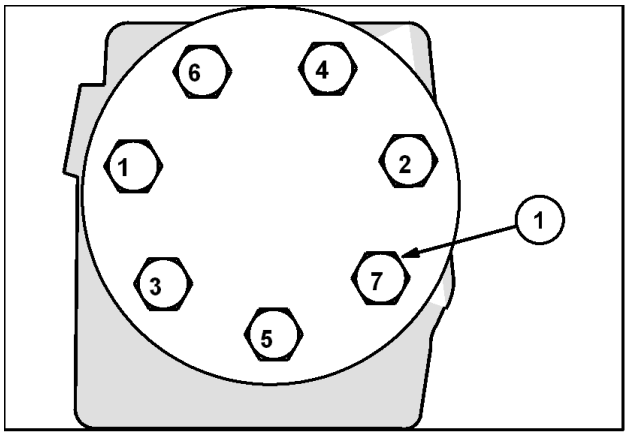
60-41-004_669 9

10. Assemble the metering unit rotor and stator and install new lightly greased O rings to either side of the stator, Figure **10**.
Assemble the rotor and stator onto the drive link.



60-41-003_670 10

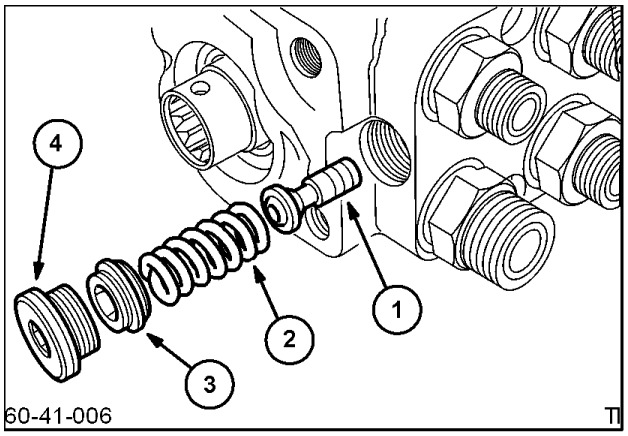
11. Install the end plate and bolts, ensure the pin bolt **(1)** is fitted in position ‘7’. Tighten the bolts in two steps, first to **8 lbf.ft** (**10.8 Nm**) and then to **21 lbf.ft** (**28.4 Nm**) in sequence as shown, Figure **11**.



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12. Install the relief valve assembly, items **(1)**, **(2)** and **(3)** Figure **12**, leaving the plug, item **(4)** out until after the relief valve has been adjusted.
Check to ensure the motor turns freely without binding.
After the relief valve has been correctly set reinstall the steering motor onto the mounting bracket and tighten the securing bolts to a torque value of **10 - 15 lbf.ft**(**12 - 20 Nm**).
Reconnect the steering hoses, tighten to a torque value of **10 - 15 lbf.ft** (**12 - 20 Nm**).
Purge the air from the system by operating the steering system from lock to lock until the system functions correctly.

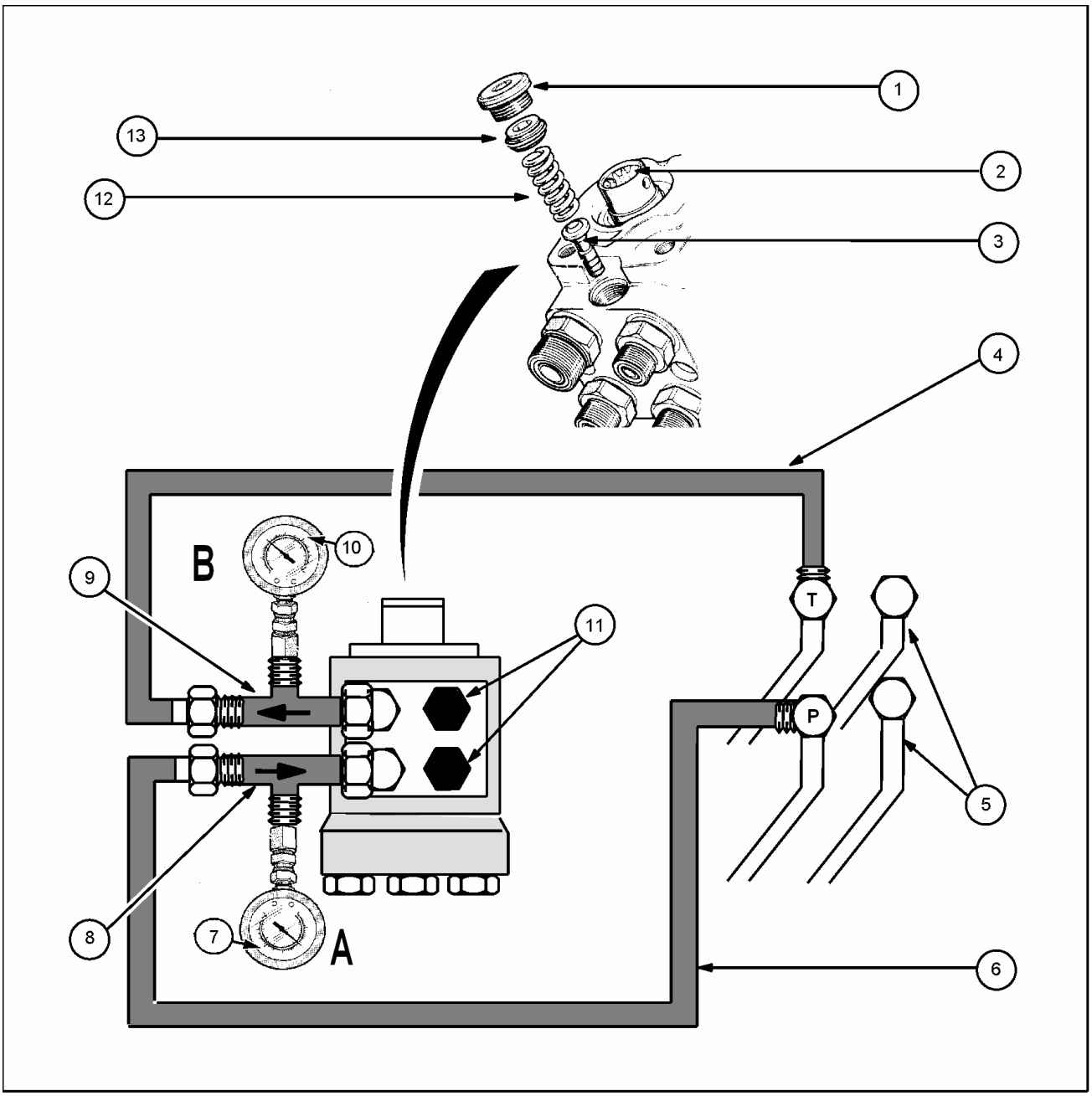


60-41-006_671 12

IMPORTANT: *The relief valve must be set to the correct pressure setting after the motor has been reassembled. Follow the correct procedure as detailed under 'Pressure relief valve setting', of this Chapter.*

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Relief valve - Pressure setting



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Steering Motor Relief Valve Adjustment

1 Plug
2 Steering Shaft
3 Relief Valve
4 Fabricated Steering Motor Output Hose
5 Tractor Tubes to Steering Cylinder
6 Fabricated Hose for Pump Supply to Steering Motor
7 Pressure Gauge **0 - 5000 lbf.in2**.
8 Size 8 ORS Swivel Running Tee
9 Size 10 ORS Swivel Running Tee
10 Pressure Gauge **0 - 500 lbf.in2**
11 Size 6 ORS Blanking Cap
12 Spring
13 Adjuster

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1. Relief Valve Adjustment - All Models
   With reference to Figure **1**.
   Disconnect the steering motor from the steering bracket, as detailed previously in **Control valve - Remove (D.20.C)** and remove from the tractor.

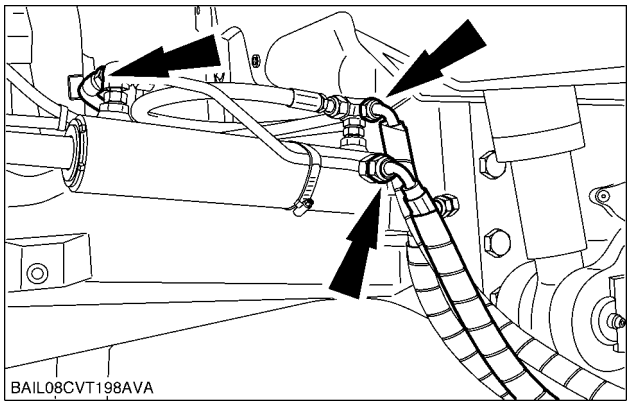
NOTE: *To adjust the steering system relief valve it is necessary to remove the steering motor from the steering bracket, to gain access to the hexagon headed adjusting screw.*

2. Fabricate suitable test hoses to connect from the tractor pressure and return tubes. Connect the hoses into locally procured tee pieces and install pressure gauges. Start the engine and idle between **1450 - 1500 rev/min**. Run the tractor until the transmission oil reaches normal working temperature of approximately **68 °C** (**155 °F**).
3. With the engine running, turn the steering motor shaft to obtain full lock. The pressure gauge reading at point ‘A’ should read **186 bar** (**2700 lbf.in2**). The gauge pressure at point ‘B’ should be in the region of **16 bar** (**235 lbf.in2**).
4. To establish actual (differential) pressure subtract gauge ‘B’ reading from the gauge ‘A’ reading. The differential pressure should be to the specification of: Gauge ‘A’ **186 bar** (**2700 lbf.in2**) minus Gauge ‘B **235 lbf.in2** (**16 bar**) = **2465 lbf.in2** (**170 bar**) on all models
5. If the pressure readings are not correct, reset the adjuster (item 13), **1**, using an **8 mm** hexagon key. Half a turn on the adjuster equates to approximately **200 lbf.in2** (**13.8 bar**).

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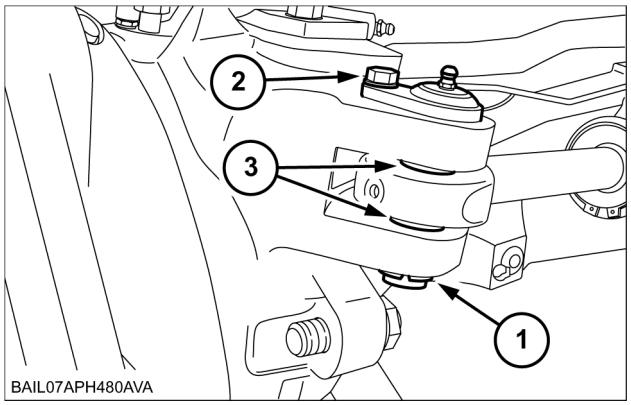
Steering cylinder - Remove

1. Disconnect steering cylinder hydraulic hoses.



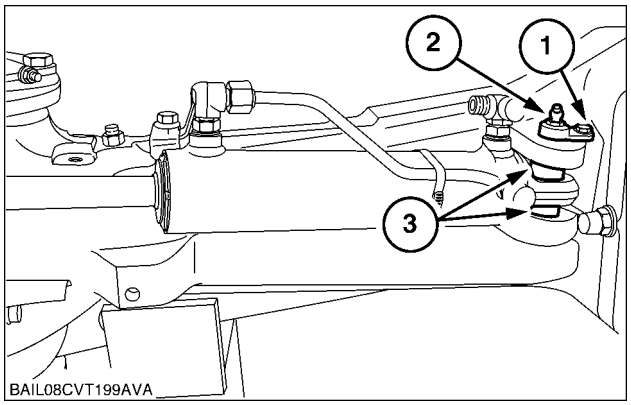
BAIL08CVT198AVA 1

2. Remove the circlip **(1)**.
   Remove the steering cylinder pivot pin retaining bolt **(2)**.
   Support the steering cylinder.
   Remove the pivot pin and retrieve the spacers **(3)**.



BAIL07APH480AVA 2

3. Remove the pivot pin retaining bolt **(1)**.
   Support the steering cylinder remove the pivot pin **(2)**.
   Retrieve the spacers **(3)**.



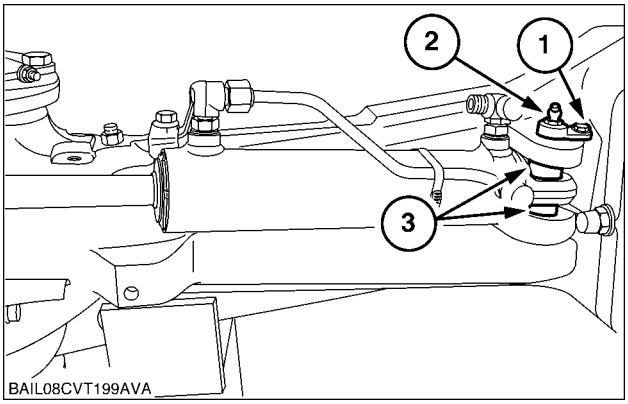
BAIL08CVT199AVA 3

4. Remove the steering cylinder.

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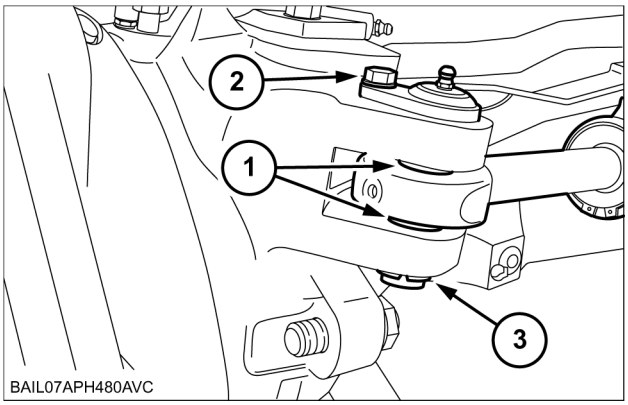
Steering cylinder - Install

1. Install the steering cylinder.
2. Install the steering cylinder pivot pin **(2)**, making sure that the spacers **(3)** are installed as removed.
   Install the steering cylinder pivot pin retaining bolt **(1)**.



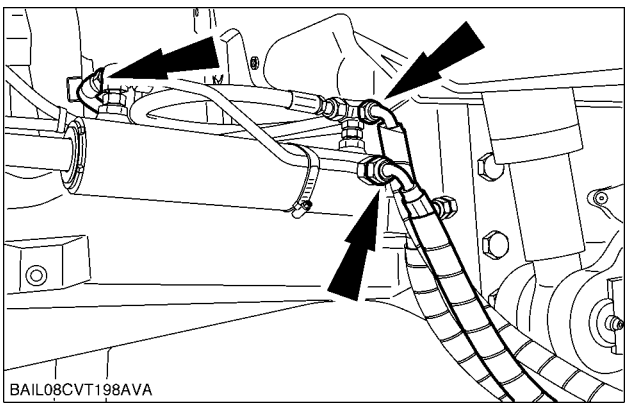
BAIL08CVT199AVA 1

3. Install the steering cylinder pivot pin, making sure that the spacers **(1)** are installed as removed.
   Install the steering cylinder pivot pin retaining bolt **(2)**.
   Install the circlip **(3)**.



BAIL07APH480AVC 2

4. Connect the hydraulic hoses.



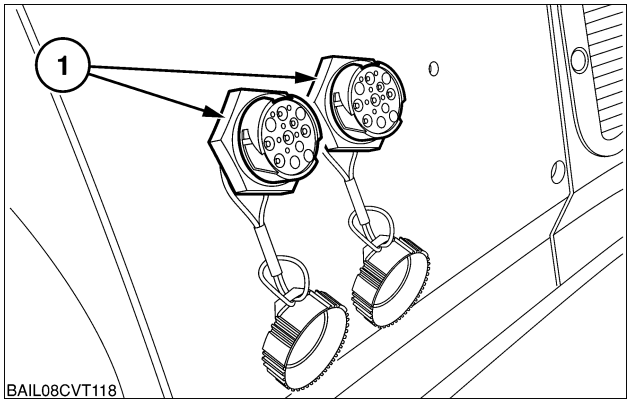
BAIL08CVT198AVA 3

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Fast steer system - Calibrate

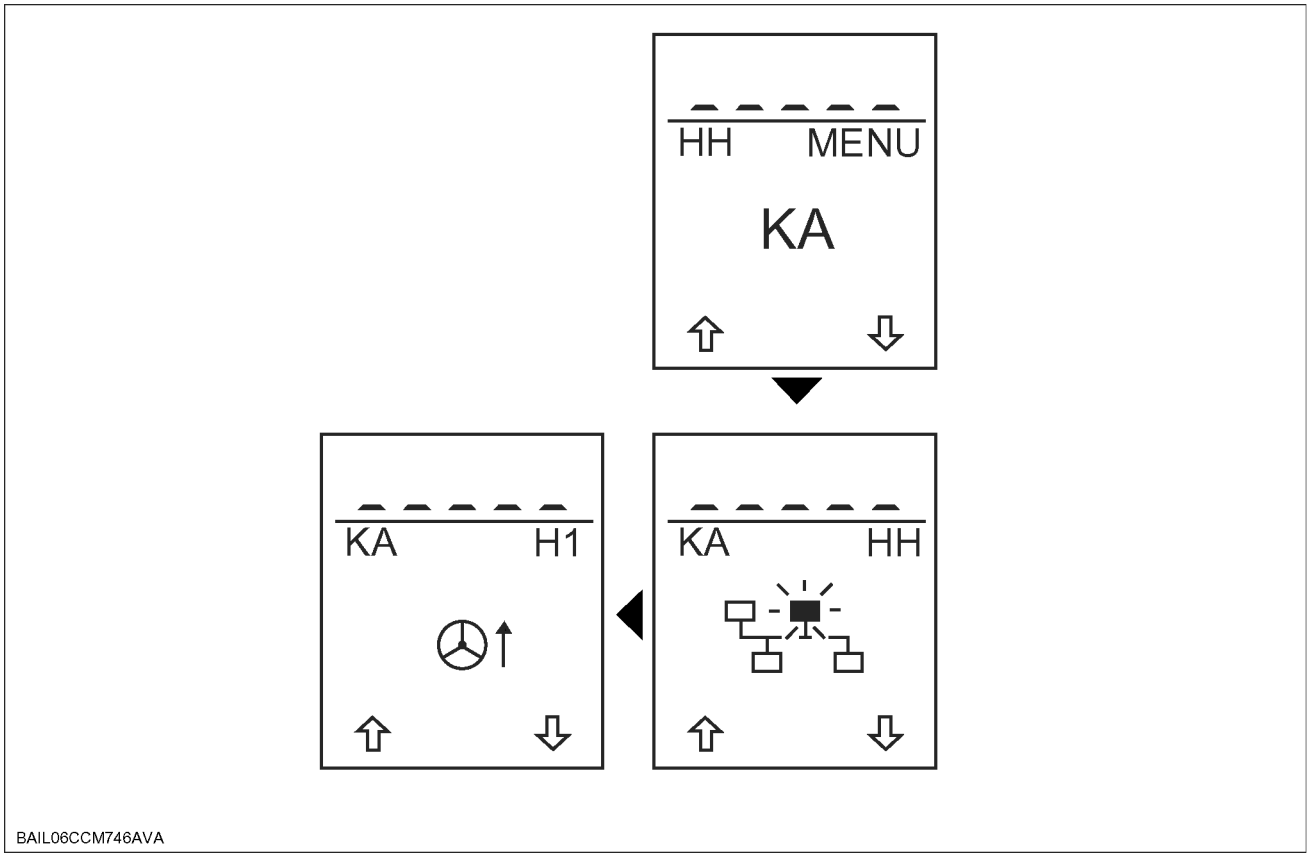
NOTE: *The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the wheels, front and rear. Check that the Ground speed display is Zero before commencing.*

1. Install the diagnostic connector **380000843** into the diagnostic socket **(1)** and start the engine.



BAIL08CVT118 1

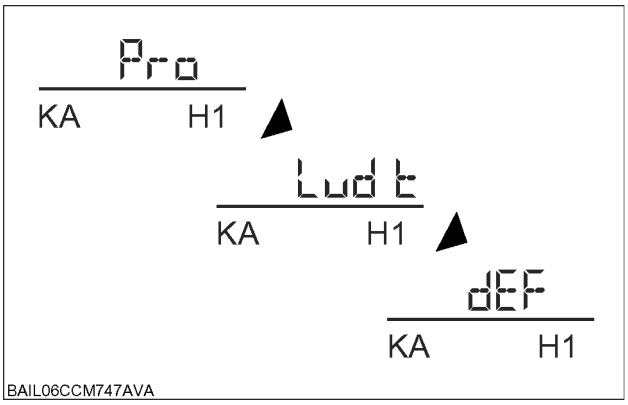
2. Use the "up", "down" and "menu" keys on the ICU3 to navigate the HH menu's to H1 and the fast steer symbol on the KA controller.



BAIL06CCM746AVA 2

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3. Scroll through the available options using the "up" and "down" keys.
The three options are:
   - "Pro" - proximity sensor
   - "Lvdt" - LVDT sensor
   - "deF" - adopt the default values

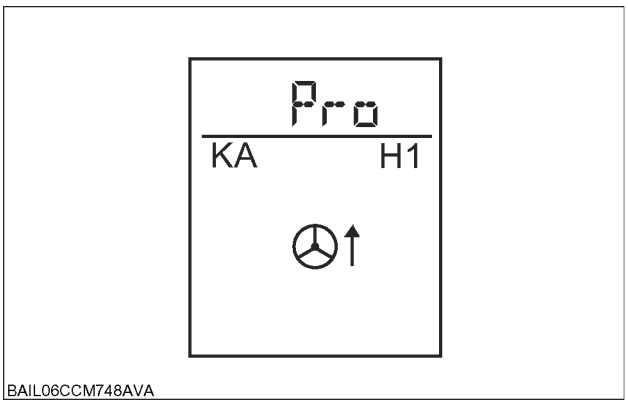


BAIL06CCM747AVA 3

4. Set the engine speed to **1300 RPM**.

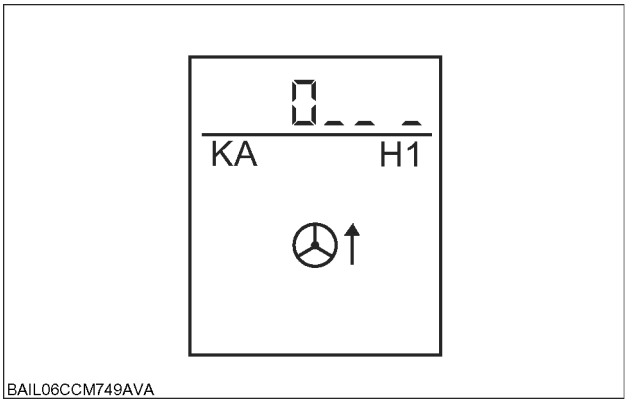
Proximity Sensor Calibration

5. Select the "Pro" option by depressing the "menu" key.



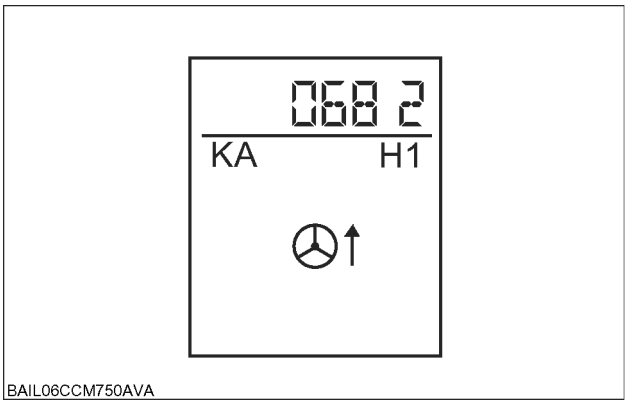
BAIL06CCM748AVA 4

6. The top section of the display will display "O _ _ _" for the steering wheel in the disengaged position.



BAIL06CCM749AVA 5

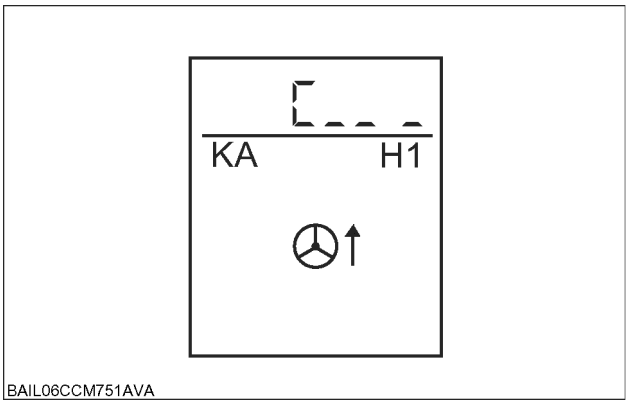
7. Depress and hold the "down" key. When the signal has been stable for 2 seconds an audible beep will be heard and the display will change to "O xxx".
"xxx" is the digital reading of the sensor voltage when the steering wheel is in the disengaged position.



BAIL06CCM750AVA 6

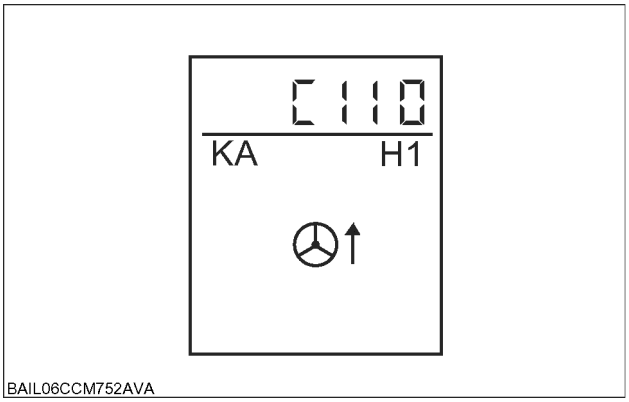
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8. The top section of the display will display "C _ _ _" for the steering wheel in the engaged position.



BAIL06CCM751AVA 7

9. Depress and hold the "down" key while the steering wheel is in the engage position. When the signal has been stable for 2 seconds an audible beep will be heard and the display will change to "C xxx". "xxx" is the digital reading of the sensor voltage when the steering wheel is in the engaged position.

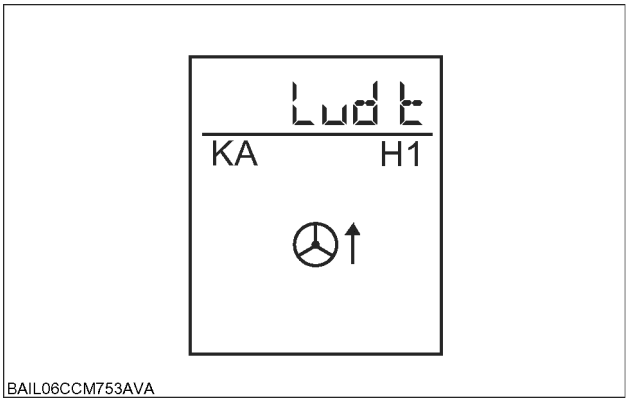


BAIL06CCM752AVA 8

10. After a short delay the display will return to the "H1" menu display.

Linear Variable Differential Transformer (LVDT) Sensor Calibration

11. Select the "Lvdt" option by depressing the "menu" key.

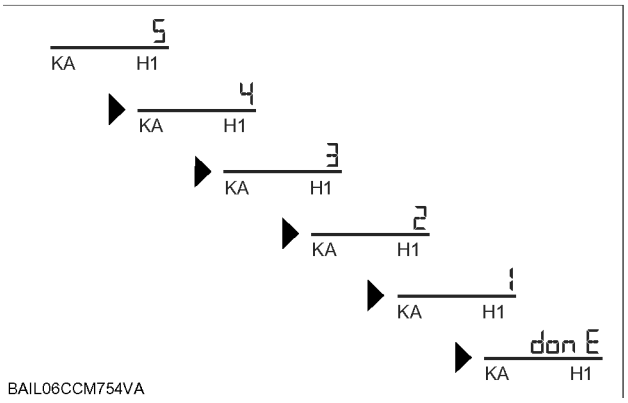


BAIL06CCM753AVA 9

12. Press menu button again to activate. The system will then automatically pilot the solenoid and measure the LVDT values in both positions and overwrite the default values.

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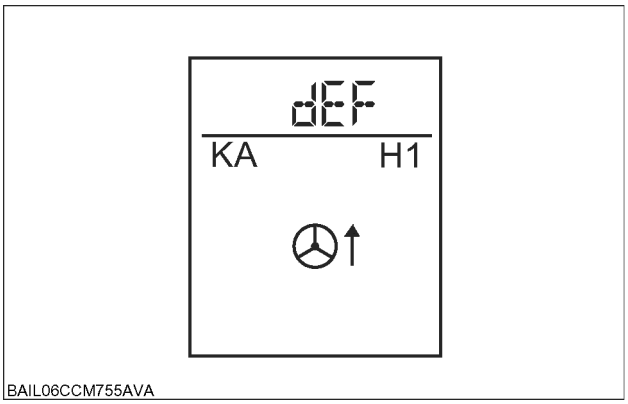
13. The top section of the display will show a countdown from "5" as the calibration is being performed. When the calibration is complete the display will change to "donE".



BAIL06CCM754AVA 10

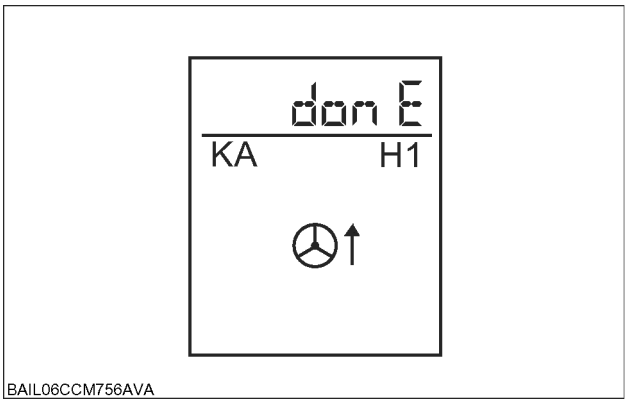
Adopting the Default Values

14. Select the "deF" option by depressing the "menu" key.



BAIL06CCM755AVA 11

15. Depress and hold the "down" key. After a short delay an audible beep will be heard to indicate that the calibration values have reset to their default values. The top section of the display will then show "donE".

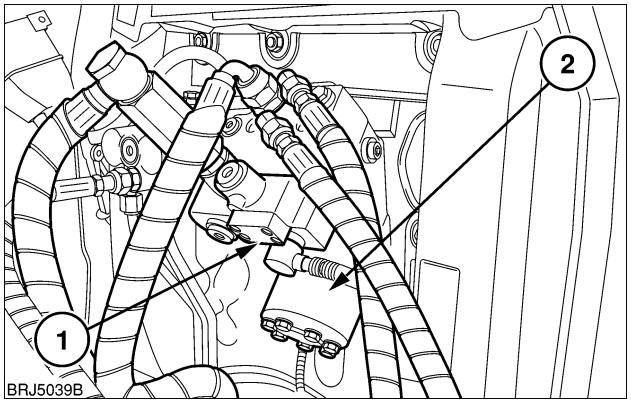


BAIL06CCM756AVA 12

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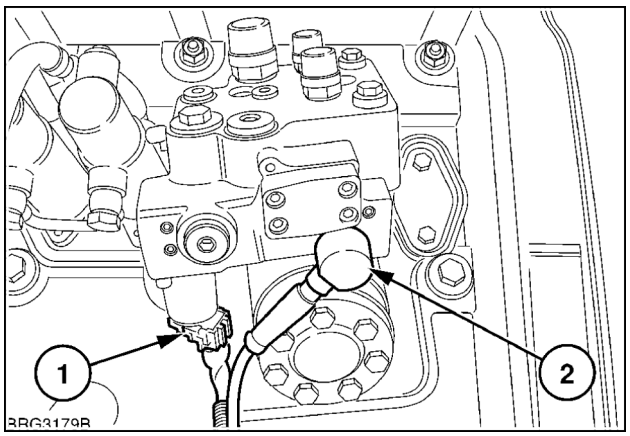
Fast steer system Control valve - Remove

1. Position the tractor on a hard level surface and apply the parking brake.
2. To gain access to the Turn Assist valve
   Disconnect the negative cable from the battery and insulate. Refer to: **Battery - Disconnect (A.30.A)**
   Raise the engine hood
   Remove the steering column console
3. Move the processor harness out of the way
4. Undo the brake reservoir and move to one side. (Do not disconnect hose)
5. Disconnect the four supply/return tubes and 'O' ring seals from the control valve **(1)** and cap the ends of the tubes.



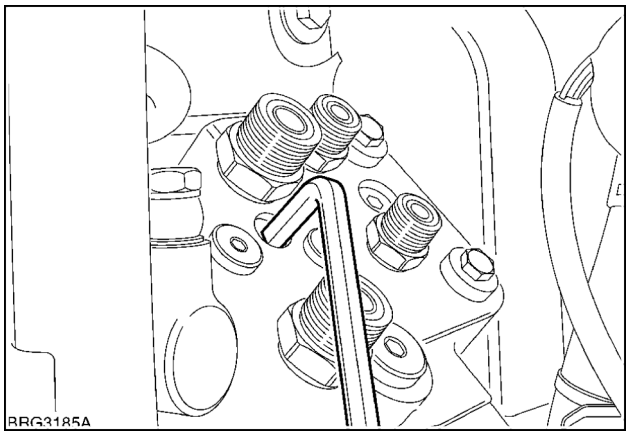
BAIL07APH352ASA 1

6. Disconnect the wiring to the solenoid **(1)** and the LVDT **(2)** sensor.



BAIL06CCM076ASA 2

7. Remove the two hexagon headed socket bolts on the control valve with an **8 mm** hexagon wrench.



BAIL06CCM081ASA 3

8. Remove the control valve assembly from the front of the cab through the engine compartment.

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⚠ WARNING ⚠

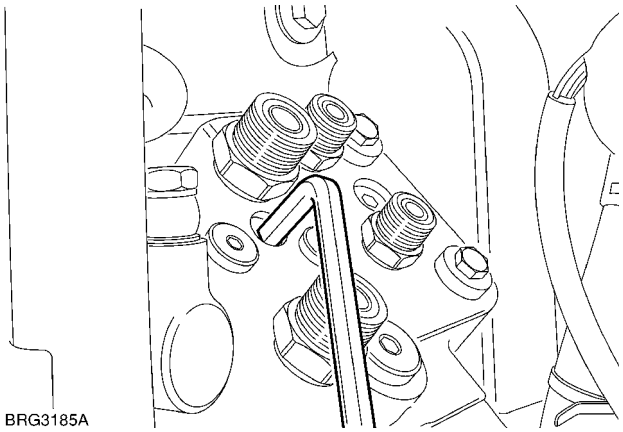
Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

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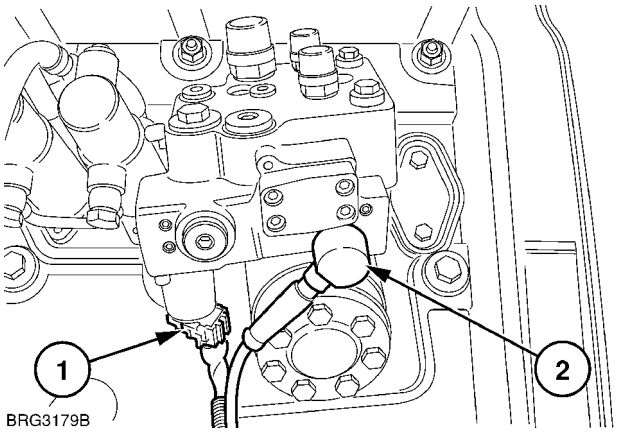
Fast steer system - Install

1. Install valve to steering motor and tighten retaining bolts to **48 Nm** (**35.4 lb ft**).



BAIL06CCM081ASA 1

2. Connect the wiring harness to the solenoid **(1)** and the LVDT sensor **(2)**.



BAIL06CCM076ASA 2

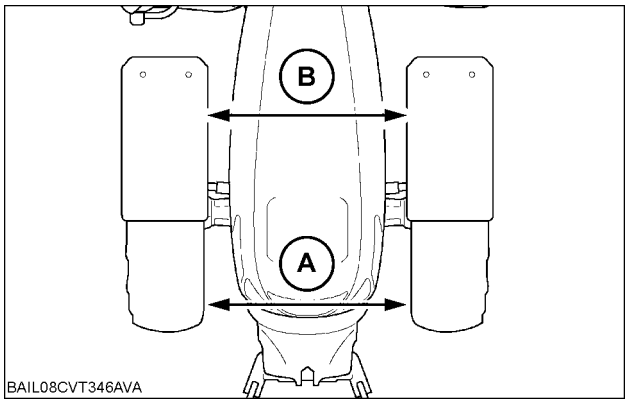
3. Connect the hoses to the valve connectors. Connect the filter fitting to the valve body and tighten to **60 Nm** (**44.3 lb ft**) . Hold the fitting and connect the inlet filter **(1)** to the fitting and tighten to **80 Nm** (**59.0 lb ft**). Connect feed hose.

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Tie rod - Toe in adjust

IMPORTANT: *When the tractor moves along a straight line, the wheels should be parallel to the tractor centre line or slightly toe-in until a maximum of 10 mm, measured between the rim edges.*
To check the correct toe-in is as follows

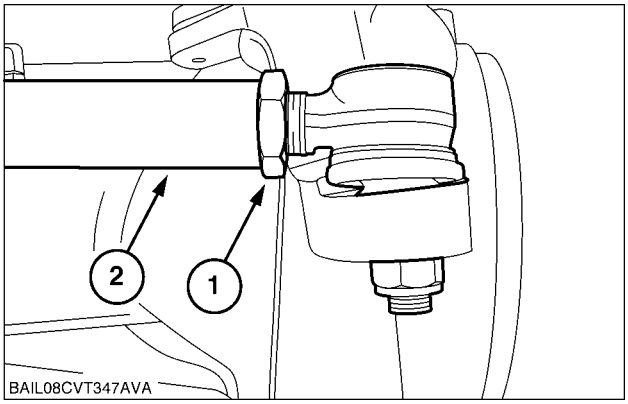
1. Inflate the front tyres to the correct pressure.
   Place the steering wheel at the mid-travel position, with one spoke along the tractor centre line.
   To check if the wheels are parallel to the tractor centre line.
   Measure the distance between the wheel rim inner edges at hub height at the front wheels. The measurement taken at **(B)** should be as **(A)** or less by up to **10 mm** (**.375 in**).
   Rotate both of the front wheels **180 °** and check the measurements again, this will eliminate wheel run out errors. The correct toe-in settings are **0-10 mm** (**.375 in**).



BAIL08CVT346AVA 1

2. Should it be necessary to adjust the front wheel toe in , proceed as follows:
   Release the locking nut **(1)** disconnect the track rod from the hub carrier.
   Wind the track rod in **(2)** to increase the toe-in and wind the track rod out to decrease the toe-in
   Tighten the lock nut **75 Nm** (**55 lb ft**) and the track rod end nut to **100 Nm** (**75 lb ft**)

NOTE: *Keep both track rod ends an equal distance out from the tie bar*



BAIL08CVT347AVA 2

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TRAVELLING - D

STEERING AutoPilot - 20.E

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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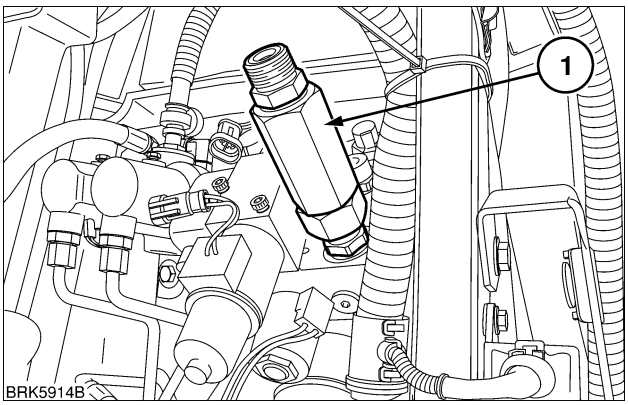
STEERING AutoPilot - Static description Auto guidance system

AccuGuide™System

The auto guidance system components are as follows:
Auto guidance valve Assembly
Steering Cylinders
Manual Steering Motor

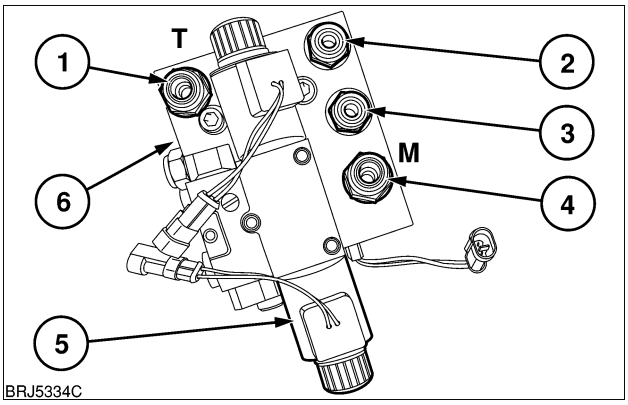
The system is fed from either a fixed displacement pump with priority flow divider, or from an axial piston pump with a priority valve.
The steering motor is similar to the unit used in a conventional steering system except the ports are configured to directly interface with the auto guidance valve and the unit is of the non reactive type. The steering motor is connected to the supply and tank lines in parallel with the auto guidance valve. The work ports of the steering motor are connected to the steering cylinders at all times. If there is manual intervention through the steering motor, the unit will override the auto guidance system and will return full control to the operator. When the auto guidance system is not in use , the auto guidance directional control valve is hydraulically isolated from the manual steering system by an isolation valve in the supply line and check valves in the steering work ports.

Inlet Filter
The inlet filter **(1)** is a 100 mesh stainless steel screen designed to prevent particle contamination of the other auto guidance components.



BAIL08CVT096ASA 1

Auto guidance valve assembly
The valve assembly consists of an aluminium manifold body in which the various hydraulic components are mounted. The manifold is mounted directly to the steering motor. All the hydraulic hose connections are made via the auto guidance valve manifold.



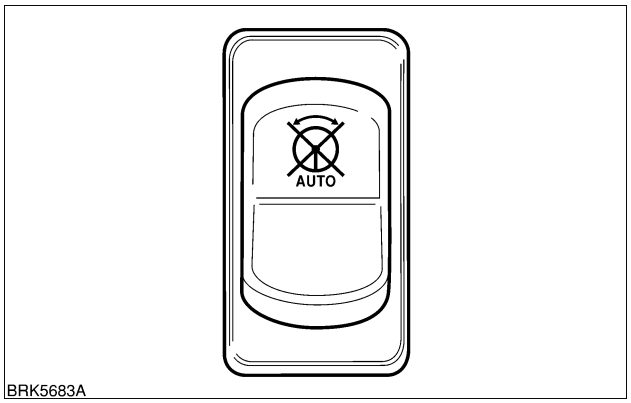
BAIL08CVT019ASA 2

1.Return to tank
2.Left steering cylinder supply hose
3.Right Steering cylinder supply hose
4.Pressure feed
5.Solenoid
6.Valve manifold

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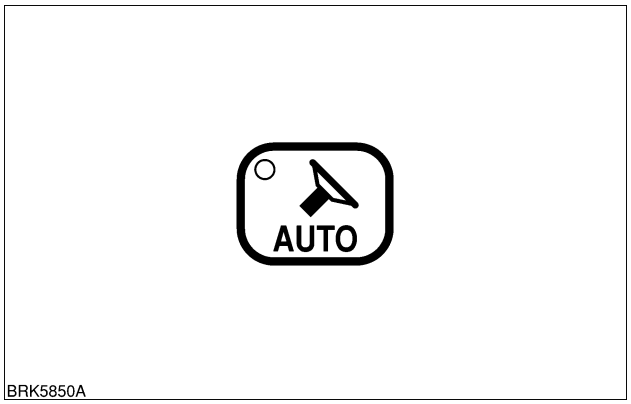
Controls

The auto guidance master switch is located on the ‘C‘ pillar on the right hand side of the cab. This switch energises the system ready for use.



BAIL08CVT046ASA 3

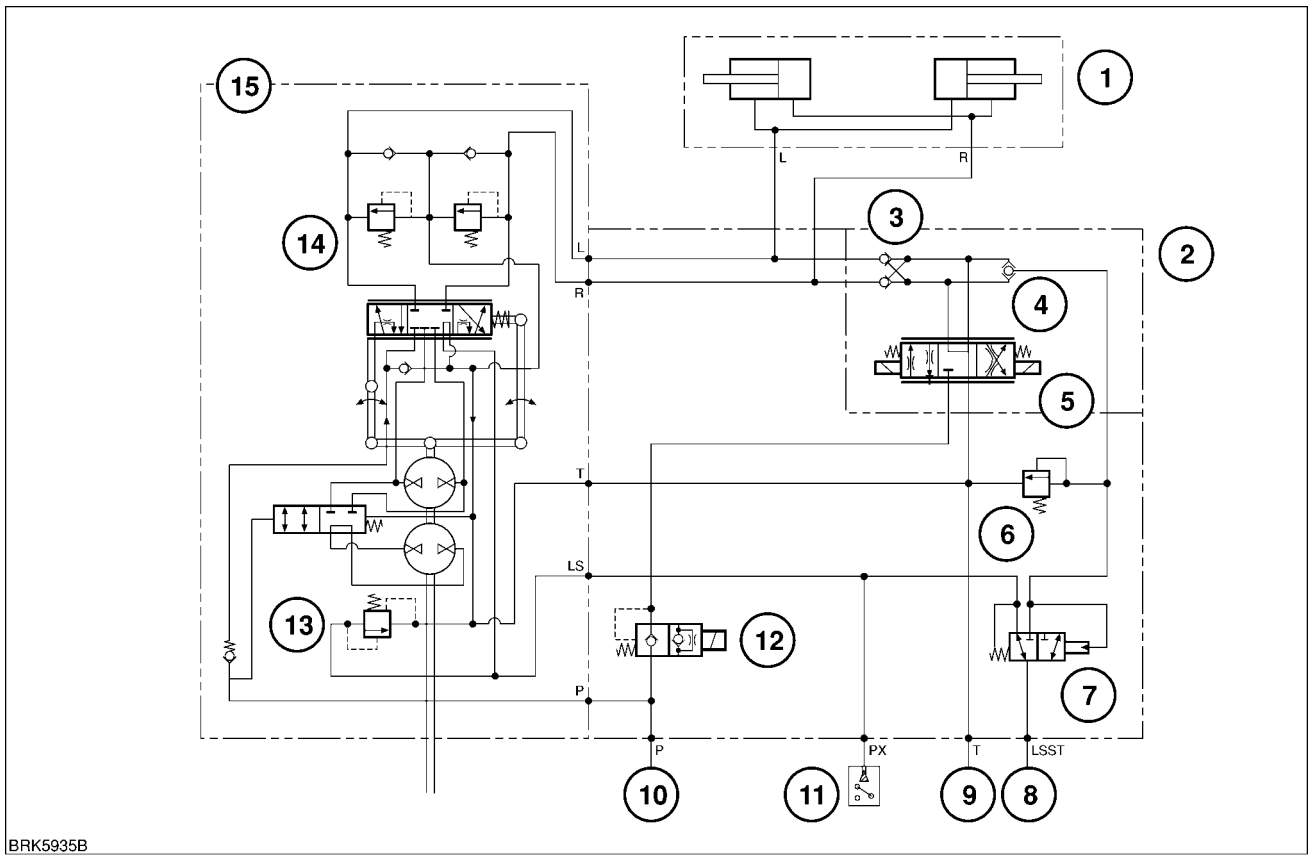
The auto guidance activation switch is located on the integrated control panel. This is used in conjunction with the AFS AccuGuide™System and display screen.



BAIL08CVT095ASA 4

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STEERING AutoPilot - Dynamic description Autoguidance system



BAIL08CVT094FSA 1

Auto guidance system schematic

1. Steering cylinders
2. Autoguidance valve assembly
3. Lock valves
4. Pilot line shuttle valve
5. Directional control valve
6. Relief valve **185 - 190 bar** (**2682.5 - 2755.0 psi**)
7. Load sensing pilot operated shuttle valve
8. Load sensing line
9. Pressure sensor
10. Pressure feed
11. Pressure sensor
12. Isolation valve
13. Relief valve **185 - 190 bar** (**2682.5 - 2755.0 psi**)
14. Shock relief valves **220 - 240 bar** (**3190.0 - 3480.0 psi**)
15. Steering control unit **190 bar** (**2755.0 psi**)

Autoguidance valve assembly (2)

The valve assembly consists of an aluminium manifold body in which the various hydraulic components are mounted. The manifold is mounted directly to the steering motor. All the hydraulic hose connections are made via the auto guidance valve manifold.

Hydraulic isolation valve (12)

This two way two position solenoid operated OFF-ON valve controls the flow of oil to the auto guidance directional control valve **(2)**. The auto guidance hydraulic isolation valve is spring biased to block flow supplied by the pump, while allowing free flow in the opposite direction. When the auto guidance is engaged in auto mode , the solenoid is energised and allows free flow from the pump to auto guidance directional control, but restricts flow in the opposite direction.

Load sense pilot operated shuttle valve (7)

The load sense pilot operated shuttle valve is a pilot operated two position spool valve (spring biased). In the neutral position the valve enables the steering dynamic load sensing signal to flow to the steering control unit from the priority

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valve . During normal steering operation the valve is maintained in the neutral position by the oil pressure of the dynamic load sensing line and a mechanical spring acting on the end of the valve spool.
In auto guidance mode, when the auto guidance directional control valve is energised, pilot oil from the left or right steer ports (via the shuttle valve) acts on the opposite end of the shuttle valve spool. When sufficient pressure is raised in the pilot line the spool moves into the second (active) position. The steering dynamic load sensing signal can then flow from the variable displacement pump via the priority valve to the auto guidance directional control valve. If the hydraulic isolation solenoid is not energised it is not possible for the shuttle valve to move into the second (active) position, as the auto guidance directional control valve will be hydraulically isolated.

AutoGuidance directional control valve (5)

This valve is a three position (left turn, neutral, right turn) four way proportional valve. The valve is spring biased to the neutral position and is actuated by two opposing pulse width modulated (PWM) solenoids. While in the spring biased neutral state, the left and right steer ports of the auto guidance directional control **(5)** and the compensator pilot line are connected to the tank line . The high pressure line is disconnected from the left and right steer ports, ensuring steering control is provided manually from the steering control unit . A signal from the auto guidance controller to either PWM solenoid counteracts the spring bias and allows flow from the high pressure supply to the corresponding steering cylinder port. Simultaneously the opposite steering cylinder port is connected to the tank return. This valve is only activated while the auto guidance is engaged and an active turning command is being issued.

Pilot line shuttle valve (4)

This two position shuttle check valve isolates work port pressure from the left and right turn ports of the auto guidance directional control valve **(5)** and relays the higher of the two pressures for use in the pilot line to the load sense pilot operated shuttle valve circuit.

Lock valves (3)

The lock valves in the work ports of the auto guidance directional control valve are used to isolate the steering pressures of the steering control unit from the directional control valve when the vehicle is operated in manual steer mode.

Auto guidance relief valve (6)

This relief valve is employed to limit the maximum differential pressure to **185 - 190 bar** (**2682.5 - 2755.0 psi**) between the P and T ports of the auto guidance valve assembly. This valve is only used when the auto guidance directional control valve is controlling the left or right steering cylinders.

PX Pressure sensor (11)

This pressure sensor ensures steering priority resides with the steering control unit when input from the steering control is sensed. The pressure sensor monitors the pressure in the supply line to the steering control unit. If the pressure rises above a preset threshold, representing a manual steering input, the auto guidance system is disengaged. Furthermore, the auto guidance system cannot be reengaged until the PX pressure sensor output is below the specified threshold.

Steering control unit (15)

The manually operated steering control unit meters steering flow to the steering cylinders from the variable displacement pump. When the steering wheel is turned, the pressure signal is passed through the load sense line to the priority valve and on to the variable displacement pump. The oil demand required by the steering control unit is matched by the variable displacement pump. The oil is metered to the vehicle steering rams via the L or R steering ports, thus giving a change in vehicle direction. If hydraulic power is lost, for example, in the event of an engine or pump failure, the steering control unit acts as a hand-powered pump and will provide manual steering control. This unit is identical to that which is used in non auto guidance tractors apart from the following points. A port-face arrangement is used to interface with the auto guidance valve. The steering unit is of the non reactive type and therefore includes shock relief valves. **(14)**.

Shock relief valves (11)

These valves are used to protect the system from over pressurisation (relief at **220 - 240 bar** (**3190.0 - 3480.0 psi**)) due to external forces applied to the steering wheels of the tractor.

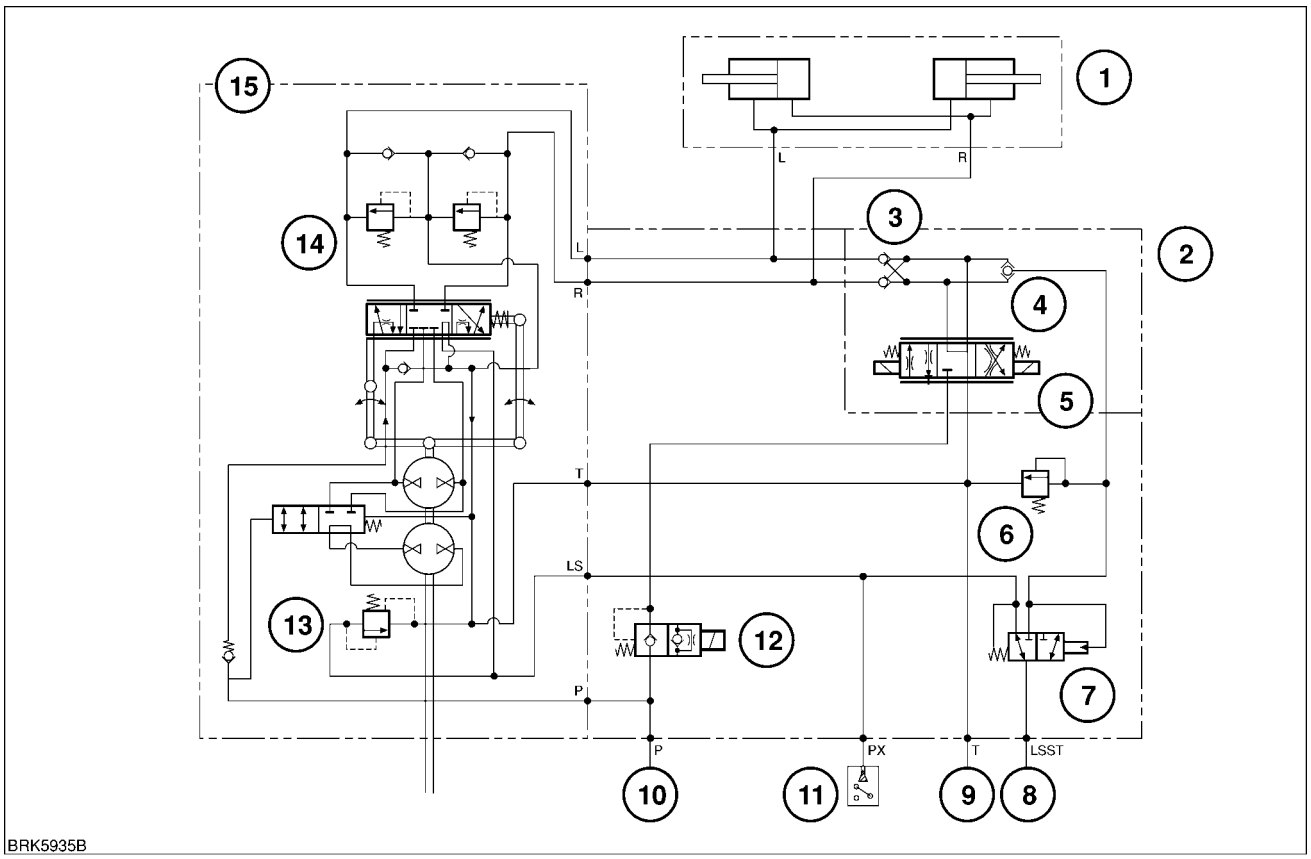
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Steering control unit relief valve (13)

The relief valve within the Steering Control Unit is used to limit the maximum differential system pressure to **185 - 190 bar** (**2682.5 - 2755.0 psi**), between ports P and T.

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STEERING AutoPilot - Hydraulic schema Autoguidance system



BAIL08CVT094FSA 1

Auto guidance system schematic

1. Steering cylinders
2. Autoguidance valve assembly
3. Lock valves
4. Pilot line shuttle valve
5. Directional control valve
6. Relief valve **185 - 190 bar** (**2682.5 - 2755.0 psi**)
7. Load sensing pilot operated shuttle valve
8. Load sensing line
9. Pressure sensor
10. Pressure feed
11. Pressure sensor
12. Isolation valve
13. Relief valve **185 - 190 bar** (**2682.5 - 2755.0 psi**)
14. Shock relief valves **220 - 240 bar** (**3190.0 - 3480.0 psi**)
15. Steering control unit **190 bar** (**2755.0 psi**)

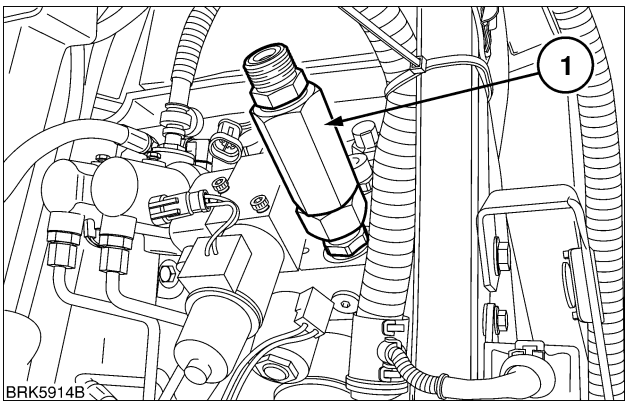
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Control valve - Remove

Prior operation:
Battery - Disconnect (A.30.A)

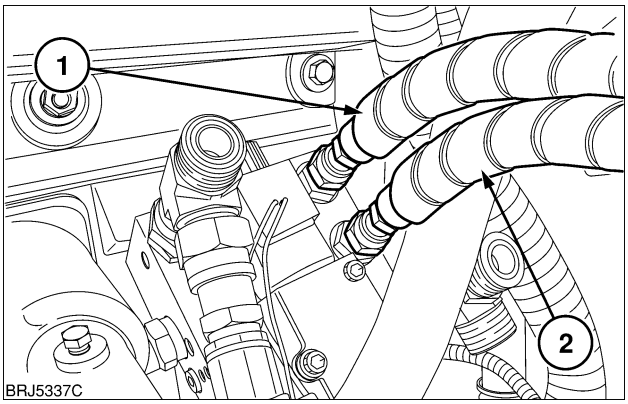
1. Disconnect the electrical connectors from the solenoids. Remove the pressure feed hose from the inlet filter **(1)**. Undo and remove the inlet filter **(1)**.

NOTE: *Drain oil from hoses into a suitable container*



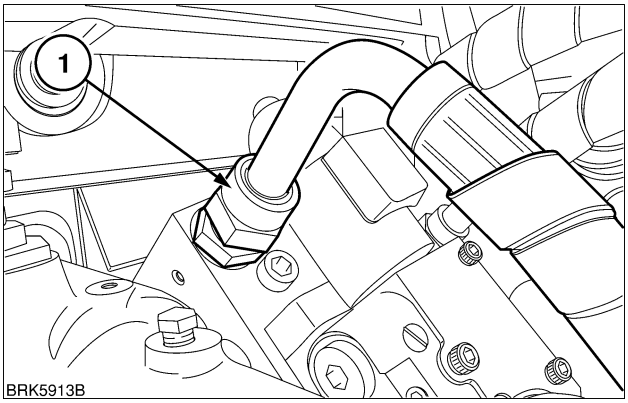
BAIL08CVT096ASA 1

2. Remove left **(1)** and right **(2)** steering cylinder supply hoses from the valve connectors.



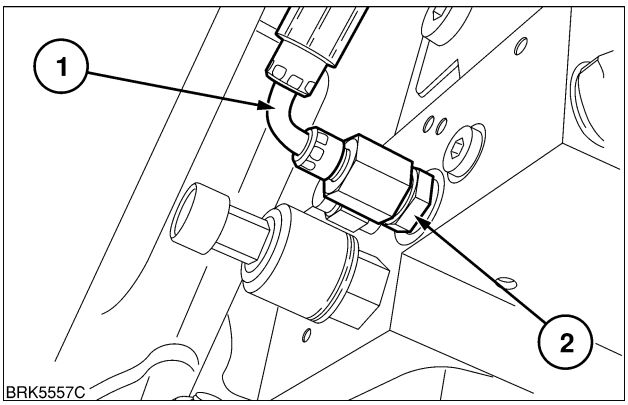
BAIL08CVT049ASA 2

3. Remove hose from the return port **(1)**.



BAIL08CVT097ASA 3

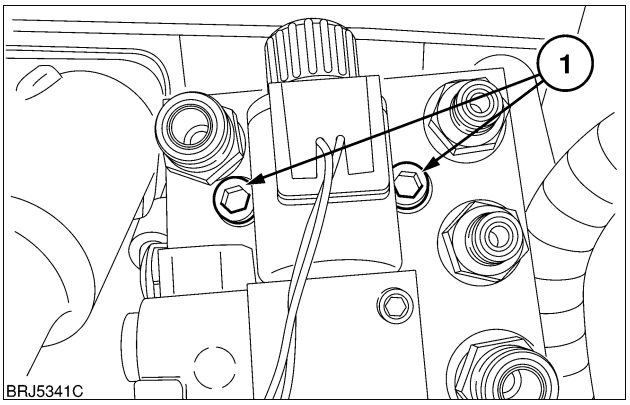
4. Undo nut **(2)** and remove load sensing hose **(1)**.



BAIL08CVT052ASA 4

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5. Undo and remove the hexagon headed retaining screws **(1)** and remove the control valve from the steering motor.



BAIL08CVT051ASA 5

⚠ WARNING ⚠

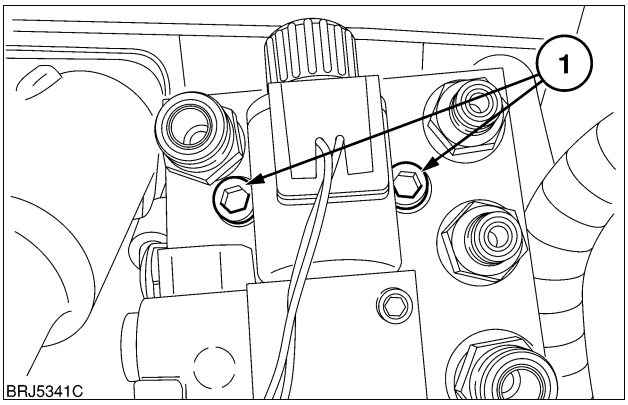
The component is heavy. ALWAYS use a hoist or get assistance to lift the component. Failure to comply could result in serious injury or death.

M944

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Control valve - Install

1. Install valve to steering motor. Insert the hexagon headed retaining screws and tighten to **48 Nm** (**35.4 lb ft**)



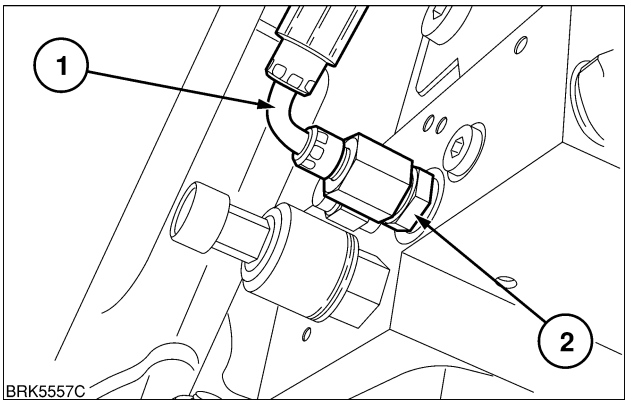
BAIL08CVT051ASA 1

⚠ WARNING ⚠

The component is heavy. ALWAYS use a hoist or get assistance to lift the component. Failure to comply could result in serious injury or death.

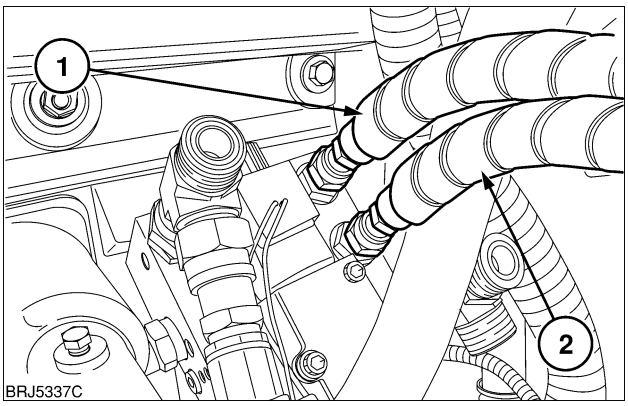
M944

2. Connect the load sensing hose **(1)** and tighten nut **(2)** .



BAIL08CVT052ASA 2

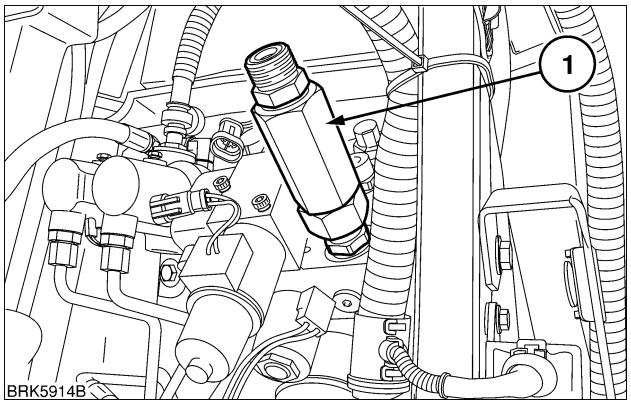
3. Connect the left **(1)**and right **(2)** steering supply hoses



BAIL08CVT049ASA 3

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4. Connect the filter fitting to the valve body and tighten to **60 Nm** (**44.3 lb ft**) . Hold the fitting and connect the inlet filter **(1)** to the fitting and tighten to **80 Nm** (**59.0 lb ft**). Connect feed hose.



BAIL08CVT096ASA 4

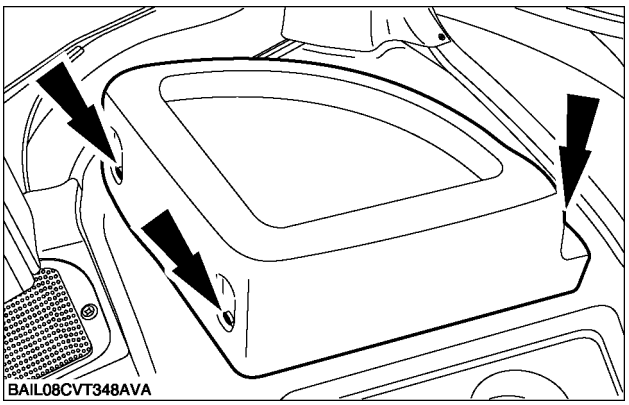
Next operation:
Battery - Connect (A.30.A)

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Electronic system - Remove

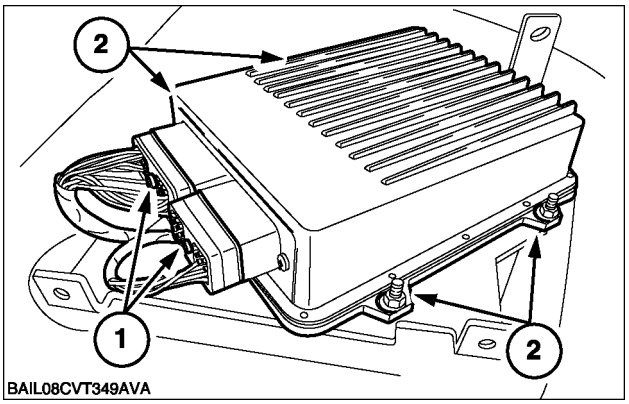
Autoguidance control module

1. Remove the left-hand utility console.



BAIL08CVT348AVA 1

2. Remove the electrical connector retaining bolts **(1)** and disconnect the electrical connectors.
   Remove the control module retaining nuts **(2)** and remove the control module.



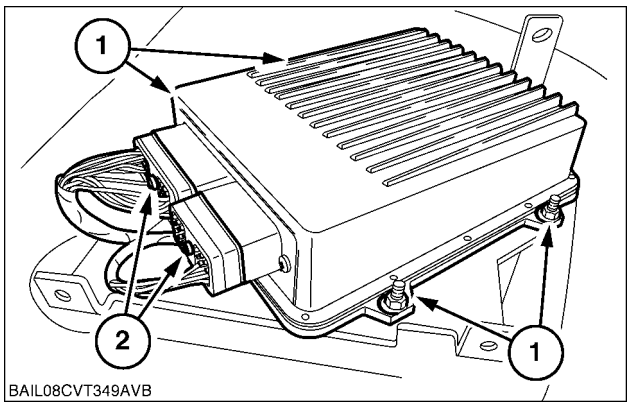
BAIL08CVT349AVA 2

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Electronic system - Install

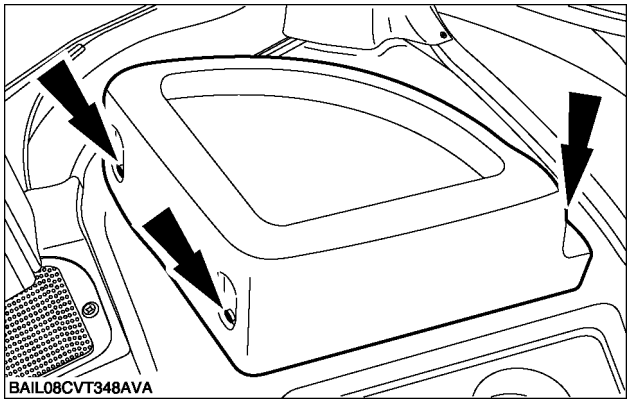
Autoguidance control module

1. Install the control module.
   Install the control module retaining nuts **(1)**.
   Connect the electrical connectors, and install the electrical connector retaining bolts **(2)**.



BAIL08CVT349AVB 1

2. Install the left-hand utility console.



BAIL08CVT348AVA 2

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TRAVELLING - D

SERVICE BRAKE Mechanical - 30.B

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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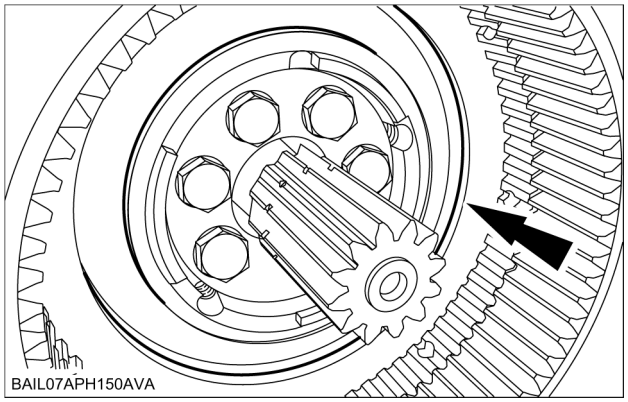
Brake - Assemble Front Axle

⚠ WARNING ⚠

Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

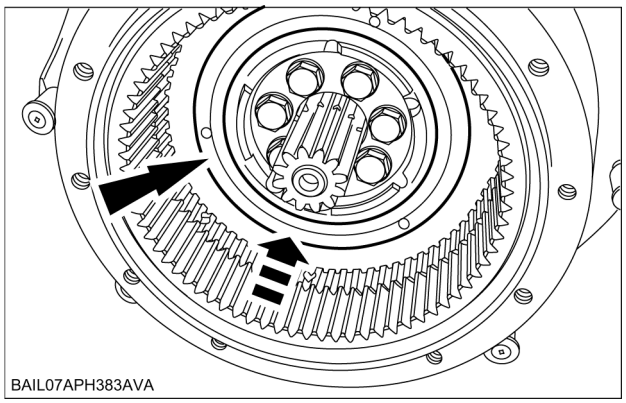
B020

1. Install new brake piston seals.



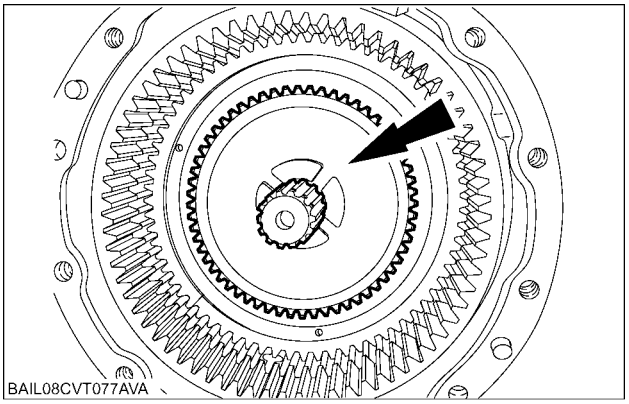
BAIL07APH150AVA 1

2. Install the piston.



BAIL07APH383AVA 2

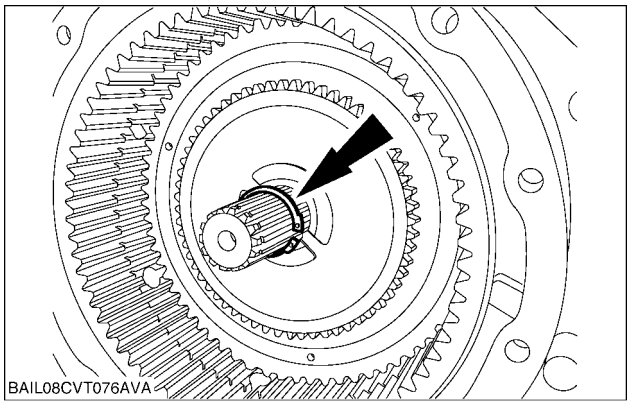
3. Install the drive gear onto the drive shaft.



BAIL08CVT077AVA 3

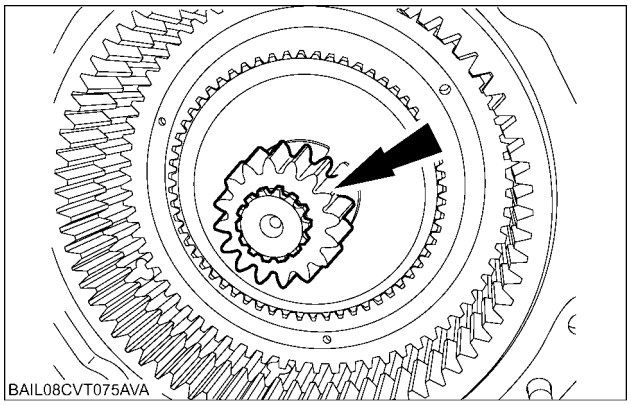
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4. Install the inner circlip



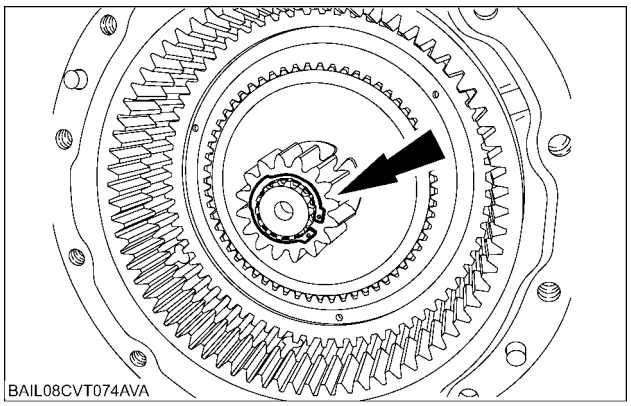
BAIL08CVT076AVA 4

5. Install the planetary drive gear.



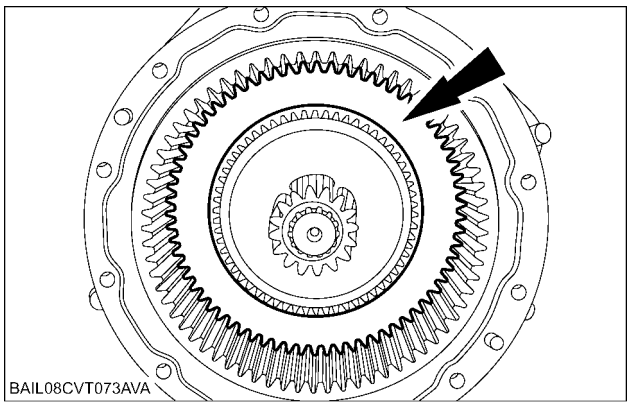
BAIL08CVT075AVA 5

6. Install the planetary drive gear retaining circlip.



BAIL08CVT074AVA 6

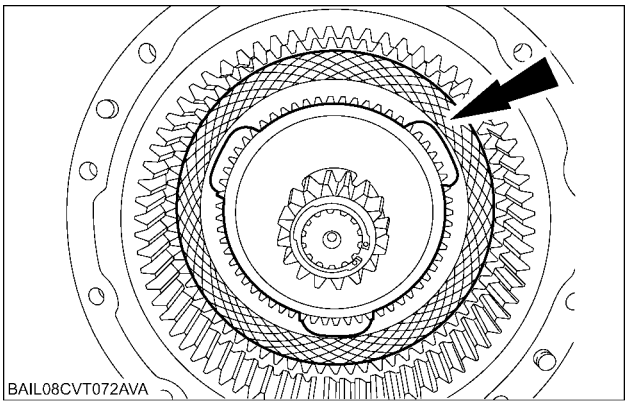
7. Install the inboard steel brake disc.



BAIL08CVT073AVA 7

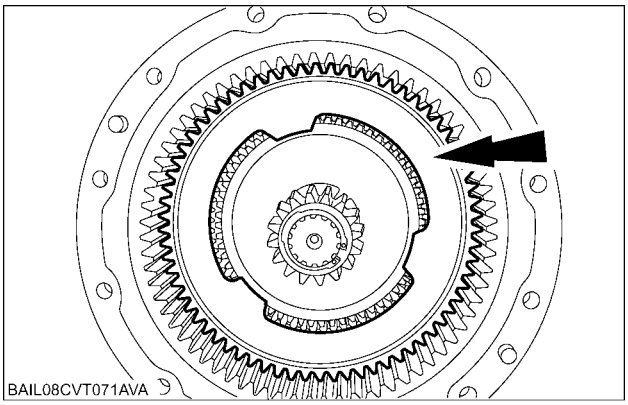
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8. Install the friction disc.



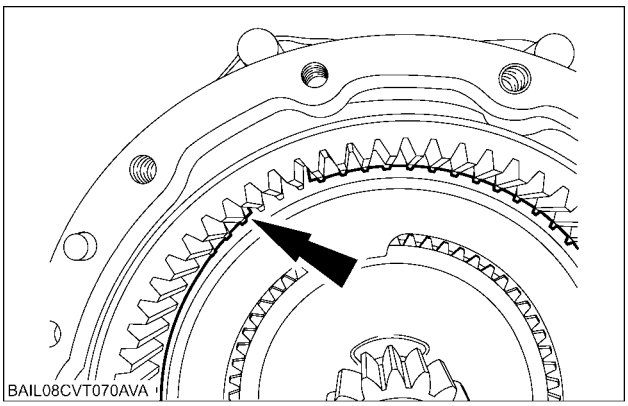
BAIL08CVT072AVA 8

9. Install the outboard steel brake disc.



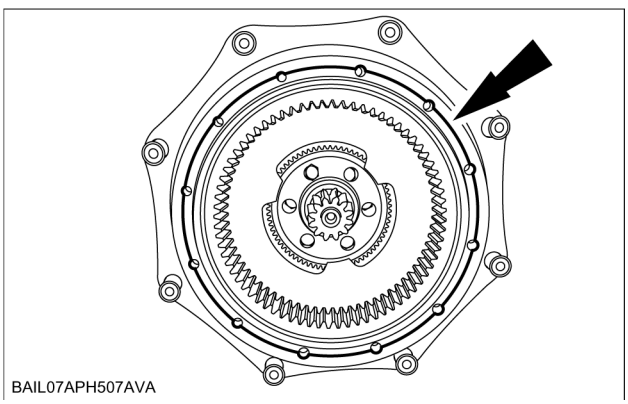
BAIL08CVT071AVA 9

10. Install the brake disc retaining snap ring.



BAIL08CVT070AVA 10

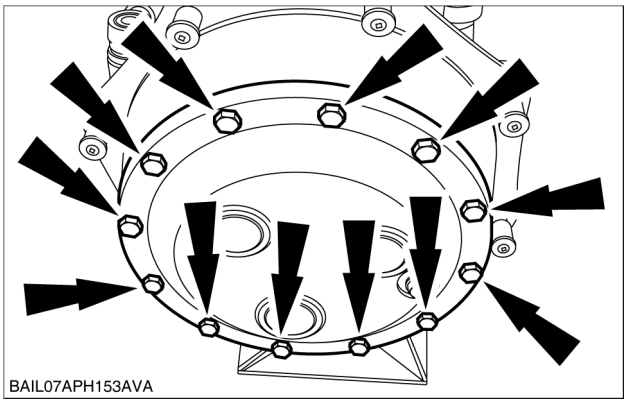
11. Prior to installation of the planetary cover, thoroughly clean and degrease the mating surfaces and apply a **2 mm** bead of flexible sealing gasket.



BAIL07APH507AVA 11

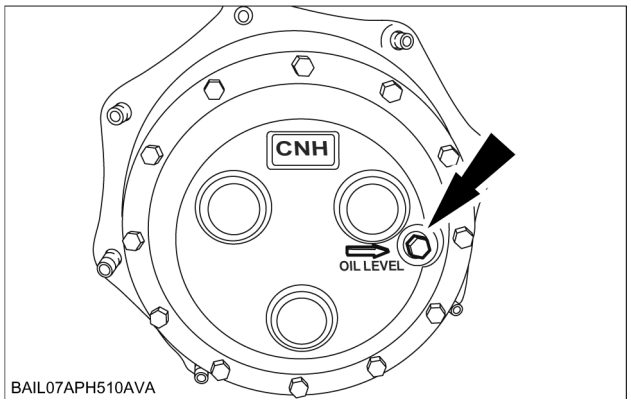
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12. Install the planetary gear cover assembly into the hub.
Tighten to **130 Nm** (**96 lb ft**).



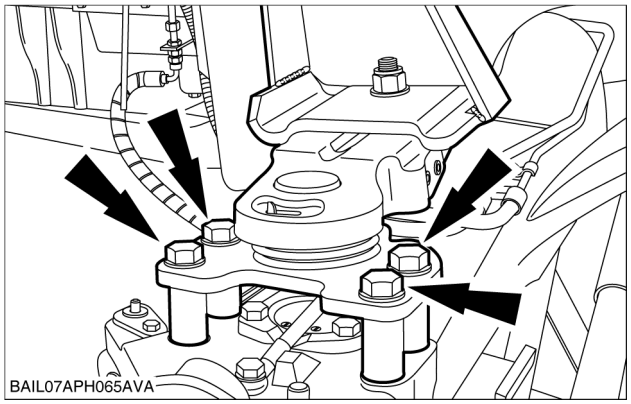
BAIL07APH153AVA 12

13. Rotate the hub so that the filler/level plug is in the horizontal position.
Remove the plug and refill the hub to the level with oil to the correct specification.
Reinstall the filler/level plug and tighten to **74 Nm** (**55 lb ft**).



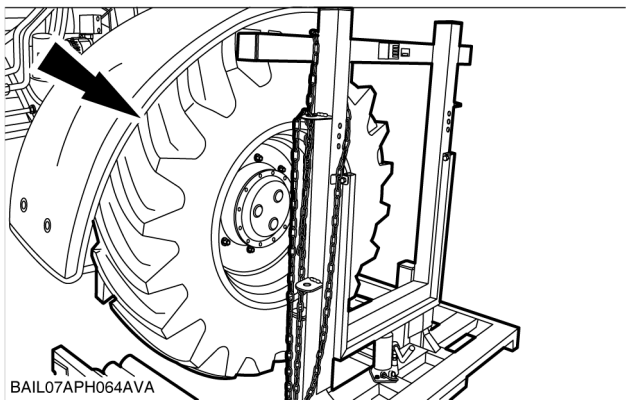
BAIL07APH510AVA 13

14. Install the dynamic front fender (if equipped).



BAIL07APH065AVA 14

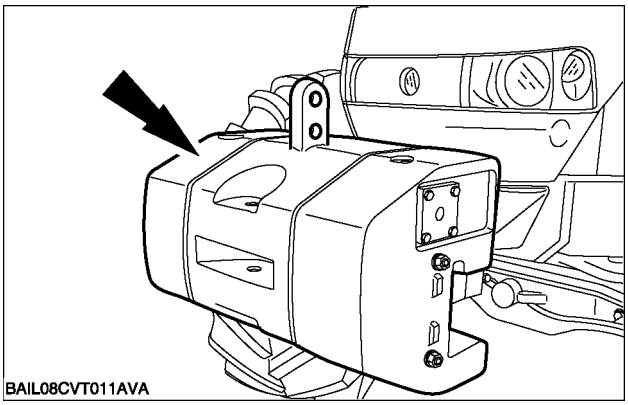
15. Install the front wheel.
Tighten the wheel nuts to the specified torque, for further information refer to **Front wheel - Torque (D.50.C)**.



BAIL07APH064AVA 15

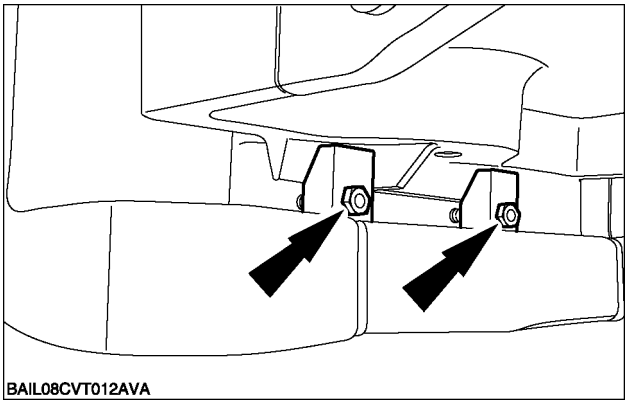
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16. Using suitable lifting equipment install the front weights onto the weight carrier..



BAIL08CVT011AVA 16

17. Secure the front weights to the weight carrier.



BAIL08CVT012AVA 17

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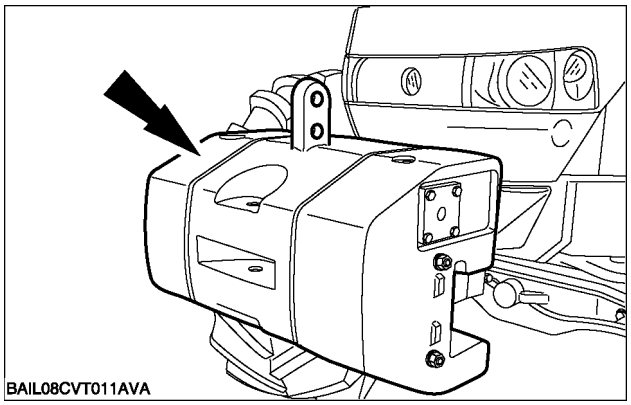
Brake - Disassemble

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

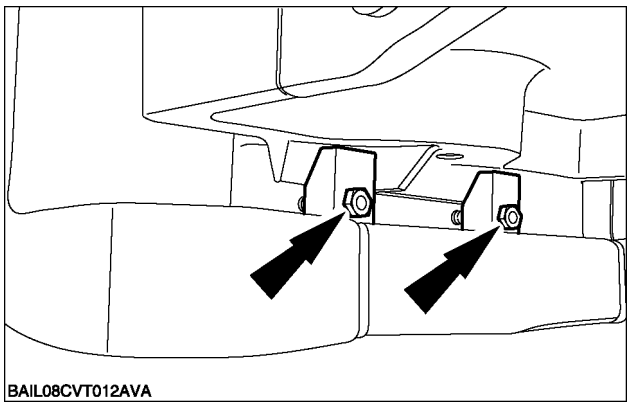
B026

1. Using suitable lifting equipment support the front weights.



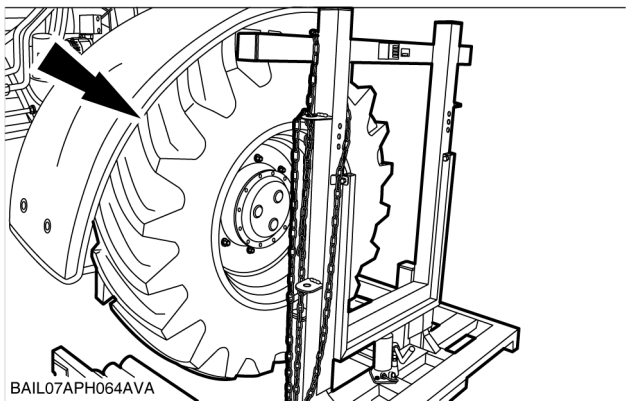
BAIL08CVT011AVA 1

2. Disconnect and remove the front weights from the weight carrier.



BAIL08CVT012AVA 2

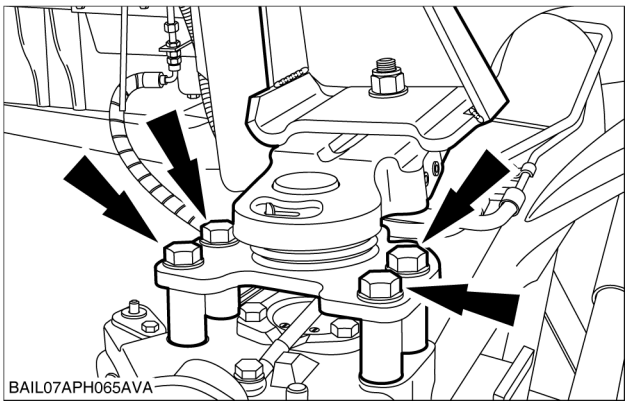
3. Raise the front of the vehicle and support with suitable axle stands under the front weight carrier. Remove the front wheel.



BAIL07APH064AVA 3

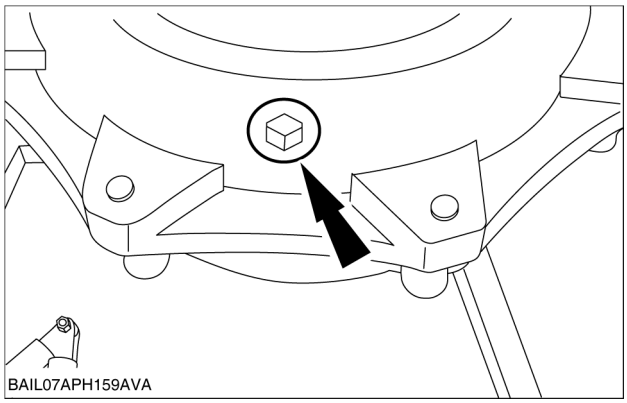
www.truck-freeworkshop.com

4. Remove the dynamic front fender (if equipped).



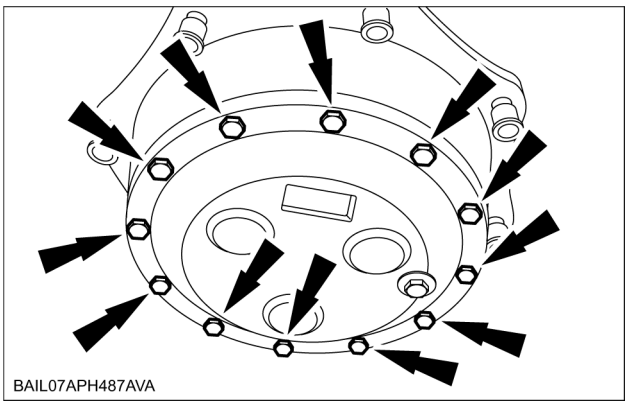
BAIL07APH065AVA 4

5. Rotate the hub until the drain plug is at the lowest point. Remove the axle hub drain plug and drain the hub oil into a suitable container.
Reinstall the drain plug and tighten to **75 Nm** (**55 lb ft**).



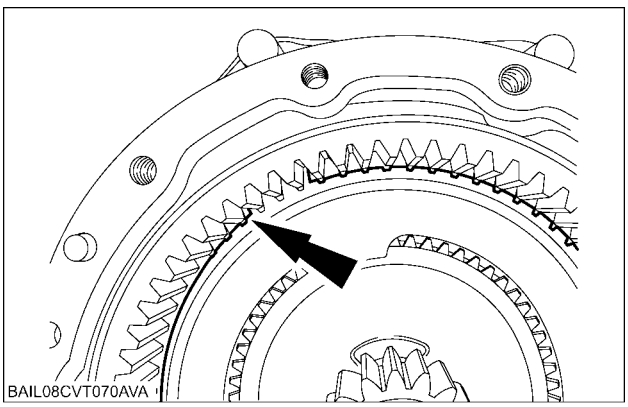
BAIL07APH159AVA 5

6. Remove the hub end plate and the planetary gears assembly.



BAIL07APH487AVA 6

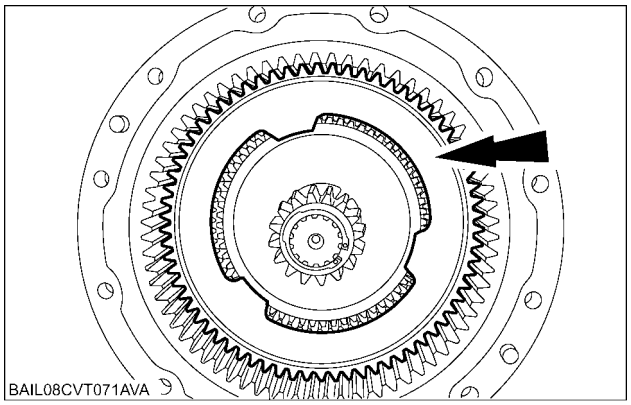
7. Remove the brake disc retaining snap ring.



BAIL08CVT070AVA 7

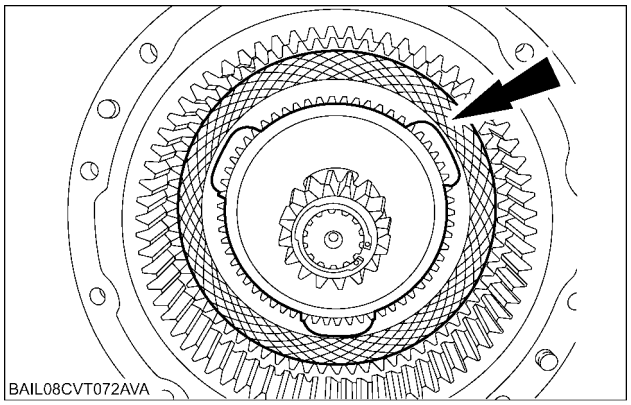
www.truck-freeworkshop.com

8. Remove the outboard brake disc.



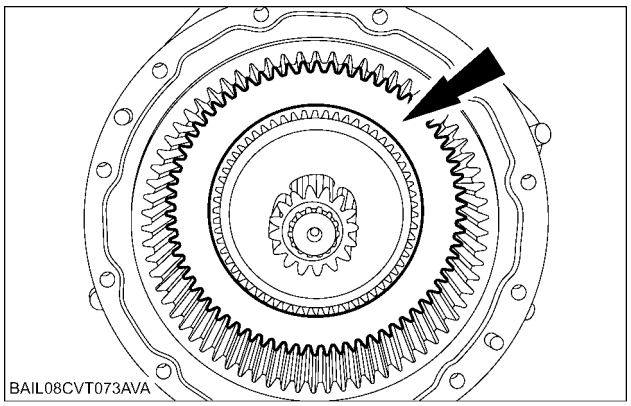
BAIL08CVT071AVA 8

9. Remove the friction disc.



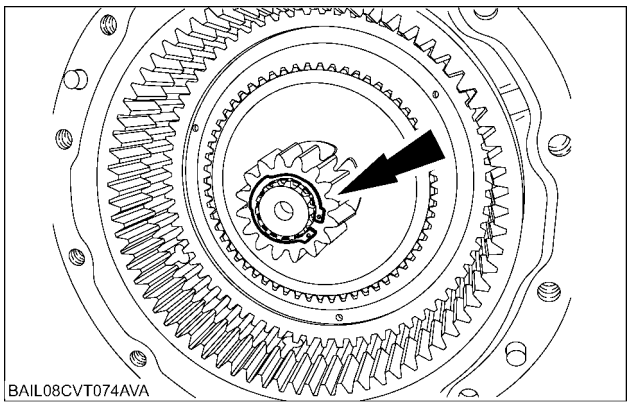
BAIL08CVT072AVA 9

10. Remove the inboard brake disc.



BAIL08CVT073AVA 10

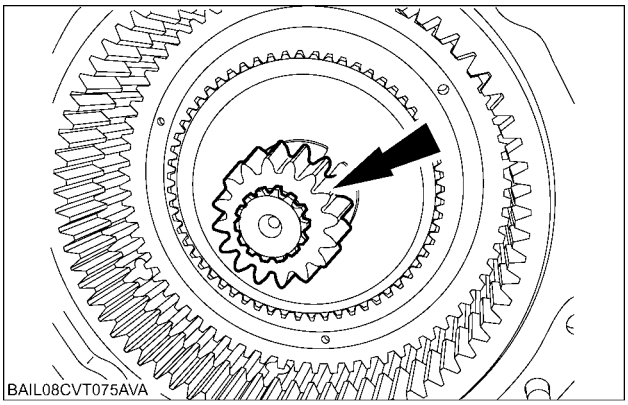
11. Remove the planetary drive gear retaining circlip.



BAIL08CVT074AVA 11

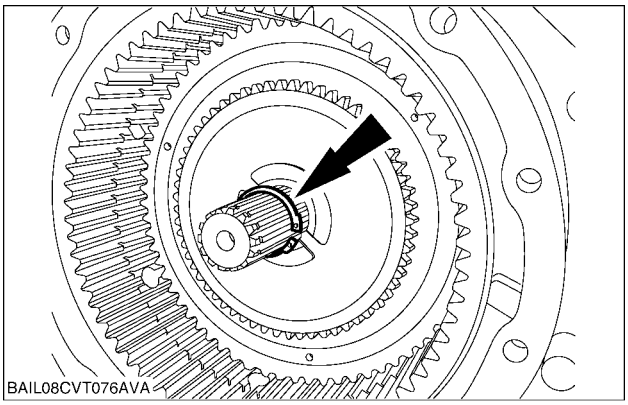
www.truck-freeworkshop.com

12. Remove the planetary drive gear.



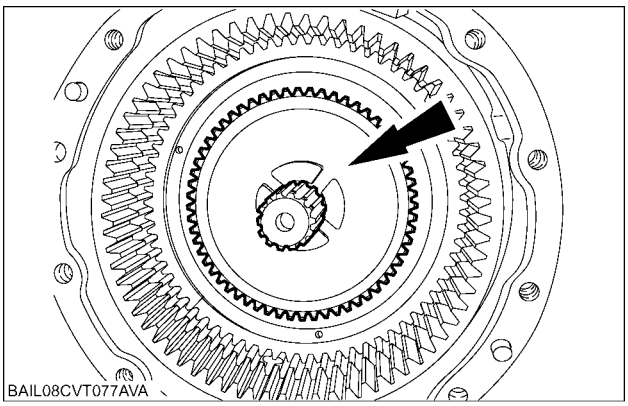
BAIL08CVT075AVA 12

13. Remove the inner circlip.



BAIL08CVT076AVA 13

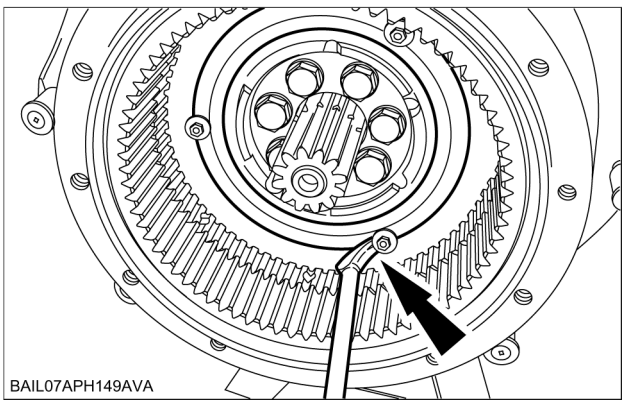
14. Remove the drive gear.



BAIL08CVT077AVA 14

15. Remove the piston from the backplate. Apply the foot brakes if necessary to aid removal.

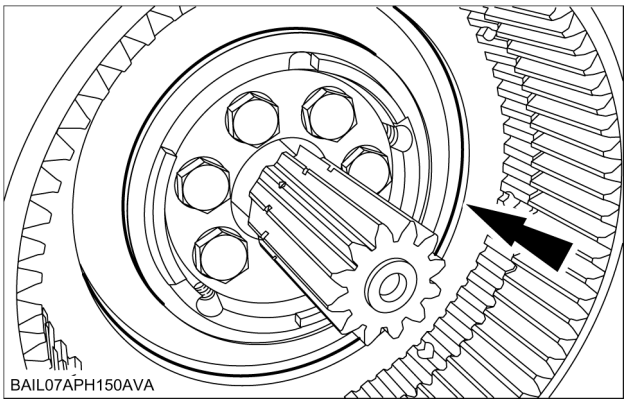
NOTE: *There are* ***3.6 mm*** *threaded bolt holes in the piston. Bolts may be inserted and levered on to aid piston removal.*



BAIL07APH149AVA 15

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16. Inspect the piston seals for damage and wear.



BAIL07APH150AVA 16

Next operation:
Brake - Visual inspection (D.30.B)

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Brake - Overhaul Rear Service Brake

Prior operation:
Disconnect the battery, for further information refer to **Battery - Disconnect (A.30.A)**
Prior operation:
Remove the final drive housing, for further information refer to **Final drive - Remove (D.12.A)**

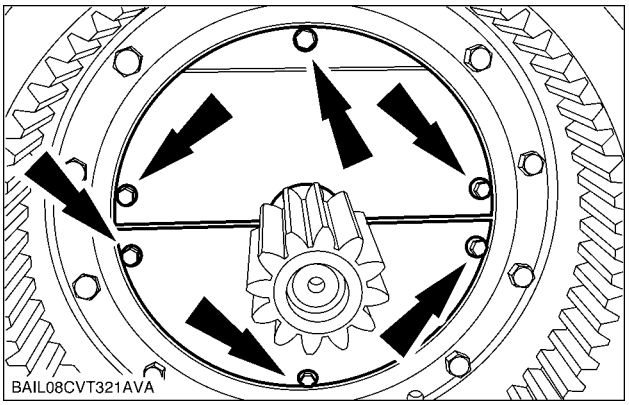
⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

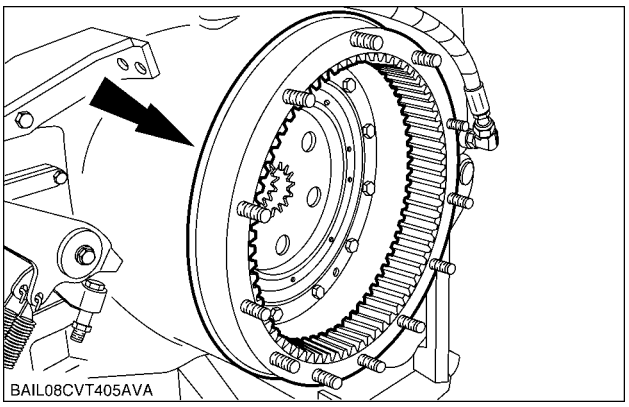
Remove

1. Remove the brake lubrication oil retention plates.



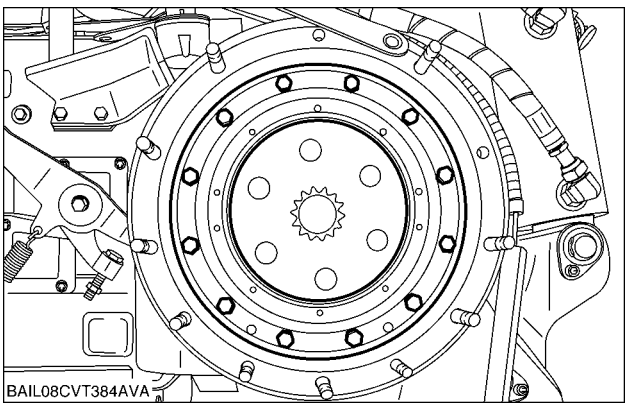
BAIL08CVT321AVA 1

2. Remove the ring gear.



BAIL08CVT405AVA 2

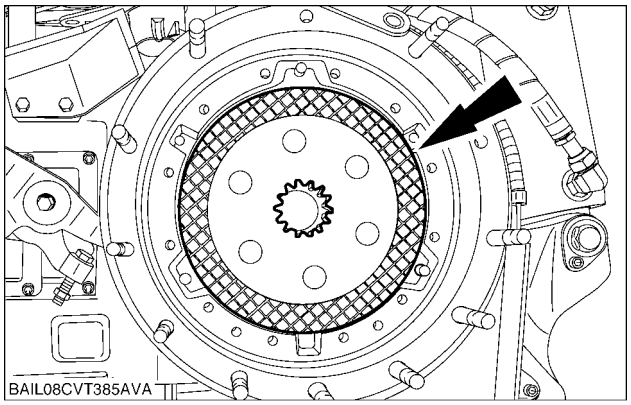
3. Remove the rear brake retaining plate.



BAIL08CVT384AVA 3

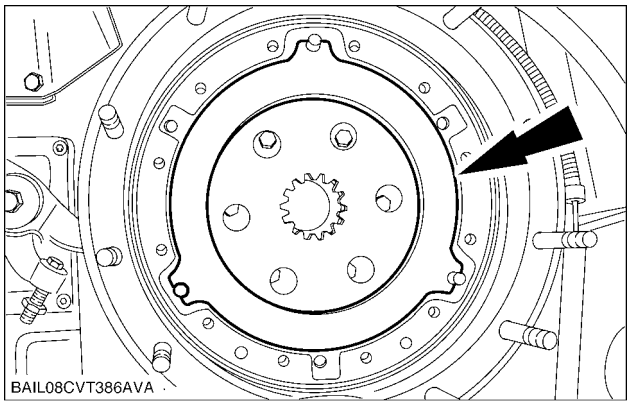
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4. Remove the outer friction brake disc.



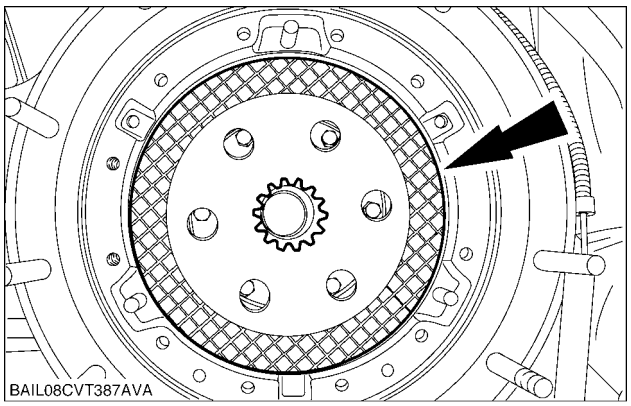
BAIL08CVT385AVA 4

5. Remove the intermediate steel brake disc.



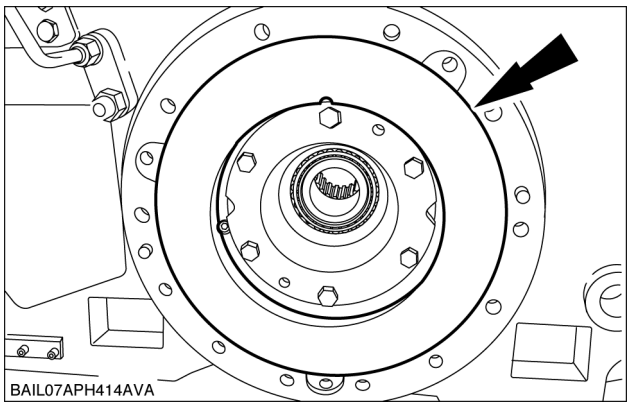
BAIL08CVT386AVA 5

6. Remove the inner friction brake disc.



BAIL08CVT387AVA 6

7. Remove the brake piston.



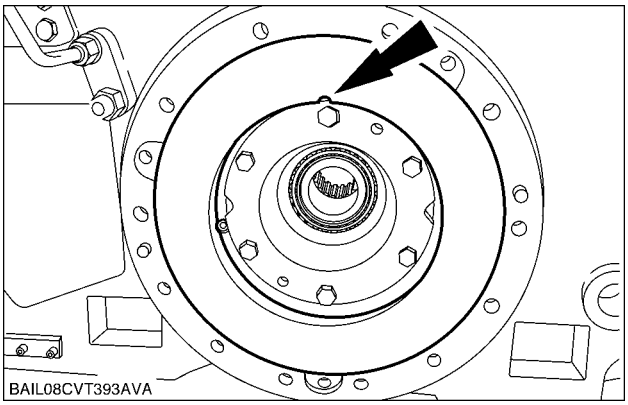
BAIL07APH414AVA 7

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Install

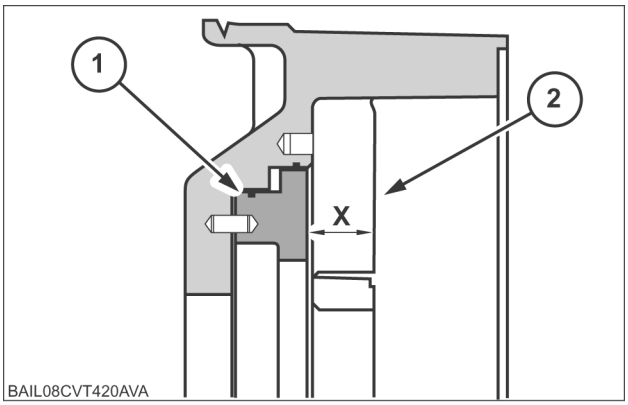
8. Install the brake piston.

IMPORTANT: *Ensure the notch on the piston is at the top of the housing*



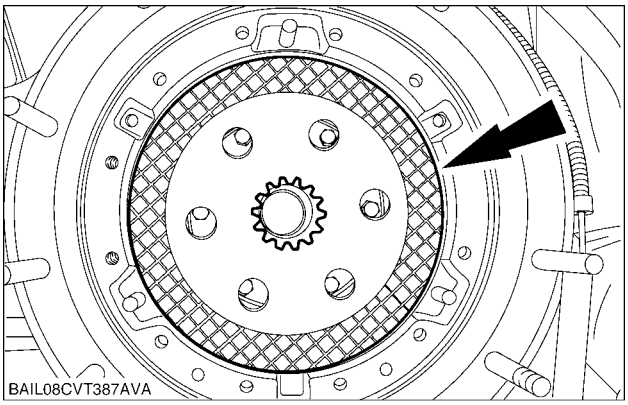
BAIL08CVT393AVA 8

9. When the piston is installed, the measurement **(X)** between the outer face of the piston **(1)** and the mating surface of the rear brake retaining plate **(2)** must read a minimum of **43.5 mm**.



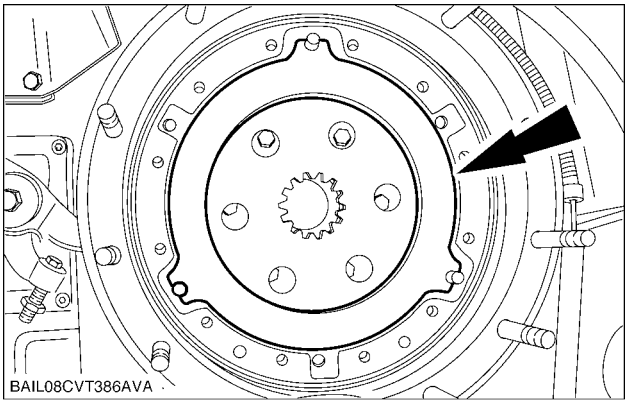
BAIL08CVT420AVA 9

10. Install the inner friction disc.



BAIL08CVT387AVA 10

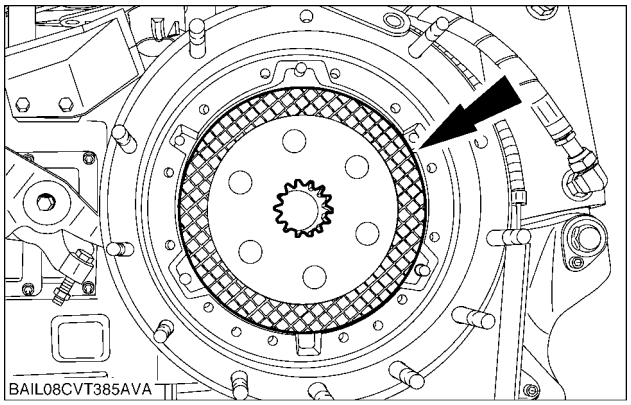
11. Install the intermediate steel brake disc.



BAIL08CVT386AVA 11

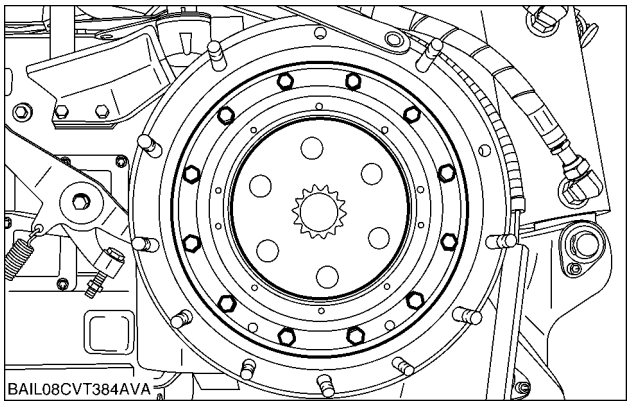
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12. Install the outer brake friction disc.



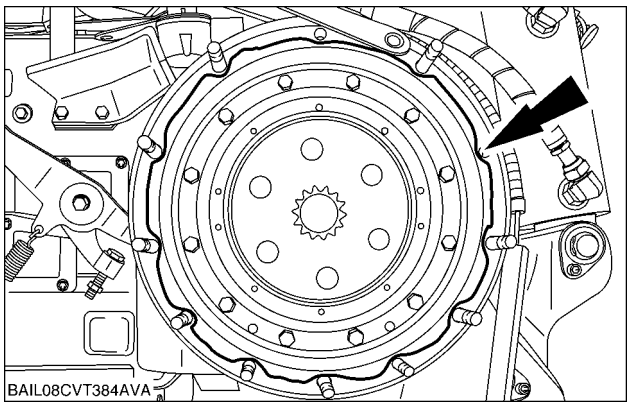
BAIL08CVT385AVA 12

13. Install the rear brake retaining plate.



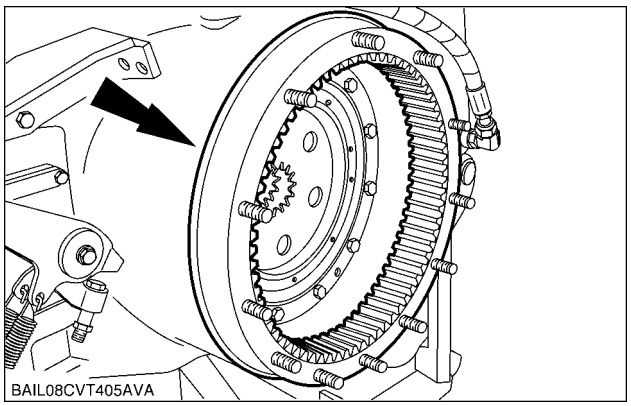
BAIL08CVT384AVA 13

14. Thoroughly clean and degrease the mating surfaces and apply a bead of sealant.



BAIL08CVT384AVB 14

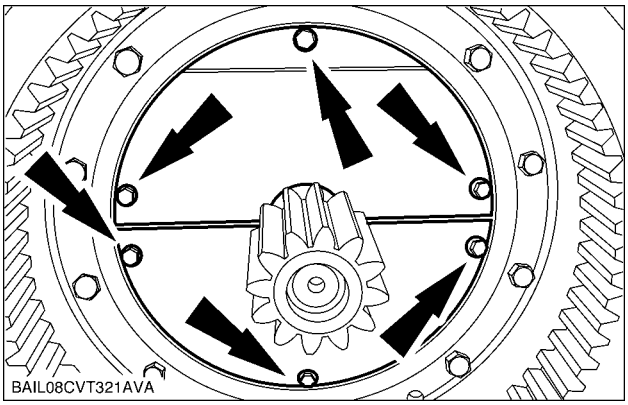
15. Install the ring gear.



BAIL08CVT405AVA 15

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16. Install the brake lubrication oil retention plates.



BAIL08CVT321AVA 16

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Next operation:
Install the final drive housing, for further information refer to **Final drive - Install (D.12.A)**
Next operation:
Bleed the brakes, for further information refer to **SERVICE BRAKE Hydraulic - Bleed (D.30.C)**
Next operation:
Connect the battery, for further information refer to **Battery - Connect (A.30.A)**

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Brake - Visual inspection Front Axle

Prior operation:
Brake - Disassemble (D.30.B)

1. Inspect the friction plate for wear and damage, replace as necessary.
2. Inspect the inner and outer brake discs, if badly scored, worn or cracked replace.
3. If the piston has been removed always install new seals before assembly.

Next operation:
Brake - Assemble (D.30.B)

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Brake - Visual inspection Front Axle 19

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TRAVELLING - D

SERVICE BRAKE Hydraulic - 30.C

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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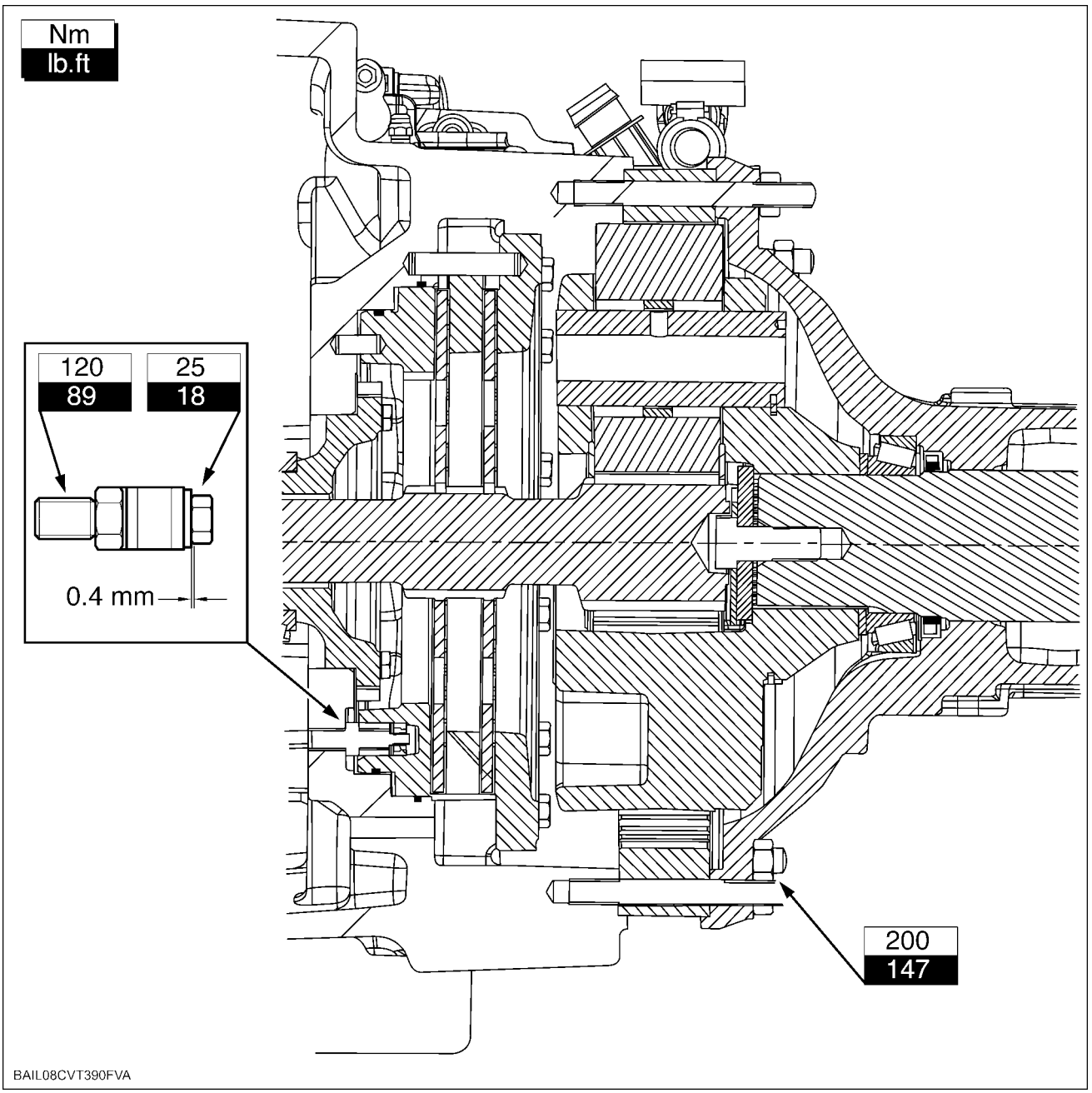
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SERVICE BRAKE Hydraulic - Torque



BAIL08CVT390FVA 1

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SERVICE BRAKE Hydraulic - Special tools

⚠ CAUTION ⚠

The operations described in this section can only be carried out with the ESSENTIAL tools indicated by an (X). To work safely and efficiently and obtain the best results, it is also necessary to use the recommended specific tools listed below and certain other tools, which are to be made according to the drawings included in this manual.

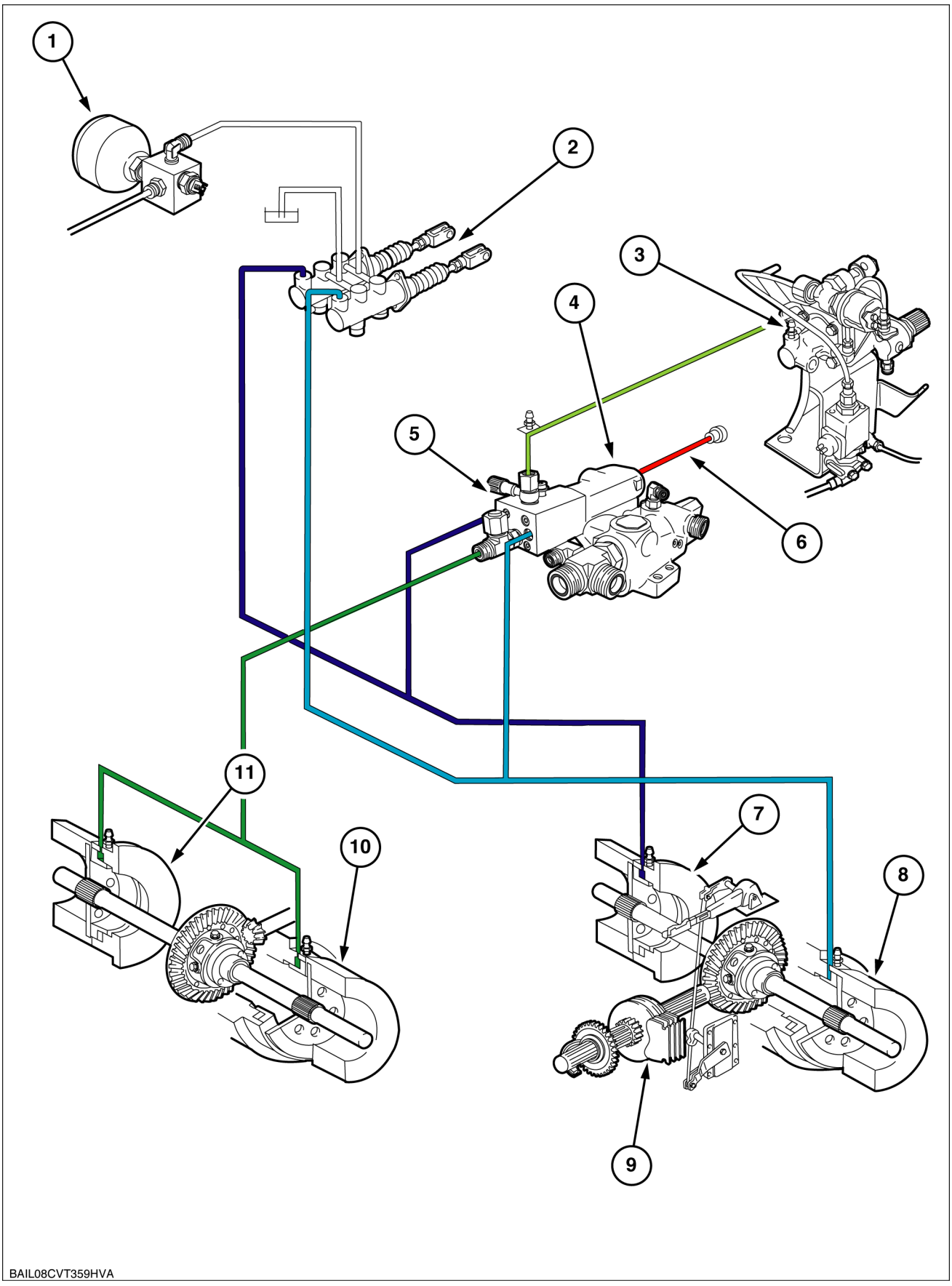
B008

SERVICE BRAKE Hydraulic - General specification

Type:	
- Service Brakes	Wet disc acting on differential axle shafts
- Parking Brake	Wet discs acting on pinion gear shaft
Controls:	
- Service Brakes	Hydraulic, independent pedals (or latched for joint operation) Front brakes power assisted
- Parking Brake	Mechanical through a hand lever
Brake Oil Specification:	Oil From Transmission
Service Brake Disc Material	resin/graphite
Static service Brake Disc Material	steel
Parking Brake Disc Material	steel
Parking Brake Lining Material	sintered or organic conglomerate
Disc Thickness:	
- Service Brakes	**10 mm**, min **8.6 mm**
Permissible Wear	**0.7 mm** per face
- Parking Brake	**5 mm**
Parking Brake Lining Thickness:	
- Side	**3.1 - 3.4 mm**
- Intermediate	**4.2 - 4.5 mm**
Hydraulic Actuation System	
Font Brake Booster Valve & Power Service Brakes Operating Pressure:	**20 - 24 bar**
Control Pedal Adjustment	see **SERVICE BRAKE Hydraulic - Adjust (D.30.C)**

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SERVICE BRAKE Hydraulic - Overview



BAIL08CVT359HVA 1

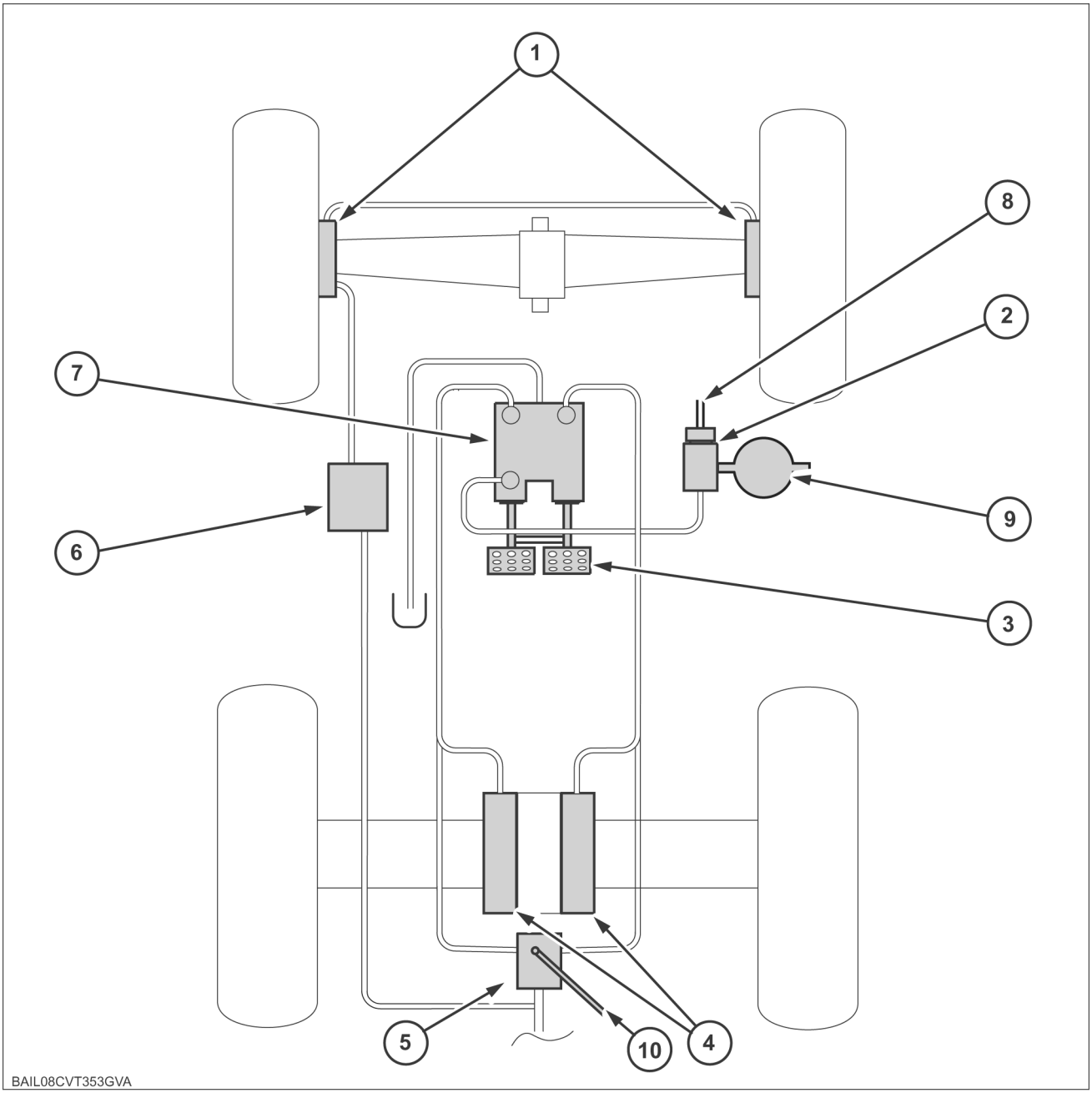
Brake System Components

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1. Accumulator
2. Master Cylinders
3. Pneumatic trailer brake valve
4. Hydraulic trailer brake control valve
5. Logic valve
6. Trailer brake valve hydraulic pressure supply
7. Rear right-hand service brake
8. Rear left-hand service brake
9. Park brake
10. Front left-hand service brake
11. Front right-hand service brake

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SERVICE BRAKE Hydraulic - Static description



BAIL08CVT353GVA 1

CONTROL CIRCUIT

All tractors are fitted with rear wheel brakes whilst others are fitted with additional front brakes. This description describes both options.

The service brakes are foot-operated by two pendulum style pedals **(3)** mounted side by side. On tractors fitted with rear wheel braking only, the left pedal operates the left side brake and the right pedal operates the right side brake. When the brake pedals are latched together, pressing either pedal applies the brakes evenly.
When four wheel braking is fitted, pressing the brake pedals individually operates the rear brakes independently but does not apply the front brakes. When the brake pedals are latched together full four-wheel braking is available.
A cast iron twin cylinder master cylinder **(7)** is mounted on the front face of the cab firewall. The master cylinders are supplied with oil from the low pressure oil circuit.
The master cylinders are interconnected to provide balanced braking, compensating for any unevenly worn brake discs.

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Hydraulic pressure is applied directly to the rear brakes **(4)** from the respective master cylinder when the brake pedals are operated. In addition, hydraulic pressure is supplied to a 'Logic Valve' **(5)** which enables the air operated trailer brakes to function via outlet **(10)** when both brake pedals have been operated together.

Also shown are **(1)** Front brakes **(2)** Reservoir **(6)** Manifold **(8)** Feed from regulated circuit **21 bar** (**304 psi**) to **23 bar** (**333 psi**) **(9)** Expansion tank **21 bar** (**304 psi**) to **23 bar** (**333 psi**).

NOTE: *The brake oil used is from the tractor low pressure circuit, and under no circumstances should a universal oil, i.e., DOT 4 type, be used.*

FRONT SERVICE BRAKES
The front service brakes are hydraulically operated wet disc type. The discs are located in the final drive cases of the front axle and are splined to the differential output axle shafts.

REAR SERVICE BRAKES
The rear service brakes are hydraulically operated wet disc type. The discs are located between the rear axle housing and final drive housings and are splined to the differential output axle shafts.

PARKING BRAKE
The parking brake is controlled mechanically. It acts on the rear pinion gear shaft and is controlled through a hand lever located at the left of the driver's seat.
When the parking brake control lever is raised, the tensioning cable acts on the actuator forcing the pads against the six brake discs splined to the tractor rear pinion gear.

Refer to **SERVICE BRAKE Hydraulic - Overview (D.30.C)**

ELECTRONIC PARK LOCK
The electronic park lock is controlled by selecting the park position on the shuttle lever.
When park is selected a separate brake cable is electronically tensioned to a preset torque. The electronic park lock will also operate if the tractor is in drive but wheel movement is not detected for approximately 45 seconds. The application of the brake is identical to the manual operation. Refer to **SERVICE BRAKE Hydraulic - Overview (D.30.C)**

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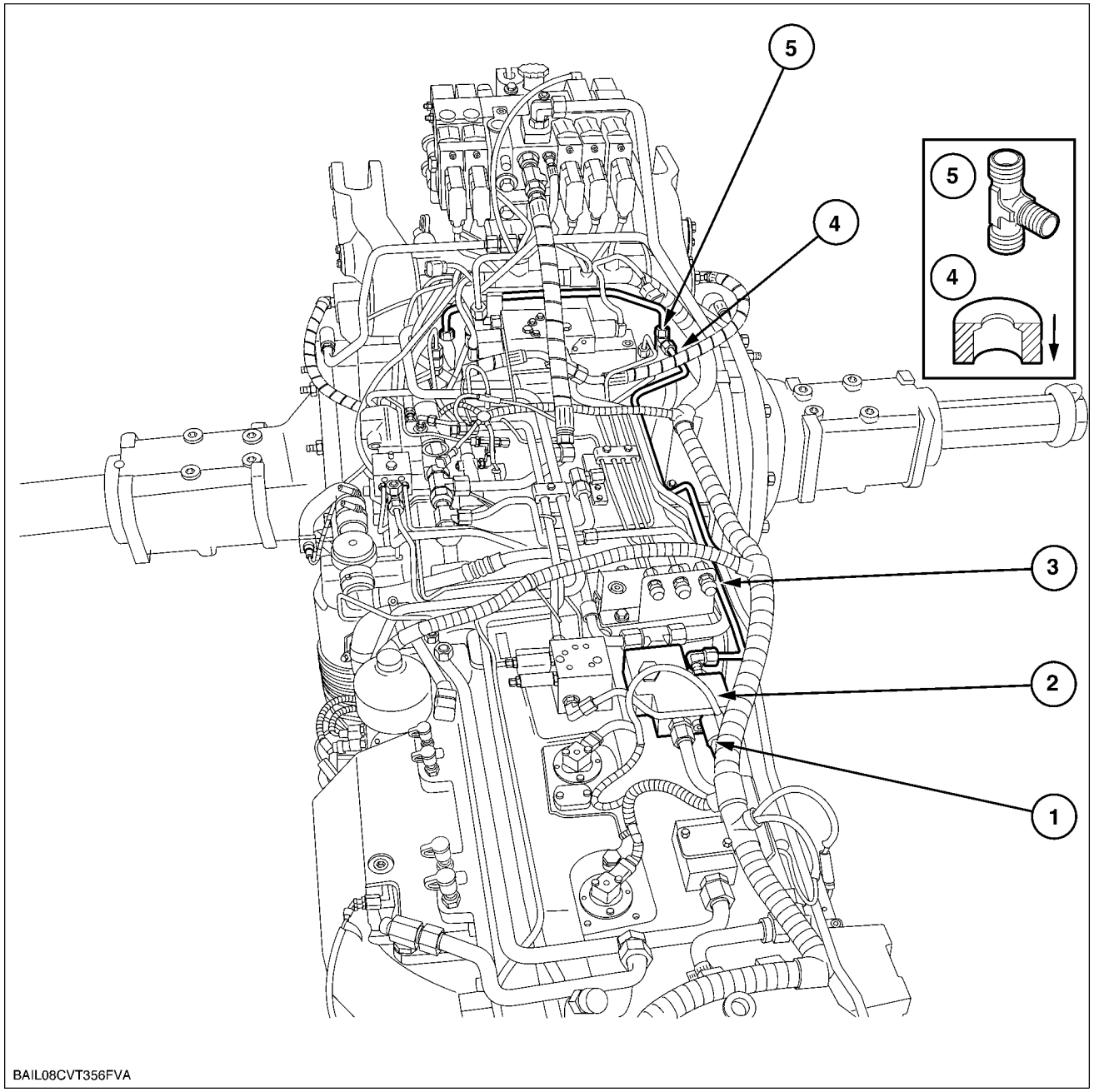
Brake Lube Logic Control

The brake lube logic control ensures the brakes are continually lubricated during normal operation.

The solenoid (1) is normally open but when the ignition is turned on a the solenoids are de-energised and lubrication oil is supplied to the brakes. During normal operation if the brake pedals are depressed, the lube on solenoids are de-energised. When the brake pedals are released the lubrication is maintained for a controlled time of 60 seconds. If the brake pedals are not depressed the lubrication system is turned on for 60 seconds every 5 minutes. Tractor speed is not relevant for this operation.

The brake lubrication flow is **8 l/min**, at **60 - 70 °C** each side. There is an orifice (4) installed in the housing on the left hand side under the 3 way connector that balances the lube flow.

Overview of the Brake Lubrication Circuit



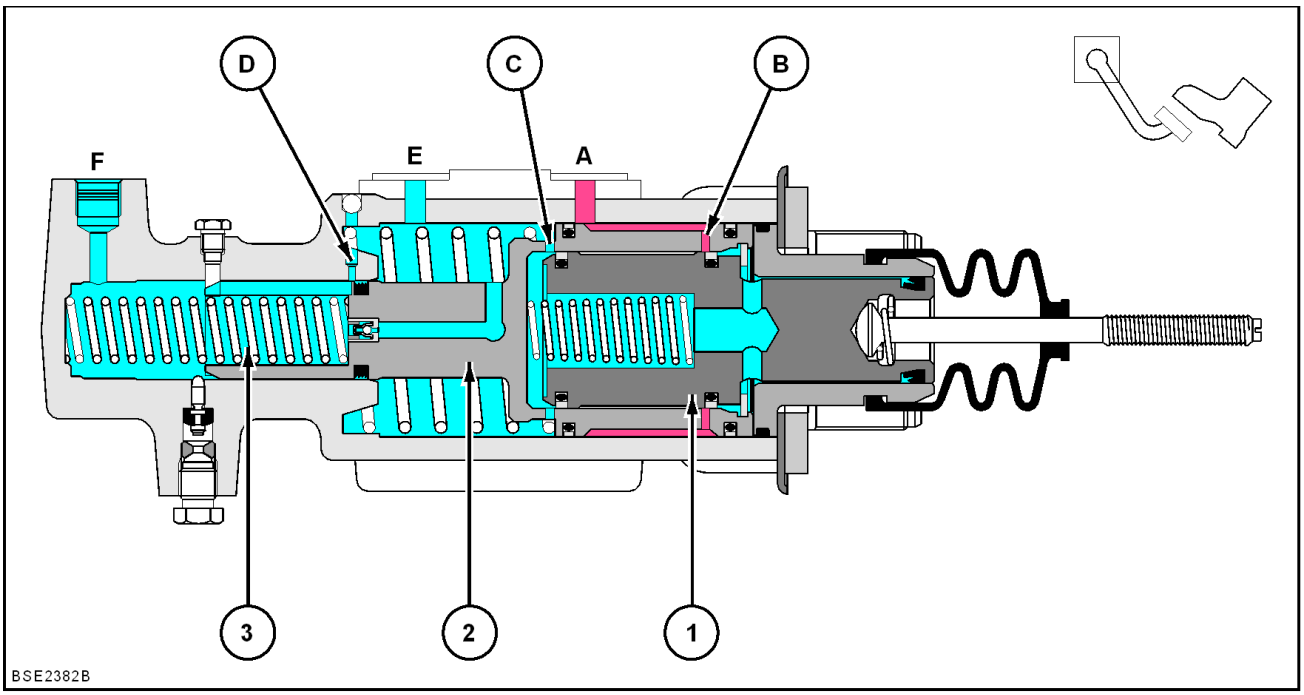
BAIL08CVT356FVA 2

(1) Solenoid **(2)** Manifold valve **(3)** Feed pipe **(4)** Balancing valve **(5)** Tee piece

NOTE: *The balancing valve must be installed as shown above*

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Master cylinder - Dynamic description



BSE2382B 1

POWER BRAKES. Brakes Off

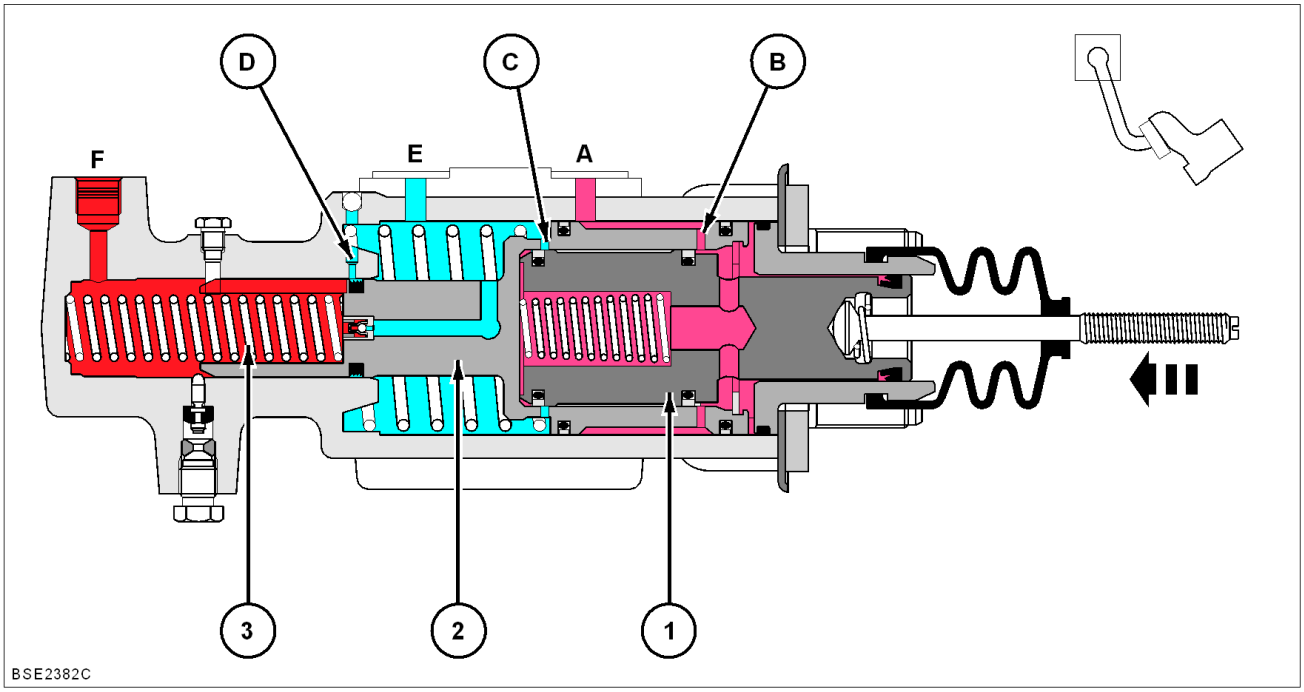
Low Pressure Oil **20 - 24 bar**

Reservoir/Sump Oil

Low pressure oil enters the valve at port A and is prevented from flowing through port ‘B’ by the actuator piston **(1)**. Oil behind the actuator piston **(1)**, booster piston **(2)** and in the master cylinder area **(3)** are open to the reservoir at port ‘E’.

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POWER BRAKE OPERATION



BSE2382C 2

POWER BRAKES. Brakes Applying

Master Cylinder Pressure Oil

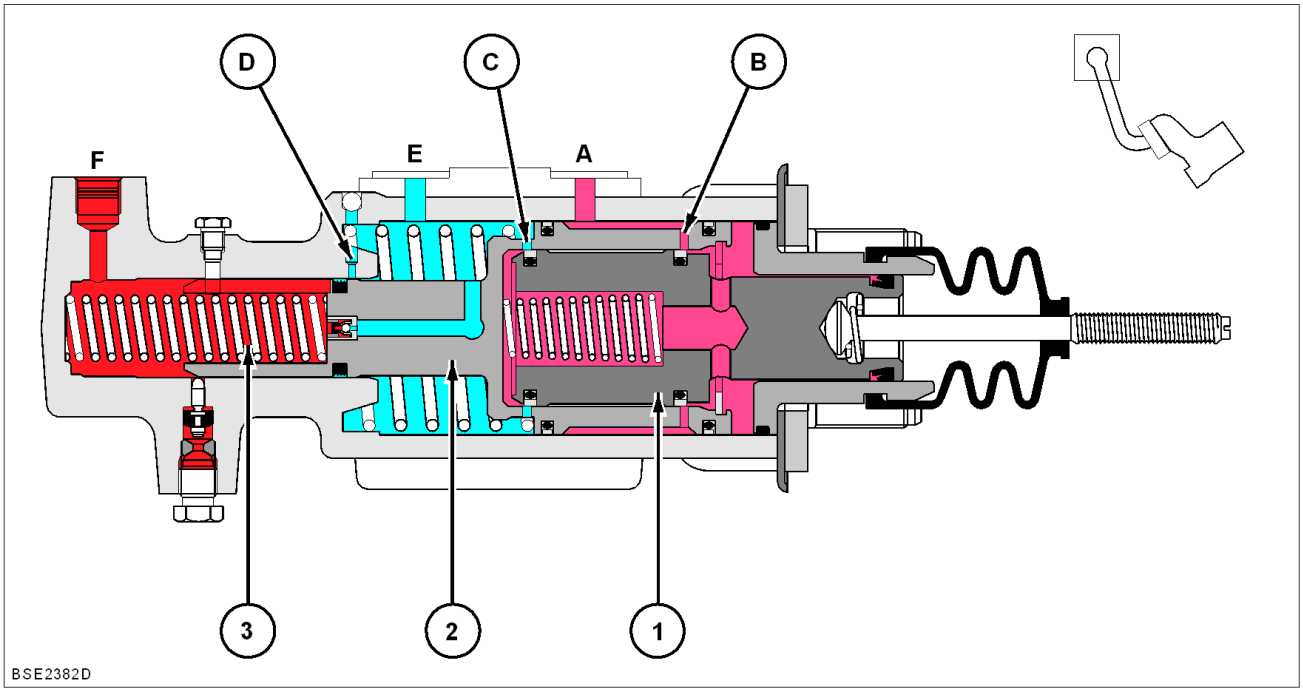
Low Pressure Oil **20 - 24 bar**

Reservoir/Sump Oil

The actuator piston **(1)** moves inside the boost piston **(2)** and uncovers port ‘B’. Low pressure oil enters the valve at port ‘A’ and flows through port ‘B’ but is prevented from flowing to sump by port ‘C’ which is closed by the actuator piston. The pressure begins to act on the back of the booster piston **(2)**, assisting pedal pressure to the master cylinder. Port ‘D’ also closes and the master cylinder pressure **(3)** begins to increase and oil flows to the brakes at port ‘F’.

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POWER BRAKE OPERATION



BSE2382D 3

POWER BRAKES. Brakes Applied

Master Cylinder Pressure Oil

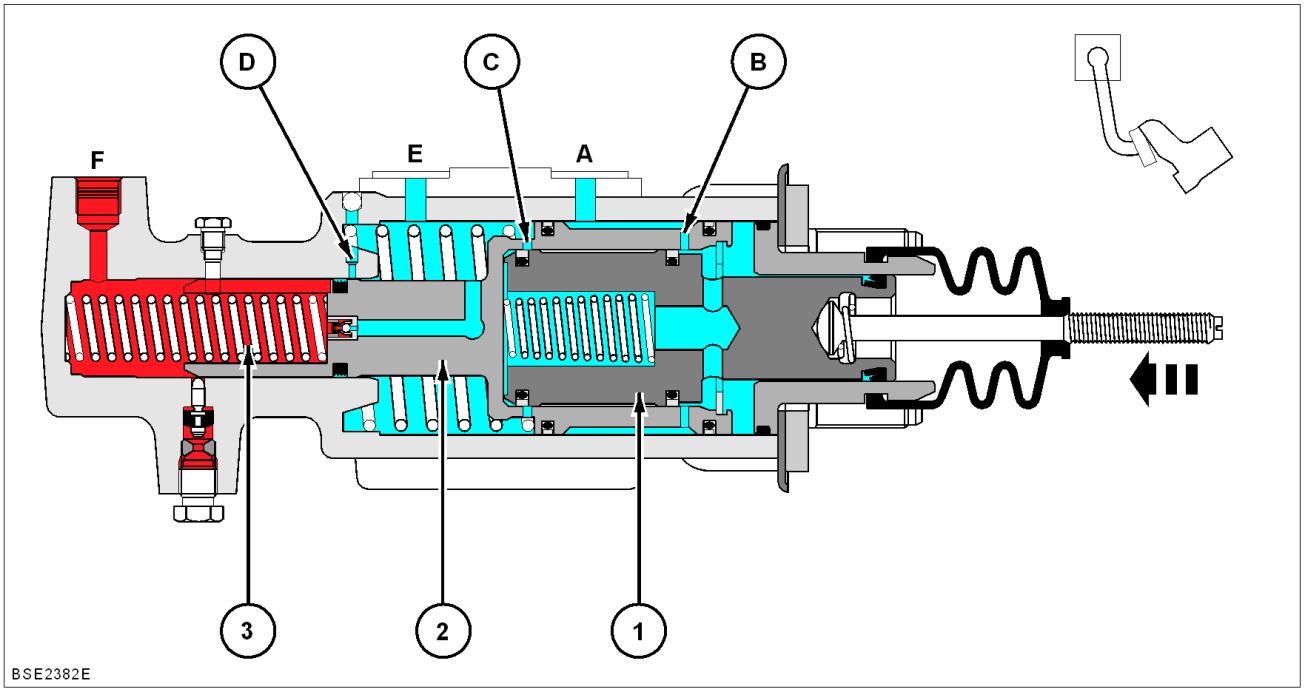
Low Pressure Oil **20 - 24 bar**

Reservoir/Sump Oil

The actuator piston **(1)** stops moving inside the boost piston **(2)** but the booster piston continues to move until ports ‘B’ and ‘C’ are balanced. Port ‘D’ is also closed and the master cylinder **(3)** maintains braking pressure to the brakes at port ‘F’.

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POWER BRAKE OPERATION



BSE2382E 4

POWER BRAKES. Brakes Manually Applied (ENGINE OFF)

Master Cylinder Pressure Oil

Reservoir/Sump Oil

Because the engine is not running there is no low pressure oil entering the valve at port ‘A’. As the pedal is depressed the actuator piston **(1)** moves inside the booster piston **(2)** until it makes mechanical contact. Mechanical pressure is transferred to the booster piston **(2)** and therefore the master cylinder **(3)** and the brake pressure at port ‘F’ increases with no boosting pressure because the engine is not running.

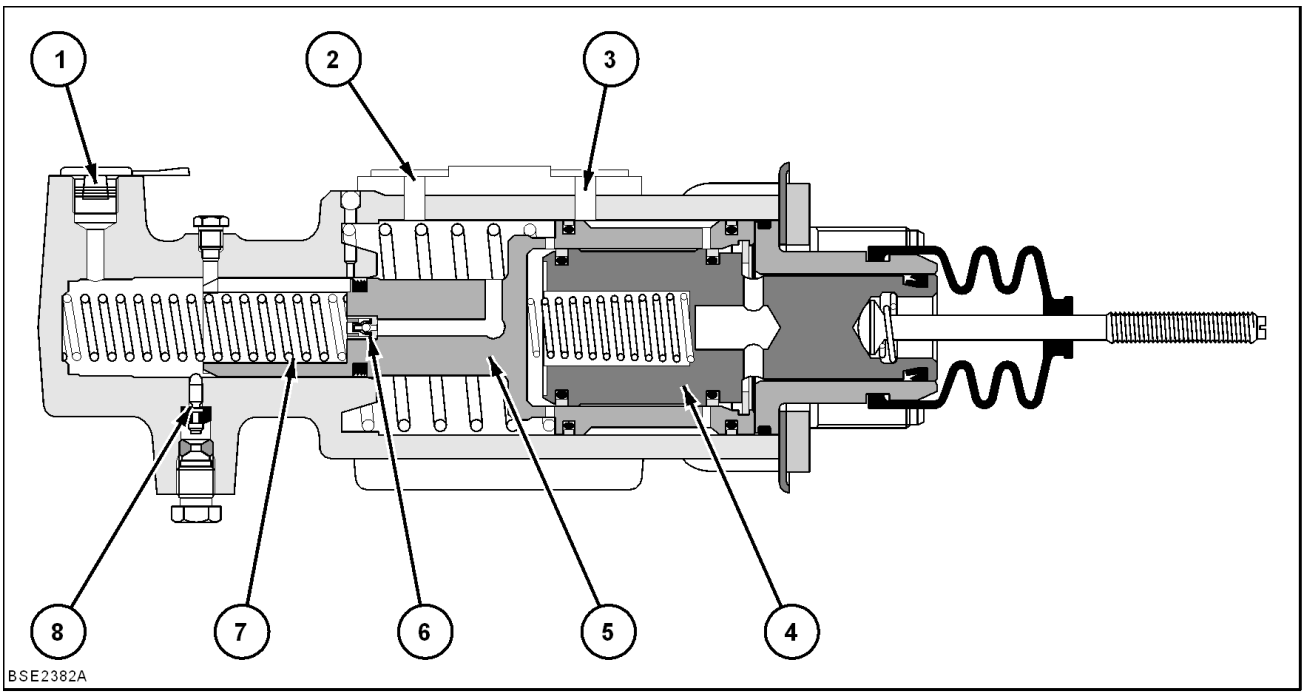
Bleeding / System Top Up

NOTE: *refer to* ***Master cylinder - Sectional view (D.30.C)****.*

Depressing the pedal exhausts oil through the various bleed nipples. As the pedal pressure is released a partial vacuum is created in the master cylinder area, causing the top up valve in the centre of the booster valve to open. This allows reservoir/sump oil to top up the master cylinder area in preparation for the next downward stroke of the pedal.

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Master cylinder - Sectional view



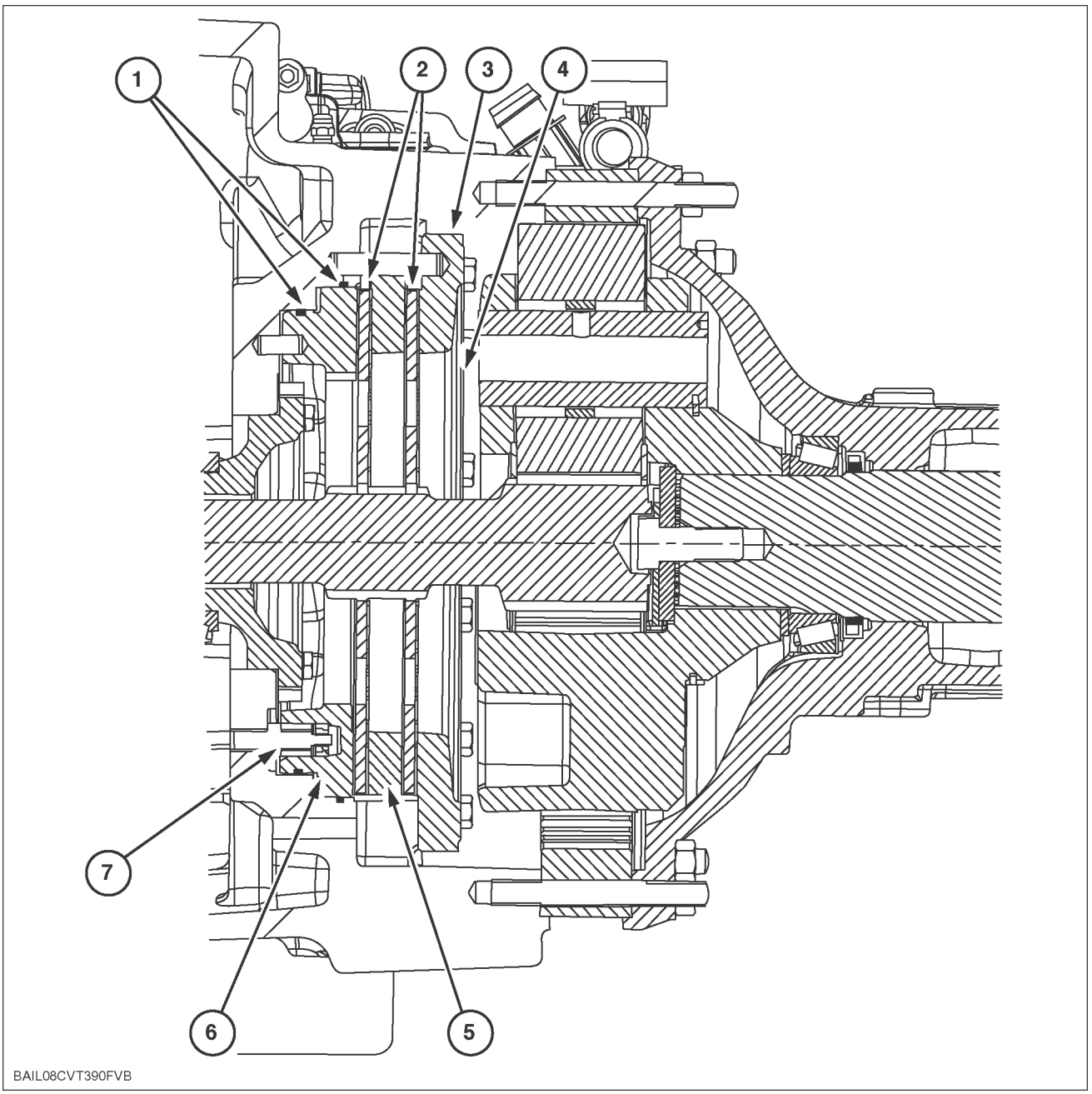
BSE2382A 1

REAR SERVICE BRAKE MASTER CYLINDER SECTIONAL VIEW

1 Outlet to Slave Cylinders
2 Low Pressure Oil Return to Sump
3 Low Pressure Oil Supply
4 Actuator Piston
5 Booster Piston
6 Bleed Top-up Valve
7 Master Cylinder
8 Balancing Valve

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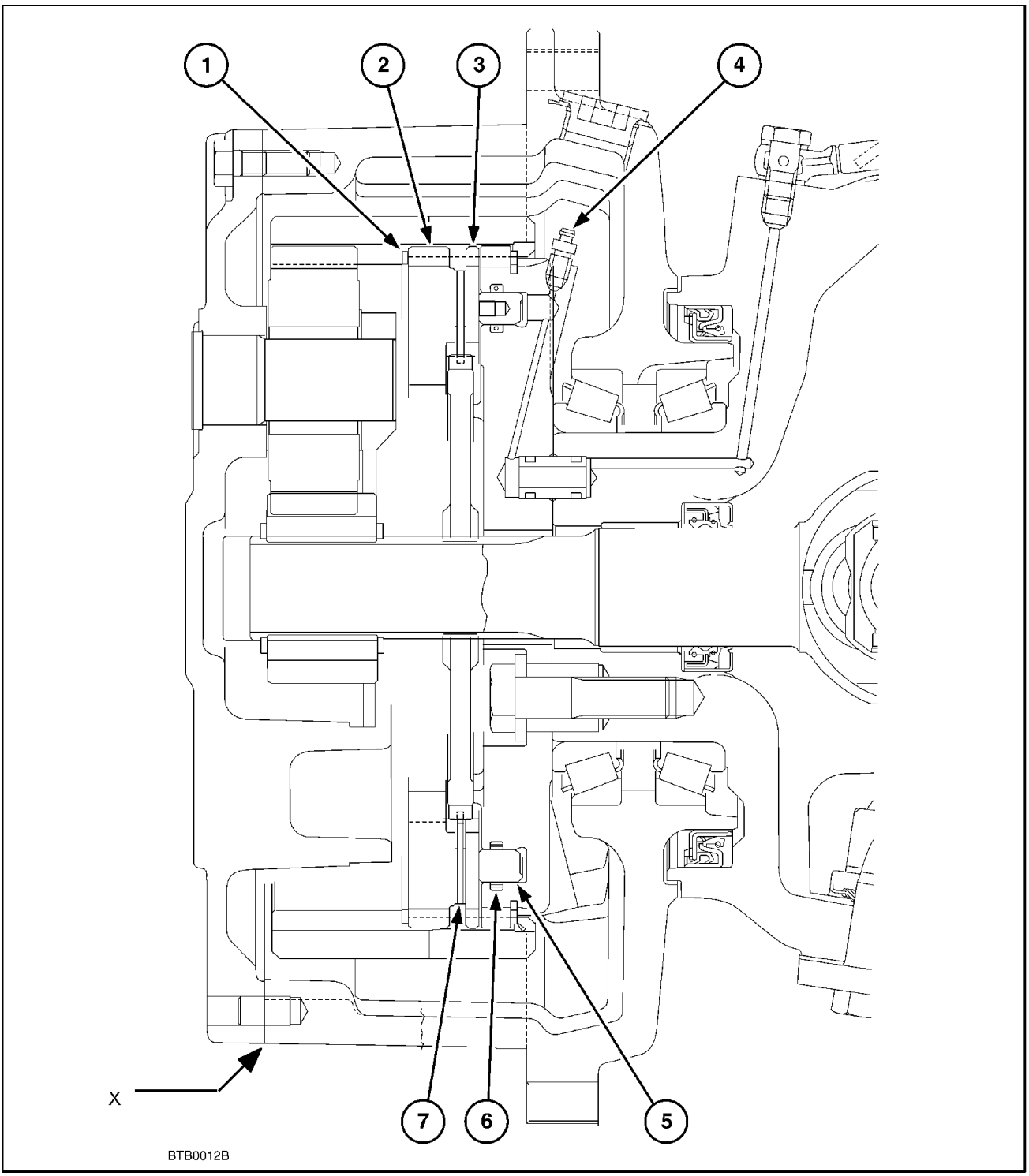
Brake - Sectional view SERVICE BRAKE



BAIL08CVT390FVB 1

1. Seals
2. Friction Disc
3. Brake Retaining Plate
4. Lubrication Oil Retaining Plates
5. Intermediate Disc
6. Piston
7. Adjuster

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BTB0012B 2

FRONT SERVICE BRAKE SECTIONAL VIEW

1 Outer Plate Retaining Ring
2 Outer Brake Plate
3 Inner Brake Plate
4 Brake Bleed Screw
5 Brake Piston
6 Piston Seal
7 Friction Disc

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SERVICE BRAKE Hydraulic - Bleed

⚠ WARNING ⚠

Air bleeding must be carried out any time the brake hydraulic system has been opened.

B016

⚠ CAUTION ⚠

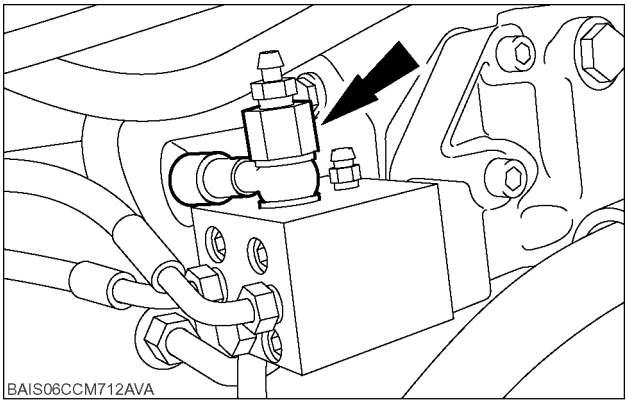
The brake accumulator can have a maximum charge pressure of 850 psi. Check for pressure in the accumulator. Remove the pressure in the accumulator before accumulator line is disconnected. Apply the brakes with the pedal approximately 40 times when the engine is off. Loosen the special fitting for removing air from the brakes and push on the brake pedal. If oil flow does not flow from the special fitting, the accumulator is not charged.

M670

All tractors

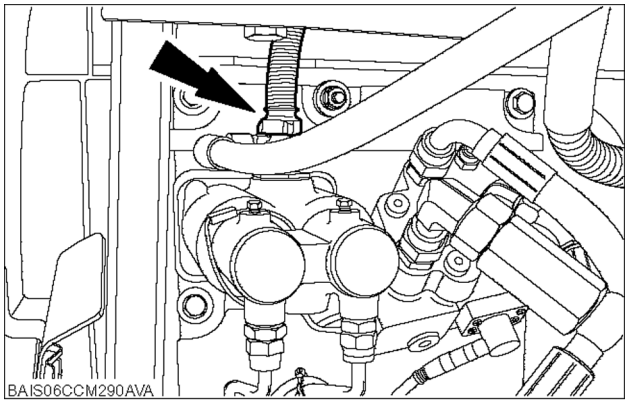
1. If fitted, remove and discard the Schrader valve assembly from the logic head.
   The valve is only used for initial filling, removal reduces possible air ingression points.
   Replace the copper washers with bonded seals (part no. 5183780).

NOTE: *Tractors without pneumatic trailer brakes shown.*



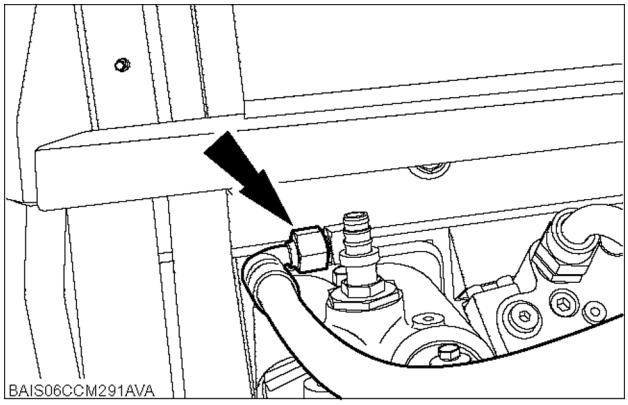
BAIS06CCM712AVA 1

2. Disconnect the master cylinder vent hose.



BAIS06CCM290AVA 2

3. Disconnect the master cylinder supply hose and fill with LHM brake oil.



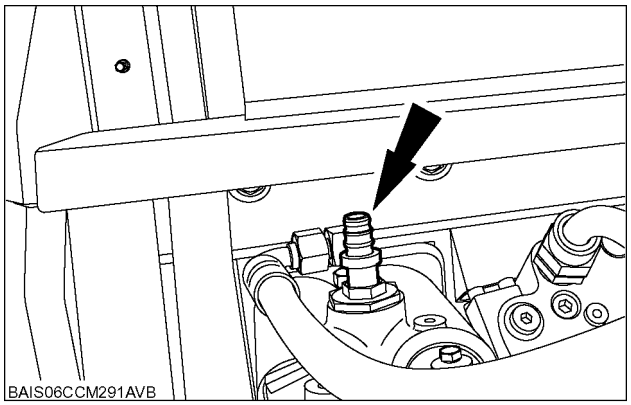
BAIS06CCM291AVA 3

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4. Fabricate a temporary reservoir and connect it to the master cylinder return port.
Fill the reservoir with LHM brake oil.

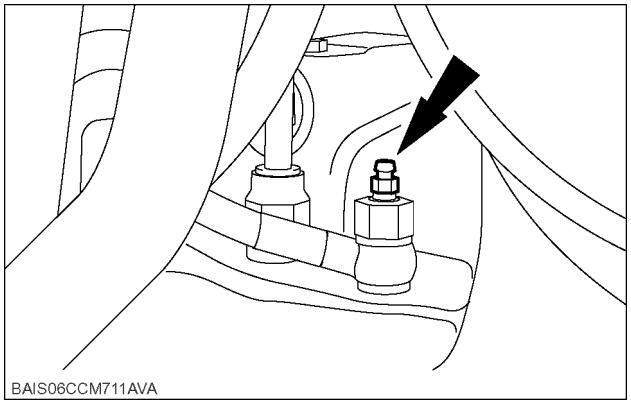
NOTE: *Ensure that the connection is air tight.*

IMPORTANT: *Ensure that the reservoir is kept topped up with oil throughout bleeding.*



BAIS06CCM291AVB 4

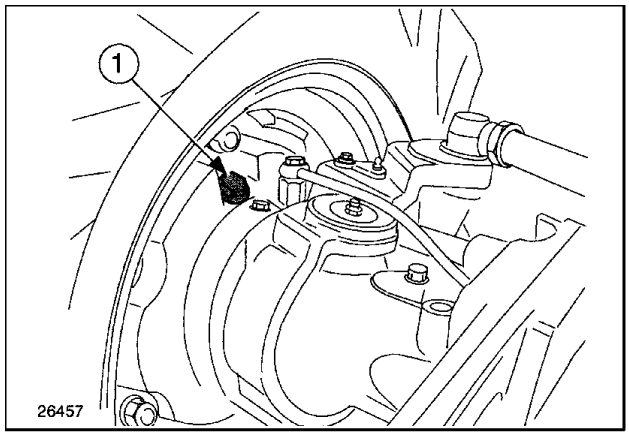
5. Uncouple the brake pedals and slowly depress the left hand brake pedal to pressurize the oil.
Attach a suitable bleed tube with a one-way valve action to the left hand bleed screw. With the brake pedal held down, unscrew the bleed screw by half a turn. Let the oil drain with any air bubbles.
Repeat this step until the brakes are completely filled with LHM oil and free of air.
Repeat for right hand side.



BAIS06CCM711AVA 5

6. Rotate the hubs to position the plug **(1)** in the vertical position. Remove the plug and ensure the bleed screw is aligned with the hole.

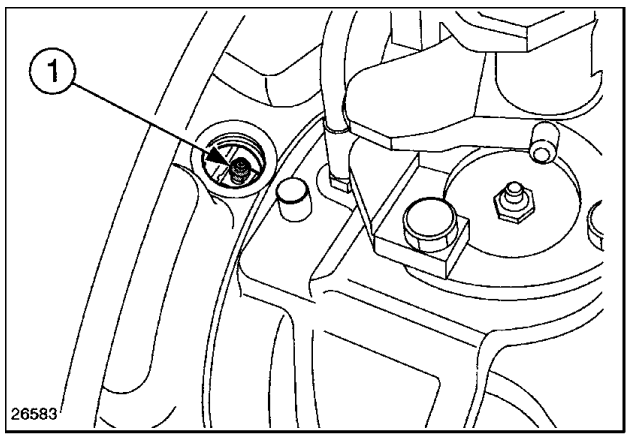
NOTE: *With some wheel options it may be necessary to bleed the brakes with the wheels removed.*



26457 6

7. Loosen the screw and attach a suitable bleeding tube with a one-way valve action. Pump the latched brake pedals until the fluid expelled is free from bubbles. Hold the brake pedals down and remove the tube and tighten the bleed screw. Repeat for the other wheel. On completion of the procedure refit the axle plug and ensure the oil level in the reservoir is at the correct level.

NOTE: *If the brake oil has escaped into the hub the hub should be drained and refilled with the correctly specified front axle oil,* ***CASE AKCELA HY-TRAN ULTRA*** .

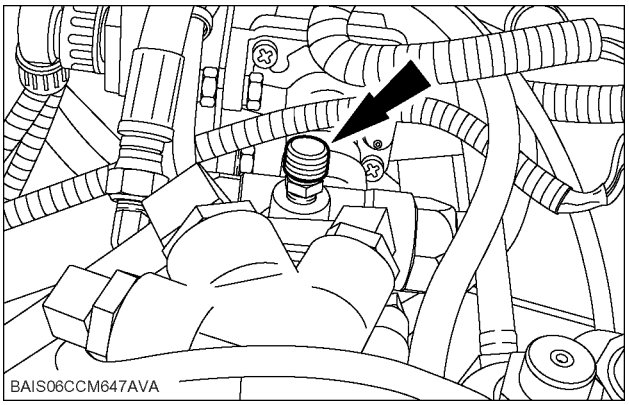


26583 7

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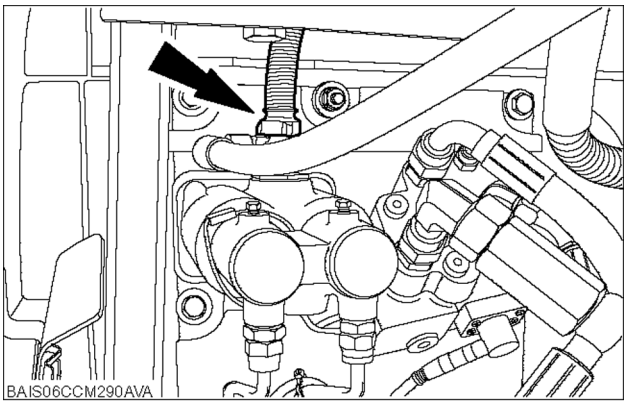
Tractors with pneumatic trailer brakes.

8. Bleed the dual line airbrake control valve.



BAIS06CCM647AVB 8

9. Disconnect and remove the temporary reservoir. Connect the master cylinder vent hose.



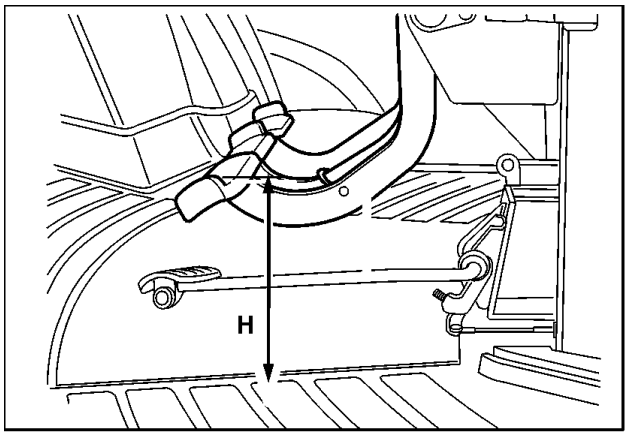
BAIS06CCM290AVA 9

Next operation:
Start the engine, press and hold the brake pedals, check there are is no pedal creep down.
Next operation:
Visually check all fittings, components and pipes for leaks.

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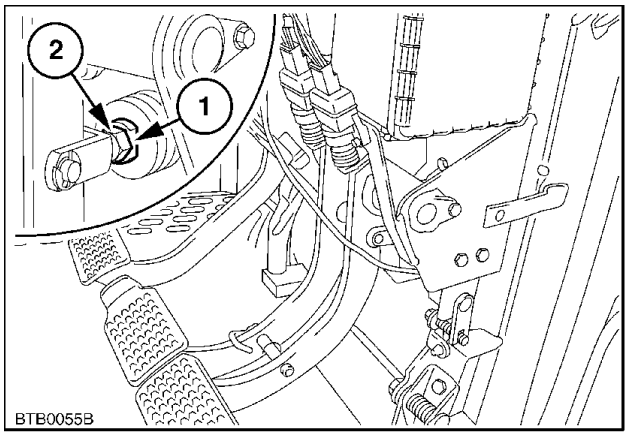
SERVICE BRAKE Hydraulic - Adjust

1. With the brake pedals connected to the master cylinder pushrods and the latching pin disconnected, check the distance **(H)** from pedal centre to the floor mat. It should be approximately **185 mm**.



1b0o2004106423 1

2. If this is not the case, release the locknuts **(2)** and screw in or out the adjust screw **(1)** to obtain the specified distance. Tighten the locknuts.



BTB0055B 2

Brake Pedal Switches Adjustment

3. After installing new master cylinders or adjusting the pedal height check that the brake switches are correctly adjusted.
   1. Locate a **2.5 mm** (0.10 inch) thick gauge bar between the switch and brake pedal. Loosen the switch retaining screws.
   2. Push the switch towards the brake pedal to the limit of the plunger travel whilst ensuring that the pedal remains stationary. Tighten the retaining screws and remove the gauge. Repeat for the other switch.
      After adjustment make sure both switches operate simultaneously.

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Control valve - Remove

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026

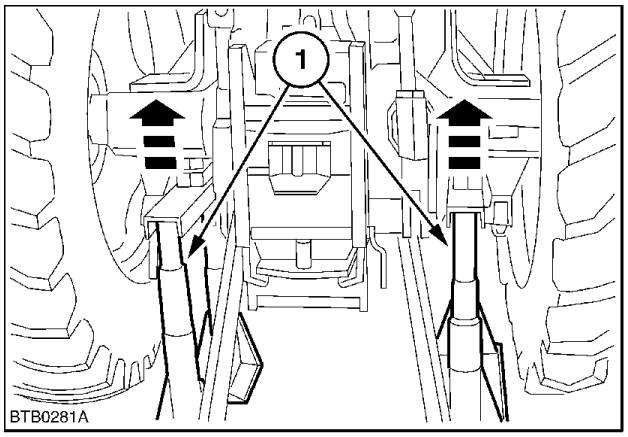
⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

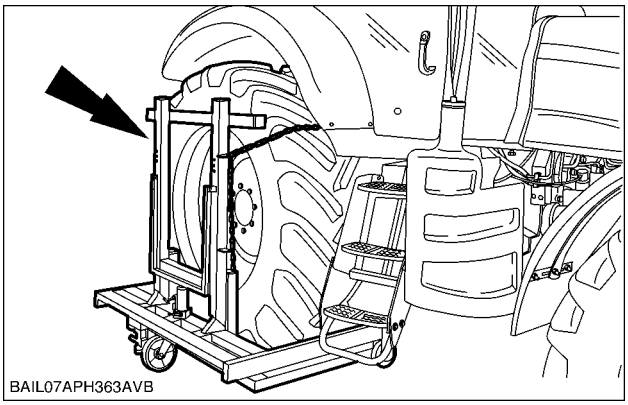
1. Make sure that the vehicle is parked on a level surface.
2. Chock the front wheels using suitable wheels stops.
3. Raise the rear of the vehicle and place two suitable axle stands **(1)** under the final drive cases.

NOTE: *If required, detach the lift rods from the lower links.*



BTB0281A 1

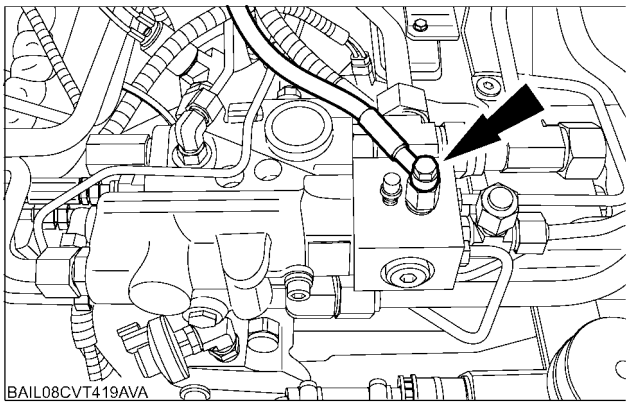
4. Remove the right-hand rear wheel.



BAIL07APH363AVB 2

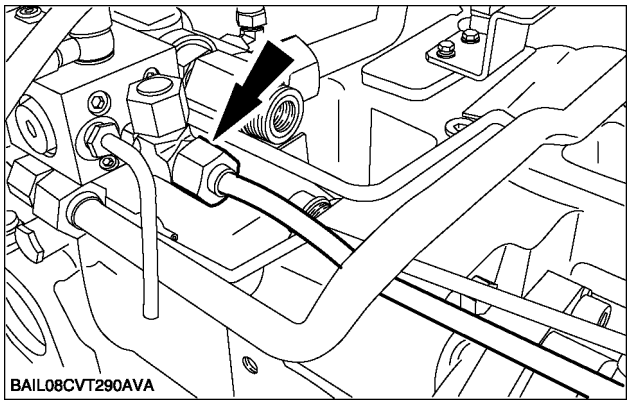
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5. Disconnect the trailer brake signal line from the control valve.



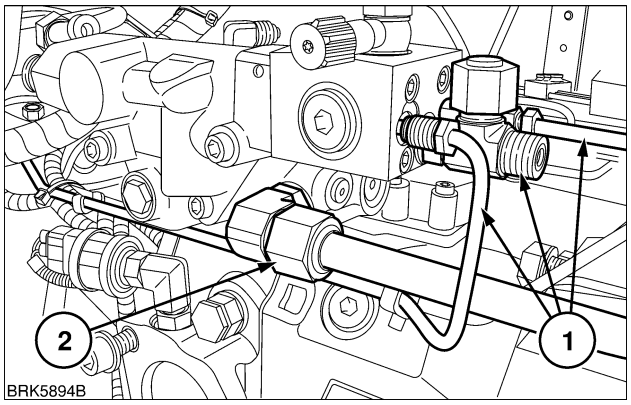
BAIL08CVT419AVA 3

6. Disconnect the front brake pipe from the control valve.



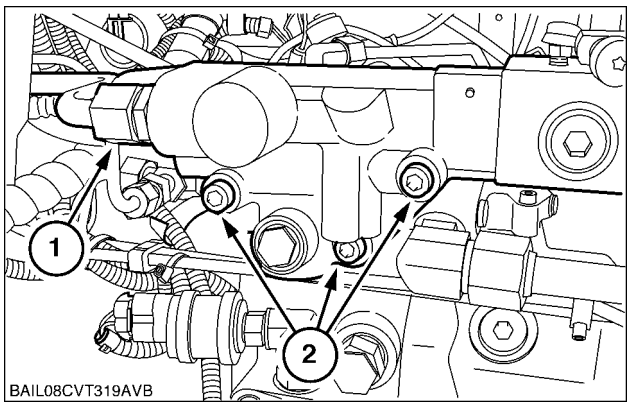
BAIL08CVT290AVA 4

7. Disconnect the trailer brake signal lines **(1)** and the return to tank line **(2)**.



BAIL08CVT072ASA 5

8. Disconnect the trailer brake valve supply line **(1)** and remove the control valve **(2)**.



BAIL08CVT319AVB 6

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Control valve - Install

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

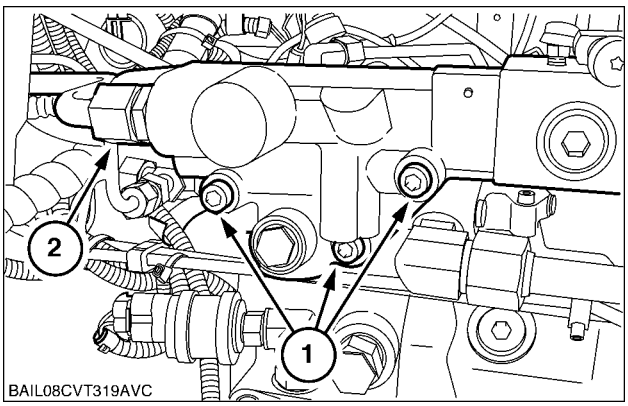
B026

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

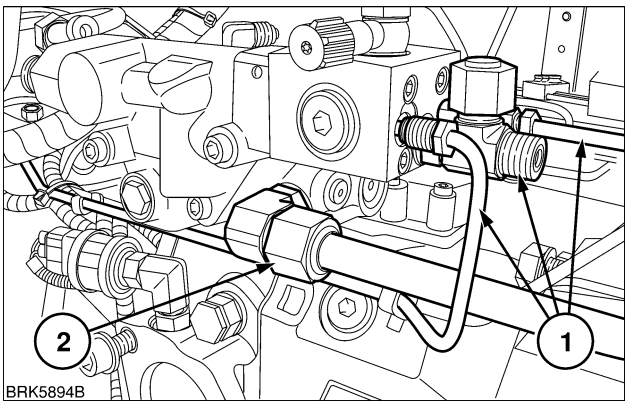
B012

1. Install the control valve **(1)**.
   Connect the trailer brake valve supply line **(2)**.



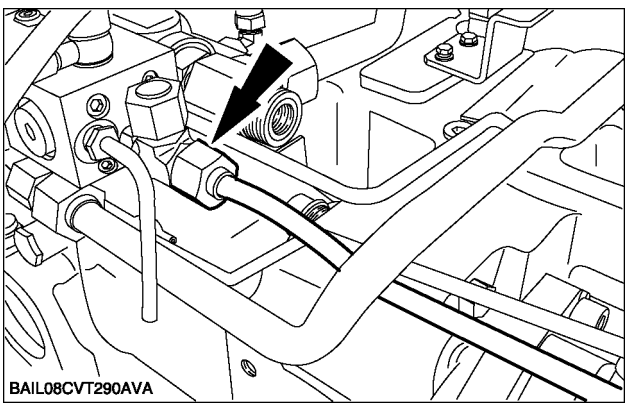
BAIL08CVT319AVC 1

2. Connect the trailer brake signal lines **(1)** and return to tank line **(2)**.



BAIL08CVT072ASA 2

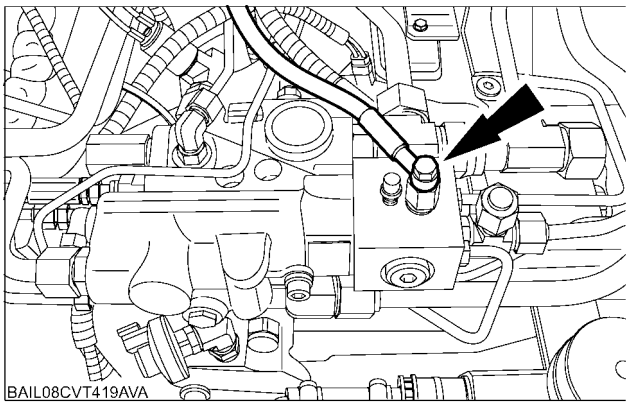
3. Connect the front brake pipe to the control valve.



BAIL08CVT290AVA 3

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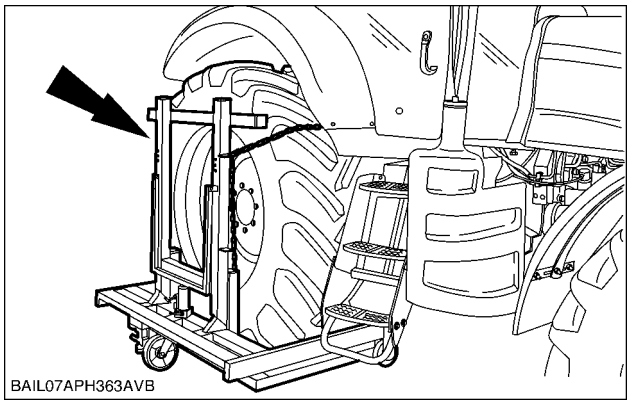
4. Connect the trailer brake signal line to the control valve.



BAIL08CVT419AVA 4

5. Bleed the brakes, for further information refer to **SERVICE BRAKE Hydraulic - Bleed (D.30.C)**.

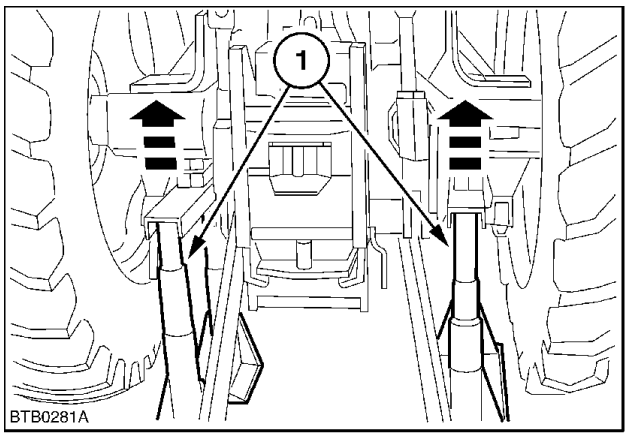
6. Install the right-hand rear wheel.
Tighten to **250 Nm** (**184 lb ft**)



BAIL07APH363AVB 5

7. Remove the axle stands **(1)**.

NOTE: *If required, attach the lift rods to the lower links.*



BTB0281A 6

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Master cylinder - Remove

Prior operation:
Before carrying out any work on the braking system carry out the following operations.
- Park the tractor on a level surface. Block the wheels to prevent the tractor moving.

Prior operation:
Disconnect the battery, for further information refer to **Battery - Disconnect (A.30.A)**

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026

⚠ WARNING ⚠

The master cylinder is not a serviceable item. If it is showing signs of leakage, damage or suspected of malfunctioning, the complete unit must be replaced. DO NOT attempt to disassemble and reassemble as seal damage will occur, rendering the unit inoperative with a resultant loss of brake performance.

B034

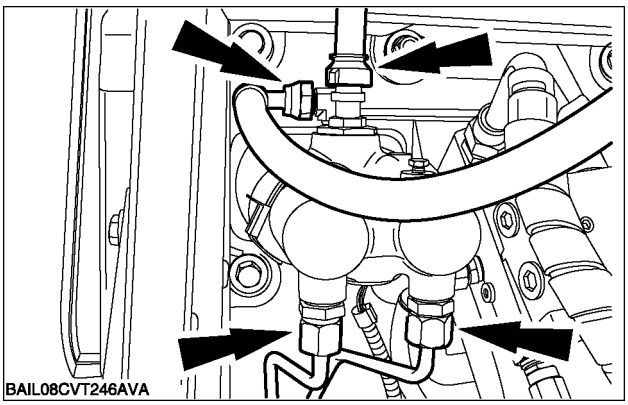
⚠ CAUTION ⚠

The brake accumulator can have a maximum charge pressure of 850 psi. Check for pressure in the accumulator. Remove the pressure in the accumulator before accumulator line is disconnected. Apply the brakes with the pedal approximately 40 times when the engine is off. Loosen the special fitting for removing air from the brakes and push on the brake pedal. If oil flow does not flow from the special fitting, the accumulator is not charged.

M670

1. Depressurise the front brake accumulator as described above.
2. Disconnect the master cylinder oil supply hose, accumulator hose and brake pipe connections.

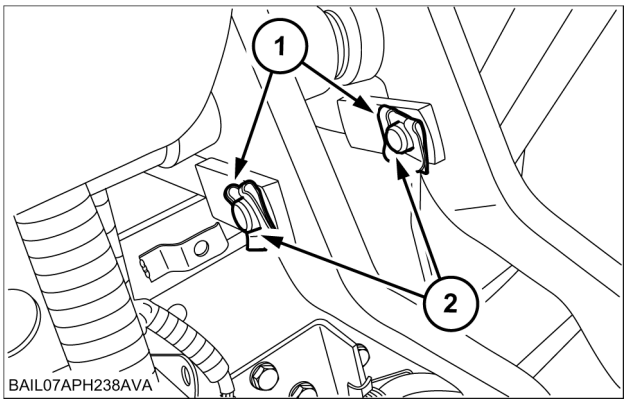
NOTE: *Place a suitable container under the master cylinder to collect drained out fluid.*



BAIL08CVT246AVA 1

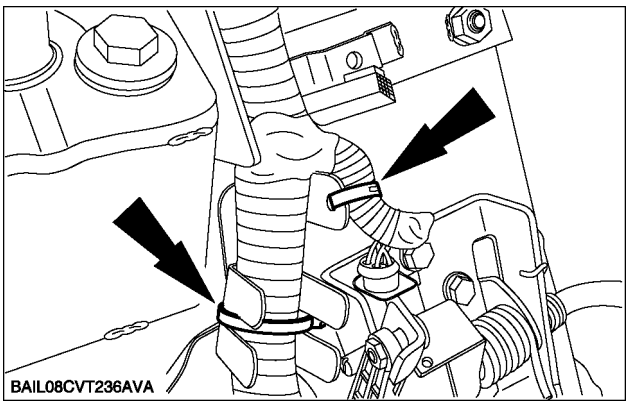
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3. Remove both master cylinder push rod clevis pin split pins **(1)**, and remove the master cylinder push rod clevis pins **(2)**.



BAIL07APH238AVA 2

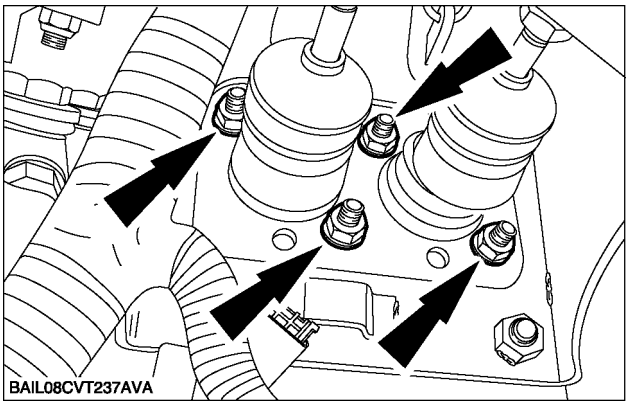
4. Cut the cable ties and position the wiring harness to one side.



BAIL08CVT236AVA 3

5. Remove the four master cylinder retaining nuts. Remove the master cylinder from the vehicle, from the engine side.

NOTE: *Lubricate the gaiters to assist removal of the master cylinder.*



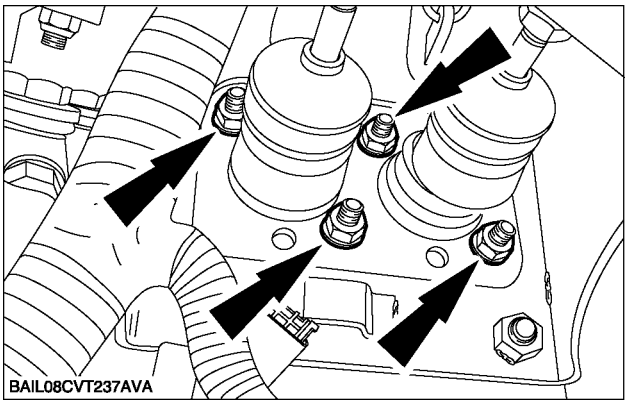
BAIL08CVT237AVA 4

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Master cylinder - Install

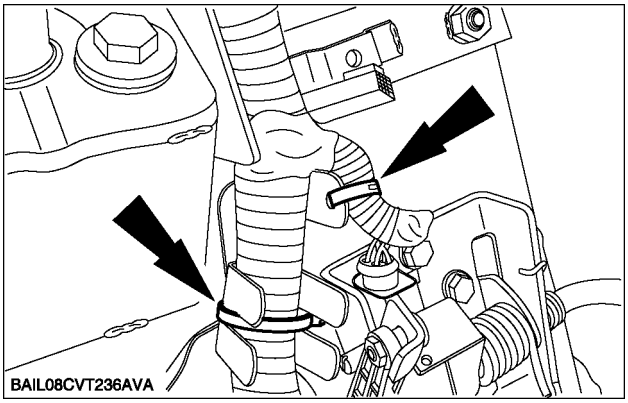
1. From the engine side, install the brake master cylinder.
   Install the four brake master cylinder retaining nuts.

NOTE: *Lubricate the gaiters to assist installation of the master cylinder.*



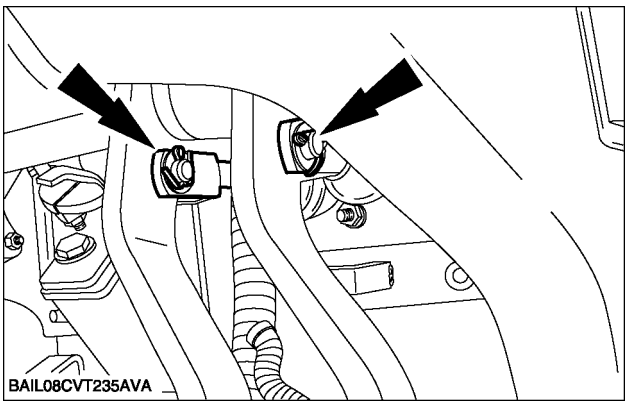
BAIL08CVT237AVA 1

2. Reposition the wiring harness and secure in place with cable ties.



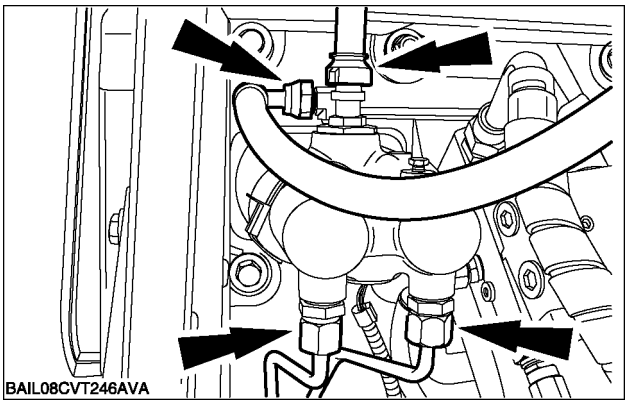
BAIL08CVT236AVA 2

3. Install both brake master cylinder push rod clevis pins **(1)**, and install the brake master cylinder push rod clevis pin split pins **(2)**.



BAIL08CVT235AVA 3

4. Connect the brake master cylinder oil supply hose, accumulator hose and brake pipe connections.



BAIL08CVT246AVA 4

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Next operation:
Adjust the brake pedal height if required.
Bleed the hydraulic brake system, for further information refer to **SERVICE BRAKE Hydraulic - Bleed (D.30.C)**

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Hydraulic line - Remove

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

B026

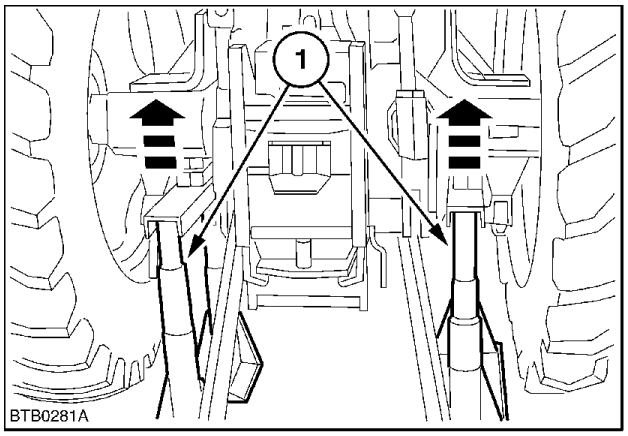
⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

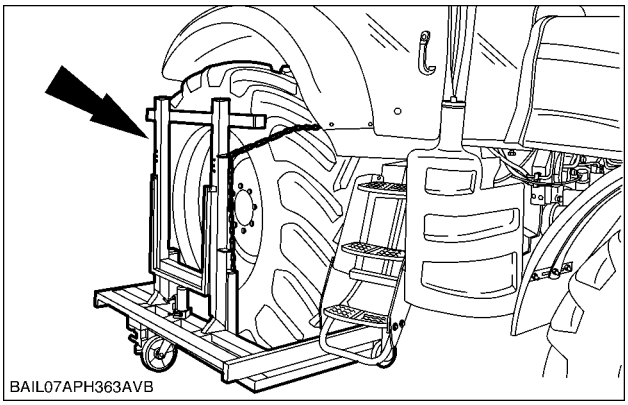
1. Make sure that the vehicle is parked on a level surface.
2. Chock the front wheels using suitable wheels stops.
3. Raise the rear of the vehicle and place two suitable axle stands **(1)** under the final drive cases.

NOTE: *If required, detach the lift rods from the lower links.*



BTB0281A 1

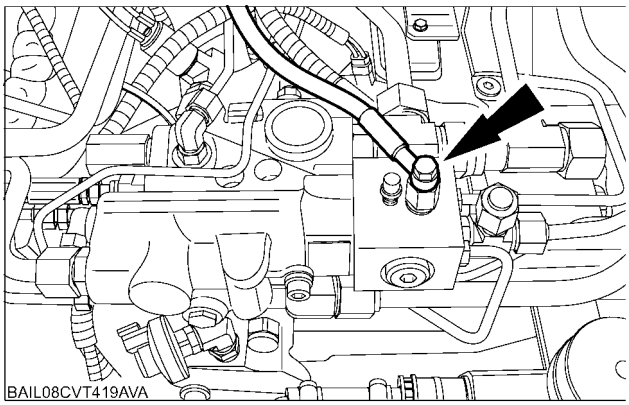
4. Remove the right-hand rear wheel.



BAIL07APH363AVB 2

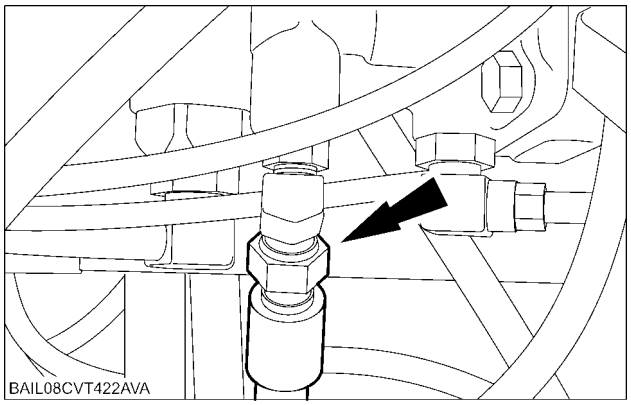
www.truck-freeworkshop.com

5. Disconnect the trailer brake signal line from the control valve.



BAIL08CVT419AVA 3

6. Remove the trailer brake signal line.



BAIL08CVT422AVA 4

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Hydraulic line - Install

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

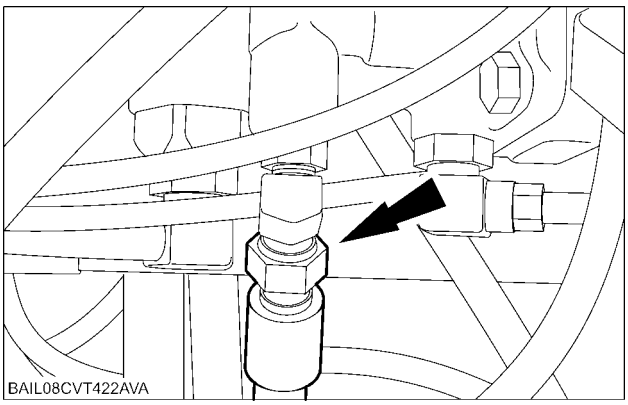
B026

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

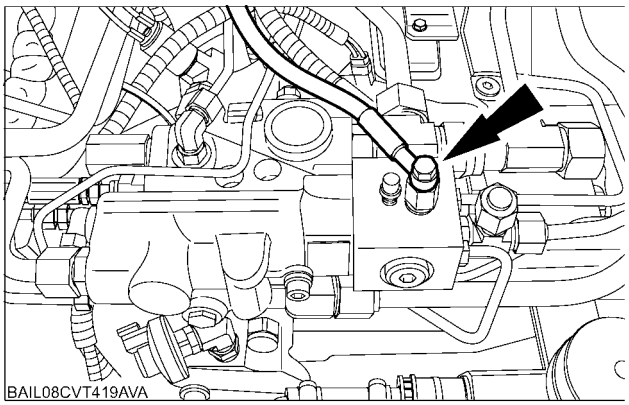
B012

1. Install the trailer brake signal line.



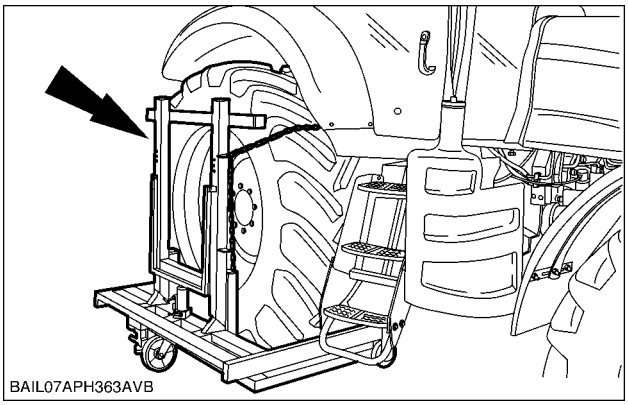
BAIL08CVT422AVA 1

2. Connect the trailer brake signal line to the control valve.



BAIL08CVT419AVA 2

3. Bleed the brakes, for further information refer to **SERVICE BRAKE Hydraulic - Bleed (D.30.C)**.
4. Install the right-hand rear wheel.
   Tighten to **250 Nm** (**184 lb ft**)

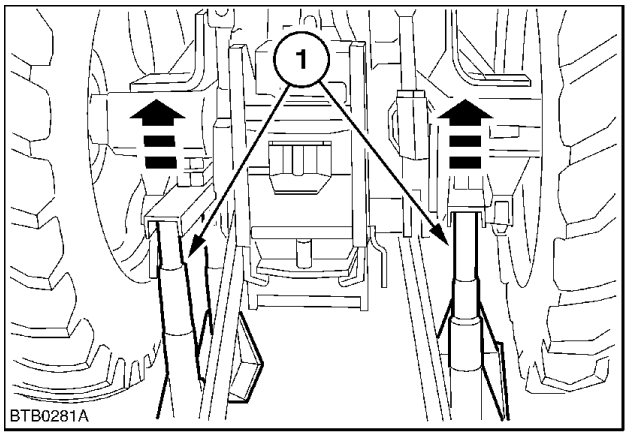


BAIL07APH363AVB 3

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5. Remove the axle stands **(1)**.

NOTE: *If required, attach the lift rods to the lower links.*



BTB0281A 4

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SERVICE BRAKE Hydraulic - Troubleshooting

Problem	Possible Cause	Correction
Brakes remain applied when the brake pedals are released	Seized master cylinder pistons.	Replace the master cylinder.
	Seized master cylinder operating linkage.	Clean and lubricate the linkage. Make sure that water and dirt ingress is not possible.
Brake pedals are difficult to operate	Seized hydraulic master cylinder.	Replace the master cylinder.
	Blocked or flattened brake control lines.	Clean or replace the brake control lines.
Excessive brake pedal travel	Air in the brake system.	Bleed the air form the brake system.
	Worn brake master cylinders	Replace the brake master cylinders.
	Oil leakage from the brake system.	Repair the leakage.
	Rear service brake self adjusters loose in the brake piston.	Replace the brake self adjusters.
Poor braking action - No/low front brake assistance	Worn brake discs.	Replace brake discs.
	Worn brake master cylinder.	Replace brake master cylinder.
	Air in the brake system.	Bleed the air form the brake system.
	Oil leakage from the brake system.	Repair the leakage.
	Front brake valve faulty.	Repair or replace the front brake valve.
	Air in the front brake circuit.	Bleed the air form the front brake circuit.
	Faulty low pressure circuit.	Pressure test the low pressure circuit.
Unbalanced braking	Wrong tyre pressure.	Inflate tyres to correct pressure.
	Worn brake master cylinder.	Replace brake master cylinder.
	Blocked or flattened master cylinder balance tube.	Clean or replace the balance tube.
	Blocked or flattened brake control lines.	Clean or replace the brake control lines.
	Worn or broken master cylinder oil seals.	Replace the master cylinder.
	Worn brake discs on one side.	Replace the brake discs.
Brake noise	Worn brake discs.	Replace brake discs.

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TRAVELLING - D

SERVICE BRAKE Pneumatic - 30.E

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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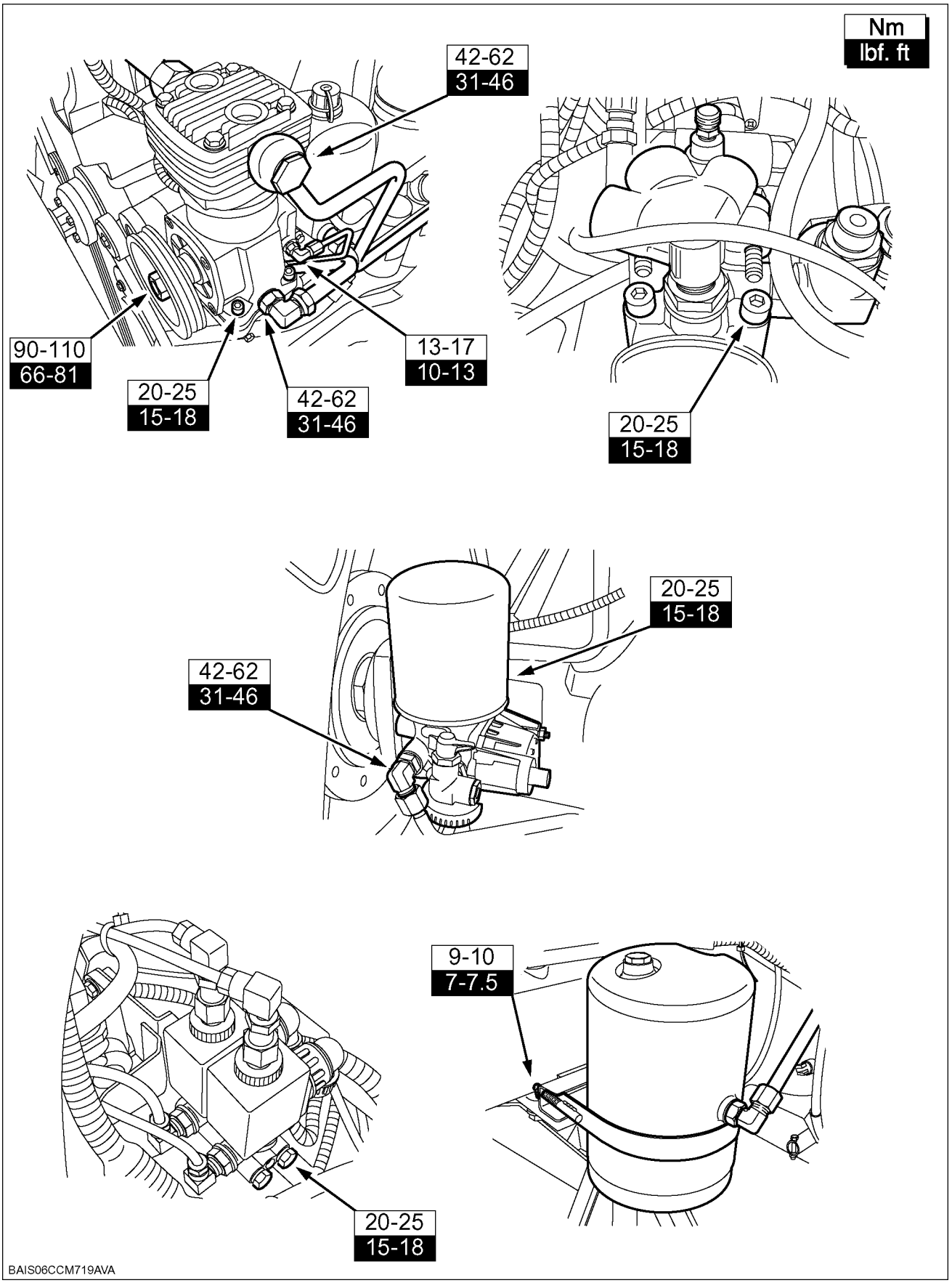
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SERVICE BRAKE Pneumatic - Torque



BAIS06CCM719AVA 1

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SERVICE BRAKE Pneumatic - General specification

Air compressor:	
Location	Left-hand side of engine.
Drive	Belt driven from crankshaft
Type	Single cylinder air cooled
Maximum working speed	**3,000 rev/min**
Lubrication	Pressure fed from engine
Bore / Stroke	**75 mm** x **36 mm**
Displacement	**159 cm3**
Maximum working pressure	**18 bar** (**261 lbf.in2**)
System Operating Pressure (Not adjustable)	**7.8 - 8.3 bar** (**113 - 120 lbf.in2**)
Safety valve setting (Not adjustable)	**14.5 bar 210 lbf.in2**)
Low pressure warning switch operates at,	**4.5 - 5.5 bar** (**65 - 80 lbf.in2**)

Pressure sender	Pressure (bars)	0	2	6	10
	Ohms	10	52	124	184

Maintenance

Drain reservoir tanks	Daily
Compressor drive belt tension	Every **300 hours**
Air drier filter	Every 2 years

Air drier heater

Heater cut-in temperature	7 **+/- 6 °C**
Heating cut off temperature	29.5 **+/- 3 °C**

Solenoid valves — Normally open

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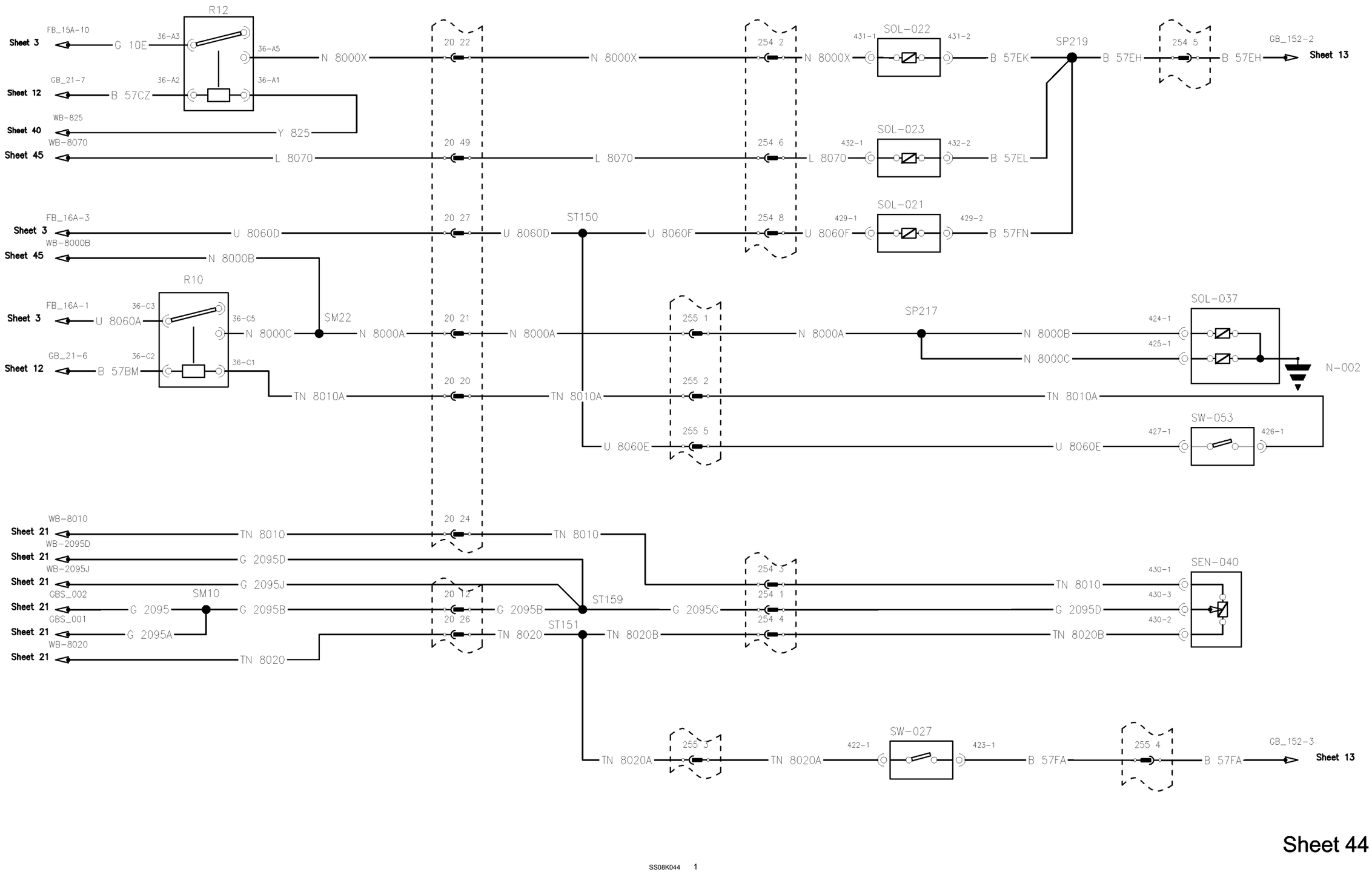
SERVICE BRAKE Pneumatic - Electrical schema Braking (Trailer Brakes)

Compo-nent	Connector	Description
R10	**X036**	Hydraulic Trailer Brake
R12	**X036**	Pneumatic Trailer Brake
SEN-040	**X430**	Pressure Sensor
SOL-021	**X429**	Brake De-Icer
SOL-022	**X431**	Pneumatic Trailer Brake
SOL-023	**X432**	Park Brake Solenoid
SOL-037	**X424**, **X425**	Hydraulic Trailer Brake Solenoid
SW-027	**X422**, **X423**	Low Brake Pressure Line Switch
SW-053	**X427**	Low Pump Output Press Switch
Additional Connectors: **X020**, **X254**, **X255**		

Wire Colour Codes

B	Black	S	Slate	G	Green	P	Purple
N	Brown	R	Red	LG	Light Green	K	Pink
LN	Light Brown	O	Orange	U	Blue	W	White
L	Lilac	Y	Yellow	TQ	Turquoise		

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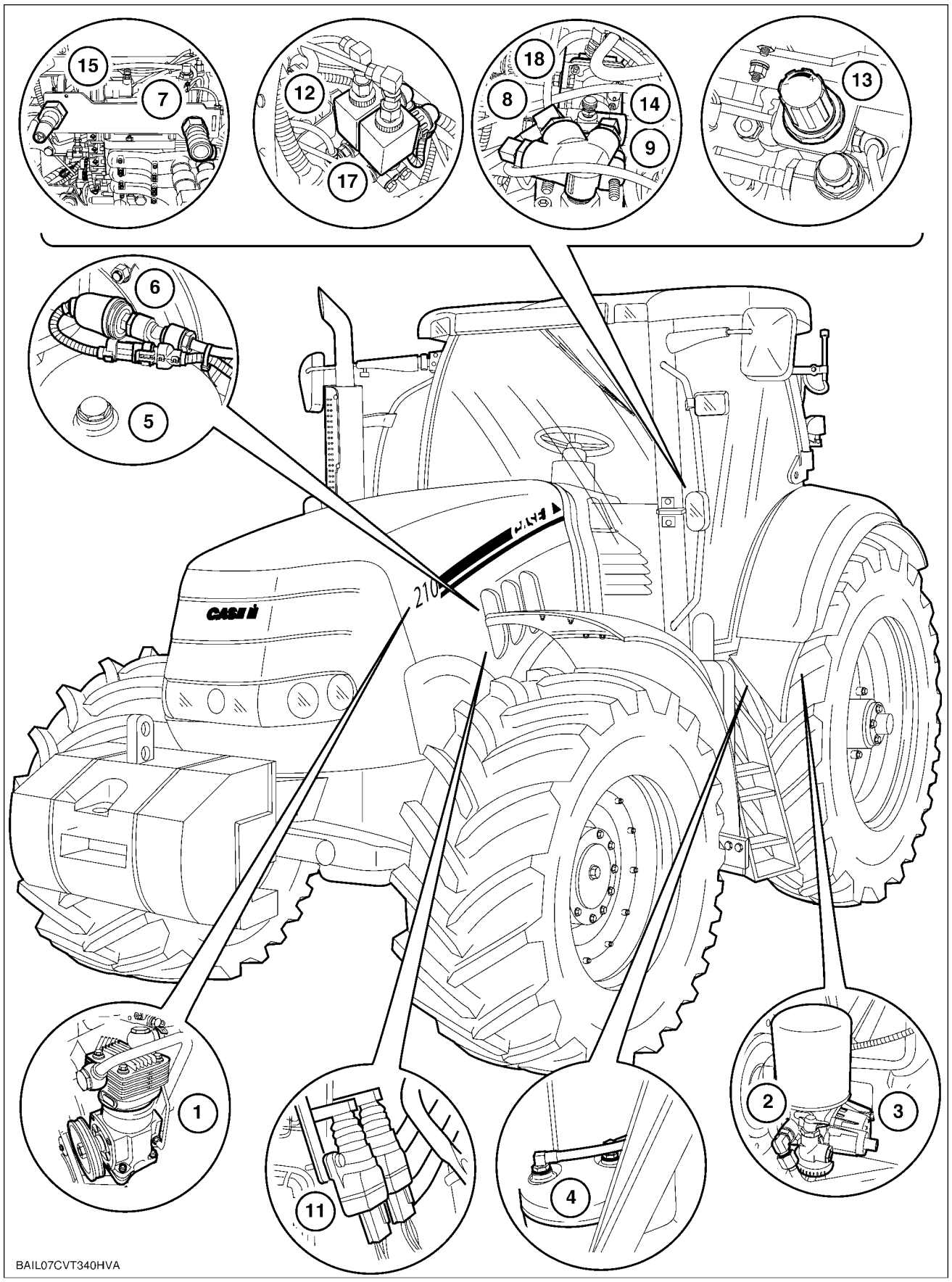
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SERVICE BRAKE Pneumatic - Dynamic description



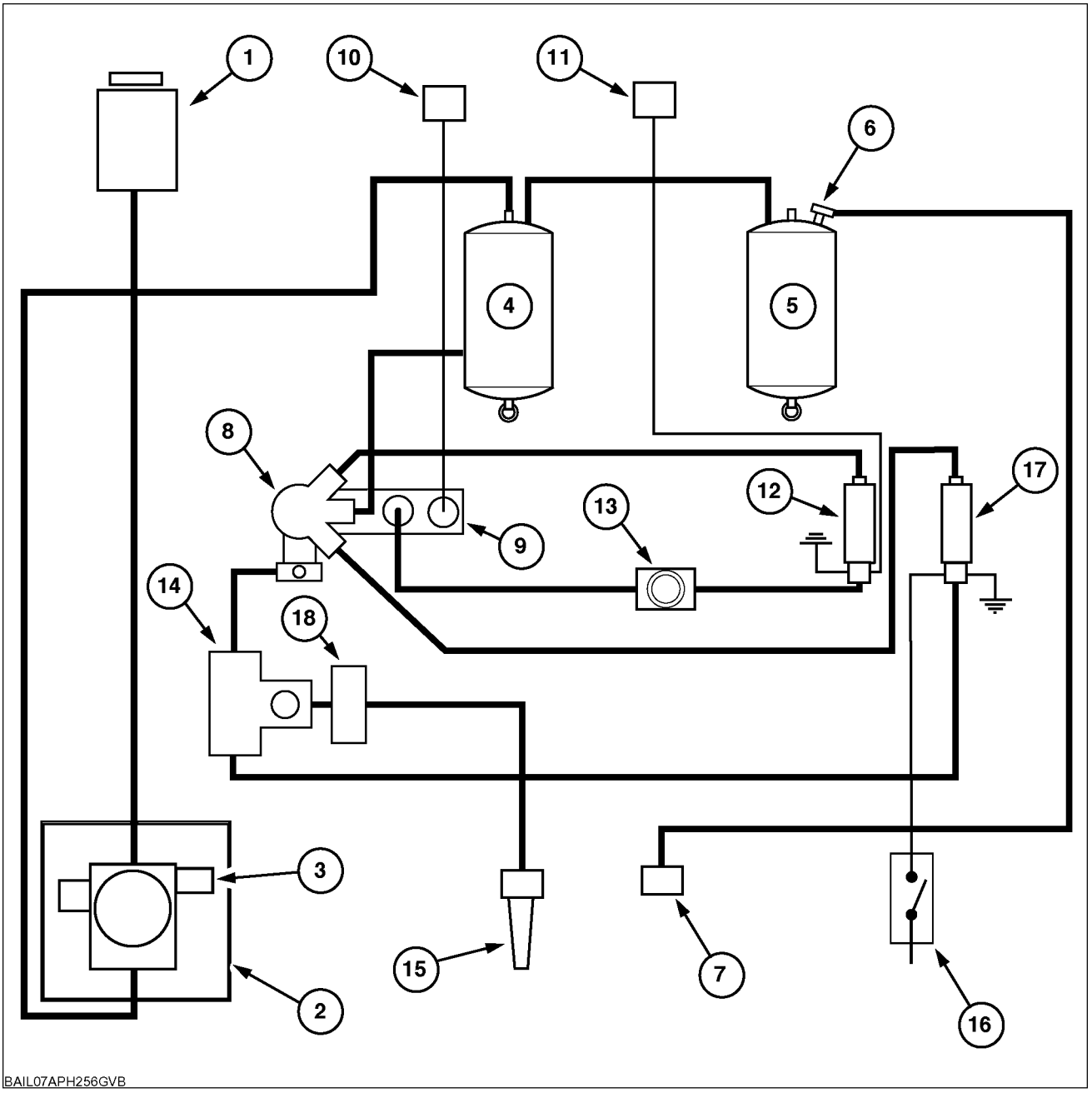
BAIL08CVT340HVA 1

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Component description

Description	Diagram Ref.	Function
Compressor	1	The air compressor is single cylinder, air cooled unit mounted on a cast bracket on the left-hand side of the engine. The unit is belt driven by the crankshaft pulley. Oil feed and return pipes connected to the engine's internal oil gallery provides compressor lubrication.
Filter/drier/heater	2	The filter/drier/heater unit is a self contained unit mounted on the left rear side of the rear axle. As compressed air passes through it on route to the air tanks, it filters and dries the air. In very cold conditions, a heater within the unit warms the air to prevent the system freezing.
Relief valve	3	The relief valve is located in the filter/heater/drier unit and regulates the system pressure, and also removes any contamination from the system during unloading.
Air tanks	4 & 5	Threaded bosses welded onto the tanks accept the various pipes and valves connected to them. Both tanks are fitted with drain valves to enable easy system pressure release.
Pressure switch sender assembly	6	The switch sender connected directly to the right hand air tank closes and completes the circuit to illuminate the warning lamp on the instrument cluster when the pressure drops to **4.5 to 5.5 bar** (**65 to 80 psi**)) or lower.
Coupler-Red	7	The red supply coupler supplies system pressure to the trailer air brakes.
Air Supply Manifold	8	The air supply manifold is a machined cast alloy component connected directly to the dual line control valve.
Dual Line Control Valve	9	The dual line control valve provides balanced control of the hydraulic and pneumatic braking systems.
Logic Control Valve	10	The logic control valve prevents the flow of hydraulic oil to the dual line control valve unless both brake pedals are operated at the same time. This prevents the trailer brakes from working when only one brake pedal has been operated in the vehicle.
Brake Pedal Switches	11	The brake pedal switches are located in the pedal box and operate when the brake pedals are depressed. When both brake pedal switches are operated simultaneously the service brake solenoid is de-energised.
Service Brake Solenoid Valve	12	When both brake pedal switches are operated, the service brake solenoid valve opens and allows a supply of system air to the dual line control valve. This establishes the trailer brake pressure before the tractor brakes become effective, thereby preventing any delay in operation.
Pressure Regulating Valve	13	The pressure regulating valve provides a means for the operator to "fine tune" the pressure supplied from the solenoid valve to the control valve to suit the characteristics of the trailers brakes.
Two-Way Valve	14	The two-way valve supplies system air from either the service brake or the parking brake system to the yellow coupler.
Coupler-Yellow	15	The yellow coupler enables the variable pressure (control) air to be connected to the trailer brakes.
Park Brake Switch	16	The park brake switch closes when the park brake is operated and the park brake solenoid is de-energised.
Park Brake Solenoid Valve	17	When the park brake solenoid valve is activated system air is made available to the yellow coupler via the two way valve.
Quick release valve	18	The quick release valve allows a rapid evacuation of the yellow control line pressures when the brake pedals or park brake are released.

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BAIL07APH256GVB 2

Air Brake Schematic Diagram

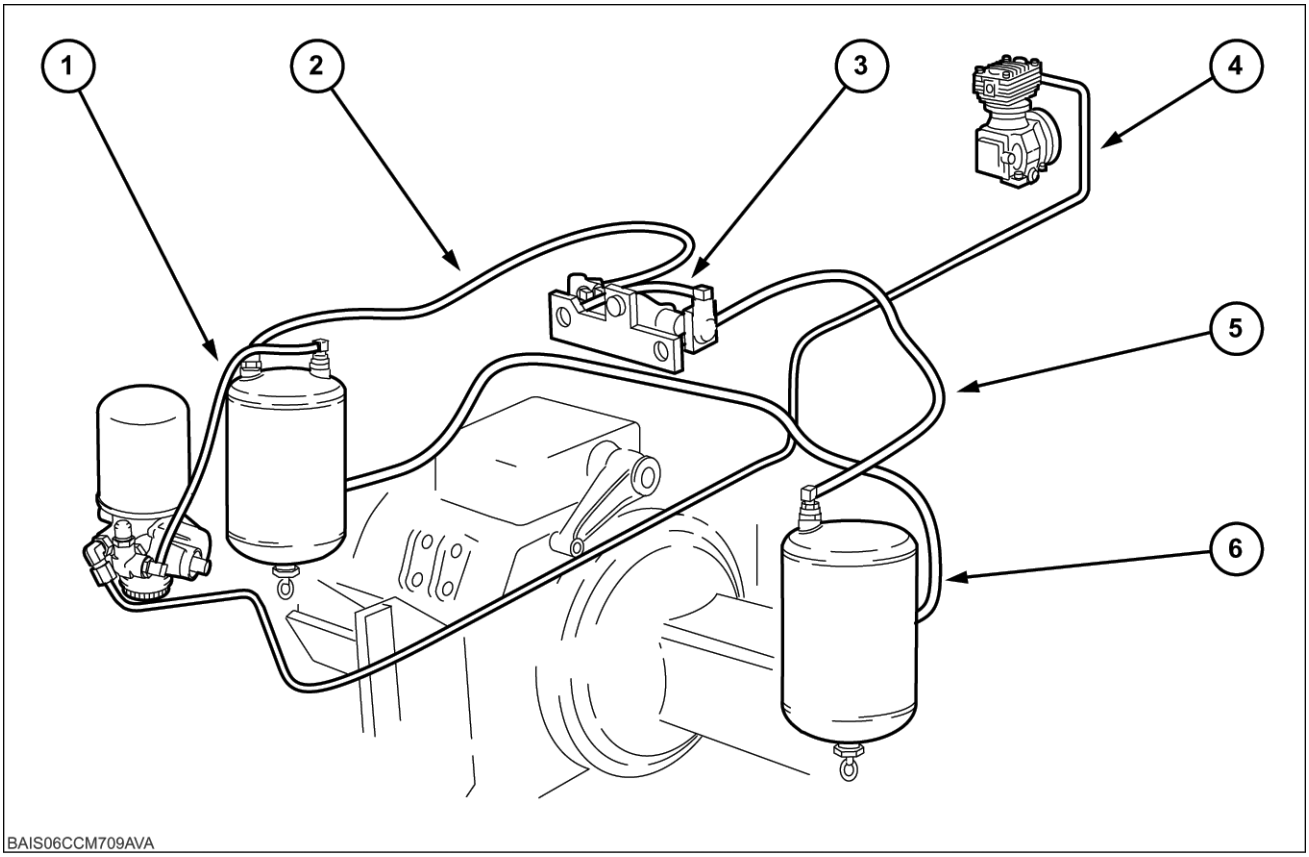
1. Air Compressor
2. Filter Drier
3. Relief Valve (**8 bar**).
4. Left-hand Air Tank (**10 litres**)
5. Right-hand Air Tank (**10 litres**)
6. Pressure Switch / Sensor Assembly
7. Coupler Dual Line (Supply) Red
8. Air Supply Manifold
9. Dual Line Control Valve
10. Logic Control Valve
11. Brake Pedal Switch
12. Service Brake Solenoid (Normally Open)
13. Pressure Regulating Valve
14. Two-Way Valve
15. Coupler Dual Line (Control) Yellow
16. Park Brake Switch
17. Park Brake Solenoid (Normally Open)
18. Quick Release Valve

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System Description

Filtered air is drawn into the system and compressed by the engine driven compressor **(1)**.
The compressed air is supplied to the air filter/drier/heater unit **(2)** which filters the compressed air and removes water vapour. In cold conditions, an internal heater will be switched on at a temperature of **7+/-6 °C** to warm the air as it passes through the drier. The heater will switch off when the temperature reaches **29.5 +/- 3 °C**.
The relief valve **(3)** releases excess air pressure preventing damage to the system. This valve also removes any contamination from the system during release.
From the filter/drier/heater unit, the compressed air is supplied to the left-hand air tank **(4)**, which via a balance pipe pressurises the right-hand tank **(5)**. This second tank increases the compressed air storage capacity and the balance pipe ensures the pressure in both tanks remains equal.
A pipe from the right-hand air tank constantly provides air at system pressure to the red coupler **(7)**. A pipe from the left hand air tank provides air at system pressure to the air supply manifold **(8)** which is connected directly to the dual line control valve **(9)**.
When both brake pedals are operated simultaneously, the logic control valve **(10)** allows hydraulic pressure to be applied to the first input of the dual line control valve **(9)**. As both brake pedal switches **(11)** open simultaneously, this de-energises the service brake solenoid **(12)**. The solenoid valve will then allow system pressure from the supply manifold **(8)** to be supplied via the manually operated pressure regulating valve **(13)** to the second input of the dual line control valve **(9)**. This starts to increase the air pressure in the yellow control line before the vehicle brakes are applied, so the trailer brakes are applied before the vehicle brakes. The manually operated pressure regulating valve **(13)** allows the operator to manually set the delay between the application of trailer brakes and the application of the vehicle brakes.
When a proportional hydraulic pressure is applied to the dual line control valve **(9)** a proportionate supply of compressed air via a two-way valve and quick release valve **(14)** is supplied to the yellow control line coupler **(18)**.
When the park brake is applied, the park brake switch opens and de-energises the park brake solenoid **(17)**. The solenoid valve will then allow system pressure from the supply manifold **(8)** to be supplied via the two-way valve **(14)** and quick release valve **(18)** to the yellow control line coupler **(15)**.
The two-way valve **(14)** and quick release valve **(18)** allow a rapid evacuation of the yellow control line pressures when the brake pedals or park brake are released.
Should system pressure fall below **4.5 to 5.5 bar** (**65 to 80 psi**) the pressure switch/sender assembly **(6)** causes a warning light to be illuminated on the instrument cluster in the cab.

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BAIS06CCM709AVA 3

Universal Air Brake - Pneumatic Connections

1. Control Valve to Left-hand Air Tank
2. Left-hand Air Tank to Dual Line Control Valve
3. Yellow Coupler Supply
4. Compressor to Relief valve
5. Red Coupler Supply
6. Air Tank Balance Pipe

Universal Air Brake Option

Brakes Disengaged

Air from the compressor is supplied to the relief valve which regulates stored system pressure in the air tanks.
Constant system pressure supplied via the red coupler disengages the trailer brakes.
The pressure sender supplies a variable electrical signal to the pressure gauge on the instrument cluster. If the pressure drops below the specified limit, the sender incorporates a switch to illuminate the instrument cluster warning lamp.

Brakes Engaged

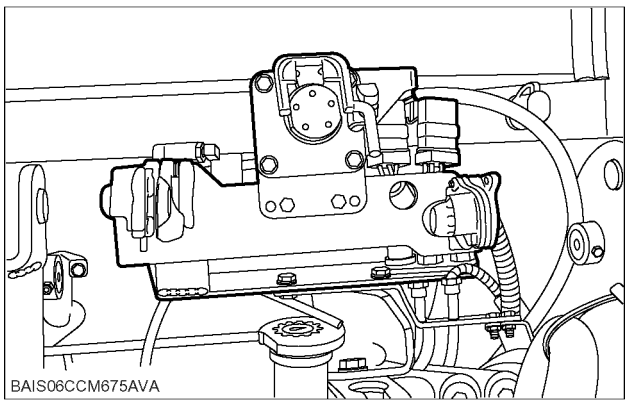
Operating the brake pedals closes the brake switches which sends a signal to the solenoid valve. When energised this supplies air via the pressure regulator to the control valve as pilot pressure to initiate operation of the trailer brakes via the yellow control line coupler .
As the vehicle brakes are applied, hydraulic pressure from the master cylinders is transferred via the brake logic valve to the control valve to progressively increase pressure in the yellow control line to the trailer's brake control valve to engage the brakes in line with the tractor brakes.

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SERVICE BRAKE Pneumatic - Static description

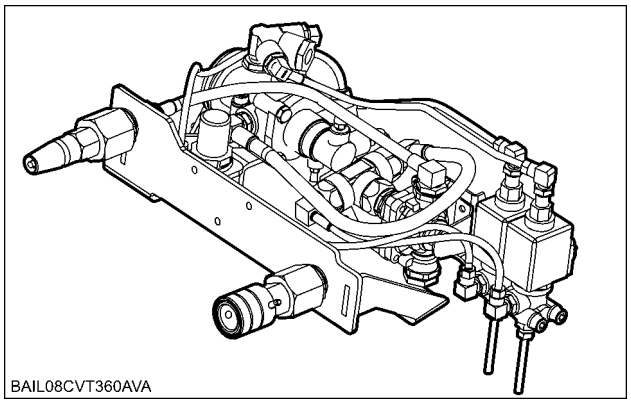
There are three versions of the air trailer brake available.
These can be easily identified by the coupler configuration at the rear of the cab.
Universal
A generally accepted air brake providing a dual line system available with either in-line fittings or side mounting type couplers depending upon national requirements.

Universal with Side mounting couplers.



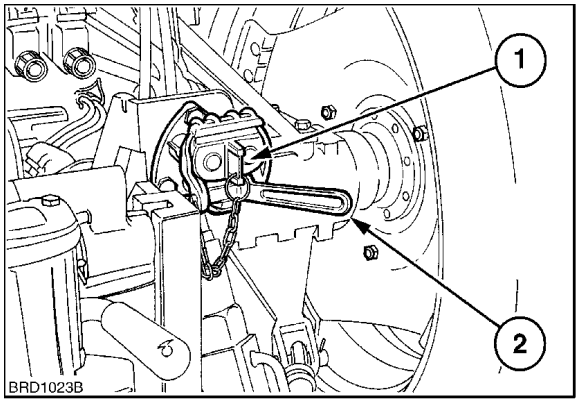
BAIS06CCM675AVA 1

Universal UK specification with push on couplers.



BAIL08CVT360AVA 2

“Italian"
An air brake system designed to meet Italian legislation and providing dual line operation.



BRD1023B 3

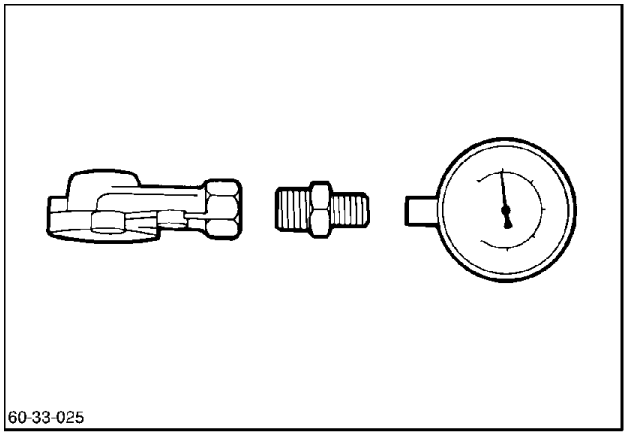
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SERVICE BRAKE Pneumatic - Pressure test

Vehicle Preparation

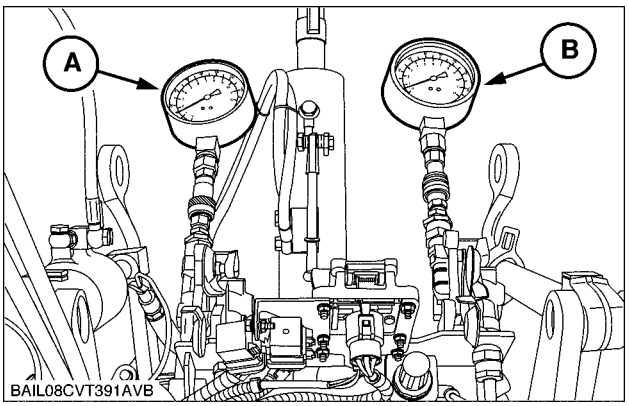
1. Position the vehicle on a flat level surface and in a suitable location to allow the engine to run during the testing.
   Chock the wheels and make sure that the parking brake is in the OFF position.

2. To carry out the test, it will be necessary to obtain the correct trailer side couplers for the system, to couple up to the tractor connectors.



60-33-025 1

3. Use suitable fittings to connect to each trailer side coupler a **0 - 10 bar**, undamped (**100 mm**), pressure gauge.
   Connect one gauge **(A)** on the red supply line and the other gauge **(B)** on the yellow control line.
   - On Italian trailer brake systems, the lines are designated as A for automatic and M for modulated.

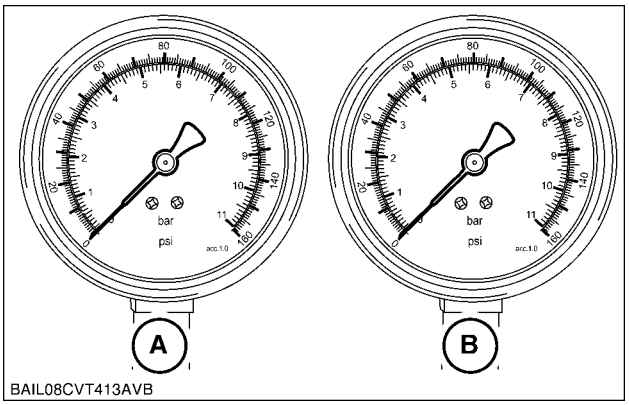


BAIL08CVT391AVB 2

4. Turn the ignition key to position 1.

5. Make sure that the parking brake and the electronic park lock (EPL) (if fitted) are fully released.

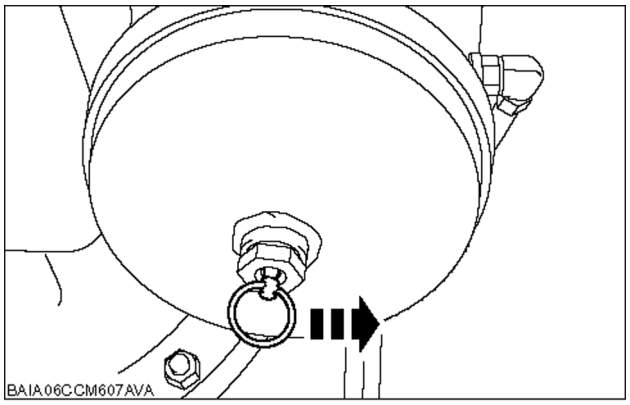
6. Make sure that the test gauges and the pressure display in the instrument cluster are reading zero.



BAIL08CVT413AVB 3

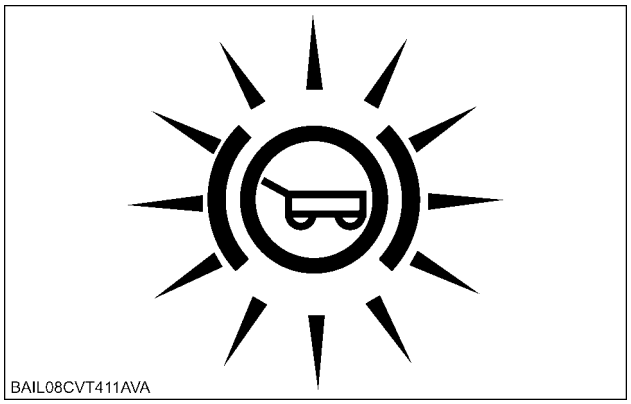
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7. Drain the air tanks if required.



BAIS06CCM607AVA 4

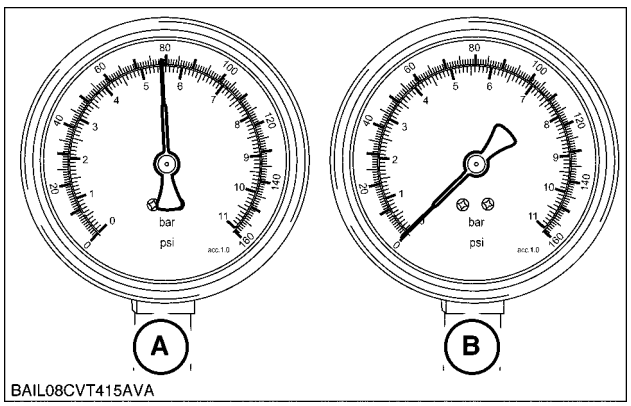
8. Make sure the low pressure warning lamp in the instrument cluster is illuminated.



BAIL08CVT411AVA 5

System Charge

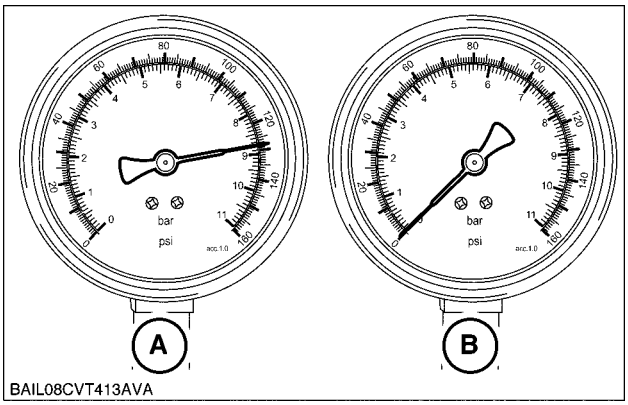
9. Start the engine and allow the pneumatic system to pressurise.
10. The system will normally be fully pressurised within 2 minutes at 900 ERPM, if maximum operating pressure is not obtained within 3 minutes, check for leaks or a faulty relief valve within the dryer assembly.
11. Make sure that the low air pressure warning lamp within the instrument cluster extinguishes as soon as the red line pressure **(A)** exceeds **5.5 bar**.



BAIL08CVT415AVA 6

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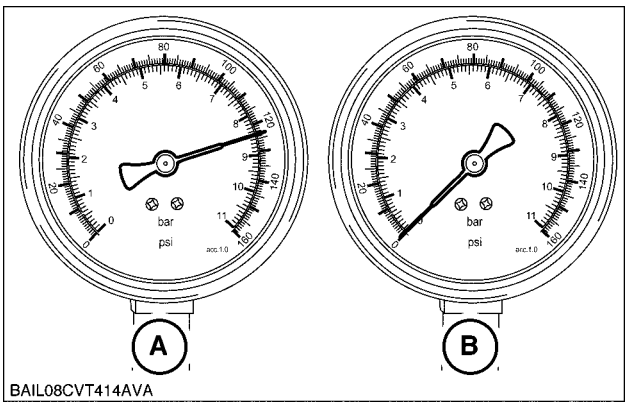
12. Observe the test gauge installed in the red supply line **(A)** to make sure that as maximum pressure of **8.3 - 8.8 bar** is achieved a pop should be heard as the relief valve operates.



BAIL08CVT413AVA 7

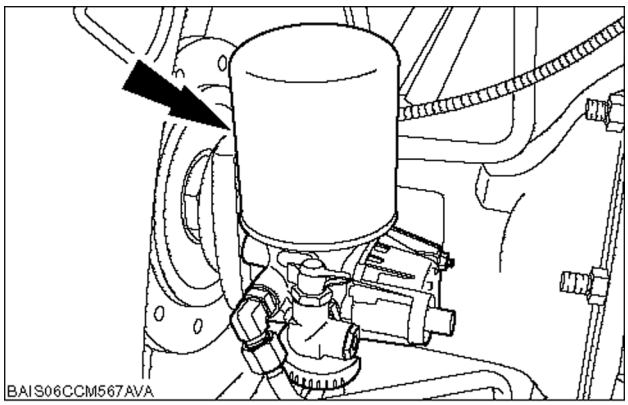
13. Gradually, during the following 3 to 5 seconds the pressure must drop by **0.3 - 0.5 bar** which indicates the dryer is regenerating.

14. Check that the final red line pressure **(A)** is between **7.8 - 8.5 bar** and the yellow line pressure **(B)** is **0 bar**.



BAIL08CVT414AVA 8

15. If the red supply line pressure is not correct, install a new dryer/relief valve assembly. DO NOT adjust the relief valve setting.



BAIS06CCM567AVA 9

16. If the yellow line pressure is not zero, refer to Performance Check - Parking Brake Operation, and Performance Check - Brake Pedal Operation (if EPL is fitted) in this procedure for fault rectification.

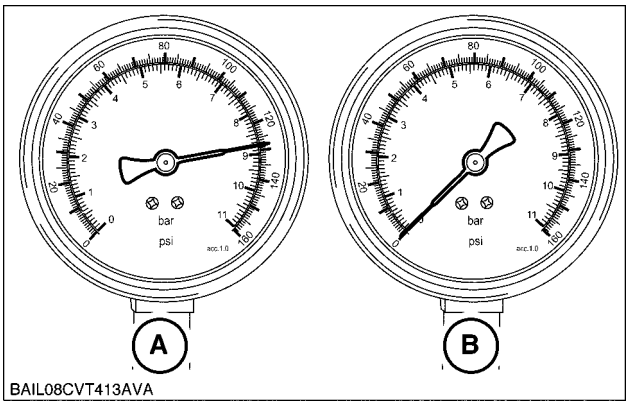
Relief Valve Operation

17. With the engine at idle, fully apply and release the foot brake pedals several times so that the air is exhausted and the system pressure falls.

18. When the pressure in the red supply line drops below **7 bar**, the compressor must come back on load and recharge the system.

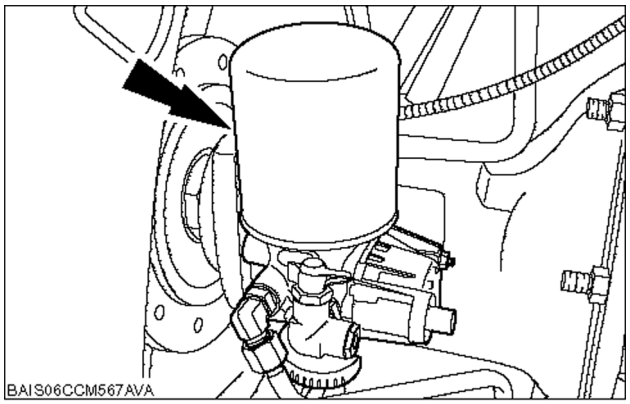
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19. When full system pressure is achieved a pop should be heard as the relief valve operates. The red line pressure **(A)** must be **8.3 - 8.8 bar**.



BAIL08CVT413AVA 10

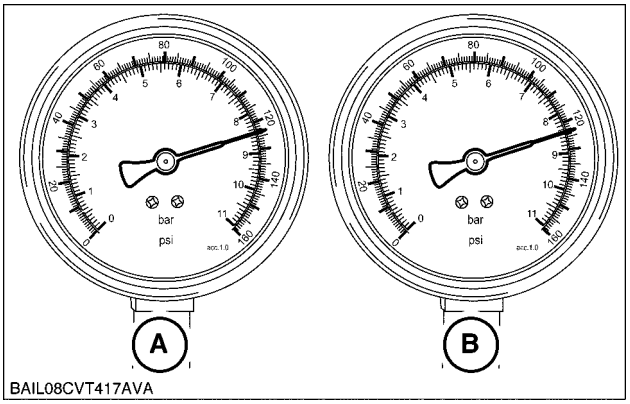
20. If the relief operation is incorrect, install a new dryer/ relief valve assembly. DO NOT adjust the pressure setting of the valve.



BAIS06CCM567AVA 11

Performance Check - Parking Brake Operation

21. With the engine at idle and the EPL disengaged (if fitted) apply the parking brake lever by 2-4 clicks on the ratchet. The test gauges must read as follows:
Red supply line **(A)** - **7.8 - 8.5 bar**.
Yellow control line **(B)** - **7.3 - 8.5 bar**.



BAIL08CVT417AVA 12

22. When the parking brake is released, the yellow control line pressure must drop to zero bar. If the pressure does not drop, check for the following possible faults:

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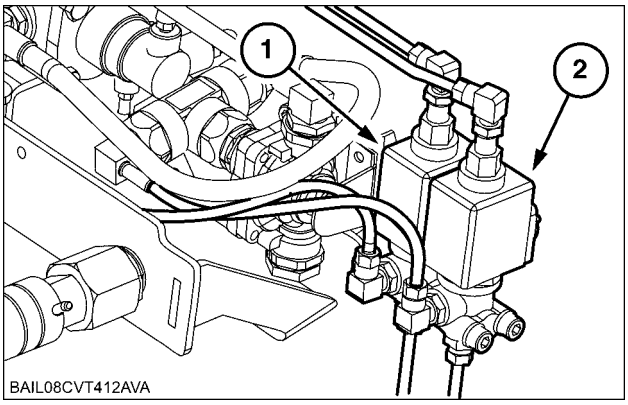
23. A. Check that both solenoid valves installed to the rear bracket assembly are electrically connected. Note: The electrical connector with the red trace (parking brake) **(2)** connects to the outer right-hand side solenoid valve and the yellow trace (advance) **(1)** connects to the inner left-hand side solenoid valve.

    B. Check that the parking brake warning switch is installed correctly to the parking brake, is electrically connected and operating correctly.

    C. The EPL (if fitted) is not engaged and is operating correctly.

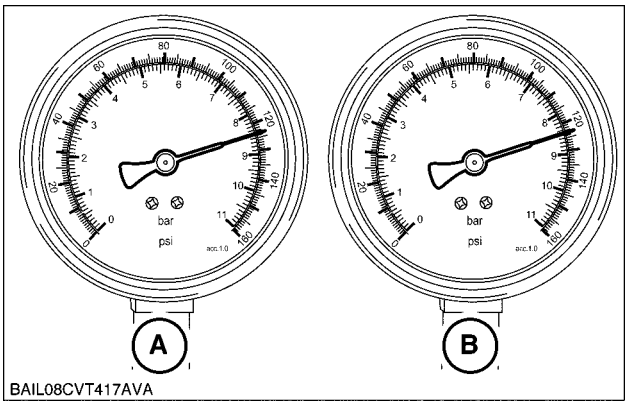
    D. Check the trailer brake relay is installed correctly.

    E. If EPL is fitted, check that the configuration in the on-board diagnostic (HH menus) XA, H3, Ch2 is set to 0001.



BAIL08CVT412AVA 13

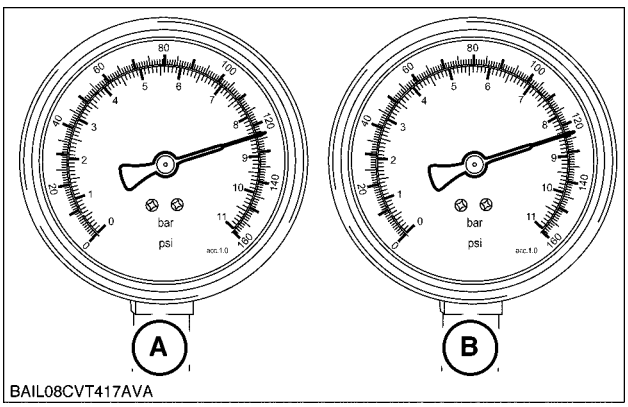
24. With the parking brake and EPL (if fitted) both disengaged and the ignition switched OFF, the yellow control line must fail-safe and the pressure in the test gauge **(B)** must rise to **7.3 - 8.5 bar**.



BAIL08CVT417AVA 14

Performance Check - Electronic Park Lock (EPL) Operation (if fitted)

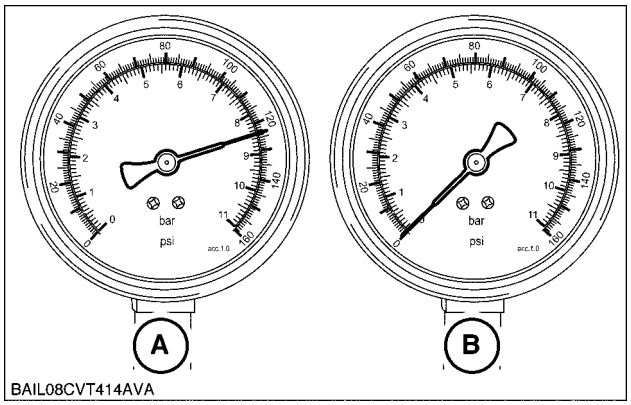
25. With the engine at idle and the parking brake disengaged, apply the EPL. The test gauges must read as follows:
    Red supply line **(A)** - **7.8 - 8.5 bar**.
    Yellow control line **(B)** - **7.3 - 8.5 bar**.



BAIL08CVT417AVA 15

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26. When the EPL is released, the yellow control line pressure **(B)** must drop to **0 bar**. If the pressure does not drop, check for the following possible faults:



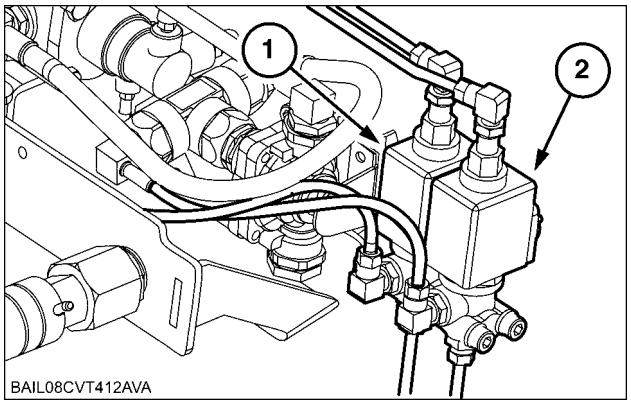
BAIL08CVT414AVA 16

27. A. Check that both solenoid valves installed to the rear bracket assembly are electrically connected. Note: The electrical connector with the red trace (parking brake) **(2)** connects to the outer right-hand side solenoid valve and the yellow trace (advance) **(1)** connects to the inner left-hand side solenoid valve.

    B. Check that the parking brake warning switch is installed correctly to the parking brake, is electrically connected and operating correctly.

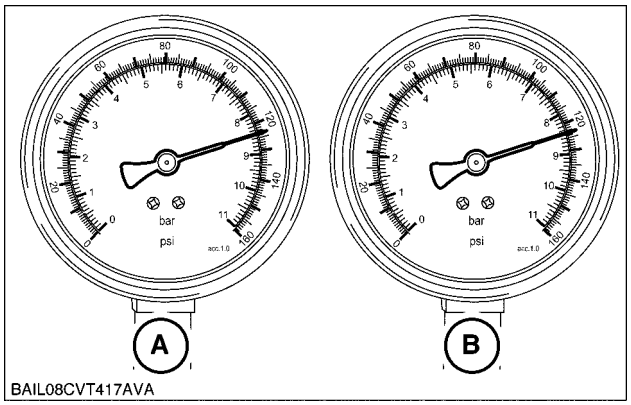
    C. Check that the parking brake is not engaged and is operating correctly.

    D. Check that the configuration in the on-board diagnostic (HH menus) XA, H3, Ch2 is set to 0001.



BAIL08CVT412AVA 17

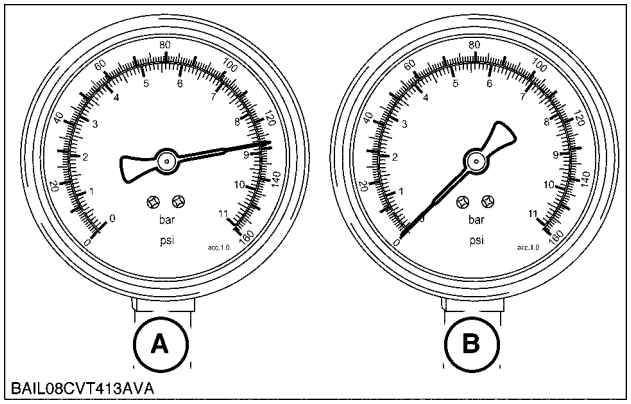
28. With the parking brake and EPL (if fitted) both disengaged and the ignition switched OFF, the yellow control line must fail-safe and the pressure in the test gauge **(B)** must rise to **7.3 - 8.5 bar**.



BAIL08CVT417AVA 18

Performance Check - Brake Pedal Operation

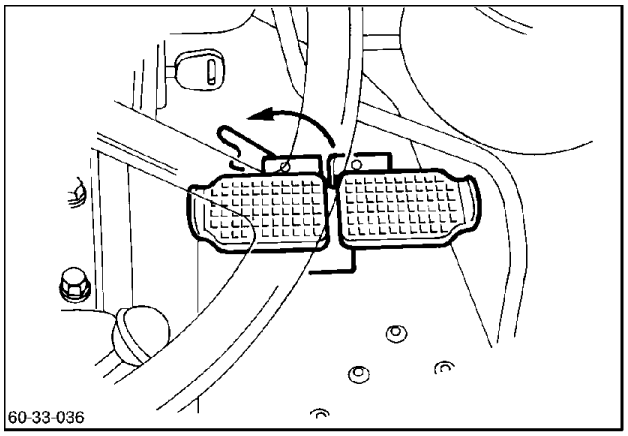
29. With the engine at idle and the parking brake and EPL (if fitted) released, check that the red line test gauge **(A)** reading is **8.3 - 8.8 bar**. If necessary apply the brake pedals several times to bring the compressor on load and wait until the relief valve operates indicated by an audible pop.



BAIL08CVT413AVA 19

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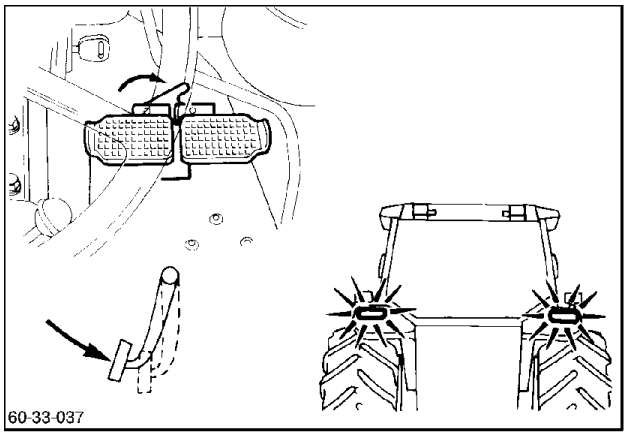
30. Unlatch the brake pedals, apply the left-hand and right-hand brake pedals individually and check the test gauge readings, there must be no change in the readings.



60-33-036 20

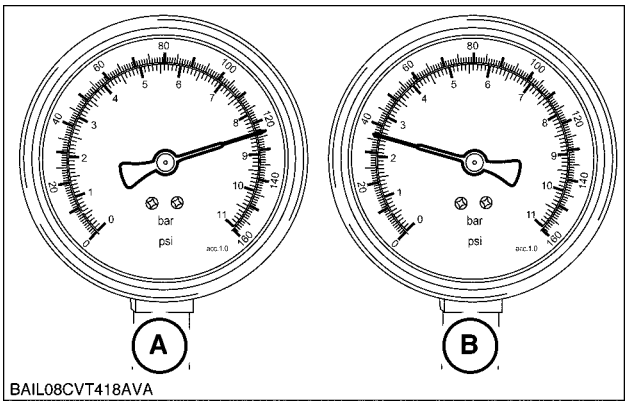
31. Relatch the brake pedals.

32. Gently apply pressure to the linked brake pedals until both brake light switches have just clicked on. The stop lights will operate and the 4WD indicator on the instrument cluster should illuminate.



60-33-037 21

33. While maintaining full red system pressure **(A)**, the yellow control line pressure **(B)** must rise to a value between **0.5 - 2.5 bar**.

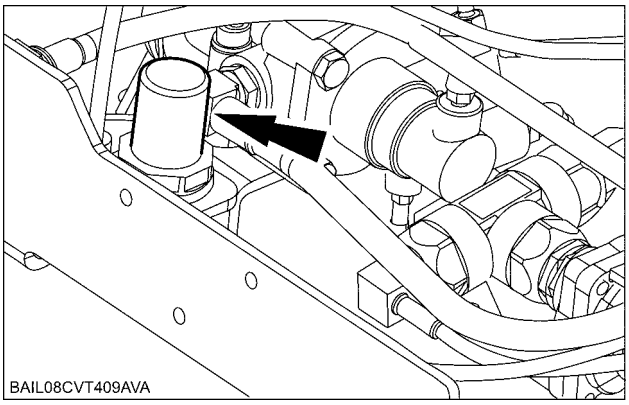


BAIL08CVT418AVA 22

34. If more than **15 mm** of brake pedal travel is required to operate either brake light switch, the required advance braking on the trailer control line may not occur. If this is the case, the brake light switch must be adjusted to operate within **15 mm**.

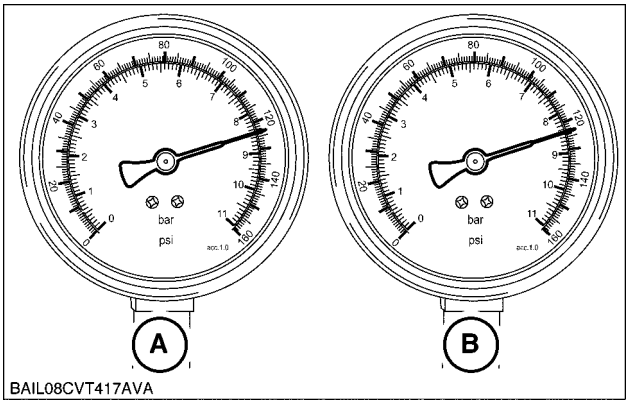
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35. If the advance pressure is still not apparent, check that the pressure regulator (if fitted), located on the rear brake assembly is turned fully clockwise (MAX). Pull out the control knob to adjust and push back in to lock.



BAIL08CVT409AVA 23

36. Apply a steadily increasing foot pressure to the latched brake pedals. The yellow control line pressure **(B)** must increase gradually to its maximum pressure of **7 - 8.5 bar**.



BAIL08CVT417AVA 24

Leak Test

37. With the system fully charged, the engine OFF and the parking brake and EPL (if fitted) applied, leave the vehicle standing.

NOTE: *Wait 30 seconds for the system pressures to stabilise before checking the system pressure.*

38. After 10 minutes there must be no more than **0.05 bar** drop in system pressure.

39. Any indication of leakage must be rectified and the test repeated.

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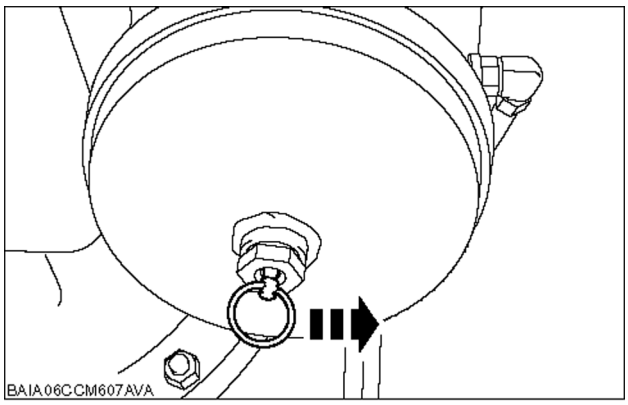
Air valve Dual line - Remove

⚠ WARNING ⚠

Before removing any air system component make sure that there is no air pressure in the system. This can be achieved by depressing and releasing the brake pedal several times with the engine off and draining the air reservoirs. Also make sure that the wheels of the vehicle are chocked.

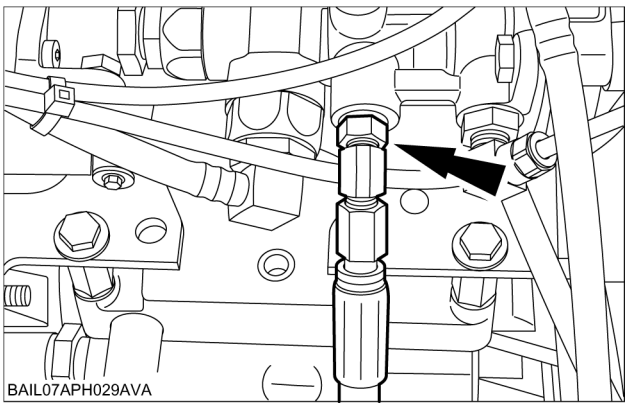
B022

1. Release the trailer brake system pressure from the trailer brake air tanks.



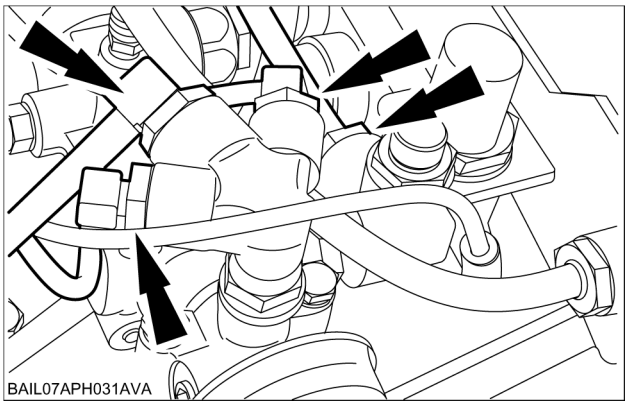
BAIS06CCM607AVA 1

2. Disconnect the hydraulic brake connection, cap the end of the tube to prevent contamination and excessive loss of brake oil.



BAIL07APH029AVA 2

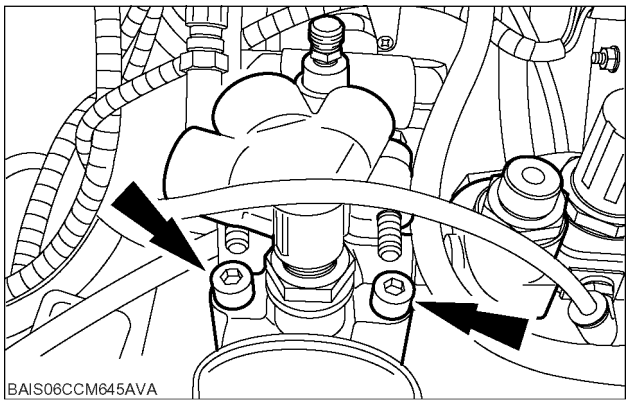
3. Disconnect the air lines.



BAIL07APH031AVA 3

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4. Remove the retaining bolts and remove the dual line control valve.



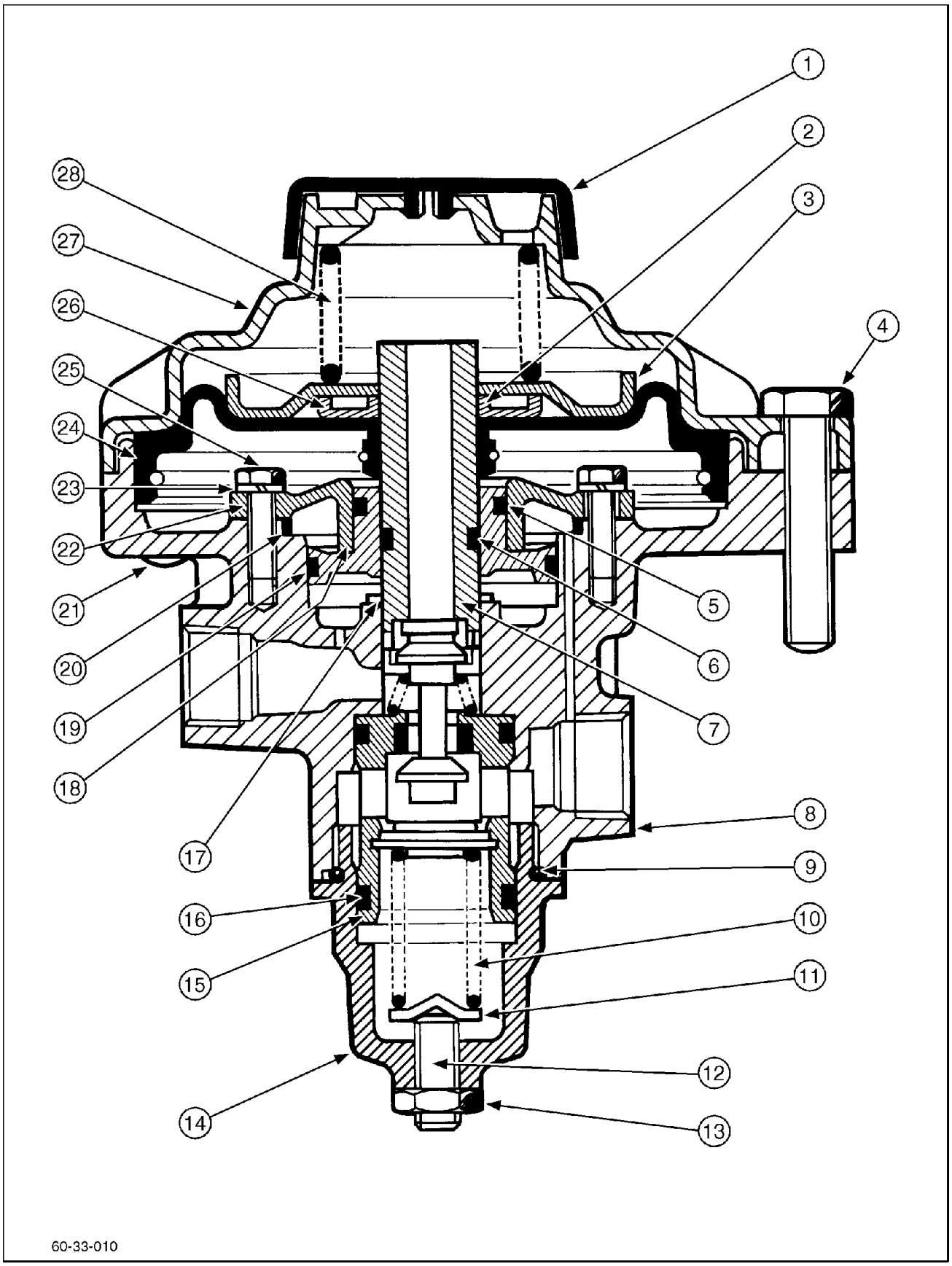
BAIS06CCM645AVA 4

5. Reassembly is the reversal of removal.

Next operation:
Bleed the brake system. For further information refer to **SERVICE BRAKE Hydraulic - Bleed (D.30.C)**.

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Air valve Dual line - Overhaul



60-33-010 1

SINGLE LINE CONTROL VALVE

Key to Components - Figure 1.

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1.	Cap	15.	Valve
2.	Lock ring	16.	O-Ring
3.	Diaphragm Disk	17.	Lock ring
4.	Bolt	18.	Piston
5.	O-Ring	19.	O-Ring
6.	O-Ring	20.	Bolt
7.	Valve Tappet	21.	O-Ring
8.	Housing	22.	Support
9.	‘O’ Ring	23.	Spring Washer
10.	Compression Spring	24.	Diaphragm
11.	Spring Plate	25.	Bolt
12.	Adjuster Screw	26.	Cup Seal
13.	Locknut	27.	Cover
14.	End Cap	28.	Spring

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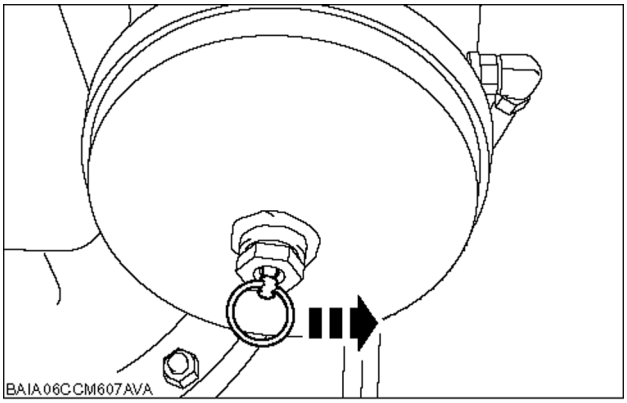
Air valve Single line - Remove

⚠ WARNING ⚠

Before removing any air system component make sure that there is no air pressure in the system. This can be achieved by depressing and releasing the brake pedal several times with the engine off and draining the air reservoirs. Also make sure that the wheels of the vehicle are chocked.

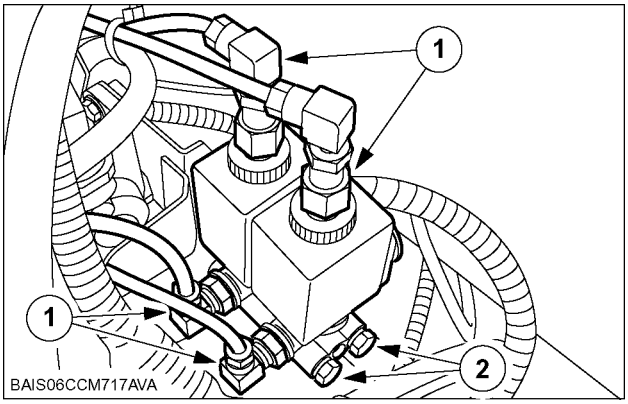
B022

1. Release the trailer brake system pressure from the trailer brake air tanks.



BAIS06CCM607AVA 1

2. Disconnect the air lines to the single line control valve and to the solenoids **(1)**. Remove the retaining bolts **(2)** and remove the single line control valve.

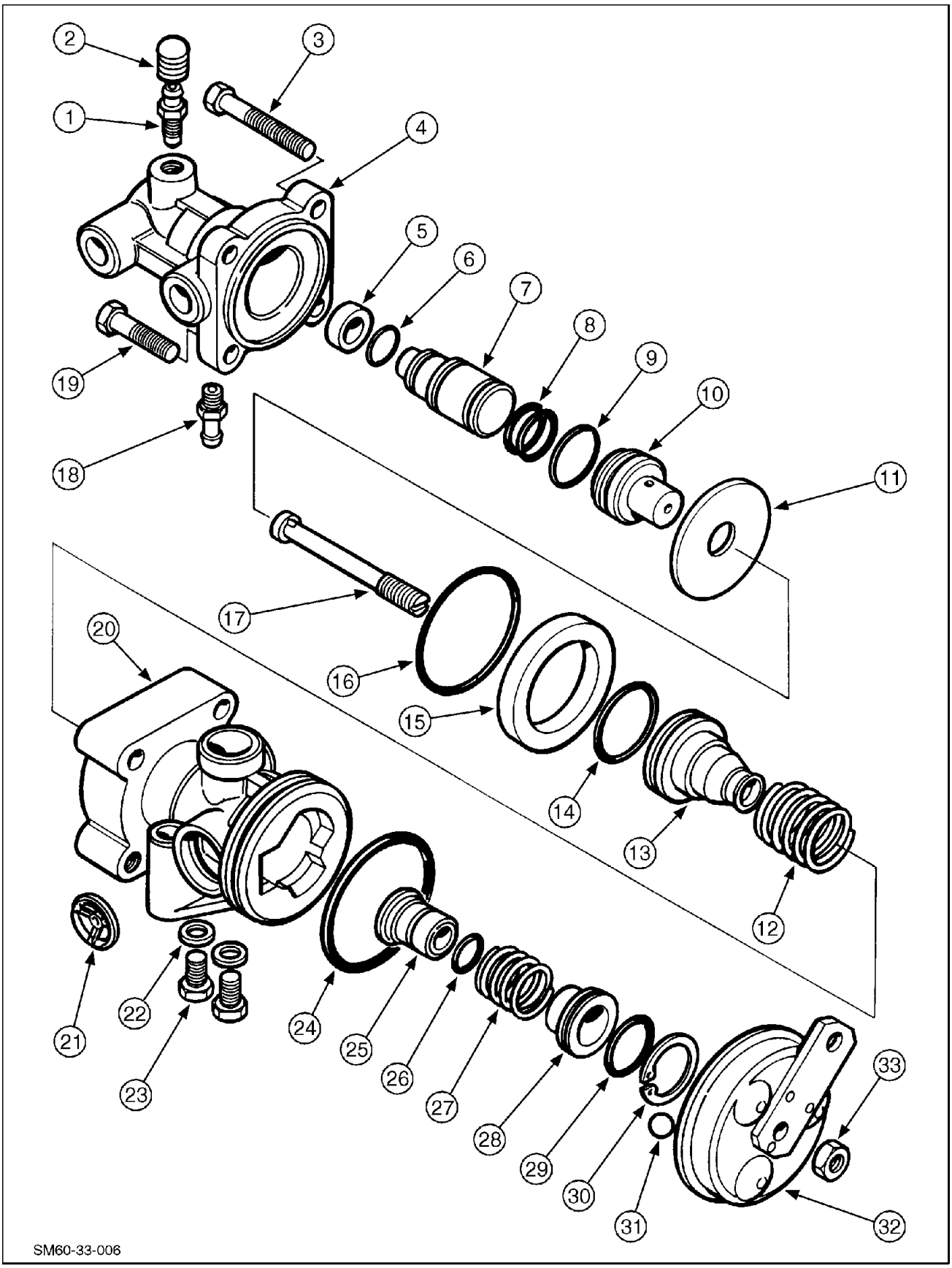


BAIS06CCM717AVA 2

3. Reassembly is the reversal of removal.

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Air valve Single line - Overhaul



SM60-33-006 1

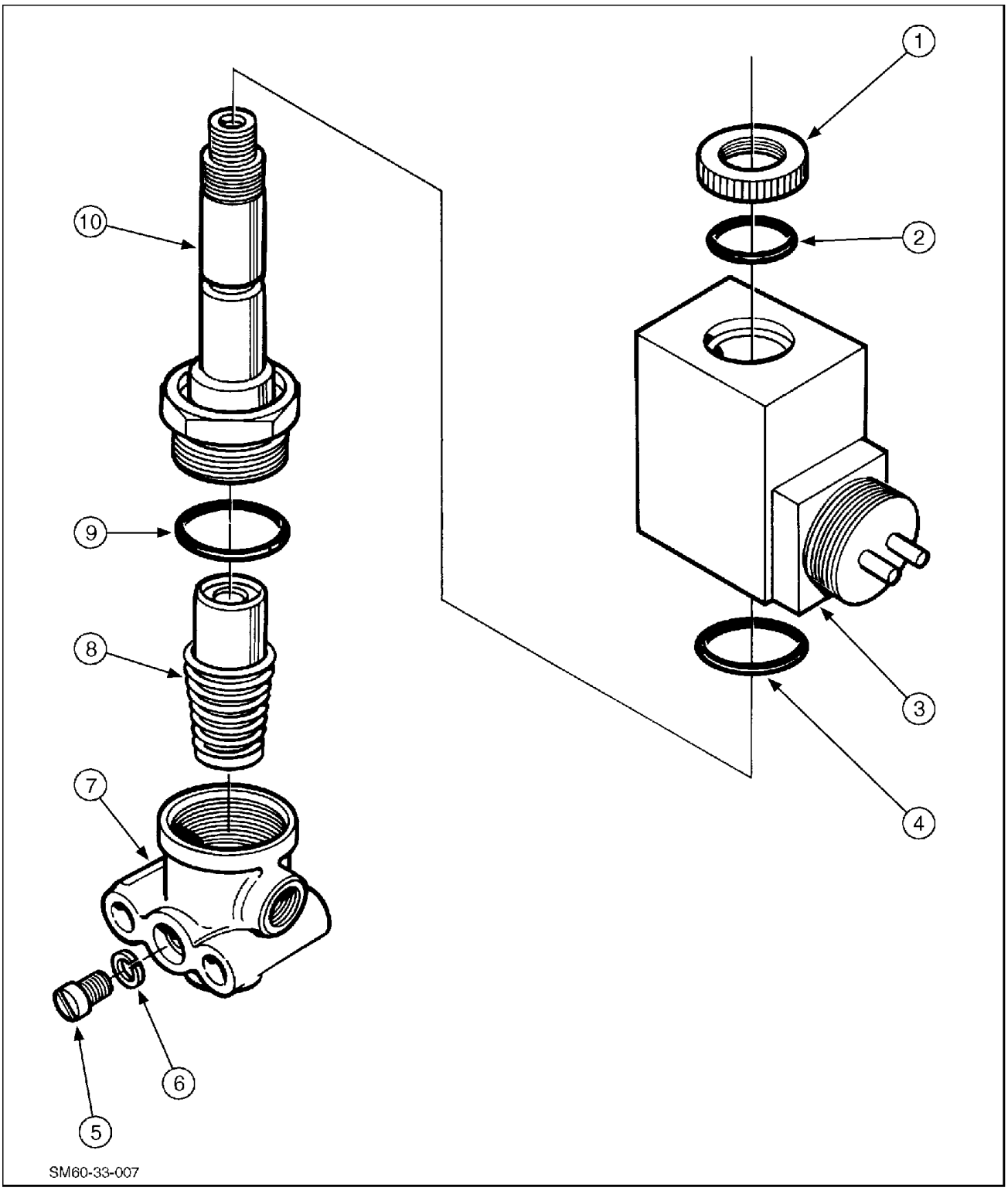
DUAL LINE CONTROL VALVE

Key to Components - Figure 1.

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1 Vent Screw
2 Protective Cap
3 Bolt
4 Housing
5 Lip Seal
6 ‘O’ Ring
7 Tappet
8 ‘O’ Ring
9 ‘O’ Ring
10 Tappet
11 Washer
12 Spring
13 Piston
14 ‘O’ Ring
15 Guide Ring
16 ‘O’ Ring
17 Rod
18 Vent Screw
19 Bolt
20 Housing
21 Valve with Lockring
22 Sealing Ring
23 Bolt
24 ‘O’ Ring
25 Valve
26 ‘O’ Ring
27 Spring
28 Guide
29 ‘O’ Ring
30 Circlip
31 Ball
32 Cap
33 Bolt

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SM60-33-007 2

SOLENOID VALVE

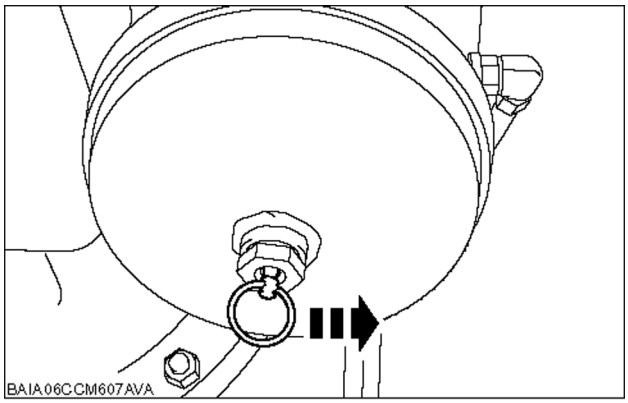
Key to Components - Figure 2.

1 Knurled Nut
2 ‘O’ Ring
3 Housing
4 ‘O’ Ring
5 Cylinder Screw
6 Lock Washer
7 Flange
8 Spool
9 ‘O’ Ring
10 Armature

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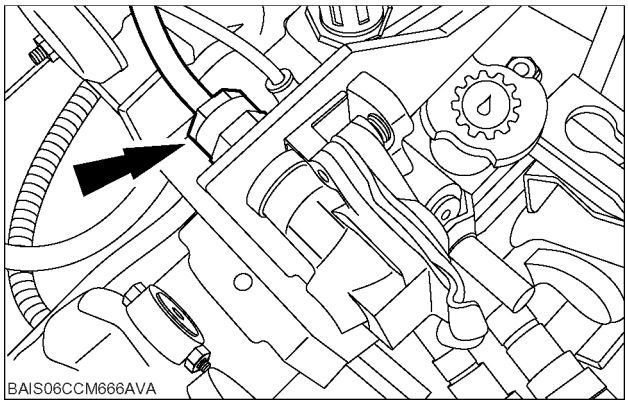
Pneumatic connector - Remove

1. Release the trailer brake system pressure from the trailer brake air tanks.



BAIS06CCM607AVA 1

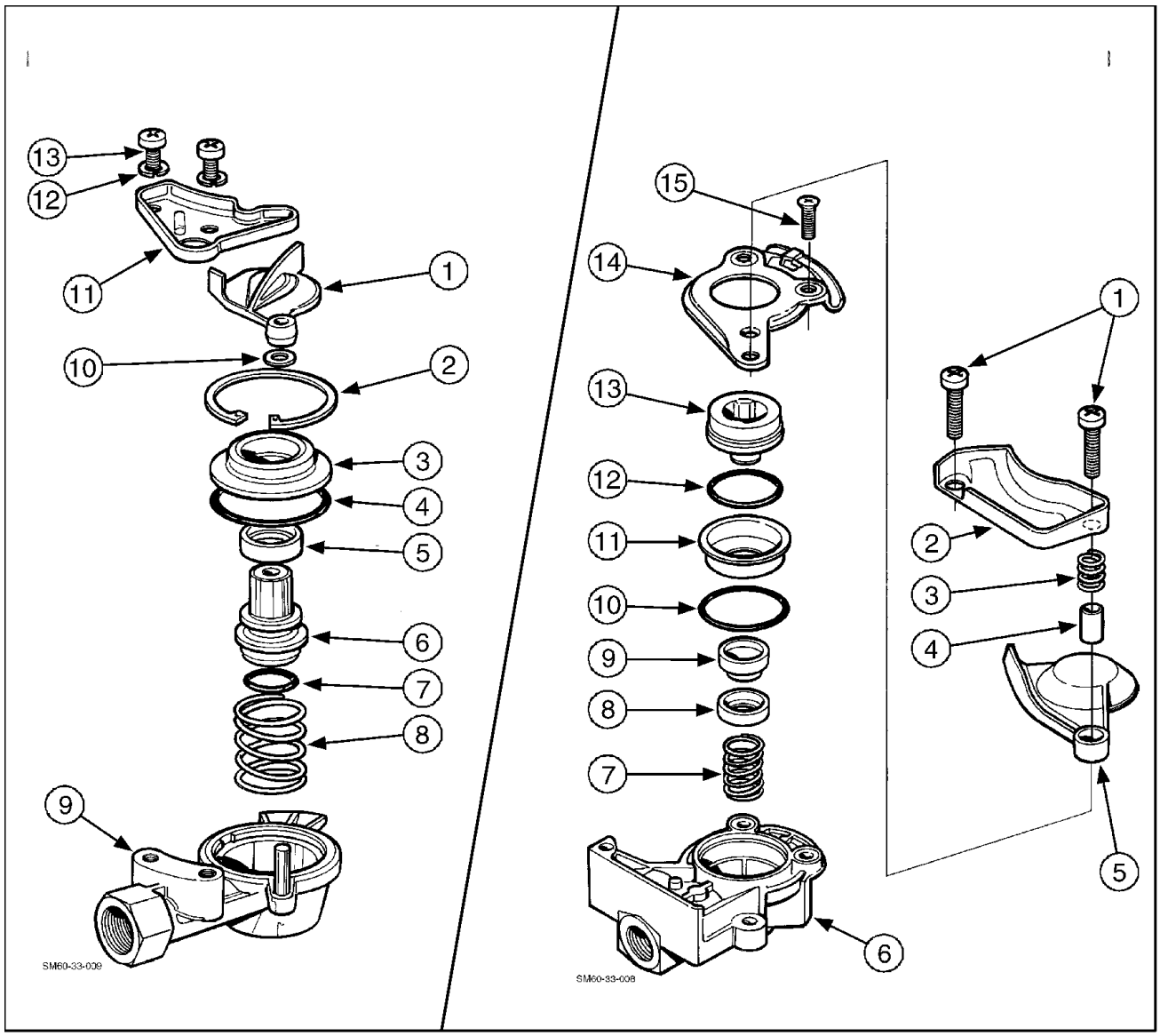
2. Disconnect the pneumatic connector supply pipe. Remove the retaining nut and remove the trailer brake pneumatic connector.



BAIS06CCM666AVA 2

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Pneumatic connector - Overhaul



SM60-33-008 1

Couplers

Key to Components - Figure 1.

A. Single Line Coupler
1. Cover
2. Circlip
3. Bush
4. 'O' Ring
5. Valve Ring
6. Valve Body
7. 'O' Ring
8. Spring
9. Housing
10. Washer
11. Guide Piece
12. Washer
13. Screw

B. Supply and Control Line Couplers
1. Screw
2. Guide Piece
3. Spring
4. Tube
5. Cover
6. Housing
7. Spring
8. Cap
9. Valve
10. 'O' Ring
11. Cap
12. 'O' Ring
13. Thrust Piece
14. Guide
15. Screw

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SERVICE BRAKE Pneumatic - Troubleshooting

Problem	Possible Cause	Correction
Instrument cluster light illuminates when the system is running.	System pressure below **4.5/3.5 bar**.	Compressor drive belt broken Check system for leaks Relief valve failed, stuck open Compressor fault Reservoir drain tap faulty
	Faulty switch or switch wiring	Disconnect wiring to the switch. If the light extinguishes replace the switch. If the light remains illuminated check the wiring for short to earth.
Trailer brakes not functioning (system air pressure OK)	Air in hydraulic braking system	Bleed brakes, for further information refer to **SERVICE BRAKE Hydraulic - Bleed (D.30.C)**
	Faulty pilot valve	Disconnect the control valve supply line from the pilot valve assembly. Operate the brakes, if oil is expelled, the pilot valve is OK. If no oil is expelled remove and inspect the pilot valve.
	Control valve faulty	Repair/replace the control valve as required
Delay in trailer brake operation	Dual line solenoid failed closed or permanently energised.	Disconnect the wiring to the solenoid. If brakes operate normally inspect the wiring for short to **+12 v**. If there is still a delay in operation after disconnecting the wire replace the solenoid assembly.
System pressure too high (exceeds 12 bar +/- 2)	Faulty Relief valve	Remove the relief valve clean/replace, for further information refer to **Relief valve - Remove (A.20.A)**

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TRAVELLING - D

PARKING BRAKE Mechanical - 32.B

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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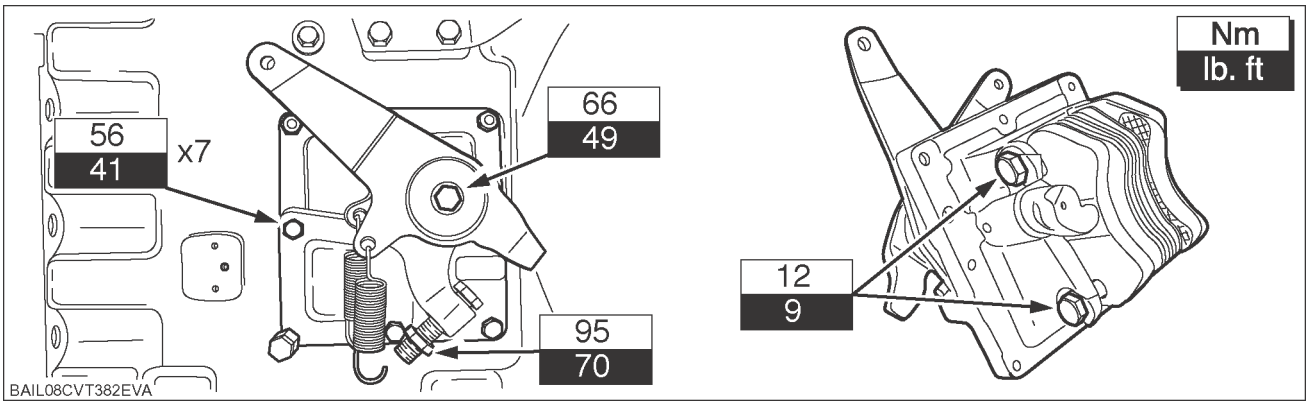
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Brake - Torque Park Brake

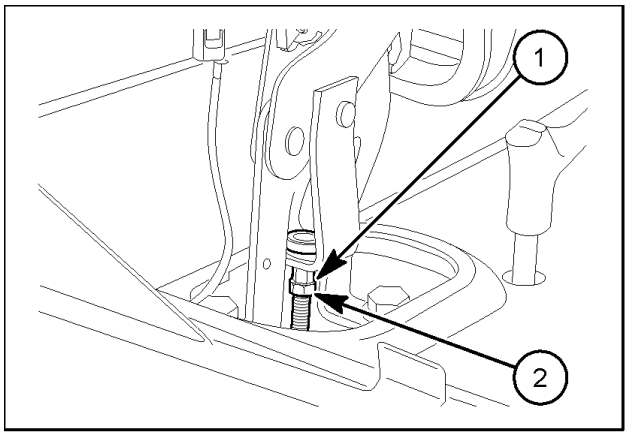


BAIL08CVT382EVA 1

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Mechanical linkage - Travel adjust

1. Adjustment of the parking brake control lever travel should be performed each time the parking brake is serviced or repaired and when the idle travel of the lever is excessive.
   Proceed as follows:
   1. Block front wheels using suitable means.
   2. Jack up the tractor rear end using a suitable means until the wheels are slightly off the ground.
   3. Raise the parking brake control lever to the third notch on the quadrant.
   4. Release the locknut **(2)** and screw in the adjust screw **(1)** until the wheels lock.
   5. Lower the parking brake control lever and ensure that the wheels can rotate freely.
   6. Apply the parking brake several times to check that the assembly does not get blocked or operate abnormally.
   7. Tighten the locknut **(2)** and lower the tractor.



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Brake - Overhaul Park Brake

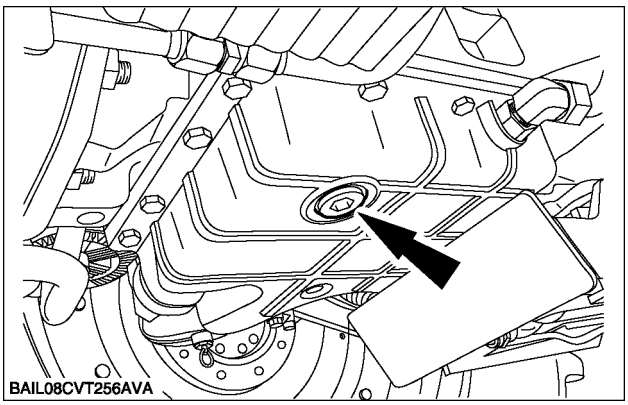
Prior operation:
Remove the left-hand fuel tank, for further information refer to **Fuel tank - Remove (B.20.A)**

⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

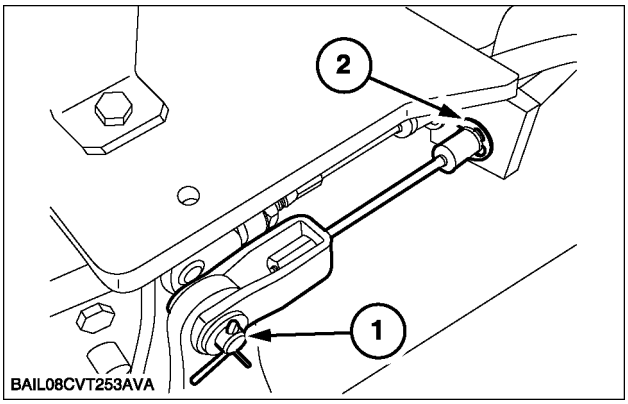
B026

1. Remove the drain plug and drain the transmission oil into a suitable container. Install the drain plug once the oil has drained.
   Tighten to **68-82 Nm** (**50-60 lb ft**).



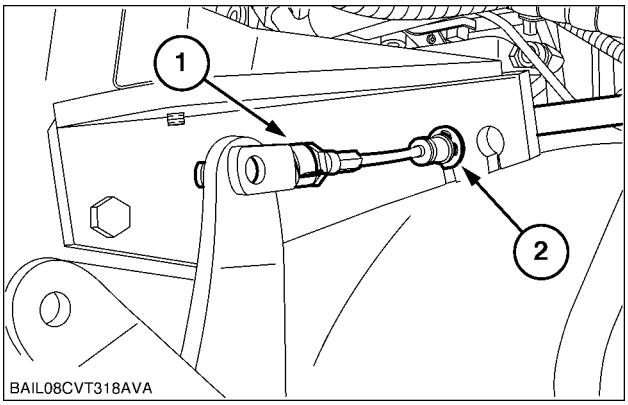
BAIL08CVT256AVA 1

2. Remove the split pin and the clevis pin **(1)** from the parking brake lever. Detach the parking brake cable **(2)**.



BAIL08CVT253AVA 2

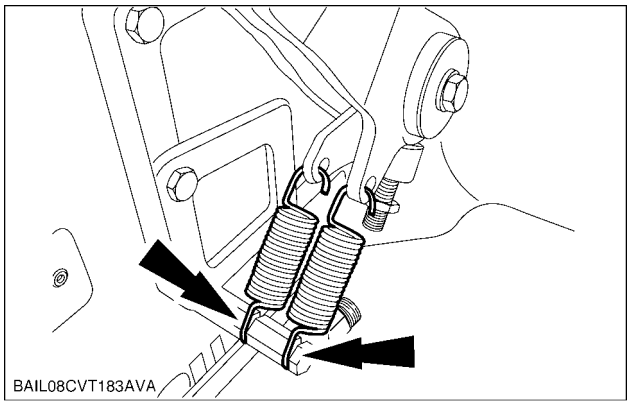
3. Remove the speed clip **(1)** from the EPL lever (if fitted) and detach the EPL cable **(2)**.



BAIL08CVT318AVA 3

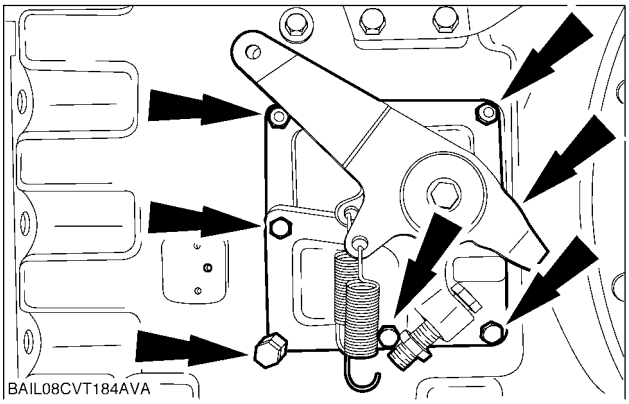
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4. Detach the return springs.



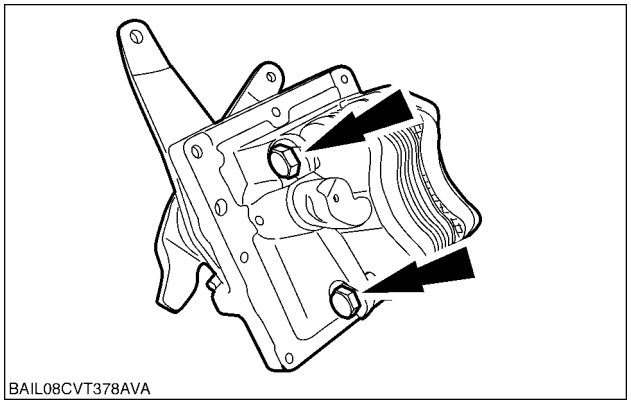
BAIL08CVT183AVA 4

5. Remove the parking brake control assembly.



BAIL08CVT184AVA 5

6. Disassemble the parking brake assembly and remove the friction pads.



BAIL08CVT378AVA 6

7. Disassembly
   - Disassemble the lever assembly to replace the seal.
   - Check lever and shaft are marked (to aid assembly).
   - Loosen lever clamp bolt.
   - Remove lever, spring.
   - Remove shaft.
   - Remove washer and seal.
8. Assembly
   - Install shaft.
   - Install new seal with washer.
   - Install spring and shaft ensuring alignment of assembly marks.

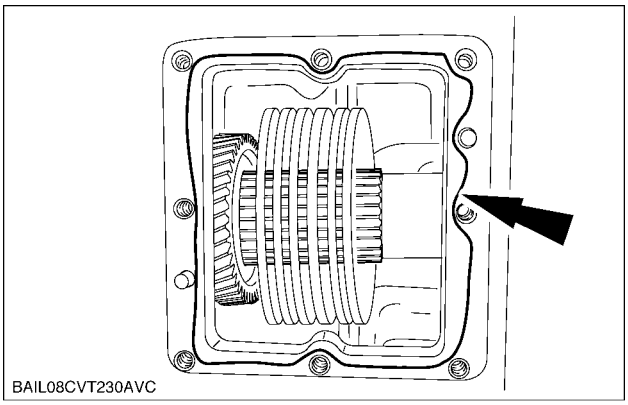
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9. Before installing the parking brake control assembly unit to the rear axle housing, thoroughly clean and degrease mating surfaces and apply a bead of sealant approximately **2 mm** of diameter following pattern shown.

⚠ WARNING ⚠

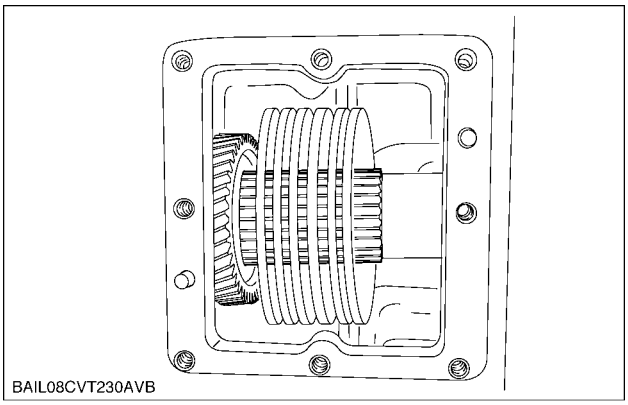
Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

B020



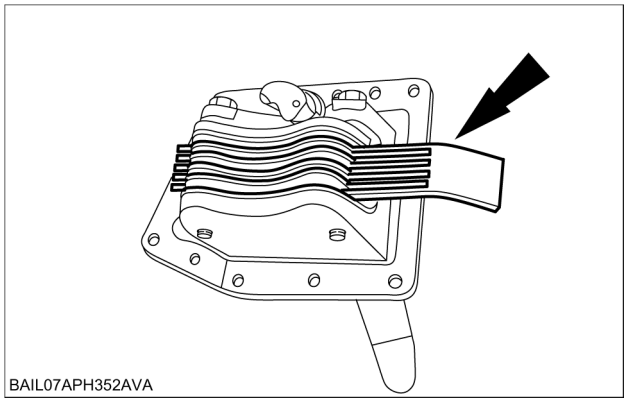
BAIL08CVT230AVC 7

10. Using special tool **380200014**, align the brake discs on the pinion shaft.



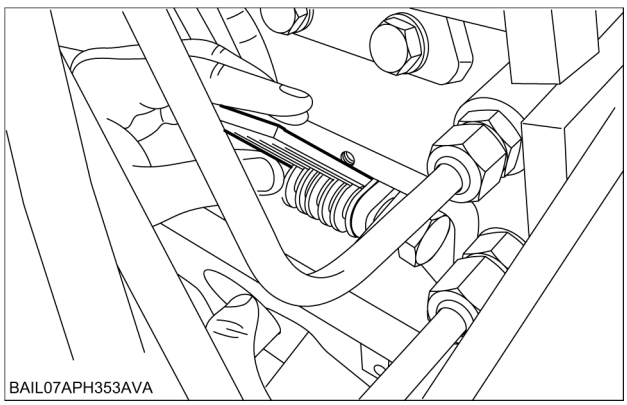
BAIL08CVT230AVB 8

11. Install the special tool **380200014**, between the friction pads.



BAIL07APH352AVA 9

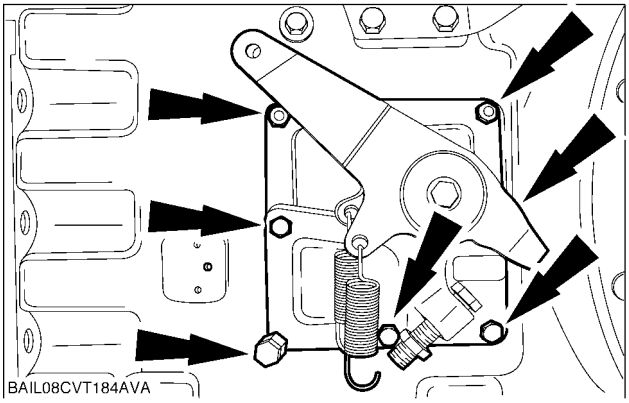
12. Position the parking brake assembly complete with the special tool **380200014**, between the brake discs on the pinion shaft. Remove the special tool while installing the parking brake assembly.



BAIL07APH353AVA 10

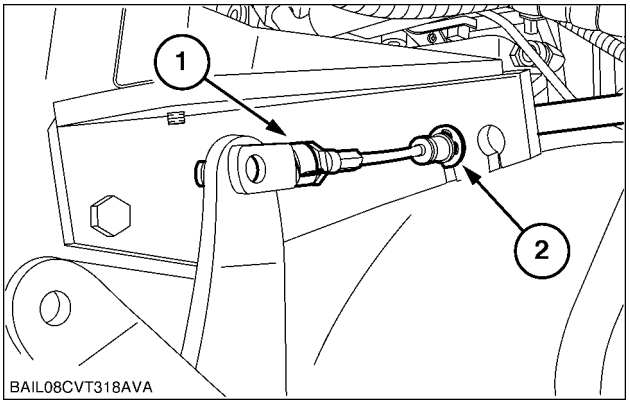
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13. Tighten the parking brake assembly retaining bolts to **49 Nm** (**36 lb ft**).



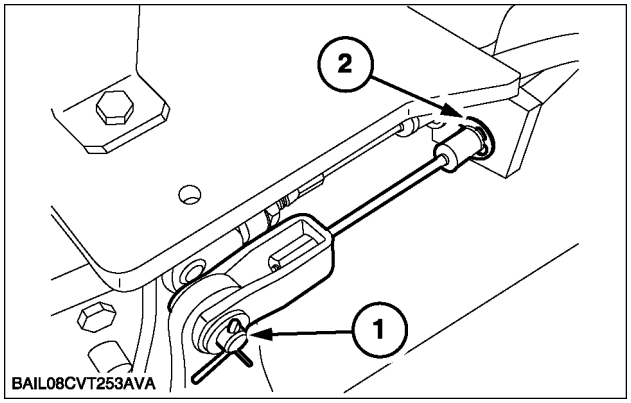
BAIL08CVT184AVA 11

14. Attach the EPL cable (if fitted) **(2)** and install the speed clip **(1)**.



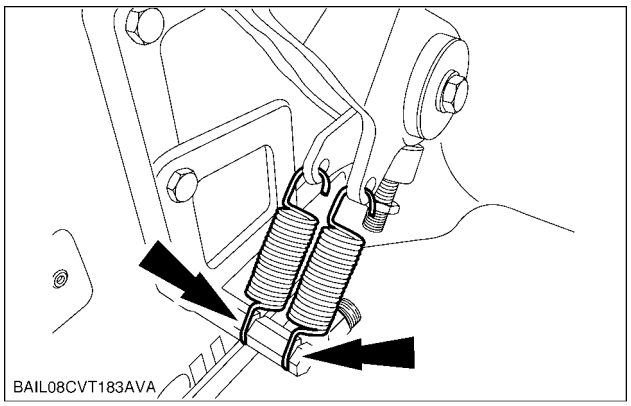
BAIL08CVT318AVA 12

15. Attach the parking brake cable **(2)** and install the clevis pin and split pin **(1)**.



BAIL08CVT253AVA 13

16. Attach the return springs.



BAIL08CVT183AVA 14

17. Fill the transmission with oil.

Next operation:
Install the left-hand fuel tank, for further information refer to **Fuel tank - Install (B.20.A)**

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Next operation:
Adjust the parking brake, for further information refer to **Mechanical linkage - Travel adjust (D.32.B)**

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PARKING BRAKE Mechanical - Troubleshooting

Problem	Possible Cause	Correction
Parking brake will not release	Restricted parking brake lever travel.	Repair as necessary.
	Seized brake pads on the brake discs.	Replace damaged parts.
Parking brake does not operate correctly	Parking brake cable incorrectly adjusted.	Adjust the parking brake cable.
	Worn brake pads.	Replace brake pads.

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TRAVELLING - D

BRAKE CONNECTION Hydraulic - 34.C

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Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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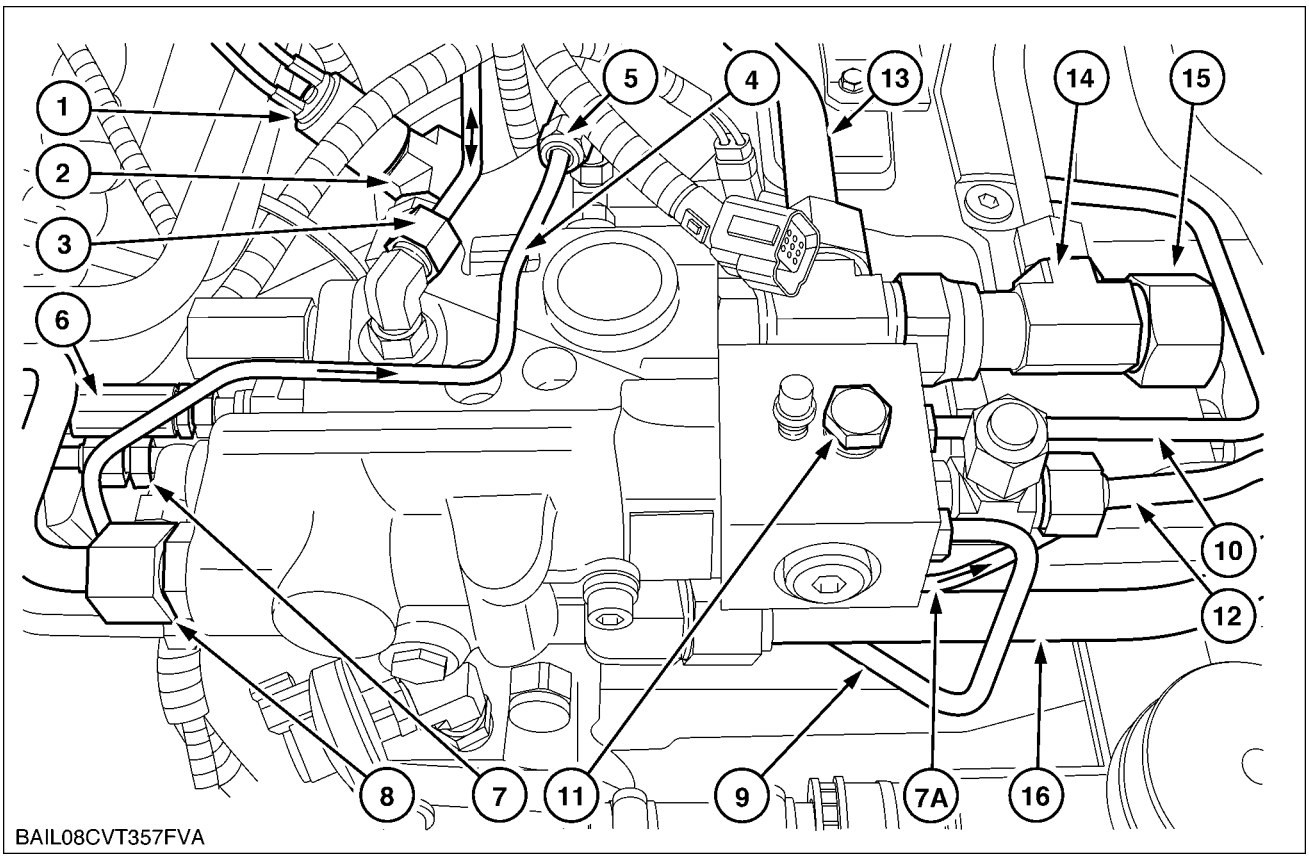
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  - External view 3
  - Hydraulic schema 4
  - Dynamic description 5
  - Static description 12

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- BRAKE CONNECTION Hydraulic
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- Trailer brake valve
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Trailer brake valve - External view

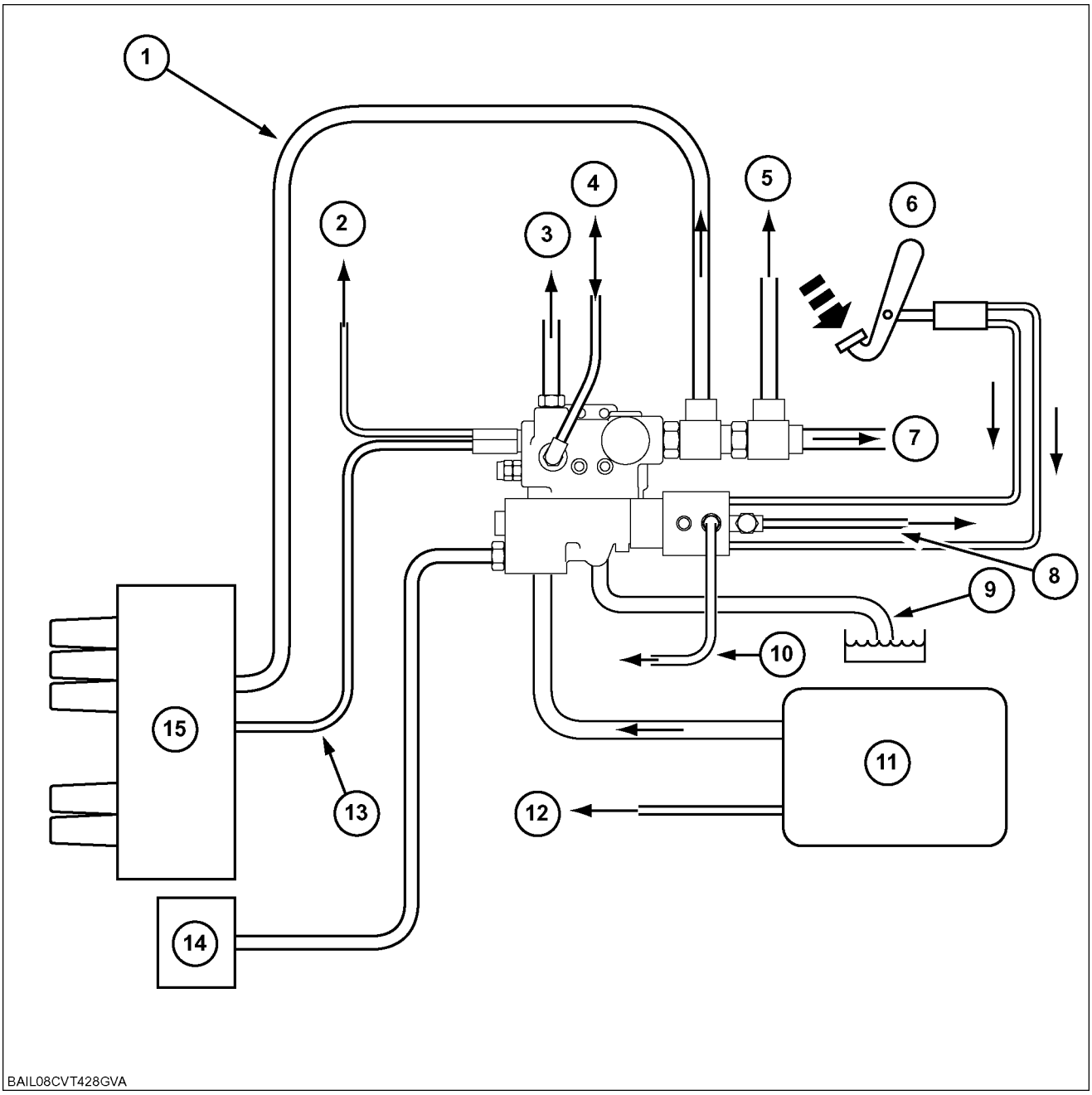


BAIL08CVT357FVA 1

1. Steering pressure switch
2. Pressure Steering
3. Load sensing, Steering - Dynamic flow
4. Load sensing - Resolved signal to compensator (Includes Resolved signal through check valves), Steering, Trailer brake valve, Rear remote valves, Front suspension, Hydraulic link levelling
5. Check valves for resolved signal and mid mount valves (if fitted)
6. Load sensing from remote valves
7. And 7a Load sensing, Front suspension, Check valves resolved signal
8. Pressure - Trailer Brake Valve to trailer brake
9. Right hand signal to Trailer Brake Valve
10. Left hand signal to Trailer Brake Valve
11. Logic head - Signal to air brakes (if fitted)
12. To front brakes
13. Main pressure to remote valves, EDC, Link levelling, Power Beyond
14. Main pressure front suspension
15. Mid mount valves (if fitted)
16. Return to tank

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Trailer brake valve - Hydraulic schema



BAIL08CVT428GVA 1

Trailer Brake Circuit

1. Main Pressure to Remote Valves, EDC, Link Levelling, Power Beyond
2. Load Sensing, Front Suspension, Check Valves Resolved Signal
3. Steering Pressure
4. Load Sensing, Steering, Dynamic Flow
5. Main Pressure Front Suspension
6. Braking Pressure
7. Mid Mount Valves (If fitted)
8. To Front Brakes
9. Return To Tank
10. Logic Head, Signal to Air Brakes (If fitted)
11. Variable Displacement Hydraulic Pump
12. Load Sense Line
13. Load Sensing from Remote Valves
14. Pressure, Trailer Brake Valve to Trailer Brake
15. Remote Valves

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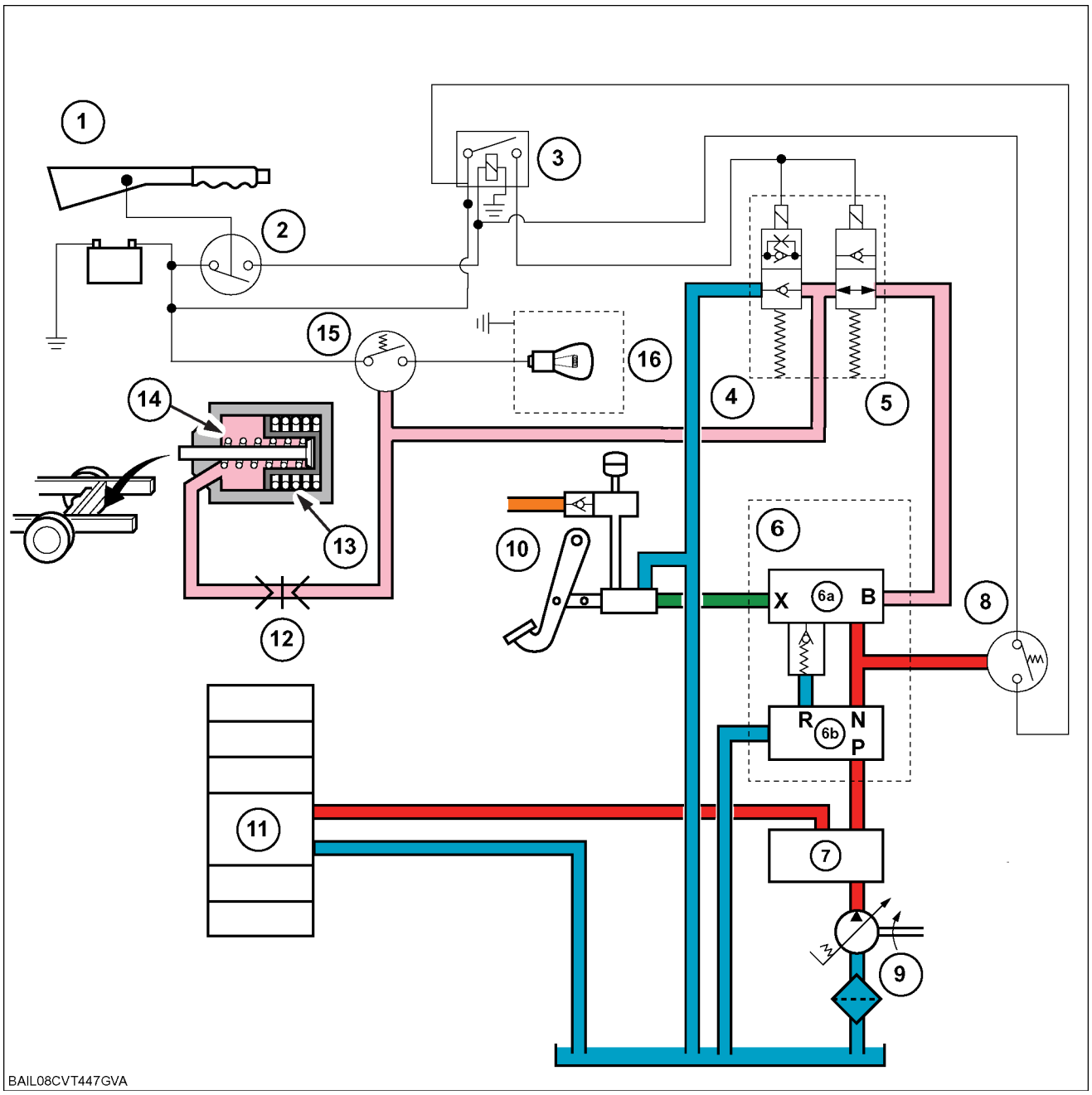
Trailer brake valve - Dynamic description

Italian Trailer Brake Valve - Engine Running Brakes Not Applied

To release the trailer braking mechanism a pressure of **11 - 12 bar** (**160 - 174 lbf/in2**) is required at the trailer brake coupling **(12)** whenever the parking brake is released while the engine is running and the foot brake is not being applied.
Oil from the hydraulic pump **(9)** flows to the trailer brake priority valve **(7)** where it is distributed to the trailer brake valve **(6b)** port **(P)** and the remote control valves **(11)**. The pressure regulating valve incorporated in **(6a)** supplies **11 - 12 bar** (**160 - 174 lbf/in2**) oil to the trailer brake coupler **(12)** passing through port **(B)** via the solenoids **(4)** and **(5)**, the excess pressure returning to reservoir through port **(R)**.
The pressure supplied by the trailer brake coupler **(12)** is sufficient to overcome spring **(13)** of the Italian brake actuating mechanism. As the spring is compressed, spring **(14)** retracts the actuating pin to disengage the braking mechanism on the trailer.

NOTE: *At engine start-up the trailer brake indicator light* ***(16)*** *will remain illuminated until the* ***11 bar*** *trailer brake release pressure has been attained. To reduce the time necessary to reach trailer brake release pressure, depress the brake pedal with the parking brake released.*

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BAIL08CVT447GVA 1

Italian Trailer Brake Valve Schematic- Engine Running Brakes Not Applied

Pump Pressure	Brake Pedal Pressure
Trailer Brake Release Pressure (**11 bar**)	Return to Reservoir
Low Pressure	

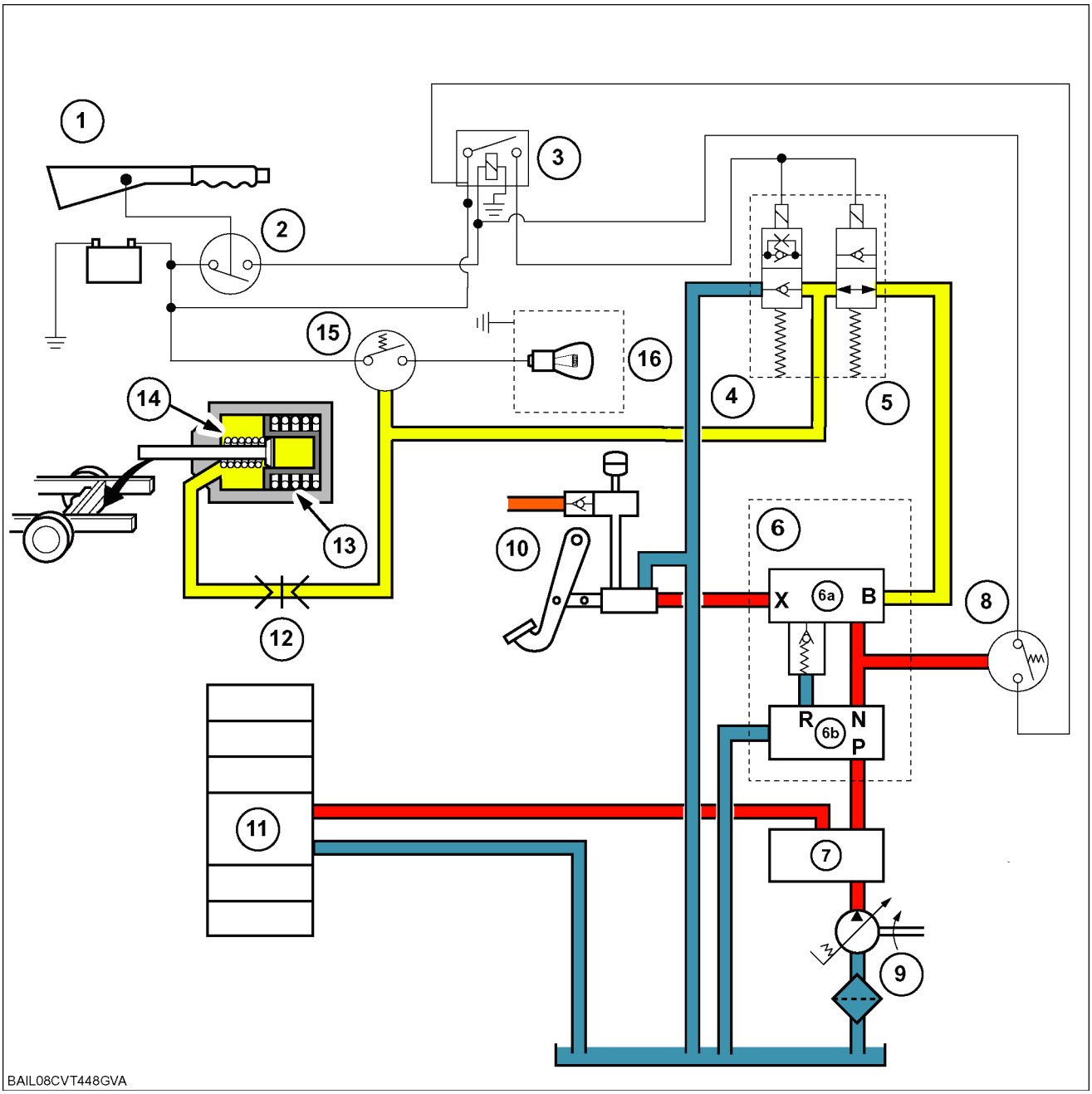
1. Parking Brake
2. Parking Brake Switch
3. Relay
4. Discharge Solenoid
5. Delivery Solenoid
6. Trailer Brake Valve Assembly
6a. **11 bar** Pressure Regulating Valve
6b. Trailer Brake Valve
7. Priority Valve
8. Low Pressure Switch
9. Hydraulic Pump
10. Brake Pedal and Master Cylinder
11. Remote Control Valves
12. Trailer Brake Coupler
13. Spring
14. Spring

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15. Trailer Brake Engaged Warning Lamp Switch
16. Trailer Brake Engaged Warning Lamp

Italian Trailer Brake Valve - Engine Running Brakes Applied

When the brake pedals are depressed the control of oil flow through the pressure regulating valve **(6a)** will range between **12 - 150 bar**(**174 - 2180 lbf/in2**), depending on the pressure applied to the brake pedals.
The delivery solenoid **(5)** is open and the discharge solenoid **(4)** is closed. Oil exiting port **(B)** flows through the 'Open' delivery solenoid valve **(5)** to the trailer brake coupler **(12)**.
When a trailer is connected to the coupler the pressure passing through the coupling to the trailer braking mechanism overcomes the spring force **(13)** and **(14)** and moves the actuating pin forward to apply the brakes on the trailer.



BAIL08CVT448GVA 2

Italian Trailer Brake Valve Schematic- Engine Running Brakes Applied

Pump Pressure

Brake Pedal Pressure Applied

Trailer Braking Pressure (**11 bar**)

Return to Reservoir

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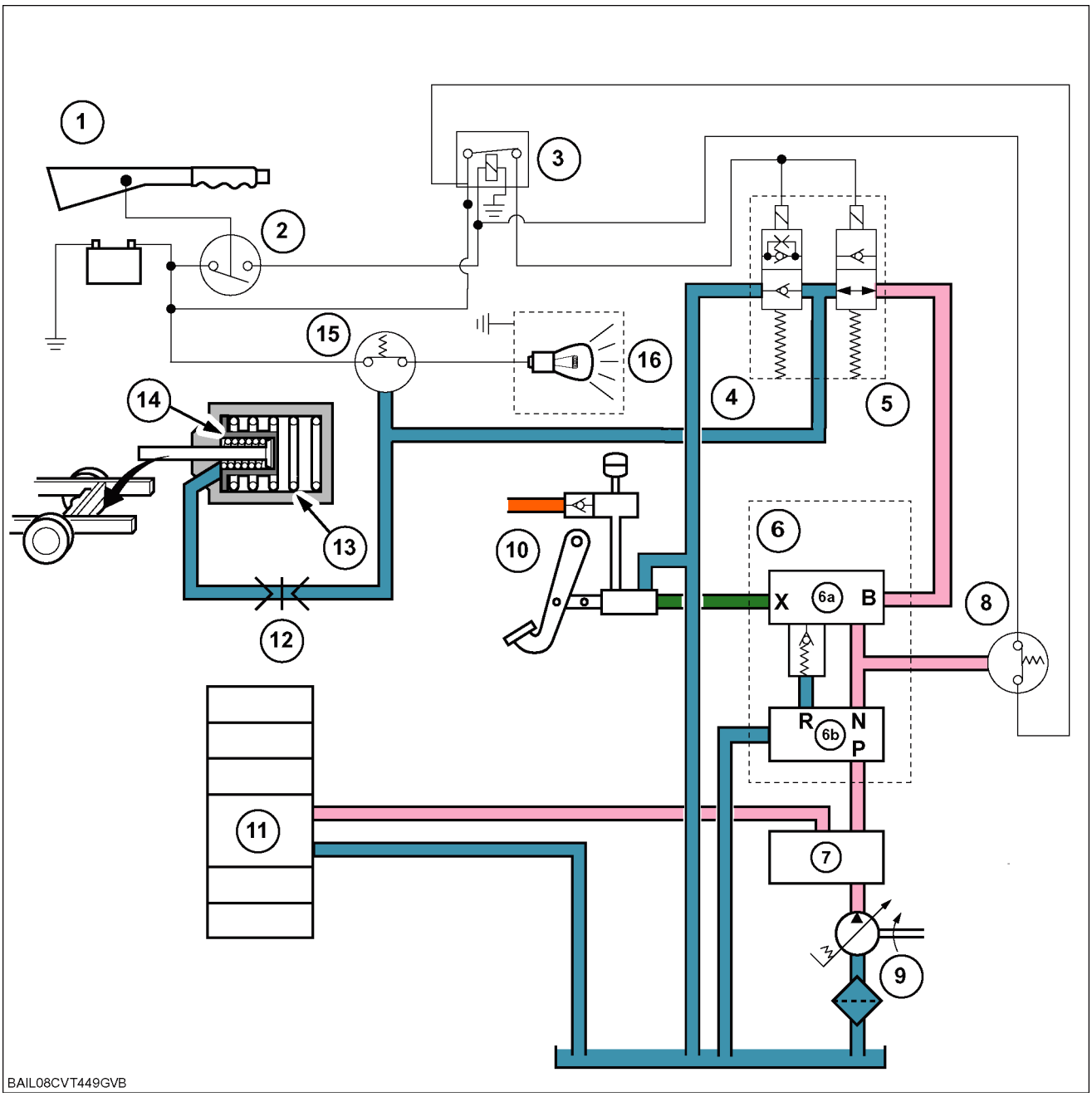
Low Pressure

1. Parking Brake
2. Parking Brake Switch
3. Relay
4. Discharge Solenoid
5. Delivery Solenoid
6. Trailer Brake Valve Assembly
6a. **11 bar** Pressure Regulating Valve
6b. Trailer Brake Valve
7. Priority Valve
8. Low Pressure Switch
9. Hydraulic Pump
10. Brake Pedal and Master Cylinder
11. Remote Control Valves
12. Trailer Brake Coupler
13. Spring
14. Spring
15. Trailer Brake Engaged Warning Lamp Switch
16. Trailer Brake Engaged Warning Lamp

Italian Trailer Brake Valve - Engine Stopped or Running but with Low Hydraulic Pump Flow.

When the engine has stopped or the output from the hydraulic pump is very low the pressure switch **(8)** closes. With the switch closed the current energizes the relay **(3)**. The relay closes, and current reaches and energizes the solenoid valves **(4)** and **(5)**. The delivery solenoid **(5)** is now closed and discharge solenoid **(4)** is open. In this condition the oil in the trailer brake line discharges to reservoir through solenoid **(4)**. There is now insufficient pressure to overcome the spring **(13)** and therefore the actuating pin moves forward to apply the brakes. Low pressure in the trailer brake line causes the switch **(15)** to close and illuminate the warning lamp **(16)**.

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BAIL08CVT449GVB 3

Italian Trailer Brake Valve Schematic- Engine Stopped or Running With Low Hydraulic Pump Flow

	Pump Pressure (Less than **10 bar**)		Return to Reservoir
	Zero Brake Pedal Pressure		Low Pressure

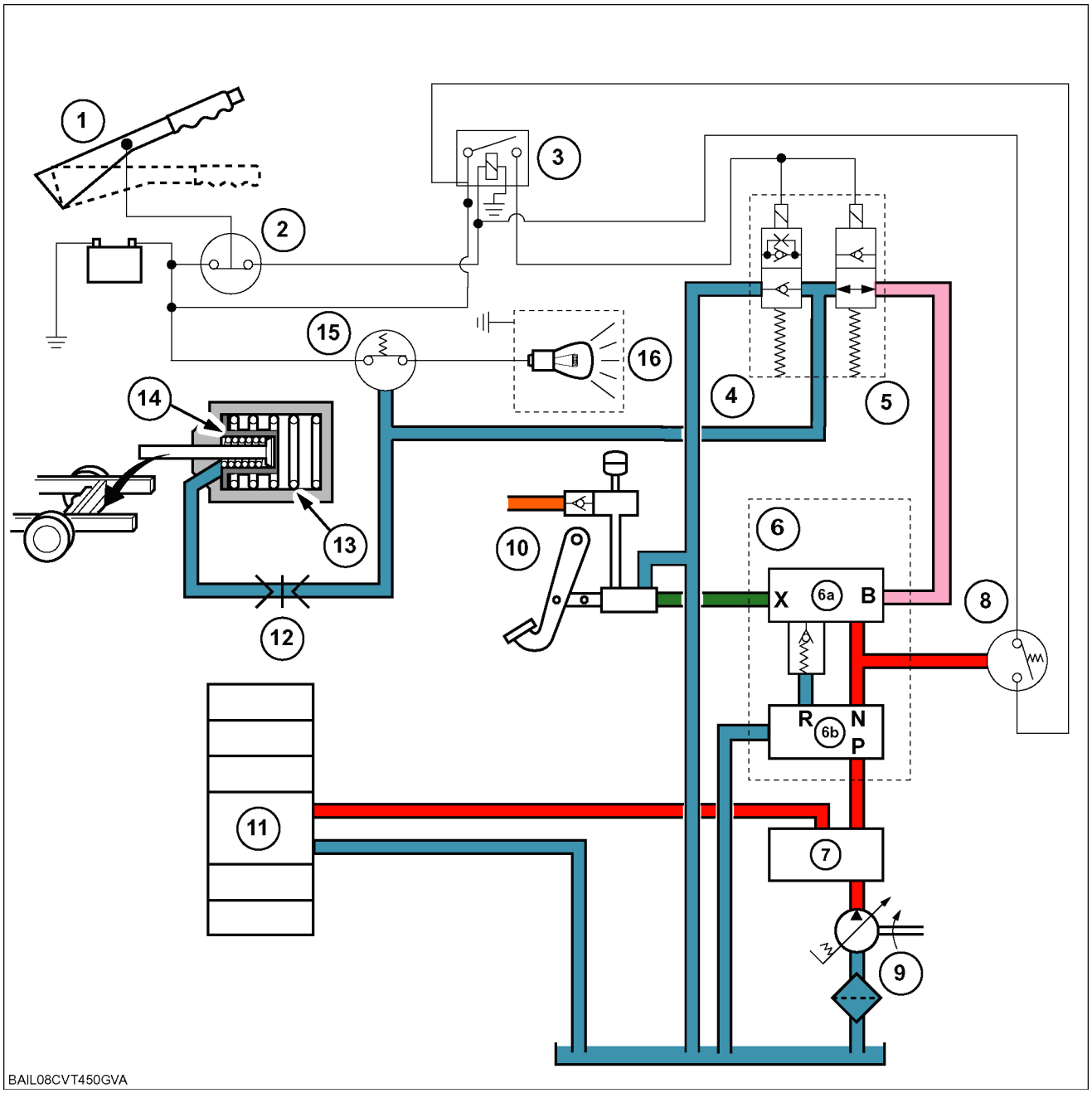
1. Parking Brake
2. Parking Brake Switch
3. Relay
4. Discharge Solenoid
5. Delivery Solenoid
6. Trailer Brake Valve Assembly
6a. **11 bar** Pressure Regulating Valve
6b. Trailer Brake Valve
7. Priority Valve
8. Low Pressure Switch
9. Hydraulic Pump
10. Brake Pedal and Master Cylinder
11. Remote Control Valves
12. Trailer Brake Coupler
13. Spring
14. Spring
15. Trailer Brake Engaged Warning Lamp Switch
16. Trailer Brake Engaged Warning Lamp

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Italian Trailer Brake Valve - Engine Running and Parking Brake Applied

When the parking brake is applied the switch **(2)** closes. energising the relay **(3)**. With the relay closed current reaches and energizes the solenoid valves **(4)** and **(5)**.
The delivery solenoid valve **(5)** is now closed and discharge solenoid valve **(4)** is open. The **11 bar** pressure oil at port **(B)** is blocked by delivery solenoid valve **(5)** and the pressure in the trailer brake coupler line is discharged to reservoir through discharge solenoid valve **(4)**.
Because there is insufficient pressure to overcome spring **(13)** the actuating pin is pushed forward to apply the brakes. The low pressure in the trailer brake coupler line causes the trailer brake warning lamp switch **(15)** to close and the in cab warning lamp will illuminate.

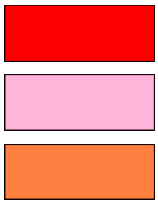
NOTE: *After applying the parking brake, wait approximately* ***10 seconds*** *before stopping the engine. This will allow complete discharge of the oil pressure in the trailer brake line to obtain full application of the trailer brakes.*



BAIL08CVT450GVA 4

Italian Trailer Brake Valve Schematic- Engine Running and Parking Brake Applied

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Pump Pressure

Trailer Brake Release Pressure (**11 bar**)

Low Pressure

Zero Brake Pedal Pressure

Return to Reservoir

1. Parking Brake
2. Parking Brake Switch
3. Relay
4. Discharge Solenoid
5. Delivery Solenoid
6. Trailer Brake Valve Assembly

6a. **11 bar** Pressure Regulating Valve

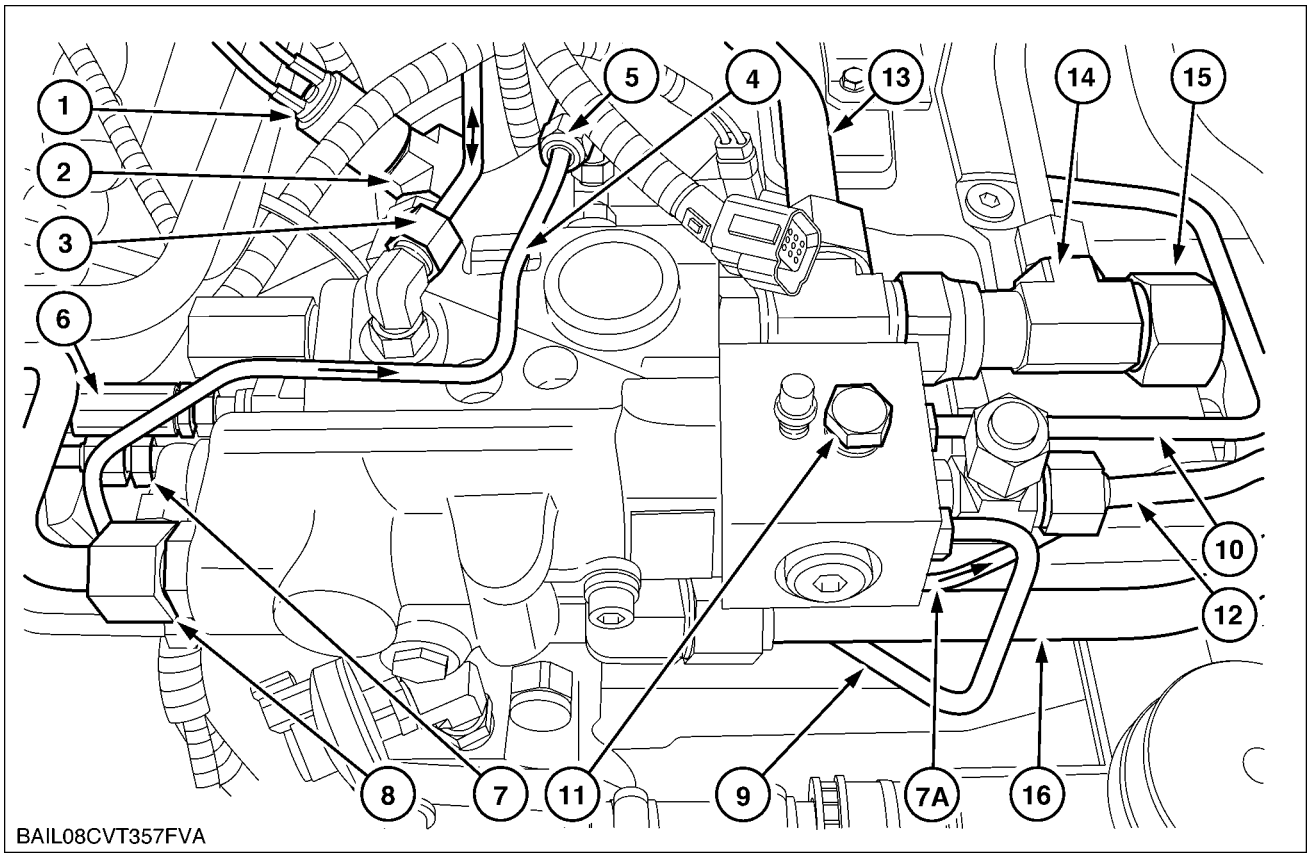
6b. Trailer Brake Valve

7. Priority Valve
8. Low Pressure Switch
9. Hydraulic Pump
10. Brake Pedal and Master Cylinder
11. Remote Control Valves
12. Trailer Brake Coupler
13. Spring
14. Spring
15. Trailer Brake Engaged Warning Lamp Switch
16. Trailer Brake Engaged Warning Lamp

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Trailer brake valve - Static description

Tractors may be fitted with a hydraulically operated trailer brake valve which operates the trailer brakes whenever the brake system is activated by depressing the foot brake pedal.
Oil flows from the hydraulic pump through the priority valve manifold and into the trailer brake valve and then returns to the priority valve manifold. The position of the trailer brake valve in the circuit makes sure that the trailer brake circuit has priority flow over the remote valves and other hydraulic high pressure circuits. Trailer braking is proportional to the effort on the foot brake pedal. Feedback is provided by the trailer brake valve to give a sense of feel to the operator which aids precise braking.



BAIL08CVT357FVA 1

1. Steering pressure switch
2. Pressure Steering
3. Load sensing (LS) - Steering - Dynamic flow
4. Load sensing (LS) - Resolved signal to compensator - Includes Resolved signal through check valves - Steering - Trailer brake valve (TBV) - Rear remote valves - Front suspension - Hydraulic link levelling.
5. Check valves for resolved signal and mid mount valves
6. Load sensing (LS) from remote valves
7. And 7a Load sensing (LS) Front suspension - Check valves resolved signal
8. Pressure - Trailer Brake Valve (TBV) to trailer brake
9. Right hand signal to Trailer Brake Valve (TBV)
10. Left hand signal to Trailer Brake Valve (TBV)
11. Logic head - Signal to air brakes
12. To front brakes
13. Main pressure to remote valves - EDC - Link levelling - Power Beyond
14. Main pressure front suspension
15. Mid mount valves (MMV)
16. Return to tank

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BRAKE CONNECTION Hydraulic - Testing

NOTE: *Trailer Brakes Not Working*

N°	Test Point	Expected Result	Other Result (Possible Cause)
1	**Condition** Has all air been bled from the trailer brakes?	**Result** YES **Action** Go to test **2**	**Action** NO Bleed the trailer brakes refer to **SERVICE BRAKE Hydraulic - Bleed (D.30.C)**
2	**Condition** Pressure test trailer brakes. Is the fault confirmed?	**Result** YES **Action** Go to test **3**	**Action** NO Verify the customer concern again
3	**Condition** Is the hydraulic lift working satisfactorily? Test maximum system pressure at the remote valve coupler. Pressure **2900 - 3000 lbf/in2** (**200 - 207 bar**)?	**Result** YES **Action** Go to test **4**	**Action** NO Go to test **5**
4	**Condition** Operate and hold the remote valve to generate maximum system pressure and at the same time operate the tractor brakes Does the trailer brake valve function correctly?	**Result** YES **Action** Go to test **6**	**Action** NO Replace the trailer brake valve
5	**Condition** Adjust the flow/pressure compensating valve Has the fault cleared?	**Result** YES **Action** Verify the customer concern has cleared.	**Action** NO Go to test **6**
6	**Condition** Examine the shuttle valve in the load sensing line between the trailer brake and the pressure/flow compensating valve Is the valve sticking?	**Result** YES **Action** Clean/replace the shuttle valve	**Action** NO Go to test **7**
7	**Condition** Examine flow/pressure the compensating valve for sticking Has the fault cleared?	**Result** YES **Action** Verify the customer concern has cleared.	**Action** NO Disassemble the variable flow pump and check the swash plate piston for sticking

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Trailer brake valve - Troubleshooting

Problem	Possible Cause	Correction
Pressure higher or lower than specified.	Faulty trailer braking auxiliary valve pressure regulating valve.	Replace trailer braking auxiliary valve.
	Faulty hydraulic pump.	Replace hydraulic pump.
Excess pressure peaks are observed when applying the brake pedals for 10 seconds.	Oil leaks from the hydraulic system.	Locate leaks and repair as necessary.
	Solenoid valve leak.	Replace solenoid valve.
	Trailer brake auxiliary valve leaks.	Replace trailer brake auxiliary valve.
Trailer brake disengagement pressure = 0 - 11 bar (0 - 160 lbf/in2)	Trailer brake disengagement pressure valve incorrectly adjusted.	Test/Replace valve.
Correct trailer brake disengagement pressure but light indicator is on.	Faulty trailer brake engaged indicator switch.	Test/Replace switch.
Trailer brake disengagement pressure not correct but light indicator is off.	Faulty indicator lamp.	Test/Replace lamp.
	Faulty trailer brake engaged indicator switch.	Test/Replace switch.
Trailer brake disengagement pressure does not zero when parking brake is applied.	Faulty parking brake engaged switch.	Test/Replace switch.
	Faulty parking brake indicator circuit relay.	Test/Replace relay.
	Discharge solenoid valve faulty or stuck closed.	Test/Repair or replace solenoid valve.
Trailer brake disengagement pressure is permanently zeroed when operating the levers described in Trailer brake valve - Pressure test (D.34.C).	Trailer brake circuit safety switch (**Connector - Component diagram 40 (A.30.A)**) adjustment exceeding rated value **2.5 - 3.5 bar** (**36 - 51 lbf/in2**).	Replace the trailer brake circuit safety switch.
	Switches (**Trailer brake valve - Pressure test (D.34.C)**) reversed in the specified positions or with exchanged power supply cables.	Move switches to correct positions or reverse power supply cables.

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TRAVELLING - D

SUSPENSION Hydraulic - 40.C

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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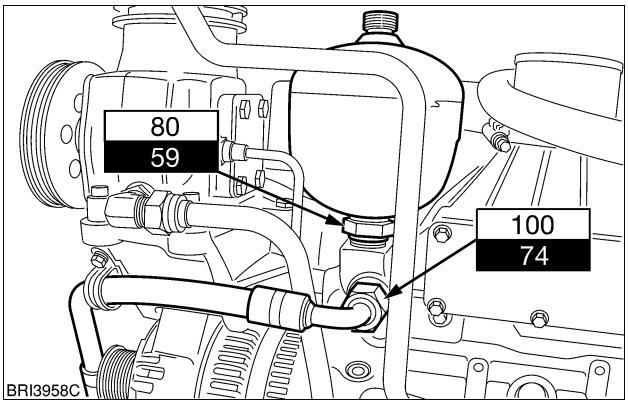
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Accumulator - Torque



BAIL06CCM255ASA 1

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SUSPENSION Hydraulic - Dynamic description

The hydraulic control system incorporates several modes of operation.
Front axle suspension mode
Anti bang function- (maximum suspension travel)
Brake function
Accelerator pedal function
Gear change function
EDC function

Front axle suspension mode

Front axle suspension mode is the default mode when the tractor is started . In this mode the lamp on the suspension switch and the warning lamp on the instrument cluster will not be illuminated. The damping of the suspension is controlled by the software. The system calculates the optimal damping force for the suspension using the velocity of the chassis and the relative velocity of the suspension. The chassis velocity is calculated by integrating the chassis acceleration as measured by the vertical chassis accelerometer and the relative suspension velocity as calculated from the front axle position sensor. (Refer to .
The calculated damping force and the relative suspension velocity are then used to determine the current to be applied to the two damping control valves.
If the suspension cylinder is in an extended position (rebound) the damping will be controlled by valve **(5)**. Valve **(3)** (Refer to Figure **1**) does not influence the damping is maintained at the optimal passive current.
If the suspension is in compression the damping will be controlled by valve **(3)** and valve **(5)** does not influence the damping but is maintained at the optimal passive current.

Anti Bang Function

When the tractor is off-road and the suspension position reaches its maximum or minimum calibrated positions then the operator comfort is affected. In order to reduce this problem once the suspension reaches the extremes of its operating range the system will command the damping control valves **(3)** and **(5)** to close. If the suspension is approaching the maximum position the system will command valve **(5)** to close. The current applied to the valve will depend on the current position of the suspension in relation to the maximum position. The same situation will occur when the suspension is within the limit of its minimum position . The current to valve **(3)** will be reduced as the suspension reaches the minimum position

Brake Function

When the operator brakes, the tractor will pitch forward causing the suspension to be shortened. To reduce this effect the brake function will command valves **(3)** and **(5)** to close. The status of the left and right brake pedal switches are sent to the control module which will then reduce the current supplied to valve **(3)**. Once either brake pedal is released the current is returned to its passive value. At the same time the function will apply the same logic to valve **(5)**.

Accelerator Pedal function

When the operator accelerates or decelerates the tractor will pitch. Under acceleration the suspension will be lengthened and under deceleration the suspension will shorten. To reduce this effect the accelerator pedal will cause the damping valves **(3)** and **(5)** to close

Gear change function

When the operator changes gear the tractor will pitch. During a gear change this function will cause the damping valves **(3)** and **(5)** to close in order to improve operator comfort. The gear change function is triggered when a shift in progress is detected.

Electronic Draft control function

When the electronic draft control system is controlling the position of the rear hitch the front suspension will extend as the hitch is lifted with an implement fitted. The EDC function of the suspension system monitors the demand signal to the rear hitch and will lock the suspension when the EDC raises the hitch. The status of the dynamic ride control feature of the EDC is also monitored, and if the dynamic ride control is active then the EDC function will not affect the operation of the suspension. The EDC function will not affect valve **(3)**.

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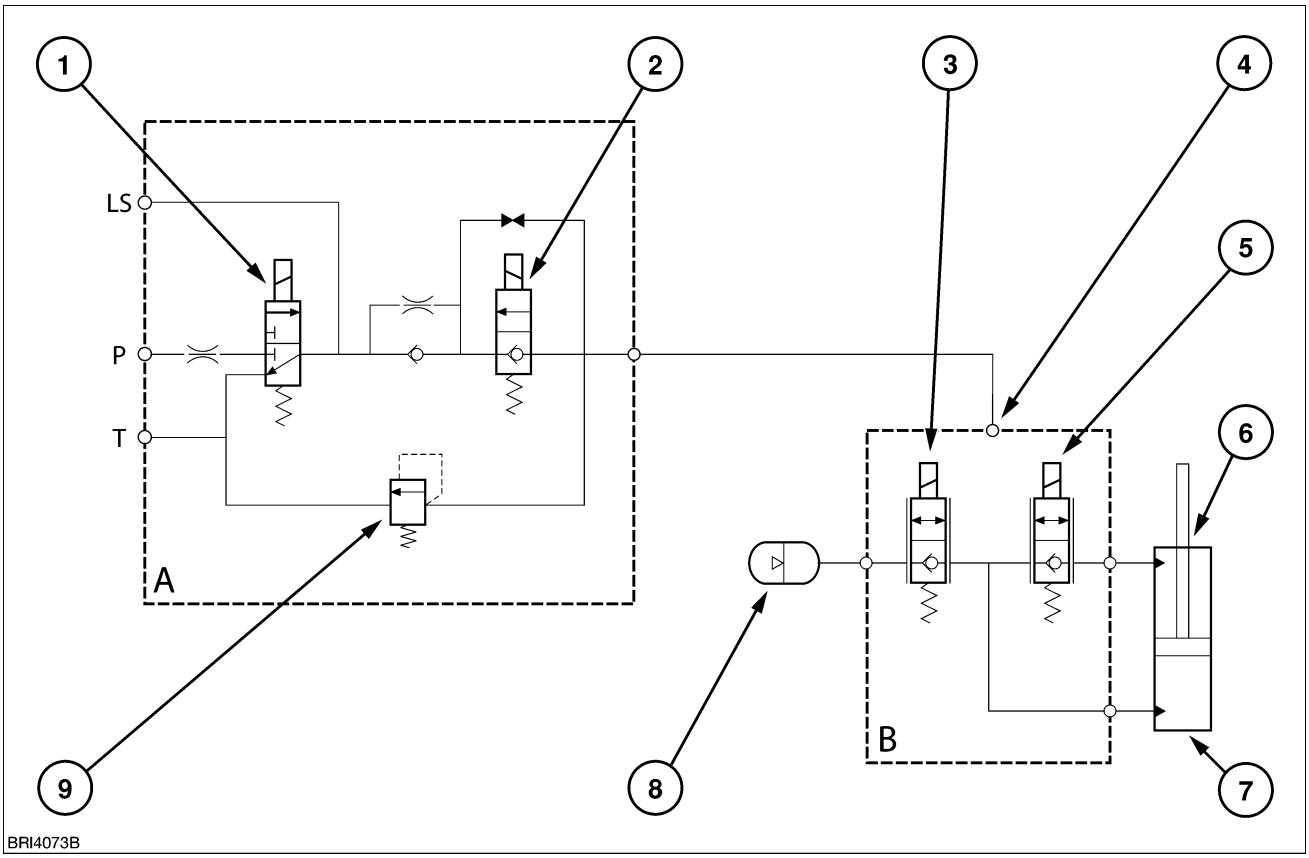
NOTE: *Ride control and the levelling system only operate when the suspension is switched on and the tractor is being driven at speeds above* ***1 kph****.*

The location of those specific components referenced in the circuit diagrams are identified in **SUSPENSION Hydraulic - Static description (D.40.C)**.

.

Suspension Control System Switched OFF

When the suspension system is 'OFF' (Speed under **1 Khm**), the raise valve **(1)** and lower valve **(2)** are deenergised as are the lockout valves (**(3)** and **(5)**). Oil is then trapped in the circuit by and the accumulator **(8)** acts like a spring. If excessive pressure above **210 bar** occurs in the system in this state the system relief valve **(9)** will open.



BAIL06CCM096FSA 1

Semi Active Front Axle With Remote Levelling

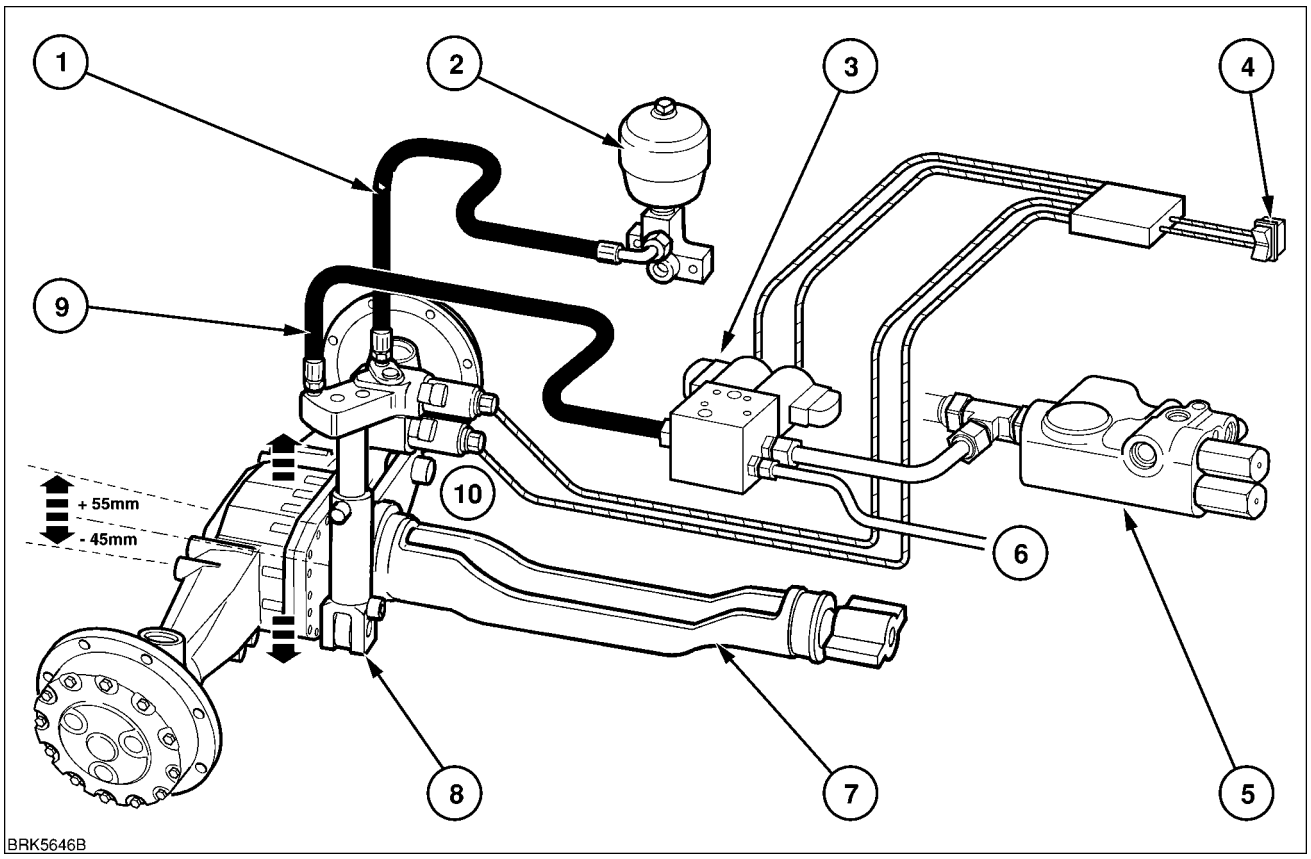
A Load Levelling Valve

B Suspension Control Valve

1. Raise Valve
2. Lower Valve
3. Oil Flow control Valve
4. Inlet Port
5. Rebound control Valve
6. Rod End
7. Cylinder End
8. Accumulator
9. Relief Valve

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SUSPENSION Hydraulic - Static description



BAIL08CVT013FSA 1

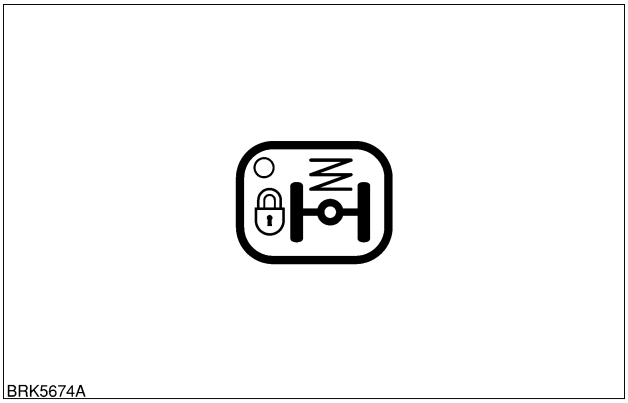
Front axle suspension system

1 Pressure oil to the accumulator
2 Accumulator
3 Levelling valve assembly
4 Suspension On/Off switch
5 Priority valve
6 Load sensing line
7 Suspension link
8 Suspension cylinder
9 Pressure oil to the control valve
10 Control valve assembly

INTRODUCTION

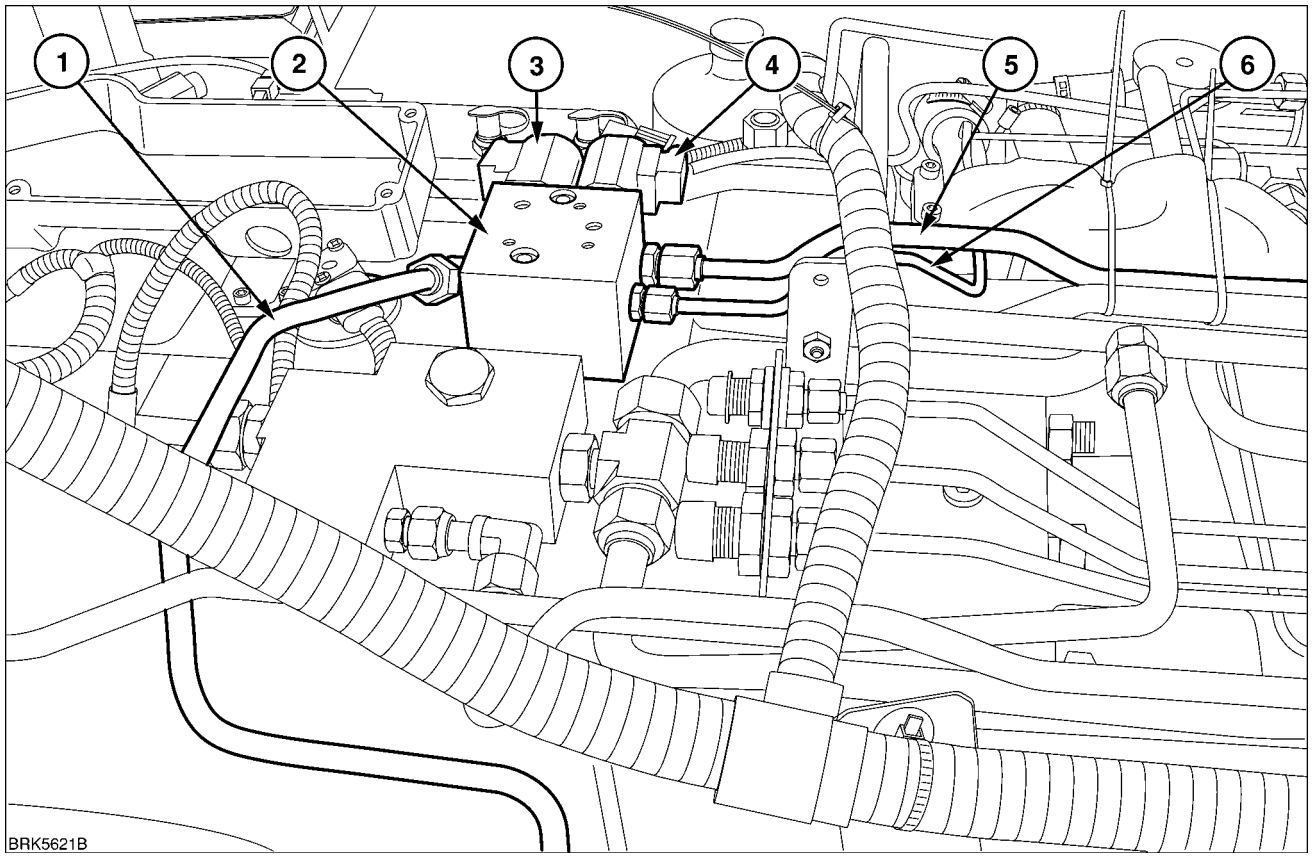
The front axle suspension system is an optional electronically controlled hydraulic suspension feature fitted to the front axle which allows the axle to raise and lower to absorb shock loads and maintain the tractor in a level plane when variations in weight are applied to the front wheels.
The suspension system reduces pitching, keeps the front wheels in contact with the ground and improves stability during fast road speeds when ground conditions could make the tractor unstable. This is especially important where the tractor is operating with minimal front axle loads while transporting heavy 3 point hitch implements.
The system is automatically engaged each time the tractor is started however when the tractor is stationary or travelling at less than **1 kmh** for more than 1.5 seconds the system is automatically "Locked Out ” for safe mounting of implements or ballast.
At speeds between **1 - 12 kmh** the operator can turn the suspension off using the switch (See figure **2** on the armrest control panel. This is ideal for instances where accurate depth control is required with implements mounted on the front linkage or for grading with a front loader.
At speeds above **12 kmh** the system is automatically engaged.
The operator can lock the suspension by pressing the lockout switch.

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BAIL08CVT022ASA 2

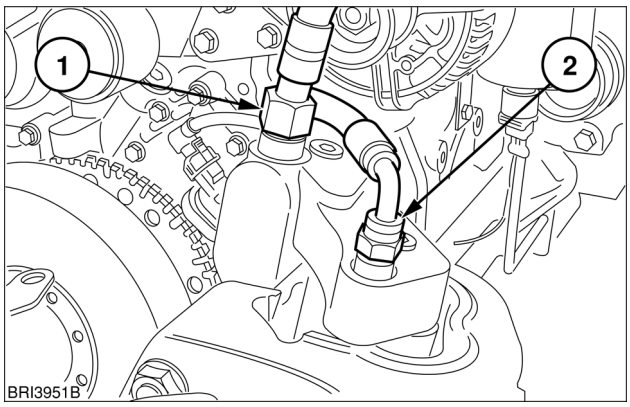
The pressure oil line **(5)** supplies oil from the pump to the levelling valve **(2)** in the suspension system (Refer to.Figure **3**) . This valve controls the raising and the lowering of the cylinder by operating the Raise solenoid valve **(3)** and Lower solenoid valve **(4)**. The oil flow is guided from a supply line **(1)** to the suspension control valve. The load sensing line **(6)** allows the system to determine the correct pressure required for all the hydraulic components in use.



BAIL08CVT014FSA 3

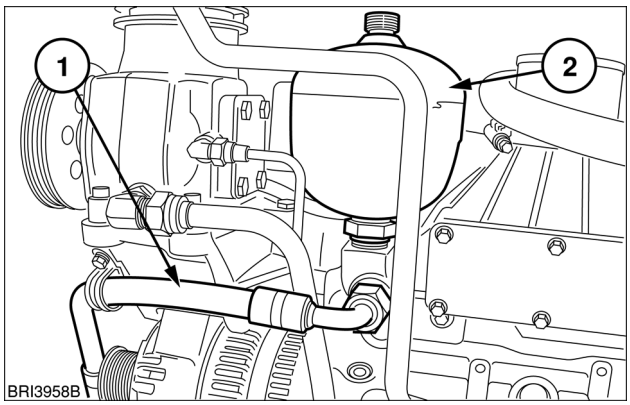
The suspension control valve is located directly above the suspension cylinder. The oil flows from the line of the levelling valve **(2)** through the valve and back through the accumulator pressure oil line **(1)**.

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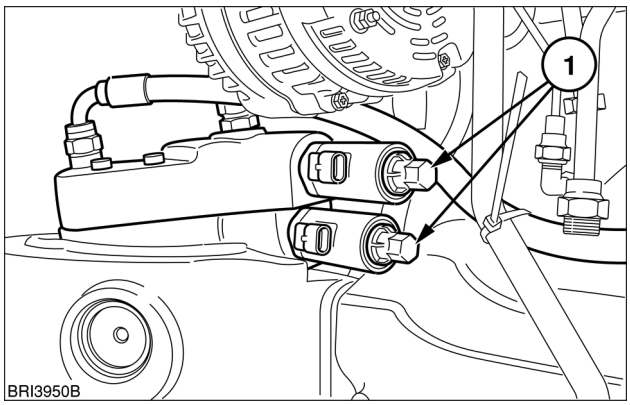
BAIL06CCM037ASA 4

The accumulator **(2)** which acts like a spring is located on the left-hand side of the engine and is supplied with oil through line **(1)** from the suspension control valve.



BAIL06CCM035ASA 5

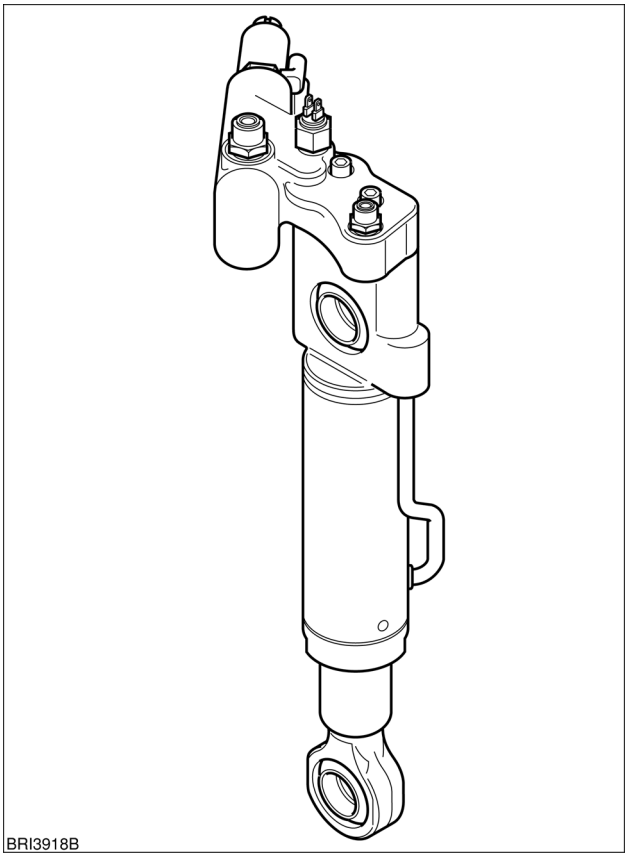
The suspension control valve is operated with solenoid valves **(1)**, which react to control signals from the electronic control unit.



BAIL06CCM039ASA 6

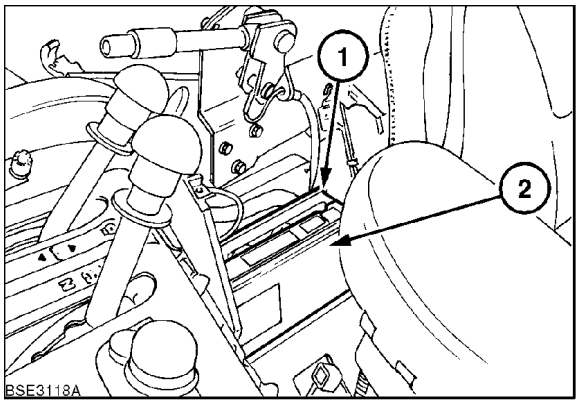
The suspension cylinder is installed in the front axle support.

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BAIL06CCM038BSA 7

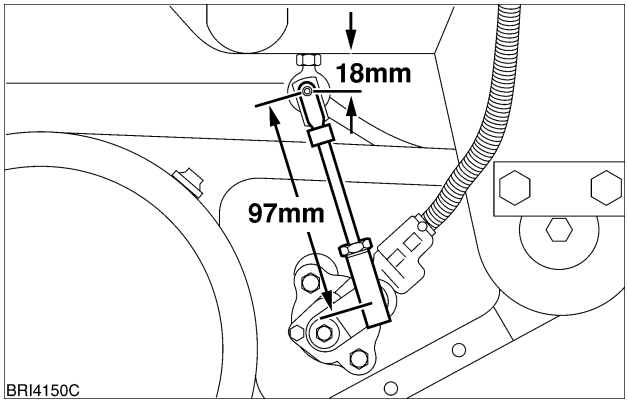
The electronic control unit, which controls the hydraulic control valve, is located behind the driver's seat.
To support fault diagnostics and to optimise performance, the electronic control unit has an inbuilt self-diagnostics function and electronic calibration.
All error codes and calibration values are displayed on the instrument cluster on the digital displays.
Further details about the calibration procedure can be found in **Control valve - Calibrate (D.40.C)**.



BSE3118A 8

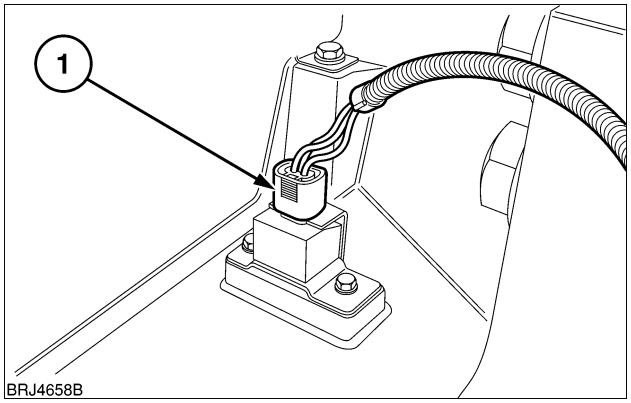
The front axle position is sensed via a potentiometer mounted on the axle.

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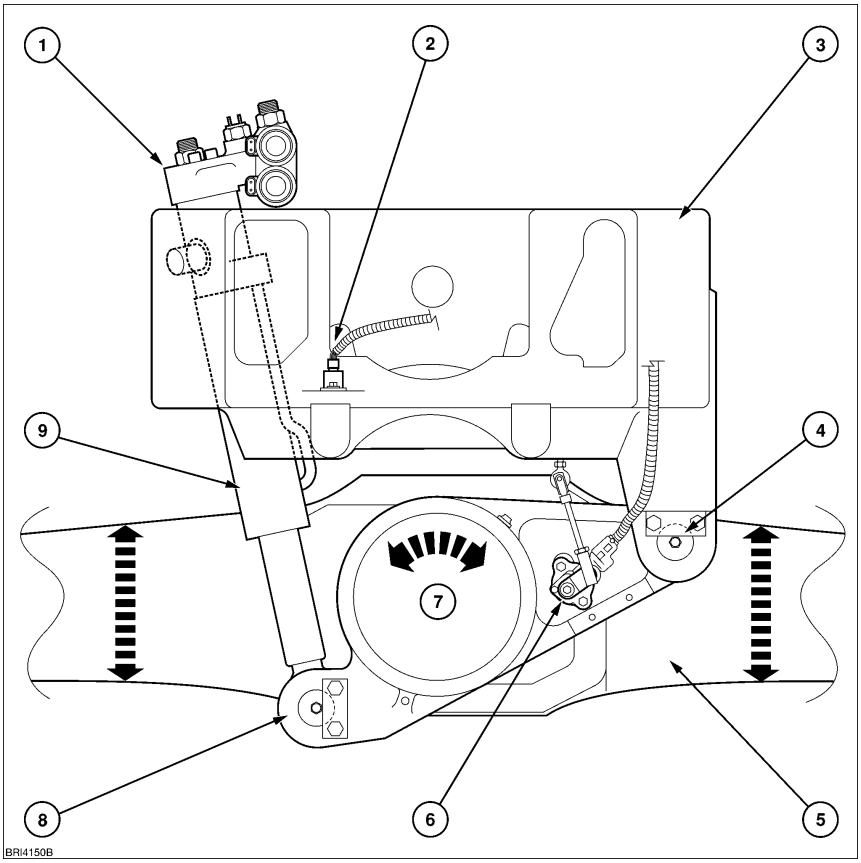
BAIL06CCM174ASA 9

An accelerometer is installed in the front axle support. This measures the ground speed. By means of this value and the information from the position sensor potentiometer from the front axle, the control unit microprocessor matches the extent of the suspension to give optimum driving comfort.



BAIL07CCM268ASA 10

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BAIL07CCM267ASA 11

Front axle suspension system

1 Suspension control valve
2 Accelerometer
3 Front axle support
4 Fulcrum point
5 Axle
6 Potentiometer
7 Front axle pivot point
8 Pivot arm (Panhard rod)
9 Hydraulic cylinder

The suspension system links the front axle **(5)** and the tractor's front axle support **(3)** via a pivot arm called a "Panhard rod" **(8)** and a hydraulic cylinder **(9)**.
Whenever the front axle is subjected shock loads, vibrations or front end weight changes, the Panhard rod pivots about the fulcrum point **(4)**, while at the same time the axle pivots around the pivot point **(7)**. This movement causes the front axle to move up or down in relation to the tractor's front axle support.
The vertical movement of the axle in relation to the speed of the front axle suspension is sensed by the potentiometer **(5)** and accelerometer **(2)**, which transmit the appropriate signals to the electronic control unit.
Depending on the extent of the shock load and the vertical axle movement recorded by the electronic control unit, the hydraulic system responds to absorb the shock loads and to correct the vertical position of the axle so that the tractor continues to work on a level plane.

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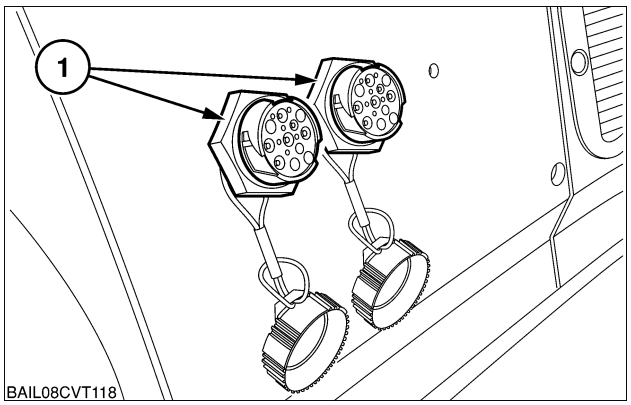
Control valve - Calibrate Front suspended axle

NOTE: *The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the wheels, front and rear. Disconnect all implements and set the shuttle lever to neutral. Check that the Ground speed display is Zero before commencing.*

NOTE: *Dependent on the failure, the Automatic Calibration procedure may have to be repeated two or three times to vent all the air out of the hydraulics*

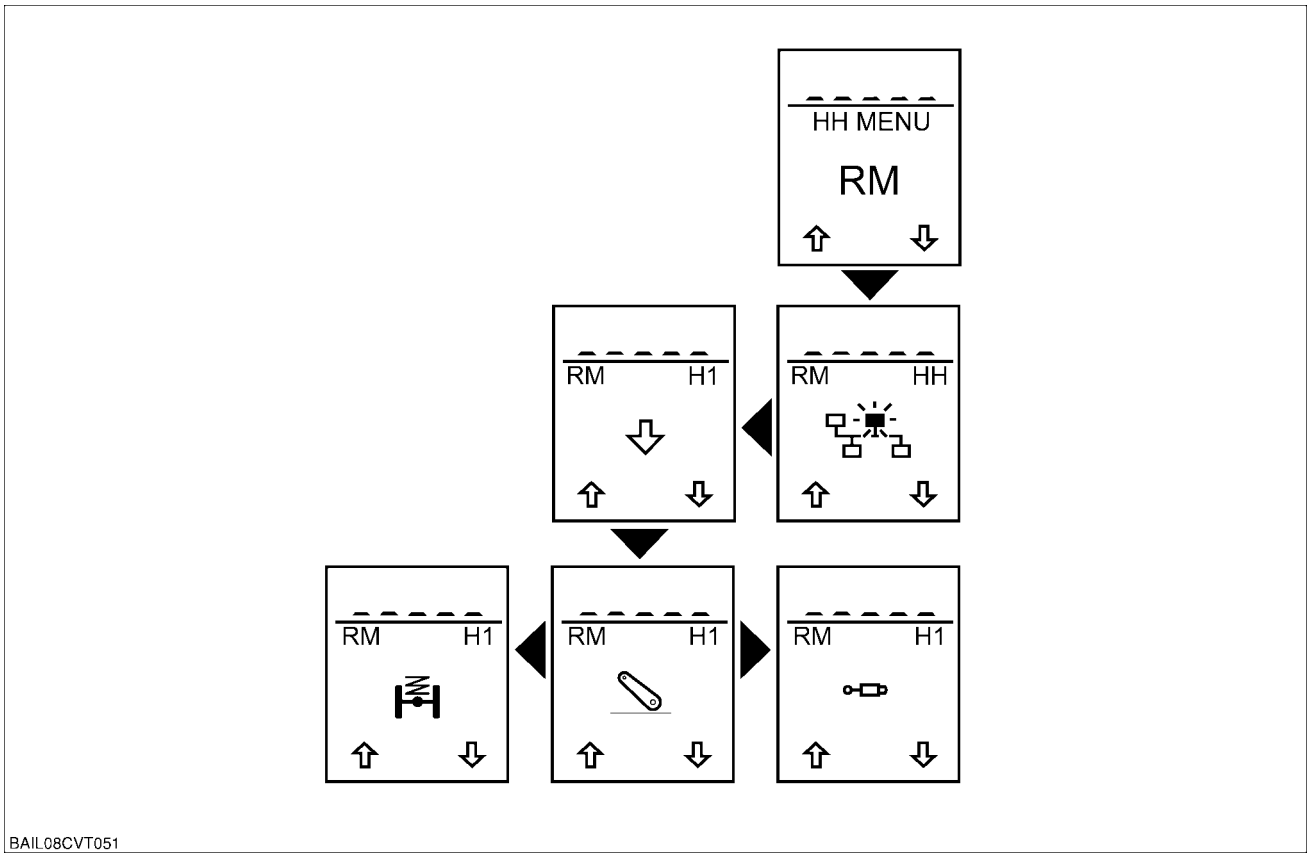
1. On a new module or following a H8, clear module settings procedure, the front suspension is defaulted to 'Not enabled'. The suspension needs to be enabled in the H3 menu mode otherwise the suspension will not calibrate.

2. Install the diagnostic connector **380000843** into the diagnostic socket **(1)** and start the engine.



BAIL08CVT118C 1

3. Use the "up", "down" and "menu" keys on the ICU3 to navigate the HH menu's to H1 and the suspension symbol on the RM controller.

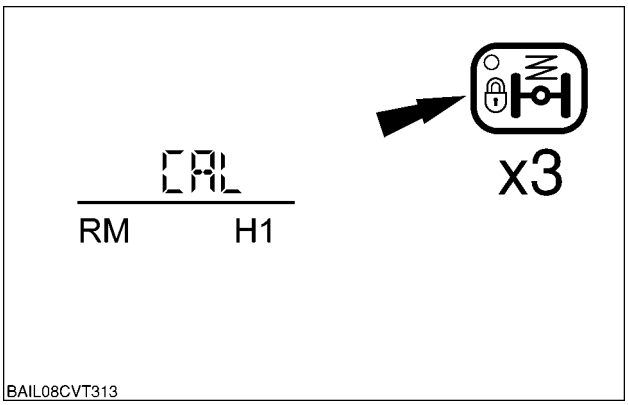


BAIL08CVT051A 2

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4. Set the engine speed to **1200 rev/min**.

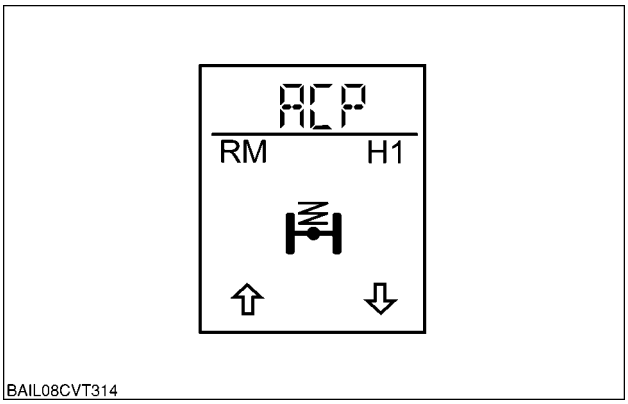
5. The top section of the display will display "CAL". Toggle the suspension switch, **(1)**, ON/OFF three times within four seconds to enter the suspension calibration mode.



BAIL08CVT313 3

6. The top section of the display will display "ACP" indicating that the Automatic Calibration Procedure has been activated.
The indicator lamp in the suspension switch will also flash.

NOTE: *If the calibration procedure needs to be stopped at any time, depress the suspension switch once.*



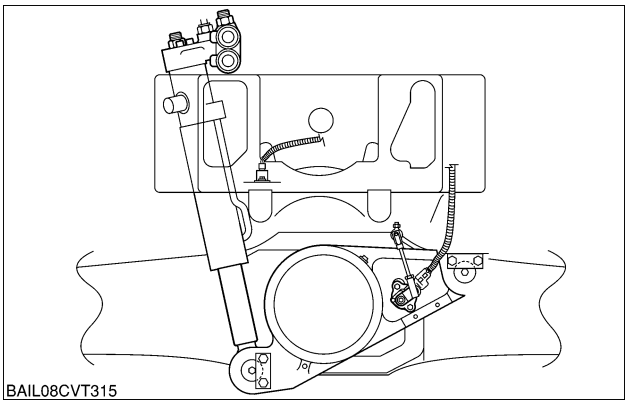
BAIL08CVT314 4

7. The ACP will activate the load levelling valve for 10 seconds, at the same time the axle height position will be displayed by a three figure number on the instrument cluster (0-999).

8. The ACP will activate the raise valve and the unload levelling valve until the front axle reaches the maximum height for a period of 4 seconds.
The potentiometer value at this maximum height will then be stored.

NOTE: *When the axle reaches the maximum position the hydraulic pump will reach the high pressure standby pressure.*

9. The ACP will activate the unload levelling valve until the front axle reaches the minimum height for a period of 4 seconds.
The potentiometer value at this minimum height will then be stored.



BAIL08CVT315 5

10. The ACP will activate the raise and unload levelling valves until the front axle reaches the nominal position.

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11. The top section of the display will display "END" when the ACP has finished.
12. All components of the suspension system are now calibrated.
13. Set engine to low idle and key OFF to store the calibration values.

NOTE: *If an error occurs during calibration a "U" code will be displayed and the procedure will need to be repeated. Refer to the "U" code listing in* ***ELECTRONIC SYSTEM - Calibrate (A.50.A)****.*

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Cylinder - Remove

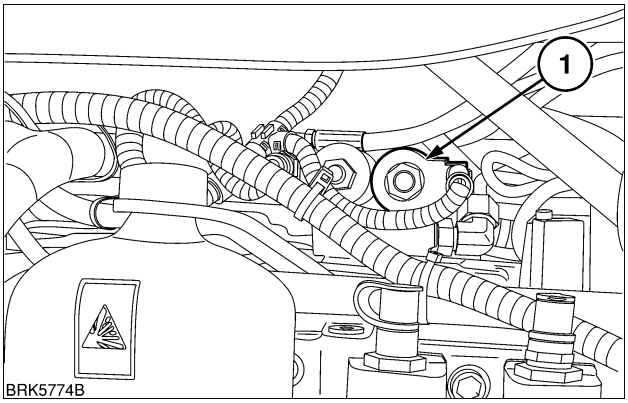
⚠ DANGER ⚠

Exercise extreme caution when performing tasks on the front suspension system. ALWAYS ensure that the system is depressurised and that the axle is at rest on the support stops.

B011

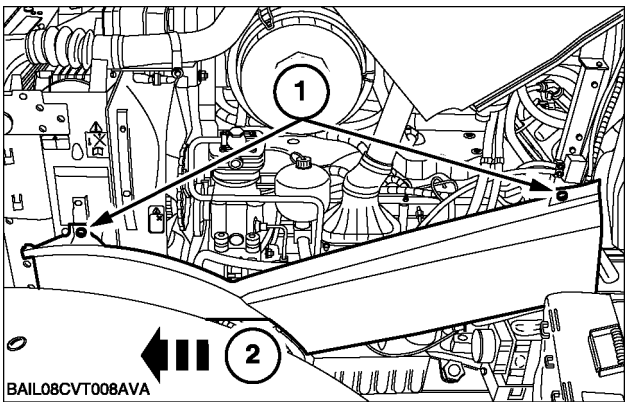
1. Disconnect the battery **(1)** to prevent accidental tractor start up. Refer to **Battery - Disconnect (A.30.A)**.

2. Depressurise the suspension system. by unscrewing knurled knob on the lower solenoid **(1)**, and allow the tractor to lower completely onto the stops then rotate the screw clockwise to return to normal operation.



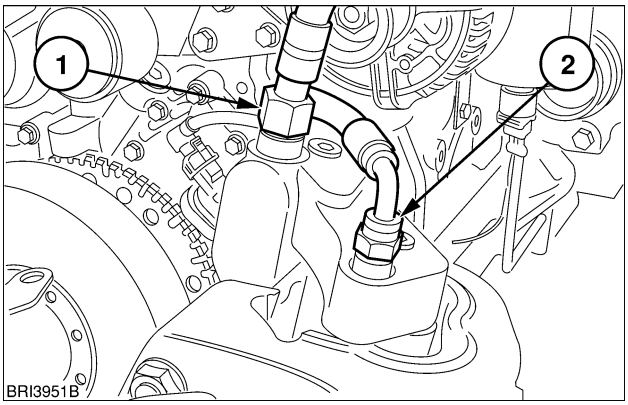
BAIL08CVT029ASA 1

3. Undo retaining bolts **(1)** and remove left hand engine side panel **(2)**.



BAIL08CVT008AVA 2

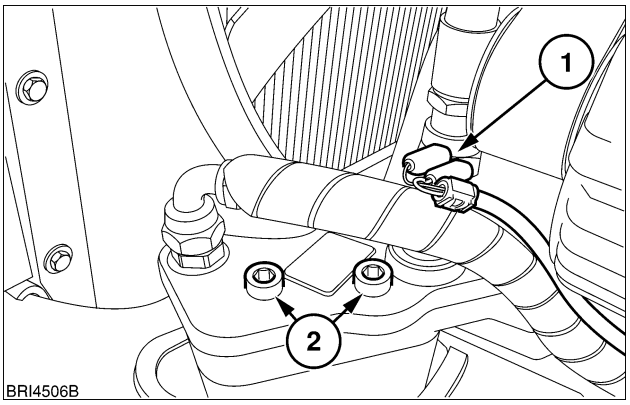
4. Place a suitable oil collecting container under the pipe connections and disconnect the pipes **(1)** and **(2)** from the cylinder.



BAIL06CCM251ASA 3

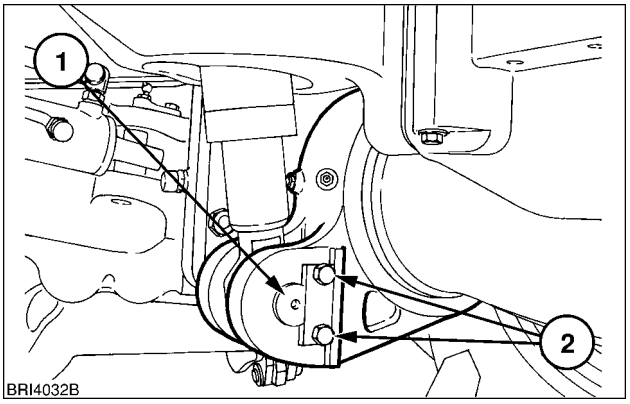
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5. Disconnect wiring harness connectors from the solenoids and pressure switch **(1)**. Undo retaining bolts **(2)** and remove control valve assembly.



BAIL06CCM256ASA 4

6. Undo and remove retaining plate bolts **(2)**- Remove the retaining plate.



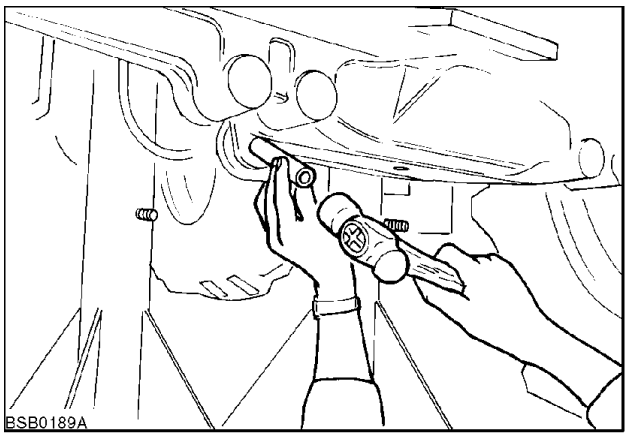
BAIL06CCM048ASA 5

7. If necessary use a suitable hoist and cable around the front support and raise the tractor until access is gained to the lower pin. Remove the retaining plate and drift the pin out from the front of the tractor.

⚠ WARNING ⚠

The component is heavy. ALWAYS use a hoist or get assistance to lift the component. Failure to comply could result in serious injury or death.

M944



BSB0189A_709 6

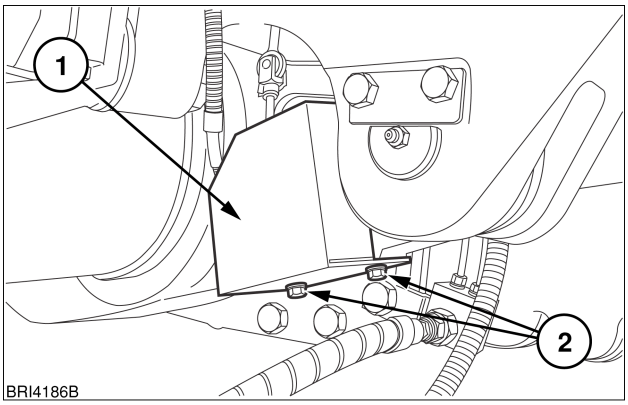
8. Remove the bolt from the top pin and using a suitable slide hammer with an M10 thread, remove the top pin and lower the cylinder assembly away from the tractor using a suitable support.

9. Ensure the O-rings are installed on the O-Ring Face Seal connectors of the cylinder.
   - Lubricate the rod end bearings with the specified grease after installation.

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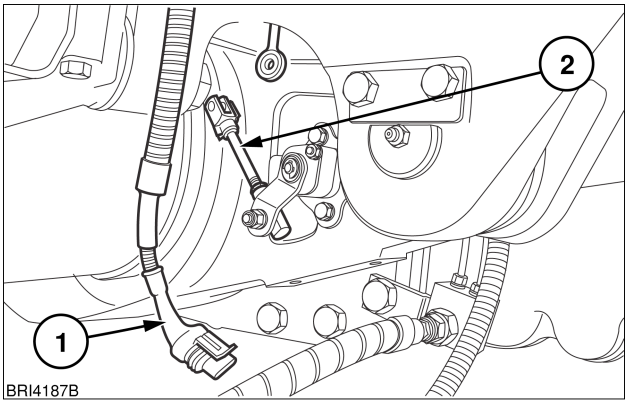
Sensing system Position sensor - Remove

1. Unscrew and remove the potentiometer guard retaining screws **(2)** and remove the guard **(1)**.



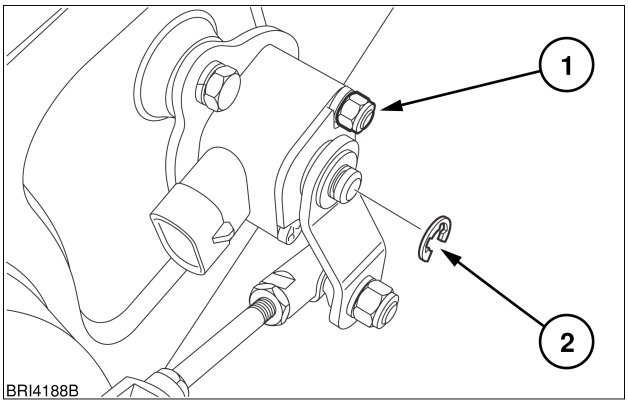
BAIL06CCM144ASA 1

2. Disconnect the harness plug **(1)** from the potentiometer and remove retaining clip from rod **(2)** .



BAIL06CCM145ASA 2

3. Remove the circlip **(2)** from the arm. Undo the potentiometer retaining nut **(1)** and slide the potentiometer off the bracket .

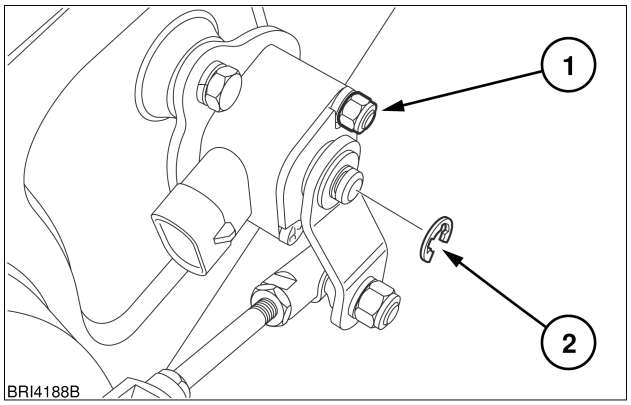


BAIL06CCM146ASA 3

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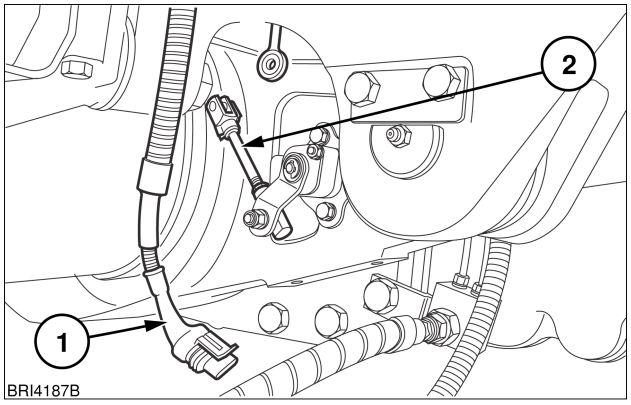
Sensing system Position sensor - Install

1. Slide the potentiometer onto the bracket. Tighten the retaining nut **(1)** and locate the circlip **(2)** into groove on the pin.



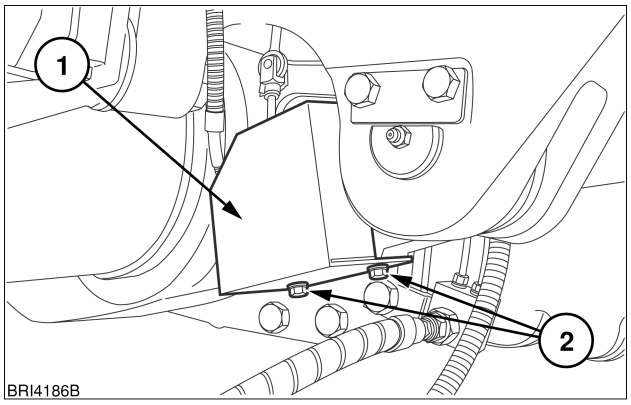
BAIL06CCM146ASA 1

2. Fix the linkage rod **(2)** to the eyelet using the retaining clip . Refer to **Sensing system Position sensor - Adjust (D.40.C)** for correct adjustment. Reconnect the harness **(1)**.



BAIL06CCM145ASA 2

3. Locate the potentiometer guard **(1)** and secure with the retaining screws **(2)** .

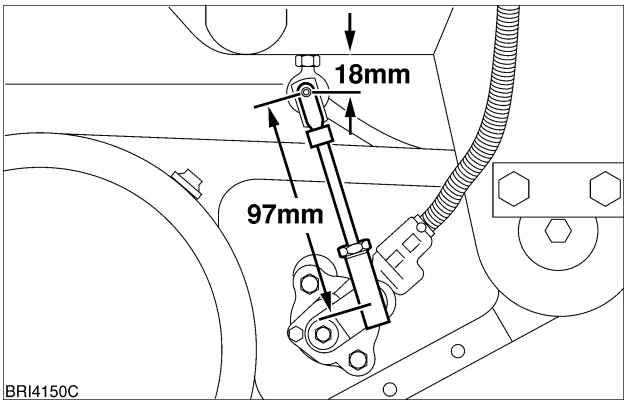


BAIL06CCM144ASA 3

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Sensing system Position sensor - Adjust

1. To ensure the front axle suspension is operating correctly, the front axle position potentiometer linkage must be set up correctly. Refer to Figure **1** for the adjustment dimensions.



BAIL06CCM174ASA 1

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TRAVELLING - D

WHEELS AND TRACKS Wheels - 50.C

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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Front wheel - Torque

	Description	Bolt/Nut Torque - Nm	Bolt/Nut Torque - lb.ft
Front 4WD	Fixed wheel assembly to hub Steel disc to hub	210 210	154.9 154.9
Front 4WD	Steel disc to rim	250	184.4

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Rear wheel - Torque

Rear Wheel Flange Type Axle

Description	Bolt/Nut Torque - Nm (lb ft)
Rear disc to hub nuts	**250 Nm** (**184.4 lb ft**)
Rear disc to rim nuts (M16 nuts)	**250 Nm** (**184.4 lb ft**)

Bar Axle - Wheels with Steel Centre Disc (welded and bolted to rim types)

Description	Bolt/Nut Torque - Nm (lb ft)
Disc to hub fixings (10 x M22 Bolts)	**500 Nm** (**368.8 lb ft**)
Disc to rim nuts (M16)	**250 Nm** (**184.4 lb ft**)
Split wedge bolts (6 x M22)	**500 Nm** (**368.8 lb ft**)

Bar Axle - Wheels with Cast Centre Disc

Description	Bolt/Nut Torque - Nm (lb ft)
Disc to rim nuts (M16 nuts)	**250 Nm** (**184.4 lb ft**)
Split Wedge bolts (6 x M20)	**300 Nm** (**221.3 lb ft**)

Dual Rear Wheels

Description	Bolt/Nut Torque - Nm (lb ft)
Disc to hub fixings (10 x M22 bolt)	**500 Nm** (**368.8 lb ft**)
Split wedge bolts (4 x M22 bolt)	**500 Nm** (**368.8 lb ft**)
Disc to rim bolts (M16 nuts)	**250 Nm** (**184.4 lb ft**)

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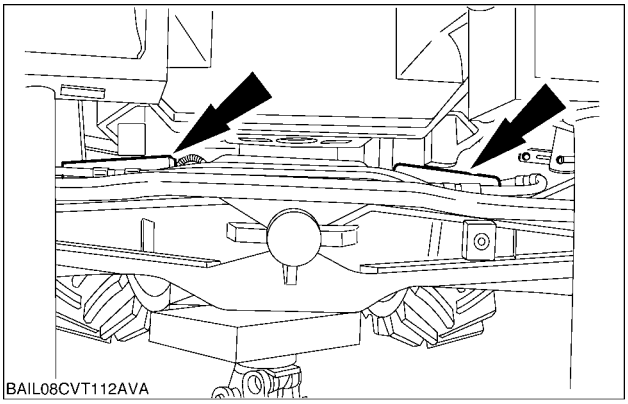
Rear wheel - Remove

⚠ WARNING ⚠

Use suitable floor (service) jacks or chain hoist to raise wheels or tracks off the floor. Always block machine in placed with suitable safety stands.

M499

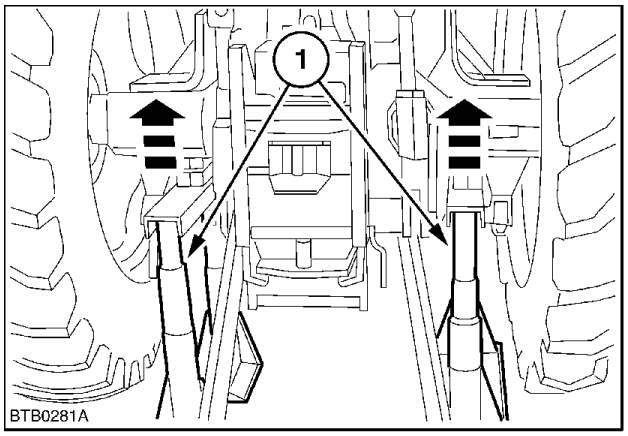
1. Position wooden wedges between the front axle and front support. These prevent articulation of the front axle.



BAIL08CVT112AVA 1

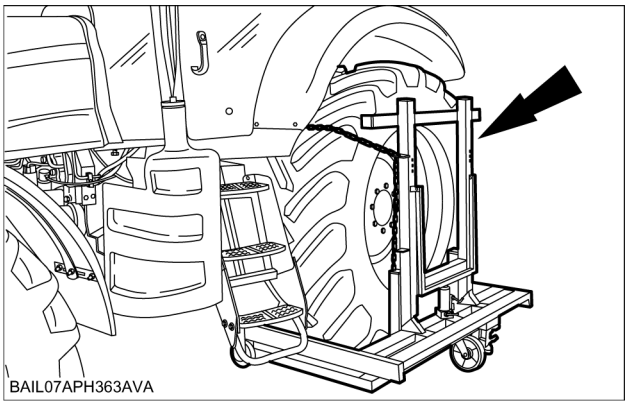
2. Raise the rear of the tractor and place two suitable axle stands **(1)** under the final drive cases.

NOTE: *If required, detach the lift rods from the lower links.*



BTB0281A 2

3. Remove both rear wheels.



BAIL07APH363AVA 3

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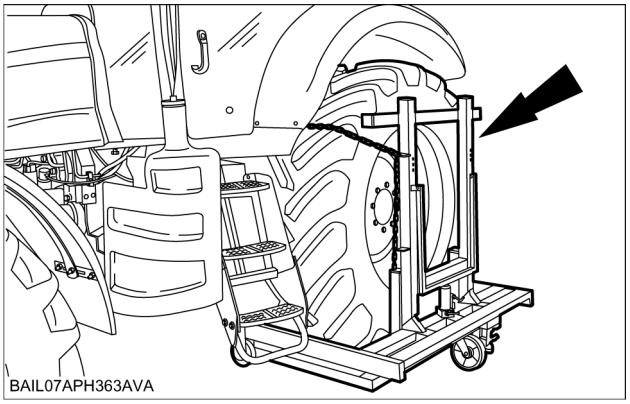
Rear wheel - Install

⚠ WARNING ⚠

Use suitable floor (service) jacks or chain hoist to raise wheels or tracks off the floor. Always block machine in placed with suitable safety stands.

M499

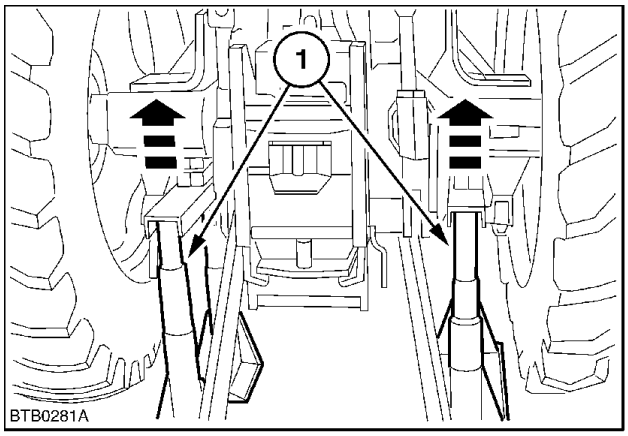
1. Install both rear wheels.
   Tighten to the specified torque, for further information refer to **Rear wheel - Torque (D.50.C)**.



BAIL07APH363AVA 1

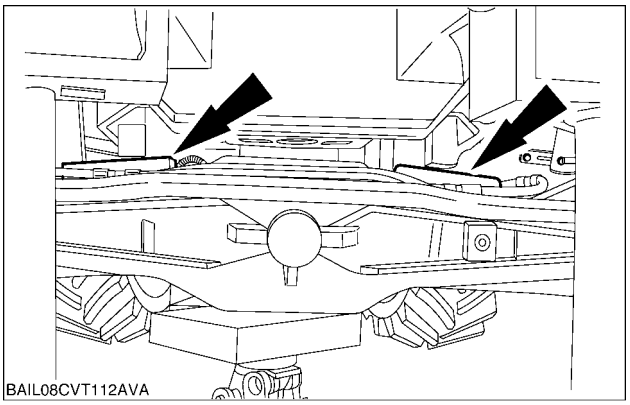
2. Remove the axle stands **(1)** from under the final drive cases.

NOTE: *If required, attach the lift rods to the lower links.*



BTB0281A 2

3. Remove the wooden wedges from between the front axle and front support.



BAIL08CVT112AVA 3

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PARKING BRAKE Electronic - 32.D

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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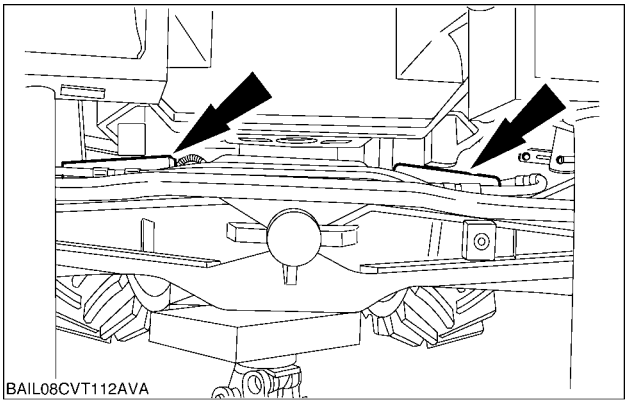
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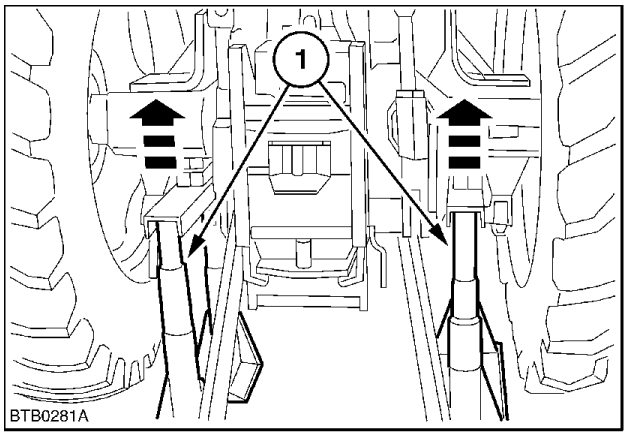
1. Make sure the vehicle is parked on a level surface.
2. Chock the front wheels using suitable wheel stops.
3. Position wooden wedges between the front axle and front support. These prevent articulation of the axle.



BAIL08CVT112AVA 1

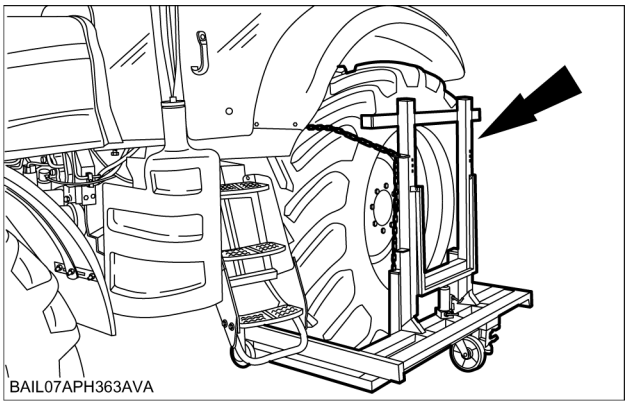
4. Raise the rear of the vehicle and place two suitable axle stands **(1)** under the final drive cases.

NOTE: *If required, detach the lift rods from the lower links.*



BTB0281A 2

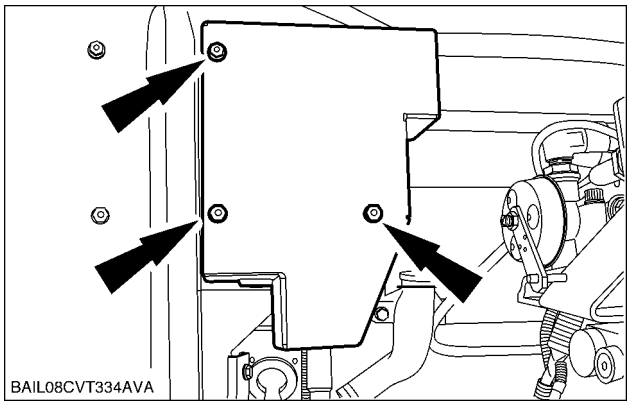
5. Remove the rear left wheel.



BAIL07APH363AVA 3

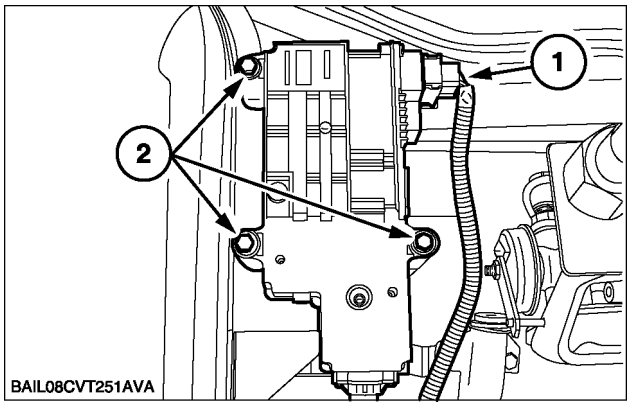
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6. Remove the electronic park lock (EPL) cover.



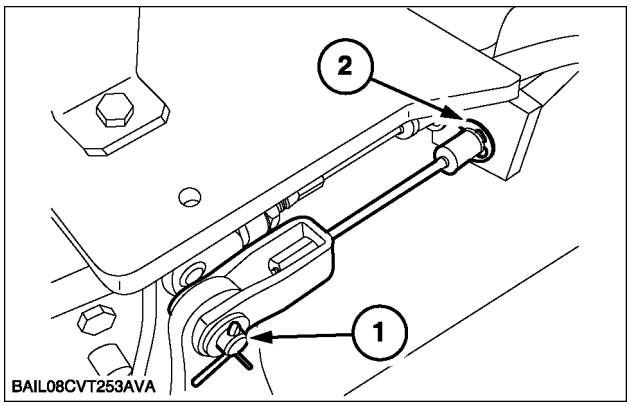
BAIL08CVT334AVA 4

7. Disconnect the EPL electrical connector **(1)** and detach the EPL from the cab **(2)**.



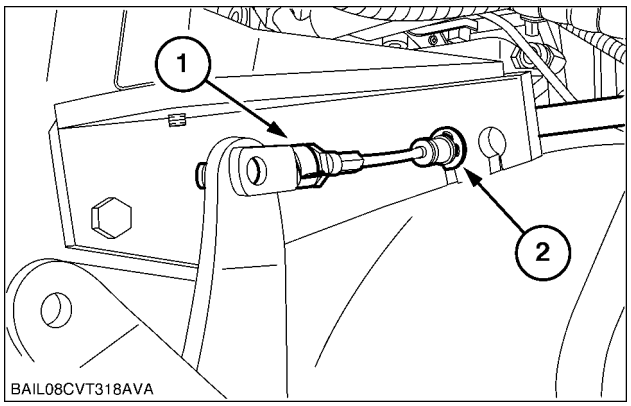
BAIL08CVT251AVA 5

8. Remove the split pin and the clevis pin **(1)** from the parking brake lever. Detach the parking brake cable **(2)**.



BAIL08CVT253AVA 6

9. Remove the speed clip and the clevis pin **(1)** from the EPL lever (if fitted) and detach the EPL cable **(2)**.



BAIL08CVT318AVA 7

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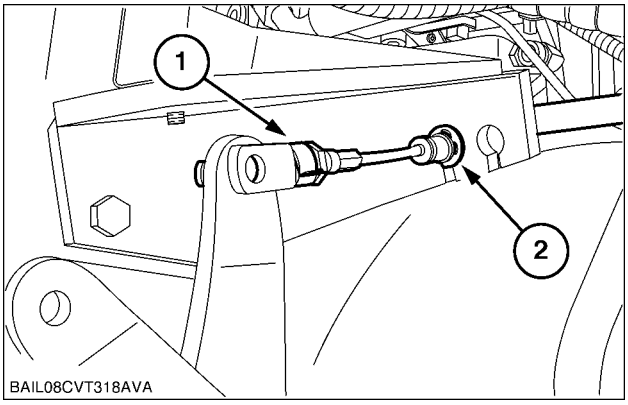
PARKING BRAKE Electronic - Install

⚠ WARNING ⚠

Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

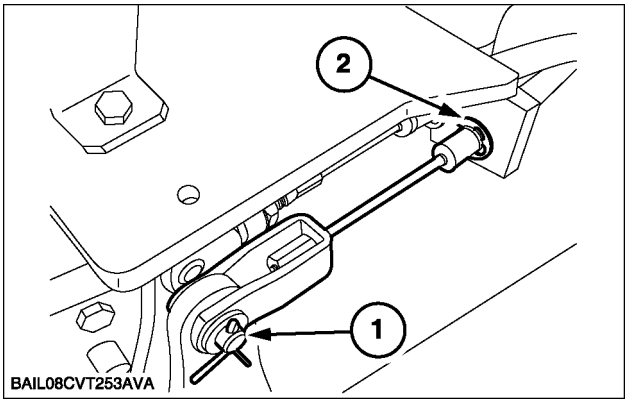
B020

1. Attach the EPL cable **(2)** and install the clevis pin and speed clip **(1)**.



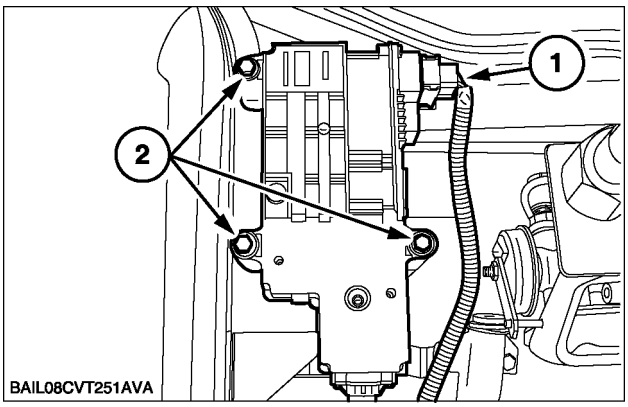
BAIL08CVT318AVA 1

2. Attach the parking brake cable **(2)** and install the clevis pin and split pin **(1)**.



BAIL08CVT253AVA 2

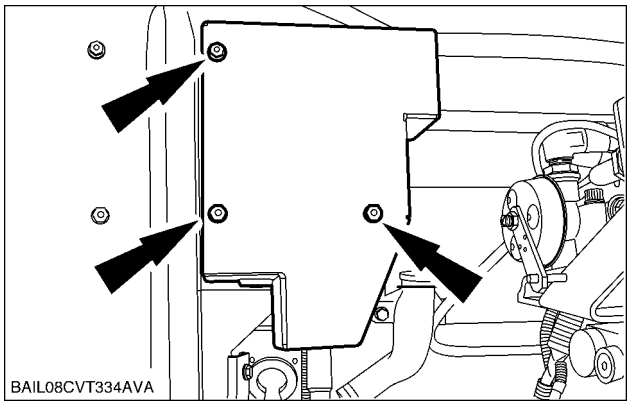
3. Install the EPL **(2)** and connect the EPL electrical connector **(1)**.



BAIL08CVT251AVA 3

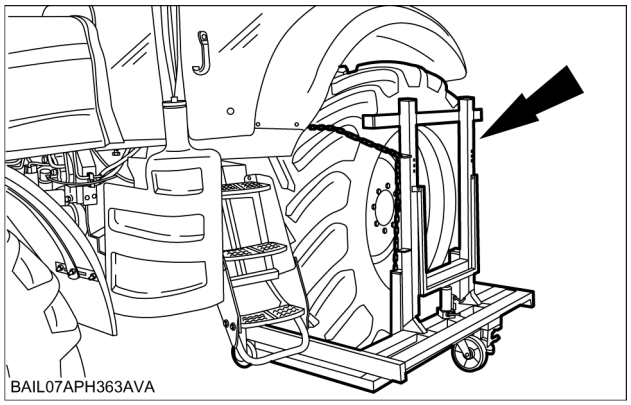
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4. Install the EPL cover.



BAIL08CVT334AVA 4

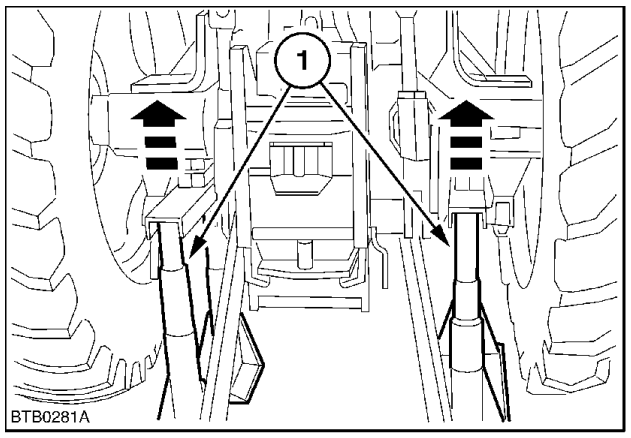
5. Install the rear left-hand wheel.
Tighten to specified torque, for further information refer to **Rear wheel - Torque (D.50.C)**.



BAIL07APH363AVA 5

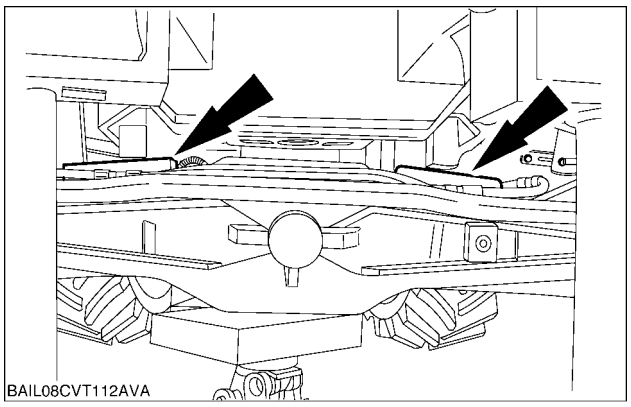
6. Raise the rear of the vehicle and remove the axle stands **(1)**.

NOTE: *If detached during removal, reattach the lift rods to the lower links.*



BTB0281A 6

7. Remove the wooden wedges from between the front axle and front support.



BAIL08CVT112AVA 7

Next operation:
Adjust the EPL, for further information refer to **PARKING BRAKE Electronic - Adjust (D.32.D)**

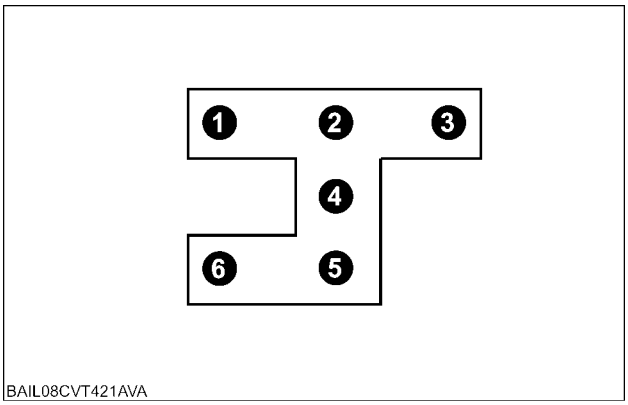
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PARKING BRAKE Electronic - Adjust

IMPORTANT: *Manual adjustment of the EPL should only be carried out if the brake pads / brake discs have been renewed.*

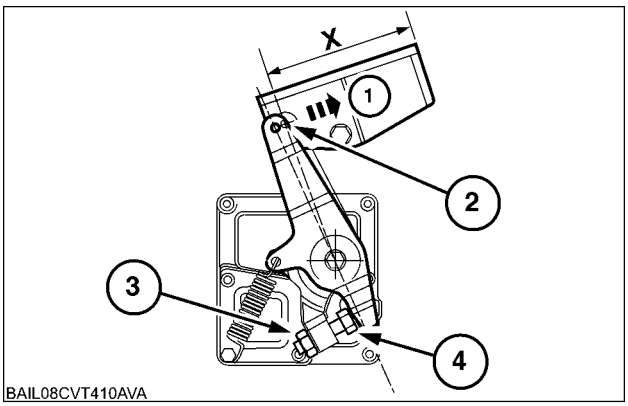
NOTE: *The manual park brake should be correctly adjusted prior to adjusting the EPL.*

1. Disengage the EPL, using either of the methods described below:
2. Electronically:
   - Turn the ignition on.
   - Move the shuttle lever to position 5 whilst depressing both the shuttle lever neutral button and both brake pedals for more than 3 seconds.
   - The EPL and park brake warning lamps will be illuminated on the cluster.
   - Turn the ignition off and the EPL will remain disengaged.



BAIL08CVT421AVA 1

3. Mechanically:
   - Using the special tool supplied in the cab, remove the EPL cover and manually disengage the EPL.
4. Block the front wheels, raise the rear wheels just clear of the ground.
5. Apply a force of **250 - 350 Nm** (**184 - 258 lb ft**) five times at the end of the EPL lever **(1)**.
6. Adjust the EPL as follows:
   - Release the locking nut **(3)**.
   - Apply a force of **250 - 350 Nm** (**184 - 258 lb ft**) and under load adjust the bolt **(4)** to achieve a measurement **174 - 176 mm** between point **(2)** and the front bracket installed as shown **(X)**.
   - Tighten the locking nut **(3)** and recheck the measurement **(X)**.



BAIL08CVT410AVA 2

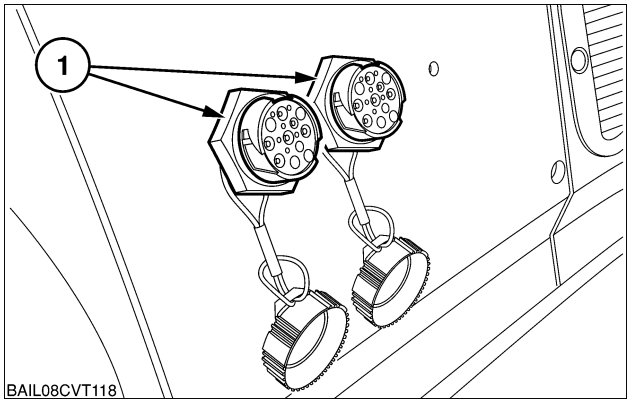
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PARKING BRAKE Electronic - Calibrate

NOTE: *This procedure calibrates the EPL (Electronic Park Lock) applied and released positions and the accelerometer.*

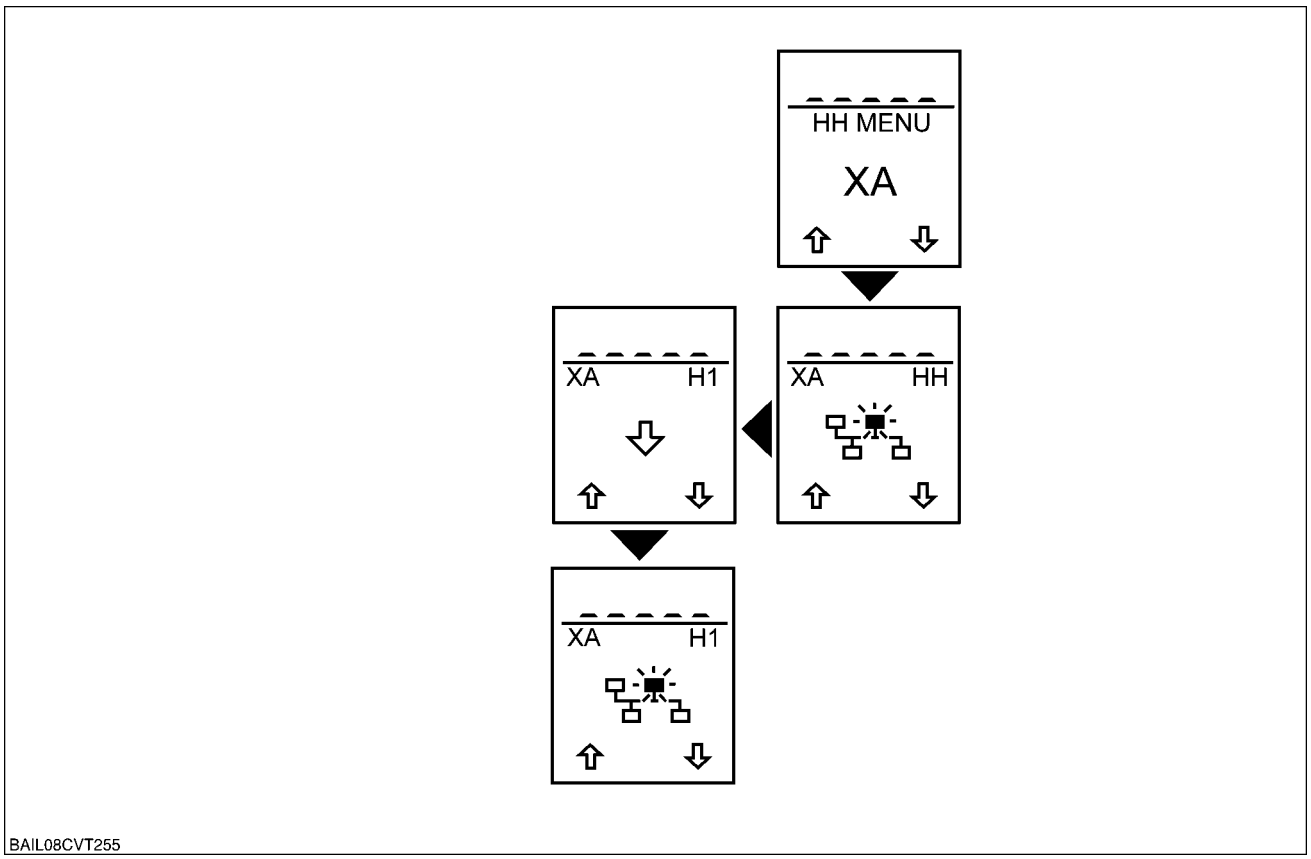
NOTE: *The calibration procedure is controlled by the electronic management system and during the calibration procedure the system is functional. Park the tractor on a flat surface away from any obstacles. The handbrake must be released and the shuttle lever in the park position.*
If required during the calibration procedure use the service brakes to prevent the tractor from moving.

1. Install the diagnostic connector **380000843** into the left hand diagnostic socket **(1)**.



BAIL08CVT118 1

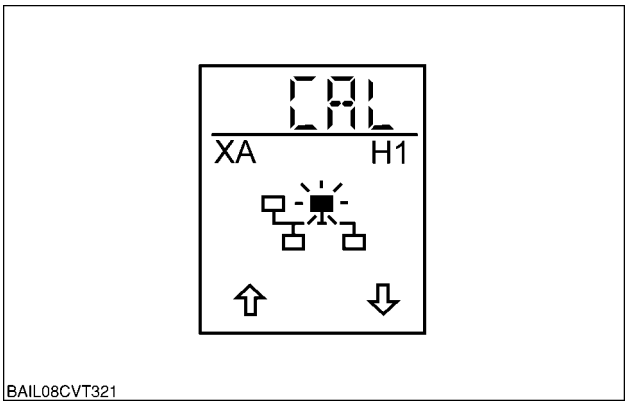
2. Use the "up", "down" and "menu" keys on the ICU3 to navigate the HH menu's to H1 on the XA controller.



BAIL08CVT255 2

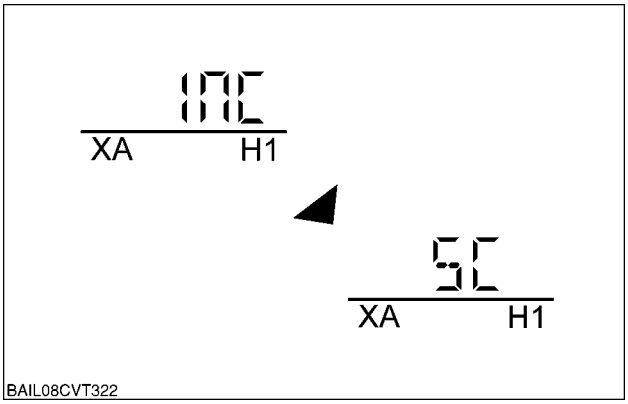
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3. To start the calibration procedure press the 'menu' button, Cal will be shown on the display.



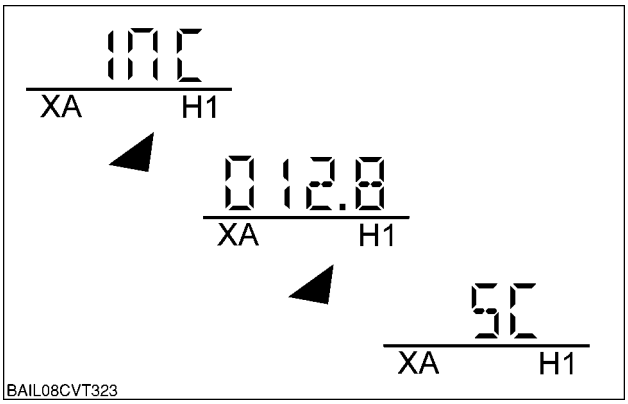
BAIL08CVT321 3

4. Depress the 'up' button , the display will show 'Inc' for the accelerometer calibration or 'SC' for the stroke calibration, use the 'up' and 'down' buttons to switch between the options.



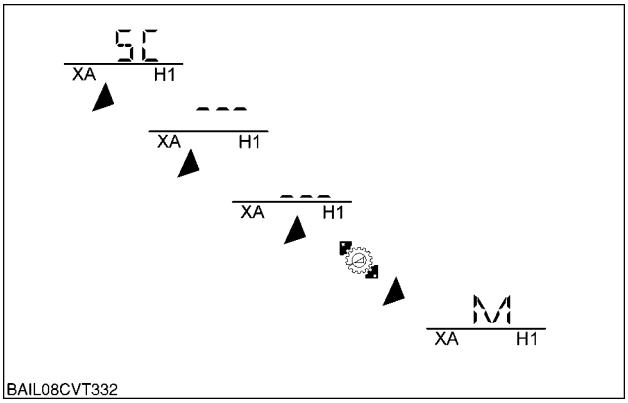
BAIL08CVT322 4

5. To calibrate the accelerometer:
Use the 'up/down" buttons to select 'Inc' on the display, Press the 'down' button to enter the accelerometer calibration routine.
The display will alternate between the calibrated value and 'Inc'.
When the calibration is complete the display will show 'SC'.



BAIL08CVT323 5

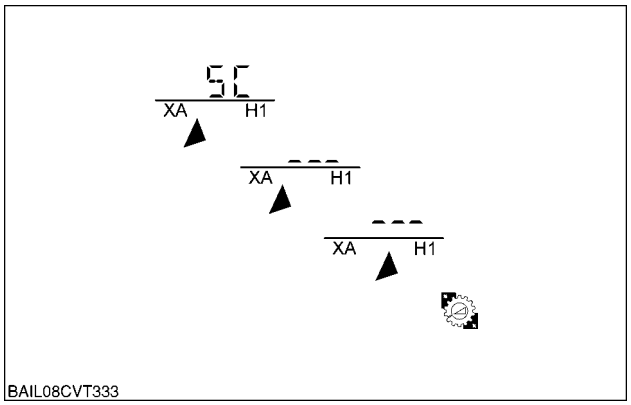
6. To calibrate the applied and released positions use the 'up/down" buttons to select 'SC' on the display, Press and hold the 'down' button to calibrate the released position.
During the calibration procedure the display will show a horizontal line which will move downwards while calibrating the released position and then the EPL release symbol will be displayed.
When the released position has been calibrated the display will show 'M', release the down button.



BAIL08CVT332 6

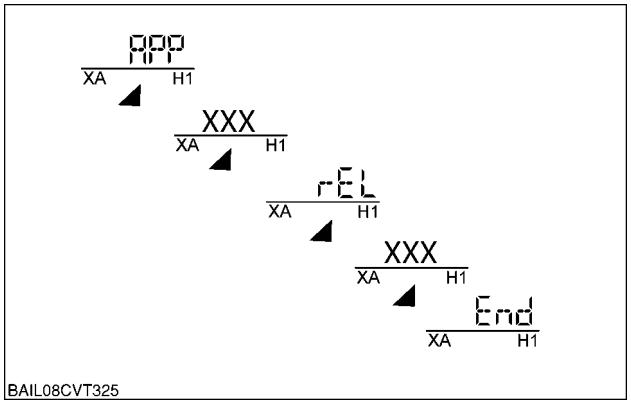
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7. Press and hold the 'down' button to calibrate the applied position. The display will show a horizontal line which will move upwards and the 'EPL applied' symbol will be displayed.



BAIL08CVT333 7

8. When the calibration is complete the display will show 'APP' followed by the applied position and then 'REL' followed by the released position.



BAIL08CVT325 8

9. Key OFF to store the calibration values.

NOTE: *If an error occurs during calibration a "U" code will be displayed and the procedure will need to be repeated. Refer to the "U" code listing in* ***ELECTRONIC SYSTEM - Calibrate (A.50.A)****.*

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SERVICE - Technical Publications & Tools



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CASE IH AGRICULTURE

SERVICE MANUAL

BODY AND STRUCTURE



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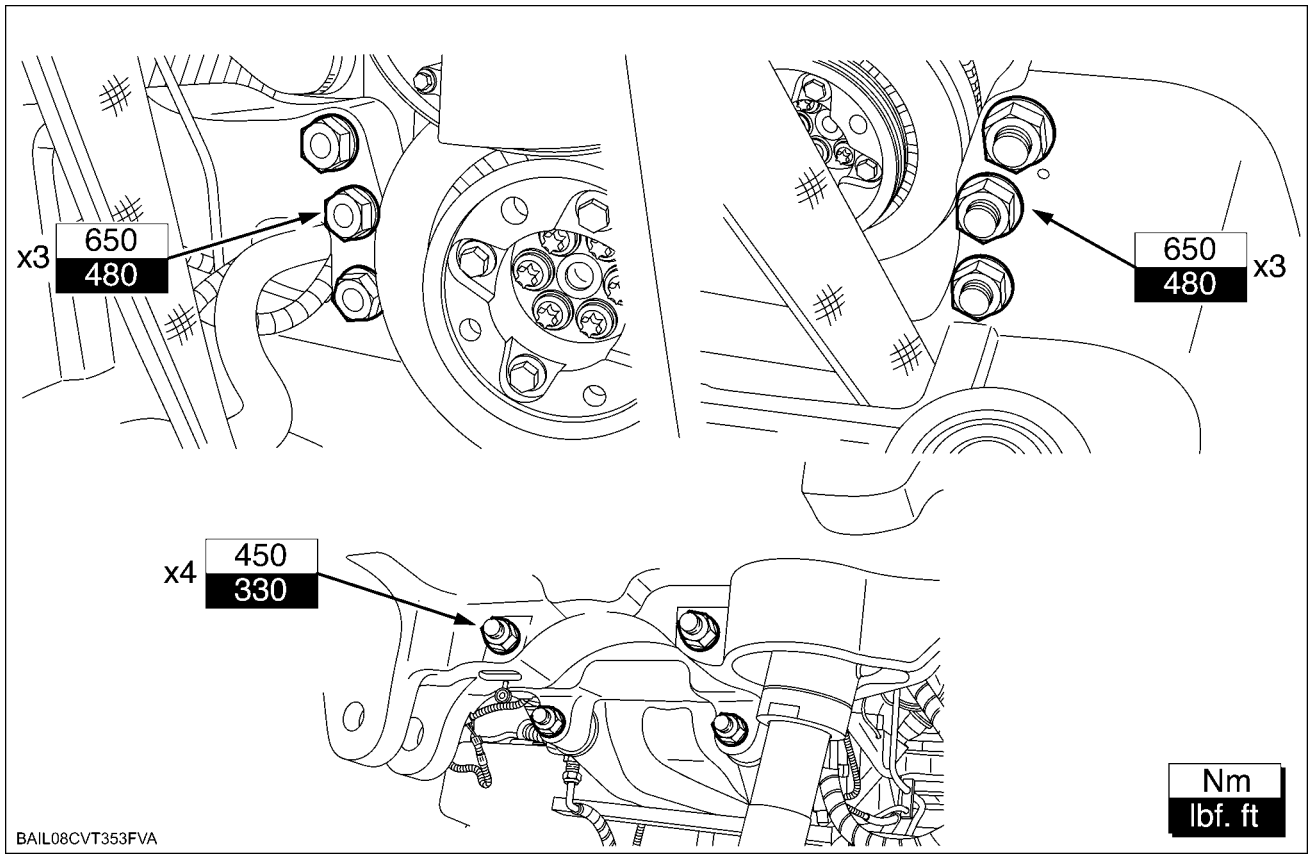
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Front - Torque



BAIL08CVT353FVA 1

The following general nut and bolt installation torque requirements (lubricated) apply to any operation not previously listed.

INCH SERIES	lbf ft	Nm
1/4 - 20	8	11
1/4 - 28	8	11
5/16 -18	14	19
5/16 -24	17	23
3/4 - 16	23	31
3/4 - 24	33	45
7/16 -14	48	65
7/16 -20	55	75
1/2 - 13	65	88
1/2 - 20	75	102
9/16 -18	90	122
5/6 -18	138	187

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Front - Remove

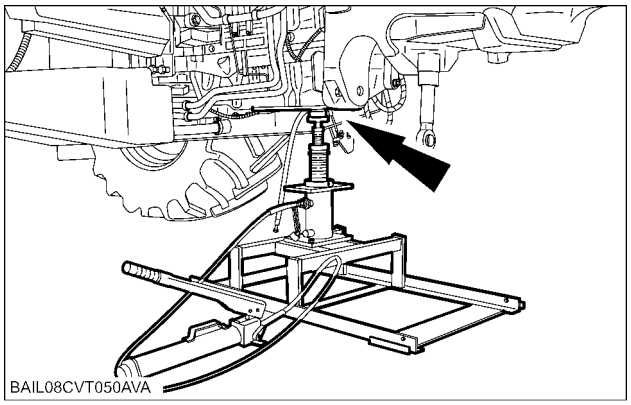
Prior operation:
Remove the front axle, for further information refer to **FRONT AXLE - Remove (D.10.A)**
Prior operation:
Remove the radiator, for further information refer to **Radiator - Remove (B.50.A)**

⚠ WARNING ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

1. Position the splitting gear **(1) MS2700C-1 (2) MS2700C-2 (3) MS2700C-4** under the engine. Raise and support the front of the tractor with the splitting gear. Once supported safely, remove the axle stands from under the front weight carrier.



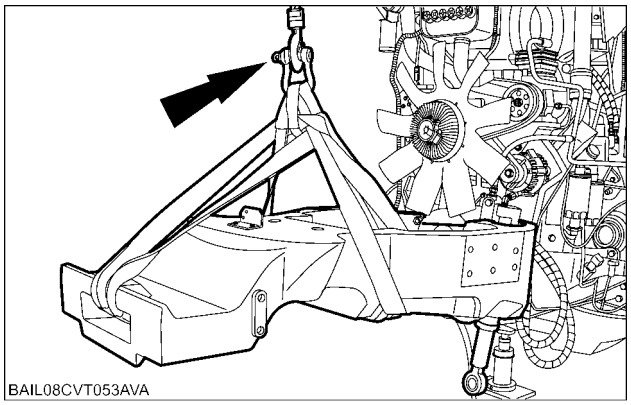
BAIL08CVT050AVA 1

2. Using suitable slings or chains attach the front and rear of the front support assembly to an overhead hoist.

⚠ WARNING ⚠

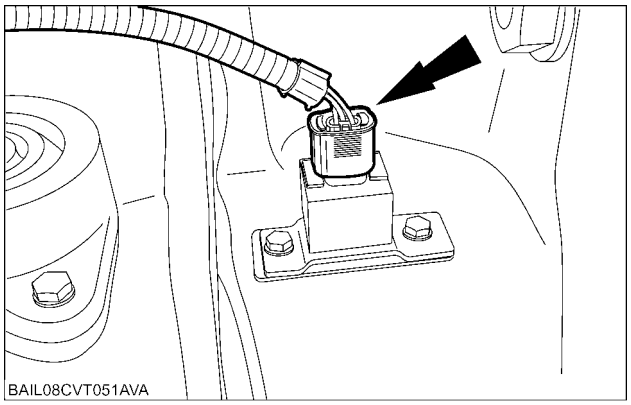
Always ensure the support is adequately supported and will remain stable when seperated from the engine. Failure to provide adequate support may cause the assembly to be unstable with possible personal injury if the support tips forwards or backwards.

B017



BAIL08CVT053AVA 2

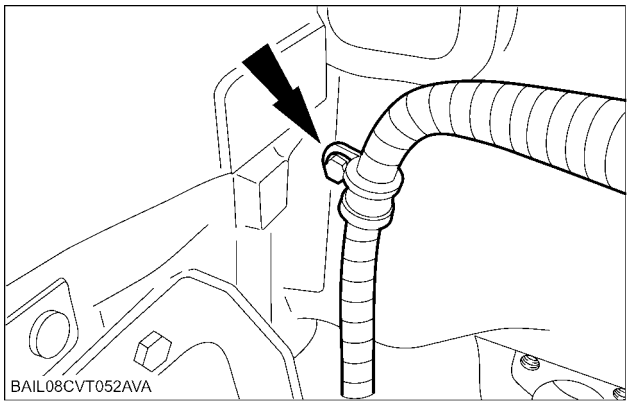
3. Disconnect the accelerometer electrical connector.



BAIL08CVT051AVA 3

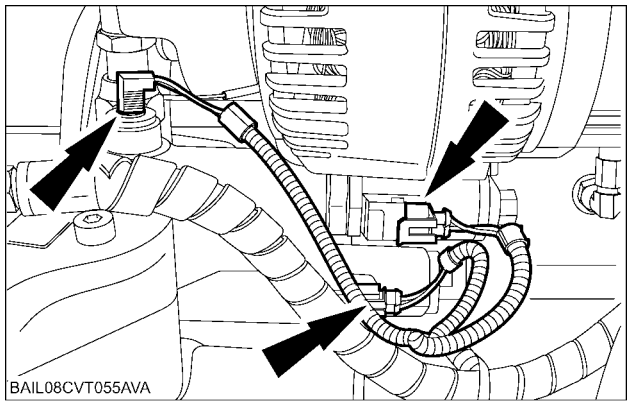
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4. Detach the accelerometer wiring harness and feed the wiring harness through the front support.



BAIL08CVT052AVA 4

5. Disconnect the front suspension electrical connectors.

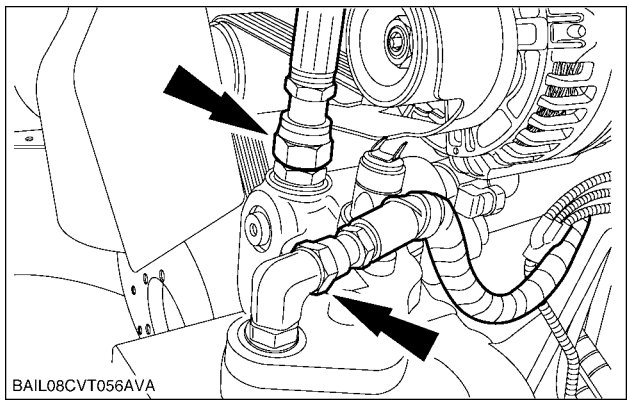


BAIL08CVT055AVA 5

6. Disconnect the front suspension hydraulic hoses.

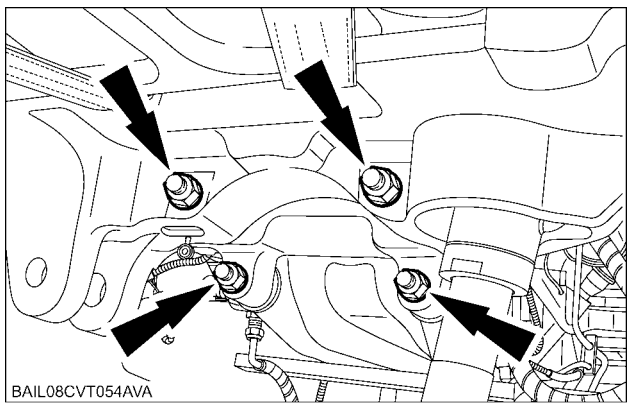
NOTE: *Make a note of the position of the hoses to aid installation.*

NOTE: *Cap all open connections to prevent contamination of the system.*



BAIL08CVT056AVA 6

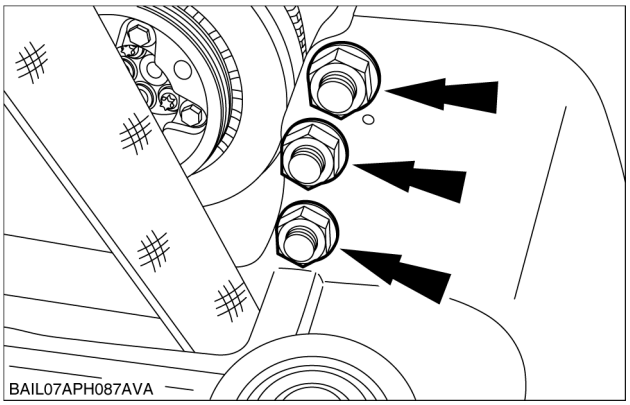
7. Remove the front lower retaining nuts.



BAIL08CVT054AVA 7

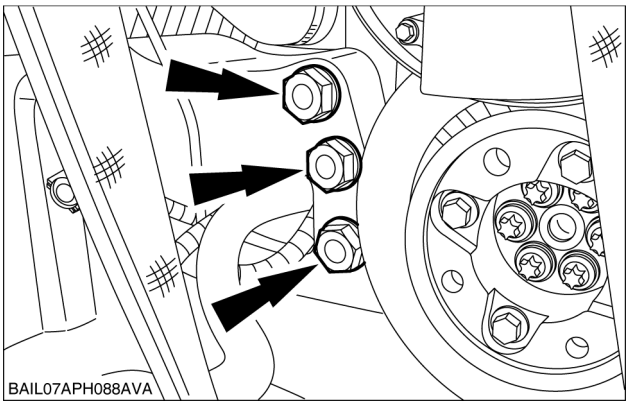
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8. Remove the front left-hand upper retaining nuts.



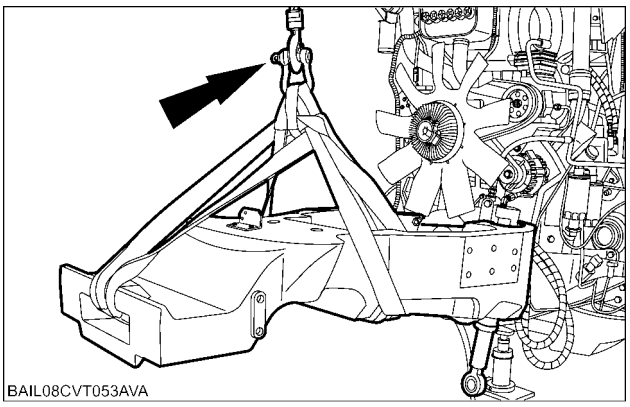
BAIL07APH087AVA 8

9. Remove the front right-hand upper retaining nuts.



BAIL07APH088AVA 9

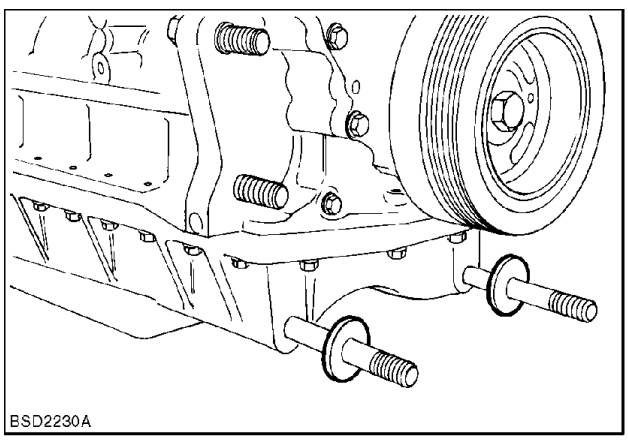
10. Remove the front support.



BAIL08CVT053AVA 10

11. Support the assembly on axle stands at front and rear of the support.

12. Identify for use during installation the two shims positioned between the engine sump and front support.



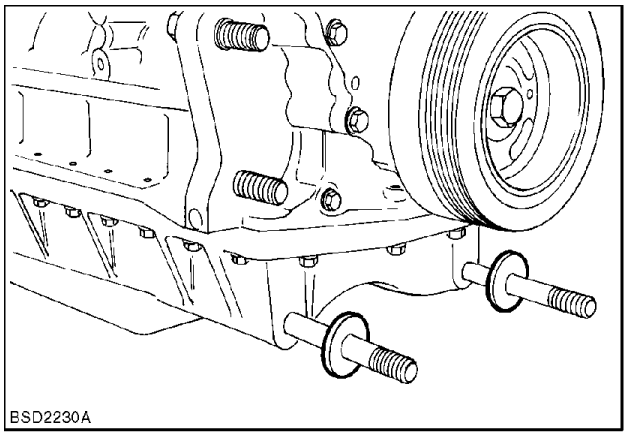
BSD2230A 11

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Front - Install

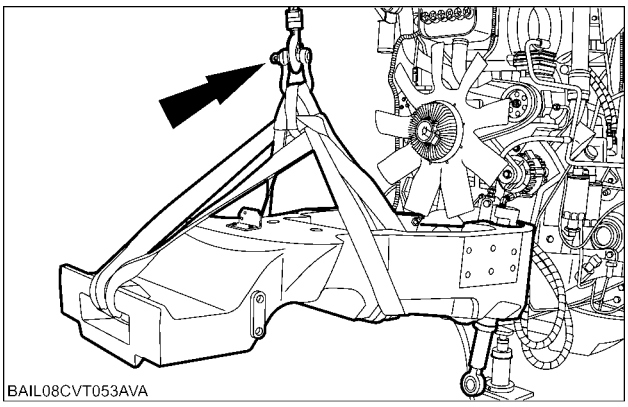
1. Make sure the shims removed during disassembly are re-positioned in the same location as when removed.

NOTE: *If a new front end or engine sump have been installed, it is necessary to recalculate the shim thickness to be installed. For further information refer to* ***Front - Clearance (E.10.B)****.*



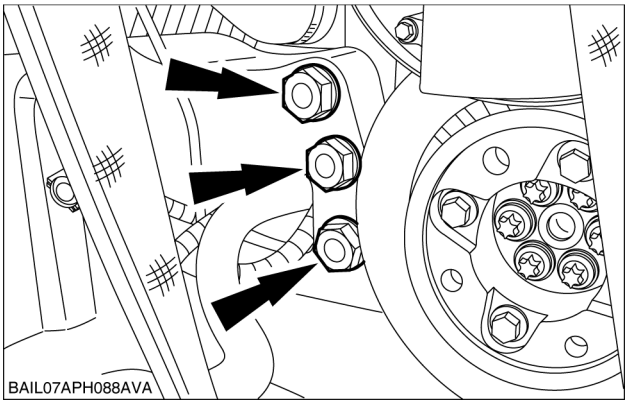
BSD2230A 1

2. Using suitable slings or chains install the front support to the engine.



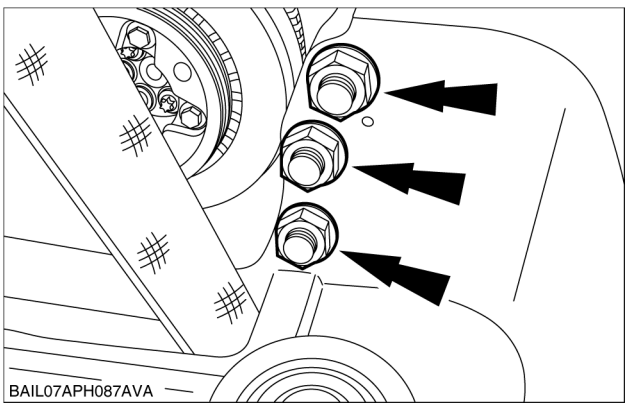
BAIL08CVT053AVA 2

3. Install the front right-hand upper retaining nuts. Tighten to **650 - 700 Nm** (**480 - 516 lbft**).



BAIL07APH088AVA 3

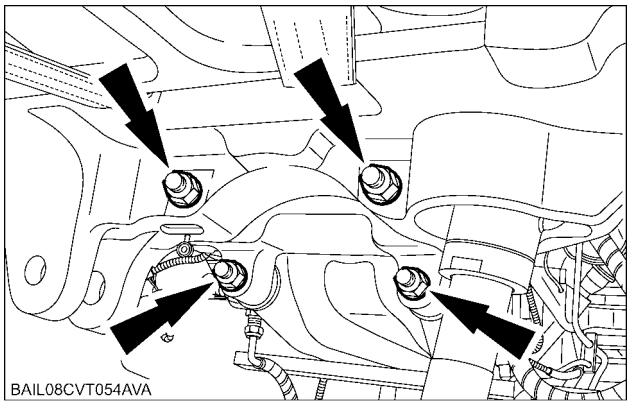
4. Install the front left-hand upper retaining nuts. Tighten to **650 - 700 Nm** (**480 - 516 lbft**).



BAIL07APH087AVA 4

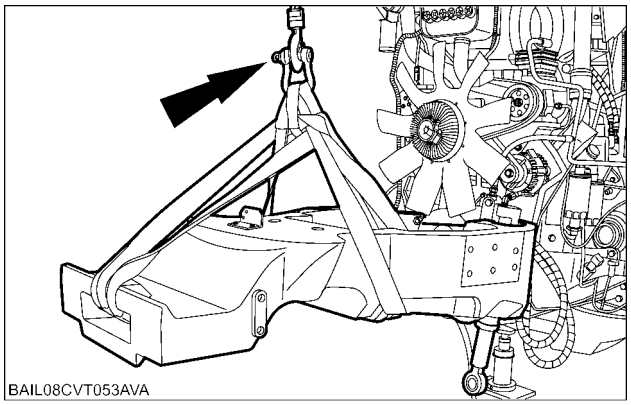
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5. Install the front support lower retaining nuts. Tighten to **450 Nm** (**330 lb in**).



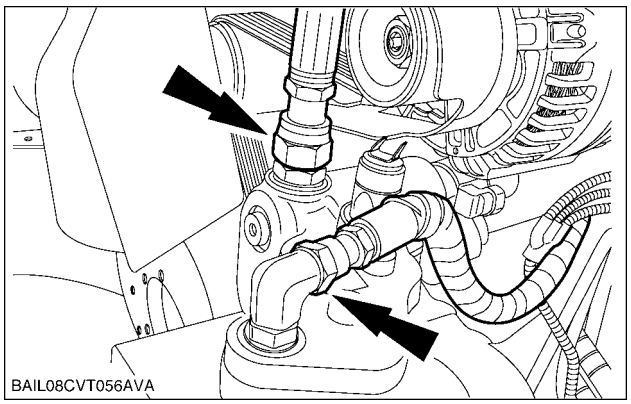
BAIL08CVT054AVA 5

6. Remove the slings or chains from the front support assembly.



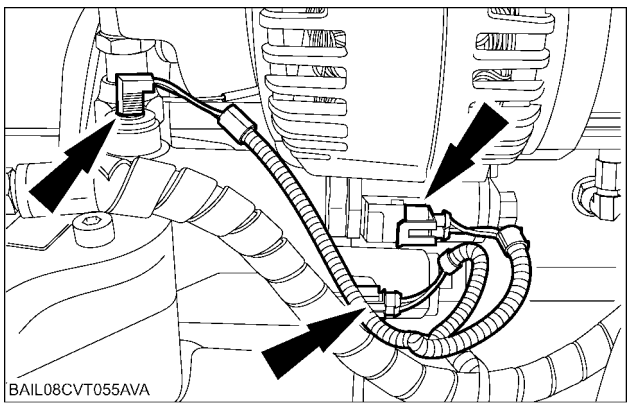
BAIL08CVT053AVA 6

7. Connect the front suspension hydraulic hoses to their noted positions



BAIL08CVT056AVA 7

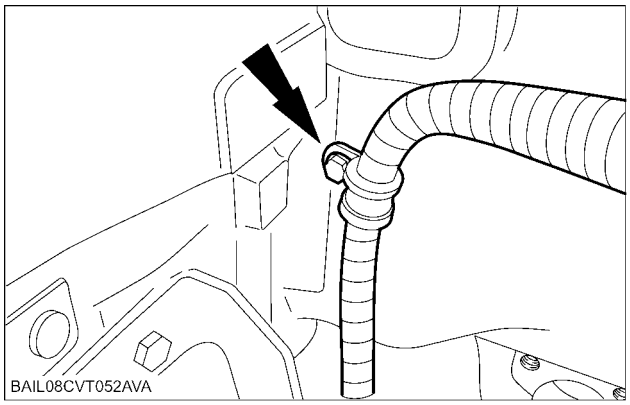
8. Connect the front suspension electrical connectors.



BAIL08CVT055AVA 8

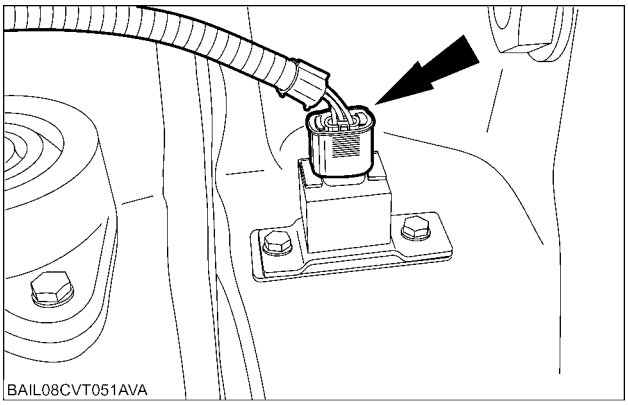
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9. Feed the accelerometer wiring harness through the front support.
Attach the wiring harness to the front support.



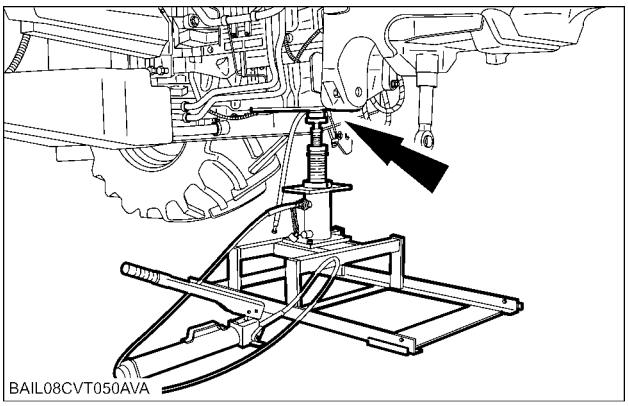
BAIL08CVT052AVA 9

10. Connect the accelerometer electrical connector.



BAIL08CVT051AVA 10

11. Support the front of the vehicle under the front weight carrier. Once supported safely, remove the splitting gear from under the engine.



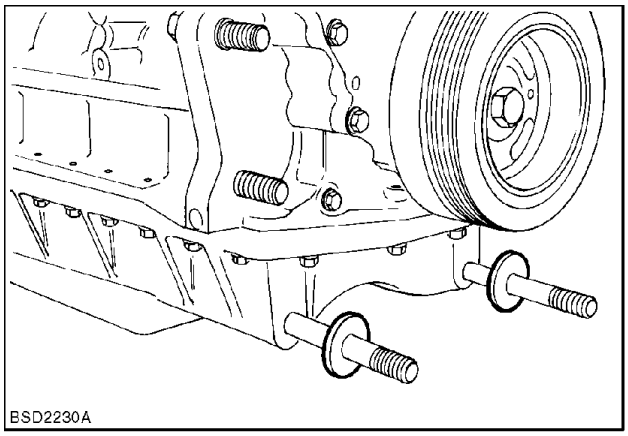
BAIL08CVT050AVA 11

Next operation:
Install the radiator, for further information refer to **Radiator - Install (B.50.A)**
Next operation:
Install the front axle, for further information refer to **FRONT AXLE - Install (D.10.A)**

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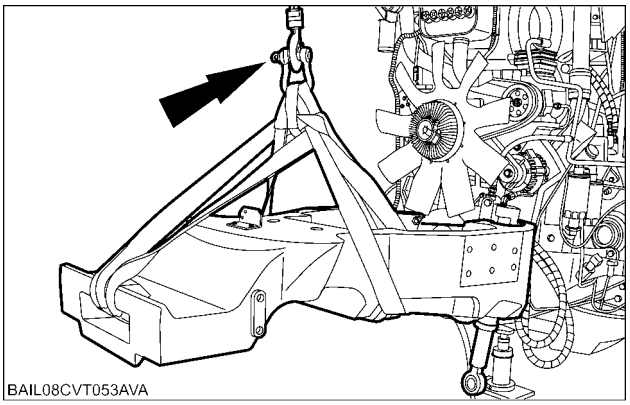
Front - Clearance

1. Install a 4.5 mm yellow shim, part number 82026240, onto each of the engine sump mounting studs.



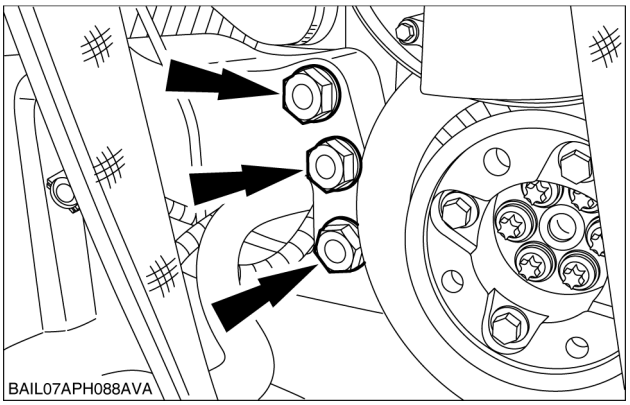
BSD2230A 1

2. Using suitable slings or chains install the front support to the engine.



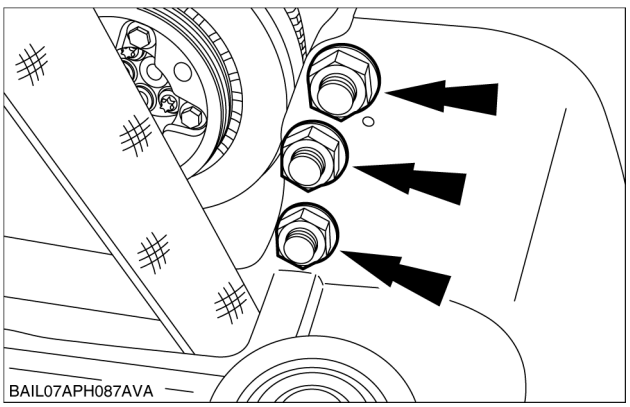
BAIL08CVT053AVA 2

3. Install the front right-hand upper retaining nuts. Tighten to **650 - 700 Nm** (**480 - 516 lbft**).



BAIL07APH088AVA 3

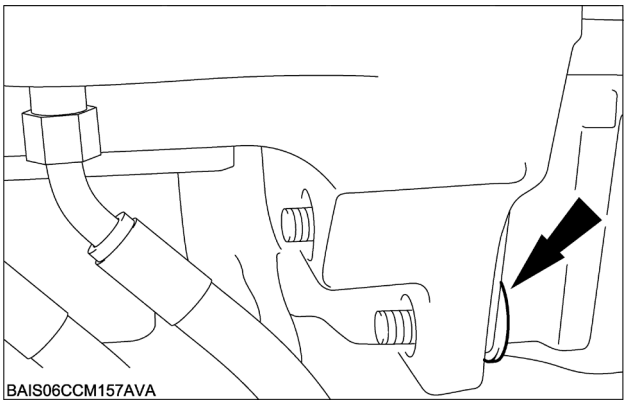
4. Install the front left-hand upper retaining nuts. Tighten to **650 - 700 Nm** (**480 - 516 lbft**).



BAIL07APH087AVA 4

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5. Using feeler gauges, measure the gap between each shim and the front.



BAIS06CCM157AVA 5

6. Add the feeler gauge measurement to the 4.5 mm shim thickness already installed and select the appropriate shim(s) from the following list.

Colour Code	Shim Thickness	Part Number
Yellow	4.5 mm	82026240
Green	4.8 mm	82026241
Red	5.1 mm	82026242
Blue	5.4 mm	82026243
White	5.7 mm	82026244
Black	6.0 mm	82026245
Pink	6.3 mm	82026246
Light Blue	6.6 mm	82026247
Gold	6.9 mm	82026248
Lime	7.2 mm	82026249
Orange	7.5 mm	82026250
Blue/Grey	7.8 mm	82026251

7. Separate the front from the engine, remove the 4.5 mm shims and replace with new ones of the appropriate thickness.

Next operation:
Install the front, for further information refer to **Front - Install (E.10.B)**

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Front - Torque 3

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BODY AND STRUCTURE - E

USER PLATFORM - 34.A

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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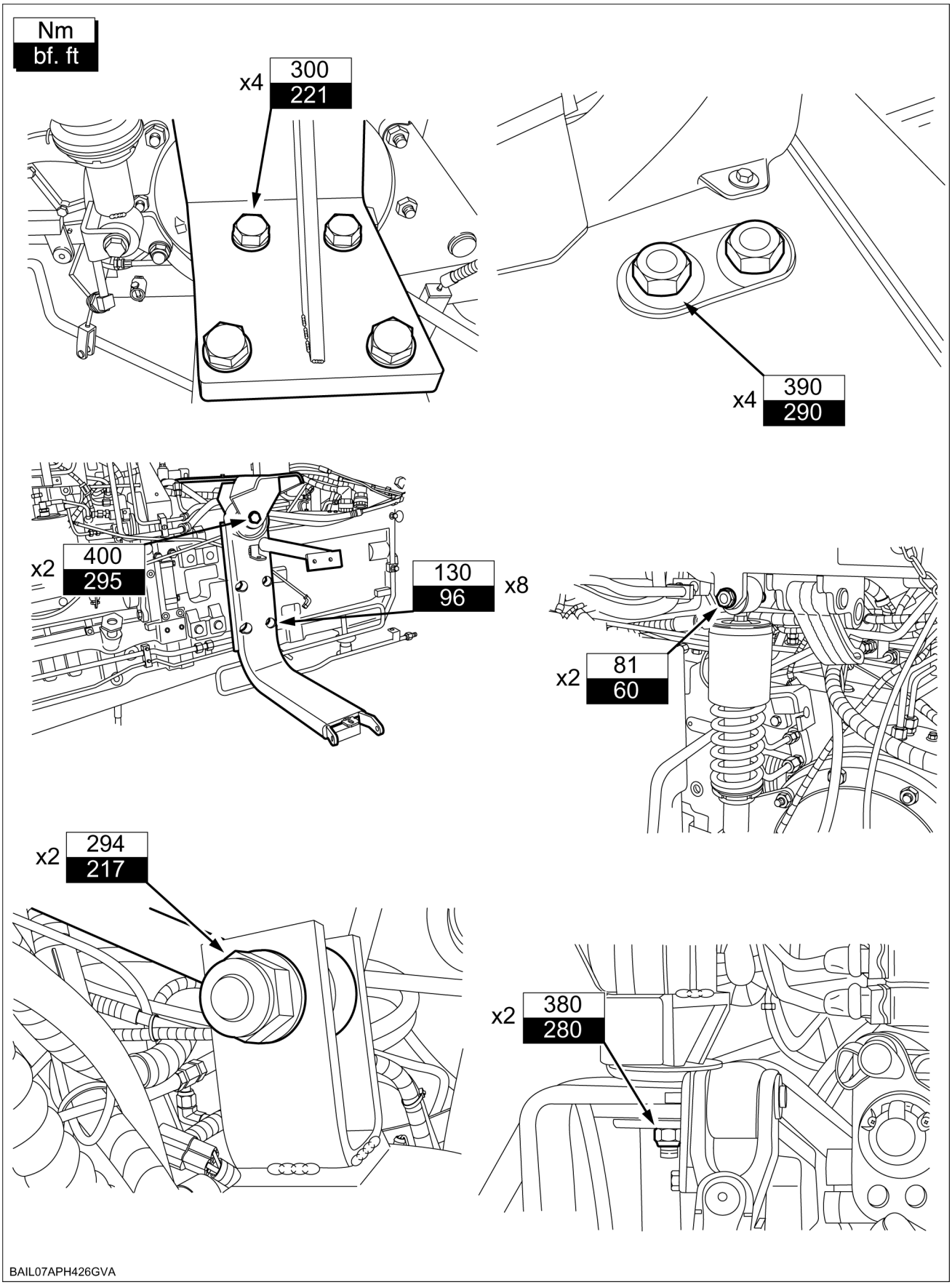
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USER PLATFORM - Torque



BAIL07APH426GVA 1

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USER PLATFORM - Special tools

Description	Tool Number
Cab Lifting Bracket	**380001157**

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USER PLATFORM - Remove

Prior operation:
Disconnect the battery, for further information refer to **Battery - Disconnect (A.30.A)**
Prior operation:
Drain the cooling system, for further information refer to **ENGINE COOLANT SYSTEM - Drain fluid (B.50.A)**
Prior operation:
Discharge the air conditioning system, for further information refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Discharging (E.40.D)**

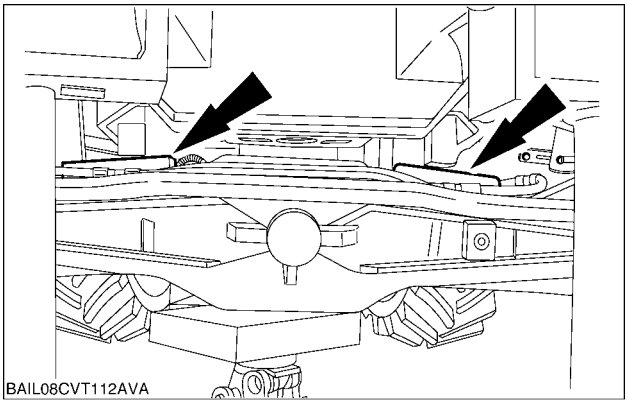
⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

All Vehicles

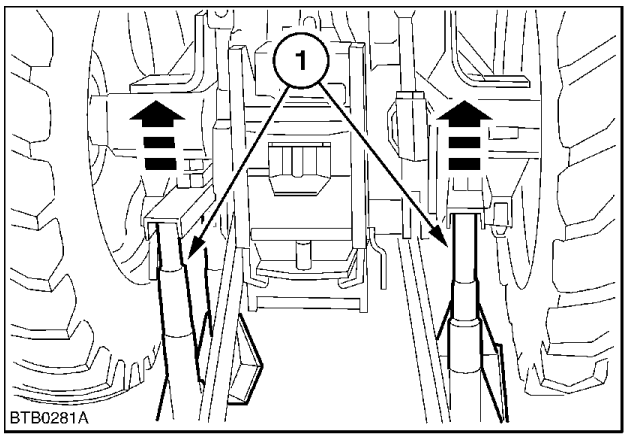
1. Make sure that the vehicle is parked on a level surface.
2. Chock the front wheels using suitable wheel stops.
3. Position wooden wedges between the front axle and front support. These prevent articulation of the axle.



BAIL08CVT112AVA 1

4. Raise the rear of the vehicle and place two suitable axle stands **(1)** under the final drive cases.

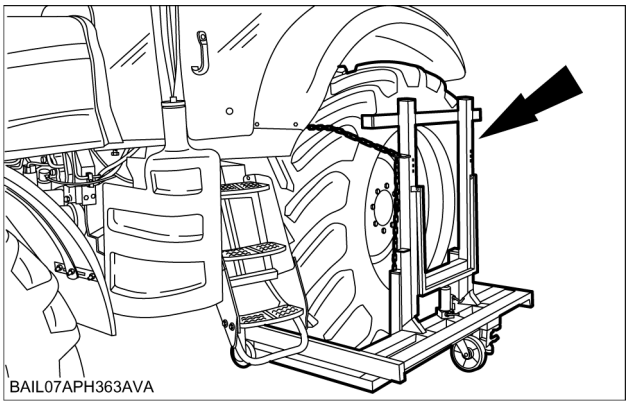
NOTE: *If required, detach the lift rods from the lower links.*



BTB0281A 2

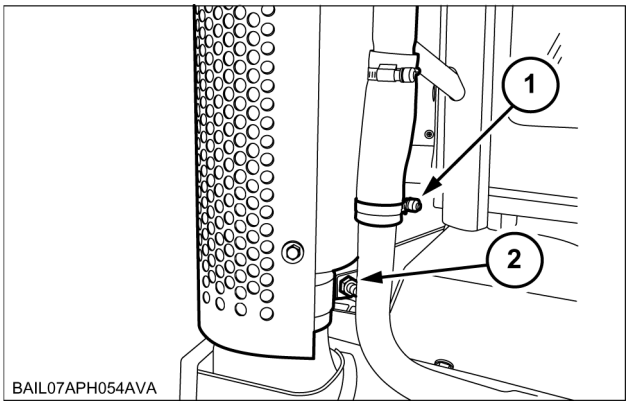
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5. Remove both rear wheels.



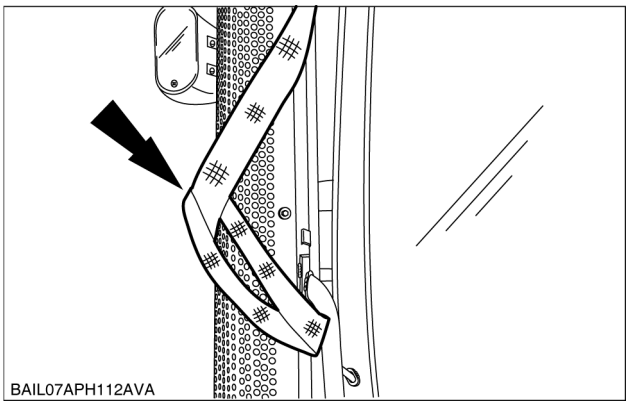
BAIL07APH363AVA 3

6. Loosen the air cleaner aspirator pipe **(1)** and exhaust clamp **(2)**.



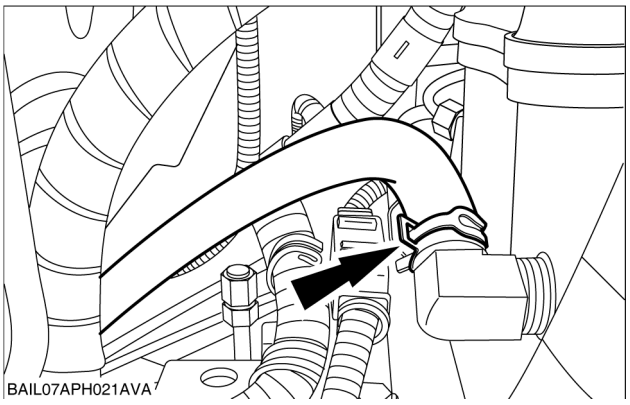
BAIL07APH054AVA 4

7. Using a suitable sling remove the exhaust muffler from the exhaust.



BAIL07APH112AVA 5

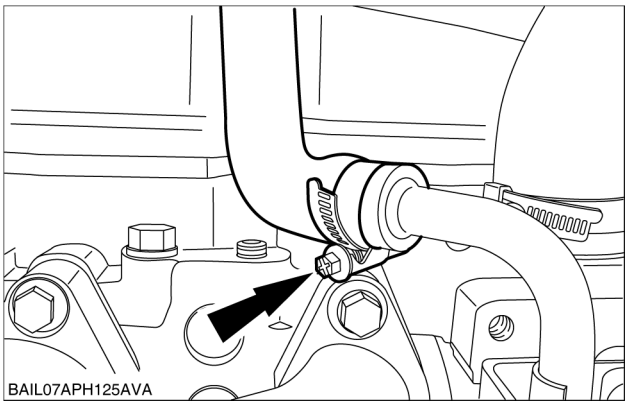
8. Disconnect the heater supply hose from the rear of the engine cylinder head.



BAIL07APH021AVA 6

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9. Disconnect the heater return hose.



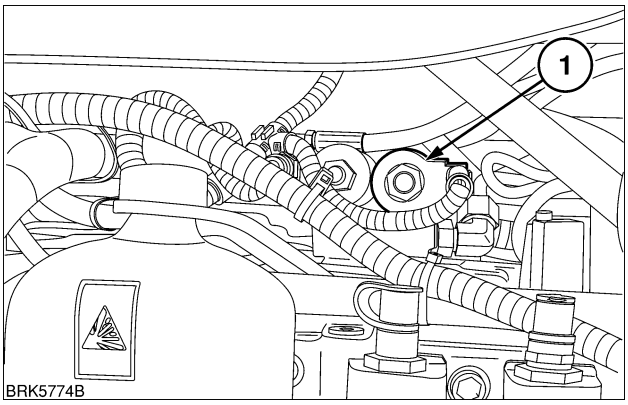
BAIL07APH125AVA 7

⚠ DANGER ⚠

Exercise extreme caution when performing tasks on the front suspension system. ALWAYS ensure that the system is depressurised and that the axle is at rest on the support stops.

B011

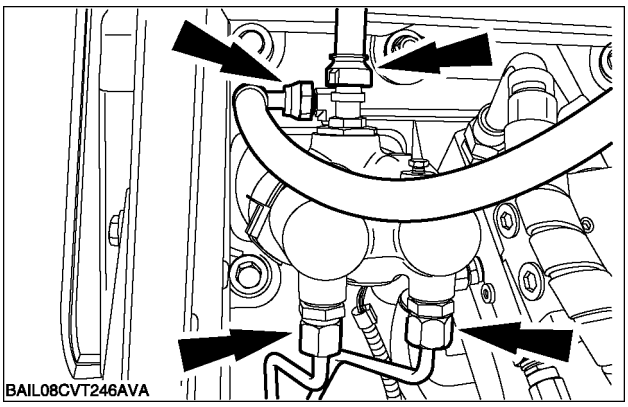
10. Depressurise the front suspension system, by rotating the knurled knob on the lower solenoid **(1)** counterclockwise, and allow the vehicle to lower completely onto the axle stops then rotate the knob clockwise to close the valve.



BAIL08CVT029ASA 8

11. Disconnect the master cylinder oil supply hose, accumulator hose and brake pipe connections.

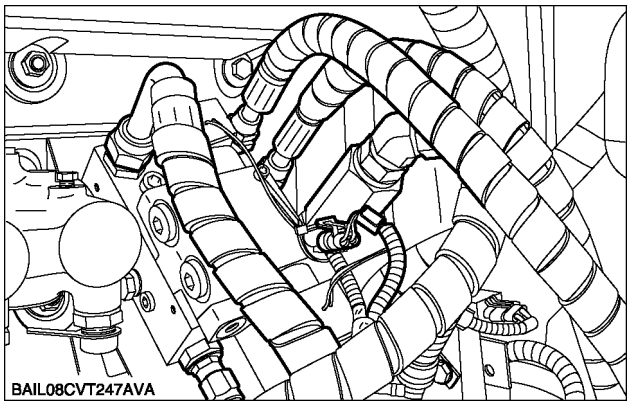
NOTE: *Place a suitable container under the master cylinder to collect drained out fluid.*



BAIL08CVT246AVA 9

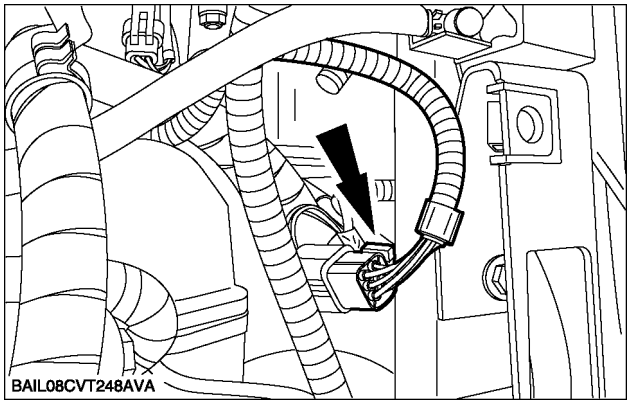
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12. Disconnect the steering valve pipes.



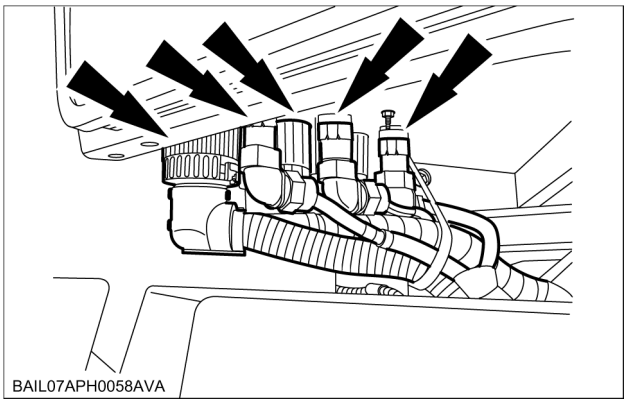
BAIL08CVT247AVA 10

13. Disconnect the isolation manifold electrical connector.



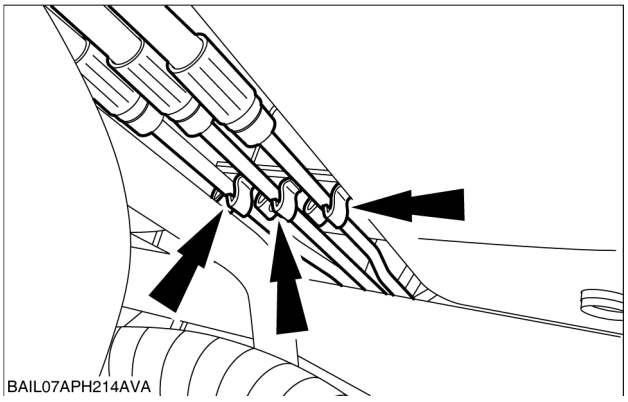
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14. Disconnect the cab electrical connectors.



BAIL07APH058AVA 12

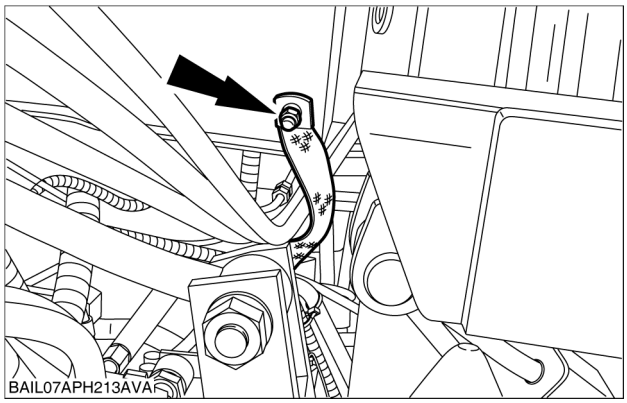
15. Detach the brake pipes from the underside of the cab.



BAIL07APH214AVA 13

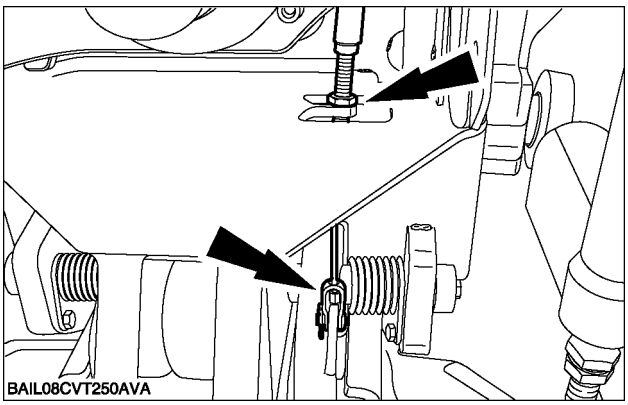
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16. Disconnect the earth strap from the cab.



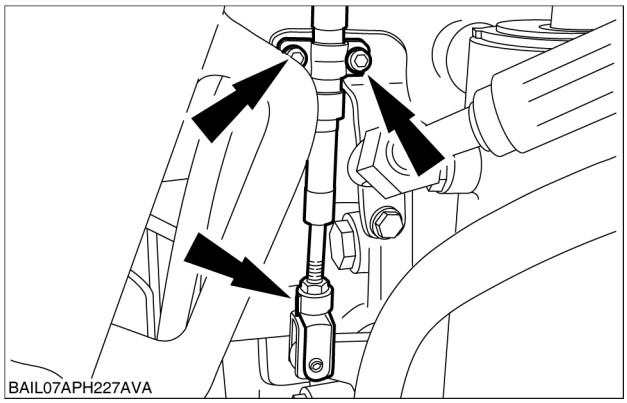
BAIL07APH213AVA 14

17. Disconnect and detach the rear mechanical hitch cable from the rear hitch.



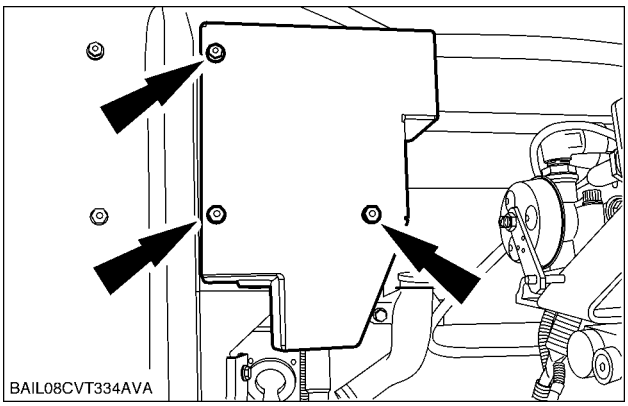
BAIL08CVT250AVA 15

18. Disconnect and detach the power take off (PTO) range lever cable from the PTO.



BAIL07APH227AVA 16

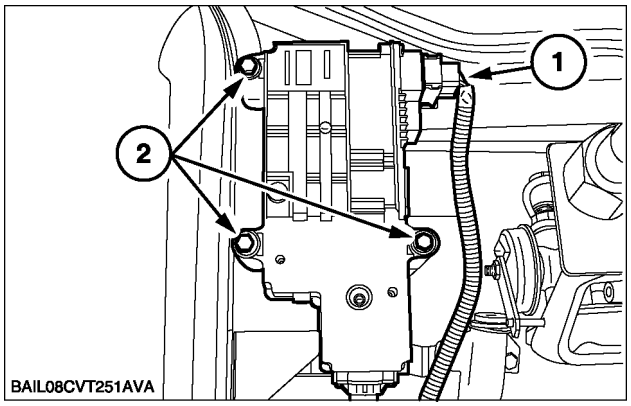
19. Remove the electronic park lock (EPL) cover.



BAIL08CVT334AVA 17

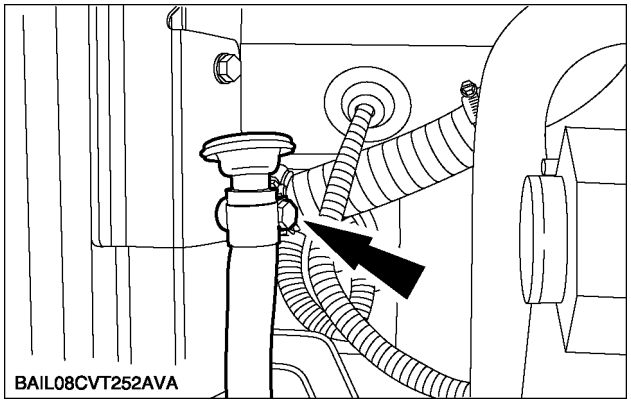
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20. Disconnect the EPL electrical connector **(1)** and detach the EPL from the cab **(2)**.



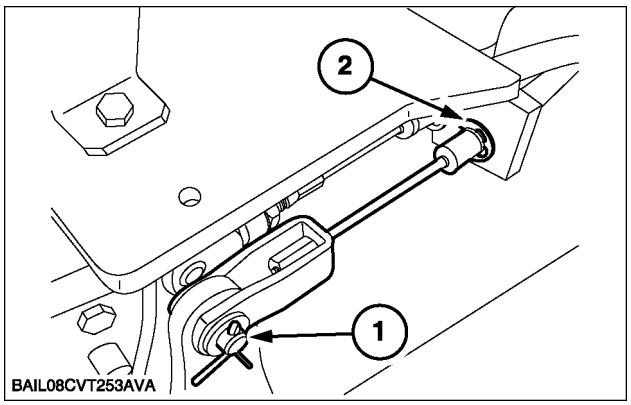
BAIL08CVT251AVA 18

21. Detach the axle breather.



BAIL08CVT252AVA 19

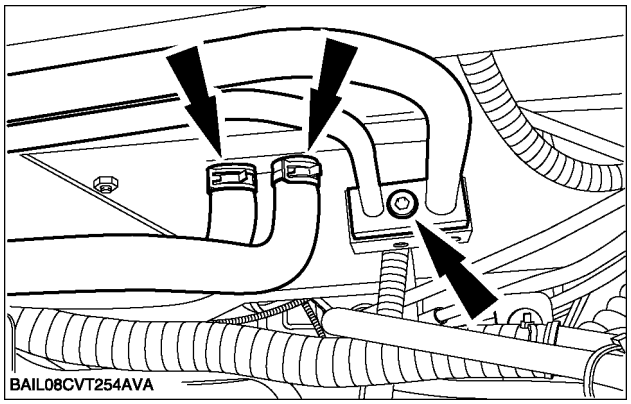
22. Remove the split pin and the clevis pin **(1)** from the parking brake lever and detach the parking brake cable **(2)**.



BAIL08CVT253AVA 20

23. Disconnect the cab heater pipes and air conditioning pipes.

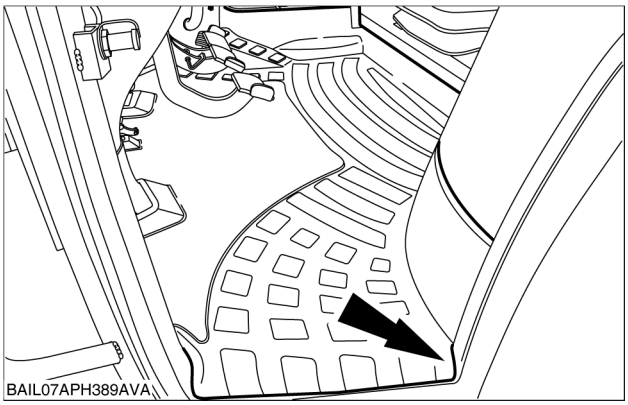
NOTE: *Make a note of the position of the hoses to aid installation.*



BAIL08CVT254AVA 21

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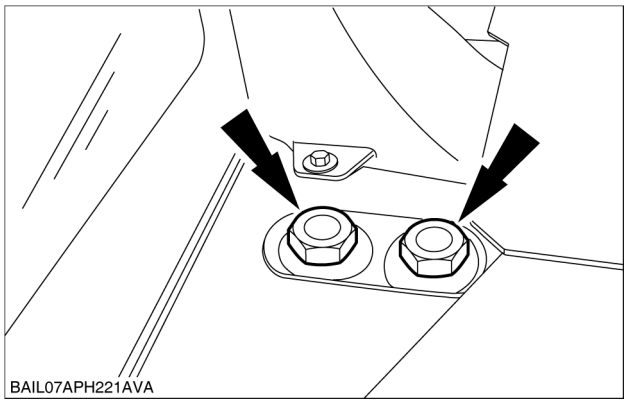
24. Remove the cab floor mat.



BAIL07APH389AVA 22

25. Loosen, but do not remove the front left-hand side cab mounting bolts.

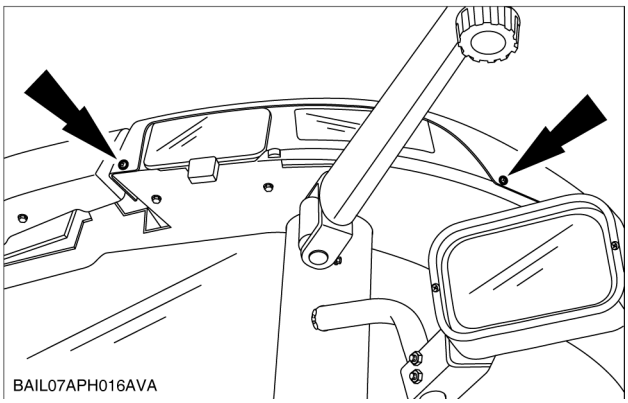
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH221AVA 23

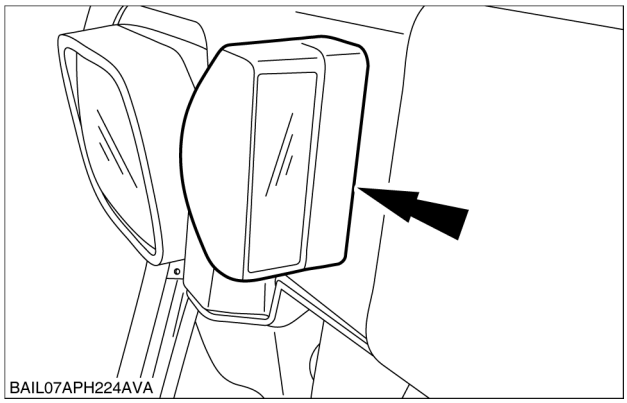
26. Remove the two retaining screws from either side of the roof lights.

NOTE: *Repeat this step for both sides front and rear.*



BAIL07APH016AVA 24

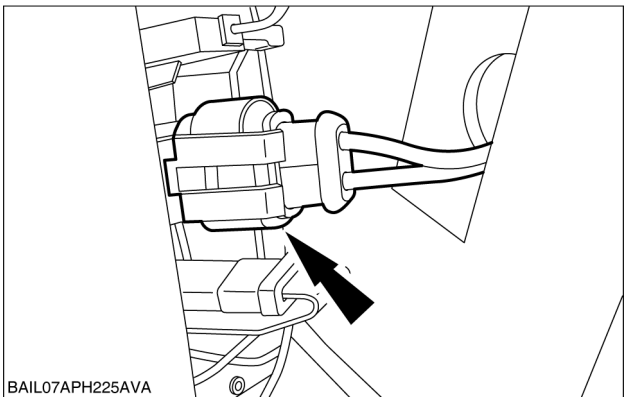
27. Detach the license plate lamps.



BAIL07APH224AVA 25

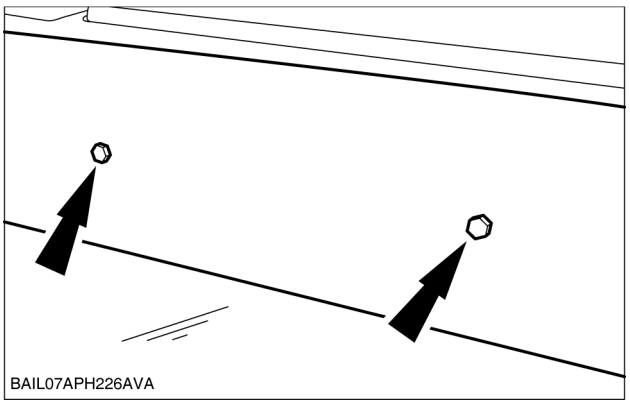
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28. Disconnect the license plate lamp electrical connectors and remove the licence plate lamps.



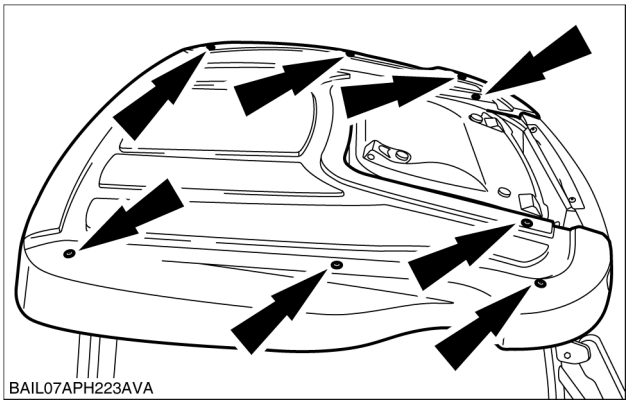
BAIL07APH225AVA 26

29. Remove the license plate.



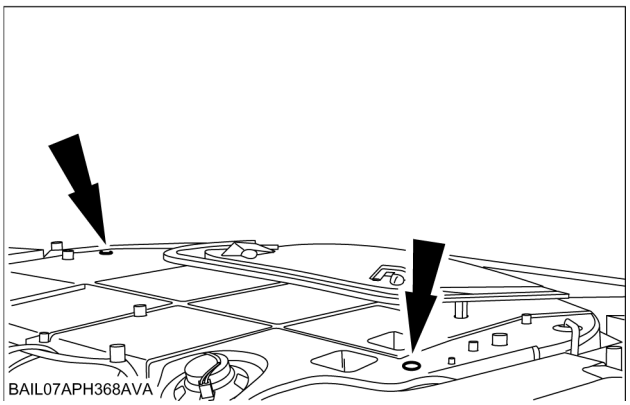
BAIL07APH226AVA 27

30. Remove the cab roof panel retaining screws and remove the cab roof panel.



BAIL07APH223AVA 28

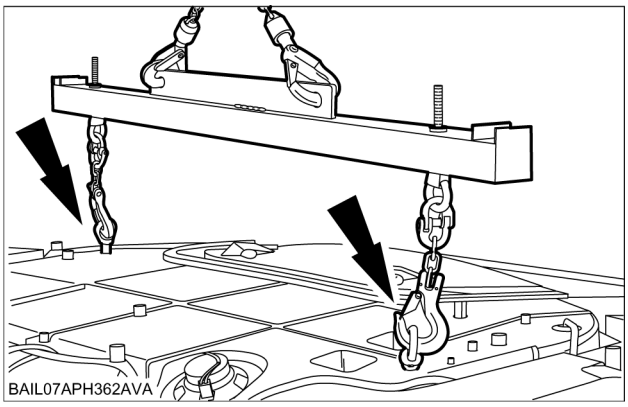
31. Remove the grommets from the cab roof that cover the access points for the cab lifting tool.



BAIL07APH368AVA 29

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32. Install the cab lifting special tool **380001157**.
Using a suitable chain, attach the cab lifting special tool to a suitable hoist.



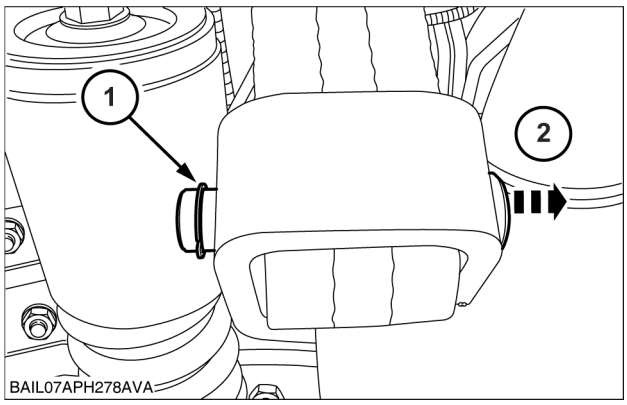
BAIL07APH362AVA 30

33. Raise the hoist to support the weight of the cab.

Vehicles with Cab Suspension

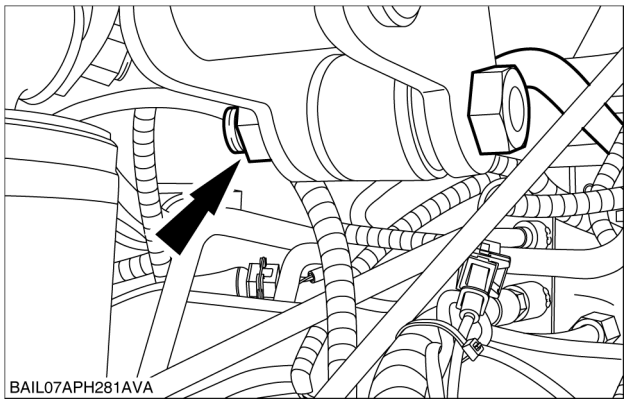
34. Disconnect the cab suspension check strap.
Remove the circlip **(1)** and remove the cab suspension check strap retaining pin **(2)**.

NOTE: *Repeat this step for the right-hand side.*



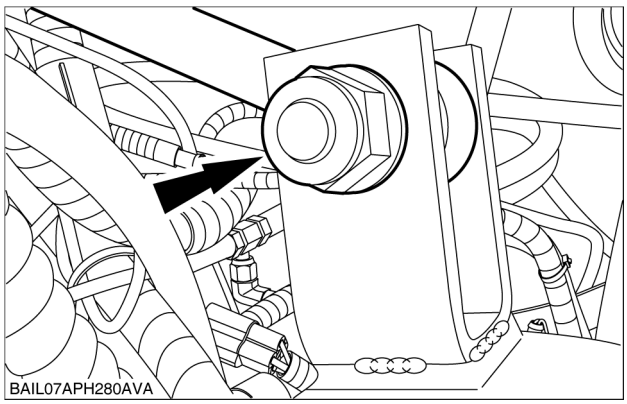
BAIL07APH278AVA 31

35. Remove the left-hand side retaining nut and the bolt from the panhard rod.



BAIL07APH281AVA 32

36. Remove the right-hand side retaining nut and the bolt from the panhard rod.
Remove the panhard rod.

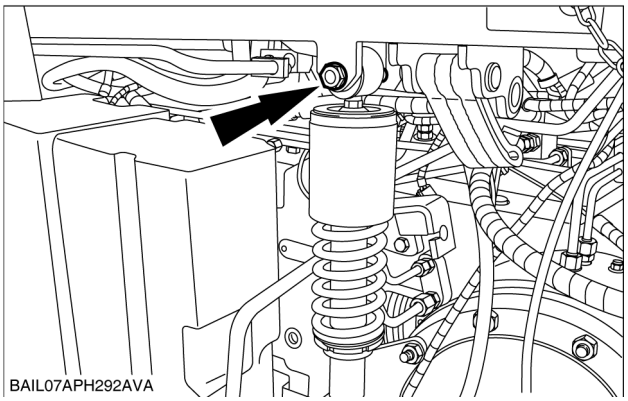


BAIL07APH280AVA 33

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37. Remove the upper left rear damper/spring assembly bolts.

NOTE: *Repeat this step for the right-hand side.*

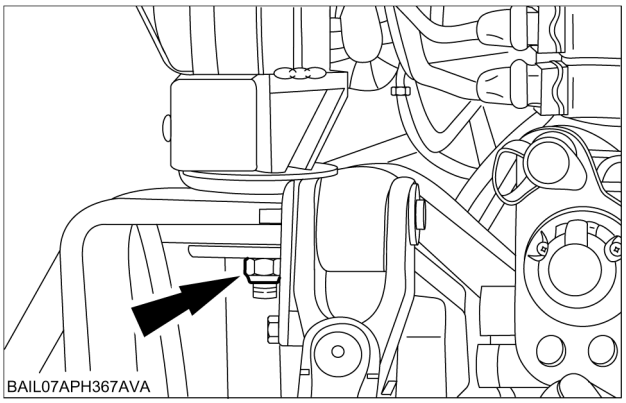


BAIL07APH292AVA 34

Vehicles with standard cab

38. Remove the rear left-hand side cab retaining bolts.

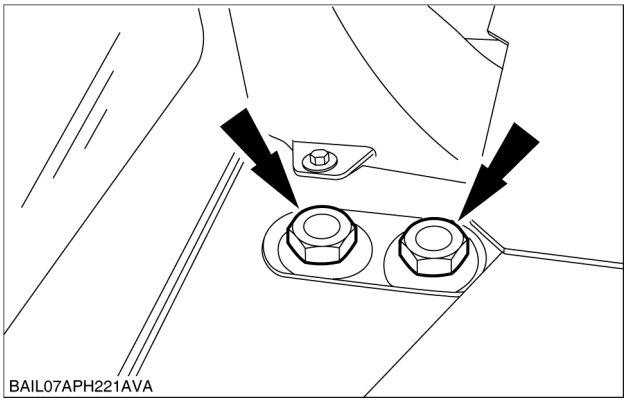
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH367AVA 35

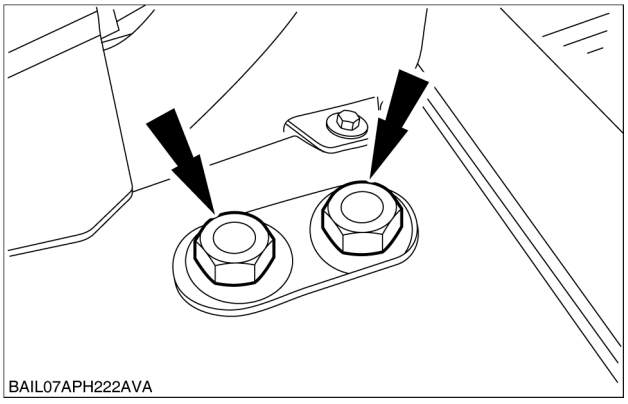
All vehicles

39. Remove the front left-hand side cab mounting bolts.



BAIL07APH221AVA 36

40. Remove the front right-hand side cab mounting bolts.

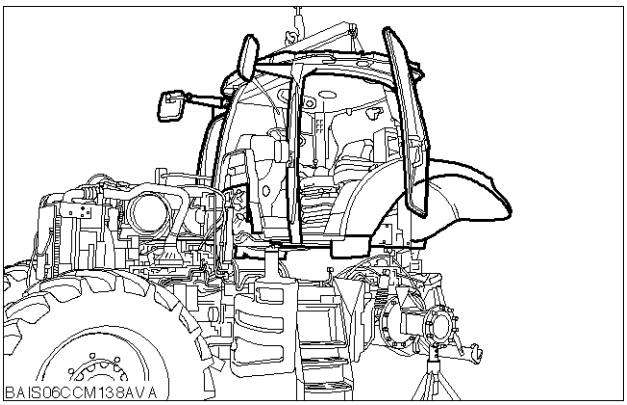


BAIL07APH222AVA 37

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41. Raise the cab slowly. Remove the cab and place on a secure stand.

NOTE: *Make sure that all cables and hydraulic hoses are free from obstruction.*



BAIS06CCM138AVA 38

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USER PLATFORM - Install

Prior operation:
Remove the user platform, for further information refer to **USER PLATFORM - Remove (E.34.A)**

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

B012

⚠ WARNING ⚠

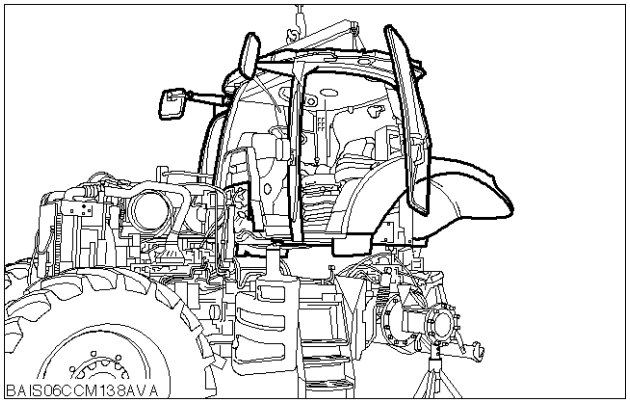
Always use suitable tools to align holes. DO NOT USE HAND OR FINGERS.

B020

All Vehicles

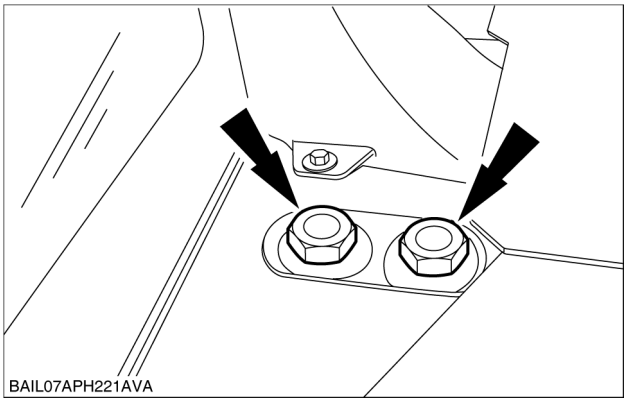
1. Install the cab using the cab lifting bracket **380001157**.

NOTE: *Make sure that all cables and hydraulic hoses are not trapped.*



BAIS06CCM138AVA 1

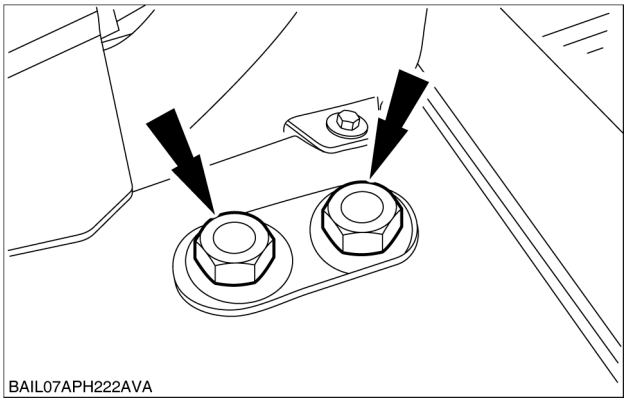
2. Install the front left-hand cab mounting bolts. Tighten to **390 - 430 Nm** (**288 - 317 lbft**).



BAIL07APH221AVA 2

3. Install the front right-hand cab mounting bolts. Tighten to **390 - 430 Nm** (**288 - 317 lbft**).

NOTE: *Make sure that all cables and hydraulic hoses are free from obstruction.*



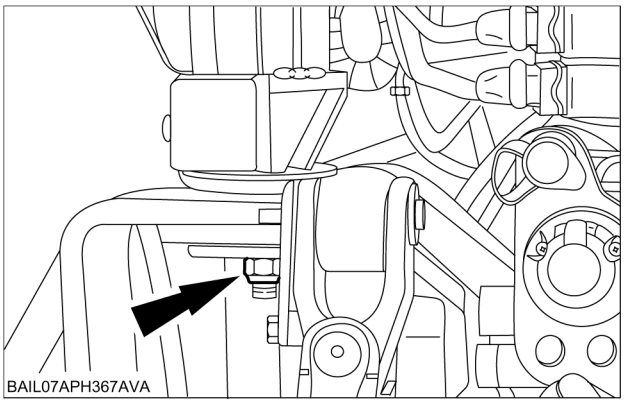
BAIL07APH222AVA 3

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Tractors with Standard Cab

4. Install the left-hand side cab rear mounting nut while holding the bolt in the cab frame.
   Tighten to **380 Nm** (**280 lb ft**).

NOTE: *Repeat this step for both sides of the vehicle.*

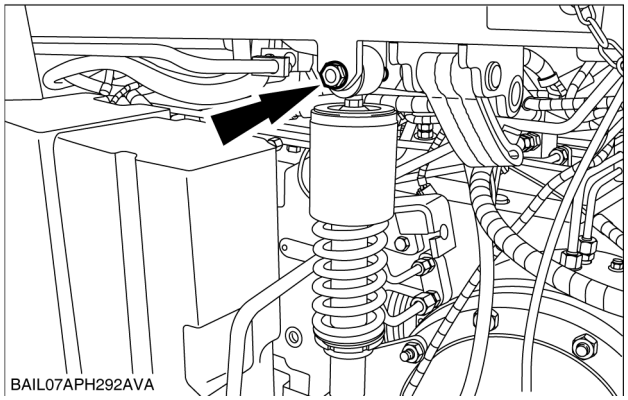


BAIL07APH367AVA 4

Vehicles with Cab Suspension

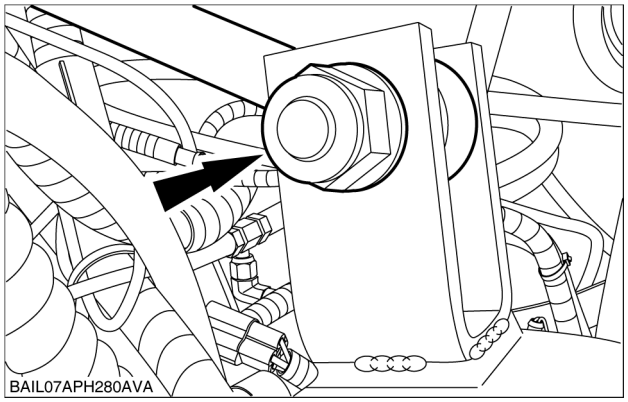
5. Install the upper left-hand rear damper/spring assembly bolt.
   Tighten to **81 Nm** (**60 lb ft**).

NOTE: *Repeat this step for the right-hand side.*



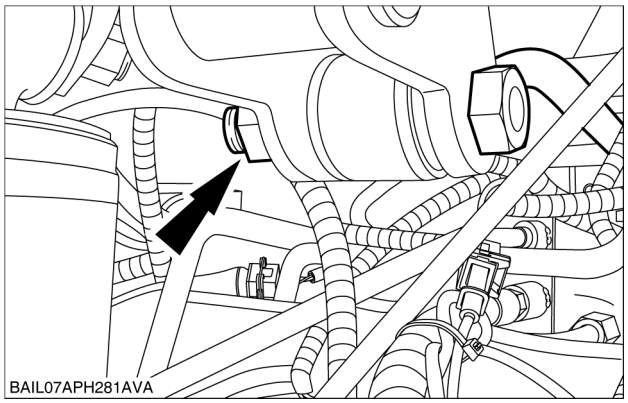
BAIL07APH292AVA 5

6. Install the panhard rod.
   Install the right-hand side panhard rod retaining nut and bolt.
   Tighten to **294 Nm** (**217 lb ft**).



BAIL07APH280AVA 6

7. Install the left-hand side panhard rod retaining nut and bolt.
   Tighten to **294 Nm** (**217 lb ft**).

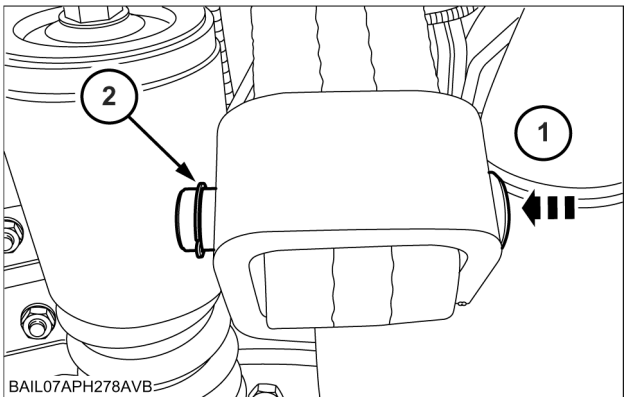


BAIL07APH281AVA 7

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8. Install the cab check strap, cab check strap retaining pin **(1)** and the circlip **(2)**.

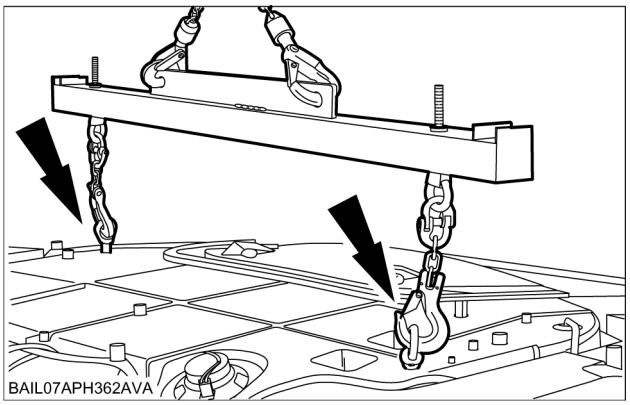
NOTE: *Repeat this step for the right-hand side.*



BAIL07APH278AVB 8

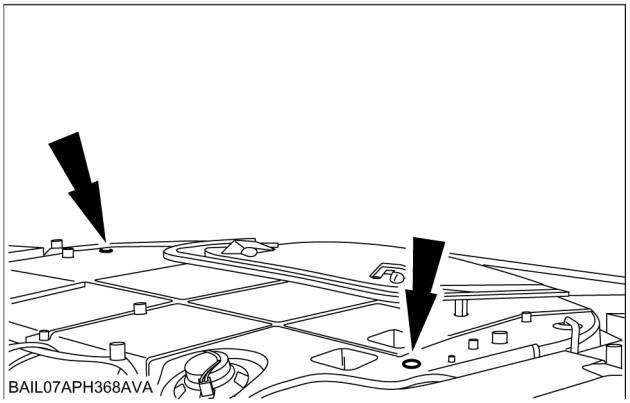
All Vehicles

9. Remove the cab lifting bracket **380001157**.



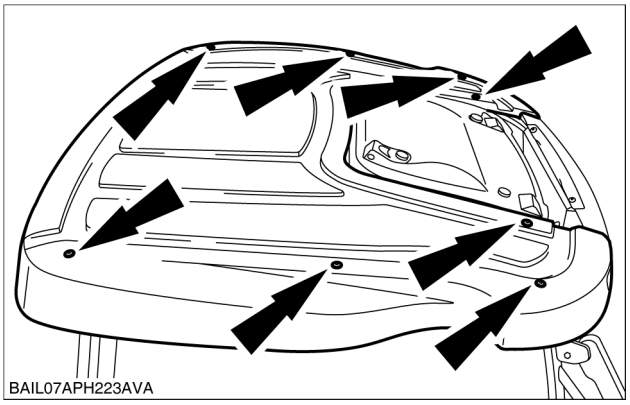
BAIL07APH362AVA 9

10. Install the grommets in the cab roof that cover the access points for the cab lifting tool.



BAIL07APH368AVA 10

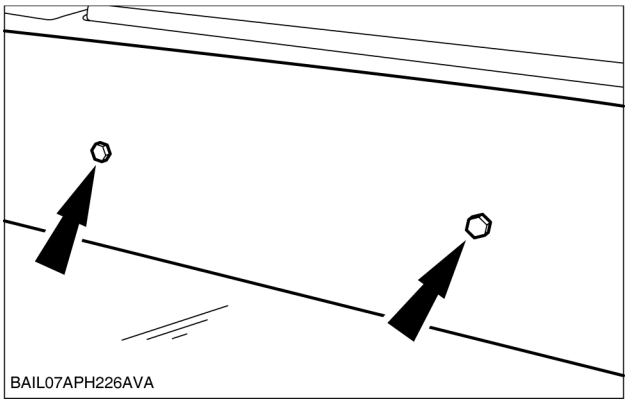
11. Install the cab roof panel.
Install the 8 retaining screws.



BAIL07APH223AVA 11

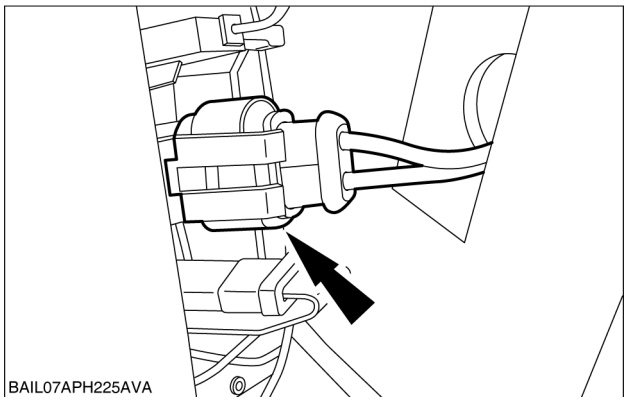
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12. Install the license plate.



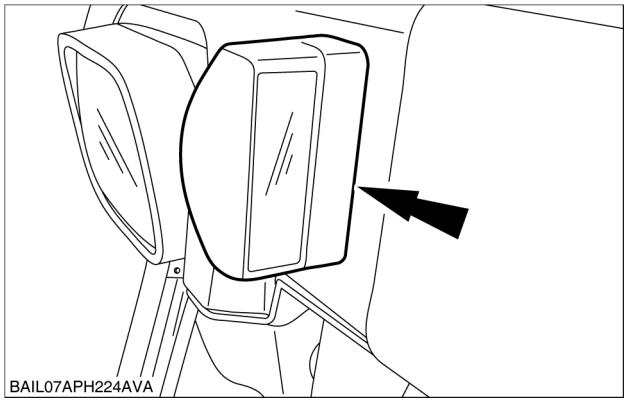
BAIL07APH226AVA 12

13. Connect the license plate lamp electrical connectors.



BAIL07APH225AVA 13

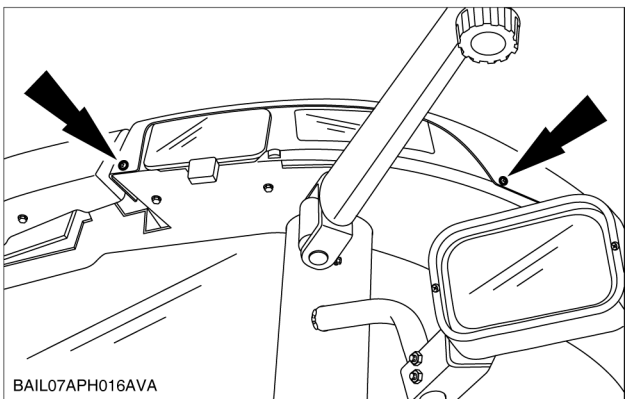
14. Install the licence plate lamps.



BAIL07APH224AVA 14

15. Install the two retaining screws from either side of the roof lights.

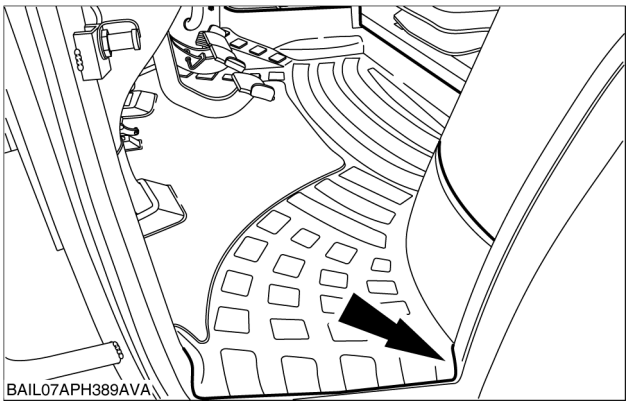
NOTE: *Repeat this step for both sides front and rear.*



BAIL07APH016AVA 15

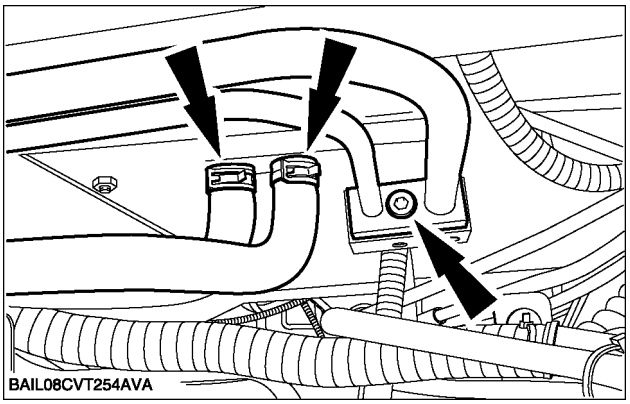
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16. Install the cab floor mat.



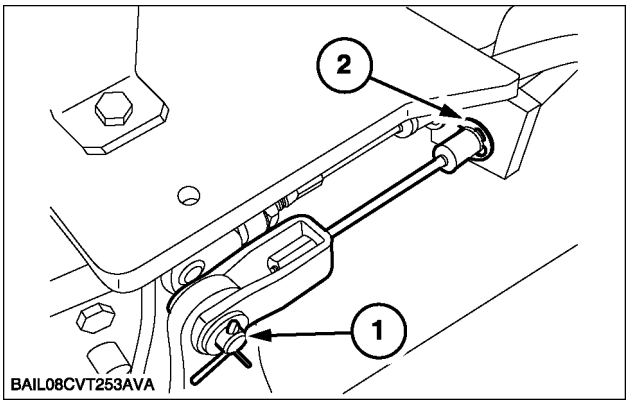
BAIL07APH389AVA 16

17. Connect the air conditioning pipes and cab heater pipes.



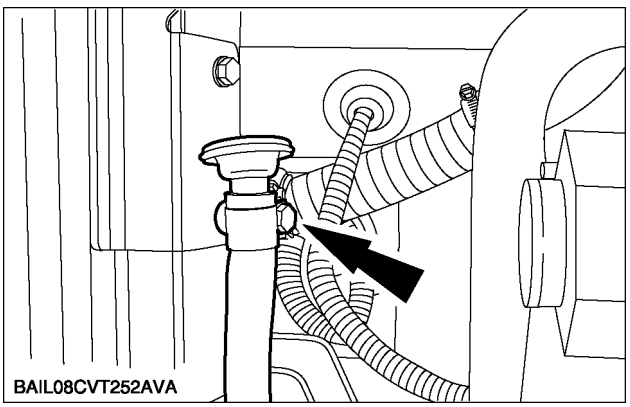
BAIL08CVT254AVA 17

18. Attach the parking brake cable **(2)** and install the clevis pin **(1)** and new split pin .



BAIL08CVT253AVA 18

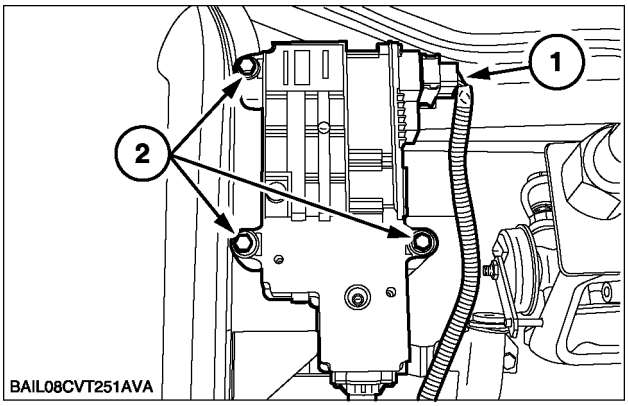
19. Attach the axle breather.



BAIL08CVT252AVA 19

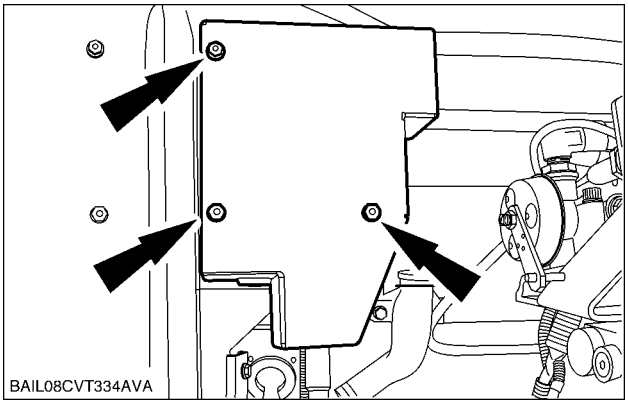
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20. Install EPL retaining bolts **(2)** and connect the EPL electrical connector **(1)**.



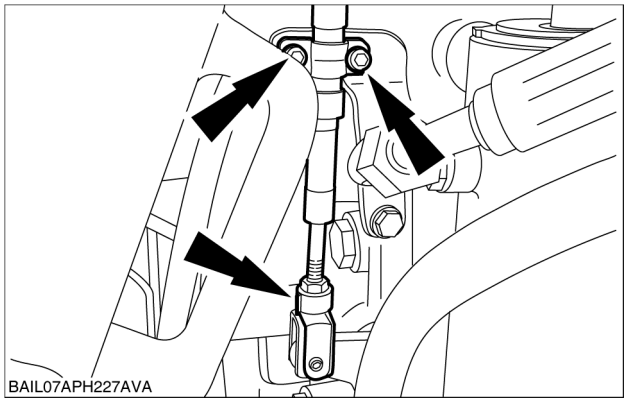
BAIL08CVT251AVA 20

21. Install the EPL cover.



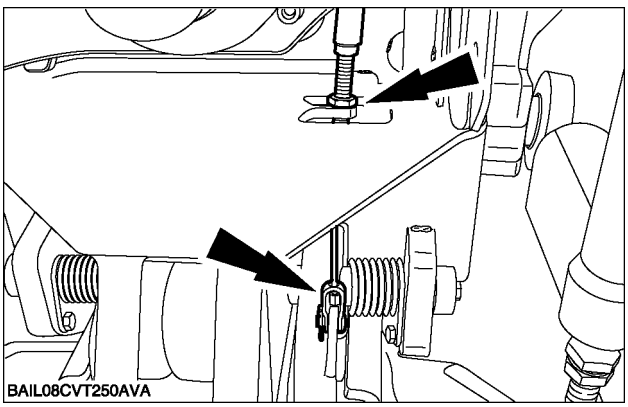
BAIL08CVT334AVA 21

22. Install the power take off (PTO) range lever cable to the PTO.



BAIL07APH227AVA 22

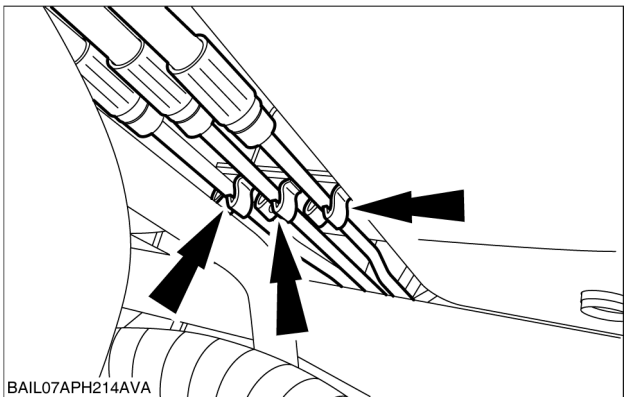
23. Install the rear mechanical hitch cable to the rear hitch.



BAIL08CVT250AVA 23

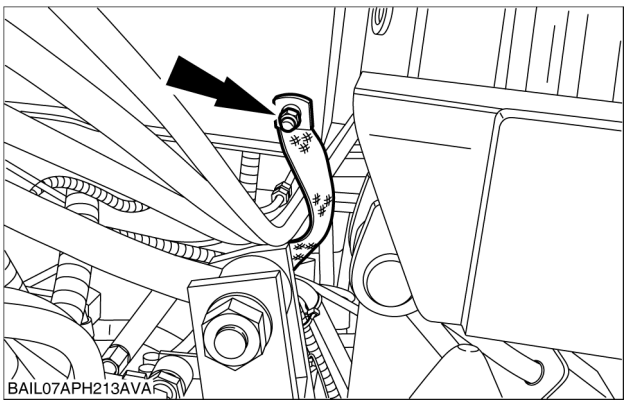
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24. Attach the brake pipes to the underside of the cab.



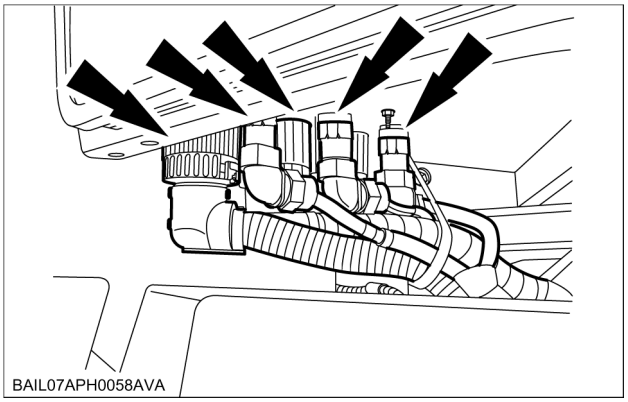
BAIL07APH214AVA 24

25. Connect the earth strap to the cab.



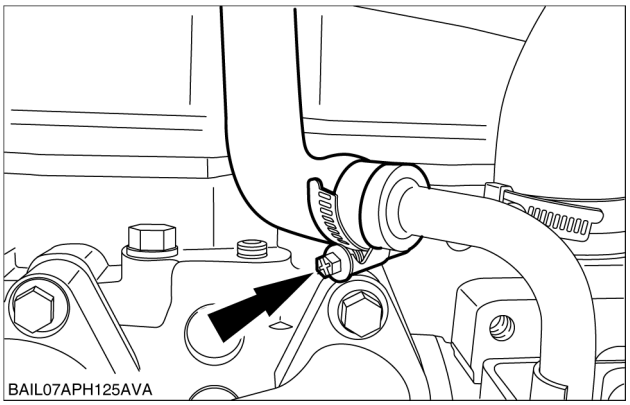
BAIL07APH213AVA 25

26. Connect the cab electrical connectors.



BAIL07APH058AVA 26

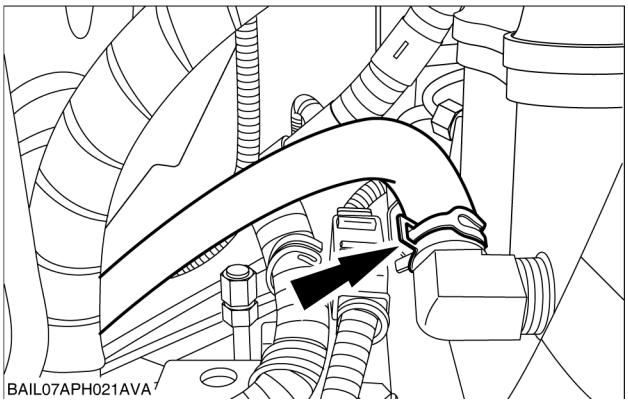
27. Connect the heater return hose.



BAIL07APH125AVA 27

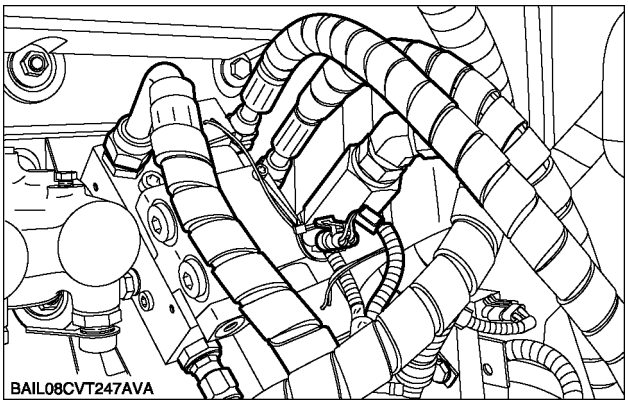
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28. Connect the heater supply hose to the rear of the engine cylinder head.



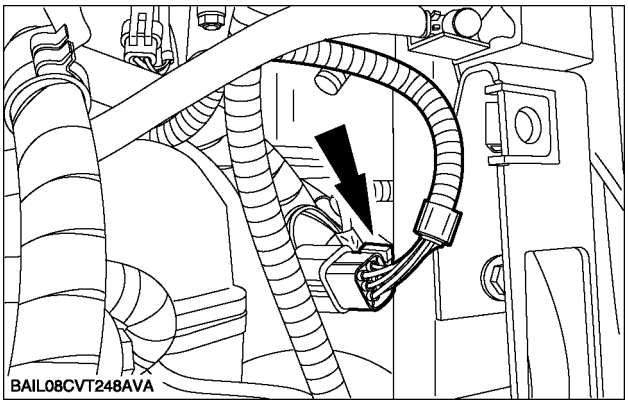
BAIL07APH021AVA 28

29. Connect the steering valve pipes.



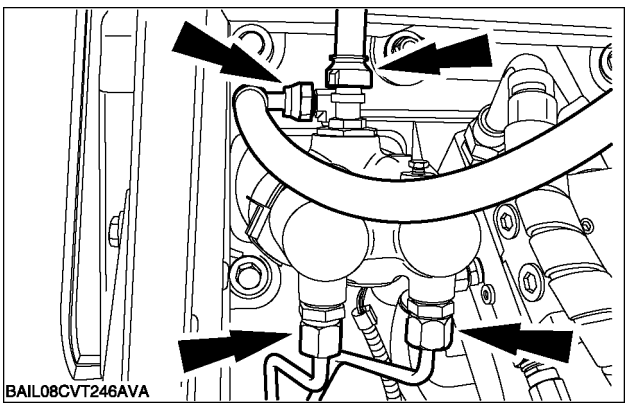
BAIL08CVT247AVA 29

30. Connect the isolation manifold electrical connector.



BAIL08CVT248AVA 30

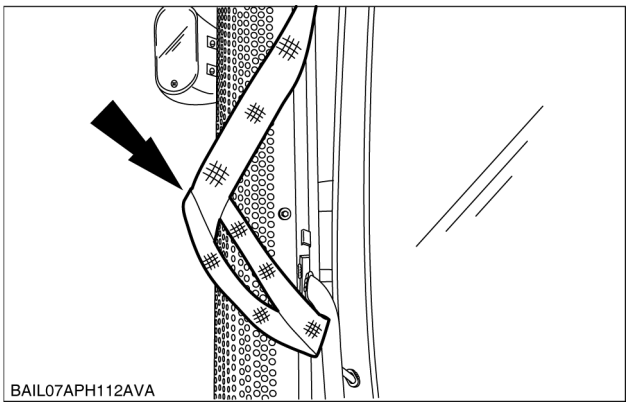
31. Connect the brake master cylinder oil supply hose, accumulator hose and brake pipe connections.



BAIL08CVT246AVA 31

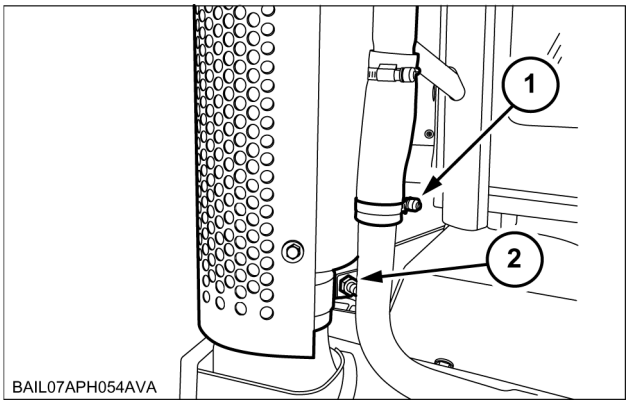
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32. Using a suitable sling install the exhaust muffler to the exhaust.



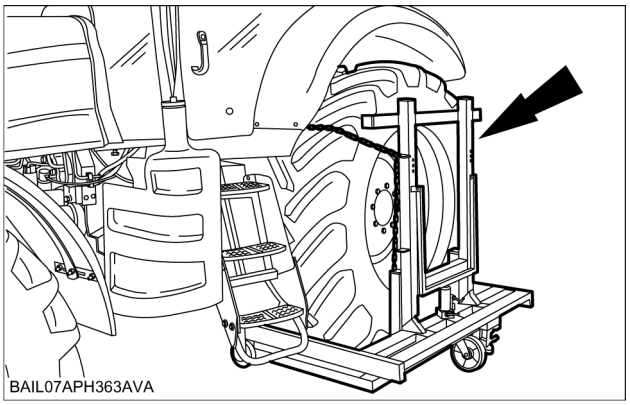
BAIL07APH112AVA 32

33. Tighten the air cleaner aspirator pipe **(1)** and exhaust clamp **(2)**.



BAIL07APH054AVA 33

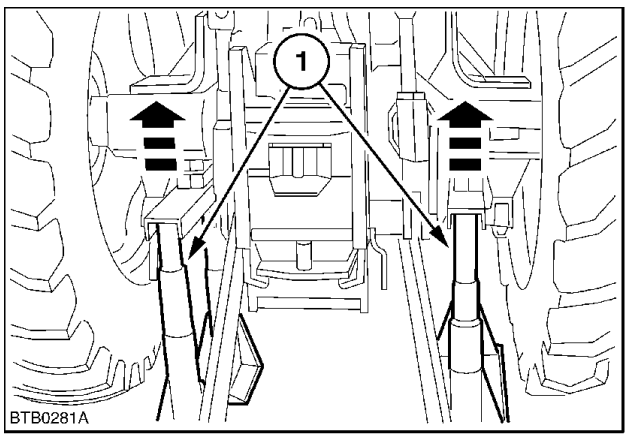
34. Install both rear wheels.
Tighten to **250 Nm** (**184 lb ft**.



BAIL07APH363AVA 34

35. Raise the rear of the vehicle and remove the axle stands **(1)**.

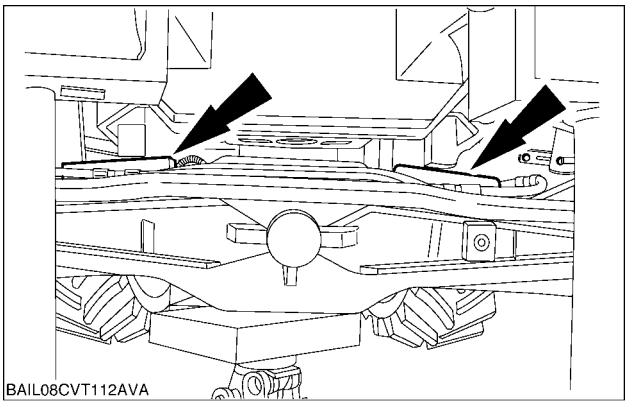
NOTE: *If detached during removal, reattach the lift rods to the lower links.*



BTB0281A 35

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36. Remove the wooden wedges from between the front axle and front support.



BAIL08CVT112AVA 36

37. Remove the wheel stops from the front wheels.

Next operation:
Fill the engine coolant system, for further information refer to **ENGINE COOLANT SYSTEM - Filling (B.50.A)**
Next operation:
Bleed the brake system, for further information refer to **SERVICE BRAKE Hydraulic - Bleed (D.30.C)**
Next operation:
Connect the battery, for further information refer to **Battery - Connect (A.30.A)**
Next operation:
Charge the air conditioning system, for further information refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Charging (E.40.D)**

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BODY AND STRUCTURE - E

ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - 40.D

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Torque

Cylinder head screws of the air conditioning compressor	**24.5-26.5 Nm** (**18-19.5 lbf.ft**)
Retaining screw of the compressor clutch front plate	**11.0-14.0 Nm** (**8-10 lbf.ft**)
Retaining screws of the air conditioning compressor	**20.5-25.5 Nm** (**15-19 lbf.ft**)

ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Special tools

Certified Refrigerant Recover, Recycling and Recharge Equipment suitable for the type of refrigerant gas used on tractor are required when servicing air conditioning systems.
This special equipment is available through recognised suppliers of air conditioning equipment. Refer to the Tool supplier for details on the latest equipment available for servicing the air conditioning system.

Vacuum/charge Portable system	Tool No. 380000558
Recovery/recharge Portable system	**380000315**
Evaporator and condenser cleaner	**380000312**
Electronic Gas Leak Detector	**380000314**
Manifold Gauge Set (Where required)	**380000239**
COMPRESSOR TOOLS: Sanden SDH715 Kit	**380000333**

ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - General specification

Refrigerant specifications	R134a
Refrigerant filling	**1.16 kg** (**2.6 lbs**)
Refrigerant oil specifications	PAG type (ISO 46 viscosity) Sanden SP10
Refrigerant oil filling quantity (air conditioning compressor and system)	**186 - 228 cm³**
Air conditioning compressor Manufacturer and type	Sanden SD7H15

At an ambient temperature of **22 - 49 °C** (**75 - 120 °F**) the cooling power is approximately. **4.5 kW**.

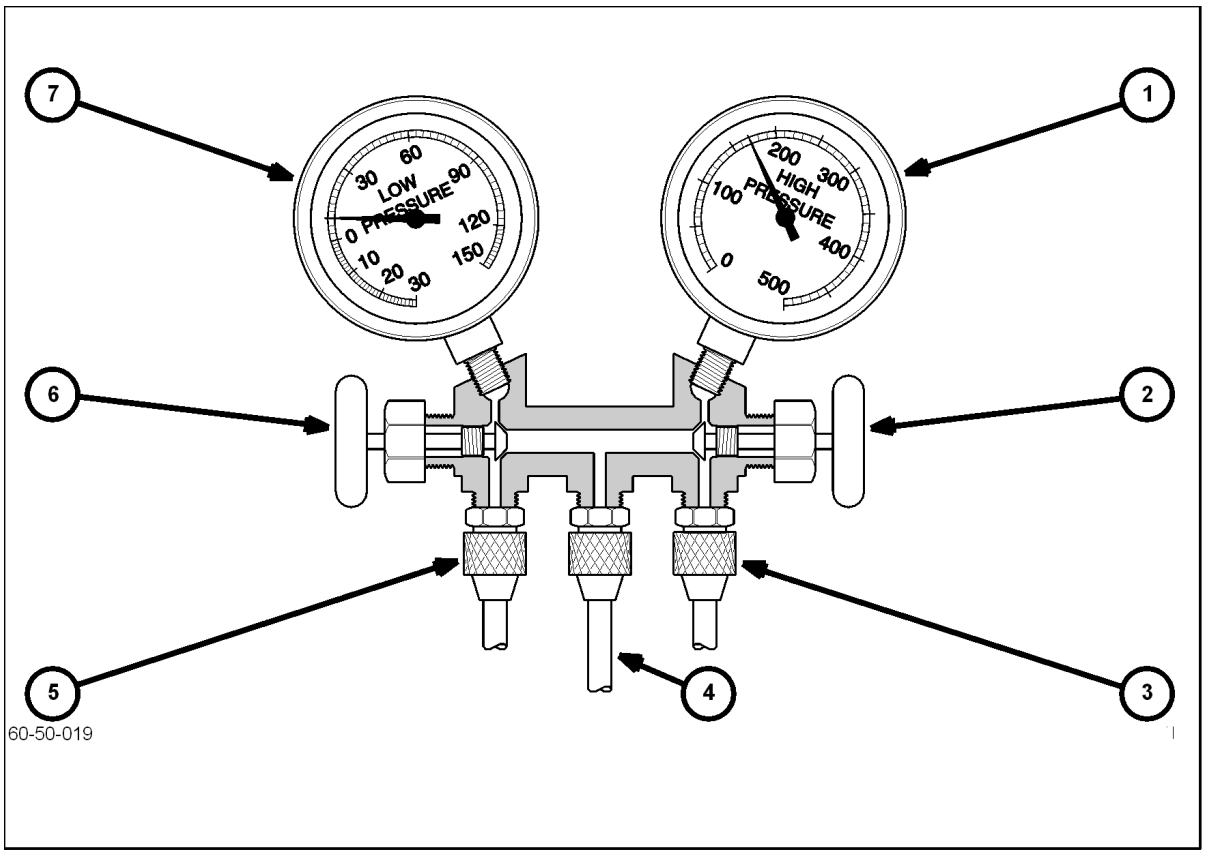
NOTE: *The actual cooling power depends on the setting made by the driver.*

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description

The following examples show typical low and high pressure gauge readings obtained when performance testing the air conditioning system with an ambient temperature of **35 °C** (**95 °F**).
The recommended corrective action is based on a similar fault as identified in the performance test diagnosis charts.

PERFORMANCE TEST EXAMPLE 1



60-50-019 1

Performance Test Example 1

1 High Side Low
2 High Side Hand Valve Closed
3 High Side Hose Connected to High Side Service Connector
4 Not Used
5 Low Side Hose Connected to Low Side Service Connector
6 Low Side Hand Valve Closed
7 Low Side Low

PROBLEM:

Little or no cooling.

CAUSE:

Refrigerant slightly low.

CONDITIONS*

Low side pressure too low. Gauge should read **1 - 2 bar** (**15 - 30 lbf/in2**).
High side pressure too low. Gauge should read **16 - 18 bar** (**194 - 215 lbf/in2**).
Evaporator air not cold.

CORRECTIVE PROCEDURES

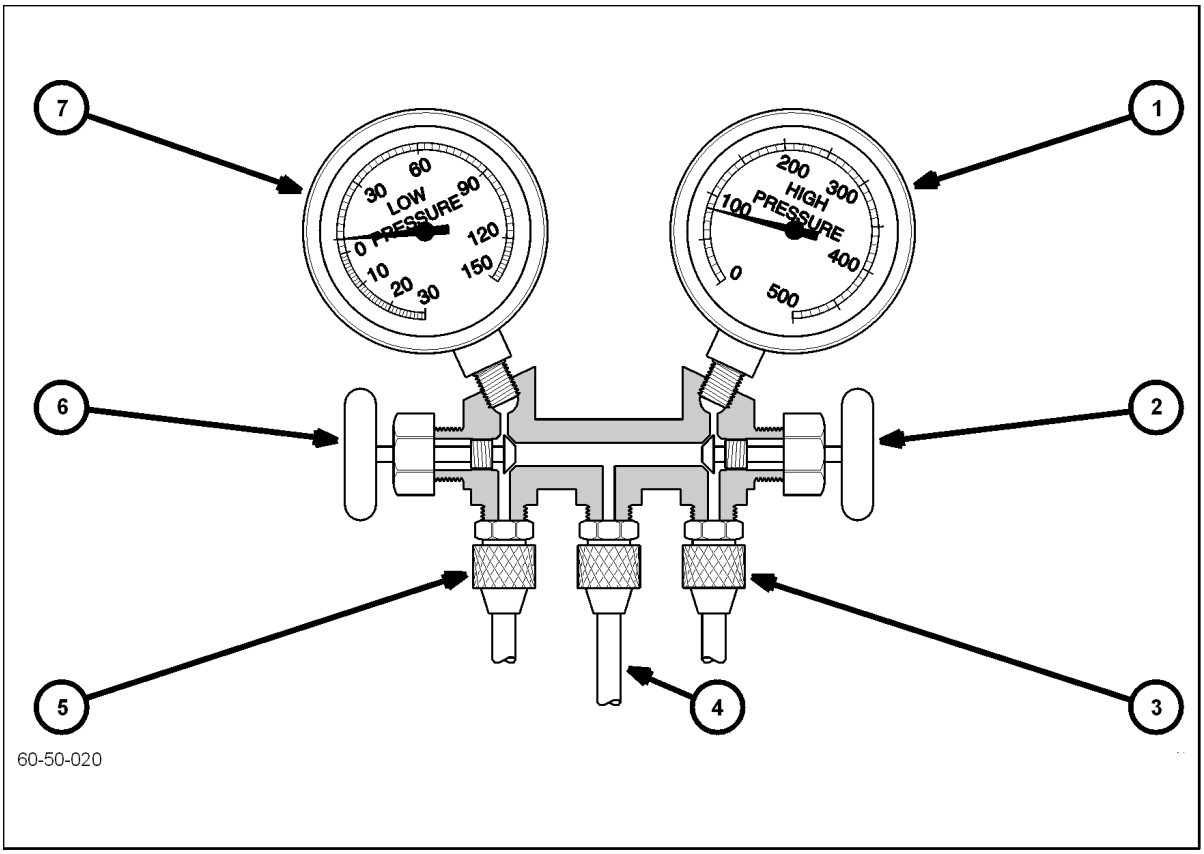
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1. Leak test the system.
2. Repair leaks. (Discharge and recover the refrigerant from the system; replace lines or components).
3. Check compressor oil to ensure no loss.
4. Evacuate the system.
5. Charge the system.
6. Performance test the system.

DIAGNOSIS: System refrigerant is low. May be caused by a small leak

NOTE: *Test procedure based upon ambient temperature of* ***35 °C*** *(* ***95 °F****). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction (E.40.D)****.*

PERFORMANCE TEST EXAMPLE 2



60-50-020 2

Performance Test Example 2

1 High Side Low
2 High Side Hand Valve Closed
3 High Side Hose Connected to High Side Service Connector
4 Not Used
5 Low Side Hose Connected t Low Side Service Connector
6 Low Side Hand Valve Closed
7 Low Side Low

PROBLEM:

Insufficient cooling.

CAUSE:

Refrigerant excessively low.

CONDITIONS*

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Low side pressure very low.
Gauge should read **1 - 2 bar** (**15 - 30 lbf/in2**)
High side pressure too low.
Gauge should read **16 - 18 bar** (**230 - 260 lbf/in2**).
Evaporator air warm.
Low pressure switch cutting out

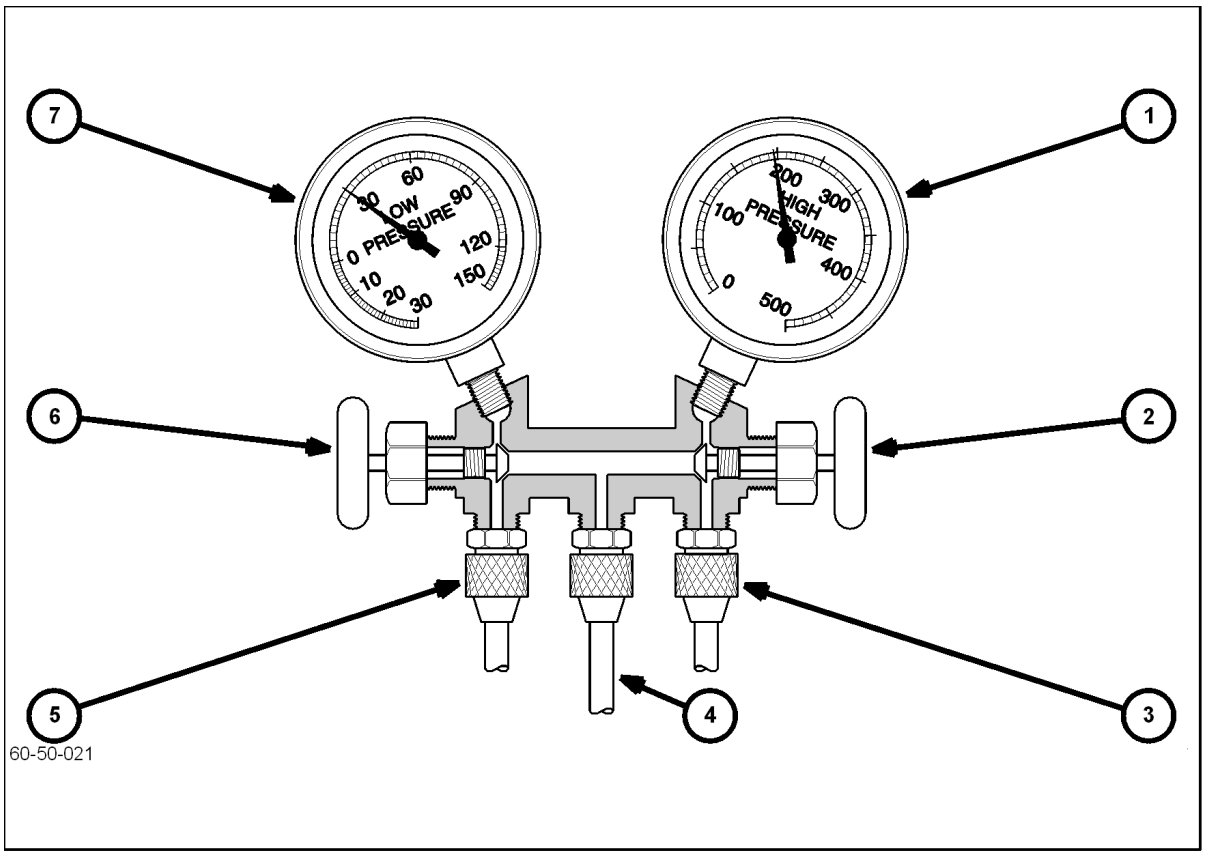
CORRECTIVE PROCEDURES

1. Leak test the system.
2. Discharge and recover the refrigerant from the system.
3. Repair leaks.
4. Check compressor oil to ensure no loss.
5. Evacuate the system.
6. Charge the system.
7. Performance test the system.

DIAGNOSIS: System refrigerant is extremely low. A serious leak is indicated.

NOTE: *Test procedure based upon ambient temperature of* ***35 °C*** *(* ***95 °F****). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction (E.40.D)****.*

PERFORMANCE TEST EXAMPLE 3



60-50-021 3

Performance Test Example 3

1 High Side Normal
2 High Side Hand Valve Closed
3 High Side Hose Connected to High Side Service Connector
4 Not Used
5 Low Side Hose Connected to Low Side Service Connector
6 Low Side Hand Valve Closed

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7 Low Side Low

PROBLEM:

Insufficient cooling.

CAUSE:

Air in system.

CONDITIONS*

Low side pressure reading does not change when compressor cycles “on" and “off".
High side pressure slightly high or slightly low. Gauge should read **16 - 18 bar** (**230 - 260 lbf/in2**).
Evaporator air not cold.

CORRECTIVE PROCEDURES

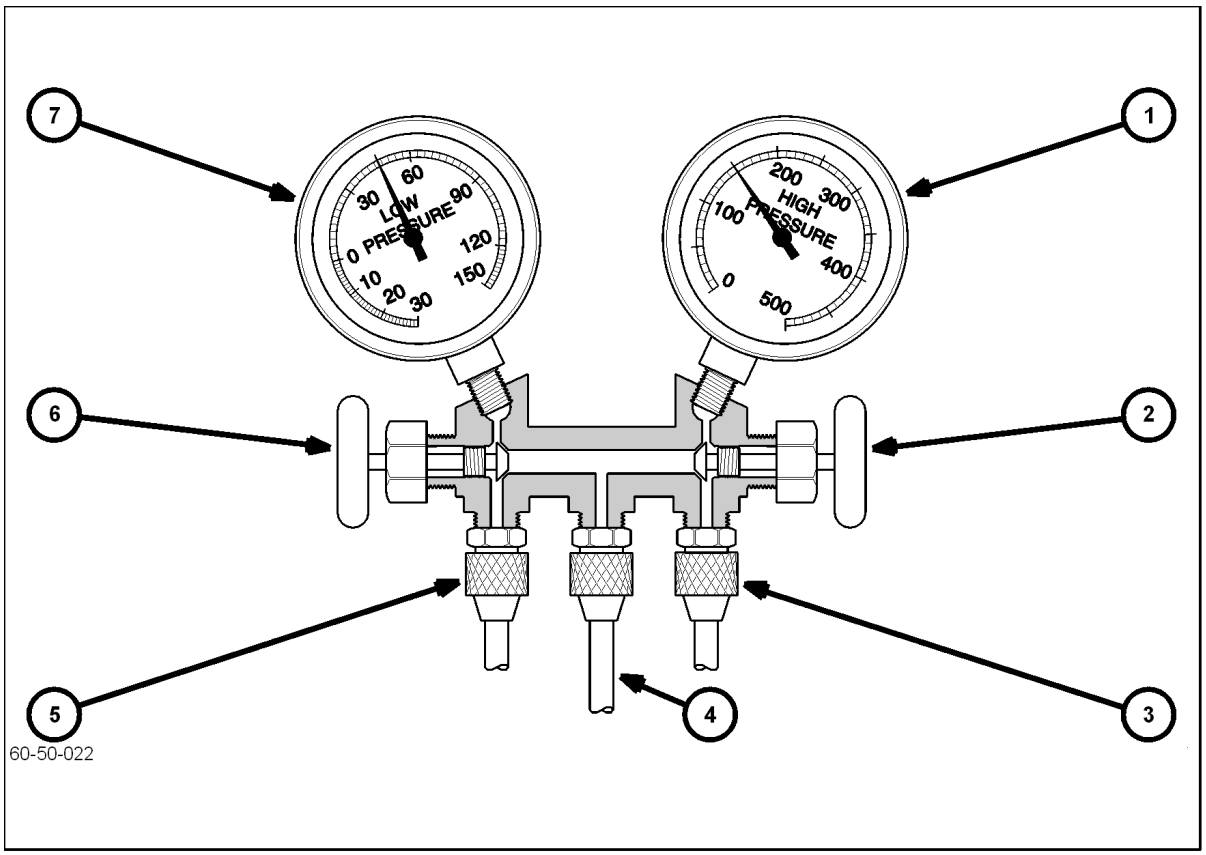
1. Leak test the system. Give special attention to the compressor seal area.
2. Discharge and recover the refrigerant from the system.
3. Repair leaks.
4. Replace the receiver/dryer.
5. Check compressor oil to ensure no loss.
6. Evacuate the system.
7. Charge the system.
8. Performance test the system.

DIAGNOSIS: Air or moisture in system. System not fully charged.

NOTE: *Test procedure based upon ambient temperature of* ***35 °C*** *(* ***95 °F****). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction (E.40.D)****.*

PERFORMANCE TEST EXAMPLE 4

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60-50-022 4

Performance Test Example 4

1 High Side Low
2 High Side Hand Valve Closed
3 High Side Hose Connected to High Side Service Connector
4 Not Used
5 Low Side Hose Connected to Low Side Service Connector
6 Low Side Hand Valve Closed
7 Low Side High

PROBLEM:

Insufficient cooling.

CAUSE:

Compressor malfunction.

CONDITIONS*

Low side pressure too high. Gauge should read **1 - 2 bar** (**15 - 30 lbf/in2**).
High side pressure too low. Gauge should read **16 - 18 bar** (**230 - 260 lbf/in2**).
Evaporator air not cold.

CORRECTIVE PROCEDURES

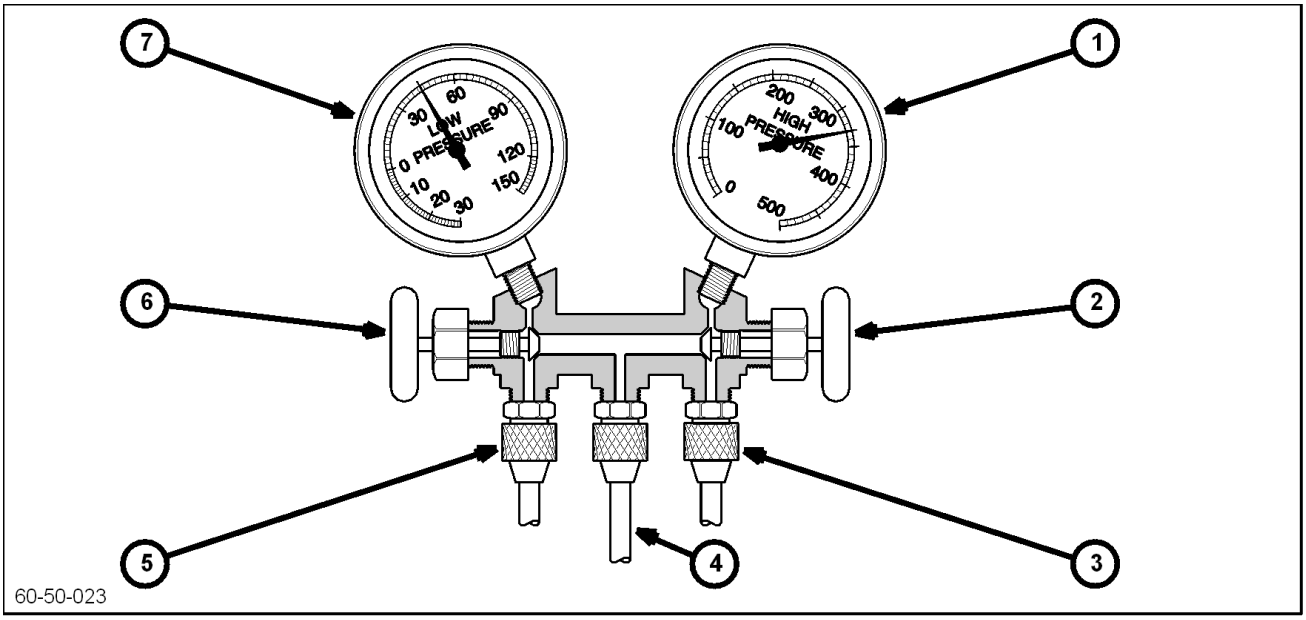
1. Replace the compressor.

DIAGNOSIS: Internal leak in compressor caused by worn or scored pistons, rings, or cylinders .

NOTE: *Test procedure based upon ambient temperature of* ***35 °C*** *(* ***95 °F****). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction (E.40.D)****.*

PERFORMANCE TEST EXAMPLE 5

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60-50-023 5

Performance Test Example 5

1 High Side High
2 High Side Hand Valve Closed
3 High Side Hose Connected to High Side Service Connector
4 Not Used
5 Low Side Hose Connected to Low Side Service Connector
6 Low Side Hand Valve Closed
7 Low Side High

PROBLEM:

Insufficient or no cooling. Engine overheats in some cases.

CAUSE:

Condenser not functioning properly.

CONDITIONS*

Low side pressure too high. Gauge should read **1 - 2 bar** (**15 - 30 lbf/in2**).
High side pressure too high. Gauge should read **16 - 18 bar** (**230 - 260 lbf/in2**).
Liquid line hot.
Evaporator air warm.
High pressure switch cutting out.

CORRECTIVE PROCEDURES

1. Check belt. Loose or worn drive belts could cause excessive pressures in the compressor head.
2. Look for clogged passages between the condenser fins and coil, or other obstructions that could reduce condenser airflow.
3. If engine is overheating replace engine thermostat and radiator pressure cap.

At this point, operate the system and check its performance. If still unsatisfactory, proceed as follows:-

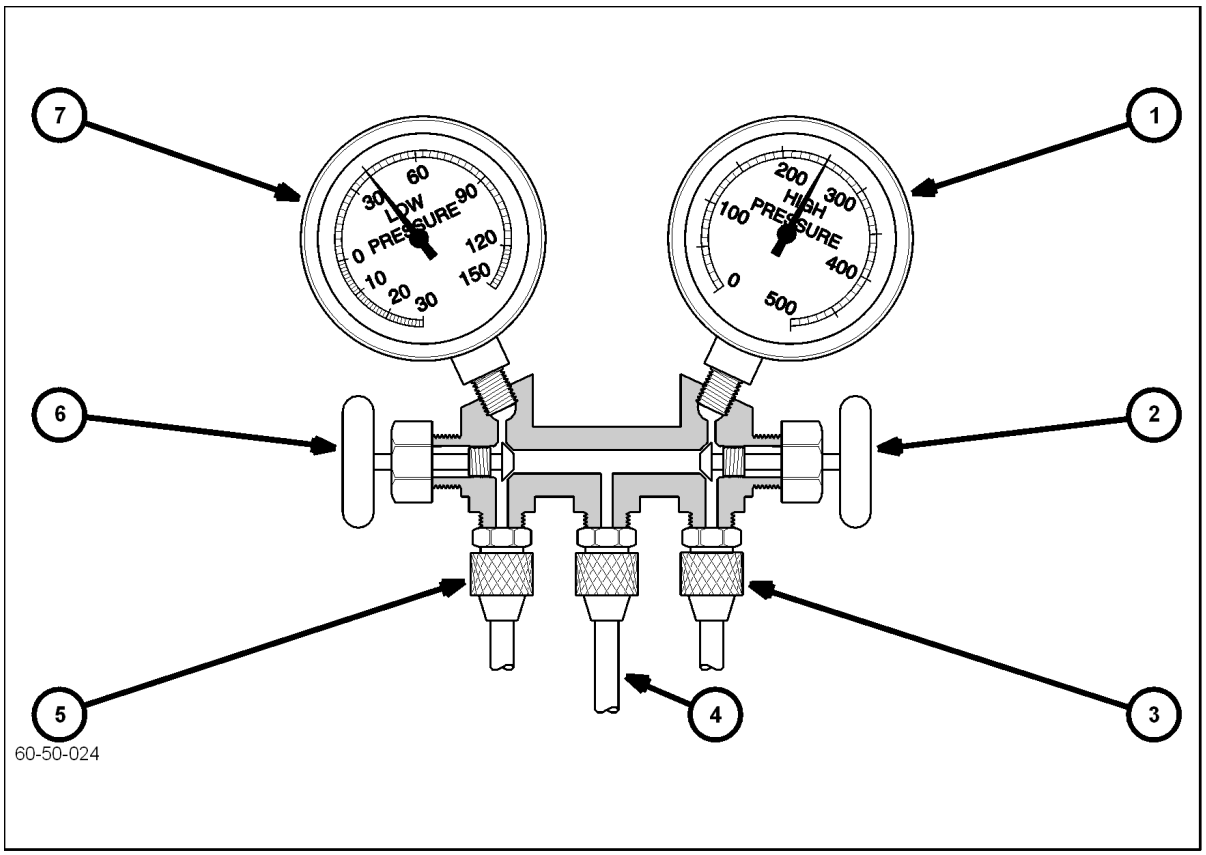
1. Discharge and recover the refrigerant from the system.
2. Remove the condenser and clean and flush it to ensure a free flow of refrigerant. Or, if the condenser appears to be unduly dirty or plugged, replace it.
3. Replace the receiver/dryer.
4. Evacuate the system, and recharge it with the correct quantity of refrigerant.
5. Performance test the system.

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DIAGNOSIS: Lack of cooling caused by pressure that is too high on the high side, resulting from improper operation of condenser. (Refrigerant charge may be normal or excessive).

NOTE: *Test procedure based upon ambient temperature of* ***35 °C*** *(* ***95 °F****). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction (E.40.D)****.*

PERFORMANCE TEST EXAMPLE 6



60-50-024 6

Performance Test Example 6

1 High Side Normal
2 High Side Hand Valve Closed
3 High Side Hose Connected to High Side Service Connector
4 Not Used
5 Low Side Hose Connected to Low Side Service Connector
6 Low Side Hand Valve Closed
7 Low Side Normal

PROBLEM:

Insufficient or no cooling.

CAUSE:

Large amount of air in system.

CONDITIONS*

Low side pressure too high. Gauge should read **1 - 2 bar** (**15 - 30 lbf/in2**).
High side pressure too high. Gauge should read **16 - 18 bar** (**230 - 260 lbf/in2**).
Evaporator air not cool.

CORRECTIVE PROCEDURES

1. Discharge and recover the refrigerant from the system.

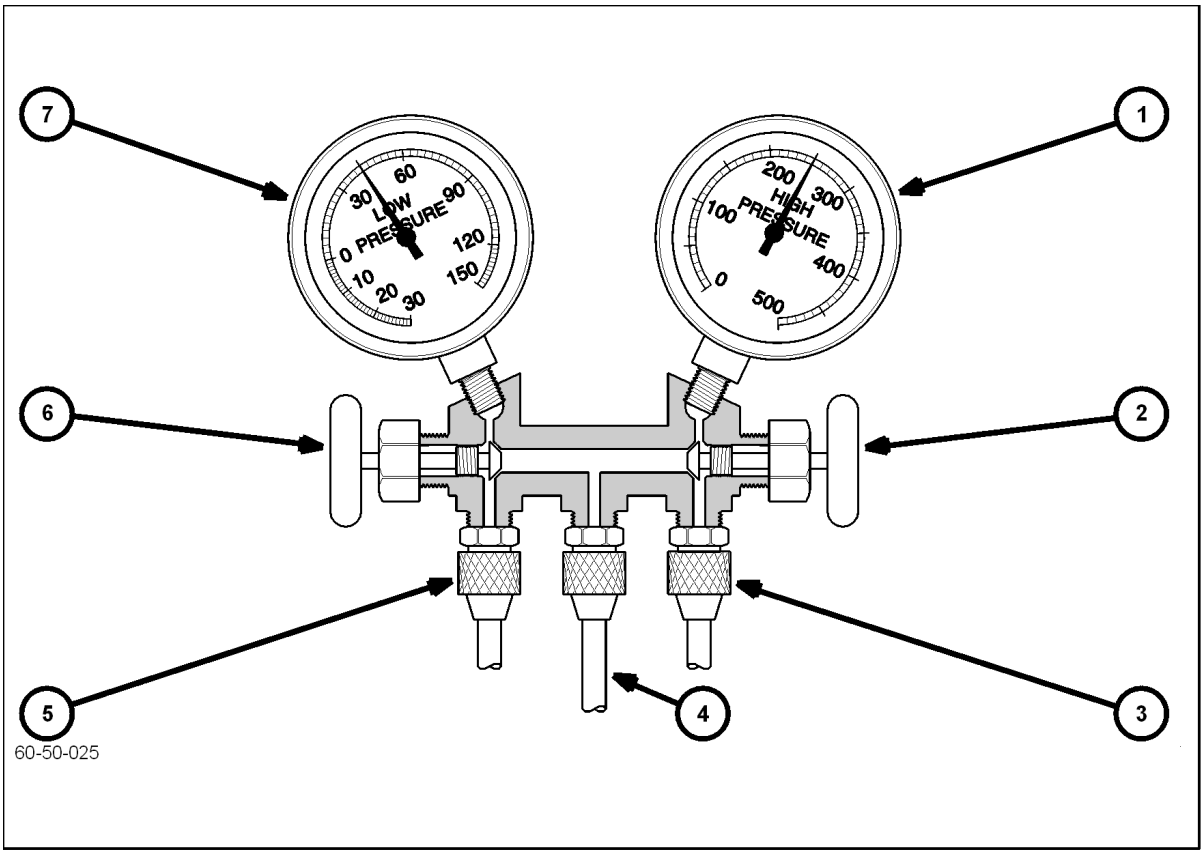
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2. Replace the receiver/dryer.
3. Evacuate the system.
4. Charge the system.
5. Performance test the system.

DIAGNOSIS: Air in system. This, and the moisture in the air, is contaminating the refrigerant, causing the system to operate improperly.

NOTE: *Test procedure based upon ambient temperature of* ***35 °C*** *(* ***95 °F****). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction (E.40.D)****.*

PERFORMANCE TEST EXAMPLE 7



60-50-025 7

Performance Test Example 7

1 High Side High
2 High Side Hand Valve Closed
3 High Side Hose Connected to High Side Service Connector
4 Not Used
5 Low Side Hose Connected to Low Side Service Connector
6 Low Side Hand Valve Closed
7 Low Side Hide

PROBLEM:

Insufficient or no cooling.

CAUSE:

Improper operation of thermostatic expansion valve (stuck open)

CONDITIONS*

Low side pressure too high. gauge should read **1 - 2 bar** (**15 - 30 lbf/in2**).

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High side pressure too high. Gauge should read **16 - 18 bar** (**230 - 260 lbf/in2**).
Evaporator air warm.
Evaporator and suction hose (to compressor) surfaces show considerable moisture.

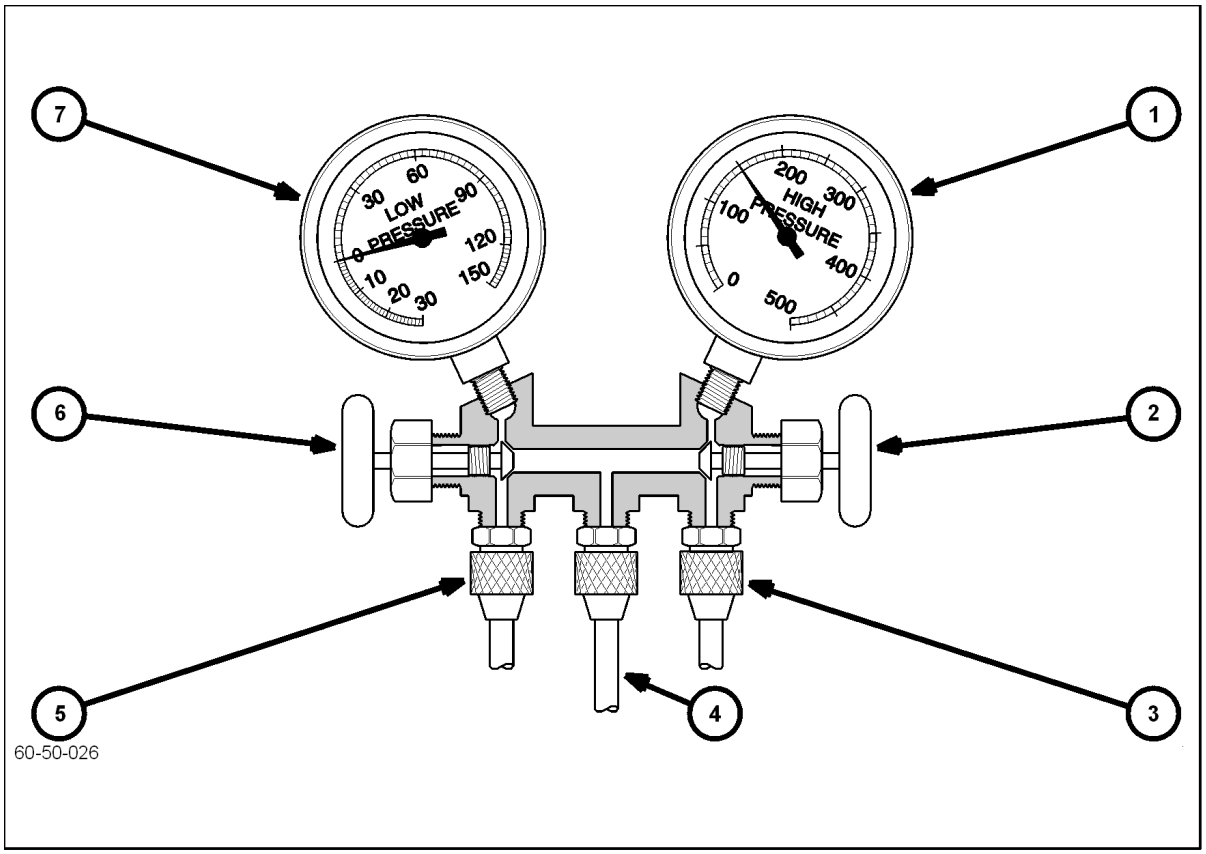
CORRECTIVE PROCEDURES

1. Check for sticking expansion valve as follows:-
   Operate the system at maximum cooling.
   Check the low side gauge. The pressure should drop slowly.
2. If the test indicates that the expansion valve is defective, proceed as follows:
   Discharge and recover the refrigerant from the system.
   Replace the expansion valve.
   Evacuate the system.
   Charge the system.
   Performance test the system.

DIAGNOSIS: Thermostatic expansion valve is allowing too much refrigerant to flow through the evaporator coils. Valve may be stuck open.

NOTE: *Test procedure based upon ambient temperature of* ***35 °C*** *(* ***95 °F****). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction (E.40.D)****.*

PERFORMANCE TEST EXAMPLE 8



60-50-026 8

Performance Test Example 8

1 High Side Low
2 High Side Hand Valve Closed
3 High Side Hose Connected to High Side Service Connector
4 Not Used
5 Low Side Hose Connected to Low Side Service Connector
6 Low Side Hand Valve Closed
7 Low Side Low

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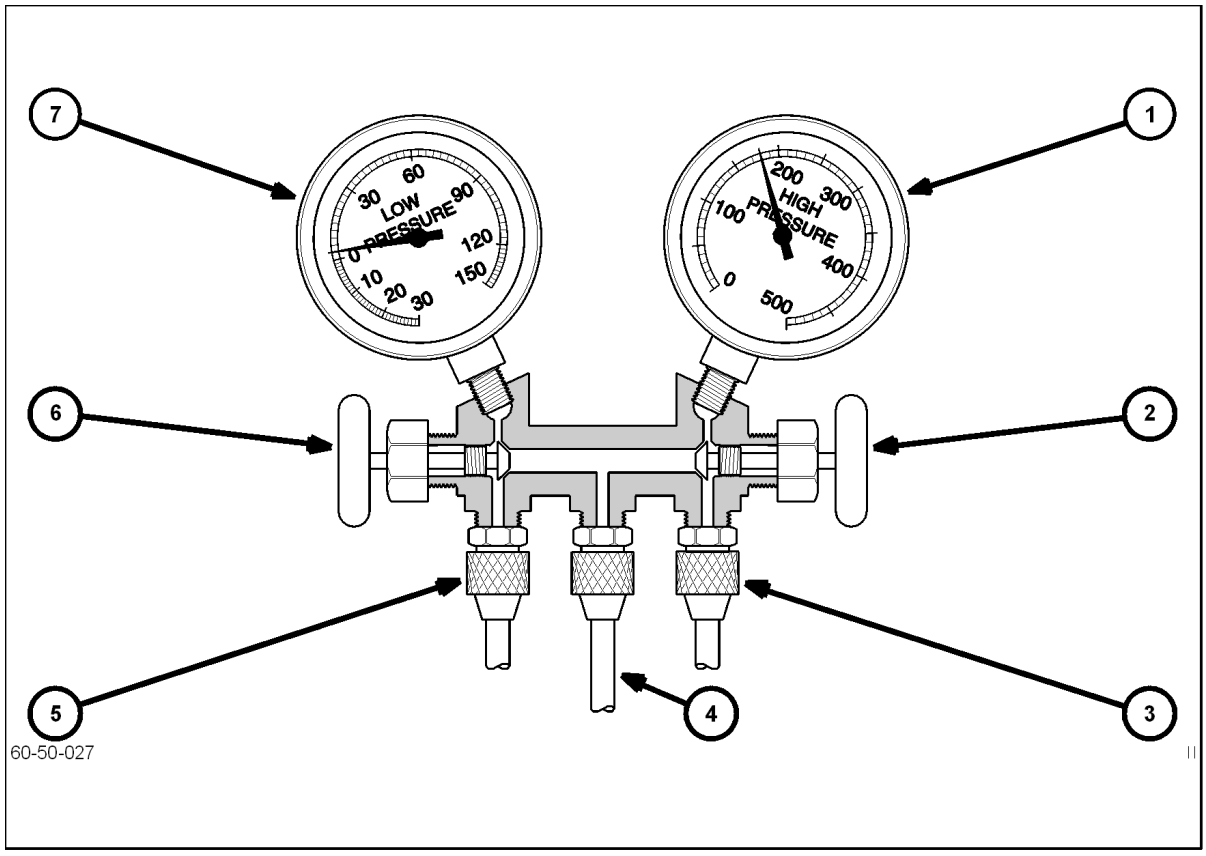
PROBLEM: Insufficient cooling.
CAUSE: Improper operation of thermostatic expansion valve (stuck closed).
CONDITIONS*
Low side pressure too low (zero or vacuum). Gauge should read **1 - 2 bar** (**15 - 30 lbf/in2**).
High side pressure low. Gauge should read **16 - 18 bar** (**230 - 260 lbf/in2**).
Evaporator air cool, but not sufficiently cold.
Evaporator inlet pipe surface shows considerable moisture or frost.
Low pressure switch cutting out.
CORRECTIVE PROCEDURES

1. Place finger on expansion valve to evaporator tube. If too cold to touch, proceed as follows:
   Operate the system at maximum cooling.
   Check the low side gauge. The pressure should drop slowly.
2. If the procedure outlined in Step 1 shows that the expansion valve is defective, proceed as follows:
   Discharge system
   Replace expansion valve
   Evacuate the system.
   Charge the system.
   Performance test the system.

DIAGNOSIS: Expansion valve is not permitting a sufficient flow of refrigerant. May be caused by valve stuck in restricted or closed position.

NOTE: *Test procedure based upon ambient temperature of* ***35 °C*** *(* ***95 °F****). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction (E.40.D)****.*

PERFORMANCE TEST EXAMPLE 9



60-50-027 9

Performance Test Example 9

1 High Side Low
2 High Side Hand Valve Closed
3 High Side Hose Connected to High Side Service Connector
4 Not Used

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5 Low Side Hose Connected to Low Side Service Connector
6 Low Side Hand Valve Closed
7 Low Side Low

PROBLEM:

Insufficient cooling.

CAUSE:

Restriction in high side of system.

CONDITIONS*

Low side pressure too low. Gauge should read **1 - 2 bar** (**15 - 30 lbf/in2**).
High side pressure too low. Gauge should read **16 - 18 bar** (**230 - 260 lbf/in2**).

NOTE: *A normal or high reading of the high side pressure gauge under these conditions indicates the system is overcharged or the condenser or receiver/dryer is too small.*

Evaporator only slightly cool.
Liquid line and receiver/dryer are cool to touch and show frost or considerable moisture.

CORRECTIVE PROCEDURES

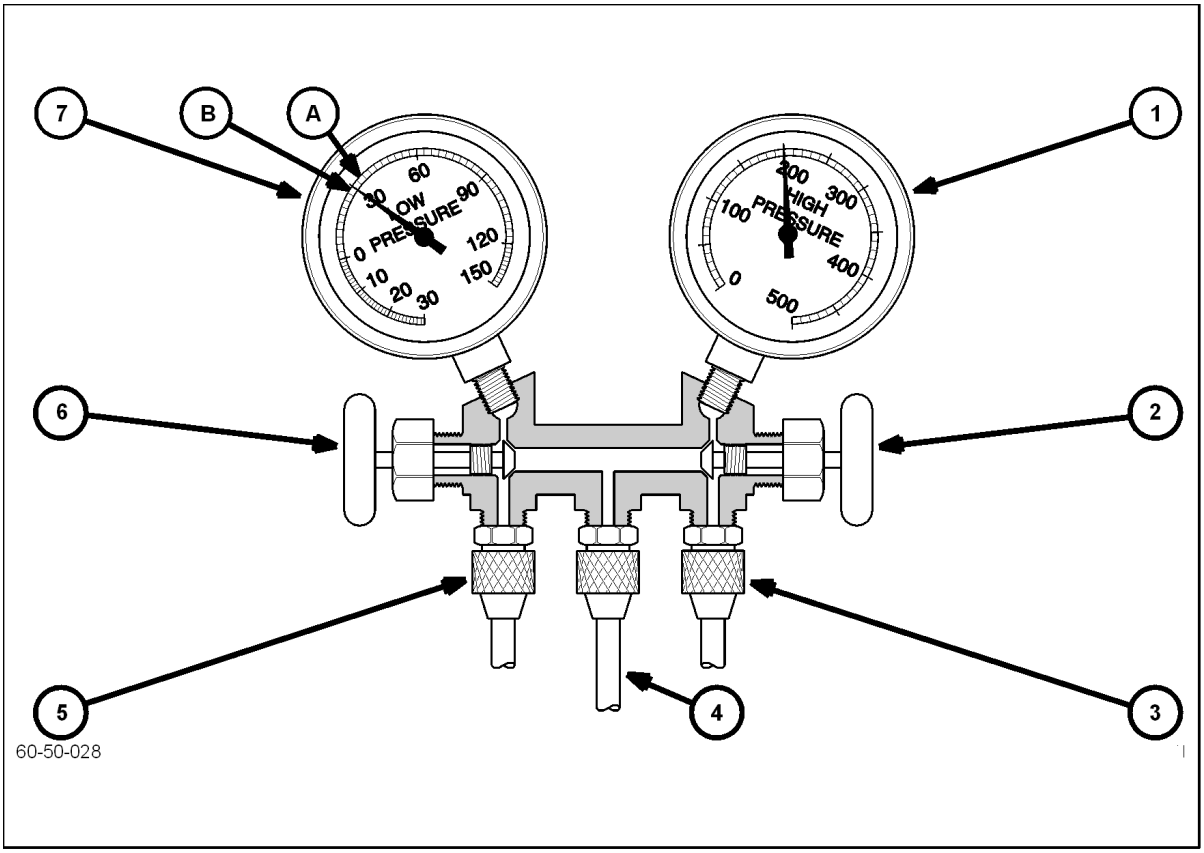
1. Discharge and recover the refrigerant from the system.
2. Replace the liquid lines, receiver/dryer, or other obstructed components.
3. Evacuate the system.
4. Charge the system.
5. Performance test the system.

DIAGNOSIS: Restriction in the liquid line and/or receiver/dryer resulting in a “starved" evaporator (compressor moving refrigerant from the evaporator faster than it can enter).

NOTE: *Test procedure based upon ambient temperature of **35 °C** (**95 °F**). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction (E.40.D)**.*

PERFORMANCE TEST EXAMPLE 10

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Performance Test Example 10

1 High Side Normal
2 High Side Hand Valve Closed
3 High Side Hose Connected to High Side Service Connector
4 Not Used
5 Low Side Hose Connected to Low Side Service Connector
6 Low Side Hand Valve Closed
7 Low Side Gauge Compressor Cycles on at **34 lbf/in2** (**2.3 bar**) Compressor Cycles off at **28 lbf/in2** (**1.9 bar**)

PROBLEM:

Compressor cycles (cuts in and out) too rapidly.

CAUSE:

Thermostatic switch defective.

CONDITIONS*

Low side pressure readings too high during both “on" and “off" compressor cycles and between cycles. Readings should be:
0.8 - 1.0 bar (**12 - 15 lbf/in2**) - cycle "off"
2.5 - 2.7 bar (**36 - 39 lbf/in2**) - cycle "on"
1.7 - 1.9 bar (**24 - 27 lbf/in2**) - between cycles
High side pressure normal. Gauge should read **16 - 18 bar** (**230 - 260 lbf/in2**).

CORRECTIVE PROCEDURES

1. Stop the engine and shut off A/C system.
2. Replace thermostatic switch with switch of same type.
3. Make sure the switch’s temperature sensor is installed in the same position and depth (in evaporator core) as previous.

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4. Performance test the system.

DIAGNOSIS: Defective thermostatic switch.

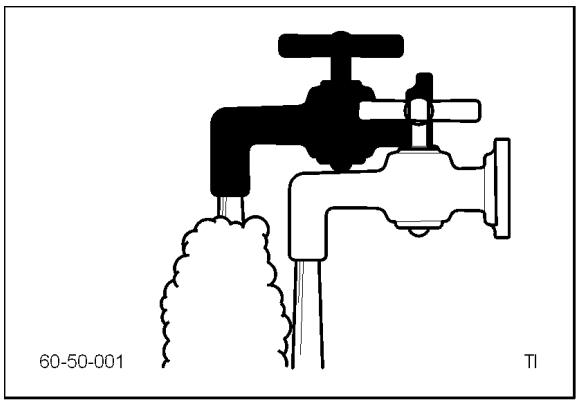
NOTE: *Test procedure based upon ambient temperature of* ***35 °C*** *(* ***95 °F****). For proper high side gauge reading for other ambient temperatures, refer to the pressure temperature chart* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction (E.40.D)****.*

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Static description

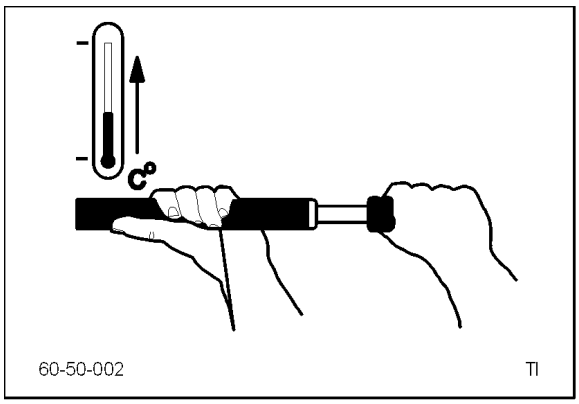
The function of the air conditioning system is to improve the operator's comfort by cooling the air temperature inside the cab and reducing the humidity level.
This temperature control is achieved by absorbing the heat within the cab into a refrigerant and then allowing the heat absorbed by the refrigerant to be transferred to the outside air.
In order to achieve this heat transfer the following principals of heat generation and transfer are applied within the air conditioning system.

1. When two bodies of different temperature come together heat is transferred from one to another. On air conditioning systems an evaporator is used to hold the low temperature refrigerant which absorbs the heat from the air within the cab.



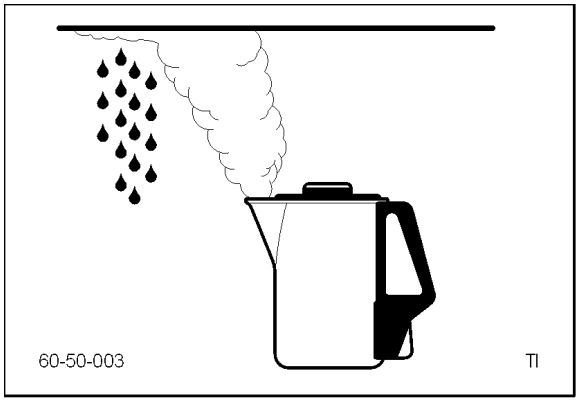
60-50-001 1

2. When a gas is pressurised the temperature of the gas will rise. In air conditioning systems the increase in pressure is achieved using a compressor.



60-50-002 2

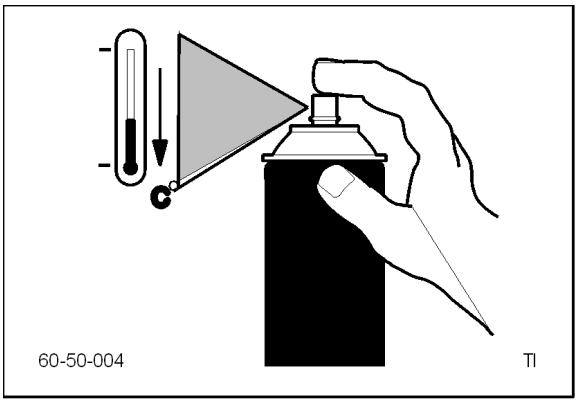
3. When a gas is cooled it will condense into a liquid. In the air conditioning system a condenser is used to cool the gas and the resulting liquid is stored in a receiver dryer.



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4. When a liquid is atomized through an orifice, the temperature of the resultant vapour will drop. The low temperature of the atomized liquid will then absorb heat from its surroundings. On air conditioning systems the refrigerant is atomized using an expansion valve.



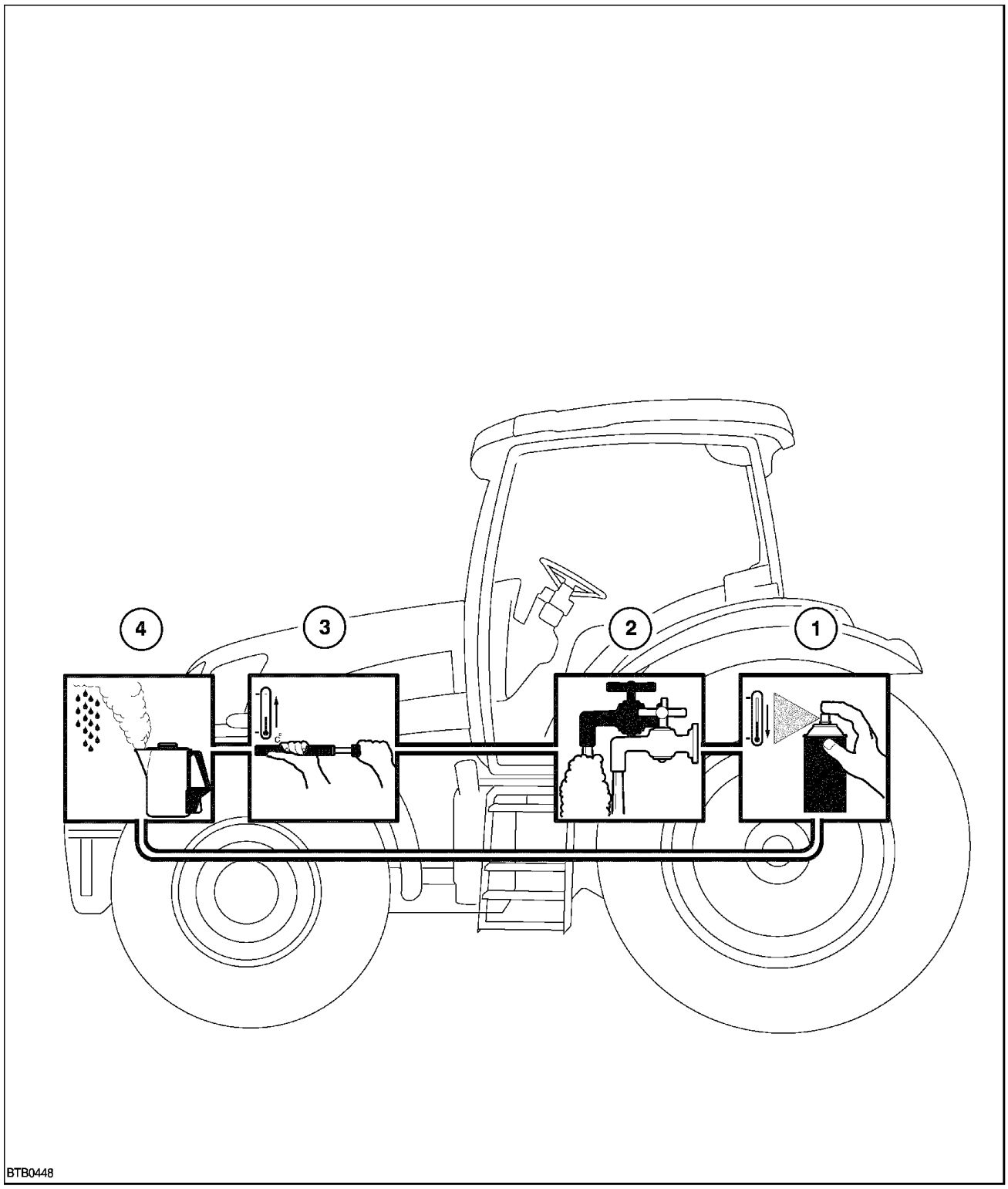
60-50-004 4

It can now be seen that the principal components of an air conditioning system are:-

- Refrigerant
- Evaporator
- Compressor
- Condenser
- Receiver/Dryer
- Expansion Valve

Figure **5**, uses the examples above to illustrate the air conditioning cycle.

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Air Conditioning Principal of Operation

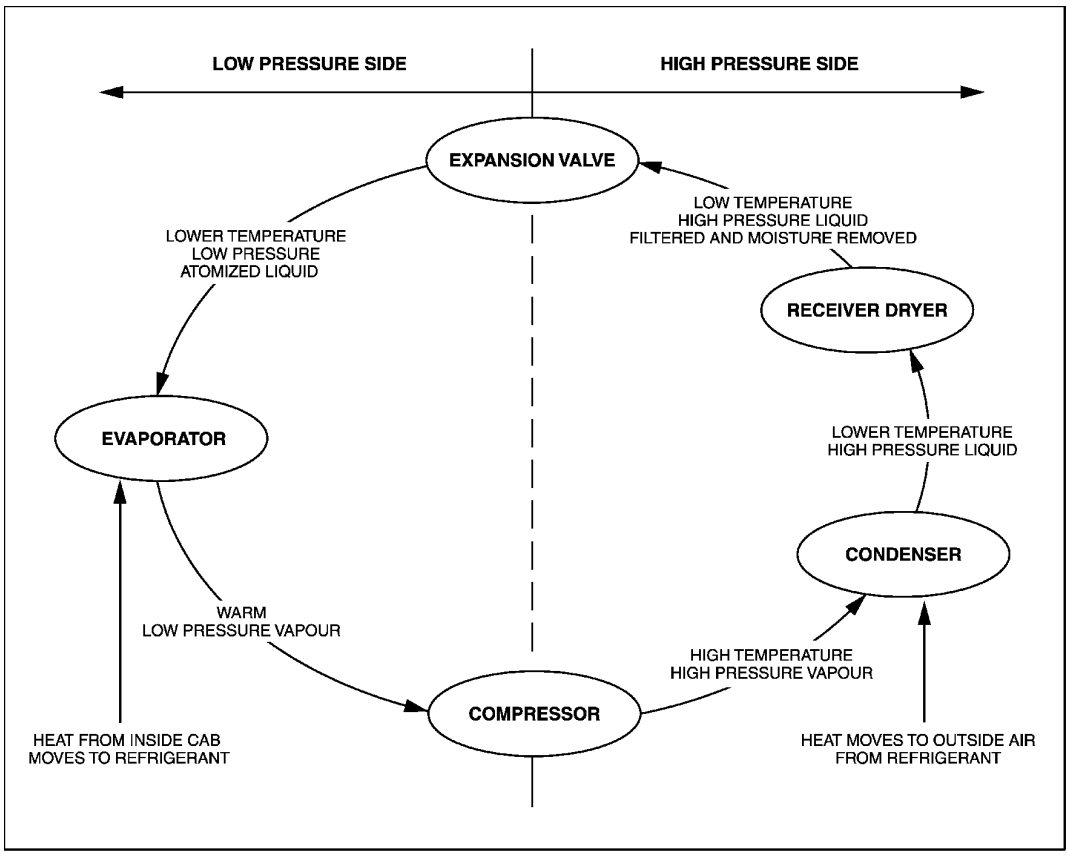
1 Expansion Valve - Atomizes Liquid Refrigerant Before Passing to Evaporator

2 Evaporator- Absorbs Heat From Air In Cab

3 Compressor - Compresses and Raises Temperature Of Refrigerant Gas

4 Condenser, Evaporator and Dryer - Converts Refrigerant from Gas to a Liquid

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Air Conditioning Flow Diagram

Figure **6**, shows in schematic form the flow of refrigerant through the five major components of an air conditioning system. Refer to, Figure **6**, for the location of these components on the tractor.
Refrigerant is drawn into the compressor as a cool, low pressure vapor which is compressed and then pumped out as a hot, high pressure vapor to the condenser.
As the hot, high pressure vapor passes through the condenser core it gives off heat to the cooler outside air, being drawn past the fins by the engine cooling fan.
By giving off heat to the outside air, the vapor is condensed to a liquid which moves under high pressure to the receiver dryer where it is stored until released to the evaporator by the temperature sensing expansion valve.
As liquid refrigerant passes through the metered orifice in the expansion valve the refrigerant changes from a high pressure liquid to a low pressure atomized liquid with a lower temperature.
This low pressure, low temperature, atomized liquid enters the evaporator coils and absorbs heat from the cab warm air blown across the coils and fins by the cab blower motor. The refrigerant now changes from a cold low pressure atomized liquid to a warm low pressure vapor and leaves the evaporator outlet, moving to the suction (low pressure) side of the compressor to repeat the cycle.
As this heat loss is taking place, moisture (humidity) in the cab air will condense on the outside of the evaporator and drain off as water through the drain hoses attached to the evaporator drain pan, thereby reducing the humidity level of the cab.

Refrigerant

To achieve the absorption and the release of heat which is, in essence, the function of an air conditioning system, requires the use of a suitable “refrigerant" - a liquid that has a relatively low temperature boiling point, plus certain desirable safety and stability features.
The refrigerant used in the air conditioning system is refrigerant R-134a.

NOTE: *To help protect the environment, legislation has been introduced in most territories banning the release into the atmosphere of refrigerants, including R134a. All service procedures contained in this manual can be carried out without the need to release refrigerant into the atmosphere.*

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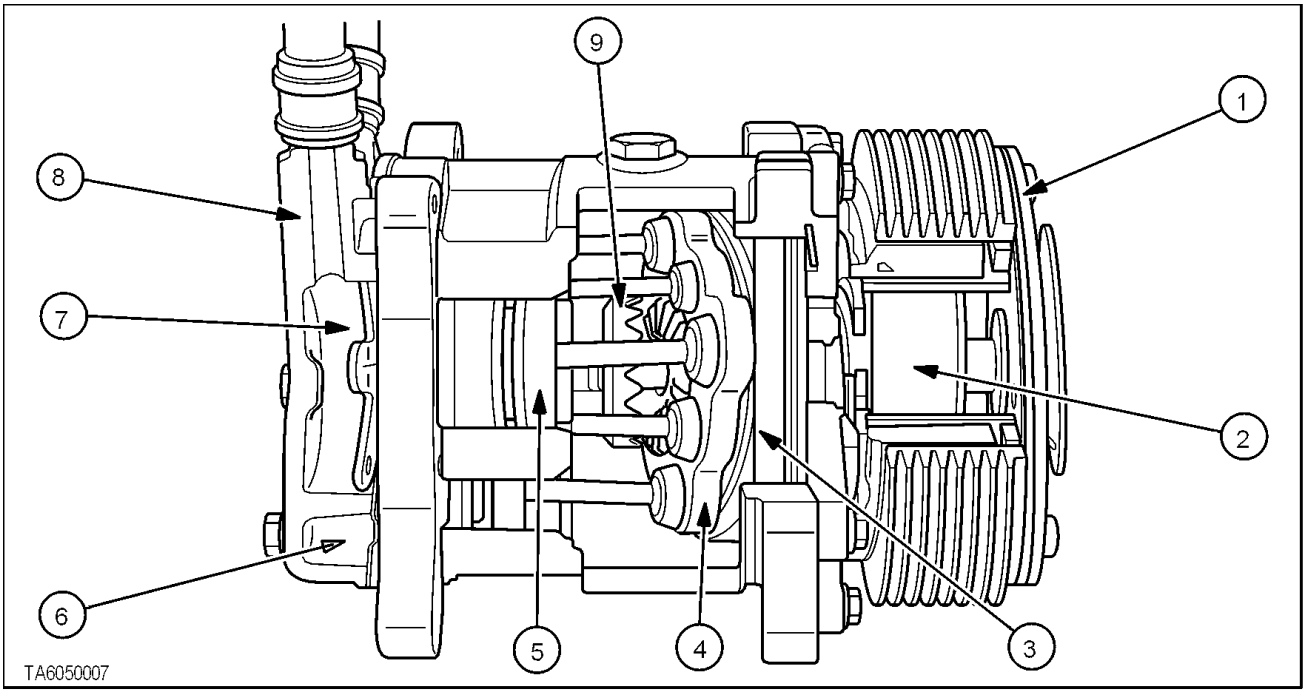
In order to prevent the incorrect type of refrigerant being charged to the system the service valves fitted to the tractor and necessary to connect up refrigerant recovery, evacuation and recycling/recharging equipment will be of two different sizes as recognised and specified by the air conditioning industry.

⚠ WARNING ⚠

R-134a refrigerant is not compatible with R-12 refrigerant. Do not attempt to replace R134a refrigerant with R-12 refrigerant or test the system using gauges or equipment previously used with R12 as damage to the system will result.

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R-134a refrigerant is stable at all operating temperatures and able to absorb great quantities of heat.
The boiling point of R-134a is - **22 °C** (- **15 °F**) at atmospheric pressure.
If the pressure is increased, R-134a will readily vaporize to absorb heat at temperatures between - **11.7 °C** (**11 °F**) at **1.9 bar** (**27.5 lbf/in2**) and **0 °C** (**32 °F**) at **42 lbf/in2** (**2.9 bar**) in the evaporator.
At higher pressures, R-134a will condense and give off heat at temperatures between **48 °C** (**118 °F**) at **12.4 bar** (**180 lbf/in2**) and **58 °C** (**136 °F**) at **15.85 bar** (**230 lbf/in2**) in the condenser.



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Typical Air Conditioning Refrigerant Compressor

1. Electro-magnetic Clutch
2. Clutch Bearing
3. Cam Rotor
4. Wobble Plate
5. Piston
6. Suction Chamber
7. Discharge Chamber
8. Cylinder Head
9. Static Gear

Compressor

The tractor air conditioning unit compressor is mounted on the left hand side of the engine and is belt driven by the crankshaft pulley.

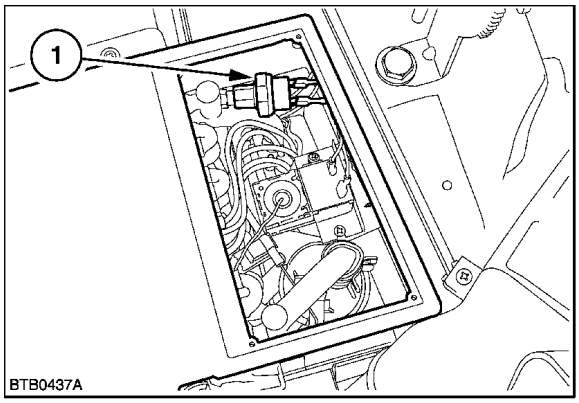
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The compressor separates the low and high pressure sides of the system and is basically a pump which has two functions:
(1) To raise the refrigerant temperature by compression to a higher degree of temperature than the ambient (outside air) temperature.
(2) To circulate the required volume of refrigerant through the system.
The refrigerant compressor is a seven cylinder wobble plate unit housed in a die cast aluminium housing.
Drive to the wobble plate is from the pulley, through the electro magnetic clutch to the main driveshaft. Attached to the driveshaft is a cam rotor which oscillates the wobble plate. The wobble plate is prevented from rotating by a static gear engaging with teeth formed in the face of the plate. The seven pistons are connected to the wobble plate by rods located in ball sockets.
Refrigerant is drawn in on the downward stroke of a piston through the reed valves located either end of the cylinder assembly. Refrigerant enters the cylinder assembly through a gallery in the outer circumference of the cylinder assembly.
The upwards stroke of the piston compresses the refrigerant and expels it through another reed valve into an inner gallery in the cylinder assembly and out into the refrigerant circuit.
The compressor is lubricated with a Polyalklene Glycol (PAG) oil. This oil is totally miscible with the refrigerant and is carried around the refrigerant circuit.
The compressor is activated by an electro-magnetic clutch which functions to engage or disengage the compressor as required in the operation of the air conditioning system.
The clutch is primarily activated by the:-

- Temperature cycling control switch
- Combined high/low pressure cut-out switch
- Low pressure cut-out switch

Low Pressure Cut-out Switch

The low pressure switch **(1)** Figure **8** is in the evaporator outlet line and is located under a lid in the evaporator housing under the rear floor.
The purpose of the switch is to shut off the compressor pump in the event of low pressure in the refrigerant system. Low refrigerant pressure may occur due to a faulty expansion valve, icing up of the expansion valve orifice or refrigerant loss. Low refrigerant pressure may result in damage to the compressor pump.
The low pressure switch is factory set and cannot be adjusted.

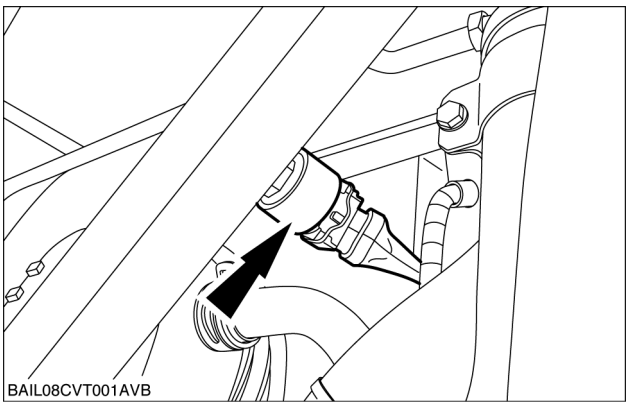


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Combined High/Low Pressure Cut-out Switch

The combined high/low pressure switch, Figure **9** is located in the condenser inlet line from the compressor. The switch shuts off the compressor pump in the event of a restriction in the high pressure line or excessively low pressure due to lack of refrigerant in the system.
Loss of refrigerant in the system will result in insufficient cooling and lubrication and continuous operation will cause damage to the compressor pump.

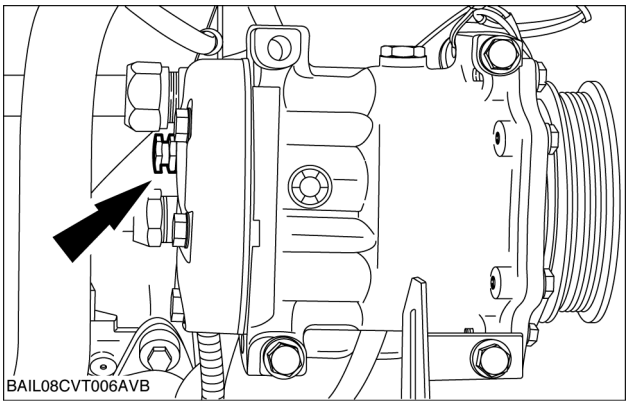
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System Pressure Relief Valve

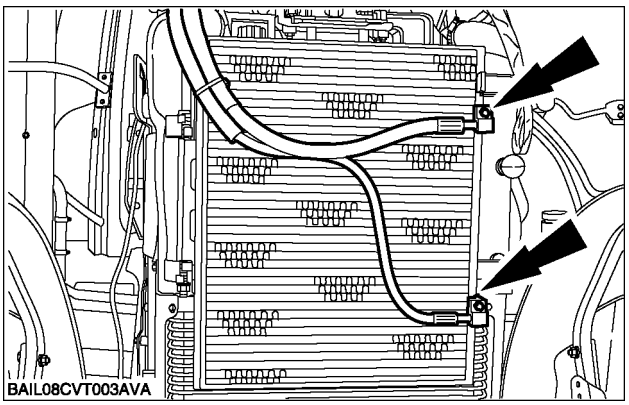
A relief valve is located at the discharge port on the compressor, Figure **10**. This allows the system refrigerant to be discharged into the engine bay (atmosphere) instead of in the cab, if the system pressure became such that a hose might fail in the cab and cause injury to the operator. This secondary safety feature will only operate in extreme conditions, for example, if the high pressure cut out switch were to fail, or in the event of an engine fire.



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Condenser And Receiver Dryer

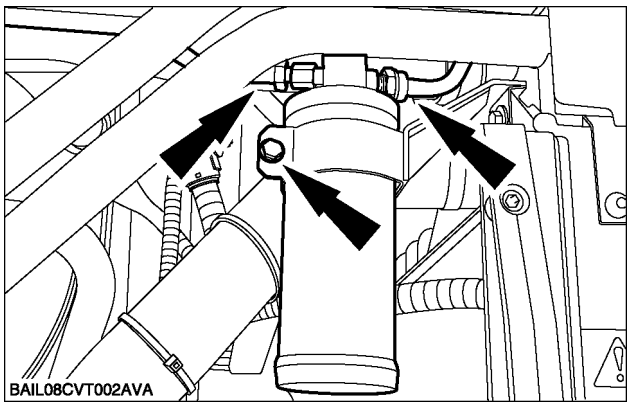
The condenser, located at the front of the tractor, Figure **11**, consists of a number of turns of continuous coil mounted in a series of thin cooling fins to provide a maximum of heat transfer in a minimum amount of space.
The condenser receives the hot, high pressure refrigerant vapour from the compressor. The hot vapour passes through the condenser coils. Cooling aire air is pulled through the condenser by the engine cooling fan.



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Heat moves from the hot refrigerant vapour into the cooler outside air flowing across the condenser coils and fins.
When the refrigerant vapour reaches the pressure and temperature that will induce a change of state, a large quantity of heat is transferred to the outside air and the refrigerant changes to a high pressure warm liquid.
The warm liquid refrigerant continues onto the receiver/drier where it is filtered and desiccated, to remove any moisture, before passing through an outlet line to the thermostatic expansion valve.

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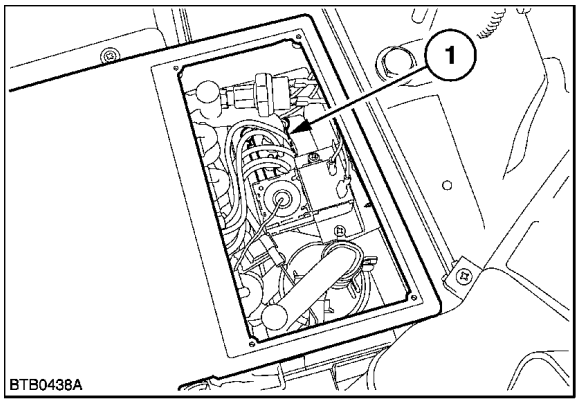
The receiver/dryer, Figure **12** stores the liquid refrigerant, to be sure that a steady flow to the thermostatic expansion valve is maintained under widely different operating conditions.
The drier section contains a desiccant (Molecular sieve) to absorb any moisture within the system and a filter prevents the entry of foreign particles.

NOTE: *Any moisture in the air conditioning system is extremely harmful. Moisture not absorbed by the dehydrator will circulate with the refrigerant and droplets may collect and freeze in the thermostatic expansion valve orifice. This action will block the refrigerant flow and stop the cooling action. Moisture will also react with refrigerant R-134a and the lubricant to form a corrosive acid.*

The desiccant can only absorb a limited amount of moisture before reaching saturation point. Because of this, after any system component replacement or repairs requiring entry into the system, the receiver/dryer should be replaced.

Expansion Valve

The expansion valve **(1)** Figure **13**, is located next to the evaporator, in the pressure line leading from the receiver/dryer and performs the following functions:



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1 METERING ACTION - A metered orifice changes the liquid refrigerant from a high pressure low temperature liquid to a low pressure, lower temperature atomized liquid.

2 MODULATING ACTION - A thermostatically controlled valve within the expansion valve body controls the volume of liquid refrigerant passing through the orifice and makes sure the refrigerant is fully vaporized within the evaporator. Liquid refrigerant would damage the compressor reed valves or freeze the pistons.

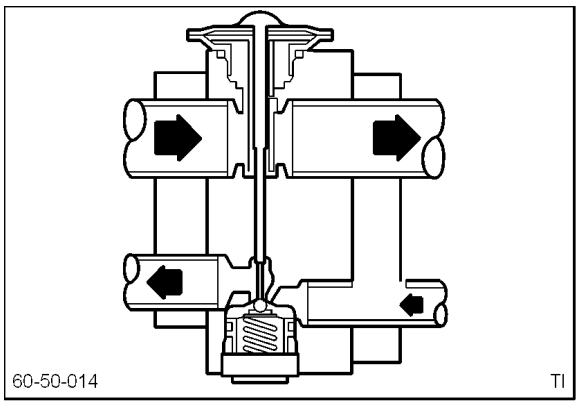
3 CONTROLLING ACTION - The valve responds to changes in the cooling requirements. When increased cooling is required, the valve opens to increase the refrigerant flow and when less cooling is required the valve closes and decreases the refrigerant flow.

Expansion Valve - Operation

All of the needed temperature sensing and pressure sensing functions are consolidated into this basic unit and no external tubes are required for these purposes.

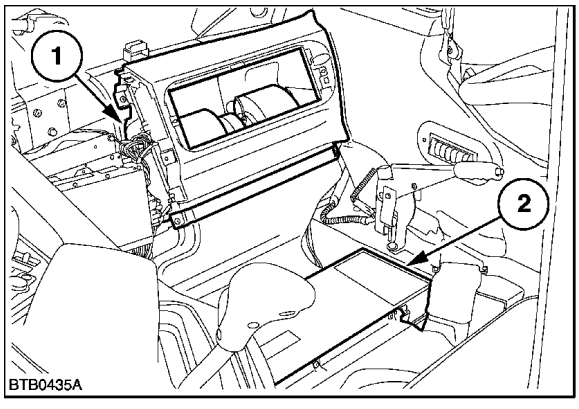
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The refrigerant from the condenser and receiver dryer enters the thermostatic expansion valve as a high pressure warm liquid. Upon passing through the ball and spring controlled metering orifice, the pressure and temperature of the refrigerant is reduced and the refrigerant leaves the thermostatic expansion valve as a low pressure, lower temperature atomized liquid.
The atomized liquid now passes through the evaporator where it absorbs heat before returning via the expansion valve to the compressor as a warm Low pressure vapour.
There are two refrigerant passages in the valve. One passage is in the refrigerant line from the condenser to the evaporator and contains the ball and spring type orifice valve. The other passage is in the refrigerant line from the evaporator to the compressor and contains the valve's temperature sensing element.
Liquid refrigerant flow from the condenser and receiver dryer is controlled by a push-rod forcing the orifice valve ball off its seat and the spring exerting pressure on the ball to keep it on its seat.
During stabilized (vehicle shutdown) conditions, the pressure on the bottom of the expansion valve diaphragm rises above the pressure on the top of the diaphragm allowing the valve spring to close the orifice.
When the system is started, the pressure on the bottom of the diaphragm drops rapidly, allowing the orifice to open and meter atomized liquid refrigerant to the evaporator where it begins to vaporize.
Suction from the compressor draws the vaporized refrigerant out of the evaporator and back through a gallery in the top of the valve which passes the temperature sensor.



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The temperature sensor reacts to variations in refrigerant gas pressure returning from the evaporator. When heat from the passenger compartment is absorbed by the refrigerant the pressure of the gas increases causing a differential pressure above and below the temperature sensor diaphragm. The diaphragm reacts to this pressure differential and a push rod forces the ball in the expansion valve orifice further off its seat. This reaction allows an increase in the atomized refrigerant to flow through the valve, to the evaporator, so that more heat can be absorbed by the air conditioning system.
Similarly when the temperature of the gas returning from the evaporator decreases the pressure of the gas decreases. This causes the diaphragm to react accordingly and allow the ball in the orifice to move closer towards its seat thus reducing the flow of refrigerant through the valve to the evaporator.

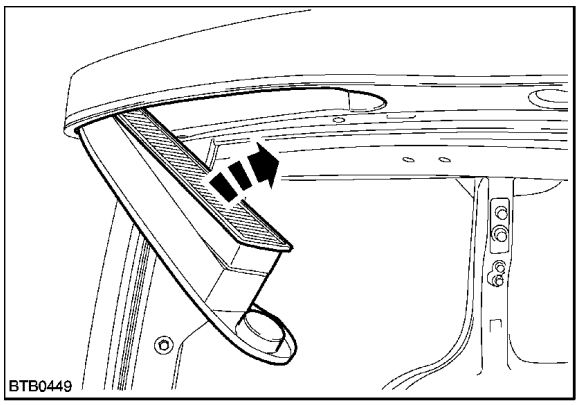


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Evaporator

The evaporator, **(2)** Figure **15**, is located under the rear seat floor and consists of a number of turns of continuous coils mounted in a series of thin cooling fins to provide a maximum of heat transfer in a minimum amount of space.
Low temperature refrigerant in the evaporator absorbs heat from the hotter air in the operator's compartment, thereby cooling the air.

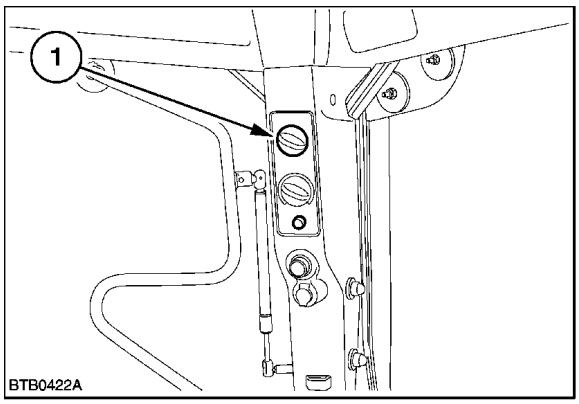
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Blower Fan

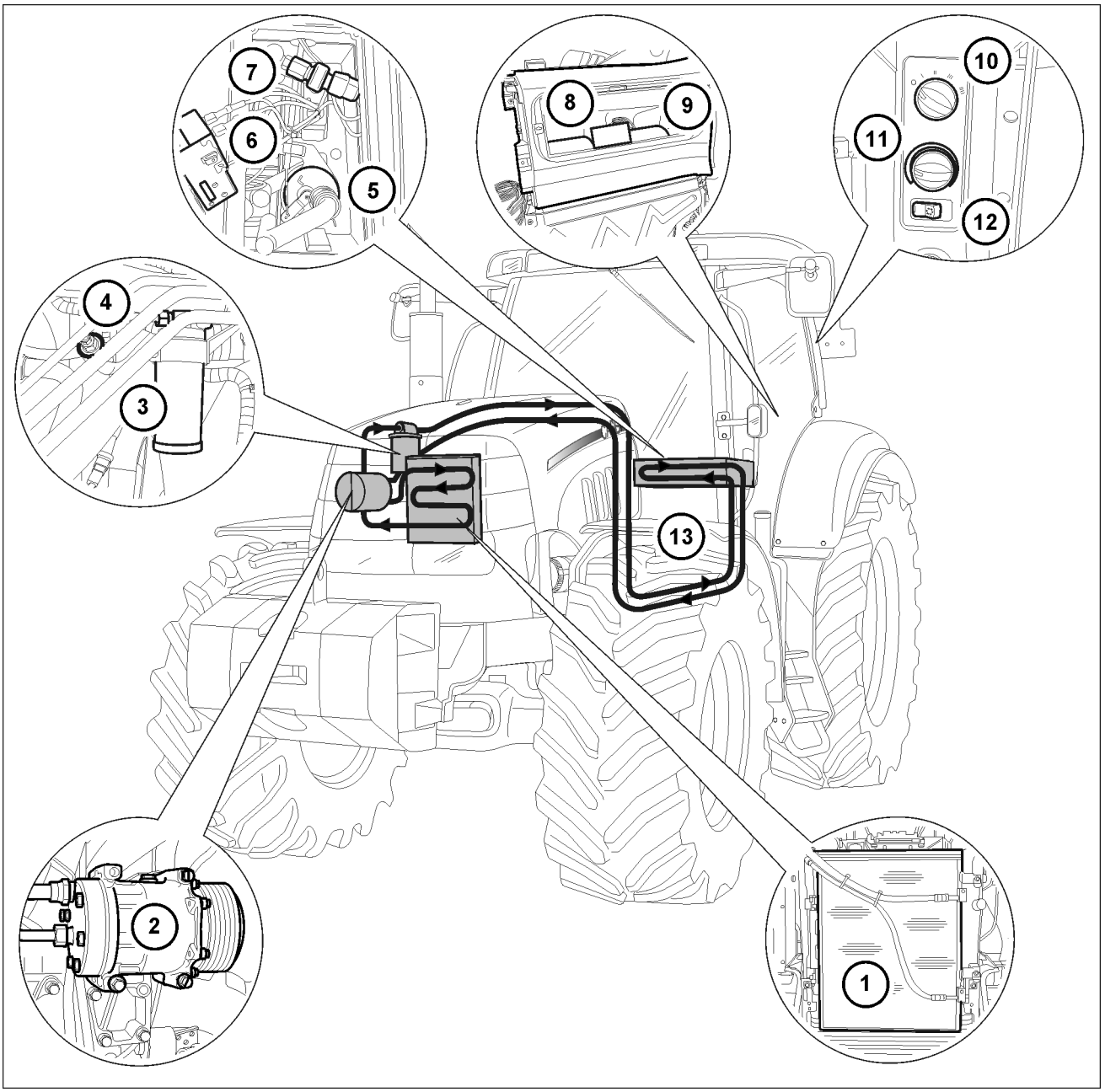
The blower fan, **(1)** Figure **15**, draws warm air from outside the cab through the intake filters, Figure **16** and forces it across the evaporator before entering the cab through louvered vents.
The blower motor is controlled by a four-speed switch **(1)**, Figure **17**. The switch uses a variable resistor to change the fan speed.
The coldest air will be obtained at the slowest fan speed but the greatest cooling capacity is obtained at the highest fan speed.



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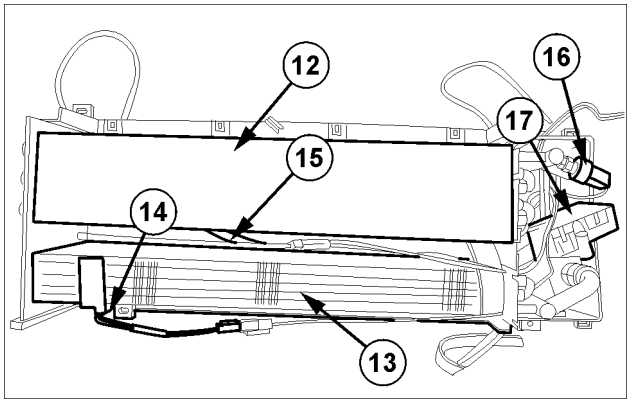
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Overview



SS08E032 1

1.	Compressor	2.	High pressure-low pressure switch
3.	Condenser	4.	Drier
5.	Heating and air conditioning unit - see diagram **2**	6.	Blower box - see diagram **3**
7.	Blower speed switch	8.	Temperature control potentiometer
9.	Operating mode switch	10.	Air conditioner connecting lines
11.	Control unit (ATC)		

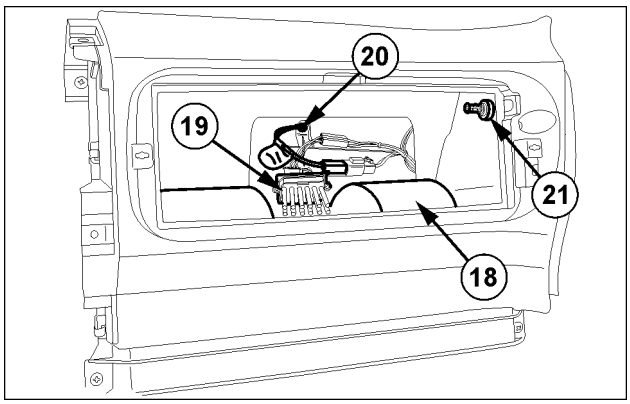
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SS08E001 2

Heating and air conditioning unit

12.	Evaporator	13.	Heating cooler
14.	Outlet temperature sensor	15.	Evaporator temperature sensor
16.	Low pressure switch	17.	Heating valve (ATC)



SS08E002 3

Blower box

18.	Blower motor	19.	Voltage regulator
20.	Outside temperature sensor	21.	Cab temperature sensor

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description

The ATC control unit is a control unit with a control cycle that obtains data from various sources and issues commands to other devices. The control parameter of the system is the inner temperature of the cab. The driver selects the desired cab temperature with the help of the temperature control potentiometer. The control unit controls the compressor, the heating valve and the blower speed in order to reach or maintain the desired value.

The control unit receives information from the following switches and sensors:

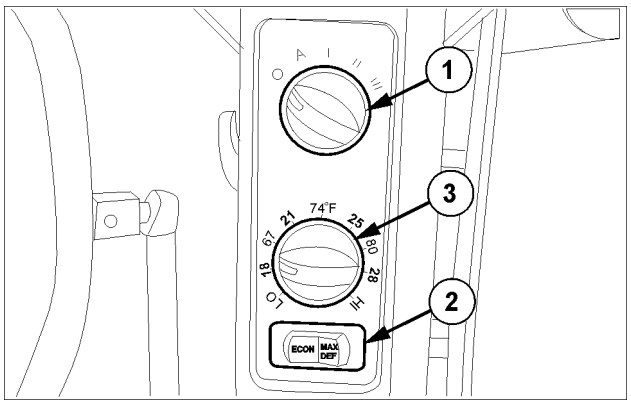
- The modes of operation switch in the positions "ECON", "OFF" and "MAX DEF" supplies information about the desired system operating mode: Economy mode, air conditioner switched off or dehumidify/defrost.
- The cab temperature sensor, which is located in the return line of the air circulation filter, sends the current cab temperature.
- The temperature desired by the driver and that which is set by the temperature control potentiometer is the desired value.
- The outlet temperature sensor in the heating air conditioning unit sends the current cooling or heating temperature.
- The low pressure switch sends information if abnormal system pressures occur on the low pressure side in the evaporator.
- The high pressure/low pressure switch sends information if abnormal system pressures occur on the high pressure side.
- The blower speed switch sends information relevant to the setting selected by the driver. The settings are "OFF" and "A" (automatic) or speed levels I-III. If the driver has left the "A" position, the blower speed determined by the controller is overridden by the driver’s selection.
- The temperature control potentiometer sends the desired temperature (°F/°C) to the control unit.

In order to realize the heating/cooling functions the control unit controls the following output devices:

- The compressor clutch via the clutch relay: The control unit determines whether the compressor is switched on or off in order to attain the desired cooling value in the cab.
- In the case of the heating valve the valve opening is varied in order to attain the desired temperature value in the cab.
- The blower speed is set via the blower speed switch: The conditioned air is delivered from the heating and air conditioning unit at a speed which is proportional to the difference between the existing cab temperature and the desired value.
- The display on ICU2 shows information for any error codes that may have occurred.

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Control elements



SS08D105 1

Blower speed switch **(1)**	Selecting the blower speed manually overrides the selection made by the control unit.	Position "0": Blower switched off Position "A": Blower speed is automatically controlled by the controller. Position "I": Slow blower speed Position "II": Middle blower speed Position "III": Fast blower speed
Operating mode switch **(2)**	Determines the operating mode.	Position "ECON": Air conditioner is switched off Position "Middle": Air conditioner is switched on Position "MAX DEF": Dehumidifier/defroster mode
Temperature control potentiometer **(3)**	Determines the desired value of the cab temperature.	Position "LO": Maximum cooling power temperature range position 18-28. Desired cab temperature in °C/°F. Position "HI": Maximum heating power

"AUTOMATIC" control mode

The automatic mode is selected by moving the blower speed switch **(1)** to position "A" automatic and the operating mode switch **(2)** to the middle position. Use the temperature control potentiometer **(3)** to set the desired temperature. In this mode the system attempts to maintain the desired temperature value selected by the driver (from **16 °C** (**61 °F**) to **32 °C** (**90 °F**) using the temperature control (ATC) and in order to do this varies the air temperature and the blower speed.

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"MANUAL" control mode

The manual mode can be selected by moving the blower speed switch **(1)** to the position "I, II or III" and using the temperature control potentiometer **(3)** to set the desired temperature. The blower speed is varied to reach the set value and then remains constant. In this case the system attempts to attain the desired temperature in the cab simply by changing the air temperature and the blower speed selected by the driver remains unchanged. If you would like to return to the automatic control mode switch the blower speed switch **(1)** to position "A" (automatic).

You can set the maximum cooling power by setting the temperature control potentiometer **(3)** to "LO" (turn all the way to the left). The air conditioner works at maximum cooling power in this mode.

The blower can be switched on in two ways:

- Turn the blower speed switch **(1)** to position “A”. In this operating mode the blower is set to maximum speed.
- The blower speed is set manually to position "I, II or III".

You can set the maximum heating power by setting the temperature control potentiometer **(3)** to "HI" (turn all the way to the right). The heating system works at maximum power in this mode.

The blower can be switched on in two ways:

- Turn the blower speed switch **(1)** to position “A”. In this operating mode the blower is set to maximum speed.
- The blower speed is set manually to position "I, II or III".

"ECONOMY" air conditioner mode.

The economy mode can be selected by moving the operating mode switch **(2)** to the position "ECON" (left position) and moving the blower speed switch **(1)** to position "A". Use the temperature control potentiometer **(3)** to set the desired temperature. If the outside temperature is low the air conditioner does not have to be running in order to maintain a constant cab temperature. In this mode the unit attempts to keep the desired value constant by regulating the heating valve and the blower speed. If the outside air temperature rises above the desired value selected, (cab temperature) the air conditioner must be switched on in order to attain the desired value.

"MAX DEF" mode.

The purpose of the "MAX DEF" mode is to remove moisture that collects on the windows of the cab in the form of fog or ice. Use the operating mode switch **(2)** to select the "MAX DEF" position and move the blower speed switch **(1)** to position "A". In this mode the heating system and the air conditioner are running; the blower runs at maximum speed. The blower speed can also be set manually. If this mode is used to defrost the windows, the temperature control potentiometer **(3)** should be turned to the "HI" position. In this position an air outlet temperature is attained which is as high as possible when the air conditioner is running in order to defrost the windows. If the windows are heavily fogged with moisture it is not necessary to change the set temperature (desired value) using the temperature control potentiometer **(3)**. In order to exit the "MAX DEF" mode and enter another operating mode. Move the operating mode switch **(2)** to the middle position (air conditioner "ON") or to the "ECON" position (air conditioner "OFF")

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Summary of automatic operation

<table>
<tr><td colspan="3">The operating mode switch (2) is in the middle position, and the blower speed switch (1) is in position "A" (automatic). No error codes active.</td></tr>
<tr><td>Temperature criteria</td><td colspan="2">The control unit only reacts when there is a difference of 1 °C (2 °F) between the desired value and the temperature recorded by the cab sensor. Then the compressor is switched on and the heating valve is opened. The driver can therefore also adjust the temperature a degree cooler or warmer than originally selected to ensure a pleasant environment in the cab.</td></tr>
<tr><td rowspan="8">Blower speed</td><td>The difference between the cab temperature and the desired value is...</td><td>Then the control unit sets the blower speed to...</td></tr>
<tr><td>≤ 1 °C (2 °F)</td><td>25 %</td></tr>
<tr><td>> 1 °C (2 °F) but ≤ 2 °C (4 °F)</td><td>35 %*</td></tr>
<tr><td>> 2 °C (4 °F) but ≤ 6 °C (3 °F)</td><td>45 %*</td></tr>
<tr><td>> 3 °C (6 °F) but ≤ 4 °C (8 °F)</td><td>55 %*</td></tr>
<tr><td>> 4 °C (8 °F) but ≤ 5 °C (10 °F)</td><td>65 %*</td></tr>
<tr><td>> 5 °C (10 °F) but ≤ 6 °C (12 °F)</td><td>75 %*</td></tr>
<tr><td>> 6 °C (12 °F)</td><td>100 %*</td></tr>
<tr><td>Switching the compressor clutch on and off.</td><td colspan="2">The compressor clutch is activated or deactivated by the control unit in order to attain or maintain the desired temperature value in the cab.</td></tr>
<tr><td>Heating valve</td><td colspan="2">The heating valve is opened or closed by the control unit in order to attain or maintain the desired temperature value in the cab.</td></tr>
<tr><td>Manual regulation of blower speed position "I, II or III"</td><td colspan="2">• Blower level remains at the level selected by the driver.
• The temperature continues to be regulated automatically but the control unit cannot change the selected blower speed in order to attain the desired temperature value.
• You can restore the fully automatic mode by moving the blower speed switch (1) to position "A" (automatic).</td></tr>
<tr><td>Maximum cooling is selected "LO"</td><td colspan="2">• Blower speed 100 %
• The clutch is only deactivated when the frost setting 0 °C (32 °F) on the evaporator temperature sensor is attained. It is reactivated when the recorded temperature increases to 3 °C (37 °F).
• If the temperature regulator is taken out of the maximum range for "LO", the system returns to automatic regulation of the compressor and the blower.</td></tr>
<tr><td>Maximum heating is selected "HI"</td><td colspan="2">• Blower speed 100 %
• The heating valve is completely open.
• If the temperature control potentiometer is adjusted from the maximum range for "HI", the system returns to automatic regulation of the heating valve and the blower speed.</td></tr>
<tr><td>Exception</td><td colspan="2">* When the heating function is selected the blower retains the speed level 25 % until the temperature recorded at the evaporator exceeds 12,8 °C (55 °F).</td></tr>
</table>

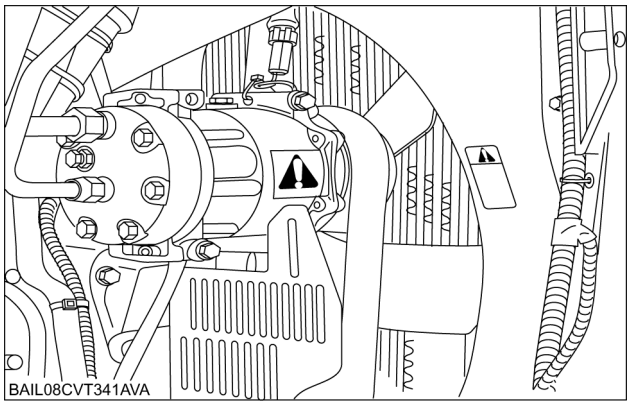
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Summary of "MAX DEF" dehumidifier/defroster operation

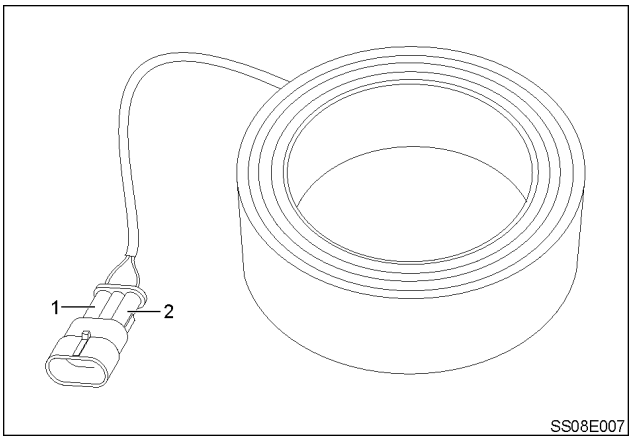
<table>
<tr><td colspan="3">The operating mode switch (2) is in the position "MAX DEF", and the blower speed switch (1) is in position "A" (automatic). No error codes active.</td></tr>
<tr><td>Temperature criteria</td><td colspan="2">The control unit only reacts when there is a difference of 1 °C (2 °F) between the desired value and the temperature recorded by the cab temperature sensor. Then the compressor is switched on and the heating valve is opened. The driver can therefore also adjust the temperature a degree cooler or warmer than originally selected to ensure a pleasant environment in the cab.</td></tr>
<tr><td rowspan="8">Blower speed</td><td>The difference between the cab temperature and the desired value is...</td><td>Then the control unit sets the blower speed to...</td></tr>
<tr><td>≤ 1 °C (2 °F)</td><td>25 %</td></tr>
<tr><td>> 1 °C (2 °F) but ≤ 2 °C (4 °F)</td><td>35 %</td></tr>
<tr><td>> 2 °C (4 °F) but ≤ 6 °C (3 °F)</td><td>45 %</td></tr>
<tr><td>> 3 °C (6 °F) but ≤ 4 °C (8 °F)</td><td>55 %</td></tr>
<tr><td>> 4 °C (8 °F) but ≤ 5 °C (10 °F)</td><td>65 %</td></tr>
<tr><td>> 5 °C (10 °F) but ≤ 6 °C (12 °F)</td><td>75 %</td></tr>
<tr><td>> 6 °C (12 °F)</td><td>100 %</td></tr>
<tr><td>Switching the compressor clutch on and off.</td><td colspan="2">** The compressor is permanently on to eliminate moisture from the cab. The clutch is only deactivated when the frost setting 0 °C (32 °F) on the evaporator temperature sensor is attained. It is reactivated when the recorded temperature increases to 3 °C (37 °F).</td></tr>
<tr><td>Heating valve</td><td colspan="2">The heating valve is opened or closed by the control unit in order to attain or maintain the desired temperature value in the cab.</td></tr>
<tr><td>Manual regulation of blower speed position "I, II or III"</td><td colspan="2">• Blower level remains at the level selected by the driver.
• The temperature continues to be regulated automatically but the control unit cannot change the selected blower speed in order to attain the desired temperature value.
• You can restore the standard air conditioning operation mode by shifting the operating mode switch (2) to the middle position.</td></tr>
<tr><td>Maximum cooling is selected "LO"</td><td colspan="2">Using the system in this manner makes little sense as the compressor runs continuously. The temperature control potentiometer should be in the heating range to attain good dehumidifying or defrosting performance in the cab.</td></tr>
<tr><td>Maximum heating is selected "HI"</td><td colspan="2">• Blower speed 100 %
• The heating valve is completely open.
• If the temperature control potentiometer is adjusted from the maximum range for "HI", the system returns to automatic regulation of the heating valve and the blower speed.</td></tr>
<tr><td>Exception</td><td colspan="2">** On very cold days the compressor does switch on until the temperature at the evaporator temperature sensor exceeds 0 °C (32 °F).</td></tr>
</table>

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Compressor Magnetic clutch - Overview



BAIL08CVT341AVA 1

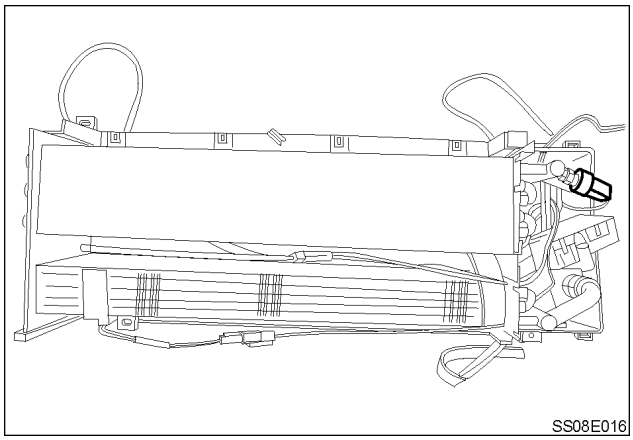


SS08E007 2

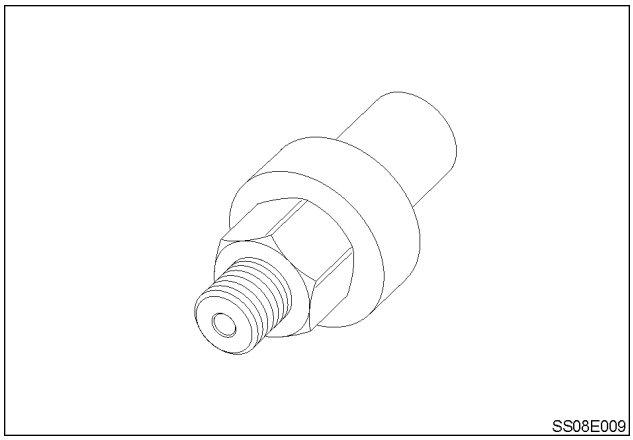
Nominal voltage	**12 V**
Intake voltage min.	**7,5 V**
Power consumption	**3,6 - 4,2 A**
Power	**43 W**
Resistance	**2,9 - 3,6 Ω**
Coupling gap	**0.4 - 0.8 mm** (**0.016 - 0.031 in**)

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Sensing system Low pressure switch - Overview



SS08E016 1



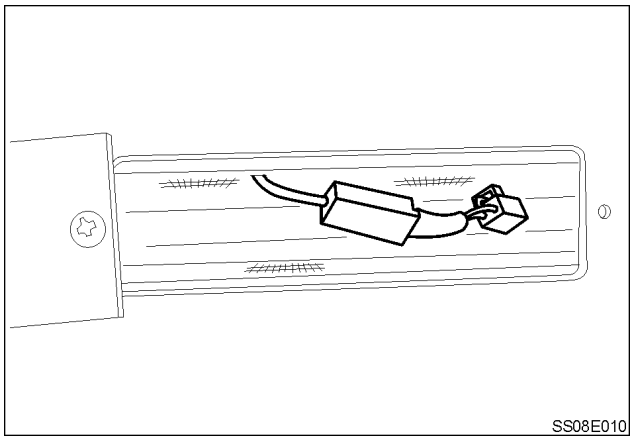
SS08E009 2

Position: Under the driver's seat in the heating air conditioning unit

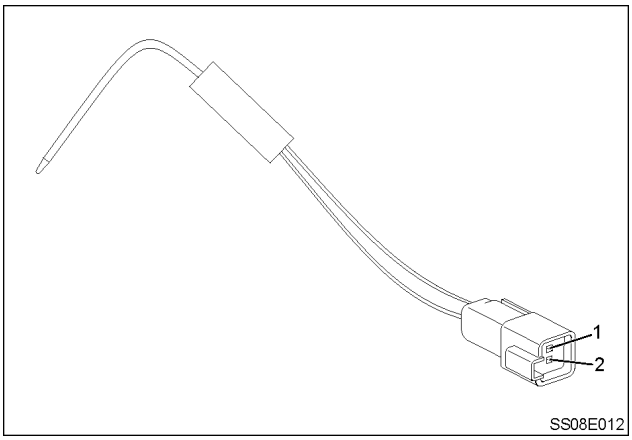
Contact	Make contact
On (switch closed)	**1.5 bar** (**21.8 psi**)
Off (switch open)	**0.4 bar** (**5.8 psi**)
Current max.	**5 A**
Temperature range	**-30 - +120 °C**
Tightening torque	**5 - 7 Nm**

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Sensing system Evaporator temperature sensor - Overview



SS08E010 1



SS08E012 2

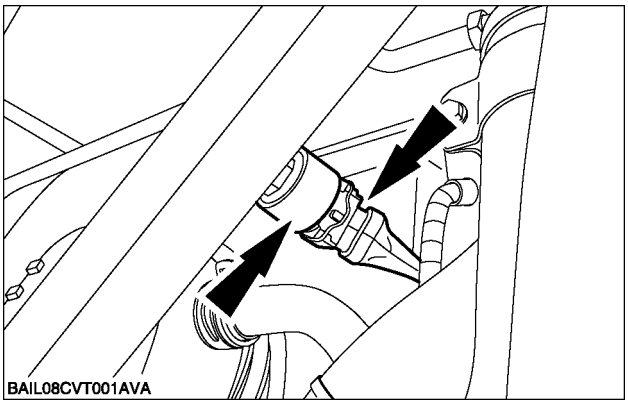
Position: Under the driver's seat in the heating air conditioning unit

System type	NTC

Temperature	Resistance
0 °C (32.0 °F)	**66000 Ω**
4.44 °C (40.0 °F)	**52625 Ω**
10 °C (50.0 °F)	**40011 Ω**
15.56 °C (60.0 °F)	**30713 Ω**
21.11 °C (70.0 °F)	**23791 Ω**
25 °C (77.0 °F)	**20000 Ω**
30.56 °C (87.0 °F)	**15736 Ω**
36.11 °C (97.0 °F)	**12475 Ω**

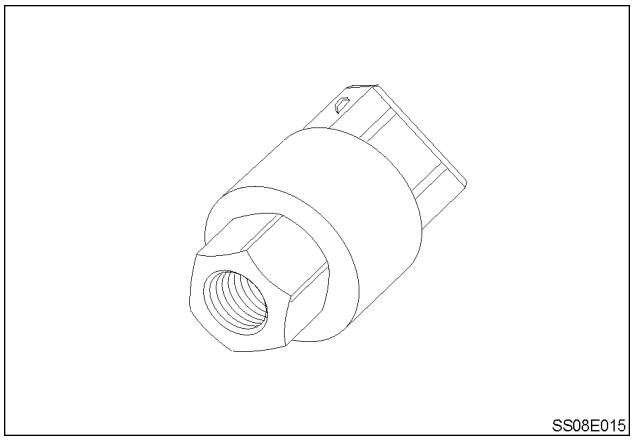
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Sensing system - Overview (High pressure-low pressure switch)



BAIL08CVT001AVA 1

Position: On the right side of the engine



SS08E015 2

High pressure switch

Contact (PIN 1-2)	Break contact
On (switch closed)	**20 ±2 bar** (**290 lbf/in2**)
Off (switch open)	**28 ±2 bar** (**406 lbf/in2**)
Current max.	**5 A**

Low pressure switch

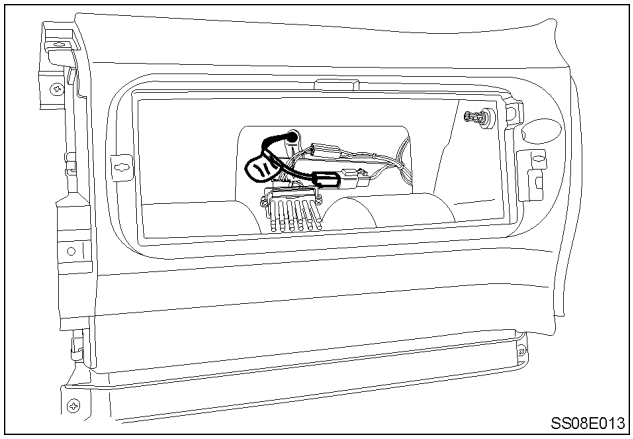
Contact (PIN 1-2)	Make contact
On (switch closed)	**2.6 ±0.1 bar** (**37 ±1.5 lbf/in2**)
Off (switch open)	**1.8 ±0.5 bar** (**26 ±7 lbf/in2**)
Current max.	**5 A**

Medium pressure switch

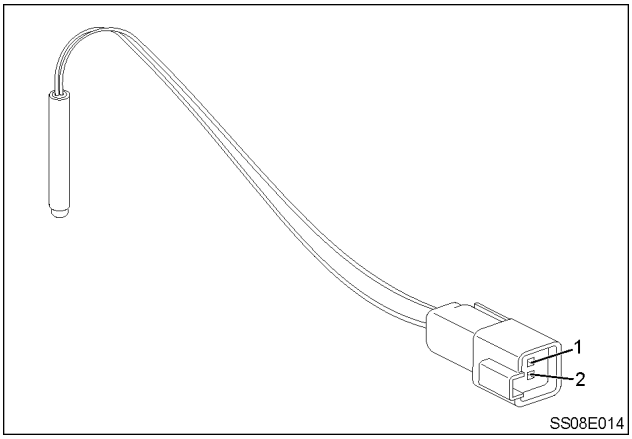
Contact (PIN 3-4)	Make contact
On (switch closed)	**18 ±1 bar** (**261 lbf/in2**)
Off (switch open)	**15 ±1 bar** (**217 lbf/in2**)
Current max.	**1 A**

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Sensing system Temperature sensor - Overview (Outside temperature)



SS08E013 1



SS08E014 2

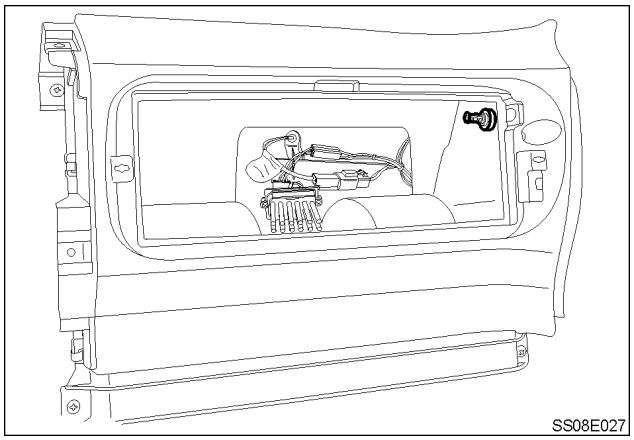
Position: Behind the driver's seat in blower box

System type	NTC

Temperature	Resistance
-10 °C (14.0 °F)	**22120 Ω**
0 °C (32.0 °F)	**13061 Ω**
10 °C (50.0 °F)	**7962 Ω**
15 °C (59.0 °F)	**6286 Ω**
20 °C (68.0 °F)	**4997 Ω**
25 °C (77.0 °F)	**4000 Ω**
30 °C (86.0 °F)	**3222 Ω**
40 °C (104.0 °F)	**2130 Ω**

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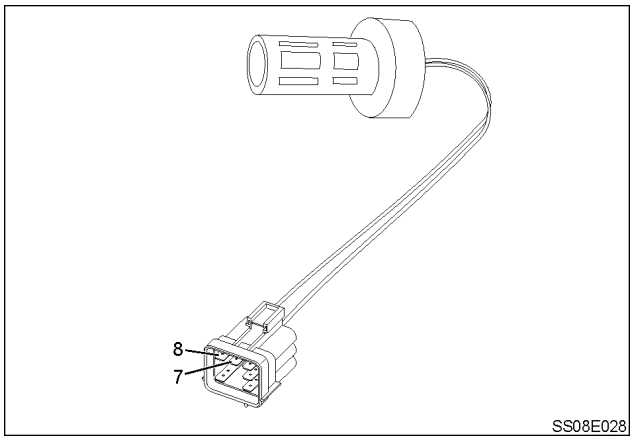
Sensing system Temperature sensor - Overview (Cab temperature)



SS08E027 1

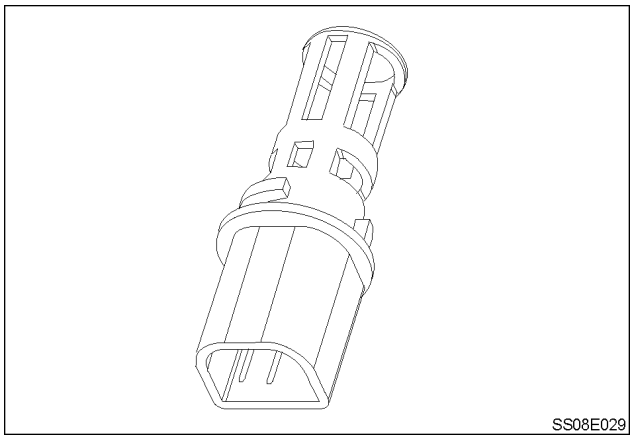
Position: Behind the driver's seat in blower box

valid → .....



SS08E028 2

valid ..... →



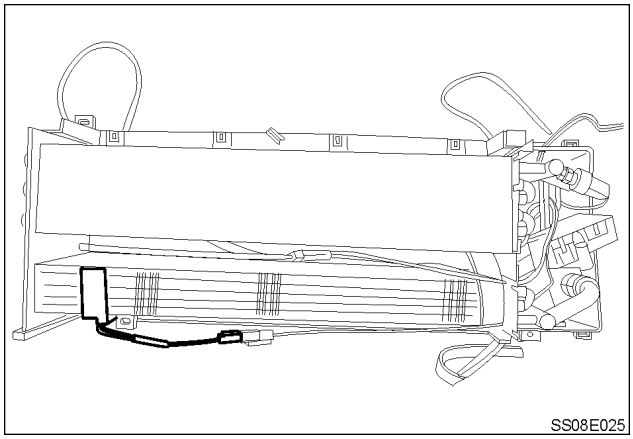
SS08E029 3

System type	NTC

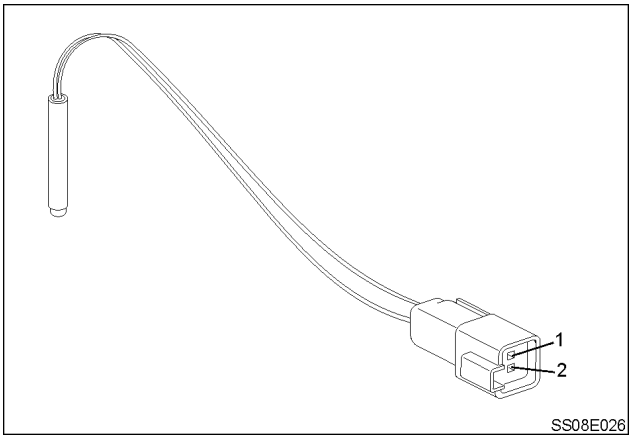
Temperature	Resistance
-10 °C (14.0 °F)	**16120 Ω**
0 °C (32.0 °F)	**9399 Ω**
10 °C (50.0 °F)	**5658 Ω**
15 °C (59.0 °F)	**4441 Ω**
20 °C (68.0 °F)	**3511 Ω**
25 °C (77.0 °F)	**2795 Ω**
30 °C (86.0 °F)	**2240 Ω**
40 °C (104.0 °F)	**1465 Ω**

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Sensing system Temperature sensor - Overview (Outlet temperature)



SS08E025 1



SS08E026 2

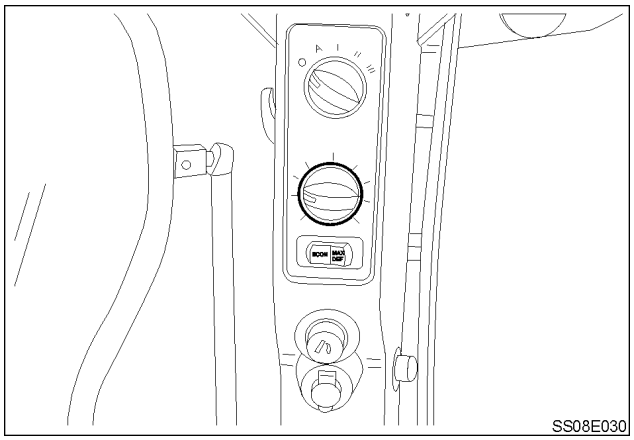
Position: Under the driver's seat in the heating and air conditioning unit

System type	NTC

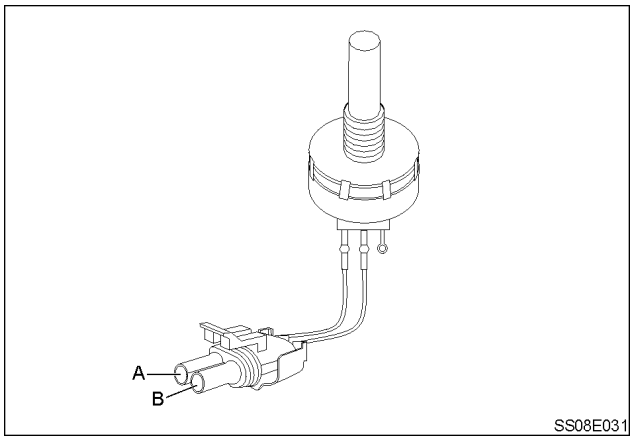
Temperature	Resistance
-10 °C (14.0 °F)	**22120 Ω**
0 °C (32.0 °F)	**13061 Ω**
10 °C (50.0 °F)	**7962 Ω**
15 °C (59.0 °F)	**6286 Ω**
20 °C (68.0 °F)	**4997 Ω**
25 °C (77.0 °F)	**4000 Ω**
30 °C (86.0 °F)	**3222 Ω**
40 °C (104.0 °F)	**2130 Ω**

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Electrical control Temperature control potentiometer - Overview



SS08E030 1



SS08E031 2

Position: On the left C-pillar

Characteristic curve	linear
resistance	**0 - 10 k Ω ± 10 %**

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction

⚠ WARNING ⚠

Before overhauling an air conditioning system read and observe the following Safety PrecautionsIf a repair or replacement becomes necessary, ensure that only certified Air Conditioning technicians are employed, using approved equipment to effect repairs. Do not attempt to disassemble the air conditioning system, It is possible to be severely frostbitten or injured by escaping refrigerant.

B042

IMPORTANT: *Do not allow refrigerant to escape into the atmosphere.*

1. Refrigerant must be handled with care in order to AVOID HAZARDS.
   Undue direct contact with liquid refrigerant can produce freezing of skin and eyes.
   Keep the refrigerant container and air conditioning system away from flame or heat sources, the resulting pressure increase can cause the container or system to explode.
   If in direct contact with open flames or heated metal surfaces, the refrigerant will decompose and produce products that are toxic and acidic.
   Make sure to comply with the following indications and simple precautions to avoid any risk of injury:
   Never discharge refrigerant into the atmosphere.
   When servicing air conditioning units a certified refrigerant recovery unit operated by a certified technician must be used.
2. When discharging the refrigerant in the system make sure you are operating in well-ventilated premises with good air circulation and far away from open flames.
3. When charging and discharging the system always wear goggles and take suitable precautions to protect the face in general and the eyes in particular, from accidental spillage of the refrigerant fluid.
4. The oil and refrigerant mixture inside the air conditioning system is pressurized. Consequently, never loosen fittings or tamper with lines unless the system has been properly discharged.
5. Before loosening any connection, cover the fitting in question with a cloth and wear gloves and goggles in order to prevent refrigerant from reaching the skin or eyes.
6. In the event of an accident, proceed as follows:-
   If the refrigerant has reached the eyes, wash them immediately with copious amounts of sterilised water or mains pressure tap water and transfer to hospital for immediate medical help.
   If the refrigerant has touched the skin, wash with cold water and transfer to hospital for immediate medical help.

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction

General information
All servicing of the air conditioning system must be undertaken by a qualified refrigeration specialist using appropriate test devices, including a leak detector for R134a refrigerant.

⚠ WARNING ⚠

Before dismantling an air conditioning system for repair the gas within the system must be discharged and recovered using a certified recovery unit designed for the type of refrigerant gas used in the system.NEVER release refrigerant gas into the atmosphere.ALWAYS wear safety goggles and gloves when servicing any part of the air conditioning system.

B043

⚠ WARNING ⚠

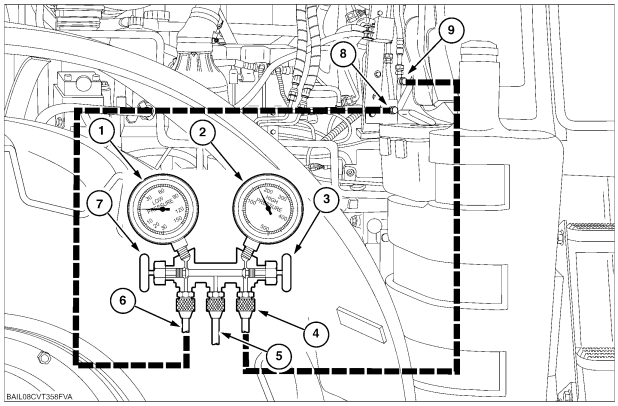
A significant amount of refrigerant vapour may have condensed to a liquid at the service fitting at the high side of the compressor. Use a cloth or other protective material when disconnecting the manifold hose from this fitting to prevent personal injury to hands and face.

B045

1. Impurities are prevented from entering the system as follows:
   Ensure that all tools, measurement devices, hoses and spare parts are stored in a perfectly clean and dry place and ensure that the refrigerant used is permitted for use in the system.
   Clean all hoses and fittings prior to removal. Seal all openings with plugs or screw caps after removal.
   When filling the system with refrigerant oil, only open the oil container just before use and then close it again straight away. It is very important that you ensure the oil cannot absorb any humidity.
2. General troubleshooting
   Always undertake general troubleshooting before carrying out a functional check of the system.
   Leave the engine to run for 10 minutes **1000 - 1200 rev/min** with the air conditioning system set to maximum cooling and the blower set to the highest speed setting.
3. Ensure that the temperature switch of the heating system is switched OFF.
4. Close the heating system shut-off valve behind the intake manifold (if fitted).
5. Check that the fan motor works at all speed levels.
6. Check that the compressor coupling is actuated when you press the air conditioner system switch. You can hear the coupling shifting by way of a clicking noise. If the coupling does not work it may be that the pressure switches on the intake and pressure side are faulty or the electro-magnetic coupling of the cooling compressor is not working.
7. Check whether the motor cooler ventilator is drawing in cold air through the condenser.
8. Check the belt tension of the cooling compressor drive belt.

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9. Check that the condenser is clean inside and out and allows an unobstructed flow of air.
10. Ensure that the cab air filter is clean and not blocked.
11. Check whether the evaporator blades are stuck or heavily soiled.



BAIL08CVT358FVA 1

Connection of pressure gauge battery to vehicle

1. Suction side pressure gauge
2. Pressure side pressure gauge
3. Shut-off valve
4. Hose to pressure side connection valve
5. Centre hose (not in use)
6. Hose to suction side connection valve
7. Shut-off valve
8. Suction side connection valve (low pressure part)
9. Pressure side connection valve (high pressure part)

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Approximate display value of the high pressure gauge

Temperature of ambient air		Display value of the high pressure gauge		
59 °F	**15 °C**	**9,5 bar**	9.7 kgf/cm2	140 lbf/in2
68 °F	**20 °C**	**13 bar**	13.3 kgf/cm2	191 lbf/in2
77 °F	**25 °C**	**15 bar**	15.3 kgf/cm2	221 lbf/in2
86 °F	**30 °C**	**18 bar**	18.4 kgf/cm2	265 lbf/in2
95 °F	**35 °C**	**20 bar**	20.5 kgf/cm2	294 lbf/in2
104 °F	**40 °C**	**22 bar**	22.5 kgf/cm2	323 lbf/in2
113 °F	**45 °C**	**23 bar**	23.5 kgf/cm2	338 lbf/in2

12. Checking the function of the air conditioning system
    The pressure gauge battery is the most important tool when checking and performing maintenance on the air conditioning system.
    If the workshop has a modern automatic suction, evacuation, recycling and filling device the pressure gauges are already installed inside them.
    The following instructions for checking the function of the air conditioning system apply to the pressure gauge battery shown in the diagram **1**. The system check using a suction and filling device with pressure gauges fitted basically follows the same process.
    When using such devices, always note the operating instructions provided by the manufacturer.

13. Notes for accident prevention
    In the closed valves the refrigerant flows around the valve stems to the pressure gauges. As a result, after connecting the pressure battery the pressure is shown by both pressure gauges.
    NEVER screw open the manual shut-off valve on the PRESSURE SIDE while the system is in operation.
    ALWAYS screw open the manual shut-off valve on the SUCTION SIDE when the refrigerant is being topped up.

IMPORTANT: *Always ensure that the manual shut-off valves are screwed shut during all of the testing steps (clockwise, to the stop).*

14. Connection of pressure gauge battery to vehicle
    Always ensure that the manual shut-off valves of the pressure gauge battery are screwed shut (clockwise, to the stop).

⚠ WARNING ⚠

To avoid personal injury, stop the tractor engine during connection of the manifold gauge set.

B044

15. Connect the hose of the high pressure gauge (usually red) to the pressure side shut-off valve, and the hose of the low pressure gauge (usually blue) to the suction side connection valve at the vehicle, see diagram **1**. Ensure that the hose fittings have been perfectly tightened.

IMPORTANT: *Prior to connecting the pressure gauge battery determine the assignment of the connections for the high pressure gauge (pressure side) and the low pressure gauge (suction side). The pressure side connection valve always sits in the line from the cooling compressor to the condenser.*

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16. The connection valves for the high pressure and low pressure sides on the vehicle are spring-loaded valves and open automatically when the pressure testing hose is connected.
    The connection valves are closed with a protective cap. Remove this cap prior to connecting the pressure gauge and fit it again when the servicing of the vehicle is complete.

NOTE: *A suitable pressure pin must be inserted into the pressure testing pipe to actuate this type of valve.*

17. Testing procedure
    After connecting the pressure gauge battery - and before the functional test is able to be carried out - shift the system into a stable operating state as follows:
    Check again whether the manual shut-off valves on the suction and pressure sides of the pressure gauge battery are completely screwed shut.
18. Actuate the parking brake and check that all gear levers are in neutral and all windows and doors of the driver cab are shut.
19. Run the engine at **1000 - 1200 rev/min**.
20. Switch OFF the temperature switch of the heating system.
21. Switch the temperature stabilisation function of the air conditioning system to maximum cooling and switch the fan motor to the highest speed setting for **10 minutes**.
22. Check that the low pressure gauge shows approximately **4 - 36 lbf/in2** (**0.28 - 2.48 bar**) (**0.28 - 2.53 kgf/cm2**).
23. Read the high pressure gauge and compare the display value with the values in the pressure/temperature table provided above.
24. Compare the temperature of the air-conditioned air flowing out of the air vents into the cab with the temperature of the intake air at the cab air filters outside the cab.
    If the system is functioning properly the air-conditioned air flowing into the cab should be **6 - 9 ° C** (**10 - 15 ° F**) cooler than the outside air that is drawn in.
25. If you determine as a result that the system is not functioning properly, proceed with troubleshooting using the troubleshooting tables and the examples in **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Troubleshooting (E.40.D)** and remedy as required.

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Overhaul

NOTE: *Before disconnecting components in the air conditioning system the refrigerant gas must be discharged and recovered using a certified recovery system. Refer to* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Discharging (E.40.D)****. Do Not discharge the gas into the atmosphere*

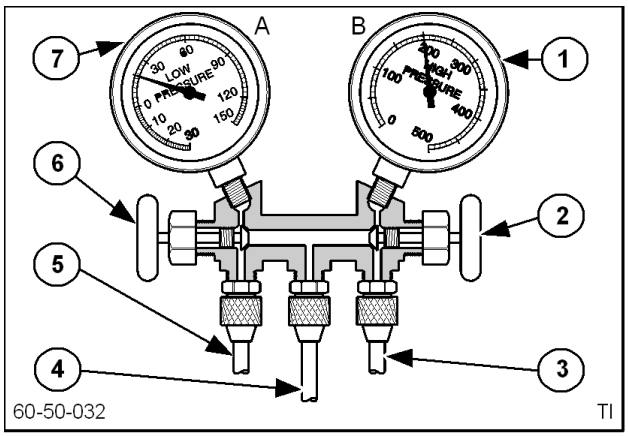
1. If an air conditioning component is to be replaced during a system overhaul it is necessary to drain any refrigerant oil that has collected in the component being replaced into a clean calibrated container.
   A volume of clean refrigerant oil equivalent to that removed from the replaced component must then be added to the new item before being installed onto the tractor.
   Upon completion of the repair evacuate, recharge, leak test and performance test the system to ensure correct operation.

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Decontaminating

Air conditioning systems may occasionally become contaminated with solid particles. This contamination may be the result of allowing dirt to enter the system while it was open, from aluminum corrosion or sludge, or from disintegrated compressor reed plates. Contamination of this nature can result in plugged evaporators, condensers and expansion valves.

1. Contaminated systems must be flushed with a special flushing solvent to remove the unwanted material. Prior to flushing, the system must be discharged as described in **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Discharging (E.40.D)**.
   Each individual component must be flushed after disconnecting every hose fitting.
   The compressor and expansion valve can not be flushed, therefore, the compressor should be disassembled and cleaned or replaced and the expansion valve should be replaced. When flushing the system always replace the receiver/drier.

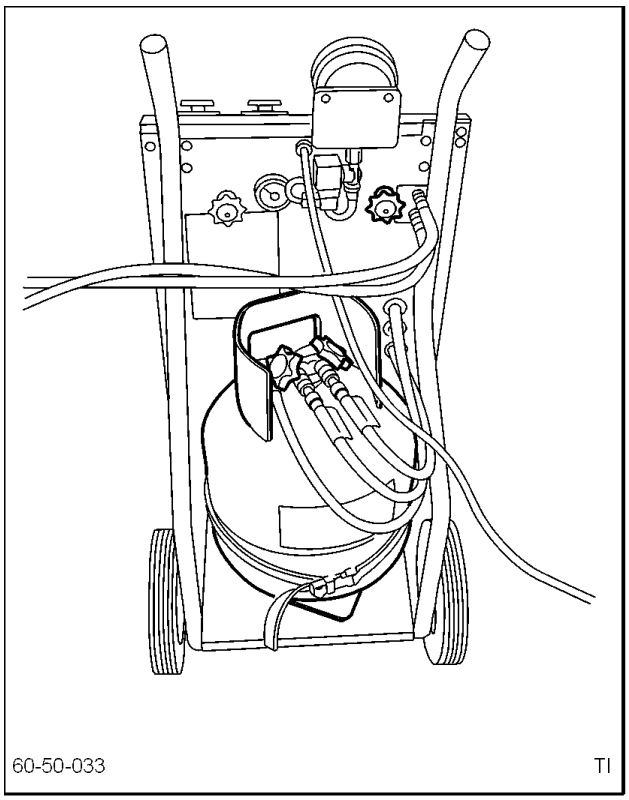


60-50-032 1

   Manifold Gauge Set (Fig. 1)
   1. High Side Gauge
   2. High Side Shut off Valve
   3. High Side hose
   4. Centre Service hose
   5. Low Side hose
   6. Low Side Shut off Valve
   7. Low Side Gauge

2. Re-assemble and evacuate the system to remove air and moisture as described in **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Evacuate (E.40.D)**.

NOTE: *Never use any solvent for flushing an air conditioning system other than a special flush solvent made specifically for air conditioning systems. Always follow the manufacturer's recommendations and directions for using the flushing equipment and solvent.*



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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Discharging

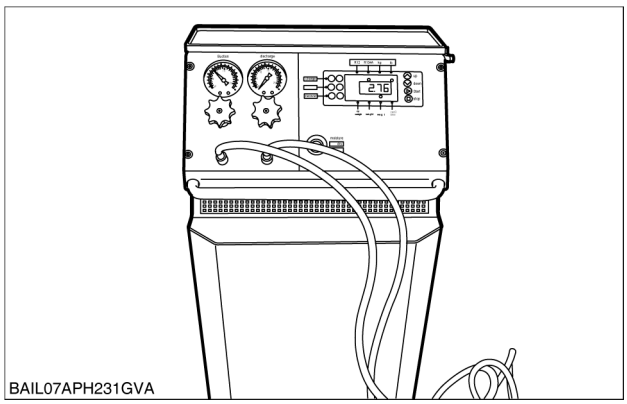
⚠ WARNING ⚠

Never discharge refrigerant gas into the atmosphere. Always where safety goggles and gloves when working with refrigerant. Only use authorised refrigerant tanks.

B030

IMPORTANT: *Legislation bans the release of refrigerant into the atmosphere.*

1. Whenever overhauling the air conditioning (A/C) system or performing other tasks which require the A/C system to be dismantled, it is necessary to discharge the refrigerant gas before commencing repair.
   Before dismantling an A/C system for repairs, you must discharge and recover the refrigerant using a certified recovery unit in accordance with the manufacturers instructions.
   Figure **1** shows a combined refrigerant recovery, evacuation and recycling/charging station. This equipment removes R-134a refrigerant from the A/C system, recycles and recharges all in one hook up. The unit is designed to be used with the manifold gauge set built into the control panel.



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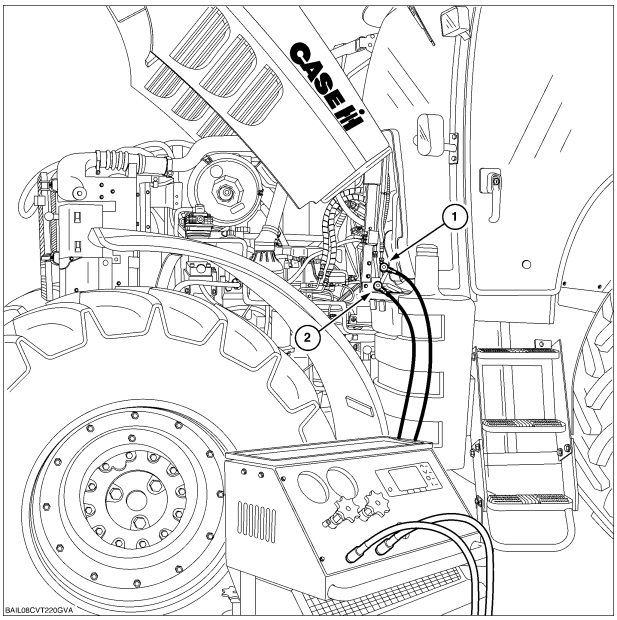
2. Other recovery systems are available where the manifold gauges are not an integral part of the machine. When this type of equipment is used a separate manifold gauge set must be used.
   The following is a summary of the steps for discharging the system using a recovery/recycling unit

IMPORTANT: *Always follow the manufactures instructions when operating recovery equipment.*

3. Run the vehicle's A/C system for a few minutes.

4. Set up the recovery unit following the manufacturer's instructions. Make sure that the units red (high side) hose is connected to the high side fitting **(1)** and the blue (low side) hose to the low side fitting **(2)**.

NOTE: *If a unit requiring the manifold gauge set is being used, the low and high sides of the manifold set are connected to the low and high sides of the A/C system. The hose from the recovery unit is then connected to the manifold centre port. Refer to* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Decontaminating (E.40.D)****.*



BAIL08CVT220GVA 2

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5. To recover refrigerant, open both high and low side valves on the control panel or the valves on the manifold gauge set if being used, refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Decontaminating (E.40.D)**.
6. Open the valves labeled “gas" and “liquid" on the recovery unit refrigerant tank, **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Decontaminating (E.40.D)**.
7. Operate the recovery system in accordance with the manufacturers instructions.
   The compressor will shut off automatically when the recovery is complete.

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Charging

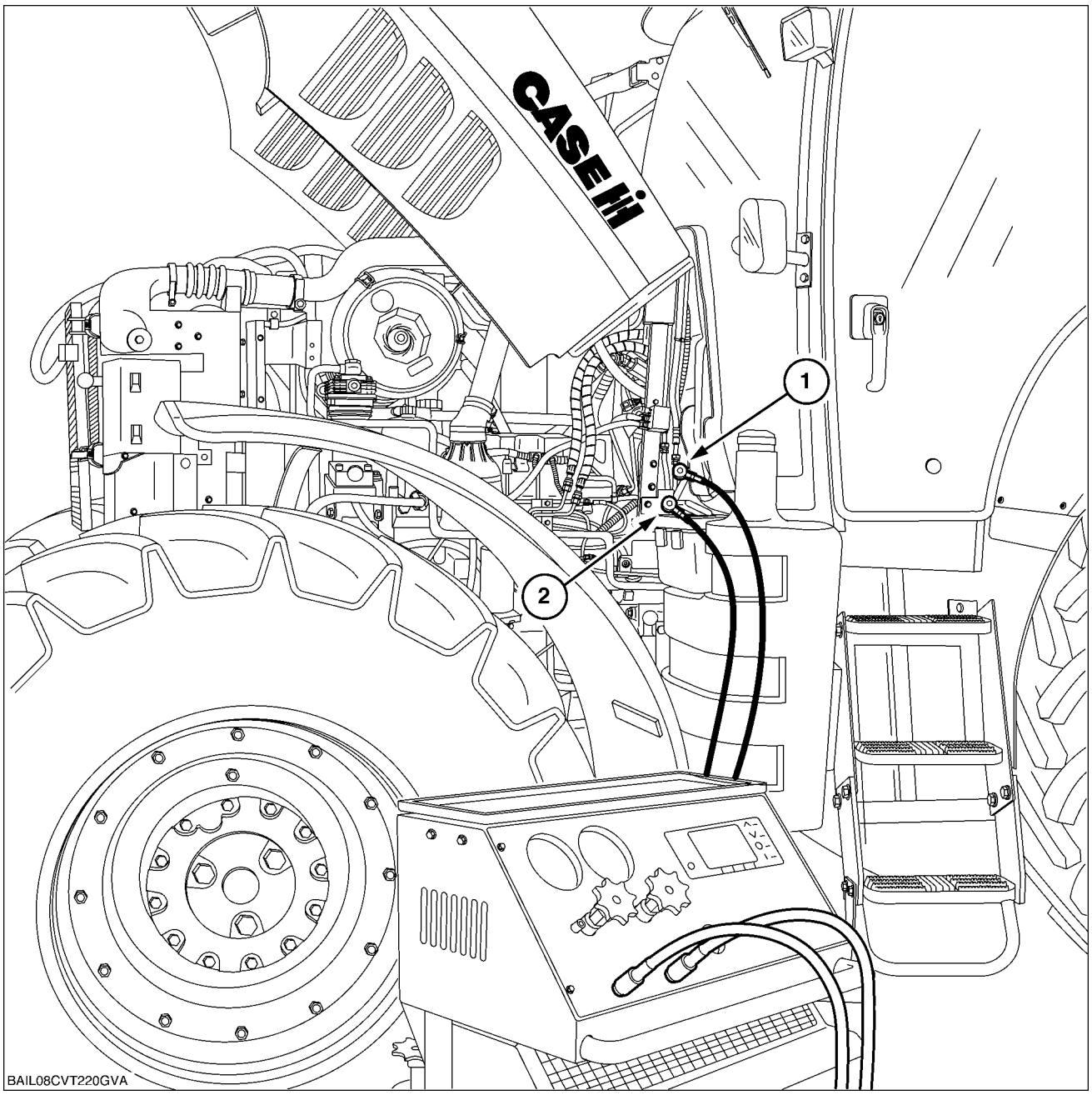
IMPORTANT: *Make sure that there are no leaks in the air conditioning (A/C) system and that the A/C system has been fully evacuated. Observe all safety recommendations when handling refrigerant R-134a, see "Precautions when Handling Refrigerant R-134a" in* ***ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Overview (E.40.D)****.*

1. Make sure that the charging unit is correctly connected to the vehicle A/C system in accordance with the manufacturers instructions.
2. If a charging unit, in conjunction with the manifold gauge set is used, open the high and low side hand valves on the manifold.
3. Charge the A/C system with **1.1 kg** (**2.4 lbs**) of refrigerant as per the manufacturers instructions.
4. If the charging rate becomes very slow close the high side valve, start the engine and set the engine speed to idle. Turn the A/C ON so that the compressor can pull the remainder of the refrigerant into the A/C system.
5. If the refrigerant charge will not completely transfer to the A/C system, recover and recharge the A/C system.
6. Close the high and low side valves on the units control panel, or manifold gauge set if being used and test the A/C system as detailed in Performance Testing The Air Conditioning System on **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Service instruction (E.40.D)**.

NOTE: *After charging an A/C system use the following start up procedure to make sure that the lubricating oil is properly dispersed around the A/C system:*

7. Make sure that the A/C system is switched OFF.
8. Start the engine and bring the engine speed down to idle.
9. Turn the A/C ON and allow the system to operate for at least one minute before increasing engine speed.

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BAIL08CVT220GVA 1

Connecting Recovery Evacuation and Recycling/Charging Station to the Vehicle

1 High Side Service Valve (Red Hose)

2 Low Side Service Valve (Blue Hose)

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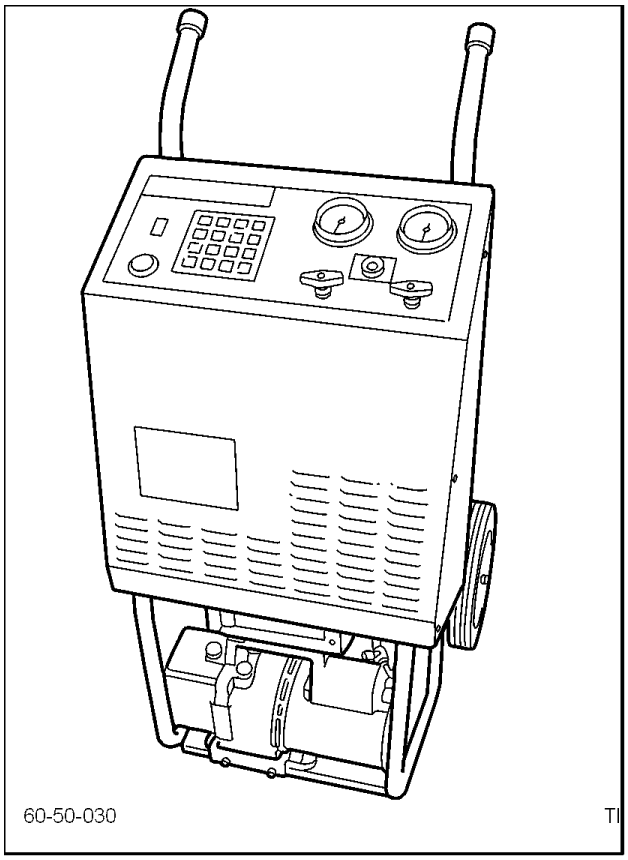
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Evacuate

IMPORTANT: *A system in which the refrigerant has been recovered to facilitate repairs, must be evacuated before new refrigerant is installed.*

NOTE: *Air and moisture are removed by evacuating the system using a vacuum pump.*
The automatic recycling, recharge and evacuation stations or evacuating and charging stations available throughout the air conditioning industry incorporate a vacuum pump within the assembly. If this type of equipment is not available a separate vacuum pump and manifold gauge set must be used.
As the system is evacuated the boiling point of any moisture within the system is similarly lowered. As the vacuum increases the boiling reduces to below that of the ambient temperate and the moisture is subsequently boiled away. The relationship of system vacuum to the boiling temperature at which the water vapor is removed from the system is as follows:

NOTE: *For every **1000 feet** (**305 m**) above sea level, the vacuum gauge reading must be corrected by adding 1 (**2.54 cm**) of mercury to compensate for the change in atmospheric pressure.*

IMPORTANT: *Be sure the system is completely discharged as refrigerant will damage the vacuum pump.*



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System Vacuum		Temperature	
In of Mercury	Cm of Mercury	°F	°C
28.0	71.0	100	37
28.9	73.4	80	27
29.4	74.6	60	16
29.7	75.4	40	5
29.8	75.7	20	-7
29.9	75.9	0	-18

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1. If the manifold gauge set is being used connect the low and high sides of the manifold to the low and high sides of the tractor air conditioning system as described for discharging the system in **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Discharging (E.40.D)**.
   Connect the manifold centre hose to the vacuum pump suction port as per the manufacturers instructions.
   Fully open both the low and high side gauge shutoff valves.
2. If a combined recovery/evacuation unit is to be used attach the unit to the air conditioning system in accordance with the manufacturers instructions. Be sure to read all installation and operating instructions carefully before starting the unit.
3. After starting the evacuation cycle, note the low side gauge to be sure the system pulls down into a vacuum.
4. Time the evacuation for a minimum of **20 minutes** from the point when lowest vacuum is attained.
5. When the low side gauge attains the lowest steady vacuum, stop the evacuation process.

NOTE: *The vacuum pump achieves ultimate vacuum with the vented exhaust valve closed.*

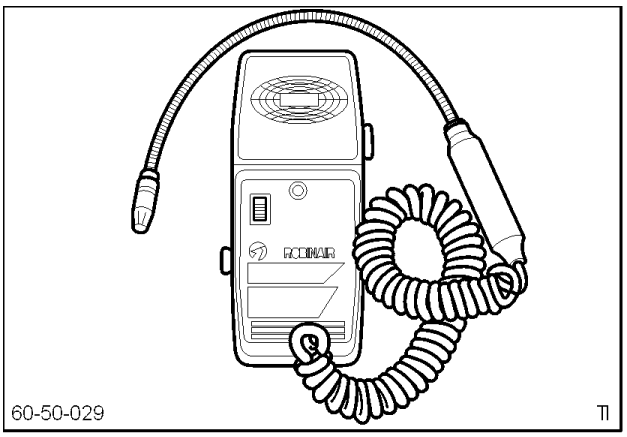
6. Check the system by closing the gauge shut-off valves, turning the vacuum pump off and noting the low side gauge reading. A loss of more than **2 in** (**5 cm**) of vacuum in **5 minutes** indicates either a leak or moisture in the system.
7. If the gauge needle remains stationary and the vacuum is maintained for **3 - 5 minutes**, close both the high and low side manifold hand valves, turn off and disconnect the center hose from the pump. The system is now ready for charging.
8. If a leak is detected, charge the system with approximately **14 oz** (**400 g**) of refrigerant, see charging the system in **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Charging (E.40.D)** and identify leak using a leak detector.
9. Once the leak is located discharge and recover the refrigerant in the system, repair the leak, then repeat the evacuation procedure.

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Leakage test

To perform a leak test if refrigerant leakage is suspected, use an electronic leak detector, Figure **1** following manufacturer's instructions.
Electronic leak detectors use flashing lights or sound to alert the operator to a leak. If the leak detector's sensitivity is adjustable, be sure you calibrate the detector according to the manufacturer's instructions before use.
When using a leak detector, keep in mind that a very slight amount of leakage in the compressor pulley area is normal and does not necessarily indicate a repair is required.
When a leak is located, follow these steps.

1. Discharge the system using a certified freon recovery system.
   Repair the leak.
   Evacuate the system.
   Partially charge system with **400 grammes** (**14 ozs**) of refrigerant.
   Check system for leaks.
   Fully charge the system.
   Always check the system for leaks as a final test after evacuating and before recharging. Refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Evacuate (E.40.D)**



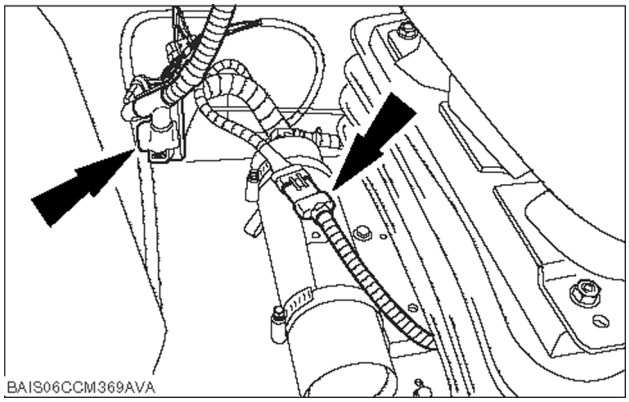
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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Remove (Heating and air conditioning unit)

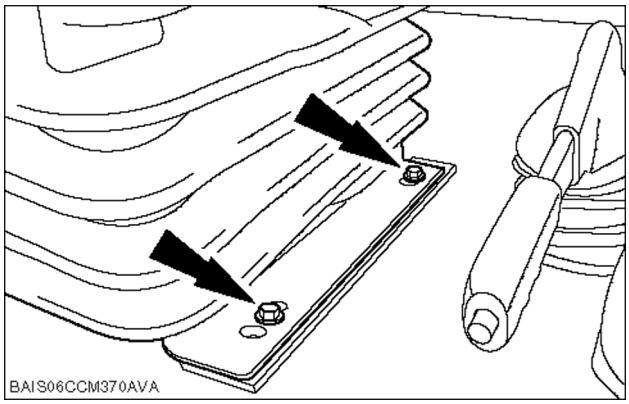
Prior operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Discharging (E.40.D)

1. Turn the starter switch to the “OFF” position.
   Disconnect the electrical plug connection for the driver’s seat and the armrest.



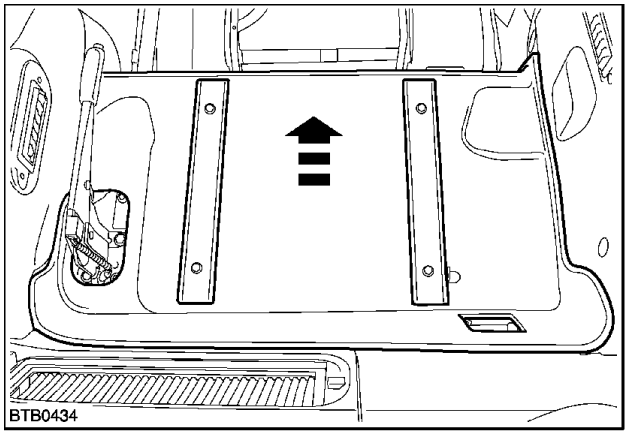
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2. Unscrew the retaining screws of the driver’s seat.
   Remove the driver’s seat.



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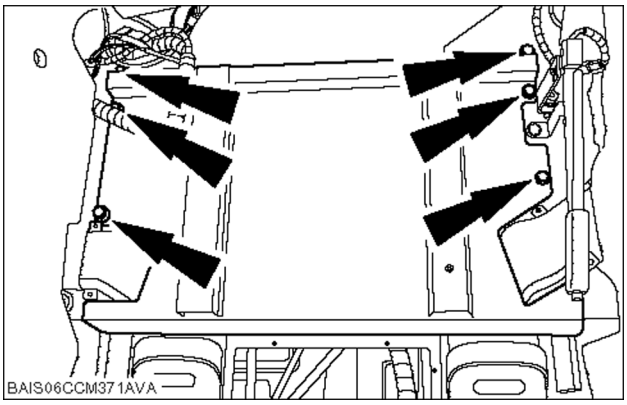
3. Take the floor mats out of the cab to obtain access to the front and rear floor plates.



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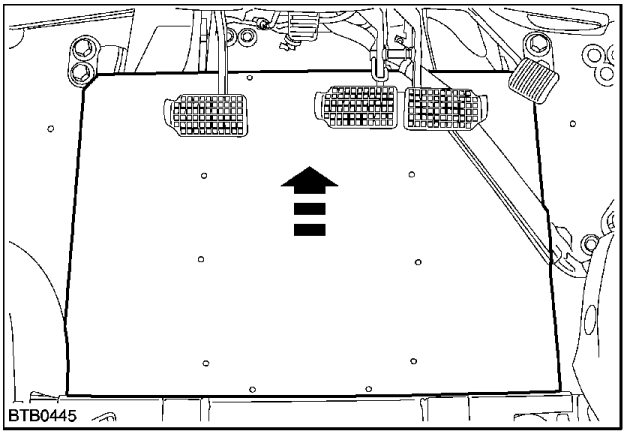
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4. Remove the rear floor plate.



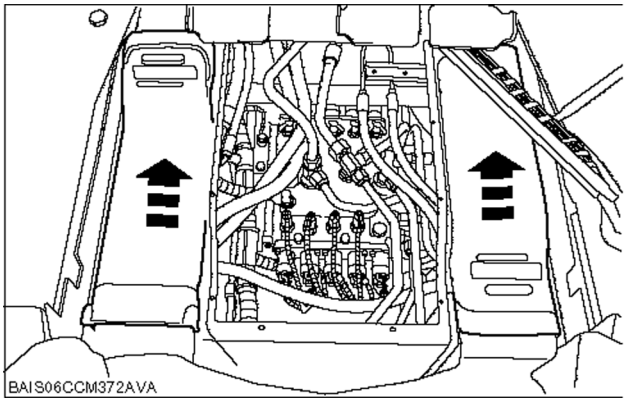
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5. Remove the front floor plate.



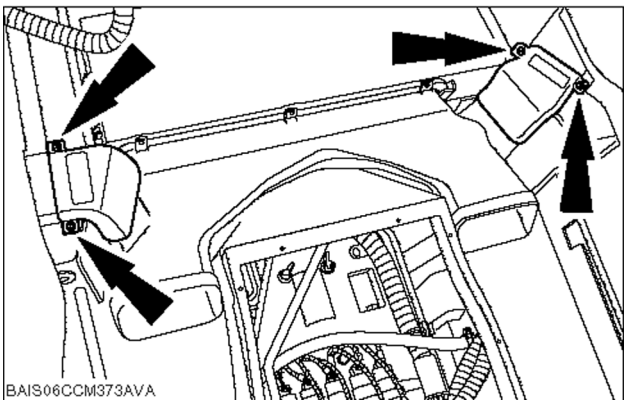
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6. Remove the front air ducts.



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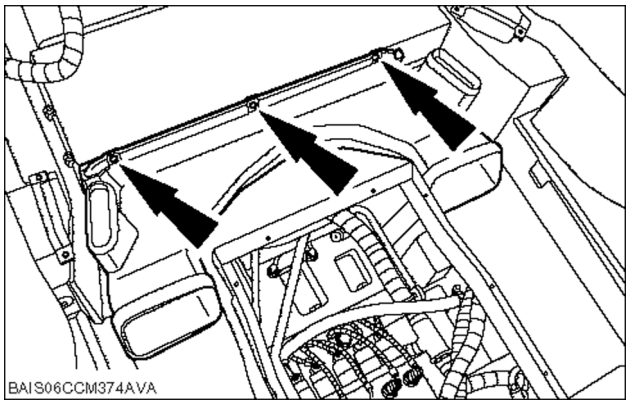
7. Remove the lower side air ducts.



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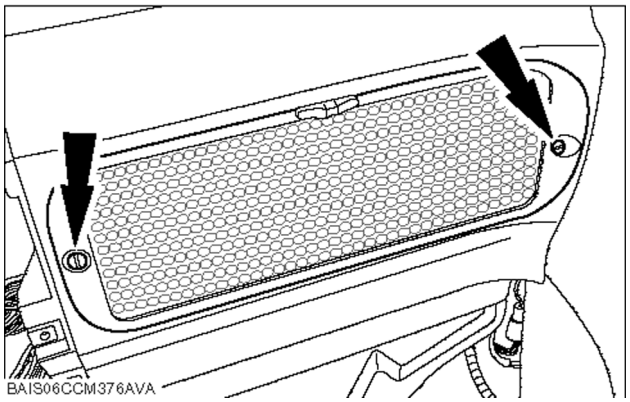
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8. Remove the exhaust duct from the front side of the heating and air conditioning unit.



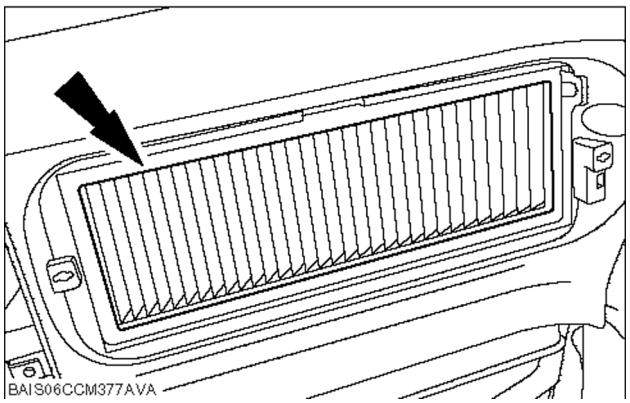
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9. Remove the air circulation grating.



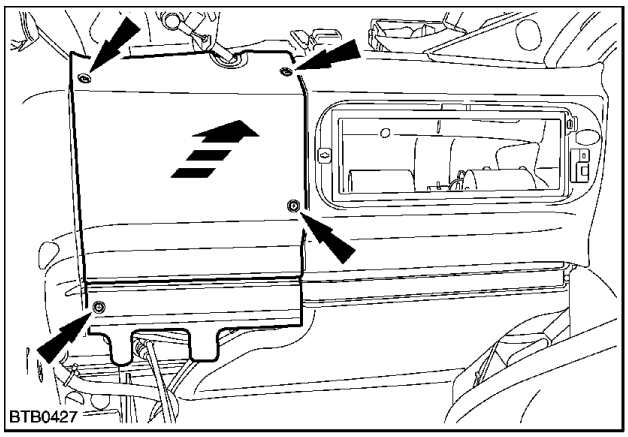
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10. Remove the air circulation filter element.



BAIS06CCM377AVA 10

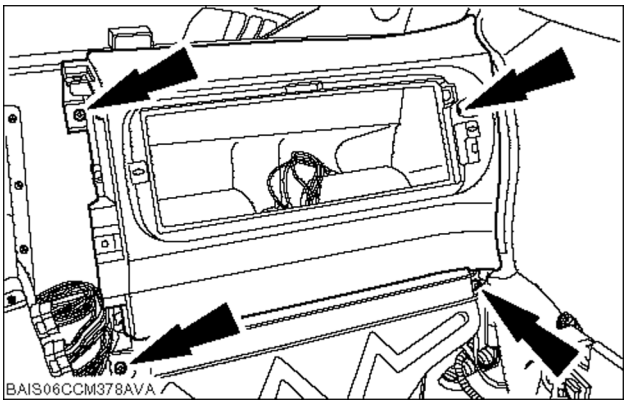
11. Remove the cover next to the fan box.



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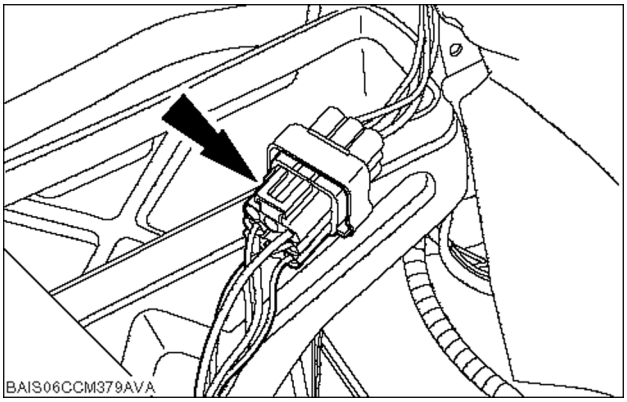
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12. Unscrew the retaining screws of the fan box.



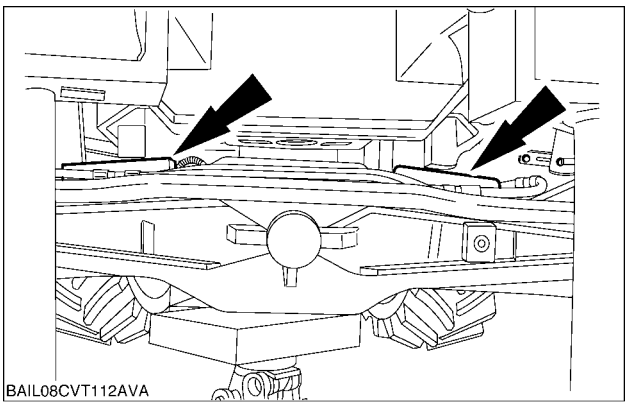
BAIS06CCM378AVA 12

13. Remove the electrical connector of the fan motor and remove the fan box.



BAIS06CCM379AVA 13

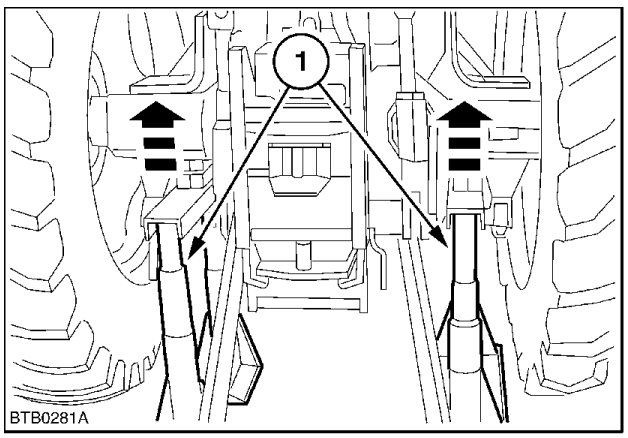
14. Ensure that the vehicle is standing on even ground.
15. Place chocks under the front wheels.
16. Drive timber wedges between the front axle and front axle bearing block. The wedges prevent the front axle from swinging.



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17. Raise the rear of the vehicle and place two suitable support frames **(1)** under the end drive housing.

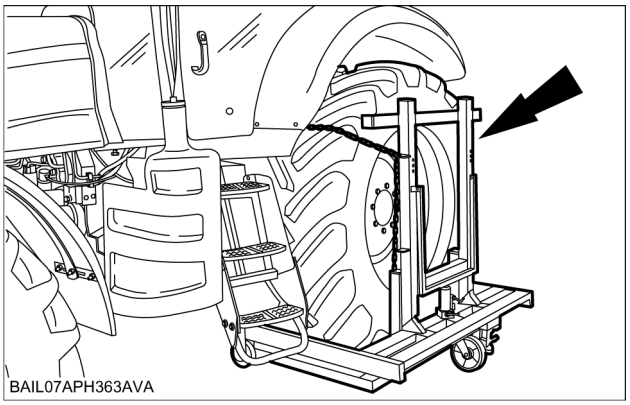
NOTE: *Remove the supports if required.*



BTB0281A 15

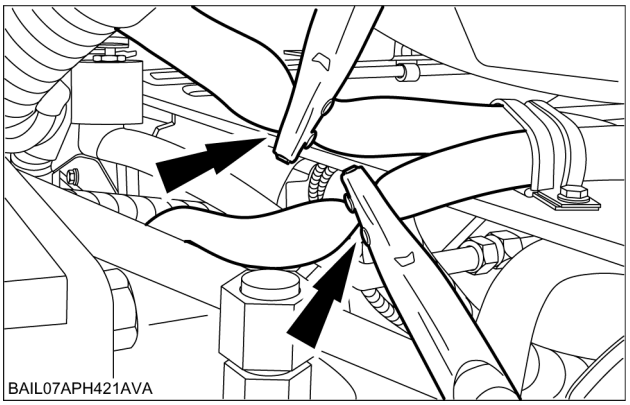
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18. Remove the rear left wheel.



BAIL07APH363AVA 16

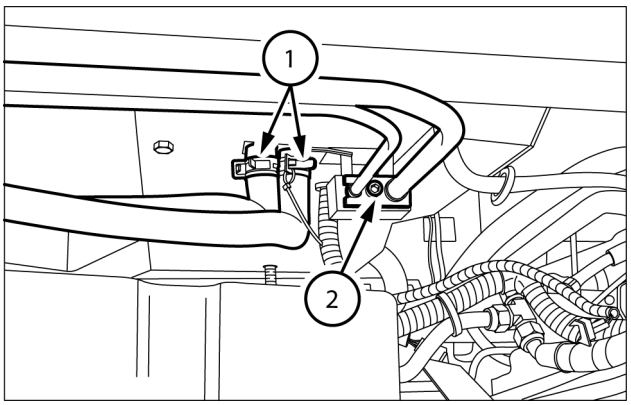
19. Attach peristaltic devices to the feed and return lines of the heating cooler.



BAIL07APH421AVA 17

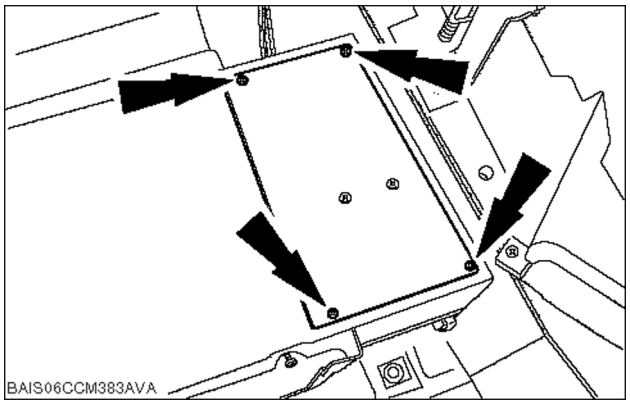
20. Remove the hoses of the cab heating system **(1)** and the air conditioner lines **(2)**.

ATTENTION: *Risk of burns due to hot coolant.*



SS08D111 18

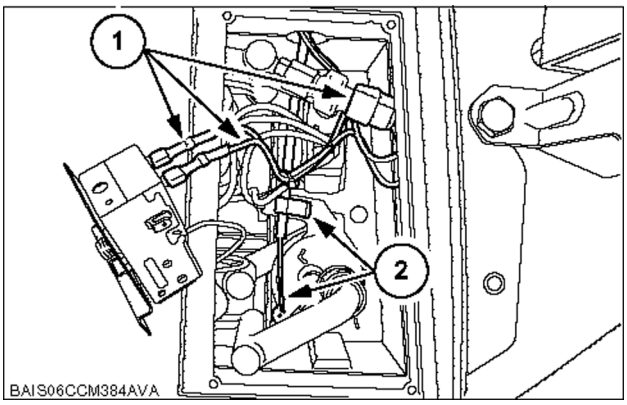
21. Remove the cover plate from the heating and air conditioning unit.



BAIS06CCM383AVA 19

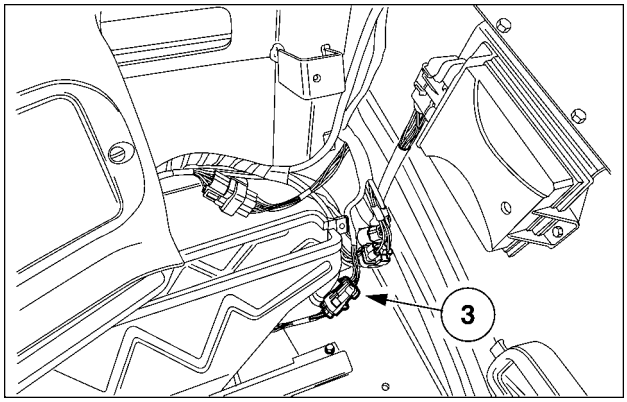
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22. Standard air conditioner design:
Remove the electrical connector **(1)**.
Unclip the Bowden cable of the heating regulator **(2)**.



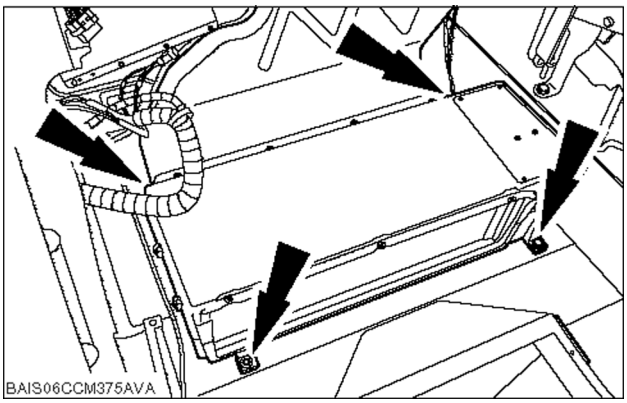
BAIS06CCM384AVA 20

Automatic air conditioner (ATC) design:
Remove the electrical connector **(3)** from the heating and air conditioning unit.



SS08D112 21

23. Remove the heating and air conditioning unit together with the rear air ducts.



BAIS06CCM375AVA 22

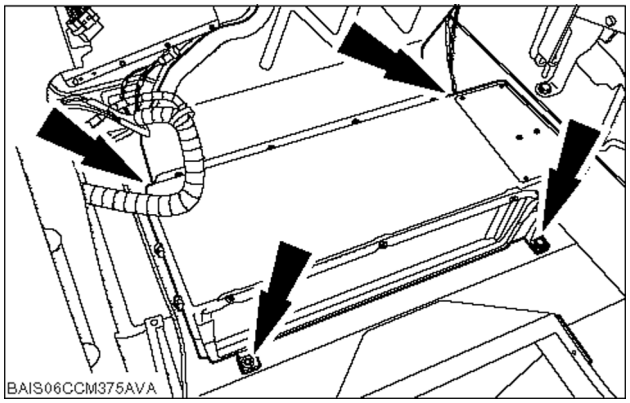
Next operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Install (Heating and air conditioning unit) (E.40.D)

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Install (Heating and air conditioning unit)

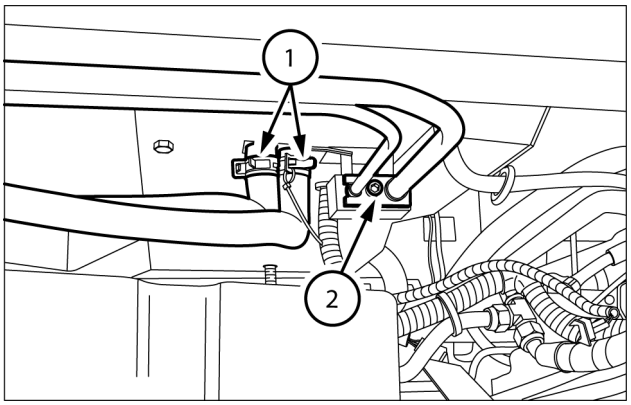
Prior operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Remove (Heating and air conditioning unit) (E.40.D)

1. Attach the rear air duct to the heating and air conditioning unit.
2. Install the heating and air conditioning unit together with the rear air duct.



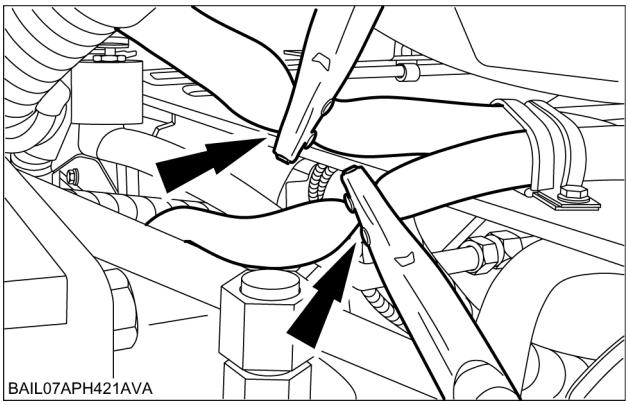
BAIS06CCM375AVA 1

3. Connect the hoses of the cab heating system **(1)** and the air conditioner lines **(2)**.



SS08D111 2

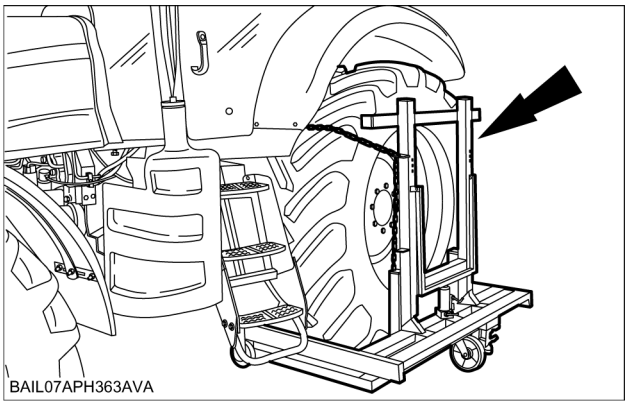
4. Remove the peristaltic devices from the heating hoses.



BAIL07APH421AVA 3

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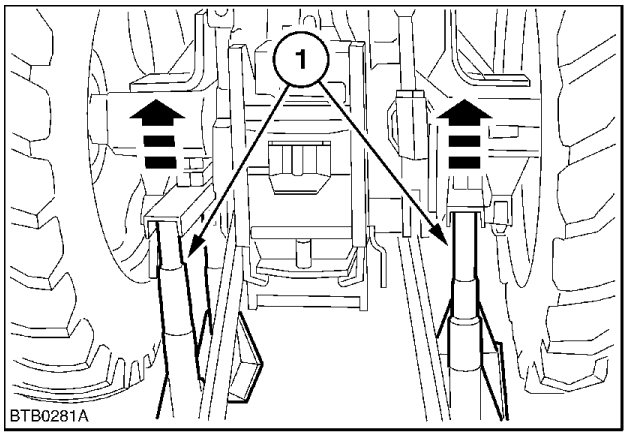
5. Mount the rear left wheel and tighten the wheel nuts to the specified torque - see **Rear wheel - Torque (D.50.C)**.



BAIL07APH363AVA 4

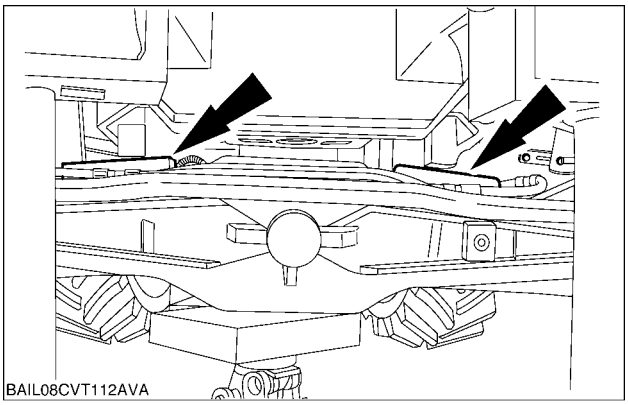
6. Raise the rear of the vehicle and remove the support frames **(1)**.

NOTE: *If the supports have been removed, fit them again.*



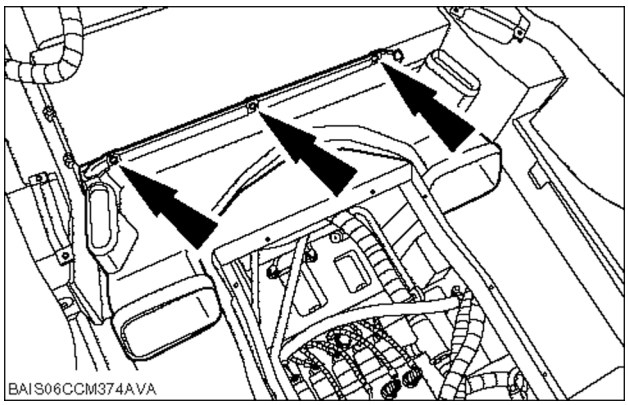
BTB0281A 5

7. Remove the timber wedges from between the front axle and front axle bearing block.



BAIL08CVT112AVA 6

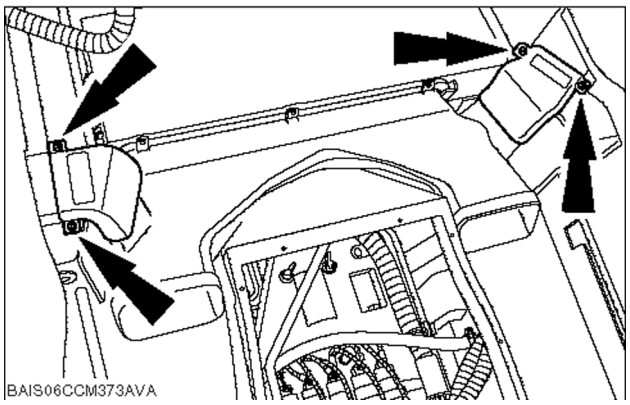
8. Remove the wedges from the front wheels.
9. Attach the exhaust duct to the front side of the heating and air conditioning unit.



BAIS06CCM374AVA 7

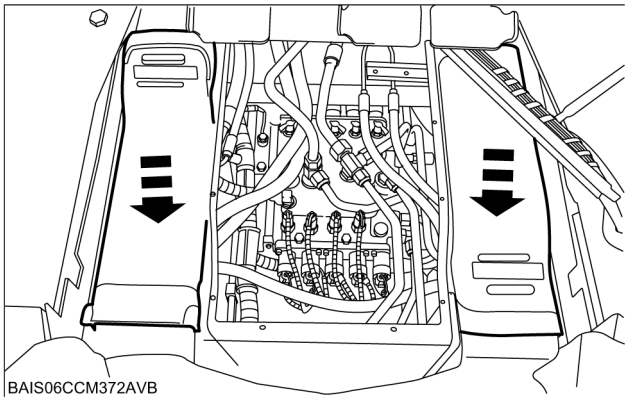
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10. Attach the lower side air ducts.



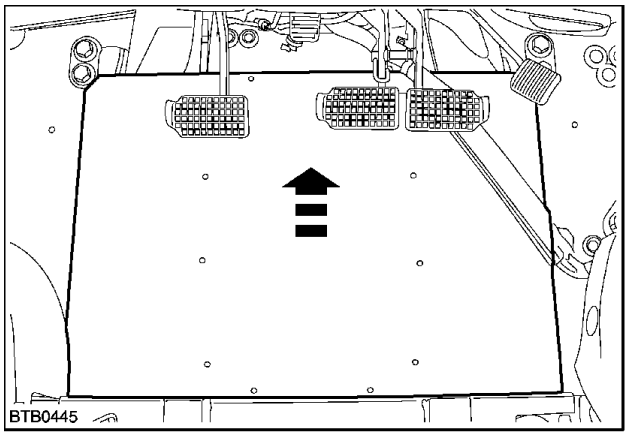
BAIS06CCM373AVA 8

11. Attach the front air ducts.



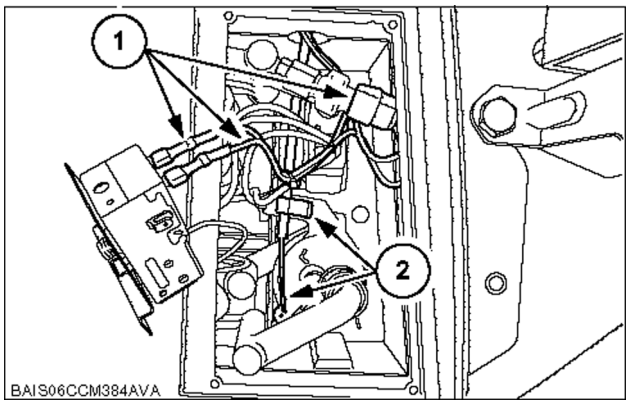
BAIS06CCM372AVB 9

12. Install the front floor plate.



BTB0445 10

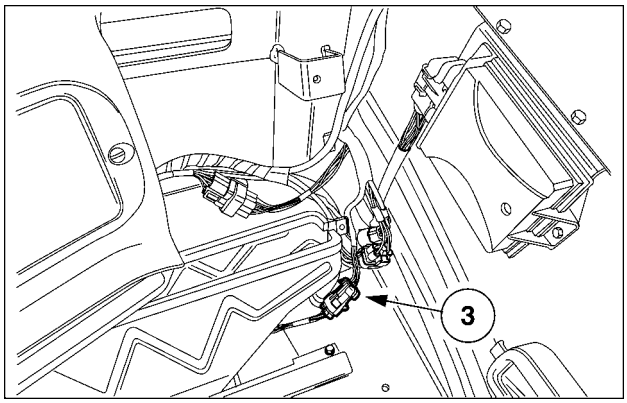
13. Standard air conditioner design:
Connect the electrical connector **(1)**.
Fit the Bowden cable of the heating regulator **(2)**.



BAIS06CCM384AVA 11

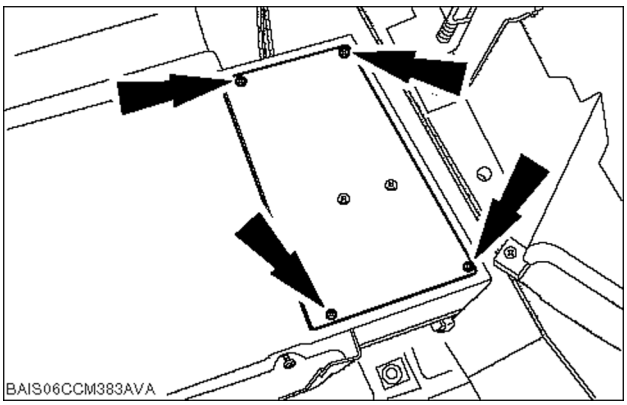
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Automatic air conditioner (ATC) design:
Connect the electrical connector **(3)** of the heating and air conditioning unit.



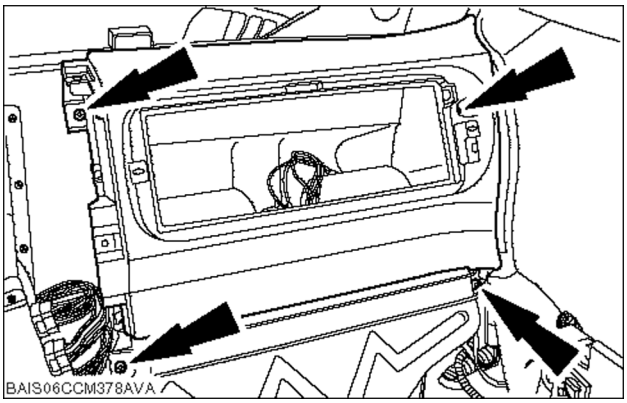
SS08D112 12

14. Attach the cover plate to the top of the heating and air conditioning unit.



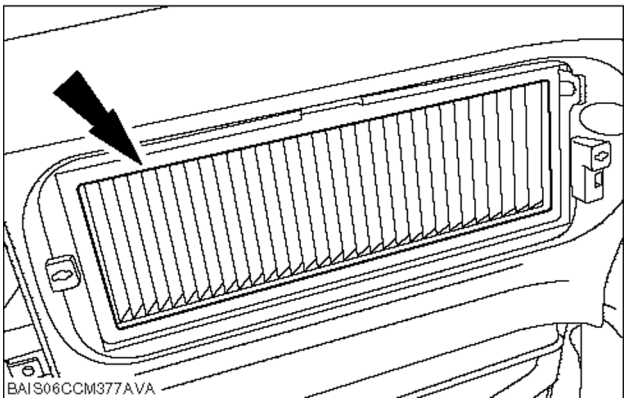
BAIS06CCM383AVA 13

15. Insert the blower box and screw in the blower box retaining screws.



BAIS06CCM378AVA 14

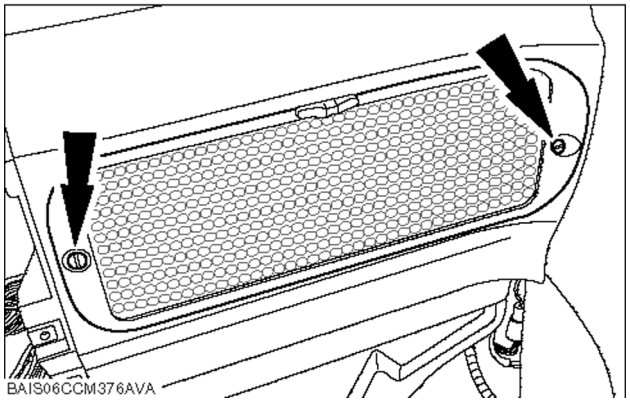
16. Fit the air circulation filter element.



BAIS06CCM377AVA 15

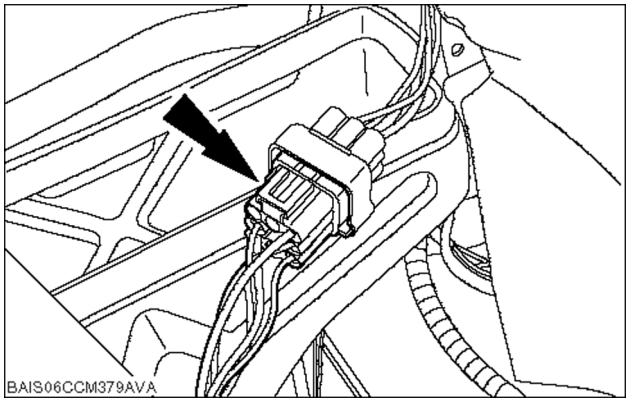
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17. Attach the air circulation grating.



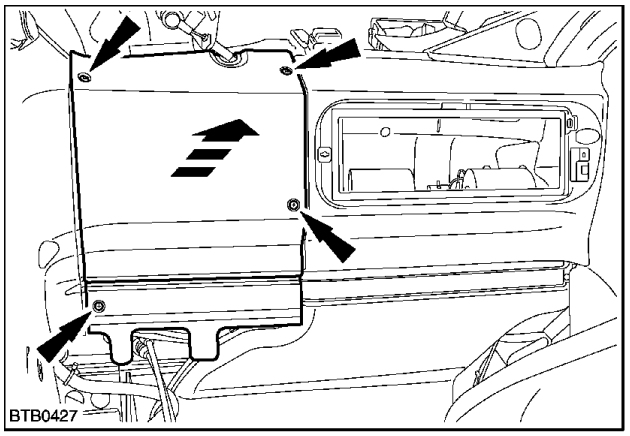
BAIS06CCM376AVA 16

18. Connect the electrical connector to the fan motor.



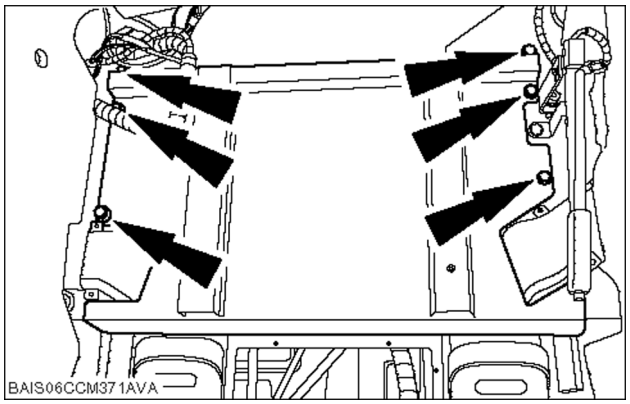
BAIS06CCM379AVA 17

19. Attach the cover.



BTB0427 18

20. Install the rear floor plate.

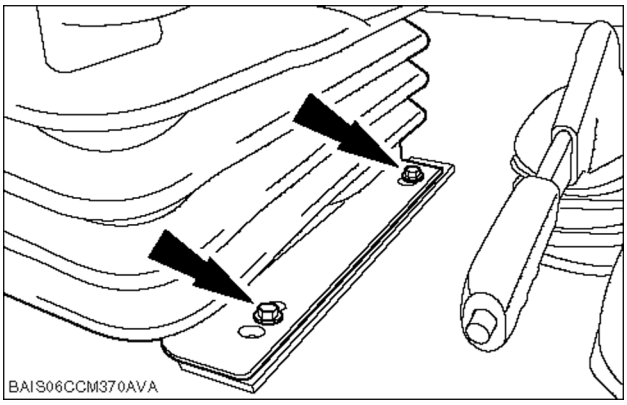


BAIS06CCM371AVA 19

21. Fit the front and rear cab floor mats.

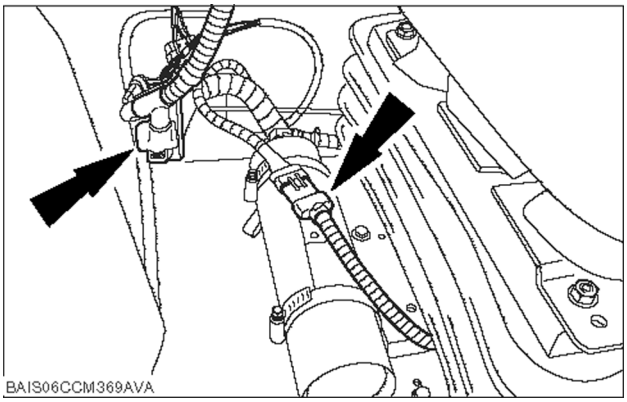
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22. Install the driver's seat.
Screw in the retaining bolts.



BAIS06CCM370AVA 20

23. Connect the electrical plug connection for the driver's seat and the armrest.



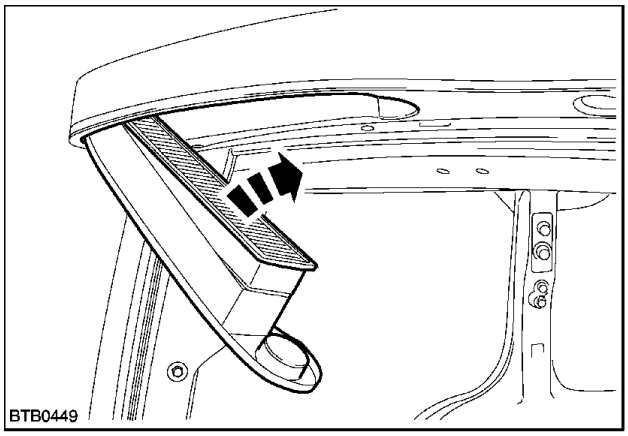
BAIS06CCM369AVA 21

Next operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Evacuate (E.40.D)
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Charging (E.40.D)
Compressor - Filling (E.40.D)
ENGINE COOLANT SYSTEM - Filling (B.50.A)

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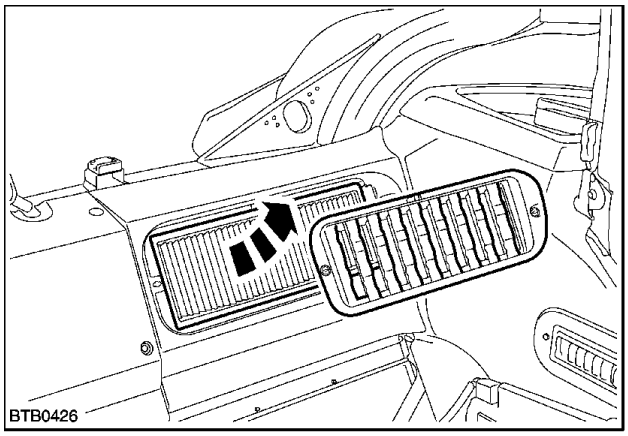
Air filter - Cleaning

1. Before servicing the filters, switch off the blower and close the roof hatch, all windows and one door. Slam the final door closed and the resulting back pressure will dislodge most of the loose dirt from the underside of the filters.
   Remove filter elements. The fresh air filters, Figure **1**, have a prefilter element fitted that is designed to catch most of the dust/chaff. This prefilter is part of the filter and should be pulled out from the underside and cleaned first, then pushed back in.
   The recirculation filter, Figure **1** is fitted with a pull tab. This should be used to remove the filter. The filter pleats should never be used to remove the filter as damage will result.
   Blow the dust from the upper surface through the element to the underside. Clean by blowing with compressed air not exceeding **2 bar** 30 (lbf/in2). Hold the nozzle at least **12 in** (**300 mm**) from the element to prevent damage to the pleats.
   Care should be taken when using compressed air as this may damage to the filter.



BTB0449 1

2. Clean all filter chambers with a damp, lint free cloth. Replace the filter elements with the rubber seal uppermost and re-install the covers.



BTB0426_505 2

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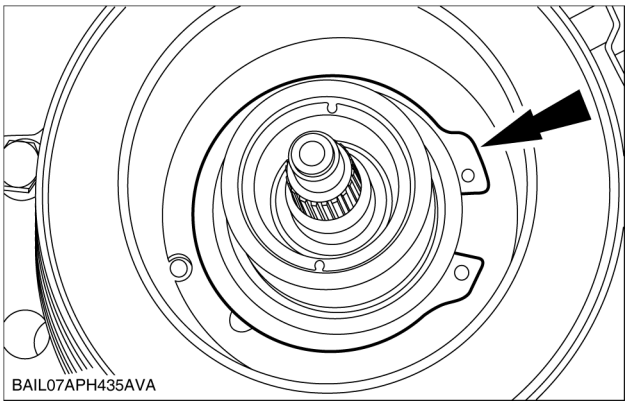
Compressor Magnetic clutch - Assemble

380000333 Air conditioning compressor toolkit

Prior operation:
Compressor Magnetic clutch - Disassemble (E.40.D)

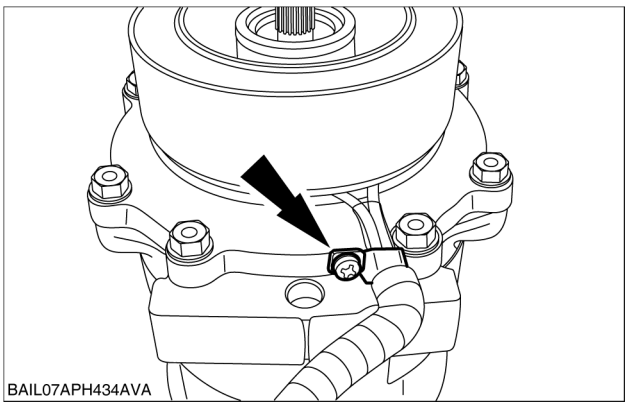
1. Fit the exciter winding.
   Secure the exciter winding using the circlip.

NOTE: *The nose of the exciter winding must be seated in the hole of the compressor housing.*



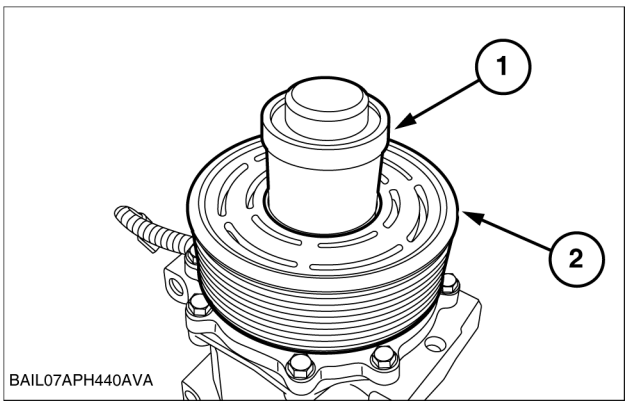
BAIL07APH435AVA 1

2. Fit cable clamp.



BAIL07APH434AVA 2

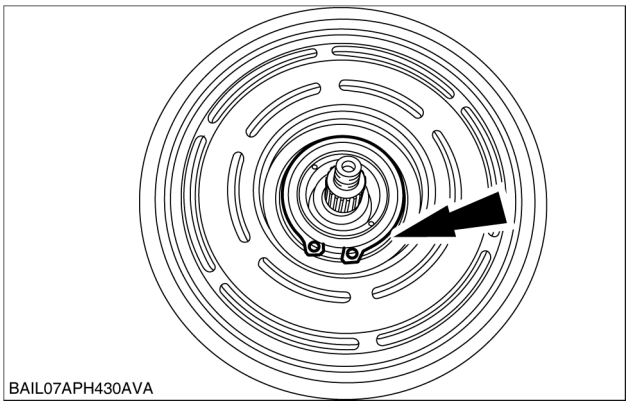
3. Use the special tool **(1)** (211-153/7) to drive the belt pulley bearing and the belt pulley **(2)** onto the hub of the compressor.



BAIL07APH440AVA 3

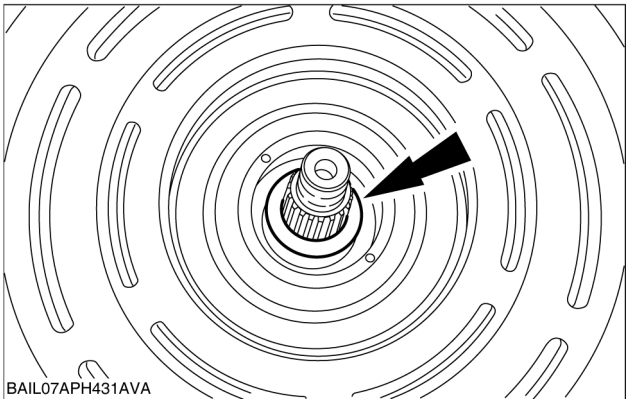
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4. Insert bearing's circlip.



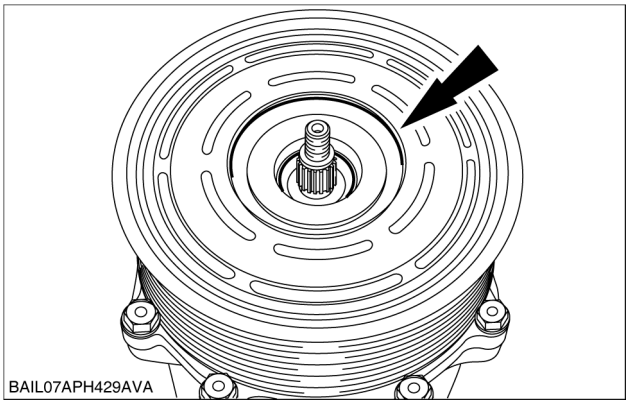
BAIL07APH430AVA 4

5. Place shims on compressor shaft.



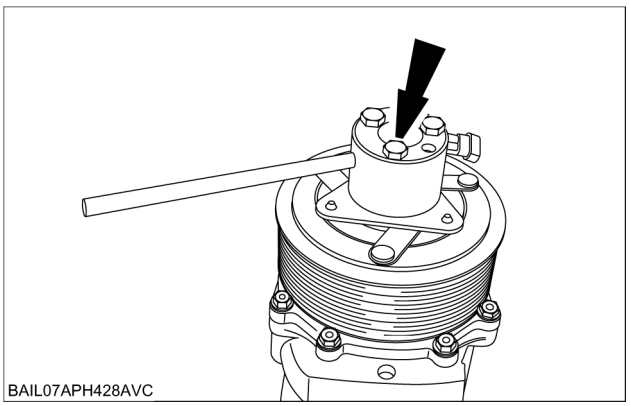
BAIL07APH431AVA 5

6. Insert a new dust protection ring.



BAIL07APH429AVA 6

7. Attach coupling plate.
Attach the special tool (211-153/1, 211-153/2) to secure the coupling plate. Screw the locknut onto the drive shaft and tighten to **18 Nm** (**13 lb in**).



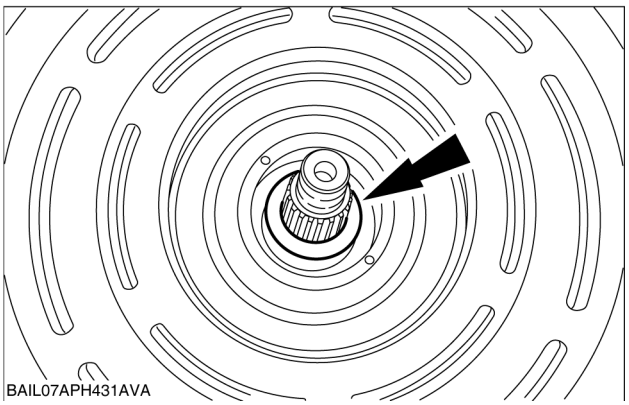
BAIL07APH428AVC 7

8. Measure the gap between the front plate of the coupling and belt pulley. The gap must be the same over the entire area and measure **0.4 - 0.8 mm** (**0.0164 - 0.031 in**).

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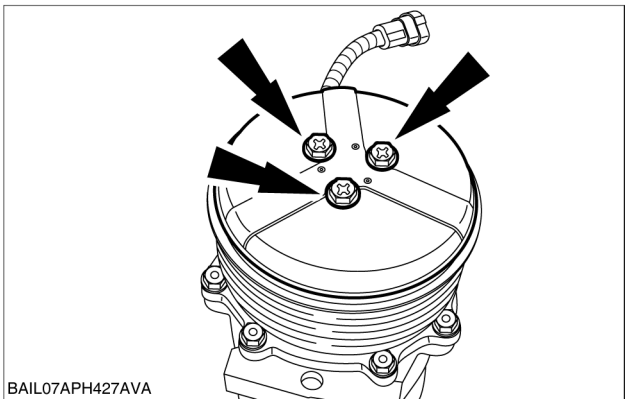
9. If the gap size is not achieved, adjusting shims must be added or removed until the prescribed gap size is achieved.

NOTE: *New shims are available in sizes 1.00,* ***0.50 - 0.13 mm****, (0.040,* ***0.020 - 0.005 in****.).*



BAIL07APH431AVA 8

10. Attach the cover to the coupling plate and fit the screws.



BAIL07APH427AVA 9

Next operation:
Compressor - Install (E.40.D)

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Compressor Magnetic clutch - Disassemble

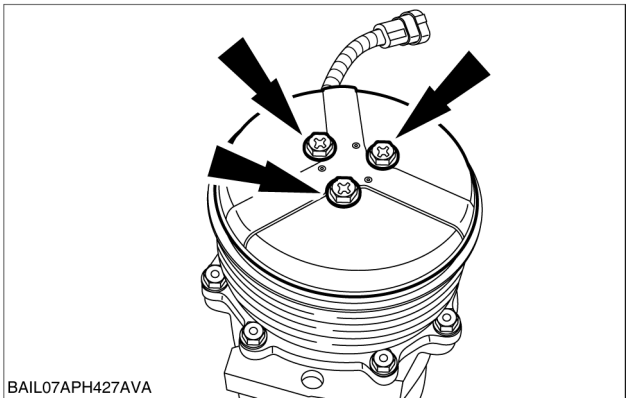
380000333 Air conditioning compressor toolkit

Prior operation:
Compressor - Remove (E.40.D)

1. Clamp the compressor into a vice with protective jaws.

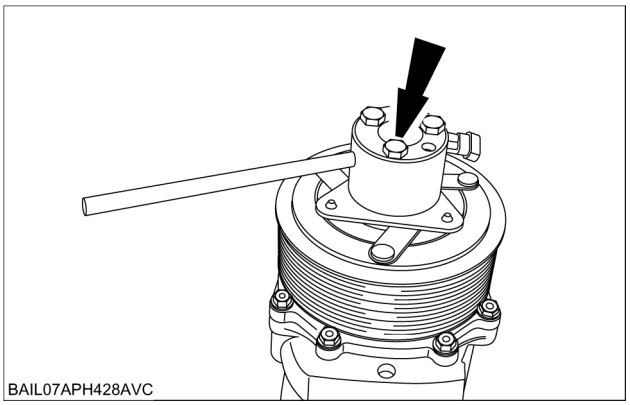
NOTE: *Do not position clamp at housing circumference.*

2. Remove the three screws and take the cover off of the coupling.



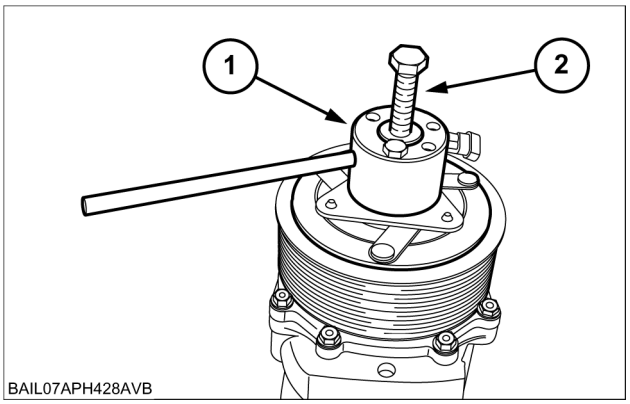
BAIL07APH427AVA 1

3. Attach the special tool (211-153/1, 211-153/2) to secure the front plate. Unscrew the locknut from the drive shaft.



BAIL07APH428AVC 2

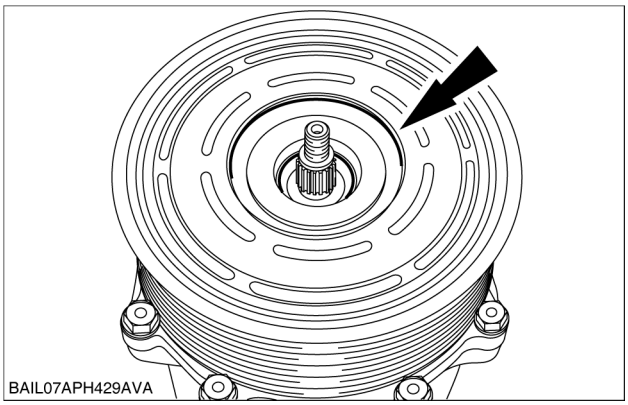
4. Place the special tool (211-153/6) onto the end of the drive shaft.
Fit special tool **(2)** (211-153/3, 211-153/4) inside special tool **(1)** (211-153/1) and pull off the front plate.



BAIL07APH428AVB 3

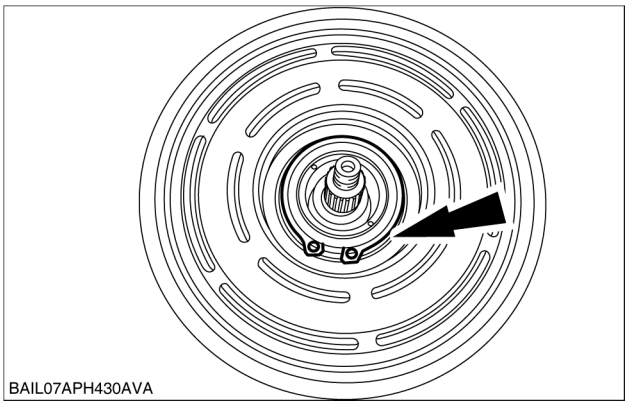
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5. Remove and dispose of the dust protection ring for the bearing.



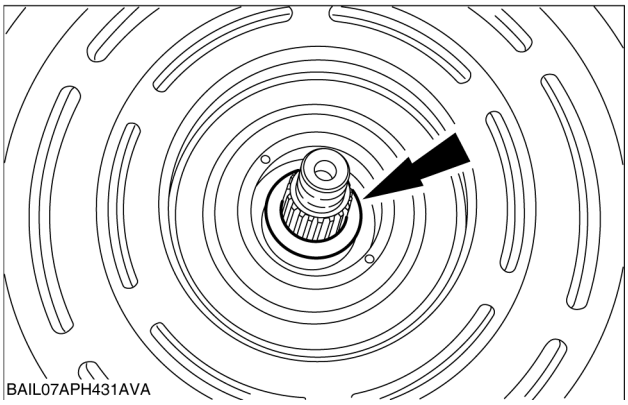
BAIL07APH429AVA 4

6. Remove belt pulley bearing's circlip.



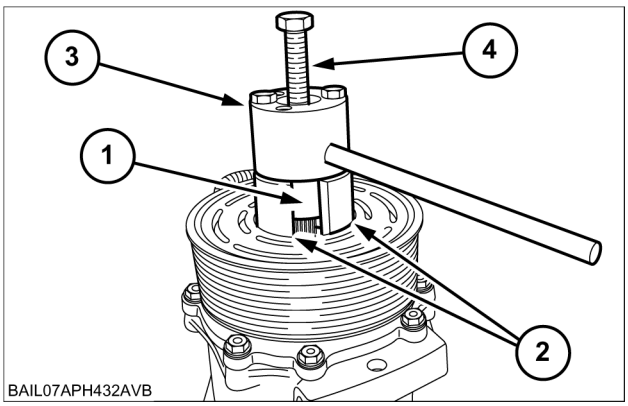
BAIL07APH430AVA 5

7. Remove the adjusting shims.



BAIL07APH431AVA 6

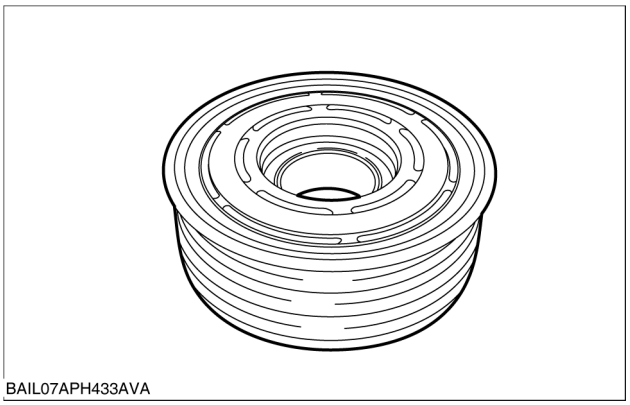
8. Place the special tool **(1)**(211-153/6) onto the end of the drive shaft.
Place the belt pulley chuck tool **(2)** (211-153/5) inside the groove.
Mount the pullers **(3)** (211-153/1, 211-153/2) and **(4)** (211-153/3, 211-153/4).
Pull off the coupling's belt pulley.



BAIL07APH432AVB 7

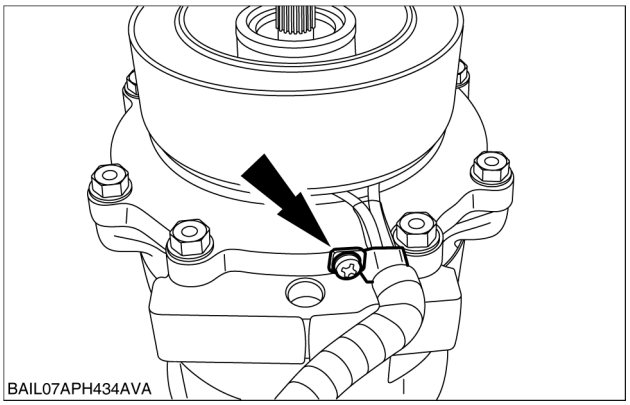
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9. Check the belt pulley bearing for wear and replace if needed.



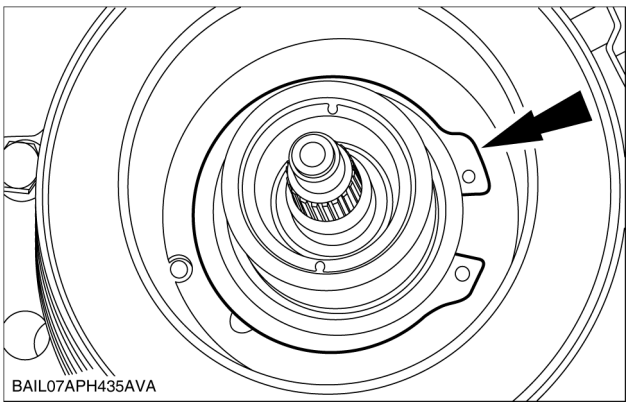
BAIL07APH433AVA 8

10. Remove cable clamp.



BAIL07APH434AVA 9

11. Remove circlip and remove exciter winding.



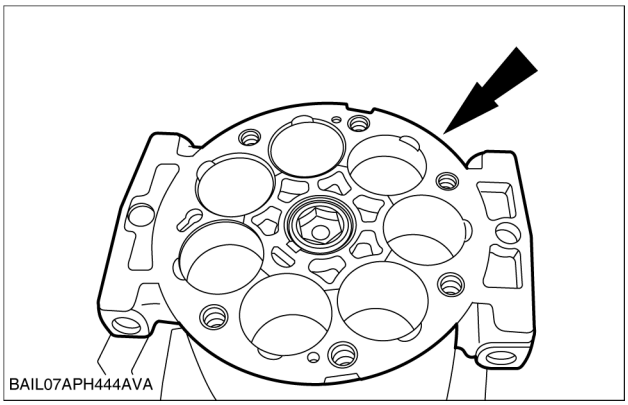
BAIL07APH435AVA 10

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Compressor Cylinder head - Assemble

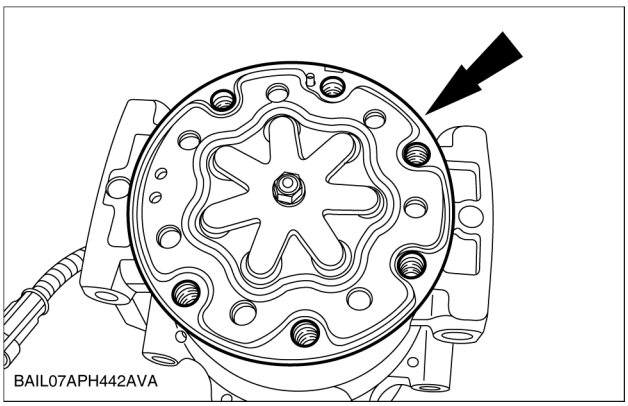
Prior operation:
Compressor Cylinder head - Disassemble (E.40.D)

1. Clean the cylinder block using a lint-free cloth.



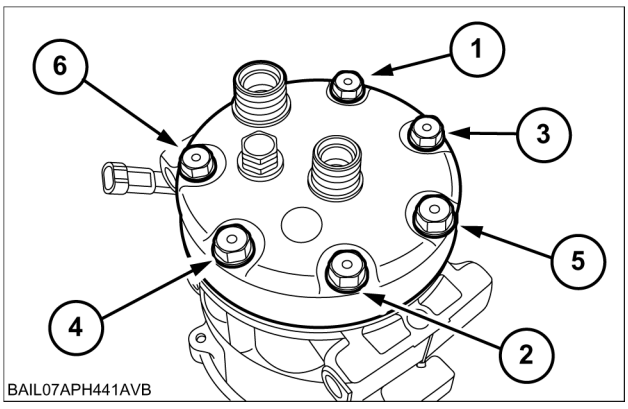
BAIL07APH444AVA 1

2. Spray new seals with fresh refrigerator oil and fit to plate valve.
3. When fitting the plate valve ensure that the dowel pins are seated correctly in the cylinder block.



BAIL07APH442AVA 2

4. Insert the cylinder head screws and tighten in the sequence pictured. First tighten the screws to **20 Nm** (**14 lbf.ft**) and then to the final torque of **32 Nm** (**24 lbf.ft**).
.



BAIL07APH441AVB 3

Next operation:
Compressor - Install (E.40.D)

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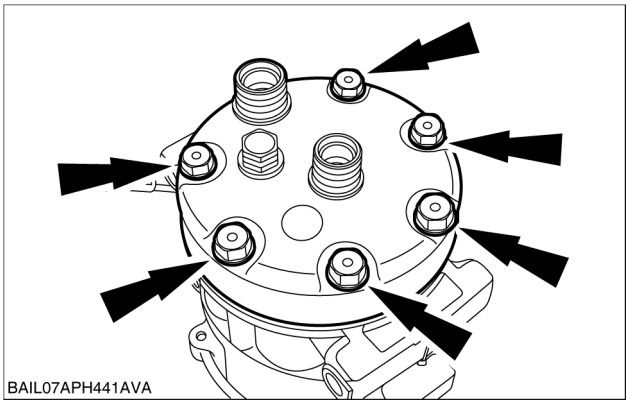
Compressor Cylinder head - Disassemble

Prior operation:
Compressor - Remove (E.40.D)

1. Clamp the compressor into a vice with protective jaws.

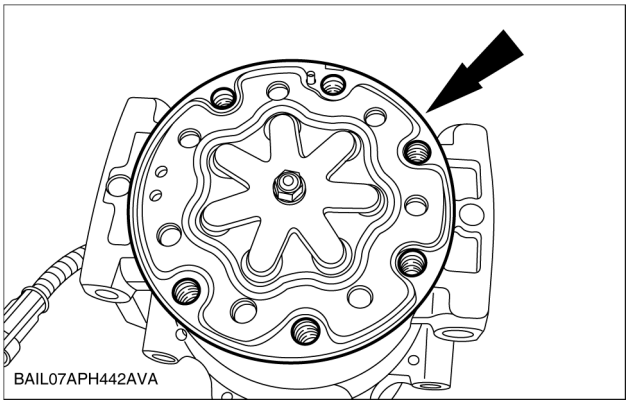
NOTE: *Do not position clamp at housing circumference.*

2. Remove the cylinder head screws. Remove the cylinder head.



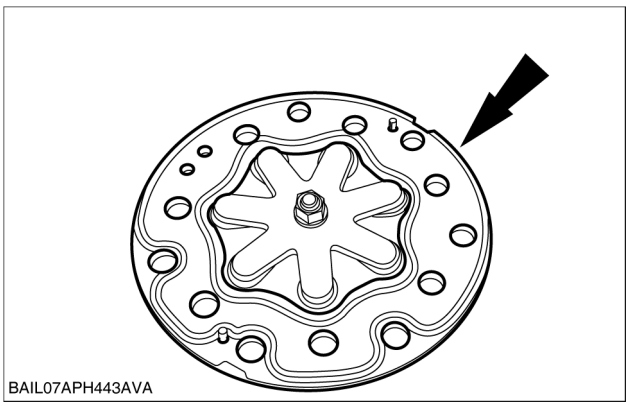
BAIL07APH441AVA 1

3. Remove the plate valve from the cylinder block and check for damage.



BAIL07APH442AVA 2

4. Remove the seals from the plate valve.



BAIL07APH443AVA 3

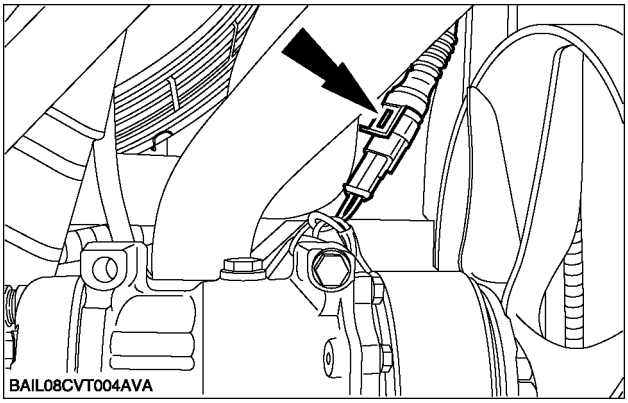
Next operation:
Compressor Cylinder head - Assemble (E.40.D)

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Compressor - Remove

Prior operation:
Discharge the air conditioning system, for further information refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Discharging (E.40.D)**
Prior operation:
Remove the air conditioning drive belt, for further information refer to **Fan and drive Belt - Remove (B.50.A)**

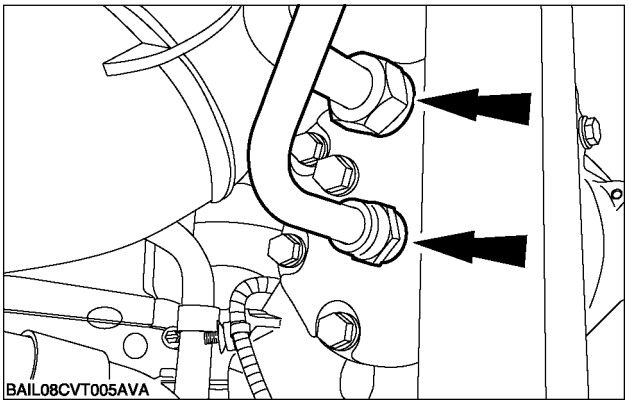
1. Disconnect the compressor electrical connector.



BAIL08CVT004AVA 1

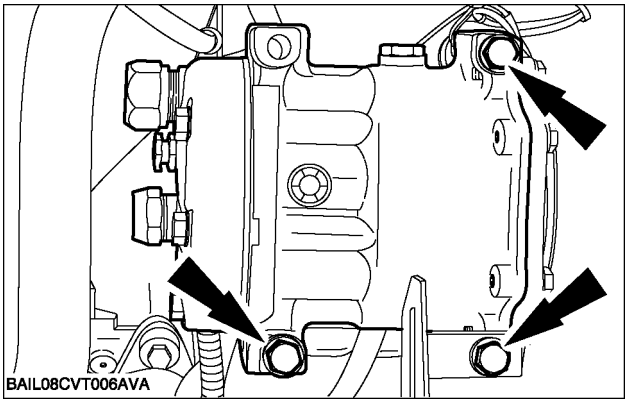
2. Disconnect the compressor supply and return pipes.

NOTE: *Cap and plug all fittings to prevent any dirt entering the system.*



BAIL08CVT005AVA 2

3. Remove the compressor.

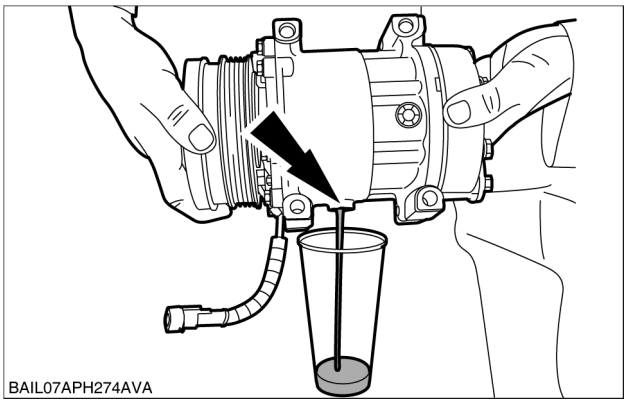


BAIL08CVT006AVA 3

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4. Drain the refrigerant oil from the compressor into a clean calibrated container. Measure and record the quantity of oil as this information is required during installation.

NOTE: *It is necessary to rotate the compressor drive shaft several times to completely expel all the oil.*



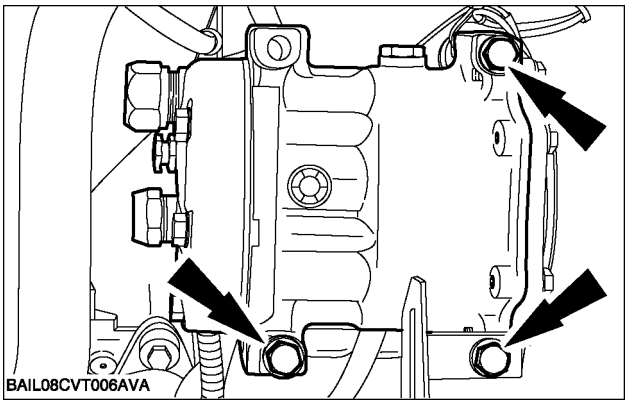
BAIL07APH274AVA 4

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Compressor - Install

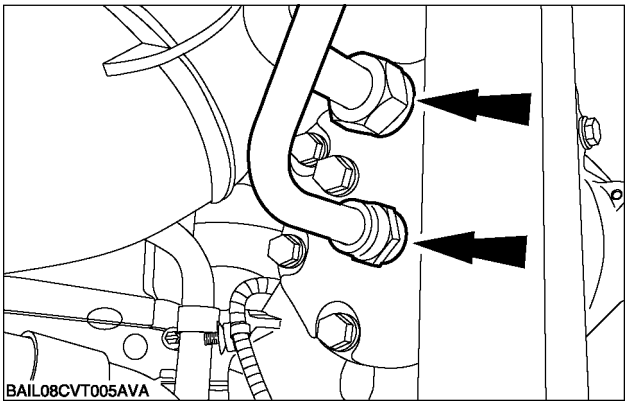
Prior operation:
Refill the compressor with new oil, for further information refer to **Compressor - Filling (E.40.D)**

1. Install the compressor.
   Tighten to **40 - 51 Nm** (**29 - 38 lbf.ft**).



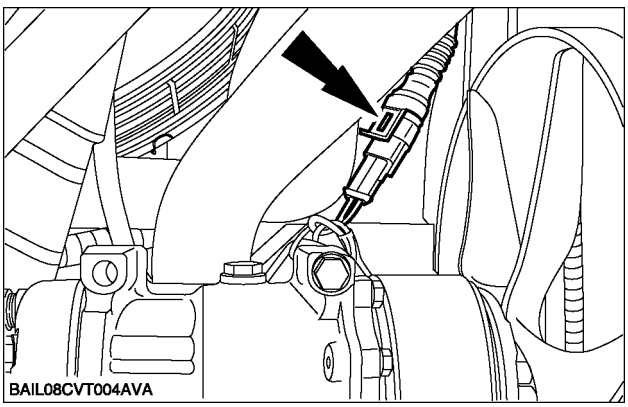
BAIL08CVT006AVA 1

2. Connect the compressor supply and return pipes.



BAIL08CVT005AVA 2

3. Connect the compressor electrical connector.



BAIL08CVT004AVA 3

4. Install the air conditioning drive belt, for further information refer to **Fan and drive Belt - Install (B.50.A)**.
5. Evacuate and recharge the air conditioning system, for further information refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Evacuate (E.40.D) ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Charging (E.40.D)**

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6. After charging an air conditioning system, use the following start up procedure to make sure that the lubricating oil is properly dispersed around the system:
   Make sure that the air conditioning is switched OFF.
   Start the engine and bring the speed down to idle.
   Turn the air conditioning ON and allow the system to operate for at least five minutes before increasing engine speed.

NOTE: *It is recommended that a new receiver/drier assembly is installed after any system component replacement or any repair that requires entry into the system.*

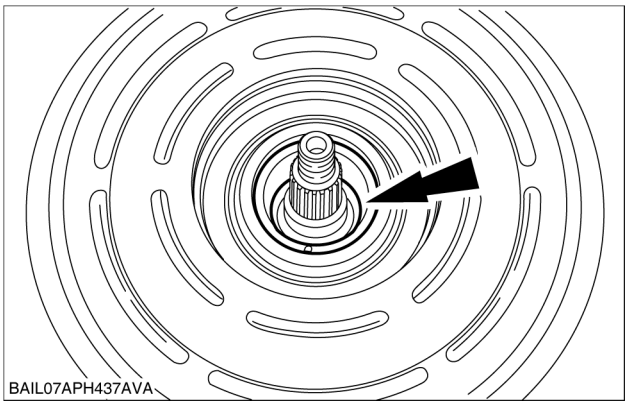
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Compressor Shaft seal - Remove

380000333 Air conditioning compressor toolkit

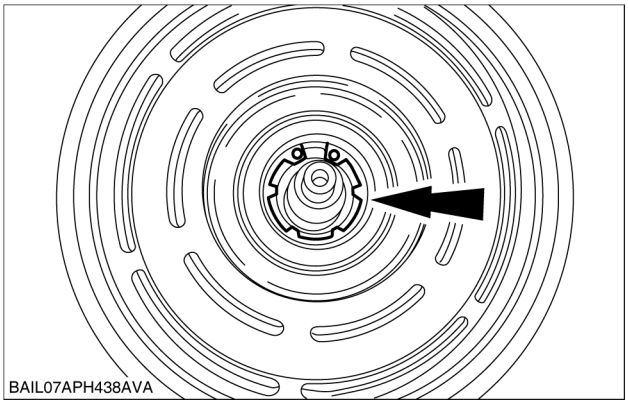
Prior operation:
Compressor - Remove (E.40.D)
Compressor Magnetic clutch - Disassemble (E.40.D) Step 1 to step 5

1. Remove and dispose of the felt ring.



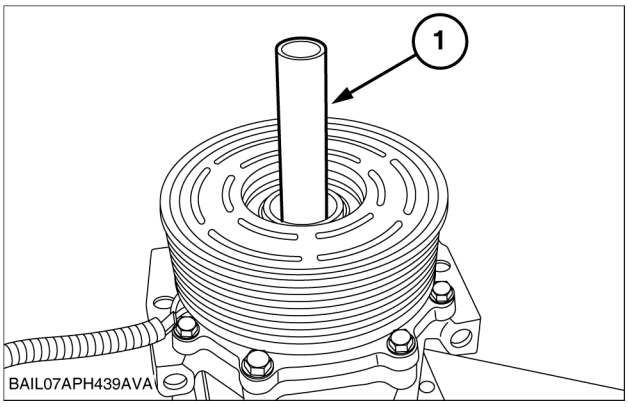
BAIL07APH437AVA 1

2. Remove sealing ring circlip.



BAIL07APH438AVA 2

3. Mount the assembly/disassembly tool for sealing rings **(1)** (211-154); remove and dispose of the sealing ring.



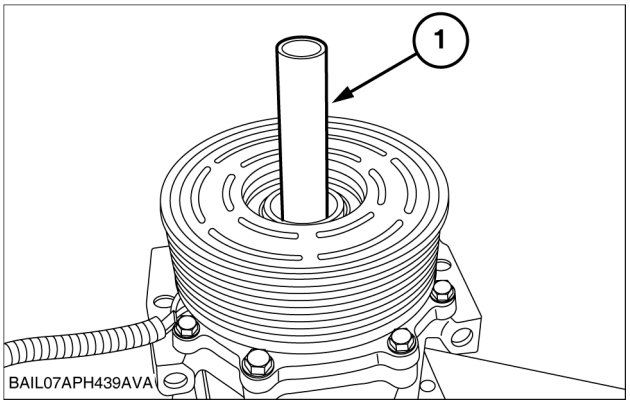
BAIL07APH439AVA 3

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Compressor Shaft seal - Install

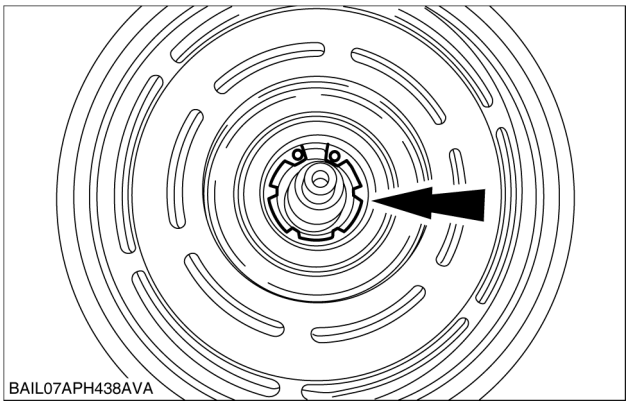
Prior operation:
Compressor Shaft seal - Remove (E.40.D)

1. Thoroughly clean seal groove in hub. A lint-free cloth must be used.
2. Spray a new sealing ring with fresh refrigerator oil. Use the assembly/disassembly tool for sealing rings **(1)** (211-154) to fit the new sealing ring.



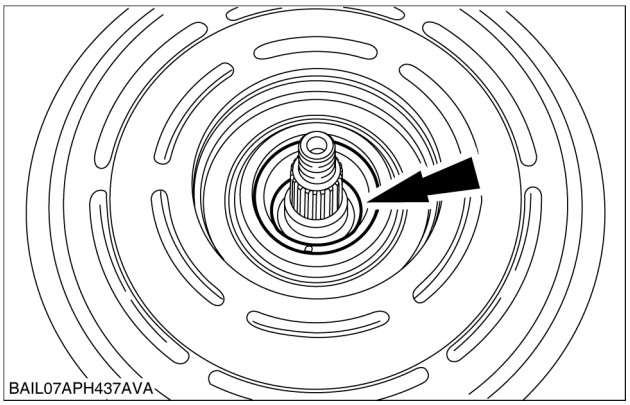
BAIL07APH439AVA 1

3. Fit sealing ring circlip.



BAIL07APH438AVA 2

4. Insert a new felt ring.



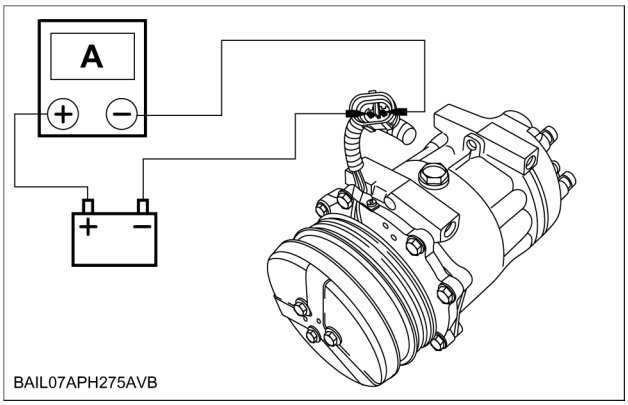
BAIL07APH437AVA 3

Next operation:
Compressor Magnetic clutch - Assemble (E.40.D) Step 5 to step 10
Compressor - Install (E.40.D)

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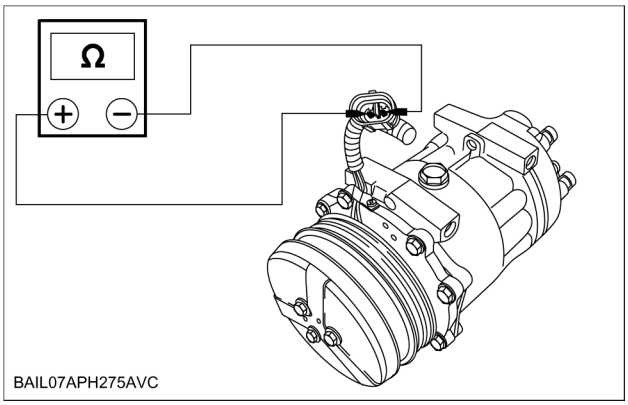
Compressor - Visual inspection

1. Rotate the compressor shaft. Use a suitable socket on the hub centre bolt or by hand using the rubber dampers.
   Using a **12 volt** battery check current drawn by the field coil which should be between **3.6 - 4.2 Amps**. Very high current readings indicate a short circuit in the field coil and no current readings indicate an open circuit. Replace coil with either fault.



BAIL07APH275AVB 1

2. Resistance of the coil using an ohmmeter should be approximately **3.0 ohms** at **20 °C**.



BAIL07APH275AVC 2

3. Make sure the clutch is disengaged and rotate the pulley by hand. If roughness in the bearing is felt, it will be necessary to replace the pulley and bearing as an assembly.

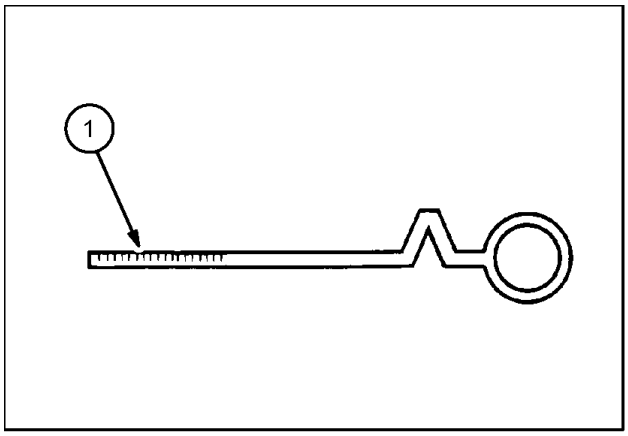
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Compressor - Filling

The oil level of the air conditioning compressor must be checked after removing a component of the air conditioner or if a leaky spot is suspected.
Use the following process to check that the correct level of oil has been filled.

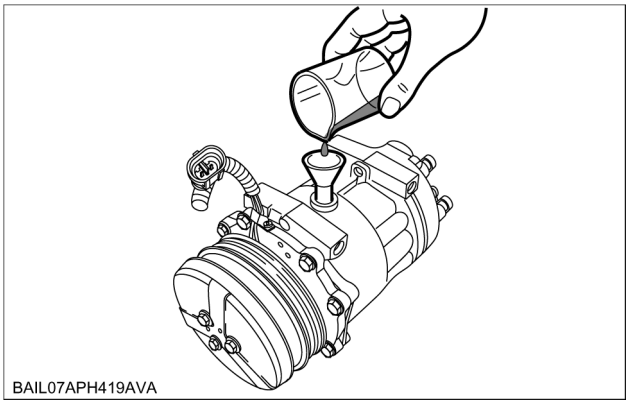
1. Start the engine and leave to idle. Switch on the air conditioner and let air conditioning compressor run for 10 minutes.
   Siphon the refrigerant out of the equipment - see **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Discharging (E.40.D)**.

2. Carefully remove the oil filling plug. Turn the cap nut of the fitting to allow the oil dip stick **(1)** that is provided in the parts set **380000333** to be completely inserted.
   Pull out the dip stick and count the notches that have been touched by oil. The oil level is sufficient if 5 - 7 notches are wet.
   Top up oil at the filling closure or siphon off oil until the specified level has been reached.
   Ensure that the filling opening and the filling closure sealing ring are totally clean and undamaged. Then screw in the screw plug again. Tighten to **15 - 25 Nm** (**11 - 18 lbf.ft**).



1b0o2004061087 1

3. Oil is contained in the components of the air conditioner.
   After replacing system components, oil must be added to the system to compensate for the amount of oil that was removed with the components.
   Some typical oil levels for the individual parts are provided in the table below. It is however recommended as a rule to measure the oil level as described above to have an exact level for installing new components.



BAIL07APH419AVA 2

Item	Typical oil level	
Evaporator	2.0 fl.oz.	**60 cm³**
Condenser	1.0 fl.oz.	**30 cm³**
Filter drier	0.5 fl.oz.	**15 cm³**
Hoses	0.3 fl.oz.	**10 cm³**

Next operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Evacuate (E.40.D)
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Charging (E.40.D)

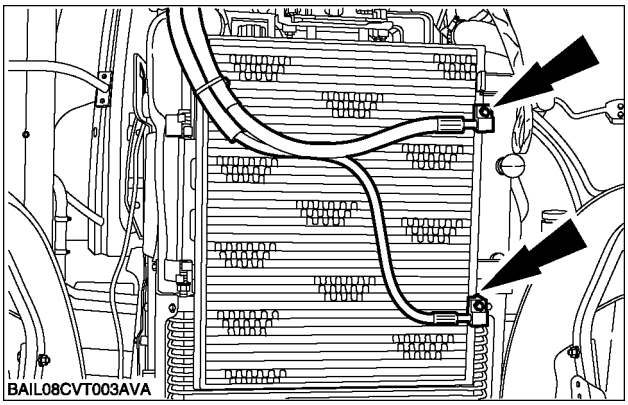
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Condenser - Remove

Prior operation:
Discharge the air conditioning system, for further information refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Discharging (E.40.D)**

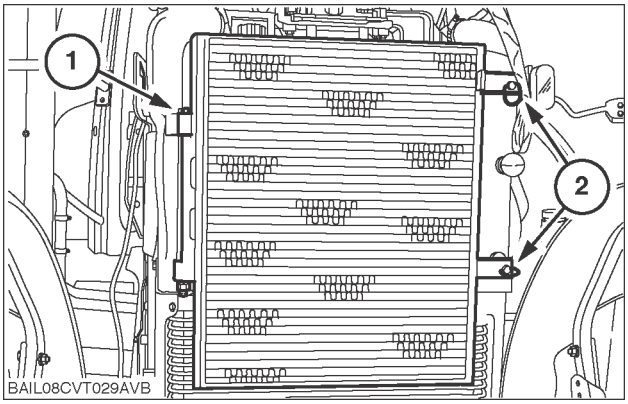
1. Disconnect the condenser supply and return hoses.

NOTE: *Cap and plug all fittings to prevent any dirt entering the system.*



BAIL08CVT003AVA 1

2. Remove the condenser pivot bolt **(1)**.
While supporting the condenser, release the catches and remove the condenser **(2)**.



BAIL08CVT029AVB 2

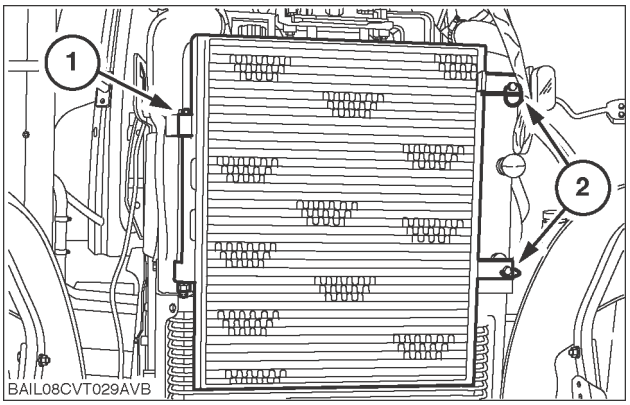
3. Inspect the condenser assembly fins for damage and blockages.
Check the condenser for signs of leakage. If the condenser is damaged or leaking, install a new condenser assembly.

4. If a new condenser is to be installed, drain the refrigerant oil from the condenser into a clean calibrated container. Measure the quantity of oil obtained and add the same quantity of new refrigerant oil directly into the new condenser, for further information refer to **Compressor - Filling (E.40.D)**

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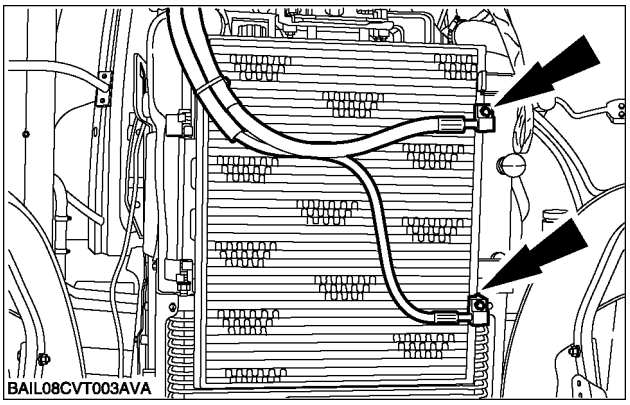
Condenser - Install

1. Position the condenser, secure with the pivot bolt **(1)** and lock the catches **(2)**.



BAIL08CVT029AVB 1

2. Connect the condenser supply and return hoses.



BAIL08CVT003AVA 2

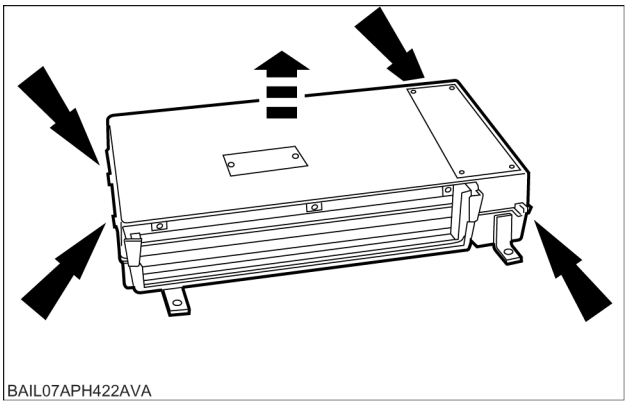
Next operation:
Evacuate and recharge the air conditioning system, for further information refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Evacuate (E.40.D) ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Charging (E.40.D)**

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Evaporator - Remove

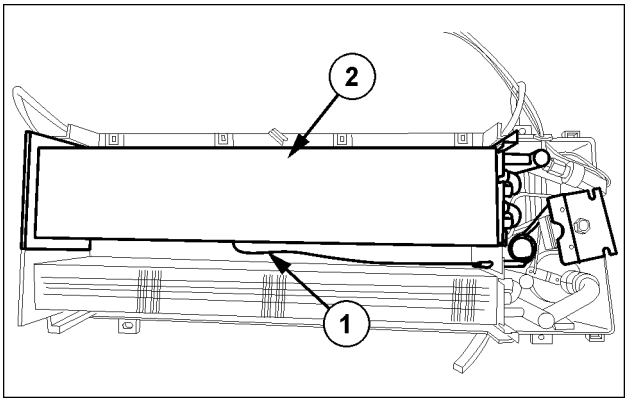
Prior operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Remove (Heating and air conditioning unit) (E.40.D)

1. Remove the retaining screws of the rear air duct; remove the air duct. Remove the four retaining clips on the housing and remove the upper part of the housing.



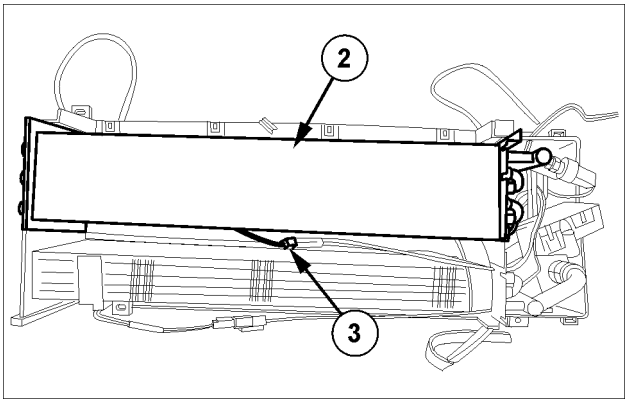
BAIL07APH422AVA 1

2. Standard air conditioner design:
Remove the evaporator temperature sensor **(1)**. Remove the evaporator **(2)**.



SS08D026 2

3. Automatic air conditioner (ATC) design:
Remove the evaporator temperature sensor **(3)**. Remove the evaporator **(2)**.



SS08D027 3

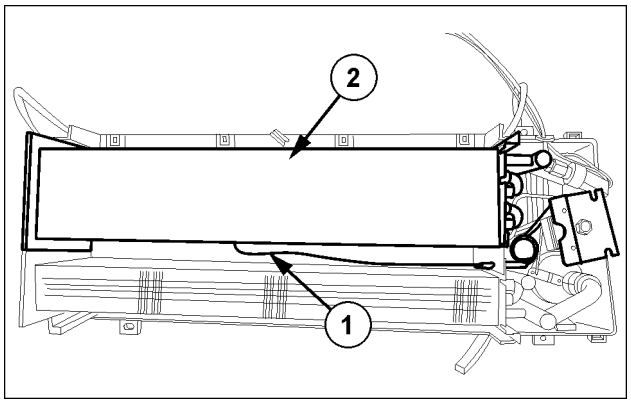
Next operation:
Evaporator - Install (E.40.D)

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Evaporator - Install

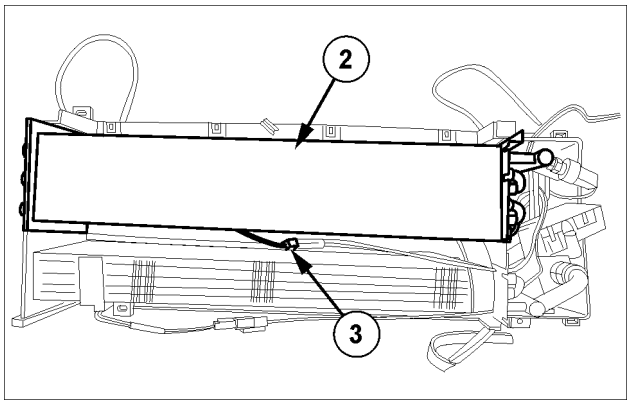
Prior operation:
Evaporator - Remove (E.40.D)

1. Standard air conditioner design:
   Install the evaporator **(2)**. Fit the evaporator temperature sensor **(1)**.



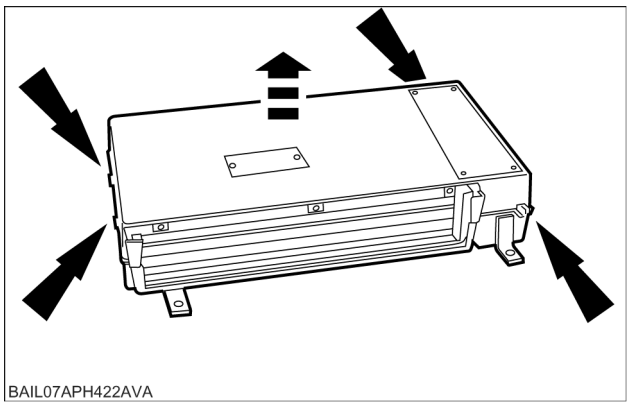
SS08D026 1

2. Automatic air conditioner (ATC) design:
   Install the evaporator **(2)**. Fit the evaporator temperature sensor **(3)**.



SS08D027 2

3. Fit the upper part of the housing.
   Attach the four retaining clips to the housing. Attach the rear air duct and screw in the retaining screws.



BAIL07APH422AVA 3

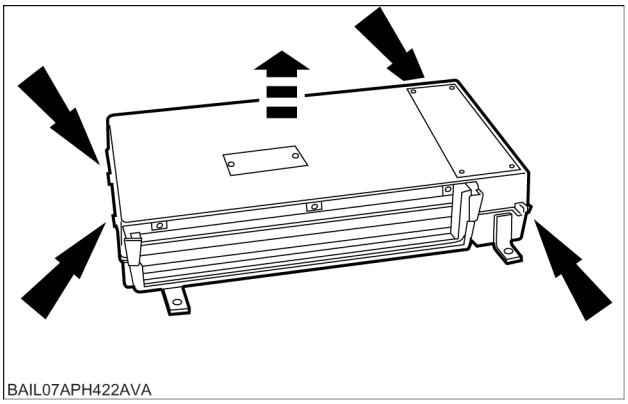
Next operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Install (Heating and air conditioning unit) (E.40.D)

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Expansion valve - Remove

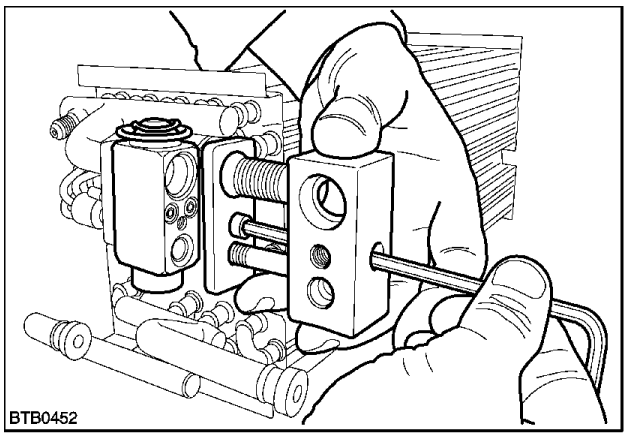
Prior operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Remove (E.40.D).

1. Remove the four spring clips on the housing and lift out the evaporator, to access the expansion valve.



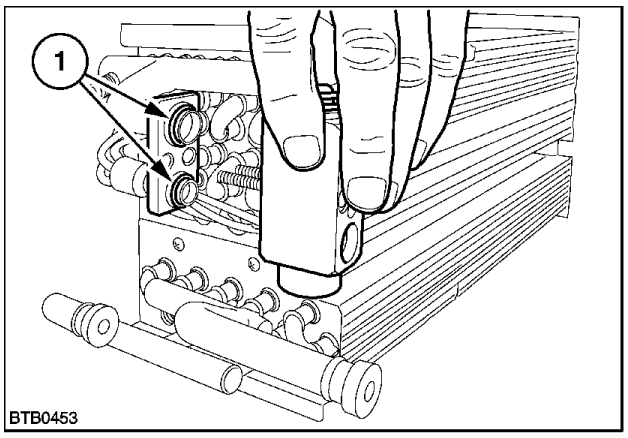
BAIL07APH422AVA 1

2. Remove the Allen screw securing the inlet/outlet connection to the expansion valve, and remove the inlet/outlet assembly.



BTB0452 2

3. Remove the expansion valve and remove the ‘O’ ring seals **(1)**.

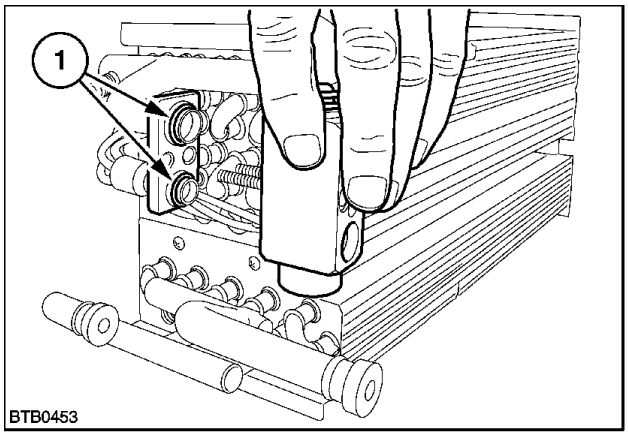


BTB0453 3

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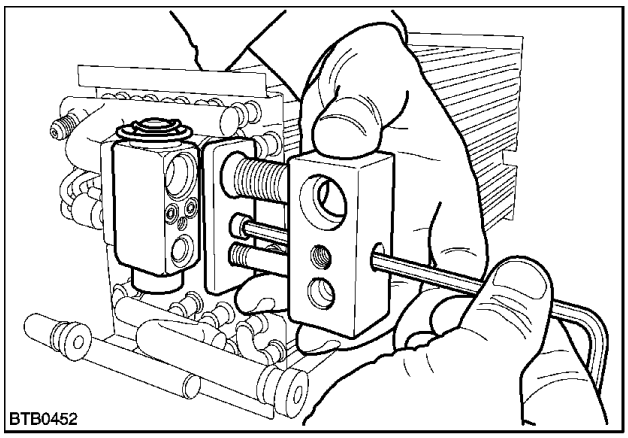
Expansion valve - Install

1. Install new 'O' ring seals **(1)**, lubricate with refrigerant oil and install the expansion valve.



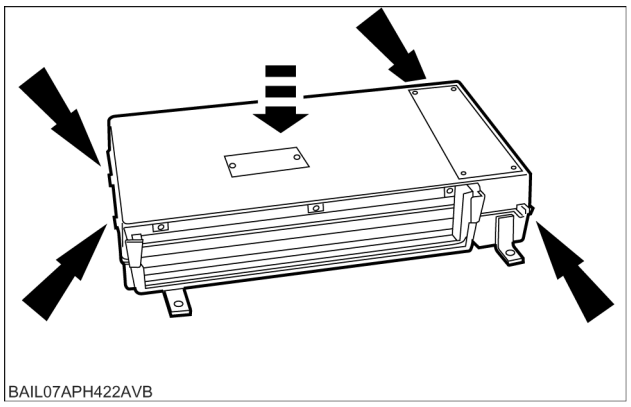
BTB0453 1

2. Install the Allen screw securing the inlet/outlet connection to the expansion valve.



BTB0452 2

3. Install the evaporator into its housing and install the four spring clips.



BAIL07APH422AVB 3

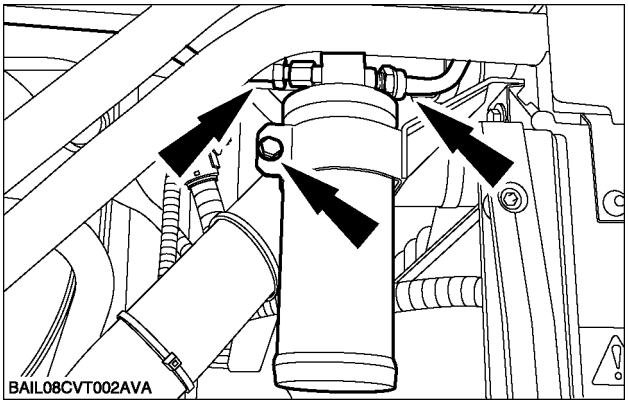
Next operation:
Install the evaporator into the vehicle, for further information refer to **Evaporator - Install (E.40.D)**
Next operation:
Evacuate and recharge the air conditioning system, for further information refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Evacuate (E.40.D) ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Charging (E.40.D)**

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Receiver/drier - Remove

The receiver/dryer, is not a serviceable item and must be replaced as an assembly. The receiver/dryer assembly should be replaced if it is suspected that moisture is in the system.
The receiver dryer must also be replaced if the system has been discharged and the air conditioning joints disconnected.

1. Discharge and reclaim refrigerant gas using certified recovery system, for further information refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Discharging (E.40.D)**
   Disconnect the hose fittings from the dryer and then release the clamp around the body of the drier and remove the drier from the tractor.

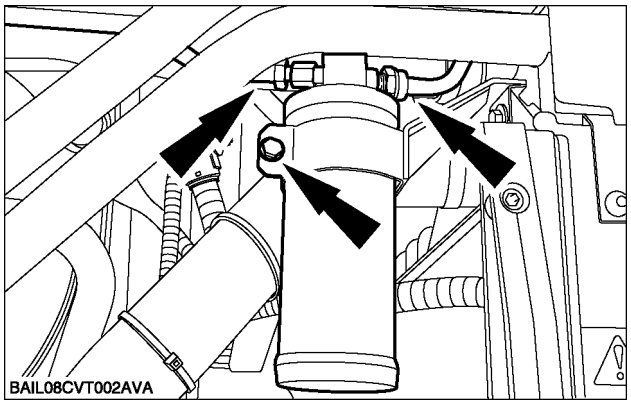


BAIL08CVT002AVA 1

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Receiver/drier - Install

1. Install the receiver/drier complete with the clamp and loosely secure to the engine. Connect the inlet and outlet pipes to the receiver/drier and tighten the pipe nuts.
   Tighten the clamp bolt.



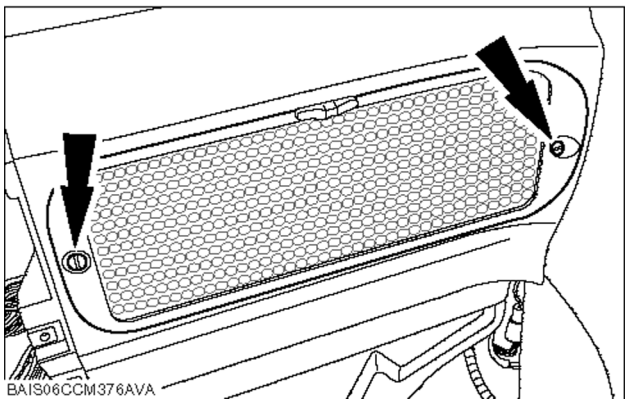
BAIL08CVT002AVA 1

Next operation:
Fill the compressor with the appropriate type and quantity of oil, for further information refer to **Compressor - Filling (E.40.D)**
Next operation:
Evacuate and recharge the air conditioning system, for further information refer to **ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Evacuate (E.40.D) ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Charging (E.40.D)**

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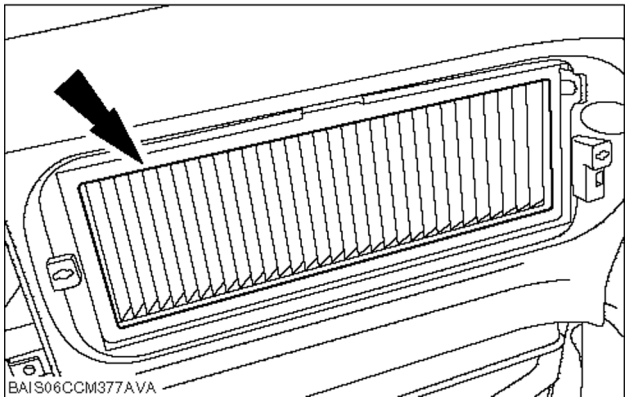
Ventilation system Motor - Remove

1. Remove the recirculation grill.



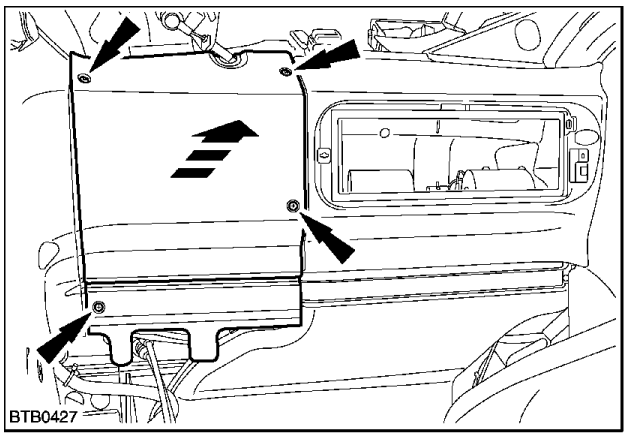
BAIS06CCM376AVA 1

2. Remove the recirculation filter element.



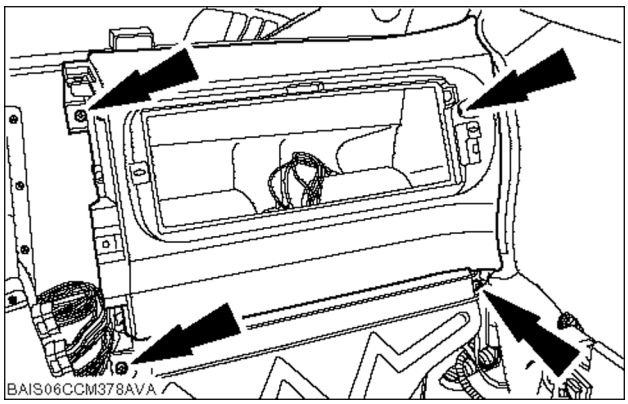
BAIS06CCM377AVA 2

3. Remove rear module cover beside blower housing.



BTB0427 3

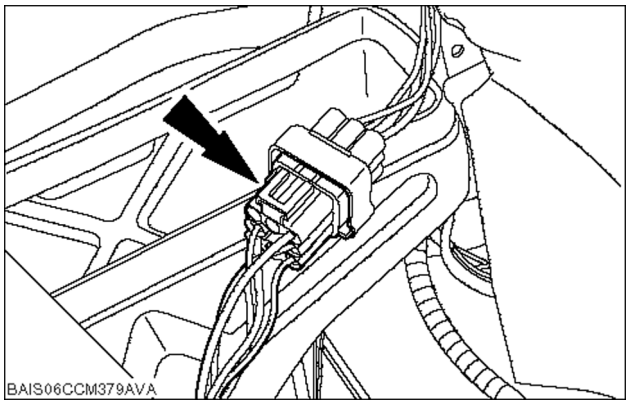
4. Remove the blower housing retaining screws.



BAIS06CCM378AVA 4

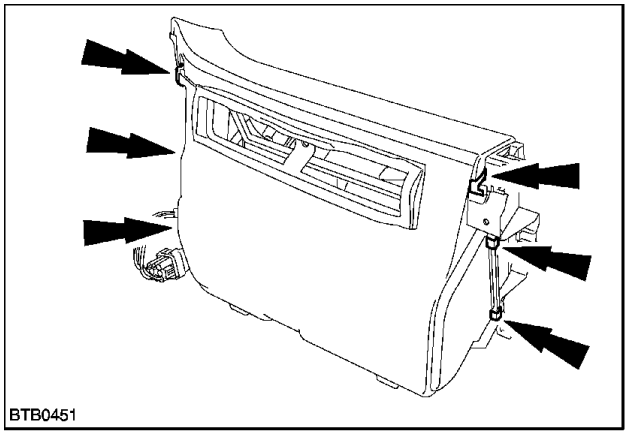
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5. Disconnect the blower motor electrical connector. Remove the blower motor housing.



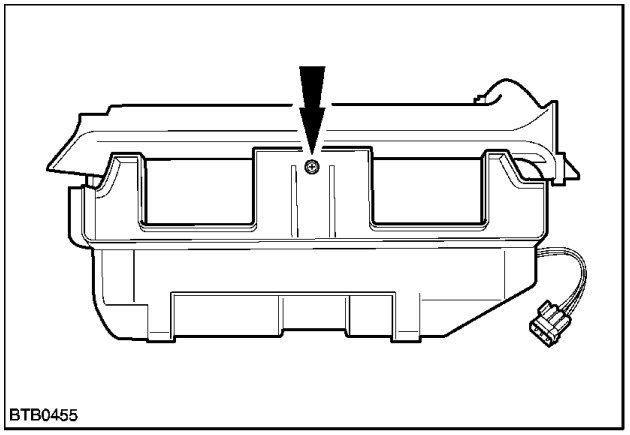
BAIS06CCM379AVA 5

6. To Gain access to the blower motor, remove the 6 spring clips that hold the 2 halves of the blower housing together.



BTB0451 6

7. Remove the blower securing screw, slide the blower out of the housing.

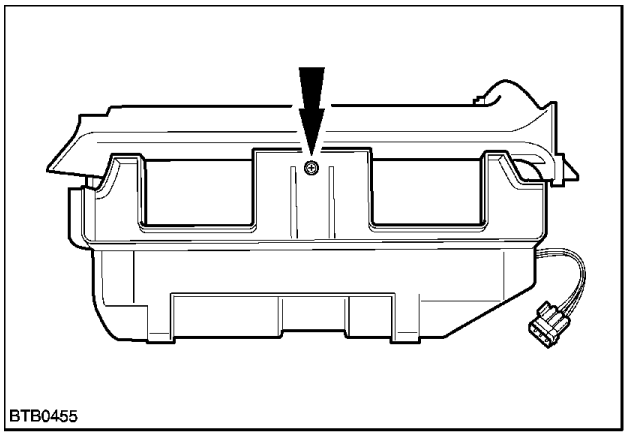


BTB0455 7

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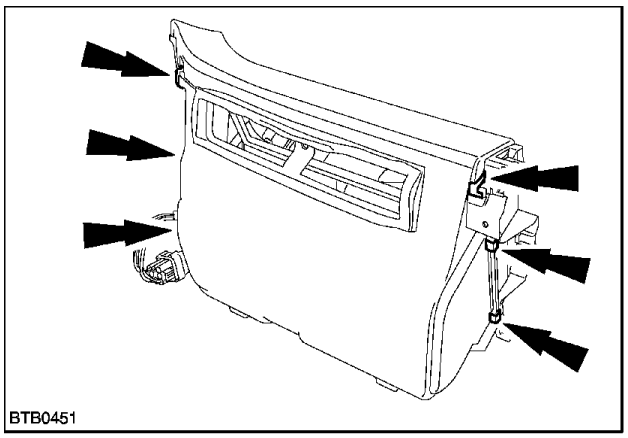
Ventilation system Motor - Install

1. Install the blower into the rear blower motor housing half and secure with the securing screw.



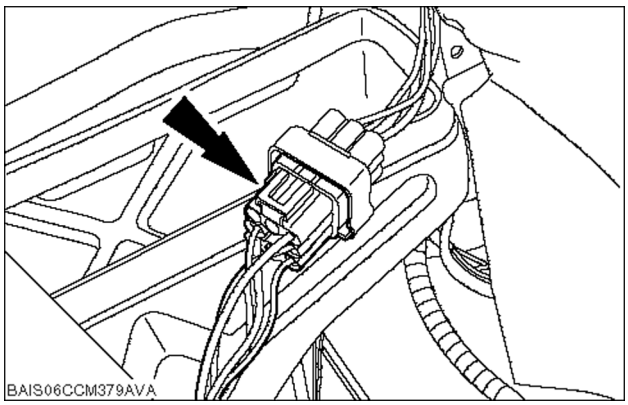
BTB0455 1

2. Assemble the two halves of the blower motor housing and secure with the 6 spring clips.



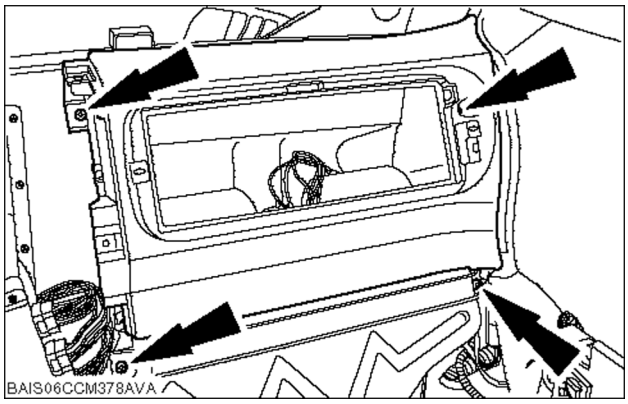
BTB0451 2

3. Connect the blower motor electrical connector and install the blower motor housing.



BAIS06CCM379AVA 3

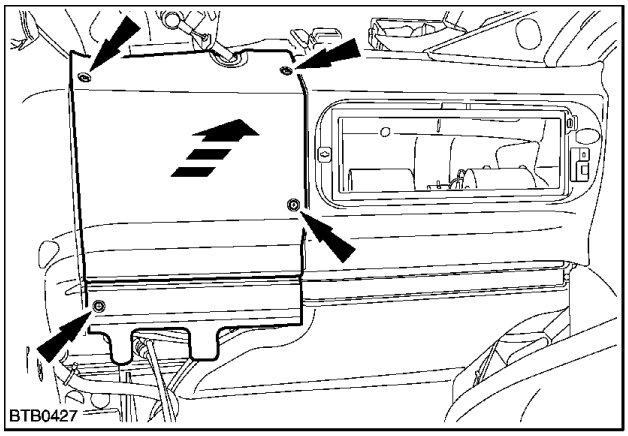
4. Install the blower housing retaining screws.



BAIS06CCM378AVA 4

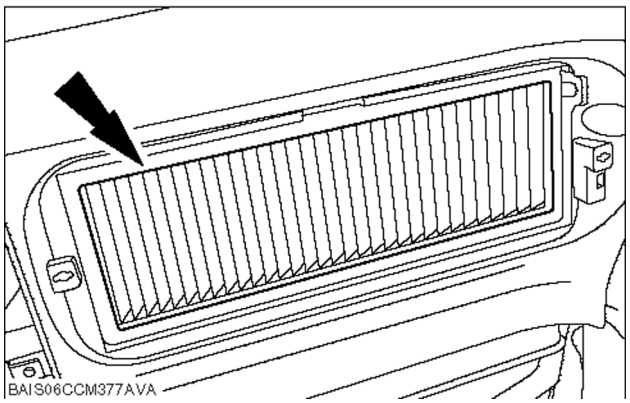
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5. Install the rear module cover beside blower housing.



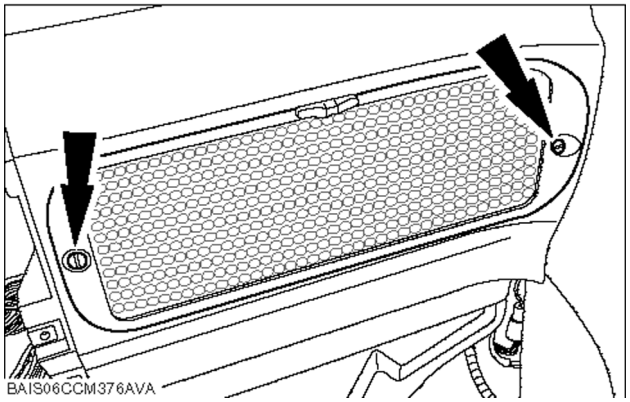
BTB0427 5

6. Install the recirculation filter element.



BAIS06CCM377AVA 6

7. Install the recirculation grill and secure with the two securing screws.



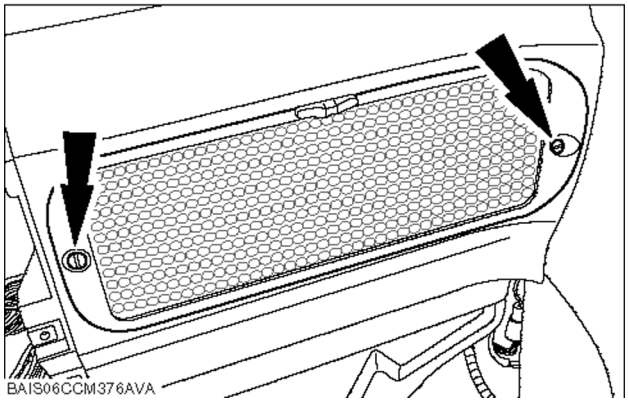
BAIS06CCM376AVA 7

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Ventilation system Blower speed drive - Replace (Voltage divider)

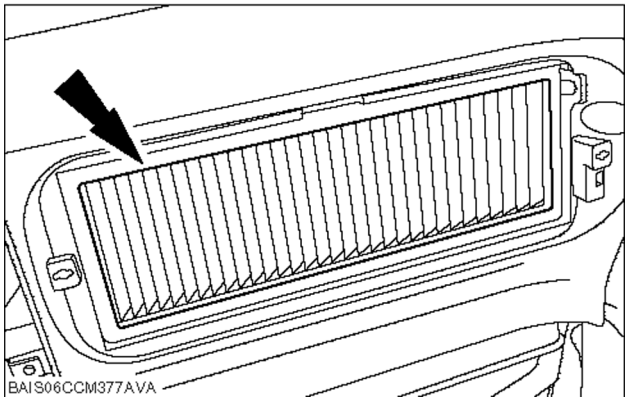
Removal

1. Turn the starter switch to the “OFF” position. Remove the air circulation grating.



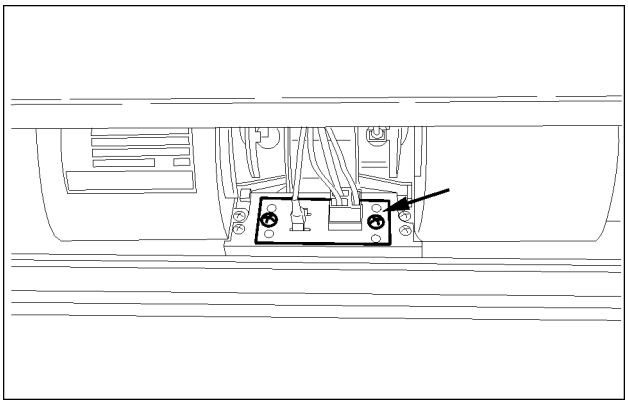
BAIS06CCM376AVA 1

2. Remove the air circulation filter element.



BAIS06CCM377AVA 2

3. Unscrew the retaining screws, disconnect the connector and remove the voltage divider.

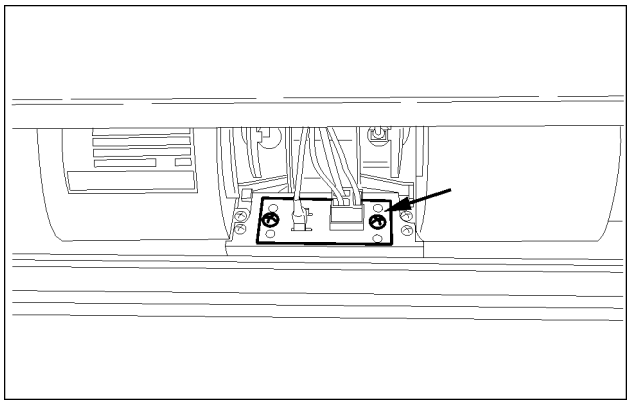


SS08D014 3

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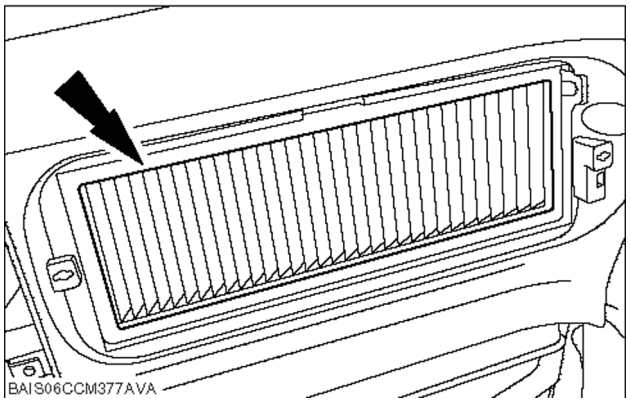
Assembly

4. Fit the voltage divider.
   Tighten the retaining screws and connect the connector.



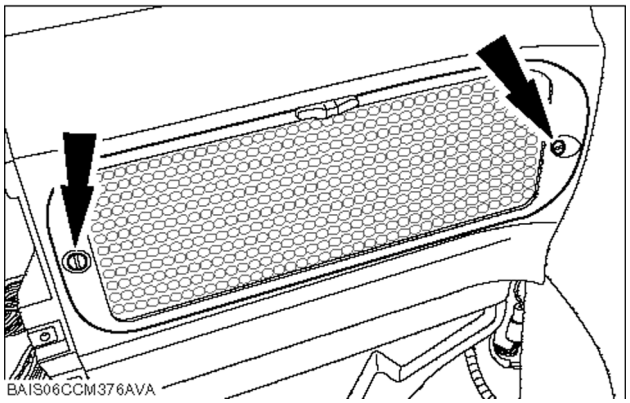
SS08D014 4

5. Insert the air circulation filter element again.



BAIS06CCM377AVA 5

6. Re-fit the air circulation grating.



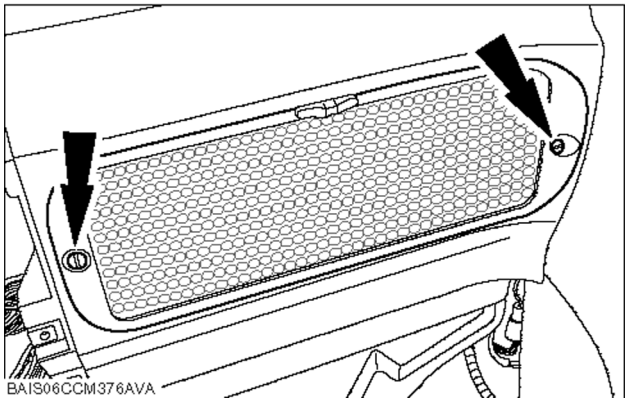
BAIS06CCM376AVA 6

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Ventilation system Blower speed drive - Replace (Voltage regulator)

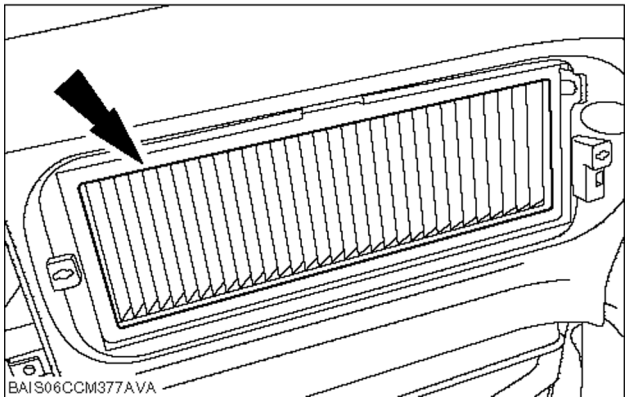
Removal

1. Turn the starter switch to the “OFF” position. Remove the air circulation grating.



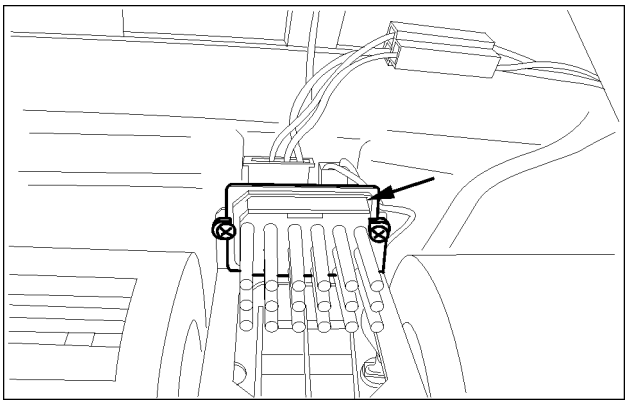
BAIS06CCM376AVA 1

2. Remove the air circulation filter element.



BAIS06CCM377AVA 2

3. Unscrew the retaining screws, disconnect the connector and remove the voltage regulator.

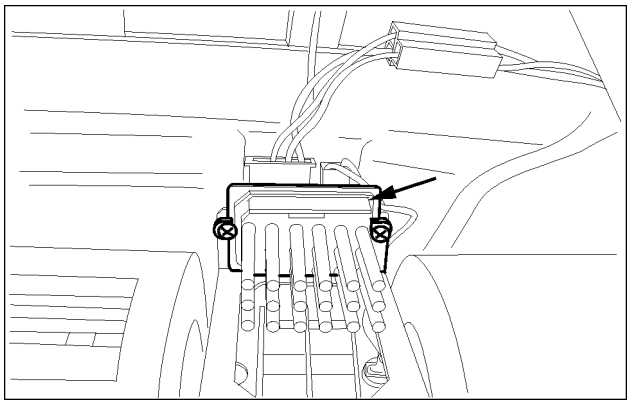


SS08D015 3

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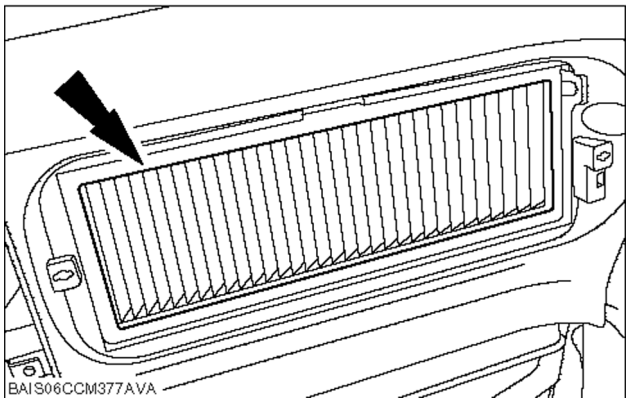
Assembly

4. Fit the voltage regulator.
   Tighten the retaining screws and connect the connector.



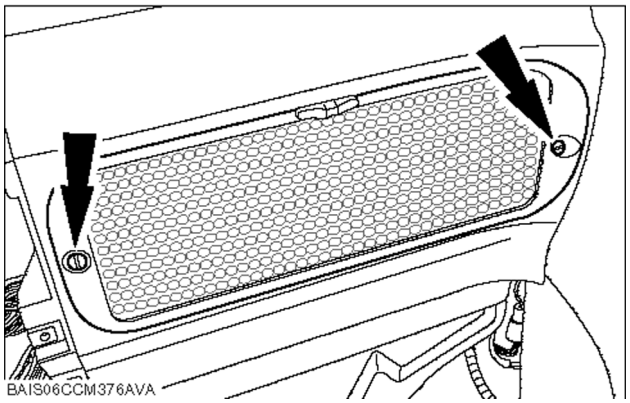
SS08D015 4

5. Insert the air circulation filter element again.



BAIS06CCM377AVA 5

6. Re-fit the air circulation grating.

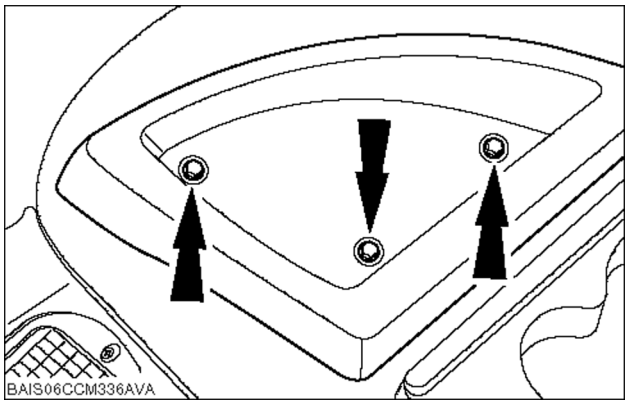


BAIS06CCM376AVA 6

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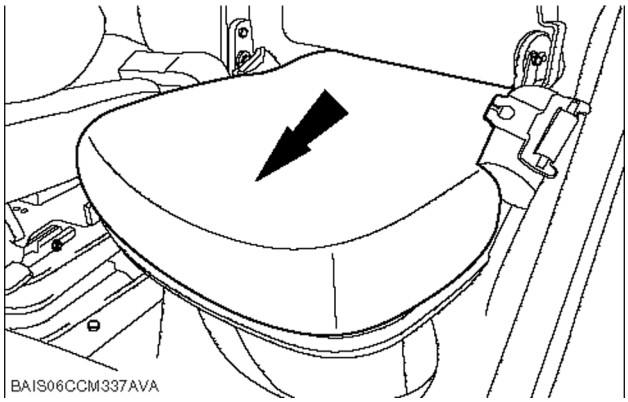
Electronic HVAC control - Remove

1. Remove the left-hand utility console.



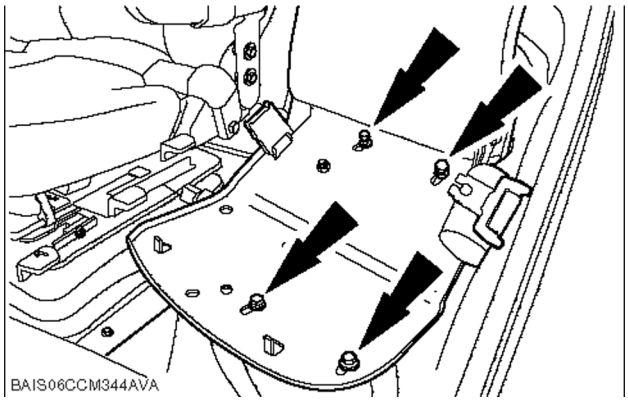
BAIS06CCM336AVA 1

2. Remove the instructor's seat base cushion.



BAIS06CCM337AVA 2

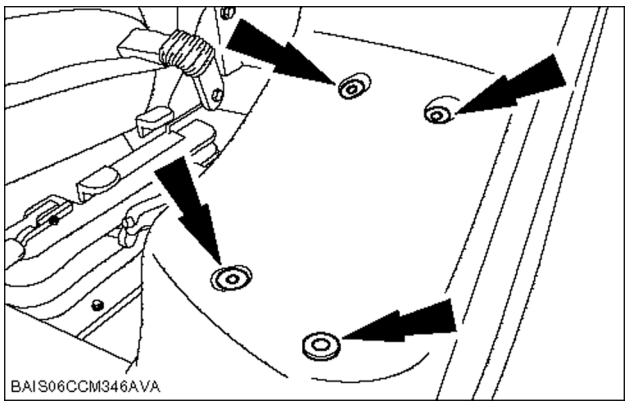
3. Remove the instructor's seat.



BAIS06CCM344AVA 3

4. Remove the instructor's seat mounting spacers.

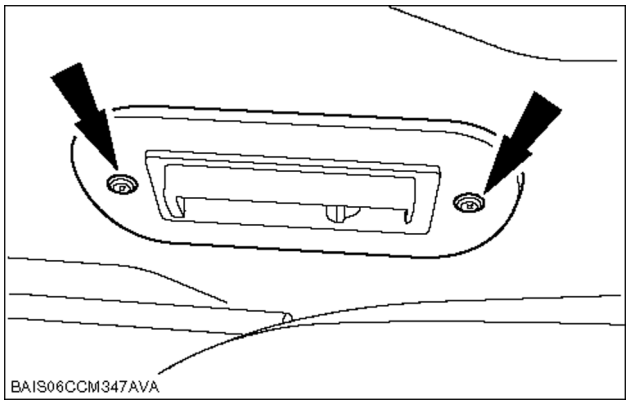
NOTE: *Make a note of the position of the spacers as they vary in thickness.*



BAIS06CCM346AVA 4

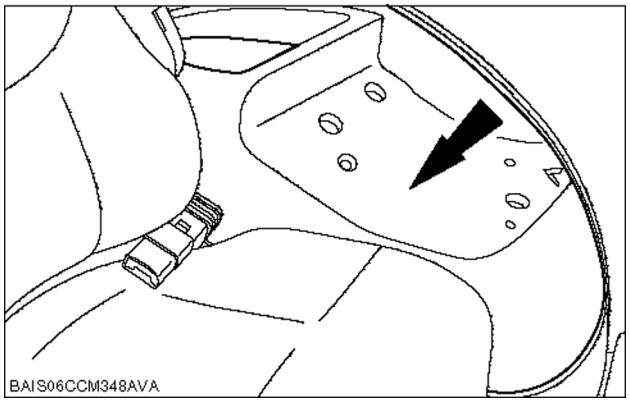
www.truck-freeworkshop.com

5. Remove the left hand air vent.



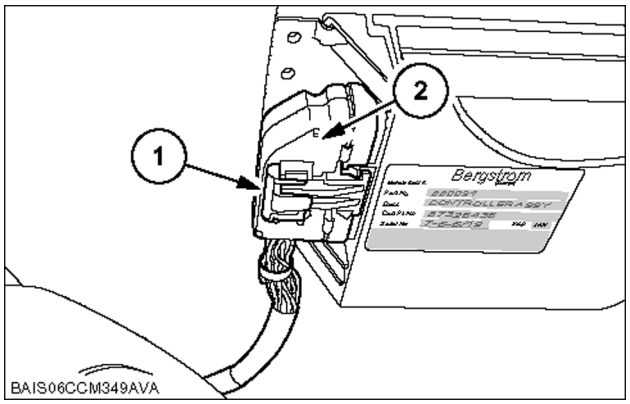
BAIS06CCM347AVA 5

6. Remove the left hand side trim.



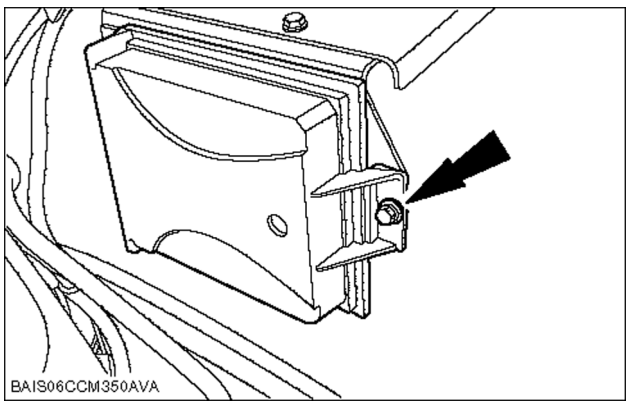
BAIS06CCM348AVA 6

7. Remove the electrical connector locking tang **(1)** and disconnect the electrical connector **(2)**.



BAIS06CCM349AVA 7

8. Remove the HVAC climate control unit.

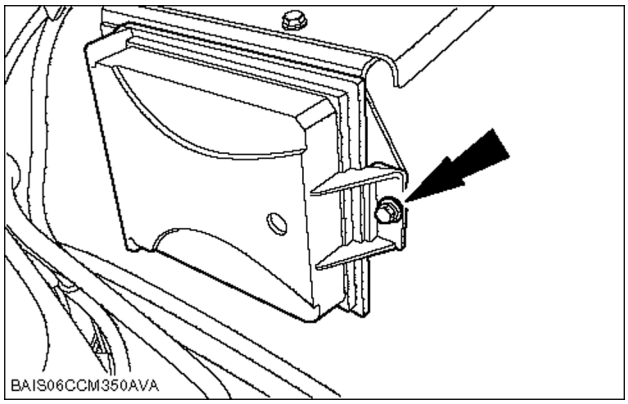


BAIS06CCM350AVA 8

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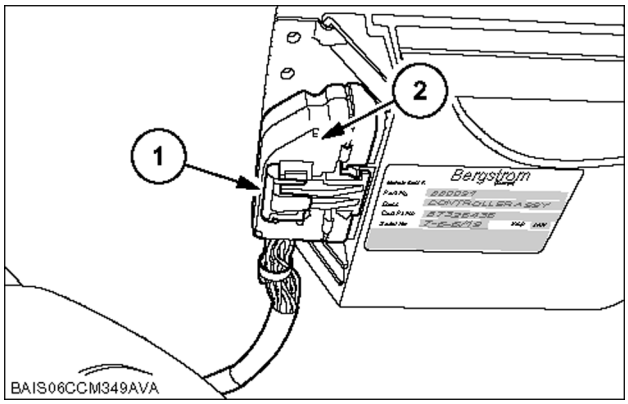
Electronic HVAC control - Install

1. Install the HVAC climate control unit.



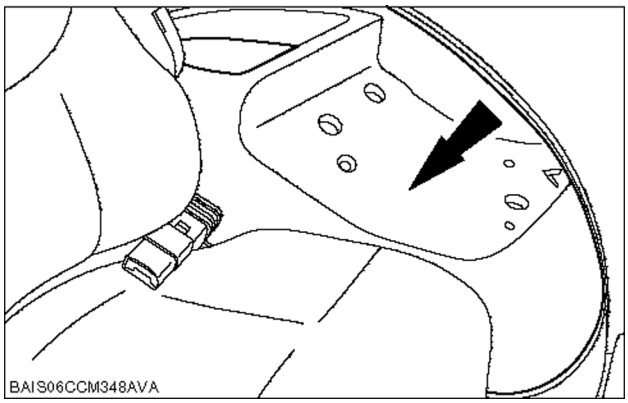
BAIS06CCM350AVA 1

2. Connect the electrical connector **(2)** and install the locking tang **(1)**.



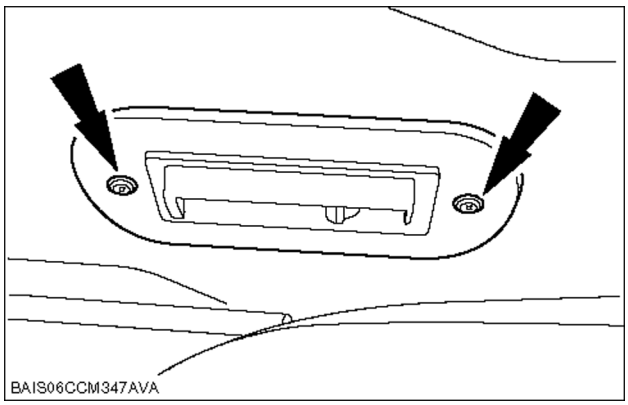
BAIS06CCM349AVA 2

3. Install the left hand side trim.



BAIS06CCM348AVA 3

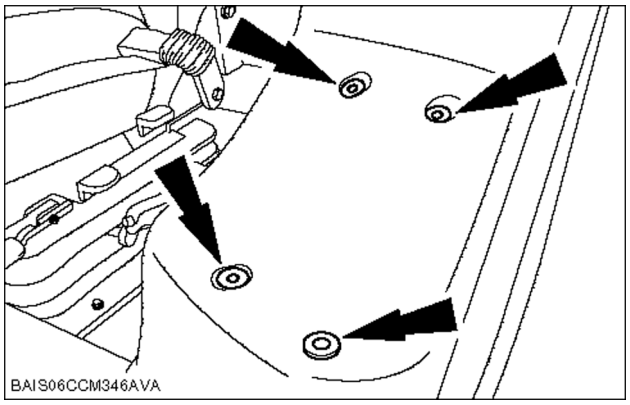
4. Install the left hand air vent.



BAIS06CCM347AVA 4

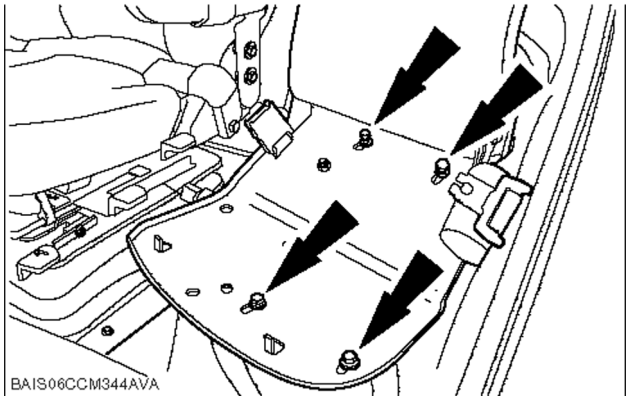
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5. Insert the instructor’s seat mounting spacers.



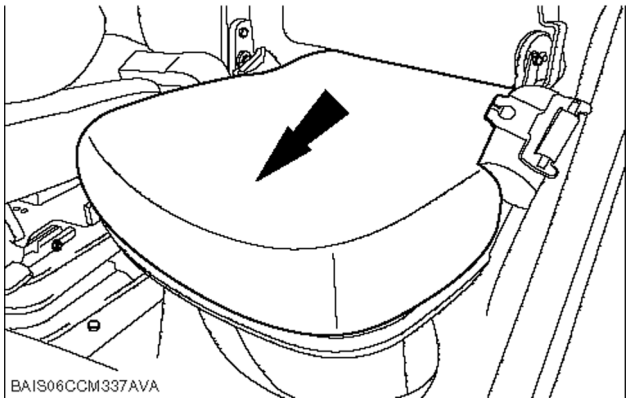
BAIS06CCM346AVA 5

6. Install the instructor’s seat.



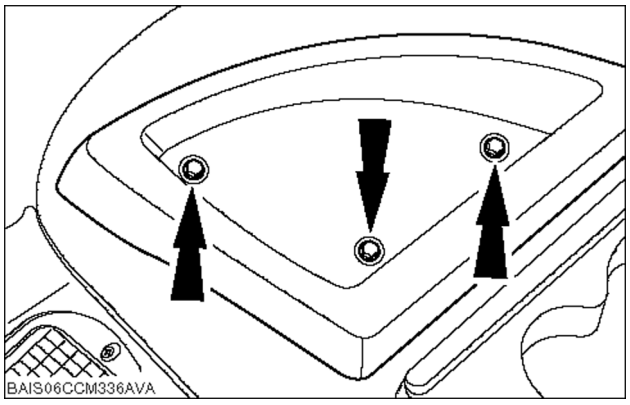
BAIS06CCM344AVA 6

7. Install the instructor’s seat base cushion.



BAIS06CCM337AVA 7

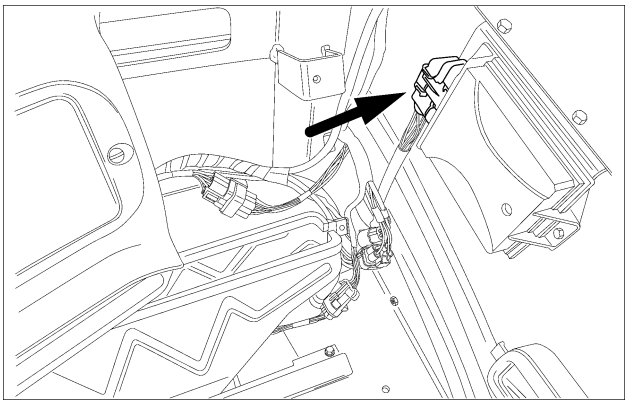
8. Install the left-hand utility console.



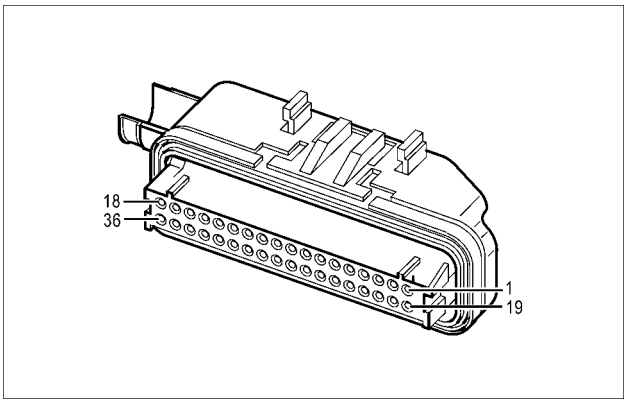
BAIS06CCM336AVA 8

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Electronic HVAC control - Electrical test



SS08F003 1



SS08F004 2

BEHIND THE CAB SIDE COVERING ON THE LEFT

Pin	Description	Function		Normal Signal	Notes
1	CAN Low	Provides CAN communication to the vehicle		**2,3 V**	
2	CAN High			**2,6 V**	
3	Water Valve Signal	Provides control signal to water valve	Full Cold (LO)	**11,2 V**	Blower switch in position "0, A, I, II, III"
			Middle (**74 °F**)	**4,6 V**	Blower switch in position "A, I, II, III"
			Full Hot (HI)	**2,1 V**	
4	Actuator Power Water Valve	Provides feed back from actuator power supply		V bat	
5	Blower Signal	Output to the Blower Control Module	Speed switch "0"	**11 V**	constant
			Speed switch "A"	**6 - 1,1 V**	variable
			Speed switch "I"	**5,8 V**	constant
			Speed switch "II"	**3,7 V**	
			Speed switch "III"	**1,1 V**	
6	Power supply from relay	Provides feed back from actuator current power	V bat	V bat	
15	Clutch Relay	Output to drive AC Clutch relay	"ON"	V bat	
			"OFF"	**0 V**	
17	Battery (+)	Input Power from vehicle	V bat	V bat	
18	Ground	Input Ground from vehicle	Ground		
21	Cabin Temperature	Input from Cabin Temperature Sensor	**0 °C**	**~ 3,87 V**	**9399 Ω ± 2,5 %**
			15 °C	**~ 3,09 V**	**4441 Ω ± 2,5 %**
			20 °C	**~ 2,81 V**	**3511 Ω ± 2,5 %**
			30 °C	**~ 2,25 V**	**2240 Ω ± 2,5 %**
22	Outlet Temperature	Input from Outlet Temperature Sensor	**0 °C**	**~ 3,56 V**	**13,06 k Ω ± 2,5 %**
			15 °C	**~ 2,64 V**	**6,28 k Ω ± 2,5 %**
			20 °C	**~ 2,32 V**	**4,99 k Ω ± 2,5 %**
			30 °C	**~ 1,76 V**	**3,22 k Ω ± 2,5 %**
23	Evaporator Temperature	Input from Evaporator Temperature Sensor	**0 °C**	**~ 3,43 V**	**66 k Ω ± 2,5 %**
			15 °C	**~ 2,51 V**	**30,7 k Ω ± 2,5 %**
			20 °C	**~ 2,20 V**	**23,7 k Ω ± 2,5 %**
			30 °C	**~ 1,72 V**	**15,7 k Ω ± 2,5 %**
24	Outside Temperature	Input from Outside Temperature Sensor	**0 °C**	**~ 3,56 V**	**13,06 k Ω ± 2,5 %**
			15 °C	**~ 2,64 V**	**6,28 k Ω ± 2,5 %**
			20 °C	**~ 2,32 V**	**4,99 k Ω ± 2,5 %**
			30 °C	**~ 1,76 V**	**3,22 k Ω ± 2,5 %**
25	Manual/Defrost	Input from Max Defrost Switch	Selected	V bat	
			Otherwise	**0,4 V**	

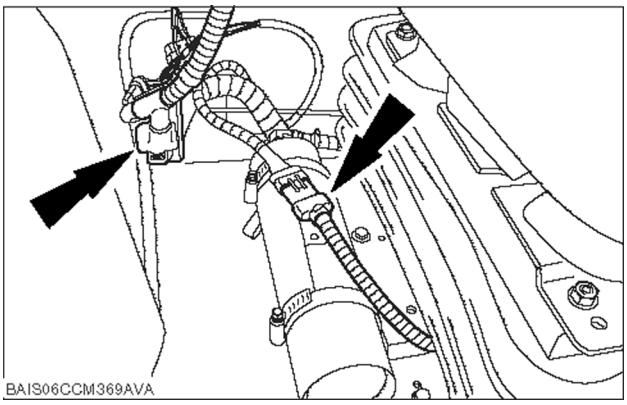
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Pin	Description	Function		Normal Signal	Notes
26	Econ	Input from Econ Switch	Selected	V bat	
			Otherwise	**0,4 V**	
27	Blower Auto	Auto Position of Blower Switch	Selected	**0,2 V**	
			Otherwise	**5 V**	
28	Blower Low "I"	Low Position of Blower Switch "I"	Selected	**0,2 V**	
			Otherwise	**5 V**	
29	Temperature Set potentiometer	Input from Temperature Set point Pot	Low **15 °C**	**0,25 V**	**10 k Ω ± 10 %**
			Med **25 °C** (**74 °F**)	**2,27 V**	
			High **32 °C**	**3,17 V**	
30	Blower Medium "II"	Medium Position of Blower Switch "II"	Selected	**0,2 V**	
			Otherwise	**5 V**	
31	Blower High "III"	High Position of Blower Switch "III"	Selected	**0,2 V**	
			Otherwise	**5 V**	
33	High Pressure (+)	(+) Input from High Pressure Switch	Closed	**2,8 V**	
			Open	**3,1 V**	
34	High Pressure (-)	(-) Input from High Pressure Switch	Closed	**2,8 V**	
			Open	**2,5 V**	
35	Low Pressure (+)	(+) Input from Low Pressure Switch	Closed	**2,8 V**	
			Open	**3,1 V**	
36	Low Pressure (-)	(-) Input from Low Pressure Switch	Closed	**2,8 V**	
			Open	**2,5 V**	

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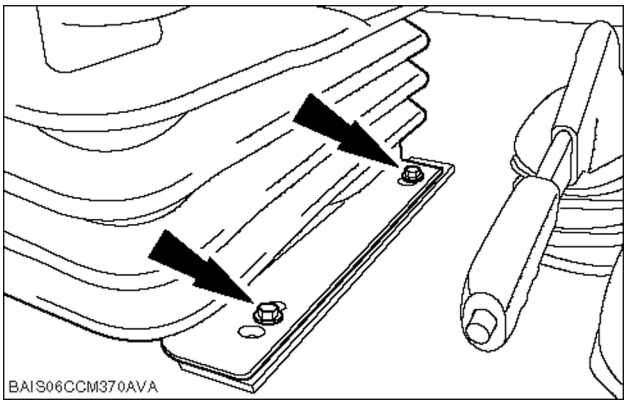
Sensing system Low pressure switch - Remove

1. Disconnect the operators seat electrical connectors.



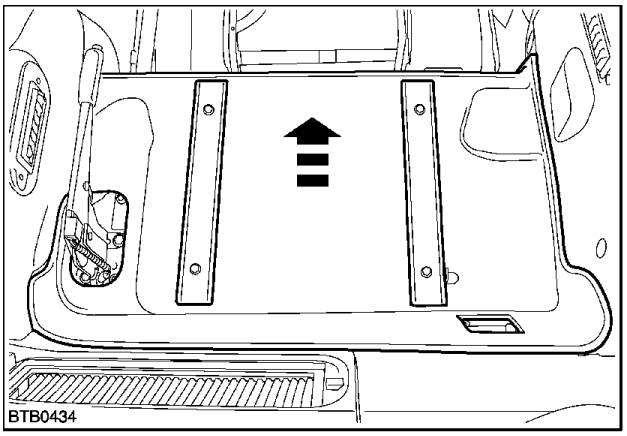
BAIS06CCM369AVA 1

2. Loosen the operators seat retaining bolts.
Remove the operators seat.



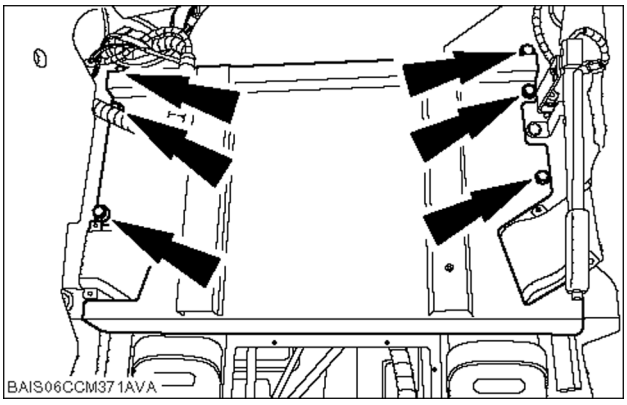
BAIS06CCM370AVA 2

3. Remove the cab floor mat to gain access to the rear floor plate.



BTB0434 3

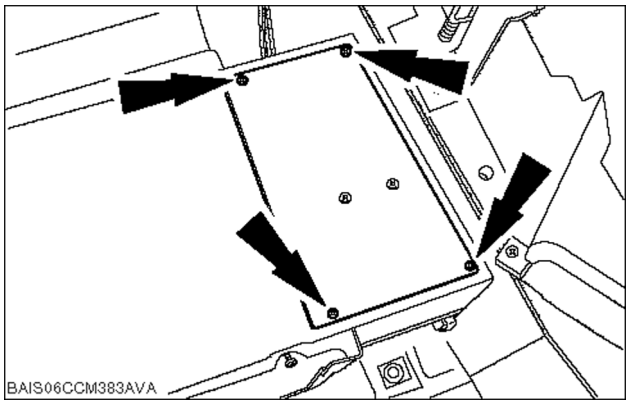
4. Remove the rear floor plate.



BAIS06CCM371AVA 4

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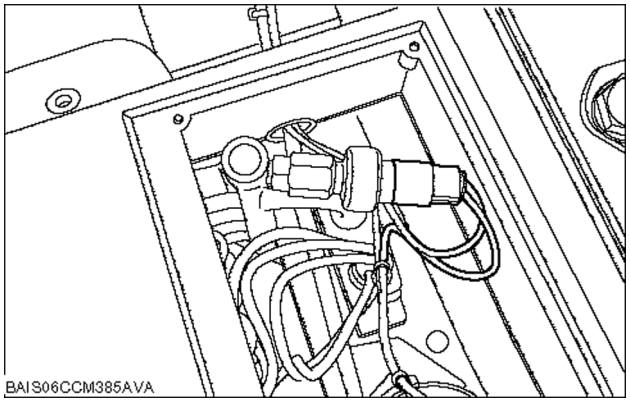
5. Remove the cover plate from the top of the HVAC unit.



BAIS06CCM383AVA 5

6. Disconnect the electrical connector and remove the low pressure switch.

NOTE: *There is no need to discharge the system as the connection is a self sealing Schraeder valve.*

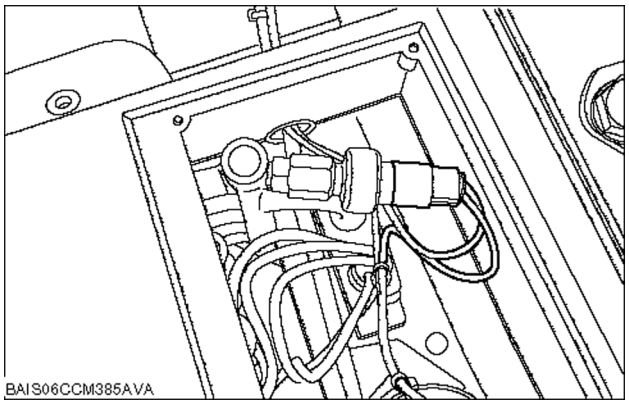


BAIS06CCM385AVA 6

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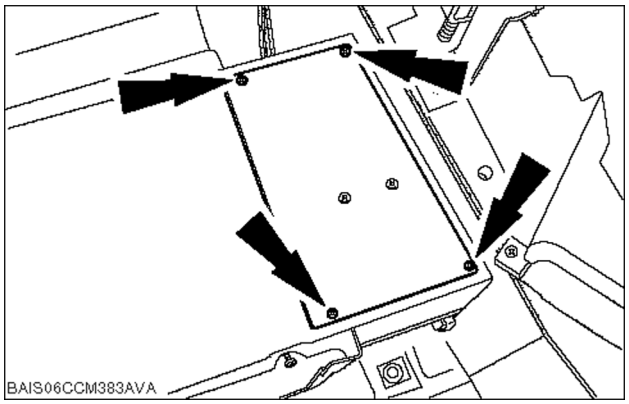
Sensing system Low pressure switch - Install

1. Install the low pressure switch and connect the electrical connector.



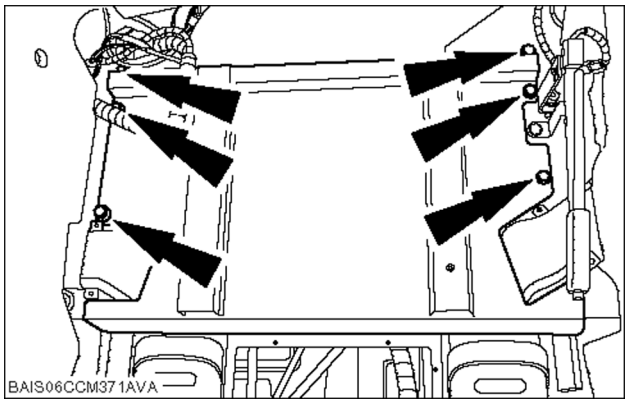
BAIS06CCM385AVA 1

2. Install the cover plate to the top of the HVAC unit.



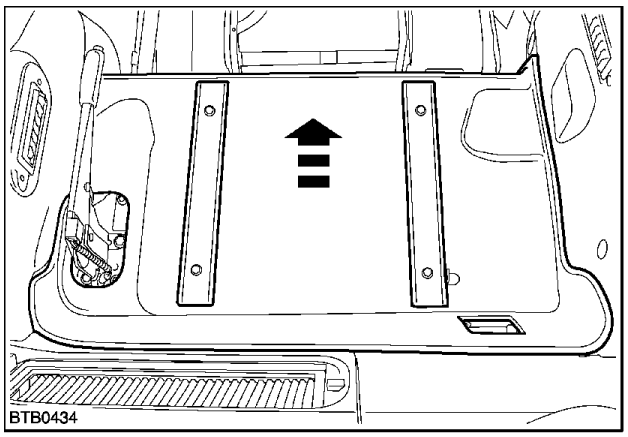
BAIS06CCM383AVA 2

3. Install the rear floor plate.



BAIS06CCM371AVA 3

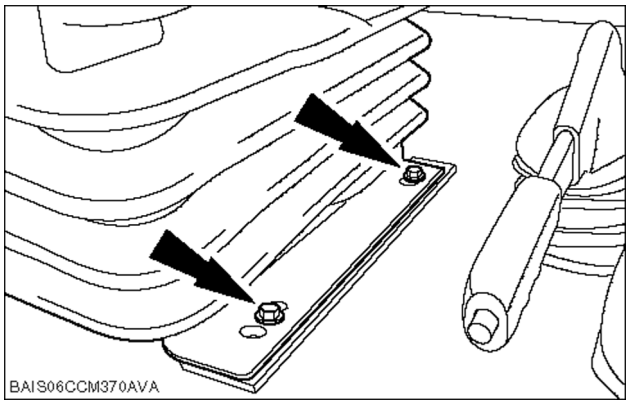
4. Install the cab floor mat.



BTB0434 4

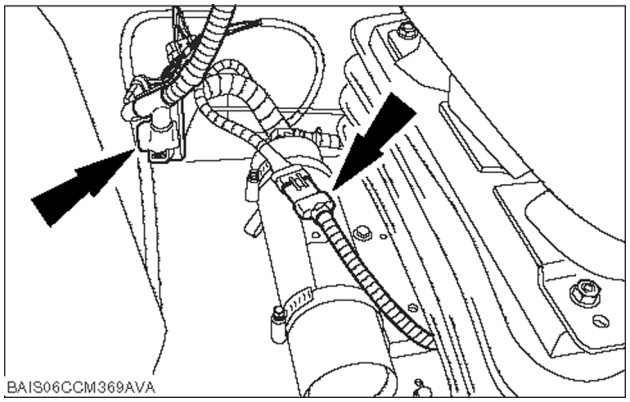
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5. Install the operator seat.



BAIS06CCM370AVA 5

6. Connect the operator seat electrical connectors.



BAIS06CCM369AVA 6

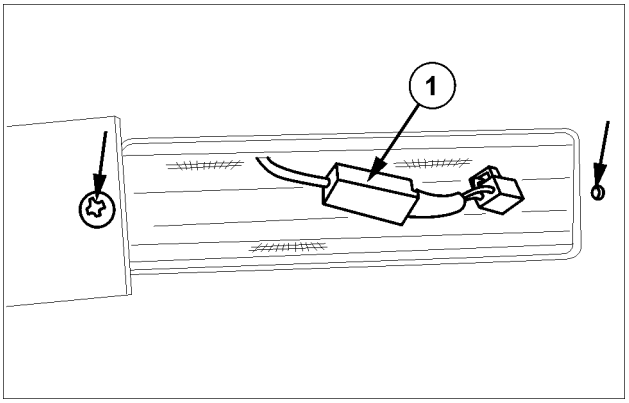
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Sensing system Evaporator temperature sensor - Replace

Prior operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Remove (Heating and air conditioning unit) (E.40.D) Step 1 to step 4

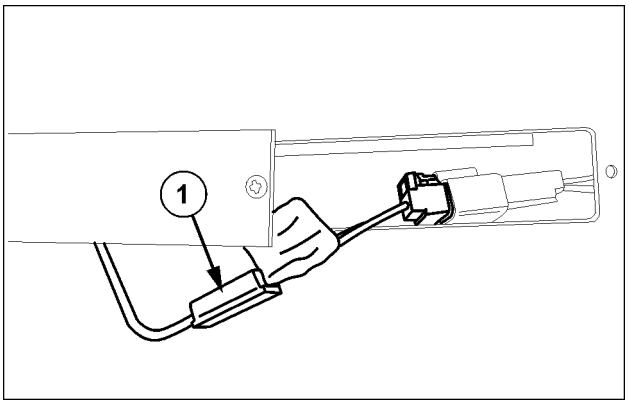
NOTE: *The refrigerant does not have to be siphoned out of the unit in order to replace the evaporator temperature sensor.*

1. Unscrew the retaining screws. Remove the cover plate for the evaporator temperature sensor **(1)** on the heating and air conditioning unit. Take the evaporator temperature sensor out of the evaporator.



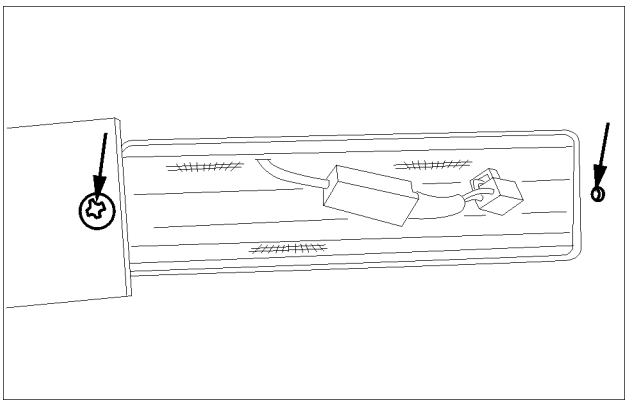
SS08D030 1

2. Pull out the plug connection and disconnect it.
Replace the evaporator temperature sensor **(1)**.



SS08D101 2

3. Connect the connector.
Push the evaporator temperature sensor into the evaporator.
Fit the cover plate for the evaporator temperature sensor on the heating and air conditioning unit.



SS08D109 3

Next operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Install (Heating and air conditioning unit) (E.40.D) Step 20 to step 23

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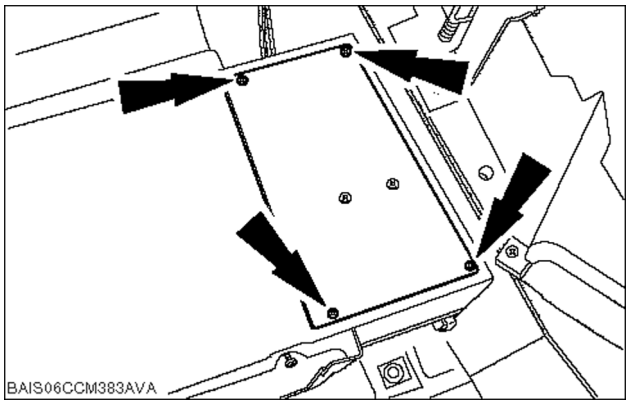
Sensing system Evaporator temperature sensor - Replace

Prior operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Remove (Heating and air conditioning unit) (E.40.D) Step 1 to step 4

NOTE: *The refrigerant does not have to be siphoned out of the unit in order to replace the evaporator temperature sensor.*

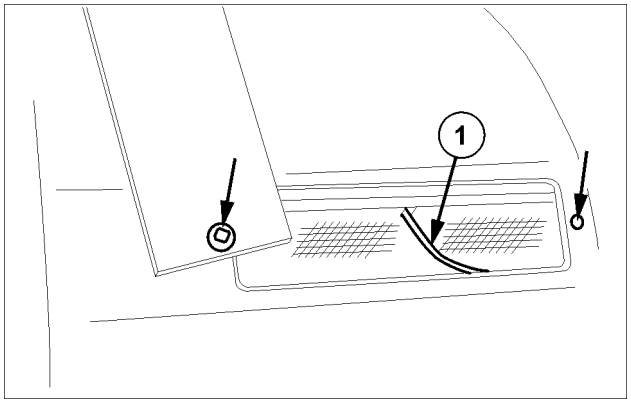
Removal

1. Remove the cover plate from the heating and air conditioning unit.



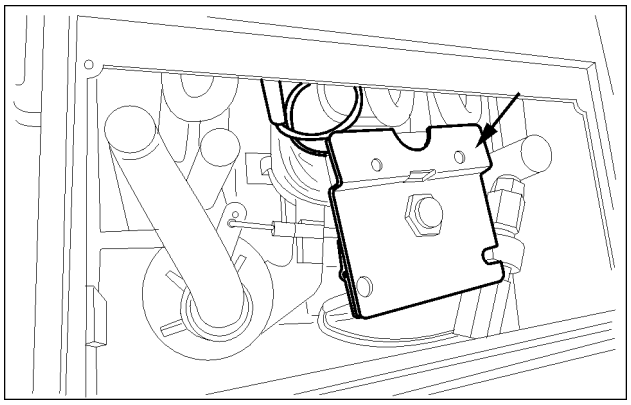
BAIS06CCM383AVA 1

2. Unscrew the retaining screws. Remove the cover plate for the evaporator temperature sensor **(1)** on the heating and air conditioning unit.



SS08D029 2

3. Take the evaporator temperature sensor out of the evaporator. Disconnect the connector.



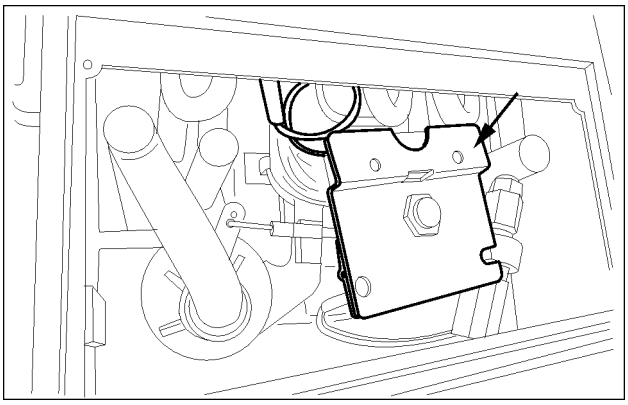
SS08D028 3

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Assembly

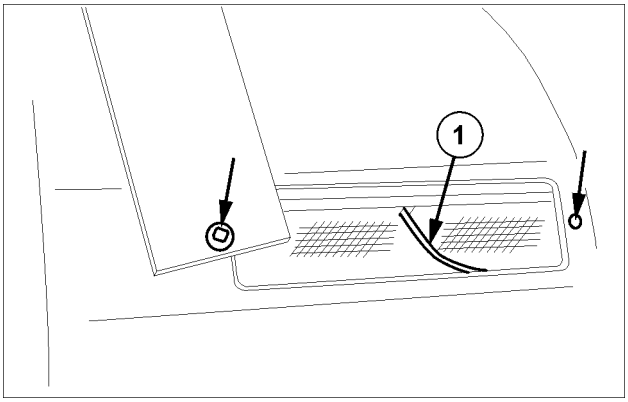
4. Push the evaporator temperature sensor into the evaporator. Connect the connector.

ATTENTION: *Carefully push the sensor pipe into the evaporator and ensure that it is not bent.*



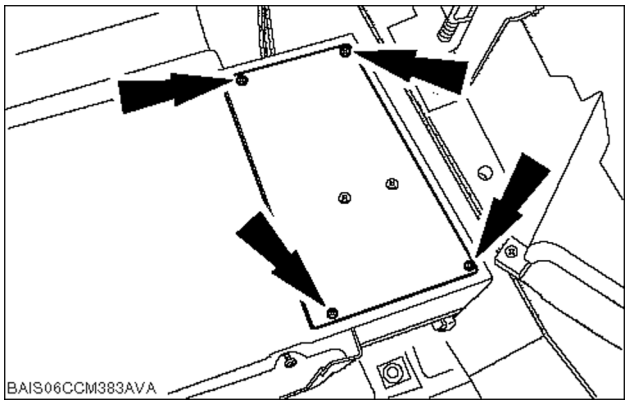
SS08D028 4

5. Fit the cover plate for the evaporator temperature sensor **(1)** on the heating and air conditioning unit and tighten the screws.



SS08D029 5

6. Fit the cover plate to the heating and air conditioning unit.



BAIS06CCM383AVA 6

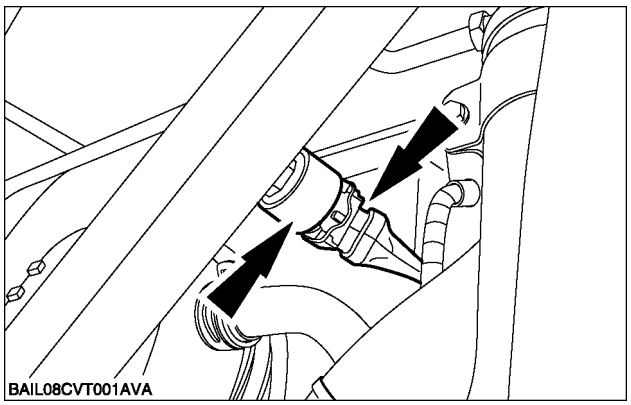
Next operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Install (Heating and air conditioning unit) (E.40.D) Step 20 to step 23

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Sensing system - Replace (High pressure-low pressure switch)

NOTE: *The refrigerant does not have to be siphoned out of the unit in order to replace the pressure switch.*

1. Turn the starter switch to the “OFF” position.
   Disconnect the electrical connector.
   Remove the switch from the self-closing valve.



BAIL08CVT001AVA 1

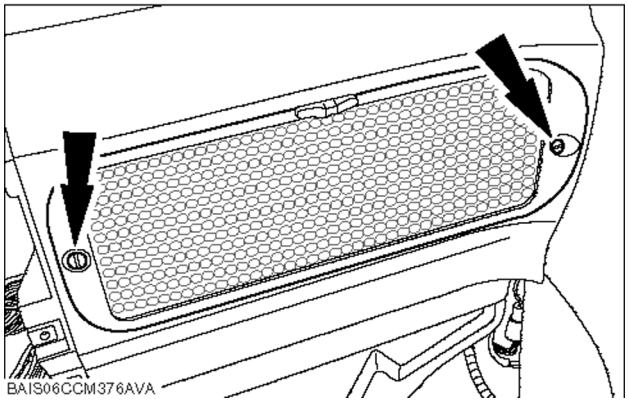
2. Install the pressure switch.
   Connect the electrical connector to the pressure switch.

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Sensing system Temperature sensor - Replace (Outside temperature)

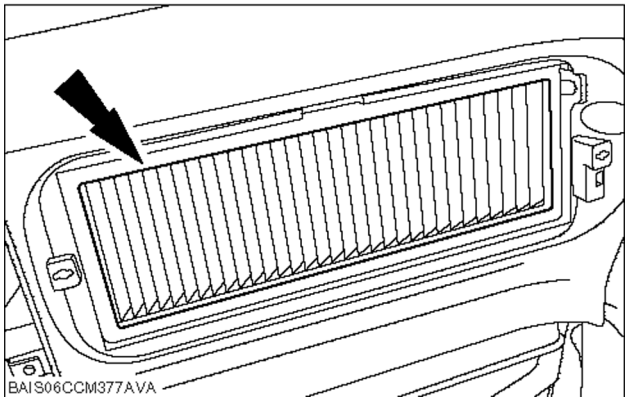
Removal

1. Turn the starter switch to the “OFF” position.
   Remove the air circulation grating.



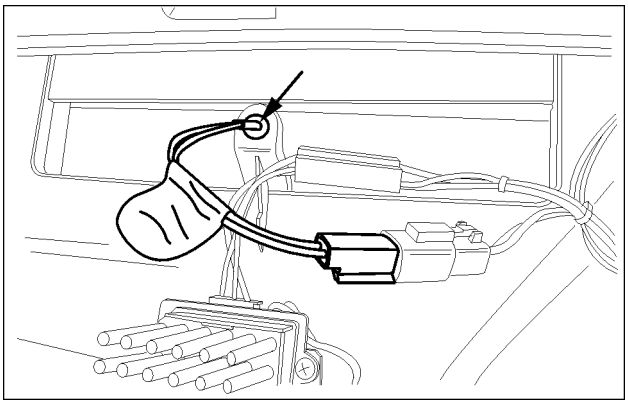
BAIS06CCM376AVA 1

2. Remove the air circulation filter element.



BAIS06CCM377AVA 2

3. Disconnect the plug connection.
   Remove the sensor.

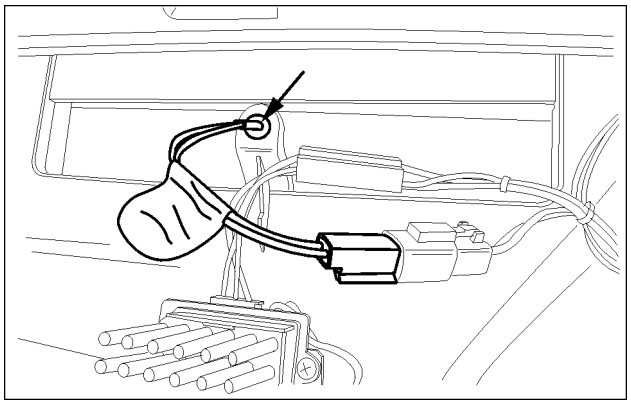


SS08D024 3

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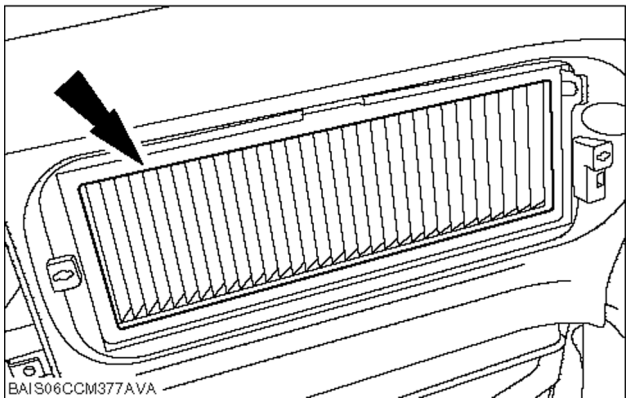
Assembly

4. Fit the sensor.
   Connect the connector.



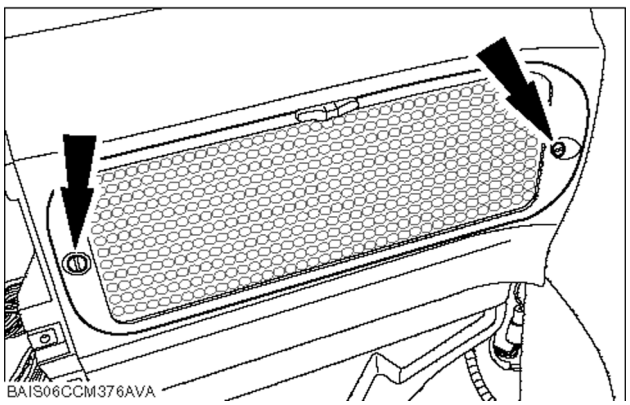
SS08D024 4

5. Insert the air circulation filter element again.



BAIS06CCM377AVA 5

6. Fit the air circulation grating.



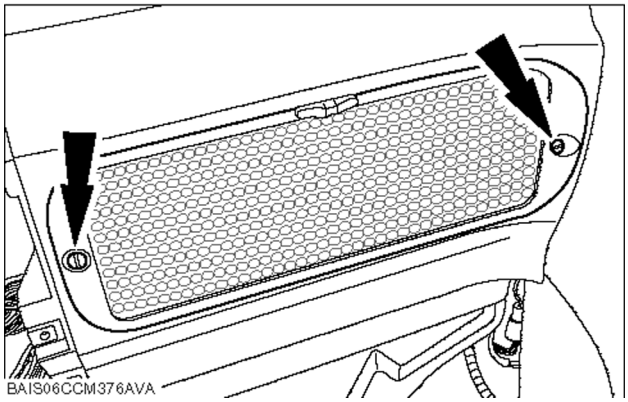
BAIS06CCM376AVA 6

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Sensing system Temperature sensor - Replace (Cab temperature)

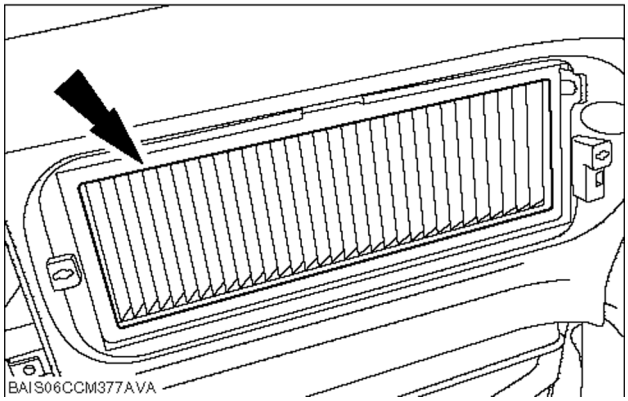
Removal

1. Turn the starter switch to the “OFF” position. Remove the air circulation grating.



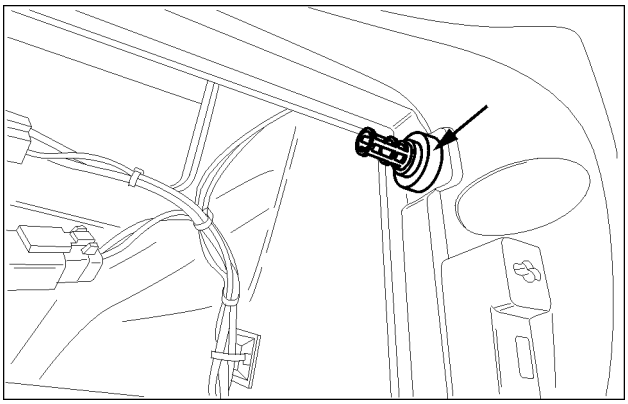
BAIS06CCM376AVA 1

2. Remove the air circulation filter element.



BAIS06CCM377AVA 2

3. Open the catch and take out the sensor. Disconnect the plug connection.

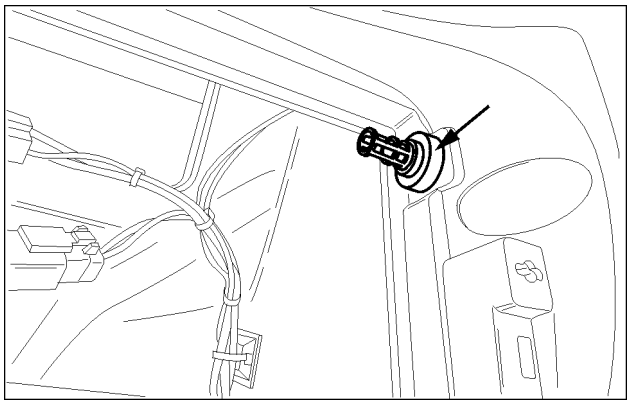


SS08D019 3

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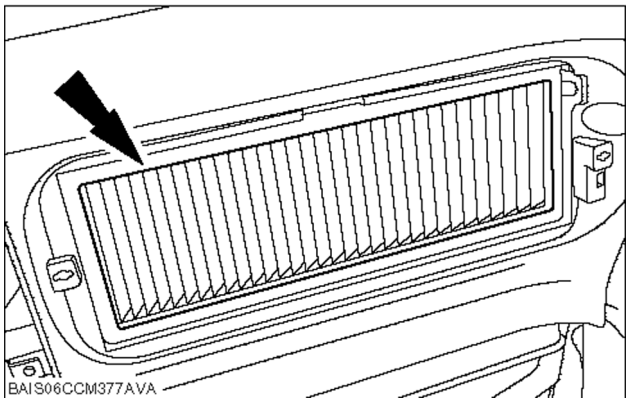
Assembly

4. Connect the connector. Push the sensor inside and close the catch.



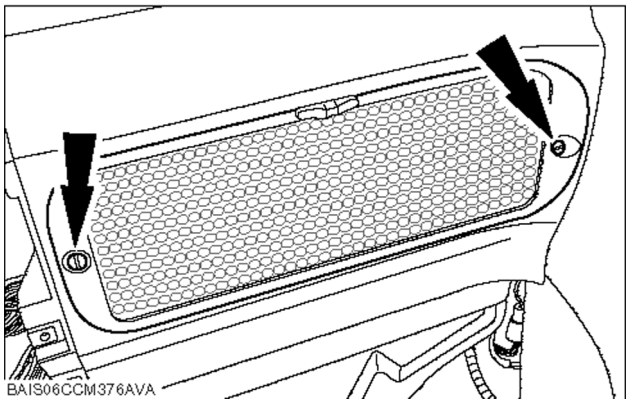
SS08D019 4

5. Insert the air circulation filter element.



BAIS06CCM377AVA 5

6. Fit the air circulation grating.



BAIS06CCM376AVA 6

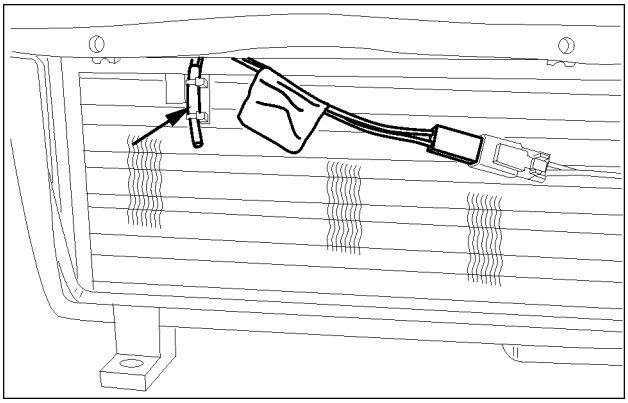
www.truck-freeworkshop.com

Sensing system Temperature sensor - Replace (Outlet temperature)

Prior operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Remove (Heating and air conditioning unit) (E.40.D) Step 1 to step 8

NOTE: *The refrigerant does not have to be siphoned out of the unit in order to replace the air outlet temperature sensor.*

1. Disconnect the connector and replace the air outlet temperature sensor.



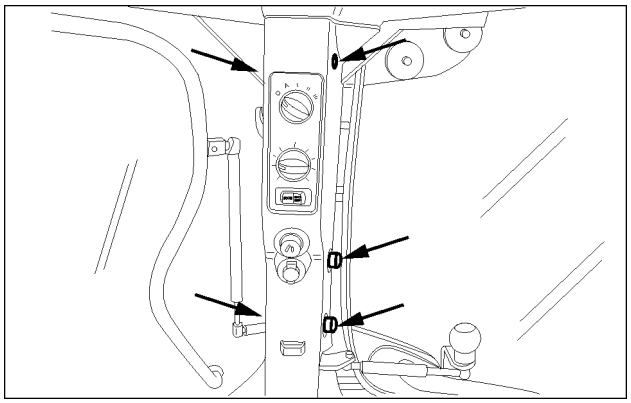
SS08D025 1

Next operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Install (Heating and air conditioning unit) (E.40.D) Step 9 to step 12 and step 20 to step 23

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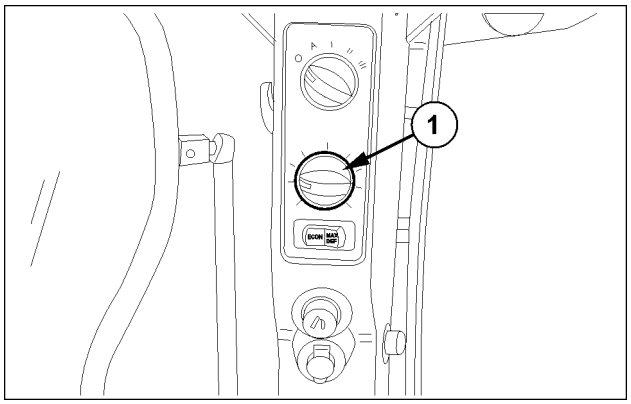
Electrical control Temperature control potentiometer - Replace

1. Turn the starter switch to the “OFF” position.
   Remove the facing.



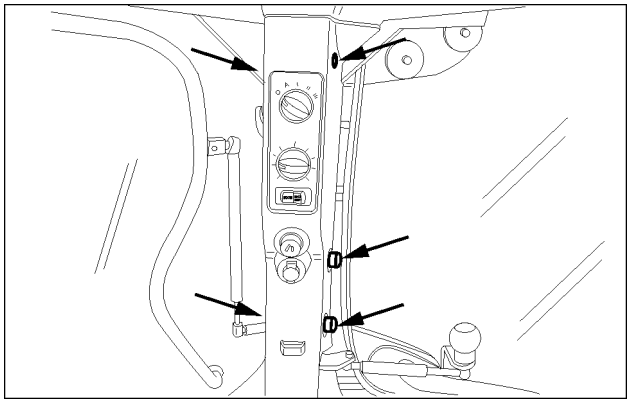
SS08D010 1

2. Remove the turning knob **(1)** and unscrew the cap nut located behind it.
   Disconnect the plug connection.
   Replace the potentiometer.



SS08D102 2

3. Tighten the cap nut and fit the turning knob **(1)**.
   Connect the connector.
4. Re-install the facing.

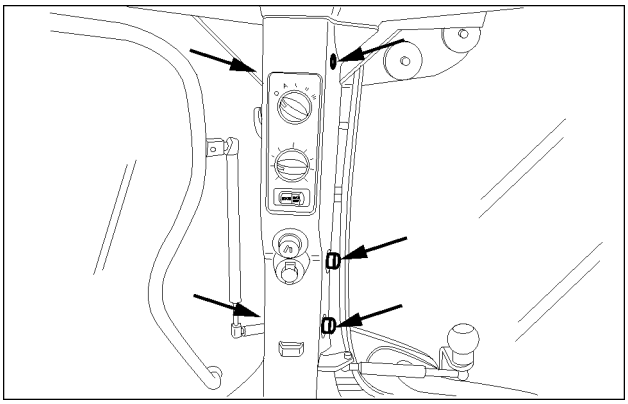


SS08D010 3

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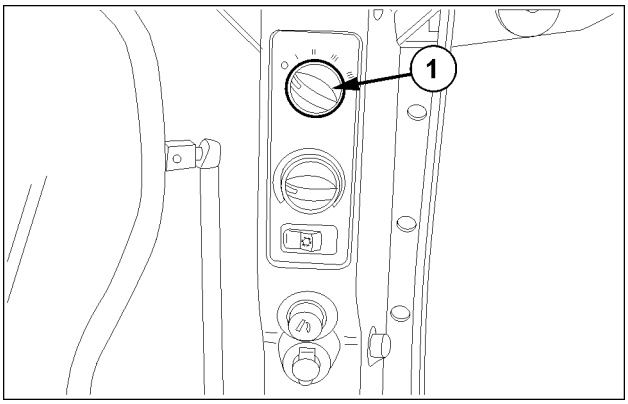
Command Switch - Replace (Blower speed)

1. Turn the starter switch to the “OFF” position.
   Remove the facing.



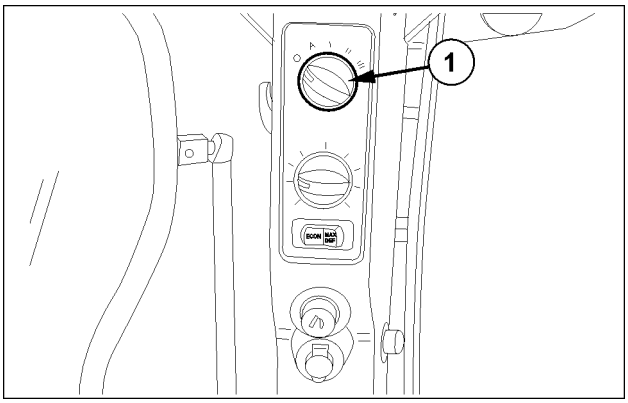
SS08D010 1

2. Standard air conditioner design:
   Remove the turning knob **(1)** and unscrew the cap nut located behind it.
   Disconnect the plug connection.
   Replace the switch.



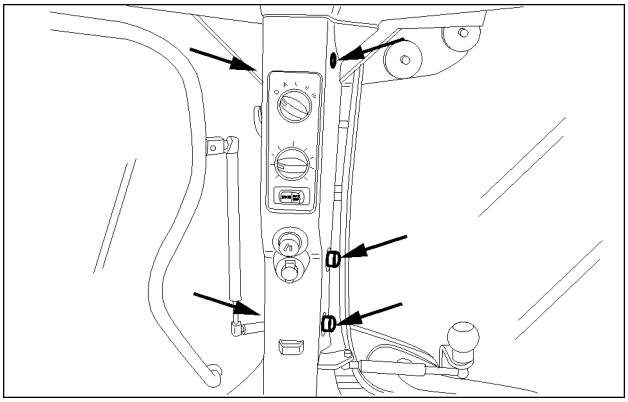
SS08D103 2

Automatic air conditioner (ATC) design:
Remove the turning knob **(1)** and unscrew the cap nut located behind it.
Disconnect the plug connection.
Replace the switch.



SS08D104 3

3. Tighten the cap nut and fit the turning knob **(1)**.
   Connect the connector.
4. Re-install the facing.

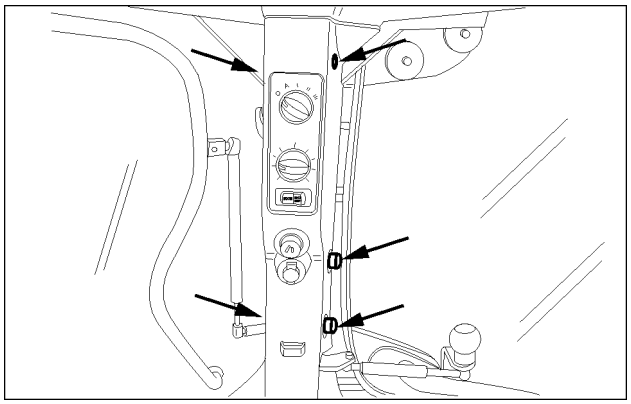


SS08D010 4

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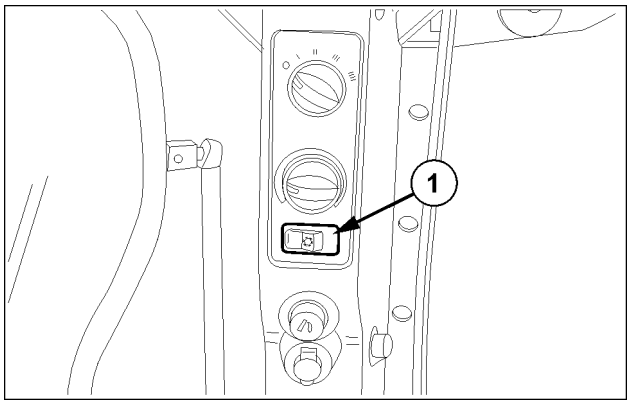
Command Switch - Replace (Modes of operation)

1. Turn the starter switch to the “OFF” position.
   Remove the facing.



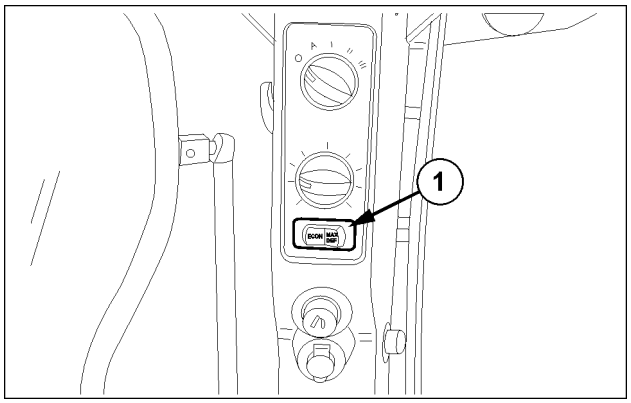
SS08D010 1

2. Standard air conditioner design:
   Remove the plug at the switch.
   Replace the switch **(1)**.



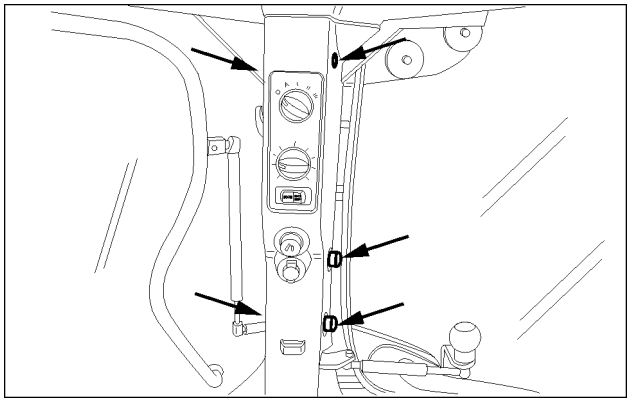
SS08D013 2

Automatic air conditioner (ATC) design:
Remove the plug at the switch.
Replace the switch **(1)**.



SS08D012 3

3. Insert the plug at the switch **(1)**.
4. Install the facing.



SS08D010 4

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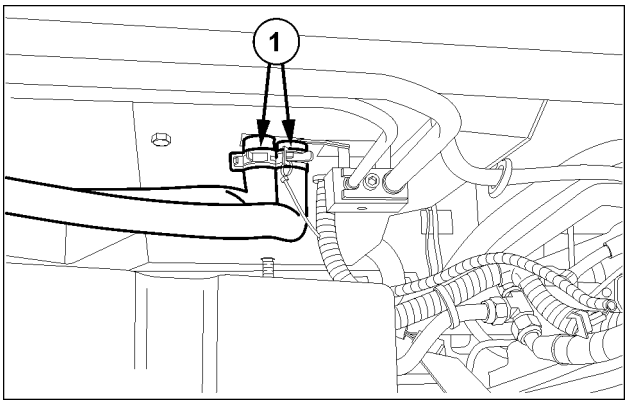
Heater valve - Replace

Prior operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Remove (Heating and air conditioning unit) (E.40.D) Step 1 to step 4 and step 14 to step 19

NOTE: *The refrigerant does not have to be siphoned out of the unit in order to replace the heating valve.*

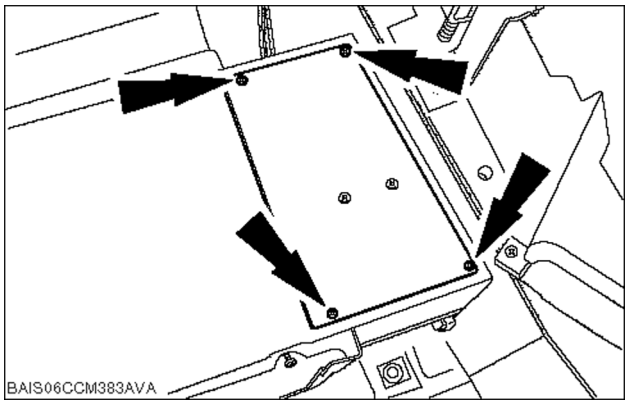
Removal

1. Pull off the hoses for the cab heating **(1)**.



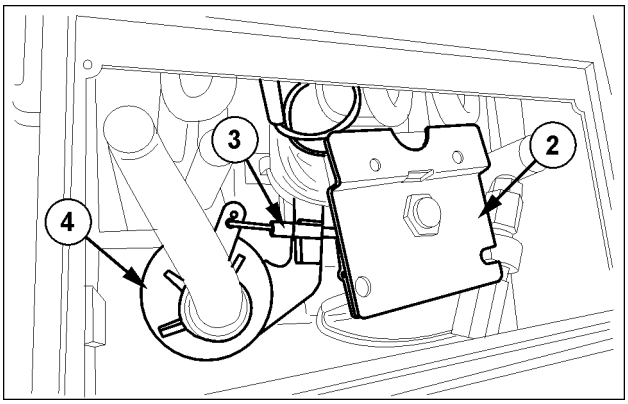
SS08D110 1

2. Remove the cover plate from the heating and air conditioning unit.



BAIS06CCM383AVA 2

3. Carefully move the evaporator temperature sensor **(2)** to the right. Remove the Bowden cable **(3)** for actuating the heating valve. Remove the hose clips **(4)** and take out the heating valve.

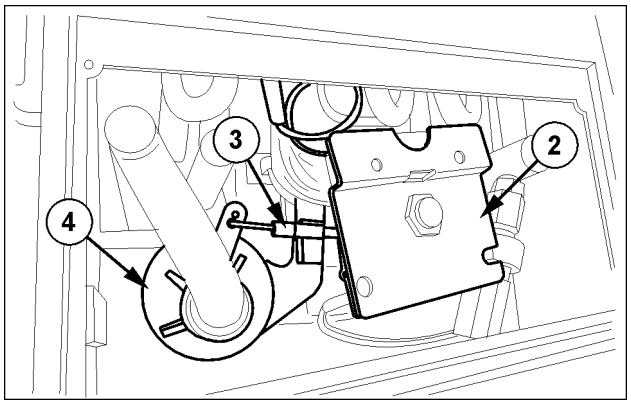


SS08D018 3

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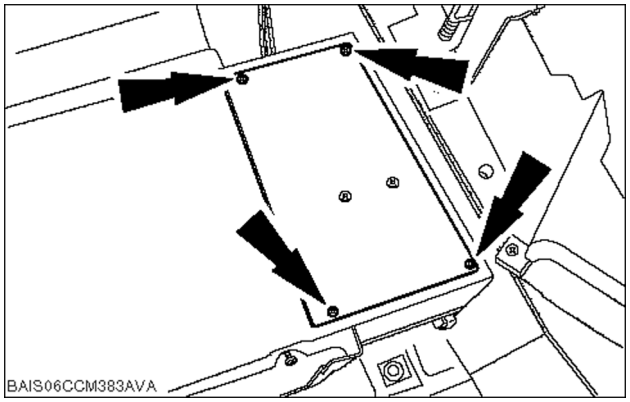
Assembly

4. Install the heating valve. Fit the hose clips **(4)**. Fit the Bowden cable **(3)** used for actuation. Carefully move the evaporator temperature sensor **(2)** to the correct position.



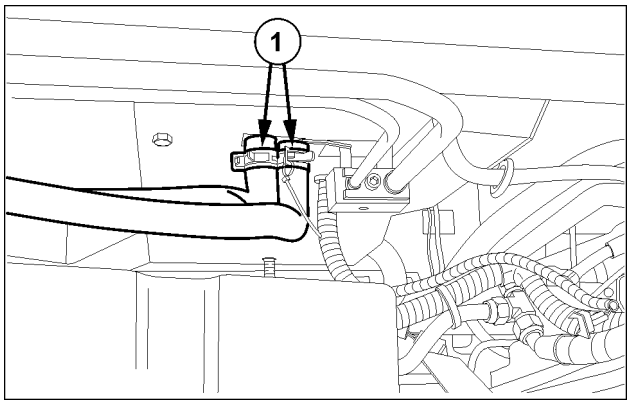
SS08D018 4

5. Fit the cover plate to the heating and air conditioning unit.



BAIS06CCM383AVA 5

6. Fit the hoses for the cab heating **(1)**.



SS08D110 6

Next operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Install (Heating and air conditioning unit) (E.40.D) Step 4 to step 8 and step 20 to step 23

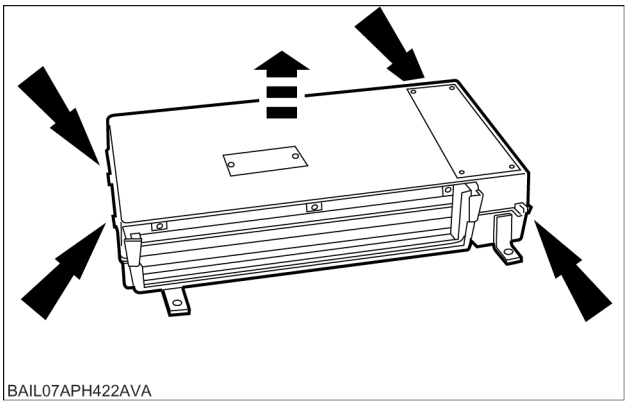
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Cooler - Replace

Prior operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Remove (Heating and air conditioning unit) (E.40.D)

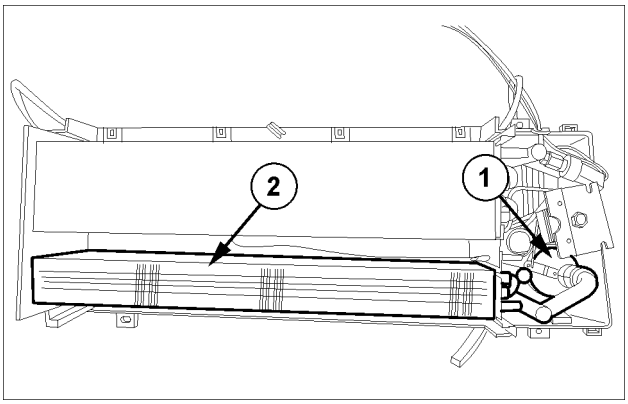
Removal

1. Remove the retaining screws of the rear air duct; remove the air duct.
   Remove the four retaining clips on the housing and remove the upper part of the housing.



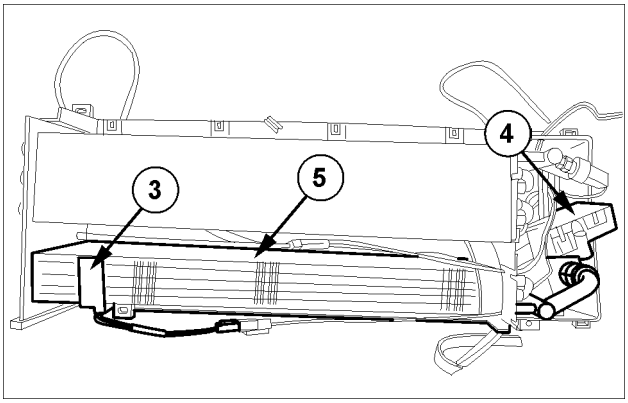
BAIL07APH422AVA 1

2. Standard air conditioner design:
   Disassemble the heating valve **(1)**. Remove the heating cooler **(2)**.



SS08D017 2

Automatic air conditioner (ATC) design:
Disassemble the air outlet temperature sensor **(3)** and the electrical heating valve **(4)**. Remove the heating cooler **(5)**.

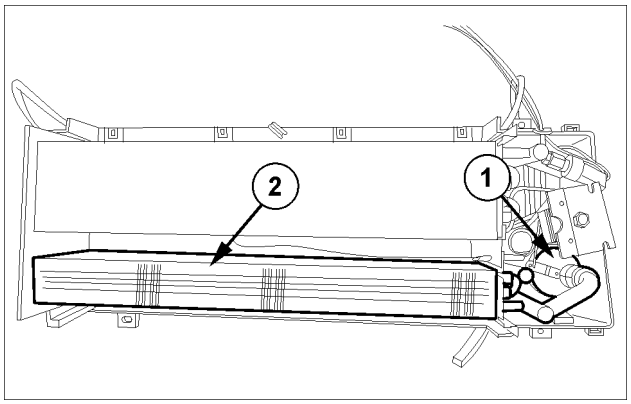


SS08D016 3

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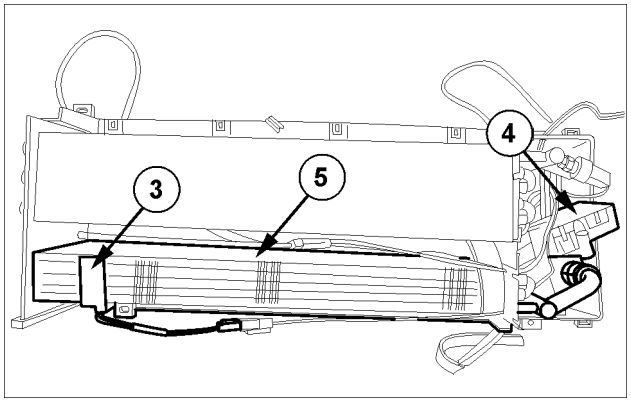
Assembly

3. Standard air conditioner design:
   Install the heating cooler **(2)**. Fit the heating valve **(1)**.



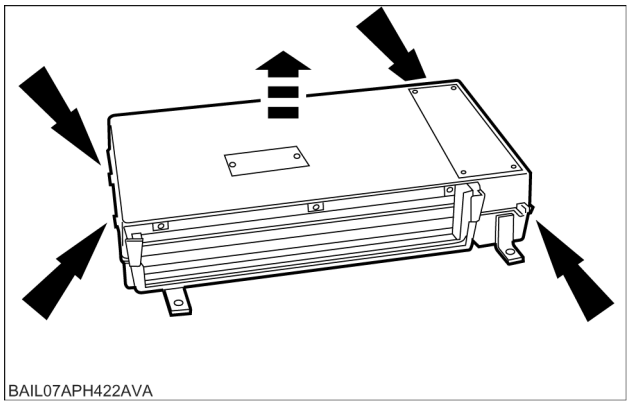
SS08D017 4

Automatic air conditioner (ATC) design:
Install the heating cooler **(5)**. Fit the air outlet temperature sensor **(3)** and the electrical heating valve **(4)**.



SS08D016 5

4. Fit the upper part of the housing again. Attach the four retaining clips to the housing. Attach the rear air duct and screw in the retaining screws.



BAIL07APH422AVA 6

Next operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Install (Heating and air conditioning unit) (E.40.D)

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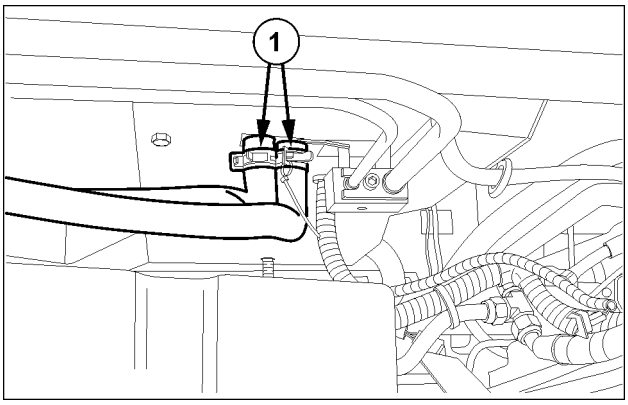
Heater Water valve actuator - Replace

Prior operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Remove (Heating and air conditioning unit) (E.40.D) Step 1 to step 4 and step 14 to step 19

NOTE: *The refrigerant does not have to be siphoned out of the unit in order to replace the heating valve.*

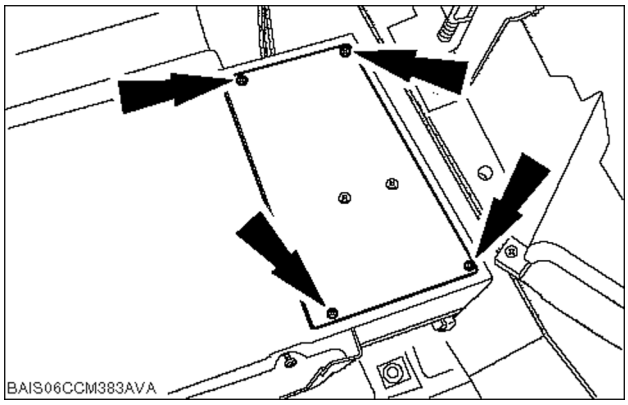
Removal

1. Pull off the hoses for the cab heating **(1)**.



SS08D110 1

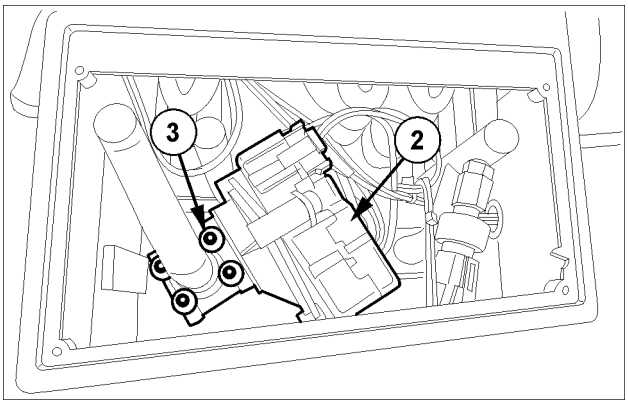
2. Remove the cover plate from the heating and air conditioning unit.



BAIS06CCM383AVA 2

3. Disassemble the connector from the electrical heating valve **(2)**. Remove the retaining screw **(3)** and remove the heating valve.

NOTE: *The servo motor can be disassembled alone or together with the heating valve as required.*

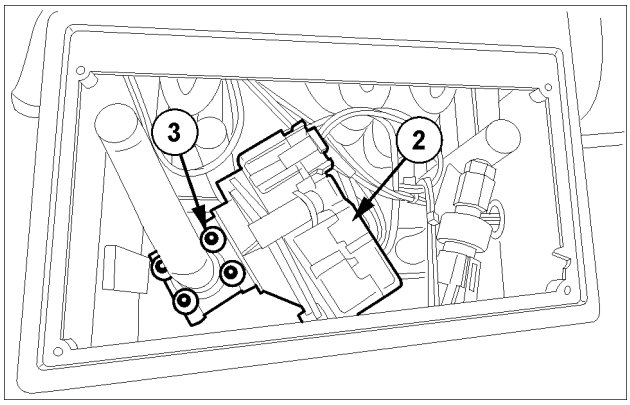


SS08D020 3

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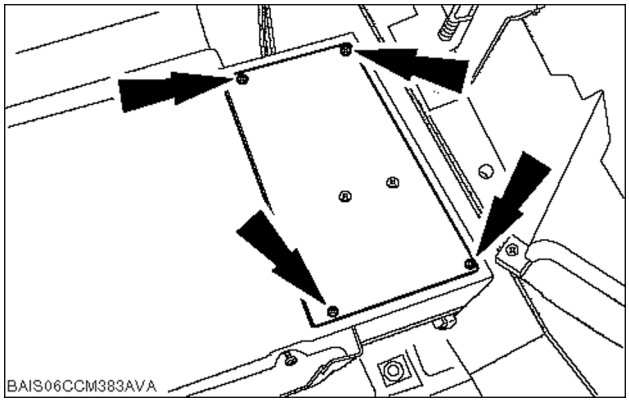
Assembly

4. Fit the heating valve using the retaining screws **(3)**. Fit the connector to the electrical heating valve **(2)**.



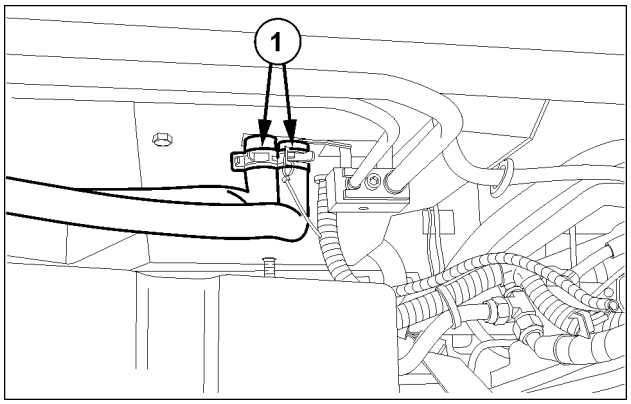
SS08D020 4

5. Fit the cover plate to the heating and air conditioning unit.



BAIS06CCM383AVA 5

6. Fit the hoses for the cab heating **(1)**.



SS08D110 6

Next operation:
ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Install (Heating and air conditioning unit) (E.40.D) Step 4 to step 8 and step 20 to step 23

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ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Troubleshooting

Problem	Possible Cause	Correction
Evaporator air not cold Gauge reading :- Low Pressure - Low High Pressure - Low (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D)).	Low refrigerant charge.	Perform leak tests and repair Evacuate system Charge system, re-test system
Evaporator air not cold Gauge reading :- Low Pressure - High High Pressure - High (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D)).	Expansion valve allowing too much refrigerant to flow through the evaporator	Check expansion valve as follows: Set for Maximum cooling. Low pressure gauge should drop slowly If expansion valve is defective: Discharge System Replace Expansion Valve Evacuate System Charge System Re-test
Evaporator air not cold Gauge reading :- Low Pressure - High High Pressure - Low (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D)).	Internal leak in compressor. (reed valves, gasket, worn or scored piston rings or cylinder)	Discharge the system Replace the compressor Evacuate the system Charge the system Re-test
Evaporator air warm Gauge reading :- Low Pressure - Low High Pressure - Low (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D)).	Extremely low refrigerant charge.	Perform leak tests and repair Evacuate system Charge system, re-test system
Evaporator air warm Gauge reading :- Low Pressure - High High Pressure - High (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D)).	Improper operation of condenser	Inspect for dirty condenser restricting air flow and cooling. Check operation of condenser cooling fans. Repair or replace as needed. Check for overcharge as follows: Stop the engine. Recover and recycle the charge using correct recovery equipment. Recharge the system with the correct quantity of refrigerant, replacing any lost lubricant. Recheck performance of air conditioning system.

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Problem	Possible Cause	Correction
Evaporator air cool but not sufficiently cold. Gauge reading :- Low Pressure - Low High Pressure - Low (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D)).	Expansion valve not permitting sufficient flow.	(1). Check expansion valve as follows: Set at max. cooling. Low pressure gauge should drop slowly. (2). If expansion valve is defective:- Discharge system. Replace expansion valve. Evacuate system. Charge system. Re-test.
Insufficient cooling Gauge reading :- Low Pressure - Low High Pressure - High (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D))	Restriction in liquid line	Discharge the system Replace the receiver/drier Inspect all lines and tubing from compressor outlet to expansion valve. Replace if needed. Evacuate the system Charge the system Re-test
Insufficient cooling Low pressure reading does not fluctuate with changes in temperature control switch (pressure should drop until compressor cycles) Evaporator air not cold. Gauge reading :- Low Pressure - Normal High Pressure - Normal (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D))	System low on charge Air or moisture present in system	Perform leak test Discharge system Repair leaks Replace receiver/drier Check oil level Evacuate system Charge the system Re-test
Low pressure switch cutting out Gauge reading :- Low Pressure - Low High Pressure - Low (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D))	Stuck valve	(1). Check expansion valve as follows: Set at max. cooling. Low pressure gauge should drop slowly. (2). If expansion valve is defective:- Discharge system. Replace expansion valve. Evacuate system. Charge system. Re-test.

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Problem	Possible Cause	Correction
Expansion valve to evaporator tube shows considerable condensation or frost. Gauge reading :- Low Pressure - Low High Pressure - Low (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D))		(1). Check expansion valve as follows: Set at max. cooling. Low pressure gauge should drop slowly. (2). If expansion valve is defective:- Discharge system. Replace expansion valve. Evacuate system. Charge system. Re-test.
Too cold to touch Gauge reading :- Low Pressure - Low High Pressure - Low (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D))		(1). Check expansion valve as follows: Set at max. cooling. Low pressure gauge should drop slowly. (2). If expansion valve is defective:- Discharge system. Replace expansion valve. Evacuate system. Charge system. Re-test.
Liquid line hot (condenser outlet to expansion valve tube) Gauge reading :- Low Pressure - High High Pressure - High (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D))	Overcharged with refrigerant	Inspect for dirty condenser restricting air flow and cooling. Check operation of condenser cooling fans. Repair or replace as needed. Check for overcharge as follows: Stop the engine. Recover and recycle the charge using correct recovery equipment. Recharge the system with the correct quantity of refrigerant, replacing any lost lubricant. Recheck performance of air conditioning system.
High pressure switch cutting out Gauge reading :- Low Pressure - High High Pressure - High (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning - Dynamic description (E.40.D))	Air in system	Inspect for dirty condenser restricting air flow and cooling. Check operation of condenser cooling fans. Repair or replace as needed. Check for overcharge as follows: Stop the engine. Recover and recycle the charge using correct recovery equipment. Recharge the system with the correct quantity of refrigerant, replacing any lost lubricant. Recheck performance of air conditioning system.
Compressor cycles “on" and “off" too frequently Gauge reading :- Low Pressure - High High Pressure - Normal (Refer to example ENVIRONMENT CONTROL Heating, ventilation and air-conditioning -	Defective temperature control (thermostatic) switch	Stop engine and shut off A/C Replace temperature control switch Re-test system and check compressor cycling

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Problem	Possible Cause	Correction
Dynamic description (E.40.D))		

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BODY AND STRUCTURE - E

SHIELD - 20.A

Puma 165 CVX
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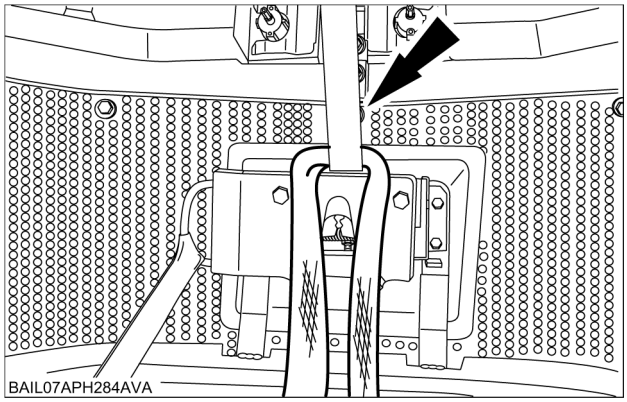
SHIELD - 20.A

SERVICE
Engine hood
Remove 3
Install 5

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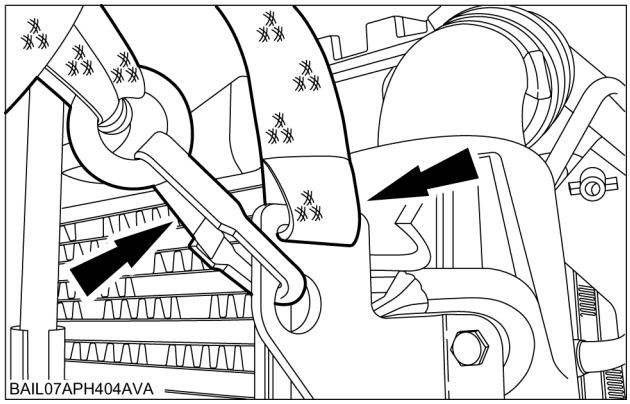
Engine hood - Remove

1. Open the hood.
2. Feed suitable straps around the hood latch and support the front of the hood on a suitable hoist.



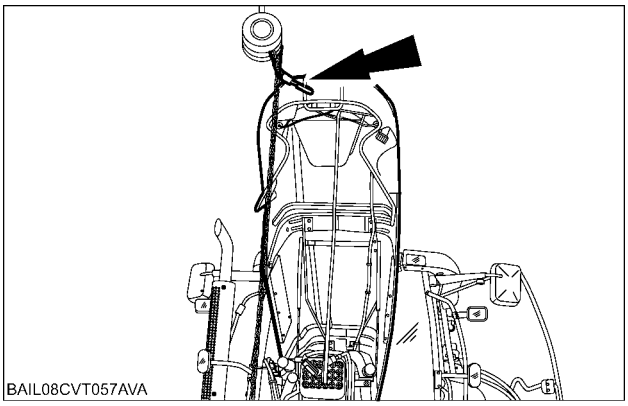
BAIL07APH284AVA 1

3. Release the hood check strap from the retaining bracket and fully open the hood.



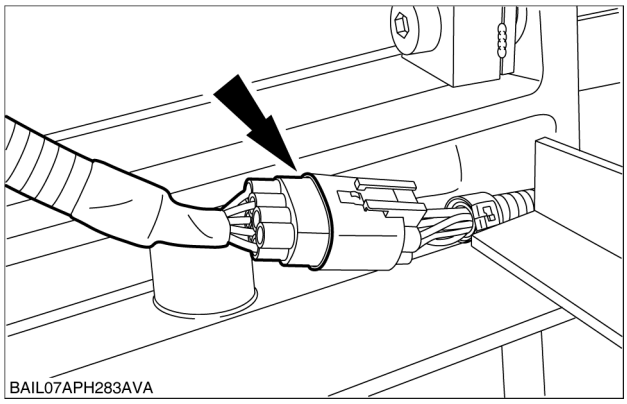
BAIL07APH404AVA 2

4. Fully raise the hood and hold in position using a suitable hoist.



BAIL08CVT057AVA 3

5. Disconnect the hood wiring harness electrical connector.

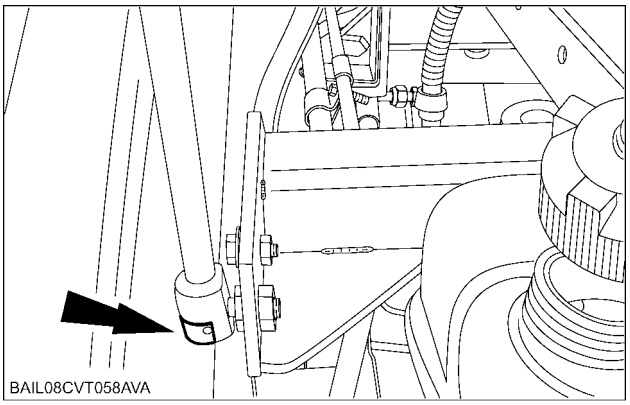


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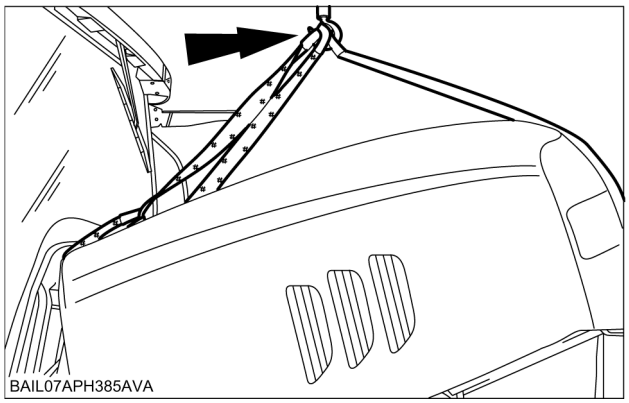
6. Disconnect the lower end of the right-hand support strut.

NOTE: *Repeat this step for the left-hand side.*



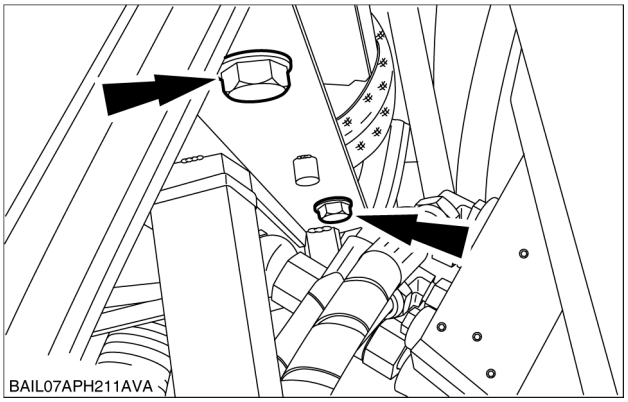
BAIL08CVT058AVA 5

7. Feed suitable straps through the rear of the hood and support the hood on a suitable hoist.



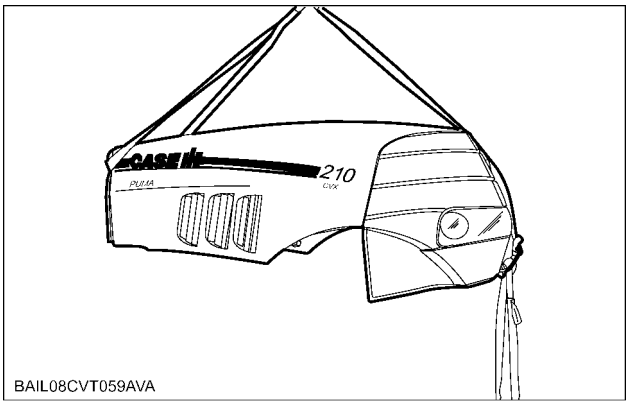
BAIL07APH385AVA 6

8. Remove the two hood retaining bolts.



BAIL07APH211AVA 7

9. Using a suitable hoist, remove the hood.

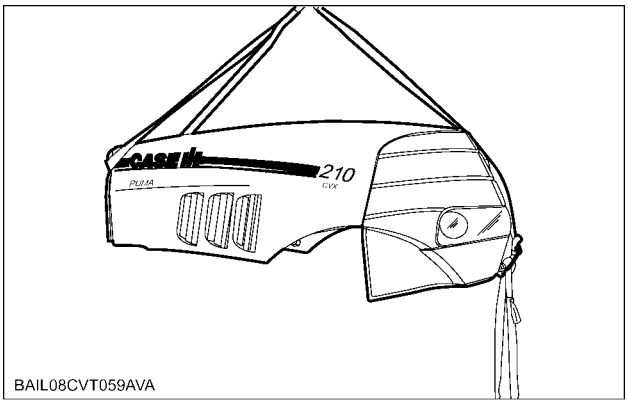


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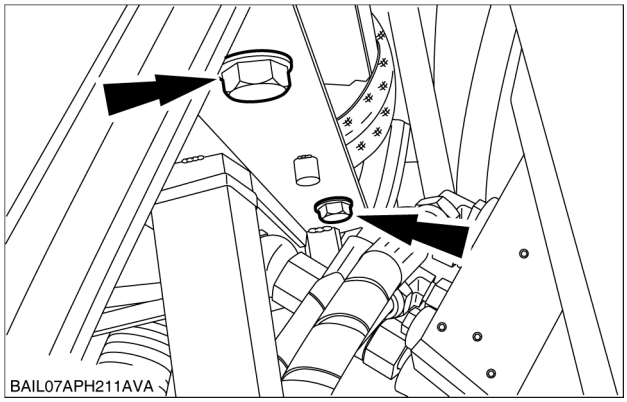
Engine hood - Install

1. Using a suitable hoist, lower the hood onto the vehicle.



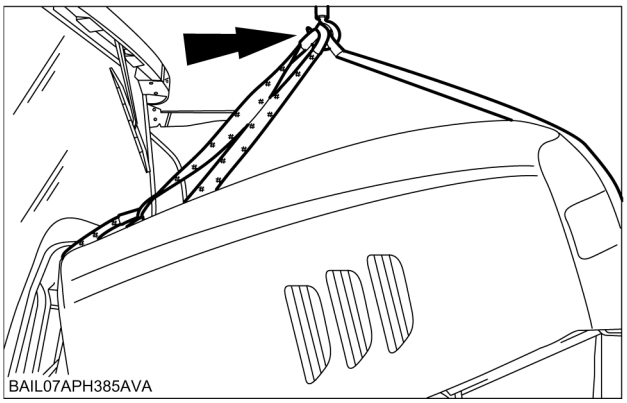
BAIL08CVT059AVA 1

2. Install the two hood retaining bolts.



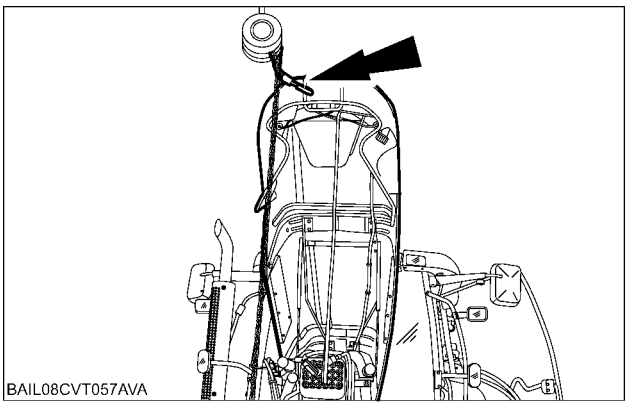
BAIL07APH211AVA 2

3. Release the rear of the hood from the hoist.



BAIL07APH385AVA 3

4. Fully raise the hood and hold in position.

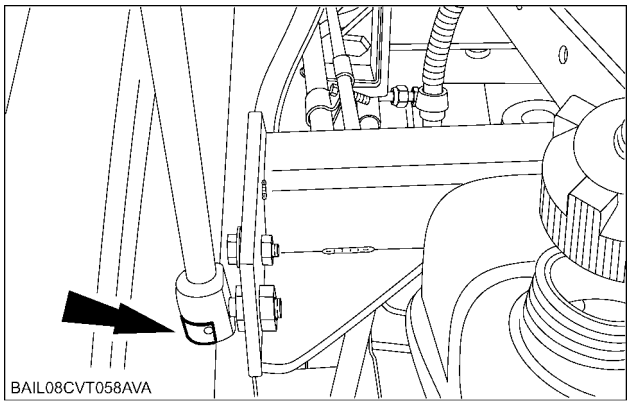


BAIL08CVT057AVA 4

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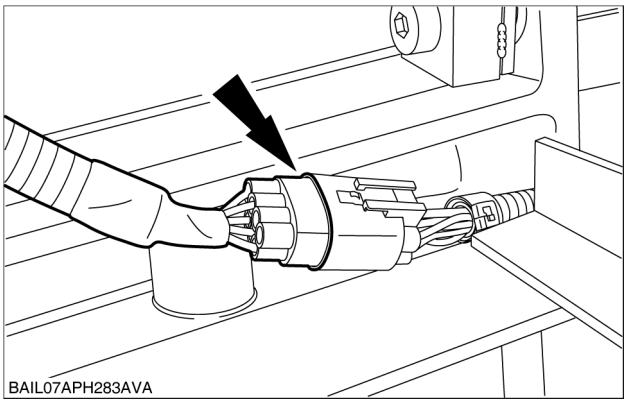
5. Disconnect the lower end of the right-hand support strut.

NOTE: *Repeat this step for the left-hand side.*



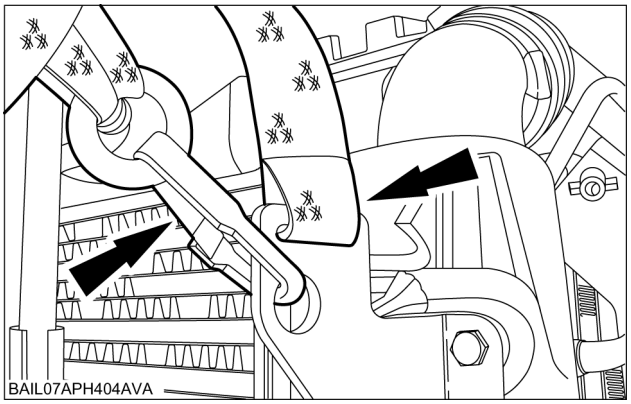
BAIL08CVT058AVA 5

6. Connect the hood wiring harness electrical connector.



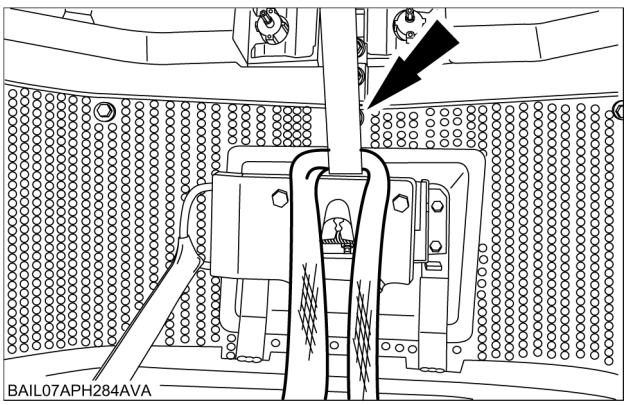
BAIL07APH283AVA 6

7. Partially lower the hood and secure the hood check strap to the retaining bracket.



BAIL07APH404AVA 7

8. Remove the straps from around the hood latch.



BAIL07APH284AVA 8

9. Close the hood.

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BODY AND STRUCTURE - E

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SERVICE - Technical Publications & Tools



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SERVICE MANUAL

WORKING ARM



Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
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WORKING ARM - H

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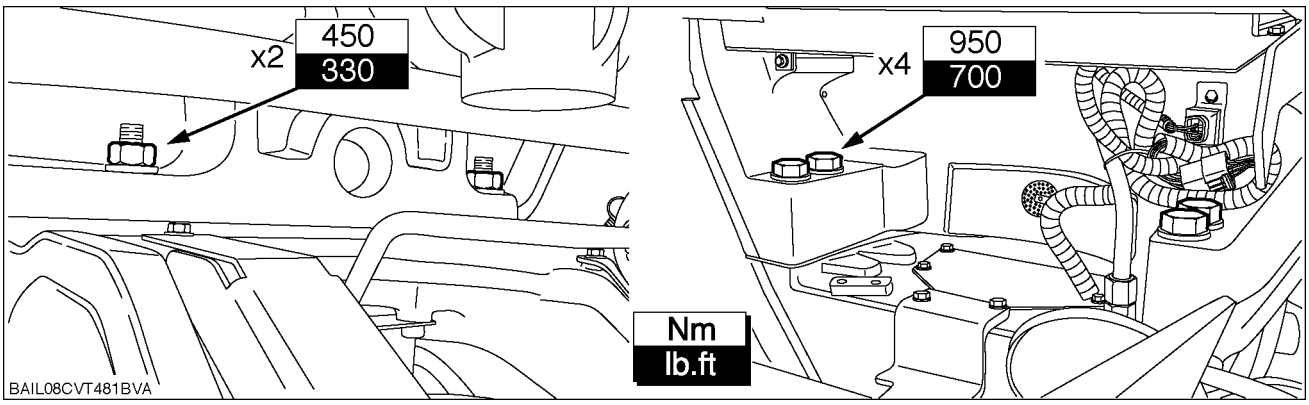
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HITCH Front hitch - Torque

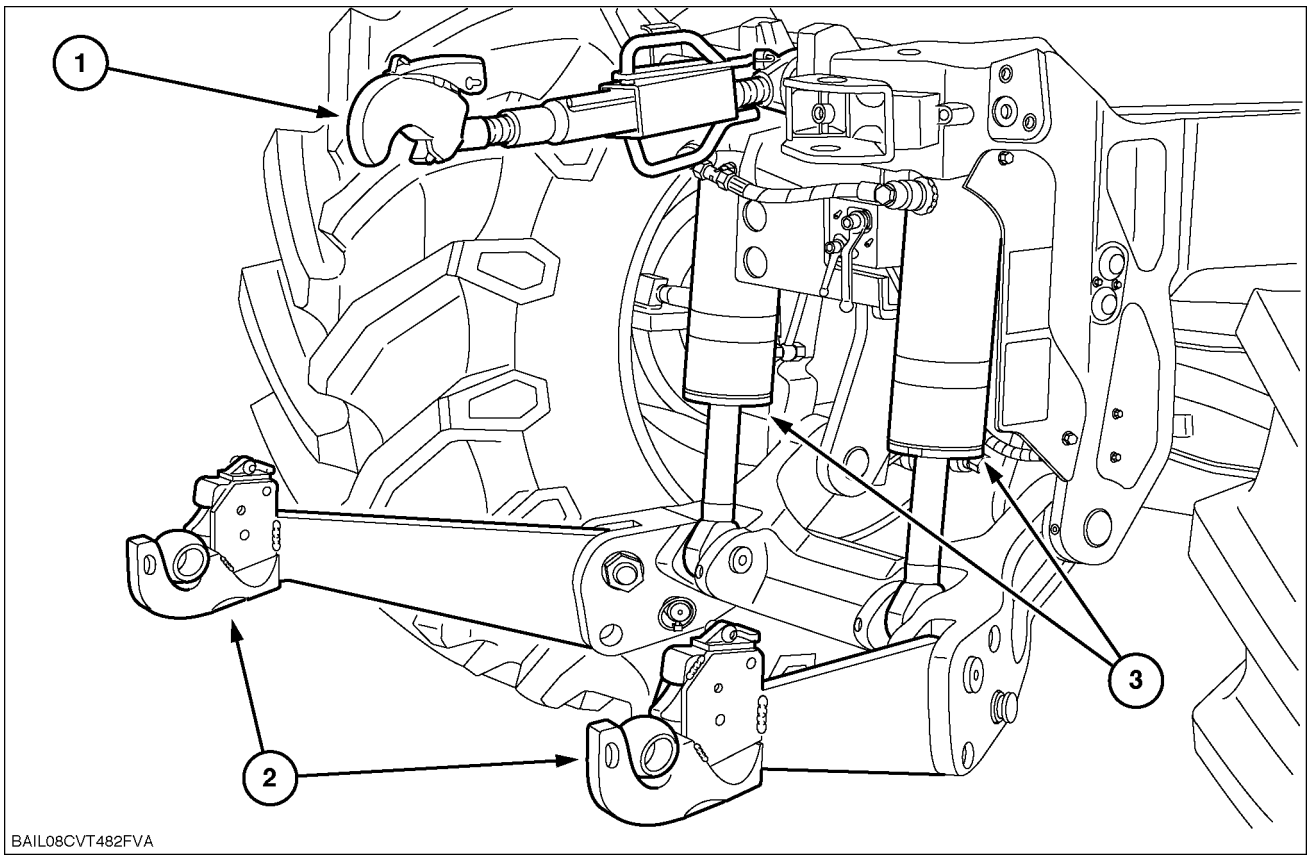


BAIL08CVT481BVA 1

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HITCH Front hitch - Static description

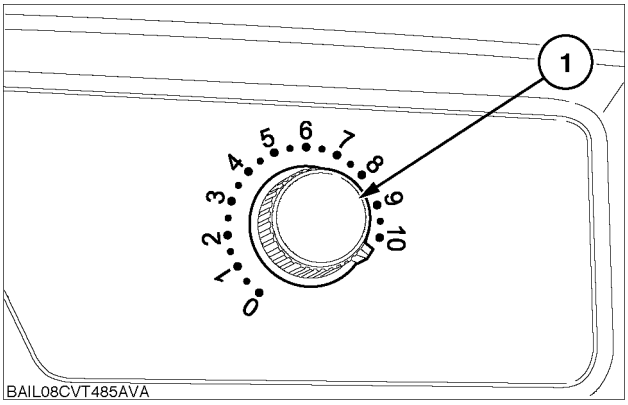
NOTE: *The three point front hitch is an option which may be fitted during manufacture, or as a dealer installed accessory. Whichever option is fitted the principles of operation described here apply to both.*



BAIL08CVT482FVA 1

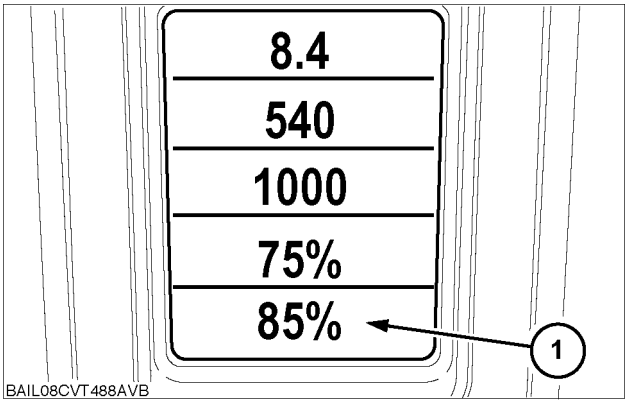
The front hitch consists of an adjustable top link **(1)** a pair of folding lower links **(2)** and two large double action cylinders **(3)**. The top link and lower links have open claw ends that permit rapid coupling and uncoupling of implements. The claws are equipped with self locking latches to ensure the positive retention of the 3 point hitch to the implement. The two large double-action cylinders provide maximum lifting power throughout the entire lifting range. The front hitch may be operated by using the electronic rear remote or mid mount valves (if fitted).

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BAIL08CVT485AVA 2

A height limiter allows the operator to set a maximum lift height of the hitch. Control of the height limiter is by a rotary control **(1)** on the armrest console. Turn fully clockwise for maximum height or anti-clockwise to reduce the height.

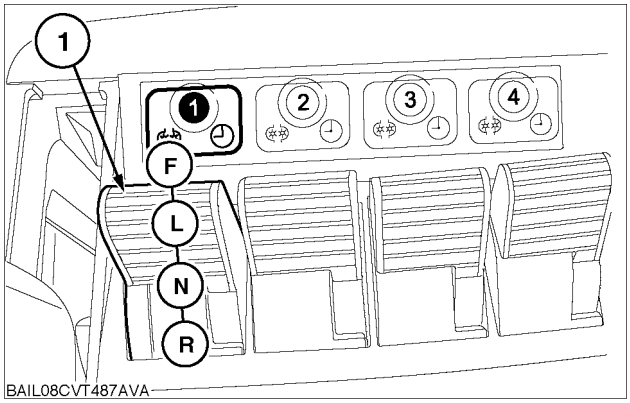


BAIL08CVT488AVB 3

Having set the required maximum hitch height on the rotary control, the height of the hitch can be shown in the display **(1)** as a percentage **(%)** ranging from 0 (fully lowered) to 100 (fully raised).

NOTE: *The lift height limit can be affected by the oil flow in the hydraulic system. If the lift height limit was set with a low engine and hydraulic pump speed, it may reach a higher setting when the engine speed rises.*

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BAIL08CVT487AVA 4

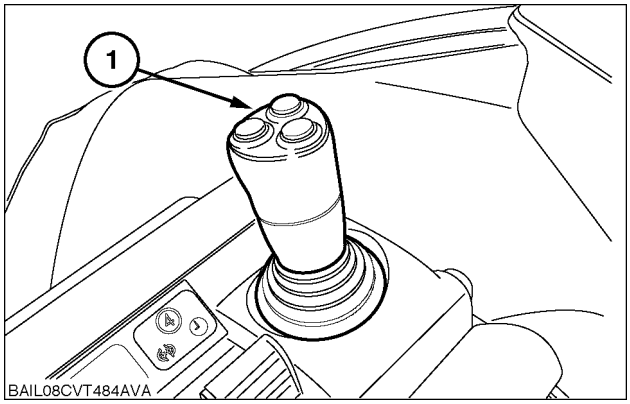
The rear remote valves may be used to operate the front hitch using the control lever **(1)** or the joystick (if fitted). As a factory fitted option the hitch will always be valve number 1 if either rear remote or mid mount valves are used.
With the hitch connected to valve number 1:

Move the lever backwards **(R)** to raise the hitch.

Move the lever forward to **(N)** to stop movement, the hitch will remain at this height.

Move the lever to **(L)** to lower the hitch.

With the lever in **(F)**, the float position is selected allowing the attached implement to follow the ground contours.
Valve number 1 is programmed to operate with the hitch height limiter.

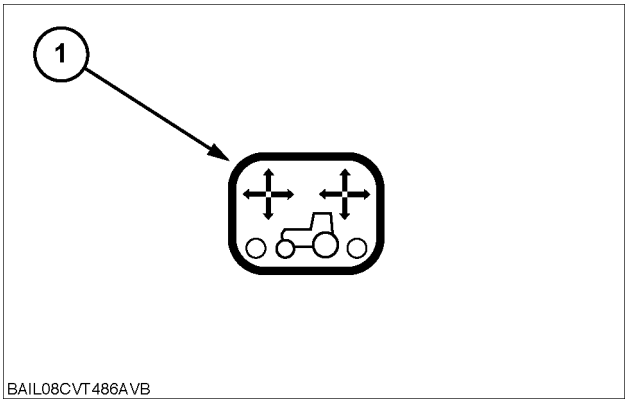


BAIL08CVT484AVA 5

Where a front hitch is supplied as a factory option, the vehicle will be fitted with a joystick and mid mount valves. The joystick **(1)** can be used to control the front hitch using the rear remote or mid mount valves.
Valve number 1 will be used to operate the hitch with the front height limiter as previously described.

NOTE: *Operation of the joystick is disabled if the operator leaves the seat and at key off.*

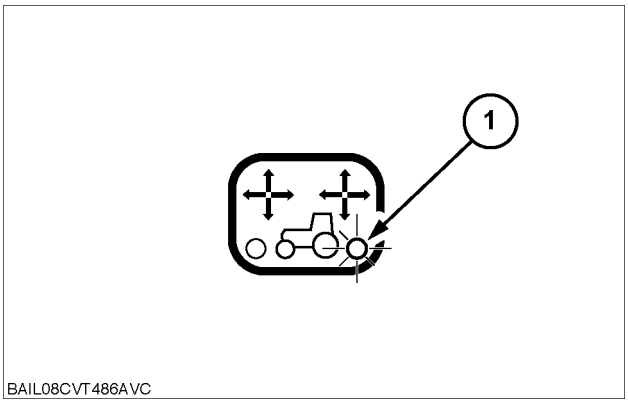
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BAIL08CVT486AVB 6

Vehicles equipped with both rear remote and mid mount valves, the joystick can be used to operate either valve assembly. A selector switch **(1)** on the armrest console allows the operator to switch joystick control between mid mount and rear remote valves. Repeated pressing of the switch will cycle between the mid mount and rear remote valves. A light in the switch indicates the current valve selection.

NOTE: *Before switching joystick operation between rear remote and mid mount valves or vice versa, make sure all remote valve levers are in the neutral position.*



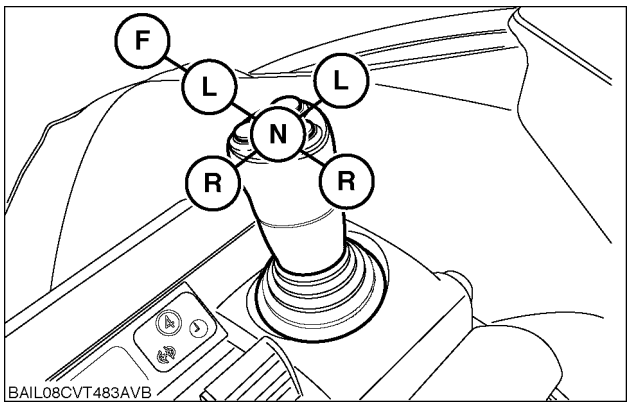
BAIL08CVT486AVC 7

To operate the front hitch using the rear remote valves and joystick, depress the switch, the rear remote valve indicator lamp **(1)** will start to flash.
After five seconds the rear indicator lamp will stop flashing and remain on, confirming control of the rear remote valves has been reactivated. Operation of the front hitch is now controlled by the joystick through the rear remote valves. Repeating the process will change control to the mid mount valves.

NOTE: *Switching the joystick from mid mount to rear remote valve operation will automatically disable the rear remote levers.*

IMPORTANT: *At key off, joystick operation is deactivated. When the joystick is deactivated the warning lights in the front and rear selector switch will flash. The joystick will be reactivated when the operator is in the seat with the engine running for more than three seconds*

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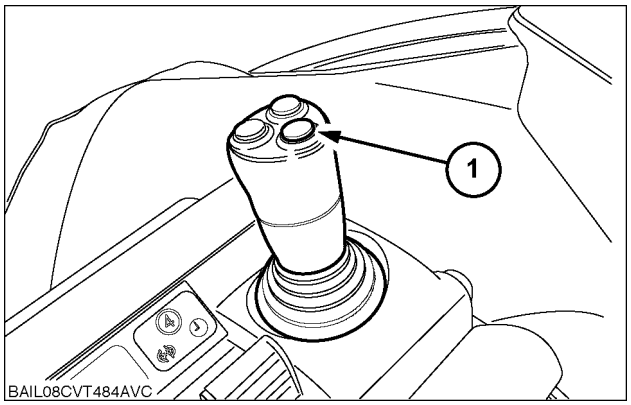


BAIL08CVT483AVB 8

Both the rear remote and mid mount valves offer the following functions when operated by the joystick:

Remote Valve 1: Move the joystick backwards or forward to select Raise **(R)**, Neutral **(N)**, Lower **(L)** and Float **(F)** on the front hitch.

Remote Valve 2: Move the joystick Left or Right to provide oil flow through the front couplers (if fitted).



BAIL08CVT484AVC 9

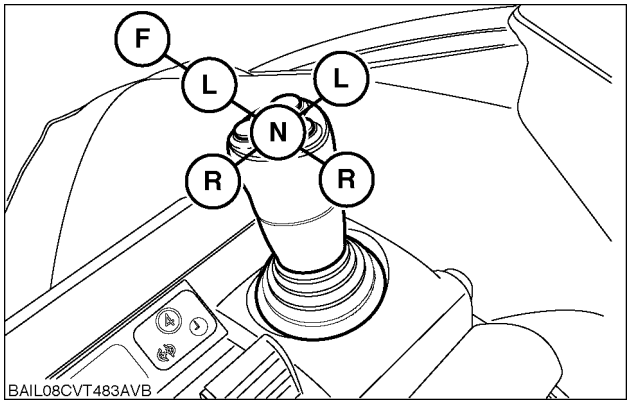
Where valves 3 and 4 are fitted the joystick functions are as follows. This applies to both mid mount and rear mount valves.

Remote Valve 3: Depress and hold the button **(1)** and move the joystick backwards or forwards to operate Raise, Neutral, Lower and Float.

Remote Valve 4: Depress and hold the button **(1)** and move the joystick left or right to operate Raise, Neutral and Lower.

NOTE: *Button **(1)** is the only button to have any functionality when the joystick is used to operate the front hitch.*

NOTE: *The joystick should not be used for hydraulic motor operation.*



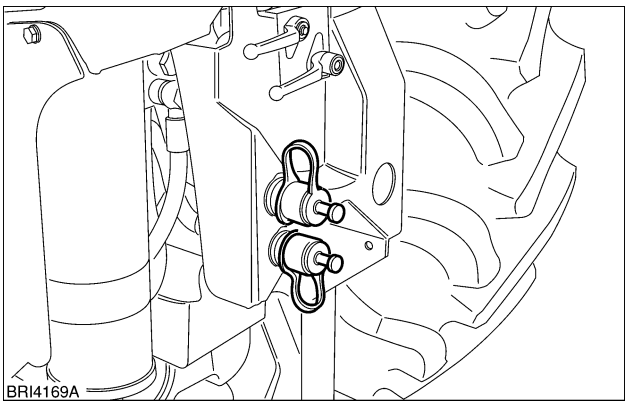
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Move the joystick backwards to position **(R)** to raise the hitch, when the maximum height set by the height limiter is reached the hitch will stop.
Move the joystick forward to position **(L)** to fully lower the hitch at a controlled rate.
Move the joystick fully forward to position **(F)** float, will allow the hitch to lower under its own weight. Float can also be used to allow the lift cylinder to extend or retract freely allowing an implement to follow the contours of the ground.
The joystick can also be moved laterally **(R)** and **(L)** to provide oil for equipment connected to the optional connectors.
By moving the joystick diagonally two cylinders may be operated simultaneously.

NOTE: *Always use the float position to lower a single acting cylinder. The lower position is for double acting cylinders only.*

NOTE: *With the joystick operating the rear remote valves, the float position for valves 2 and 4 (lateral movement of the joystick) is not available.*



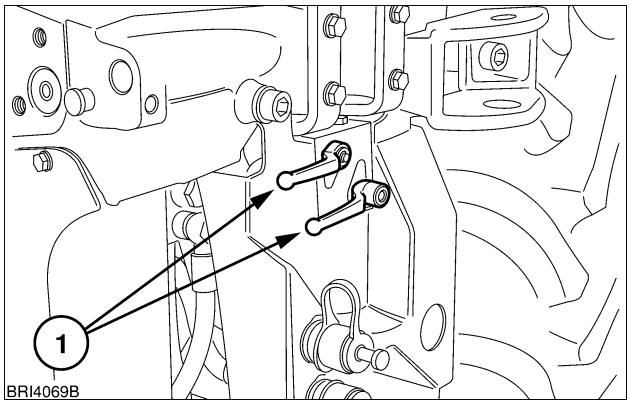
BAIL07CCM294ASA 11

Two auxiliary connectors with **1/2 in** female couplings may be fitted to the front hitch frame. These will provide a double acting hydraulic service for equipment mounted on the front 3 point hitch. When operated by the joystick lateral movement of the joystick (left or right) will provide pressurized oil at the couplings.

NOTE: *When the front couplers are not in use the protective plugs should always be inserted into the coupler to prevent dust or debris entering the hydraulic system.*

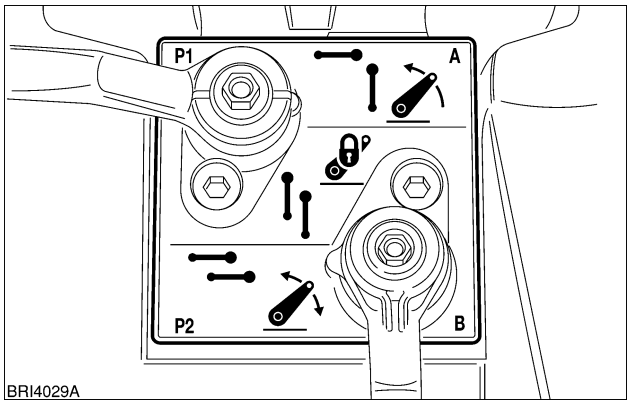
NOTE: *Before disconnecting hoses from the front couplers, any residual pressure in the hydraulic lines must be released.*

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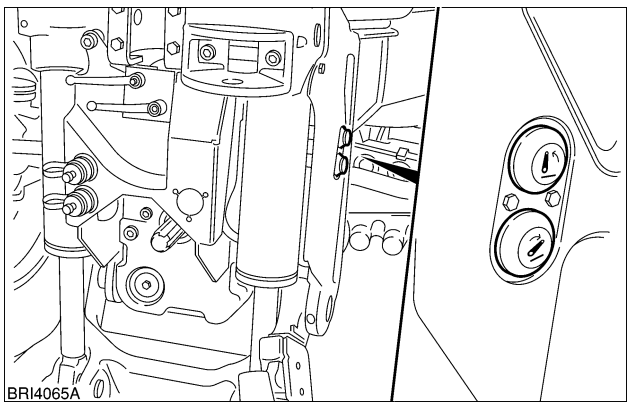
BAIL07CCM295ASA 12

Two selector levers **(1)** are mounted on the front of the hitch assembly, making it possible to change the front hitch between single-action mode, double-action mode or a fixed working height.



BAIL07CCM296ASA 13

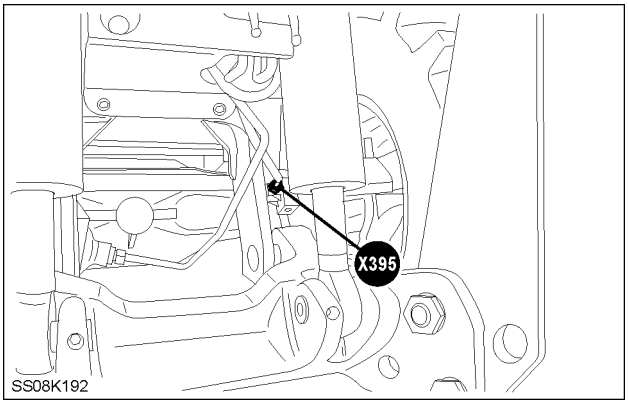
Lever positions:
Upper lever horizontal, lower lever vertical, the hitch operates in single-action mode, raised by the hydraulics, but lowered by the mounted equipment's dead weight.
With both levers horizontal, the hitch operates in double-action mode, raised and lowered by the hydraulics.
With both levers vertical, both hydraulic cylinders are hydraulically locked and the lower links cannot move.



BAIL07CCM297ASA 14

External controls are available as an optional extra, mounted on the left-hand side of the hitch.

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SS08K192 15

Vehicles fitted with a front hitch have an auxiliary control unit fitted in addition to, and mounted alongside the central control unit behind the driver's seat. This auxiliary controller processes information from the front hitch height potentiometer, via connector **X395** to regulate height limit settings and provide **(%)** height references to the cluster.

⚠ WARNING ⚠

Extreme care must be exercised when adjusting and checking hitch and control linkage when the engine is running and when linkage is under hydraulic or mechanical load. Study the linkage and hitch travel-keep the hands, arms, legs and feet out of the travel arc of the hitch and linkage.

M148B

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HITCH Front hitch - Remove

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

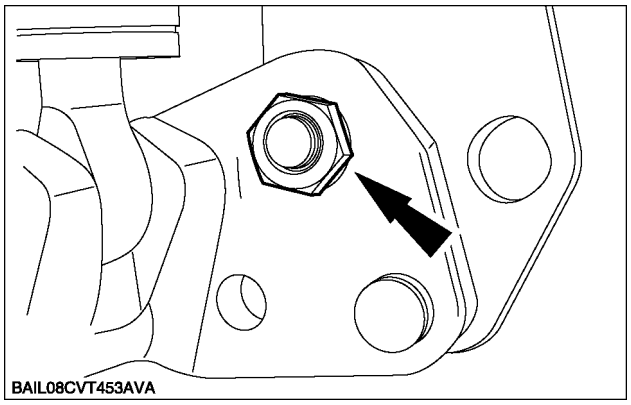
B012

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

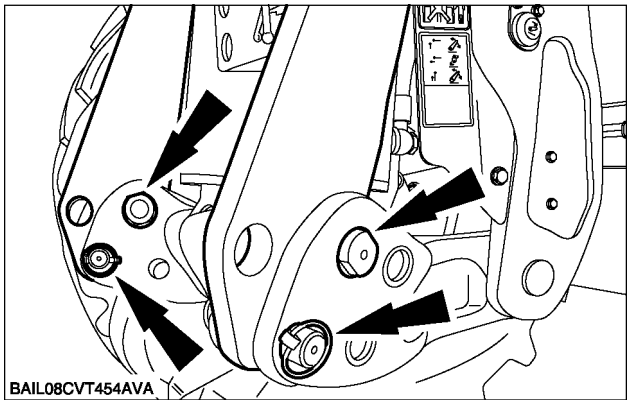
B026

1. Fully lower the front hitch.
2. Disconnect the battery ground cable, for further information refer to **Battery - Disconnect (A.30.A)**.
3. Remove the lower lift link pin retaining nuts.



BAIL08CVT453AVA 1

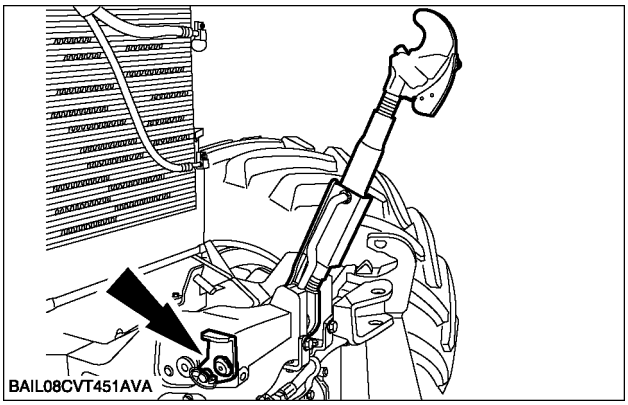
4. Remove the lower lift link retaining pins and remove lower lift links.



BAIL08CVT454AVA 2

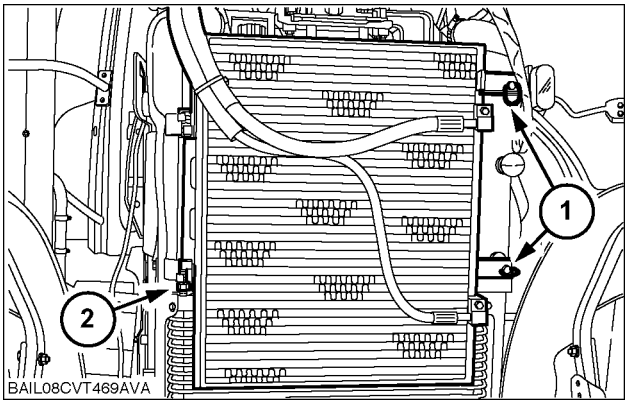
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5. Remove the retaining pin and remove the top link.



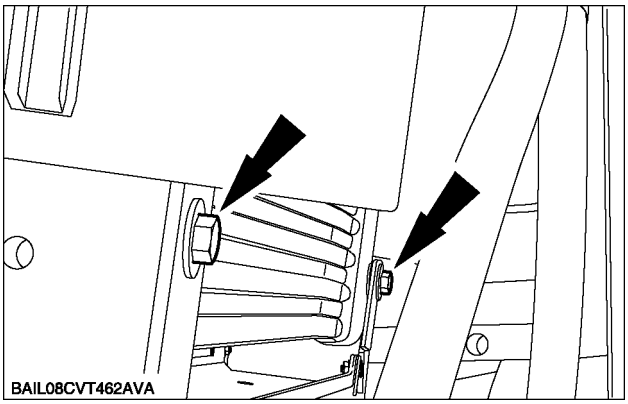
BAIL08CVT451AVA 3

6. Release the condensor retaining clips **(1)** and remove the condensor hinge bolt **(2)**.
Detach the condensor and carefully position it on top of the engine.



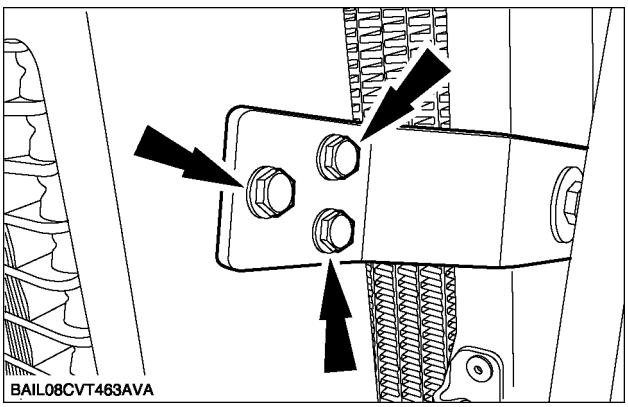
BAIL08CVT469AVA 4

7. Remove the oil cooler rear retaining bolts.



BAIL08CVT462AVA 5

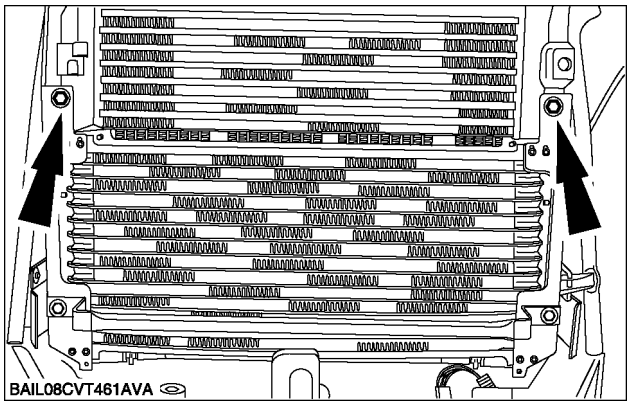
8. Detach the cooling assembly brackets from the oil cooler.



BAIL08CVT463AVA 6

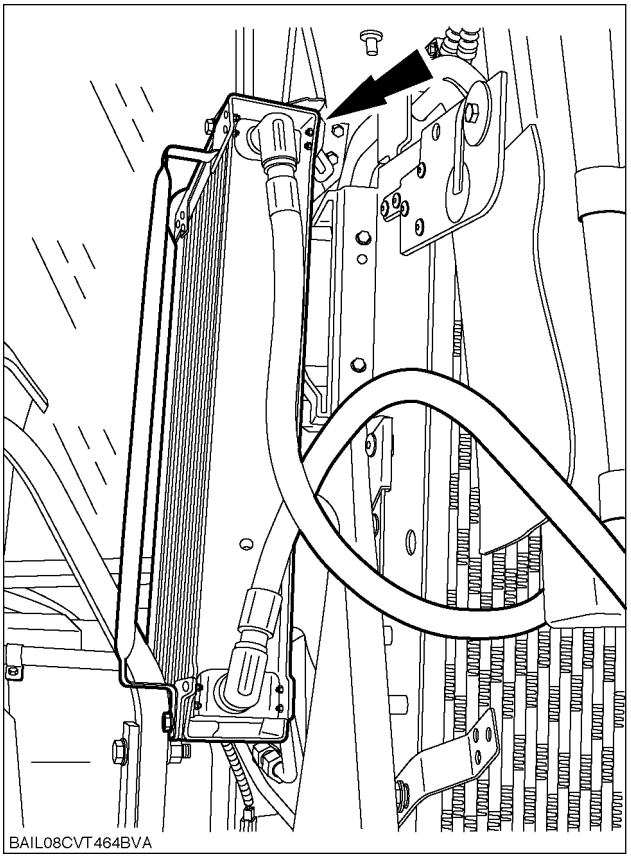
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9. Detach the oil cooler.



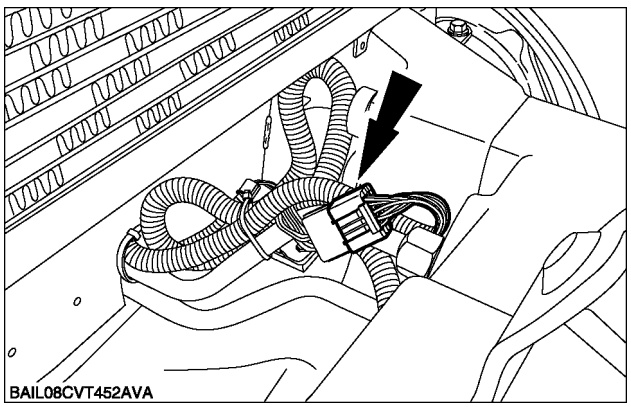
BAIL08CVT461AVA 7

10. Carefully secure the oil cooler to one side.



BAIL08CVT464BVA 8

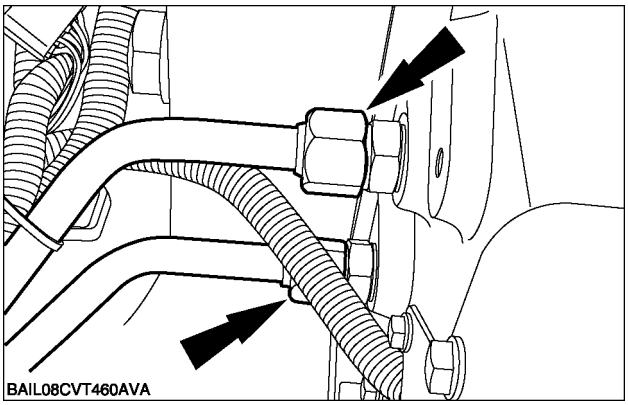
11. Disconnect the front hitch electrical connectors.



BAIL08CVT452AVA 9

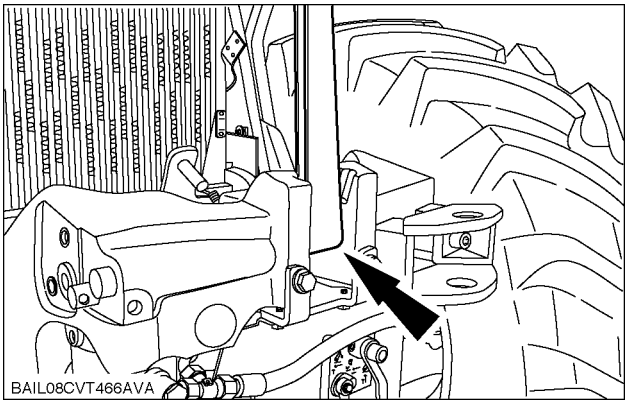
www.truck-freeworkshop.com

12. Disconnect the hydraulic oil supply and return pipe.



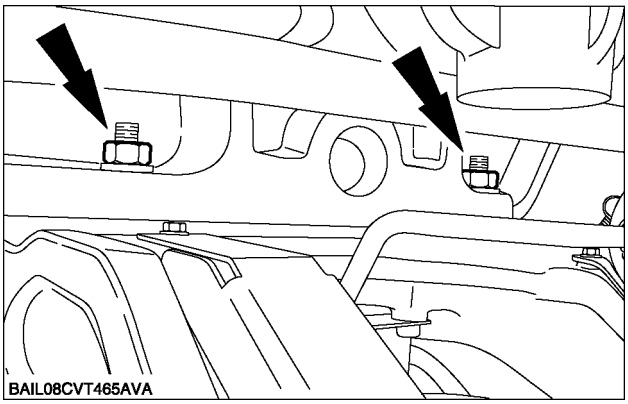
BAIL08CVT460AVA 10

13. Using suitable lifting equipment, support the front hitch.



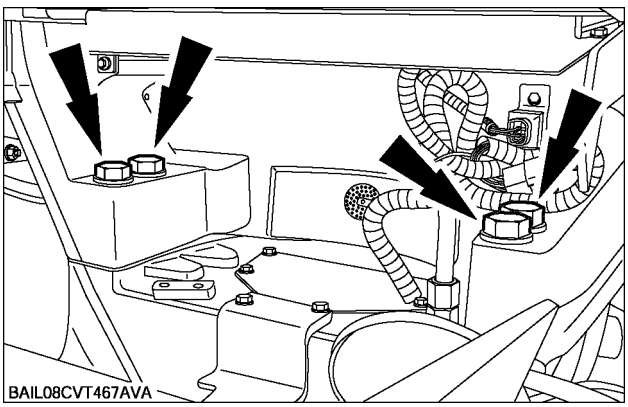
BAIL08CVT466AVA 11

14. Remove the front hitch lower retaining nuts.



BAIL08CVT465AVA 12

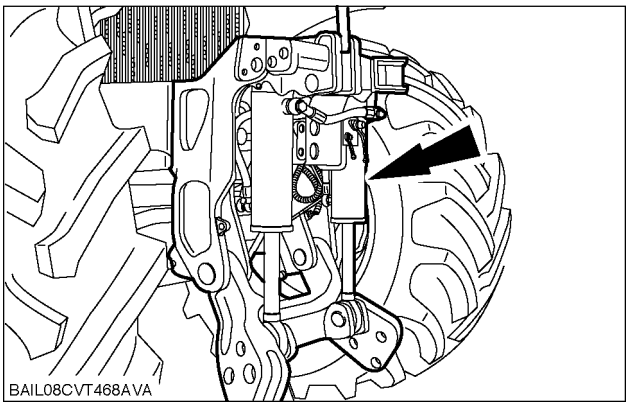
15. Remove the front hitch upper retaining bolts.



BAIL08CVT467AVA 13

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16. Remove the front hitch.



BAIL08CVT468AVA 14

www.truck-freeworkshop.com

HITCH Front hitch - Install

⚠ DANGER ⚠

Lift and handle all heavy components using lifting equipment of appropriate lifting capacity. Make sure that units or parts are supported by suitable slings or hooks. Make sure that no-one is in the vicinity of the load to be lifted. Failure to comply could result in serious injury or death.

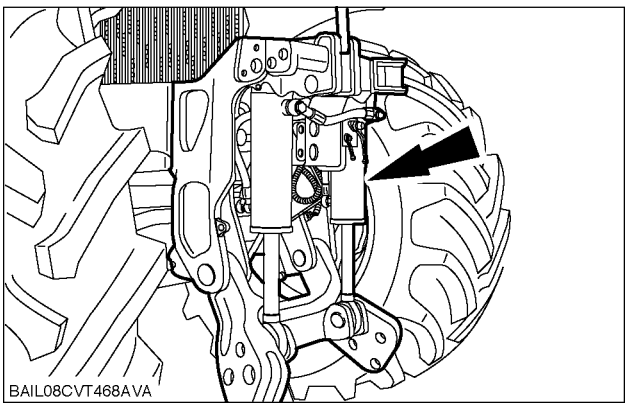
B012

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

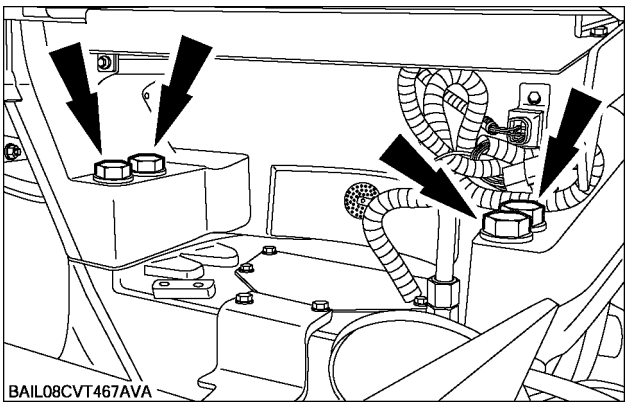
B026

1. Using a suitable hoist, install the front hitch.



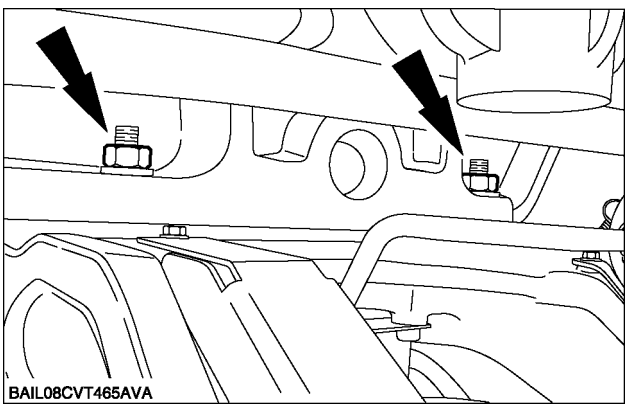
BAIL08CVT468AVA 1

2. Install the front hitch upper retaining bolts. Tighten to **650 Nm** (**480 lb ft**)



BAIL08CVT467AVA 2

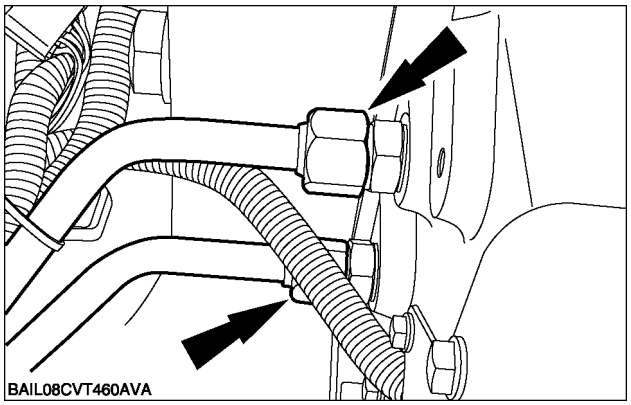
3. Install the front hitch lower retaining nuts. Tighten to **650 Nm** (**480 lb ft**)



BAIL08CVT465AVA 3

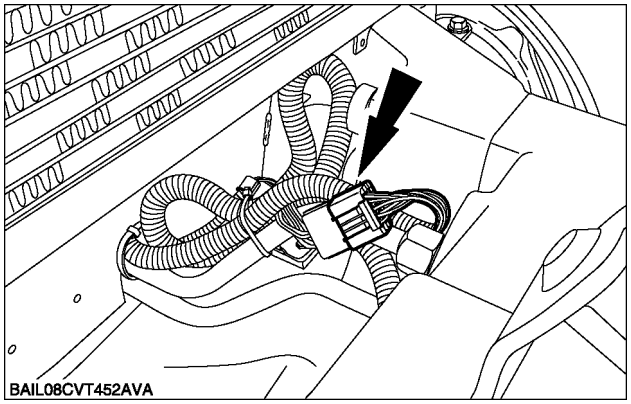
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4. Connect the hydraulic oil supply and return pipes.



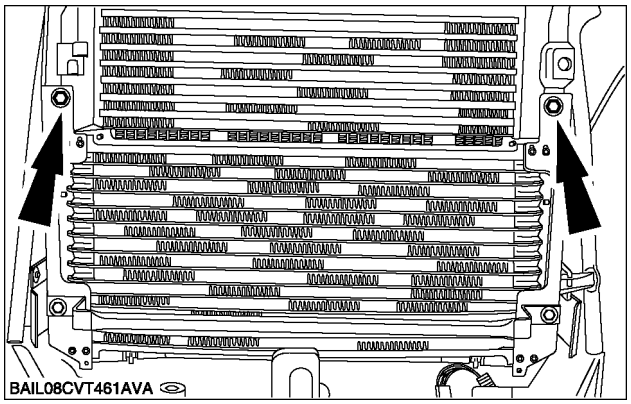
BAIL08CVT460AVA 4

5. Connect the front hitch electrical connector.



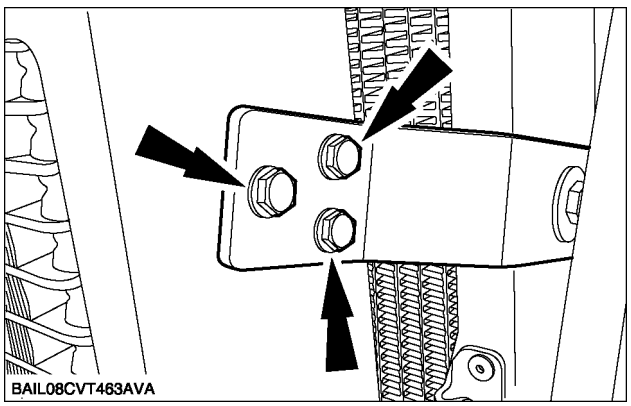
BAIL08CVT452AVA 5

6. Attach the oil cooler.



BAIL08CVT461AVA 6

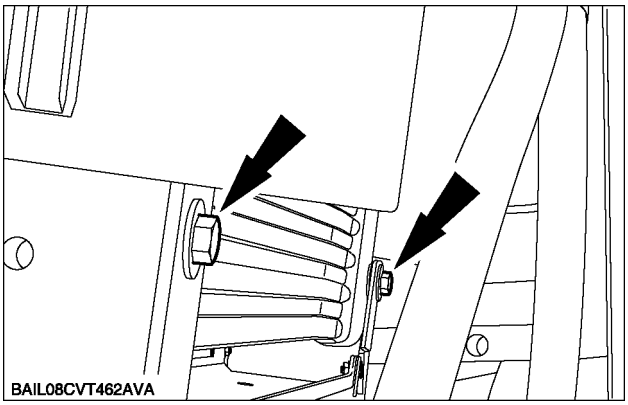
7. Attach the cooling assembly brackets to the oil cooler.



BAIL08CVT463AVA 7

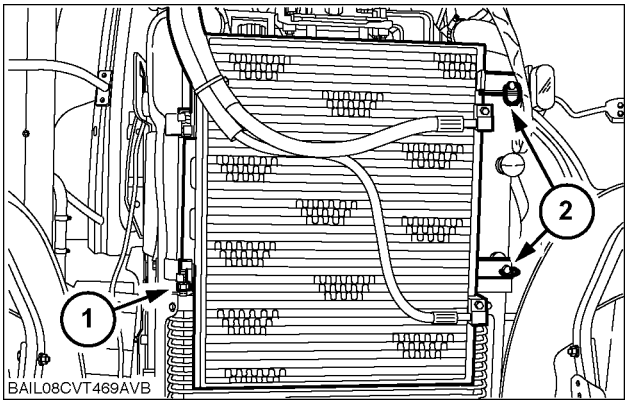
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8. Install the oil cooler rear retaining bolts.



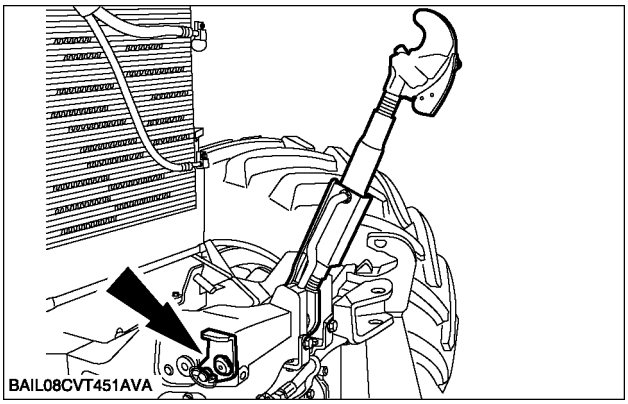
BAIL08CVT462AVA 8

9. Install the condensor into position.
Install the condensor hinge bolt and retaining nut **(1)** and secure the condensor retaining clips **(2)**.



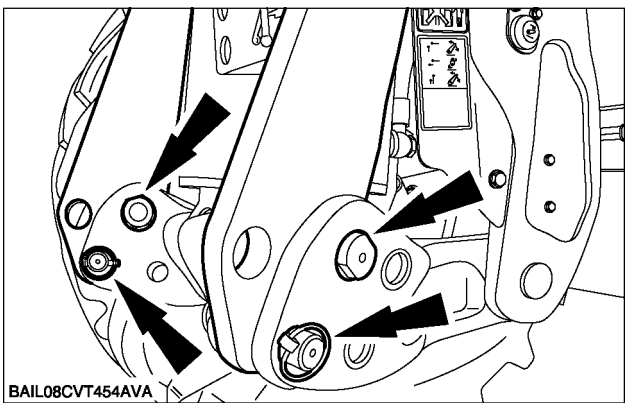
BAIL08CVT469AVB 9

10. Install the front top link and install the retaining pin .



BAIL08CVT451AVA 10

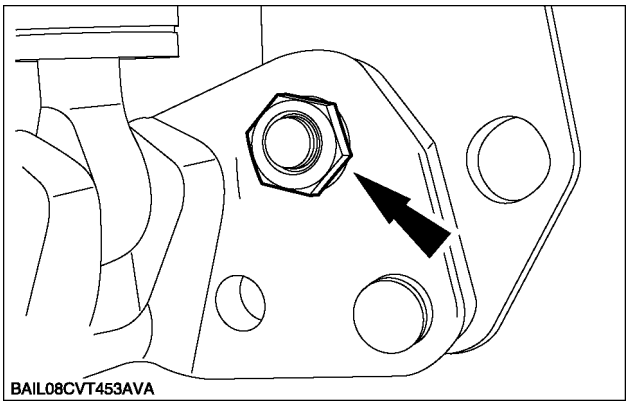
11. Install the lower lift links, and retaining pins.



BAIL08CVT454AVA 11

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12. Install the lower lift link pin retaining nuts.



BAIL08CVT453AVA 12

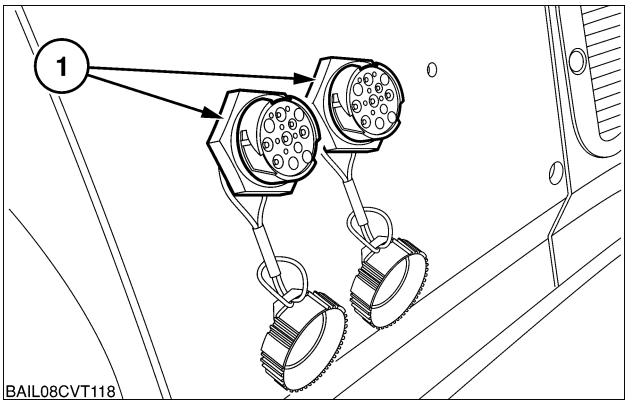
Next operation:
Connect the battery ground cable, for further information refer to **Battery - Connect (A.30.A)**

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HITCH Front hitch - Calibrate

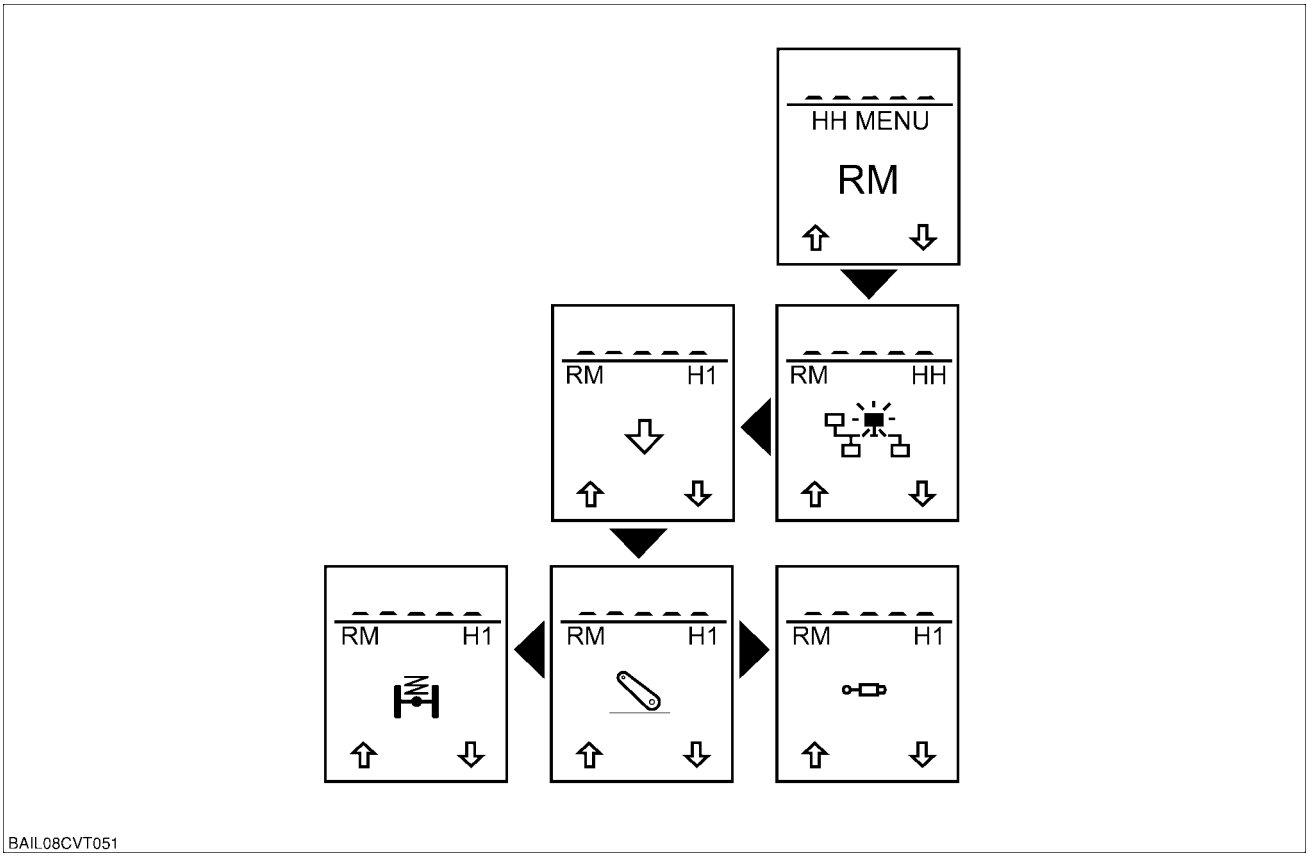
NOTE: *The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the wheels, front and rear. Check that the Ground speed display is Zero before commencing. Calibration cannot proceed unless the tractor is stationary.*

1. Install the diagnostic connector **380000843** into the diagnostic socket **(1)**.



BAIL08CVT118 1

2. Turn the height set control to the OFF position.
3. Use the "up", "down" and "menu" keys on the ICU3 to navigate the HH menu's to H1 and the front hitch symbol on the RM controller.

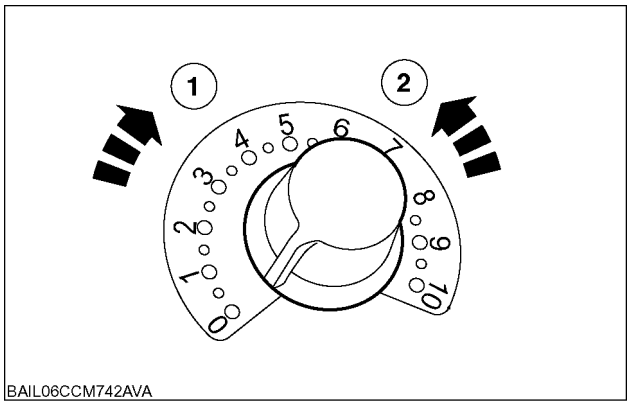


BAIL08CVT051 2

4. Turn the height set control to the ON position and then back to the OFF position.
The current potentiometer position will show on the top section of the display.

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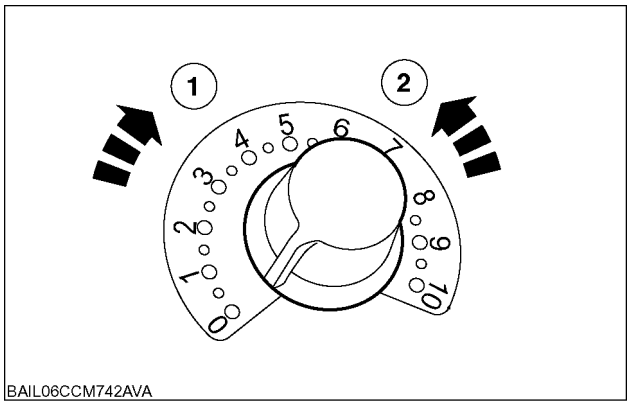
5. Lower the front hitch to it's lowest position.
When the end stop is reached, turn the height set control to the ON position and then back to the OFF position.



BAIL06CCM742AVA 3

6. The bottom value position is recorded and displayed in the top section of the display for 2 seconds.

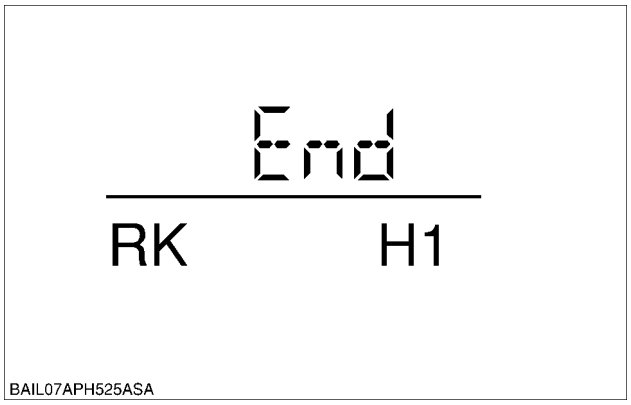
7. Raise the front hitch to it's highest position.
When the end stop is reached, turn the height set control to the ON position and then back to the OFF position.



BAIL06CCM742AVA 4

8. The top value position is recorded and displayed in the top section of the display for 2 seconds.

9. The display will then show "End" to indicate that the calibration process has been completed successfully.



BAIL07APH525ASA 5

10. Key OFF to store the calibration values.

NOTE: *If an error occurs during calibration a "U" code will be displayed and the procedure will need to be repeated. Refer to the "U" code listing in* ***ELECTRONIC SYSTEM - Calibrate (A.50.A)****.*

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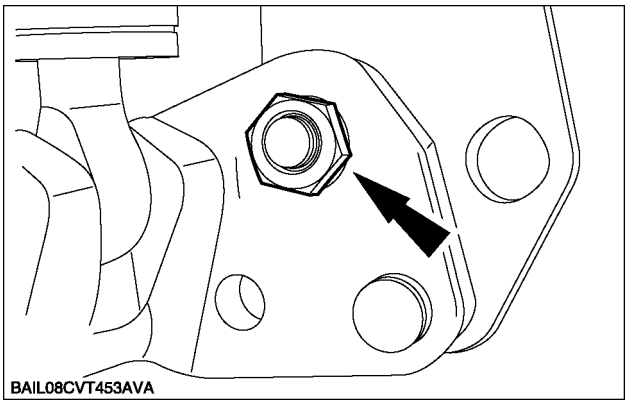
Lift arm - Remove

⚠ **WARNING** ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

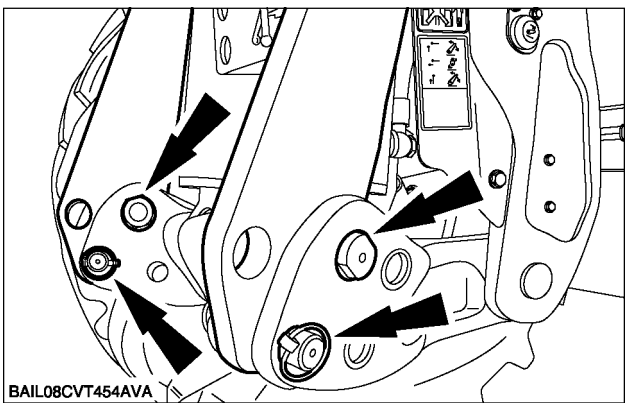
B026

1. Fully lower the front hydraulic lift arms.
2. Disconnect the battery ground cable, for further information refer to **Battery - Disconnect (A.30.A)**.
3. Remove the lift arm pin retaining nuts.



BAIL08CVT453AVA 1

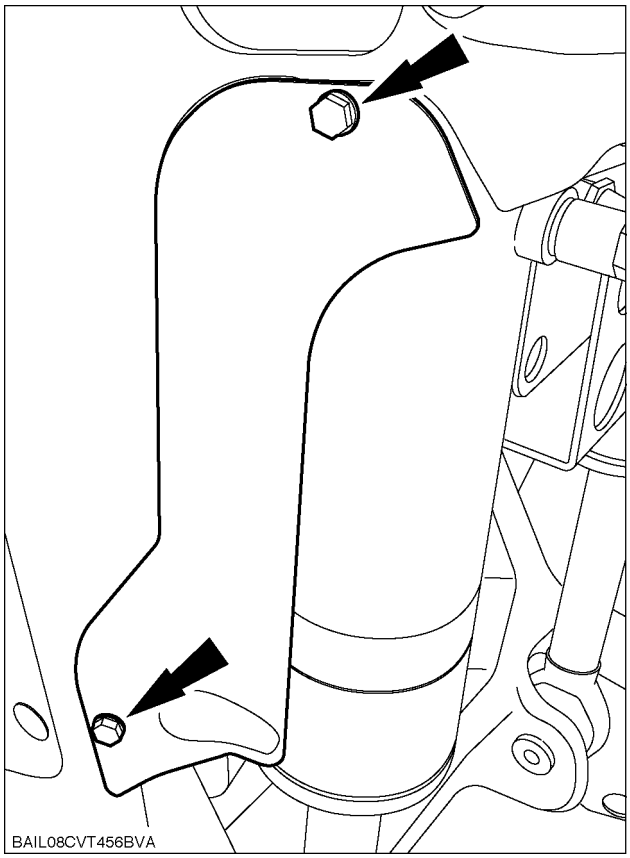
4. Remove the lower lift arm retaining pins and remove lower lift arms.



BAIL08CVT454AVA 2

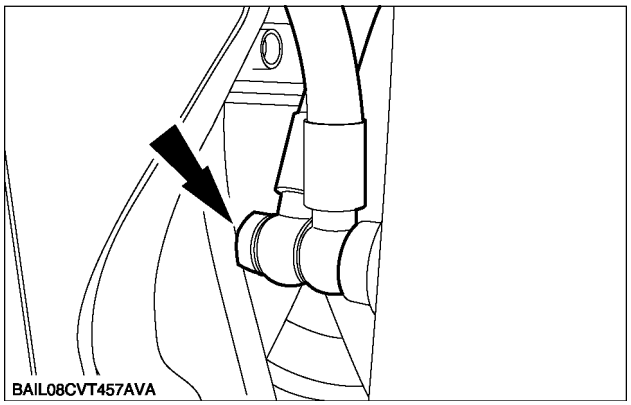
www.truck-freeworkshop.com

5. Remove the lift ram shield.



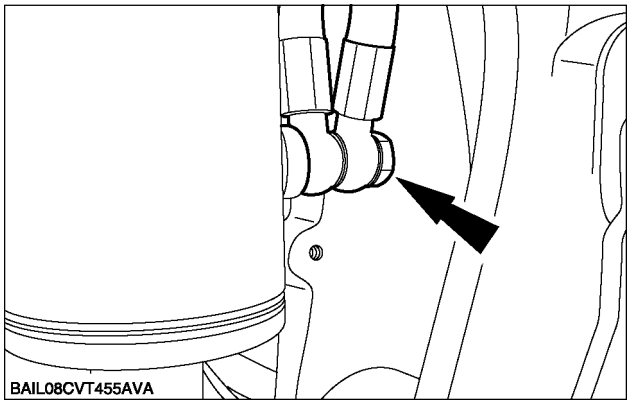
BAIL08CVT456BVA 3

6. Disconnect the lift ram upper hydraulic hoses.



BAIL08CVT457AVA 4

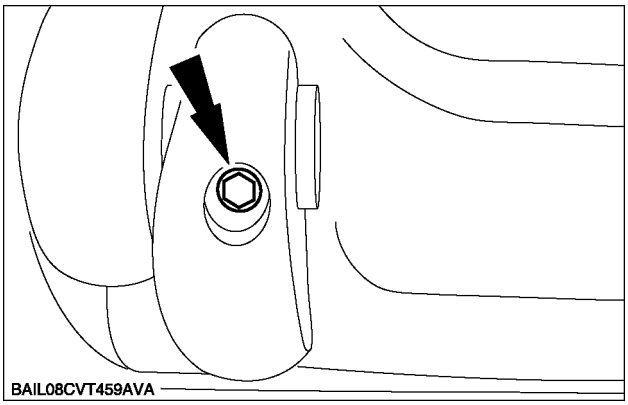
7. Disconnect the lift ram lower hydraulic hoses.



BAIL08CVT455AVA 5

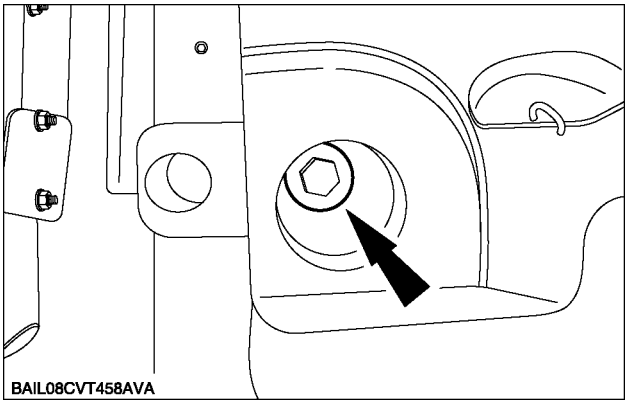
www.truck-freeworkshop.com

8. Remove the lift ram lower retaining pin.



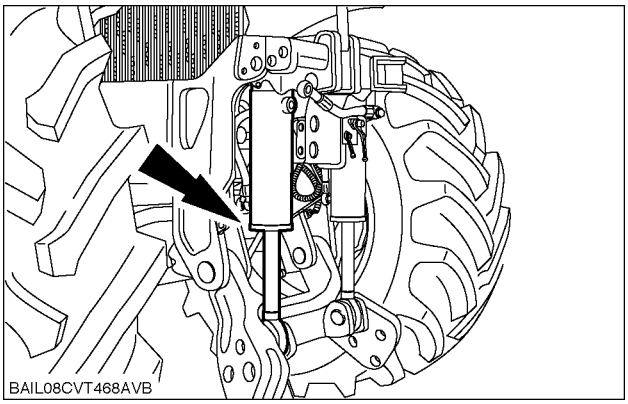
BAIL08CVT459AVA 6

9. Support the lift ram and remove the lift ram upper retaining pin.



BAIL08CVT458AVA 7

10. Remove the lift ram.



BAIL08CVT468AVB 8

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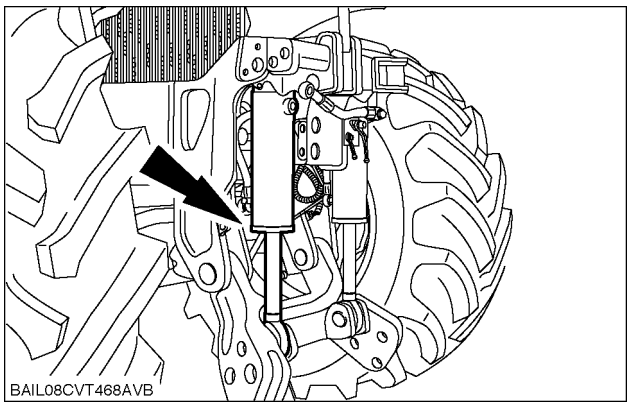
Lift arm - Install

⚠ WARNING ⚠

Handle all parts carefully. Do not put your hands or fingers between parts. Wear suitable safety clothing - safety goggles, gloves and shoes.

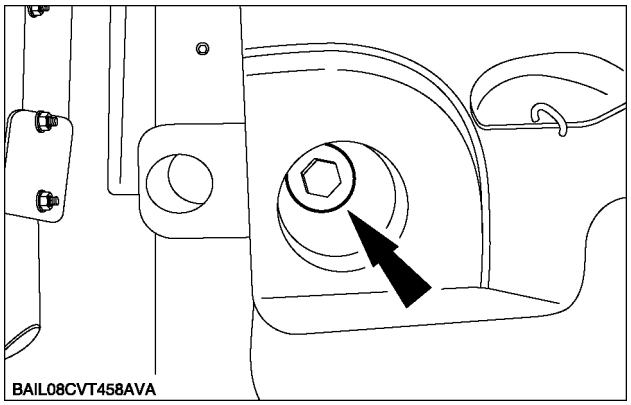
B026

1. Install the lift ram into position.



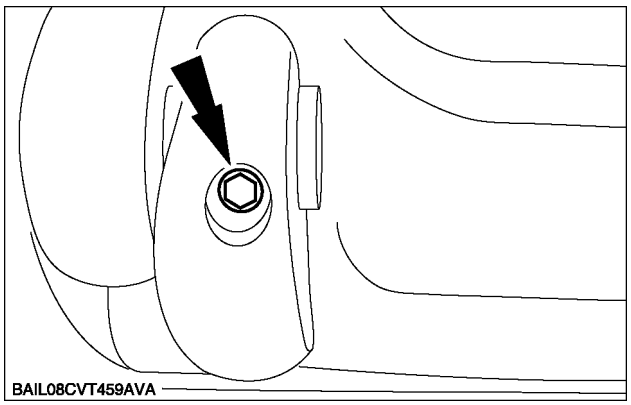
BAIL08CVT468AVB 1

2. Install the lift ram upper retaining pin.



BAIL08CVT458AVA 2

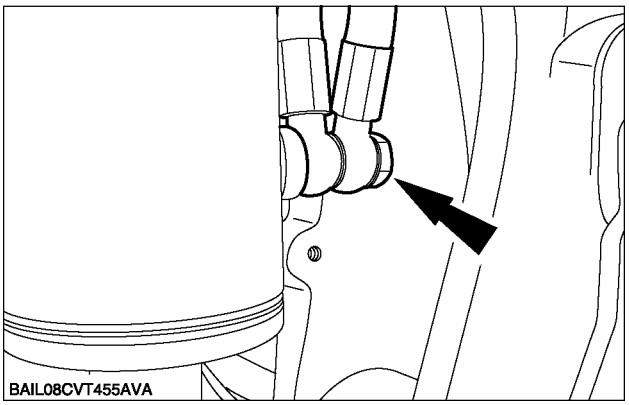
3. Install the lift ram lower retaining pin.



BAIL08CVT459AVA 3

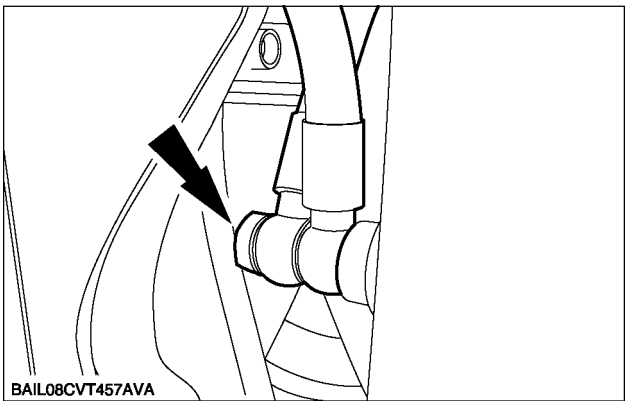
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4. Connect the lift ram lower hydraulic hoses.



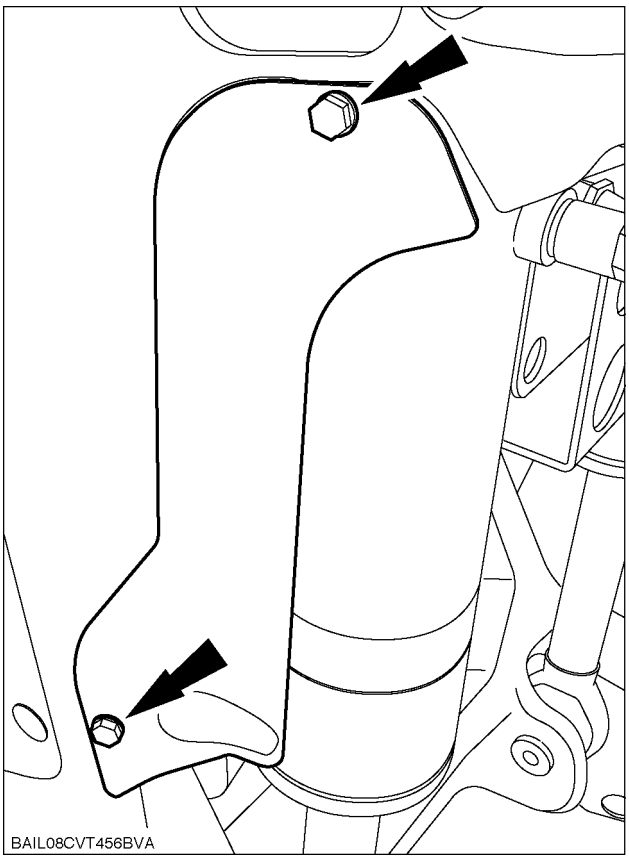
BAIL08CVT455AVA 4

5. Connect the lift ram upper hydraulic hoses.



BAIL08CVT457AVA 5

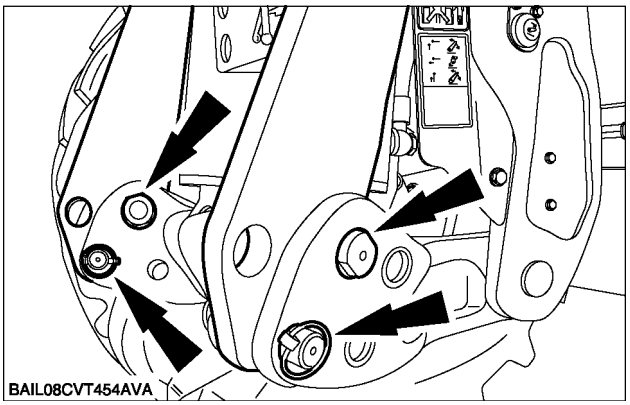
6. Install the lift ram shield.



BAIL08CVT456BVA 6

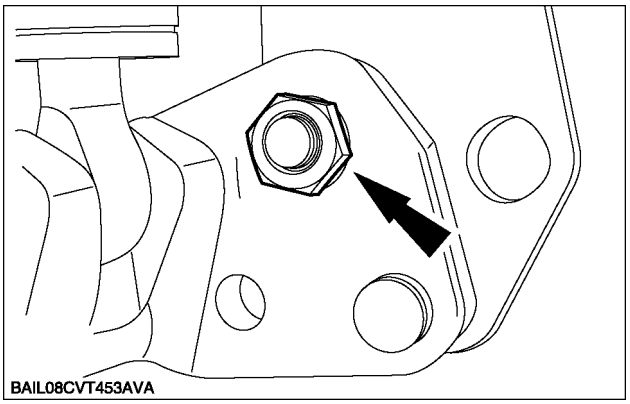
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7. Install the lower lift arm retaining pins



BAIL08CVT454AVA 7

8. Install the lift arm pin retaining nuts.



BAIL08CVT453AVA 8

Next operation:
Connect the battery ground cable, for further information refer to **Battery - Connect (A.30.A)**

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HITCH Front hitch - Troubleshooting

Problem	Possible Cause	Correction
Front hydraulic lift not raising	Diverter valve not open.	Open the diverter valve.
	Height limit control incorrectly set.	Adjust the height limit control to the required setting.
	Front hydraulic lift arm position sensing potentiometer damaged.	Replace the potentiometer.
Front hydraulic lift will not raise heavy loads	Front hydraulic lift cylinder oil seals leaking.	Overhaul the front hydraulic lift cylinders.

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WORKING ARM - H

HITCH Rear hitch - 10.C

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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WORKING ARM - H

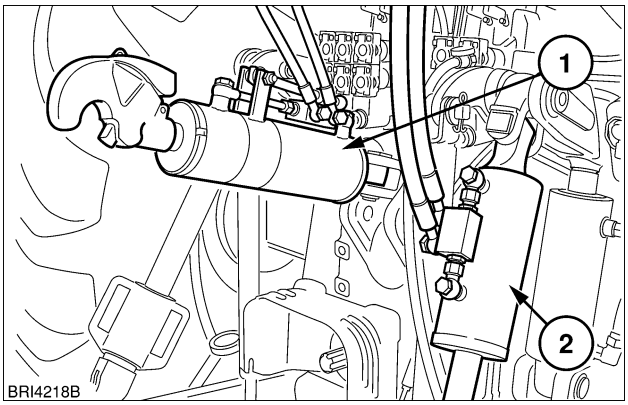
HITCH Rear hitch - 10.C

FUNCTIONAL DATA
Top link
Static description 3

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Top link - Static description

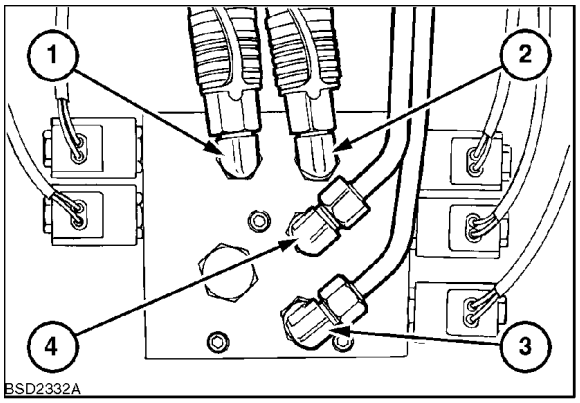
All models can be fitted with a hydraulically adjustable top link **(1)** and right hand lift link **(2)**.



BAIL07CCM298ASA 1

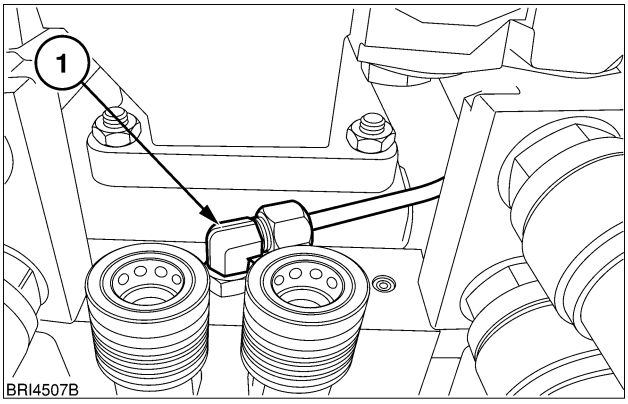
The cylinders are connected to a solenoid valve block by hydraulic hoses and tubes. The solenoid valve block is situated to rear of the centre housing and is fed high pressure oil via a hose connected by a tee piece which also feeds the suspension valve

1. Connector to Hydraulically Adjustable Top Link
2. Connector to Hydraulically Adjustable Top Link
3. Connector to Hydraulically adjustable Lift Link
4. Connector to Hydraulically adjustable Lift Link



BSD2332A 2

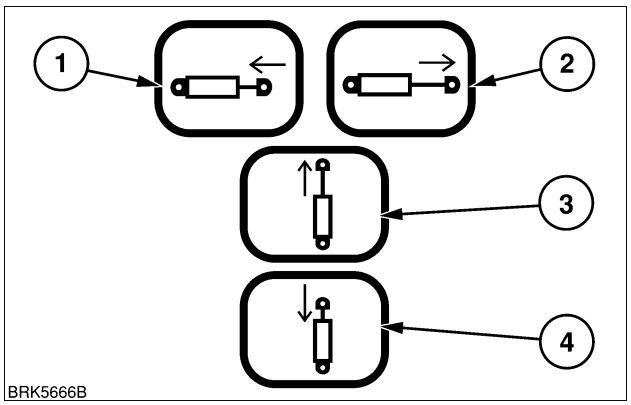
A load sensing line is connected to the manifold



BAIL06CCM257ASA 3

Control of these cylinders is by the switches located on the control panel in the right hand armrest unit of the seat.

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BAIL08CVT021ASA 4

1.Top Link retract
2.Top Link extend
3.Right hand link extend
4.Right hand link retract

NOTE: *It is only possible to turn the solenoids on or off with the switches. There is no method of adjusting the flow rates for these functions.*

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WORKING ARM - H

HITCH Rear hitch - 10.C

Top link - Static description 3

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WORKING ARM - H

HITCH Electronic draft control - 10.D

Puma 165 CVX
Puma 180 CVX
Puma 195 CVX
Puma 210 CVX
Puma 225 CVX

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WORKING ARM - H

HITCH Electronic draft control - 10.D

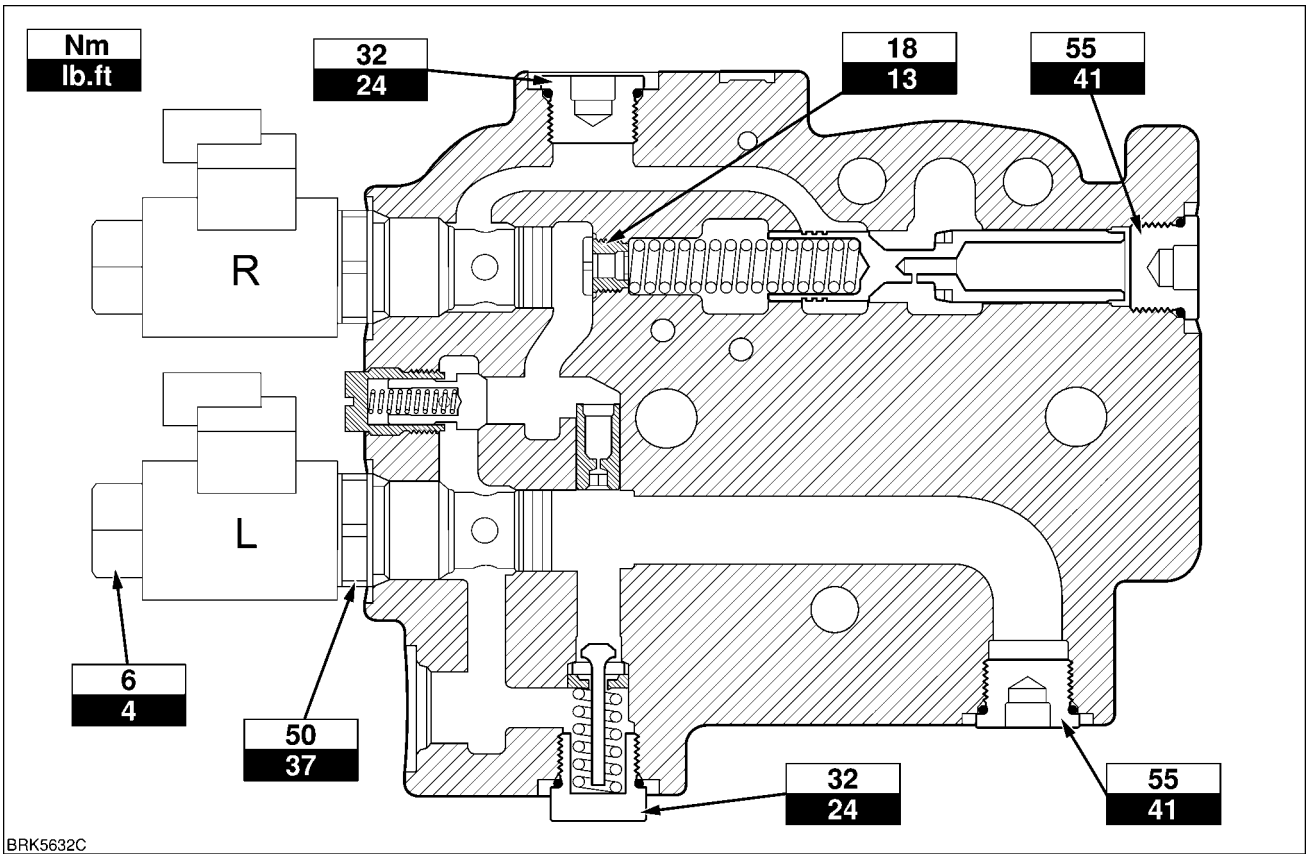
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Control valve - Torque



BAIL08CVT016FSA 1

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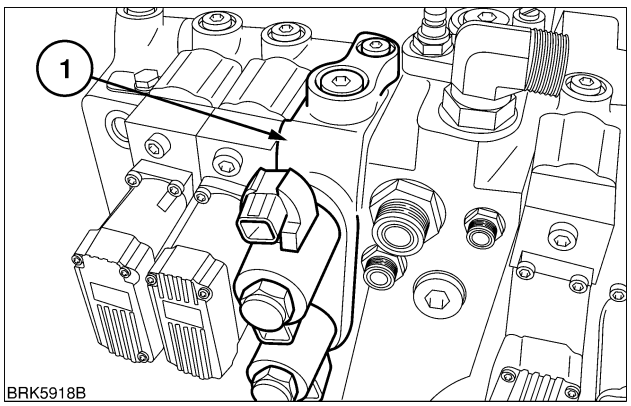
HITCH Electronic draft control - Static description

One method of providing a more constant depth control is to take advantage of the fact that draft loading increases with implement depth. If a fixed implement draft is maintained a fixed implement depth will result, providing the tractor speed and type of soil being worked remain constant.
The hydraulic lift electronic draft control system provides a means of accurately controlling implement draft and soil penetration depth on fully or semi mounted implements.
The principle of electronic draft control, is to sense draft variations through two load sensing pins in the lower links and using a microprocessor translate these variations into electrical signals for controlling the draft loading and working depth of an implement.
The smoothness and accuracy provided during operation gives this system a clear advantage over conventional mechanical systems.
In addition to providing draft control, it is also necessary to provide a system where the hydraulic links can be maintained at a position relative to the tractor regardless of draft forces on the implement. This method of maintaining the implement position is called position control.

COMPONENTS

Hydraulic Lift Assembly and Control Valve (Figure **1**)

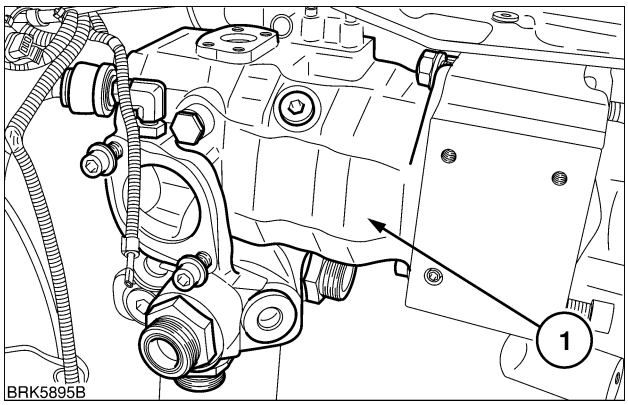
The hydraulic lift Electronic Draft Control valve (EDC valve) is a stack type proportional solenoid operated valve **(1)** mounted with the remote control valves at the rear of the tractor.
The valve responds to pulse width modulated signals from the microprocessor to direct pump pressure oil to and from the hydraulic lift cylinders in direct proportion to the degree of lift required.



BAIL08CVT084ASA 1

Hydraulic Pump (Figure **2**)

Oil flow to the electronic draft control system is provided by the Load Sensing Variable Displacement piston pump **(1)** which adjusts output according to hydraulic circuit demand.



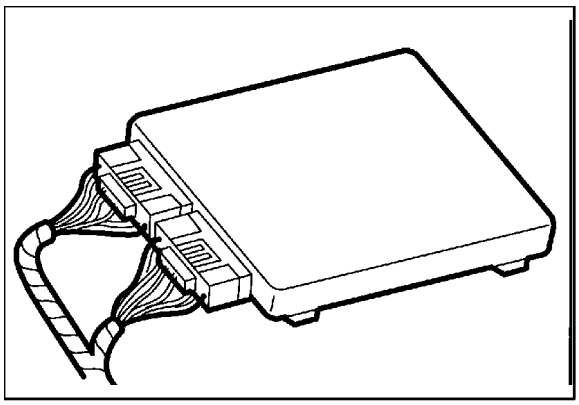
BAIL08CVT085ASA 2

Electronic Draft Control (EDC) Processor (Figure **3**)

The processor is the management system for the electronic draft control hydraulic lift assembly.

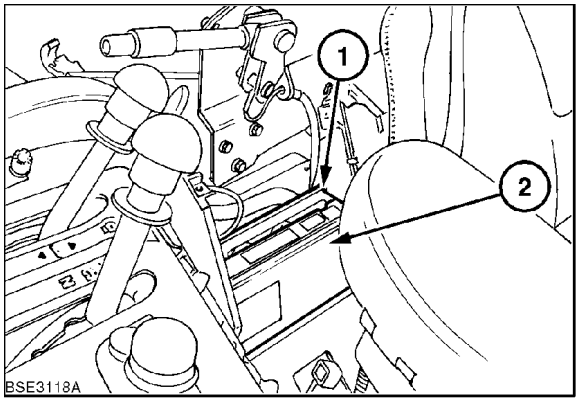
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The processor is housed in a protective casing and connected to the electrical harness via multi-pin connectors. The processor contains no serviceable parts and requires direct replacement when faulty.



1b0o2004061064 3

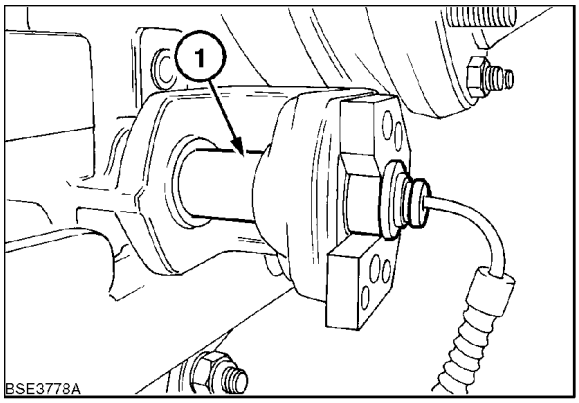
The processor **(1)** is located behind the panel to the rear of the operators seat (Figure **4**)
The processor converts electronic signals from the operator controls, lift arm position sensing potentiometer and lower link load sensing pins to operate the pulse width modulating valve and raise/lower the hydraulic lift.
The processor also has a self diagnostic capability which detects when the system is not functioning correctly. When this occurs an error code is generated and held in the processor memory so they may be retrieved when diagnosing faults on the tractor.



BSE3118A_464 4

Load Sensing Pins

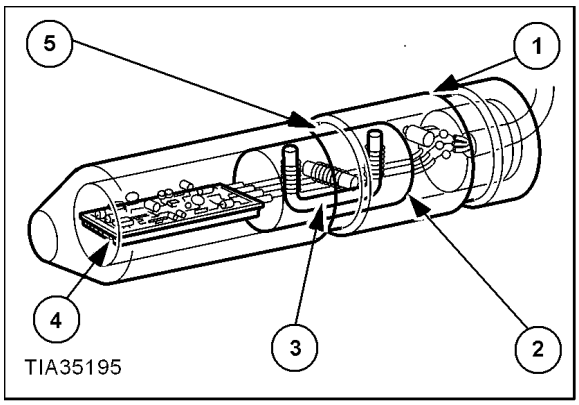
The load sensing pins **(1)** (Figure **5**) sense draft variations applied by an implement on the lower links.
The pins react to draft shear forces in the horizontal plane but not forces due to the weight of the implement.



BSE3778A 5

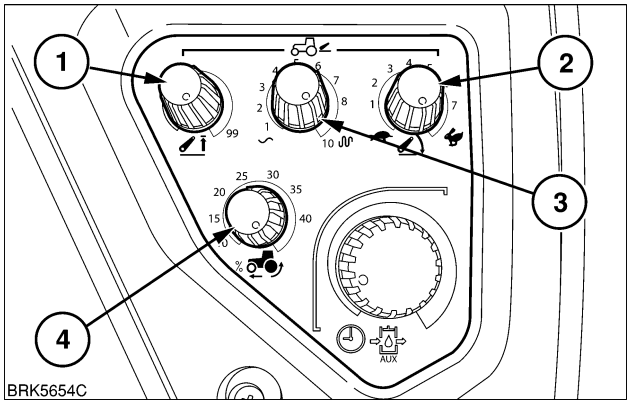
Each load sensing pin (Figure **6**) consists of a hollow metal tube **(1)** containing a circuit board **(4)** and load sensing core **(2)**. Within the core material are three wire coils **(3)** supported by metal rods. The coils are energised by the **8.5 volt** supply and create a stable pattern of magnetic flux within the core.
The outer casing of the pin is made from a metal with unique electromagnetic properties. When the metal is subjected to a shear force, which is centred on the wasted section **(5)** of the pin, the natural magnetism of the pin casing changes, which distorts the magnetic flux pattern of the core and is transformed into an electrical output signal. This signal which is proportional to the draft load acting on the implement is then received by the processor.

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Controls



BAIL08CVT043ASA 7

HEIGHT LIMIT CONTROL **(1)** (Figure **7**)

Located on the armrest console, the height limit control knob limits the height to which the linkage may be raised. Maximum height is achieved through turning the knob fully clockwise.

DROP RATE CONTROL **(2)** (Figure **7**)

Located on the armrest, the drop rate control knob controls the speed at which the implement drops during a lowering cycle. Turning fully clockwise maximises hitch drop rate, turning fully anticlockwise will lock the hitch to set the drop rate to zero.

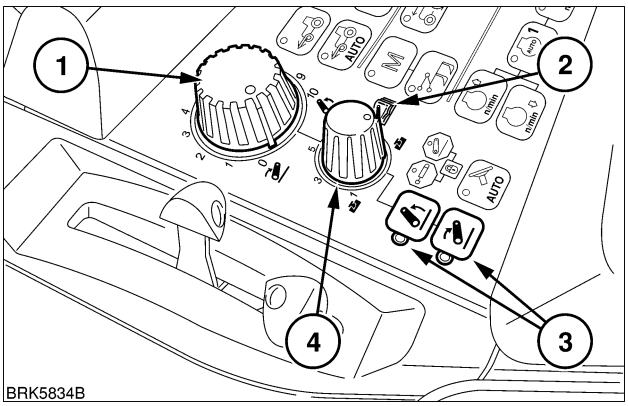
DRAFT SENSITIVITY CONTROL **(3)** (Figure **7**)

Located on the armrest console, this control knob is used to make the system more or less sensitive to changes in draft loading. Turning fully clockwise indicates maximum draft sensitivity.

SLIP LIMIT CONTROL **(4)** (Figure **7**)

Located on the armrest console, this control knob enables the operator to set a wheel slip threshold, above which the implement will raise until wheel slip returns to the set level. This feature is only available with the optional radar unit. Turning fully clockwise allows maximum slip.

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BAIL08045ASA 8

POSITION CONTROL LEVER **(1)** (Figure **8**)

Is used to set the implement height when operating in position control and the maximum depth when operating in draft control. Selecting position 99 sets maximum height.

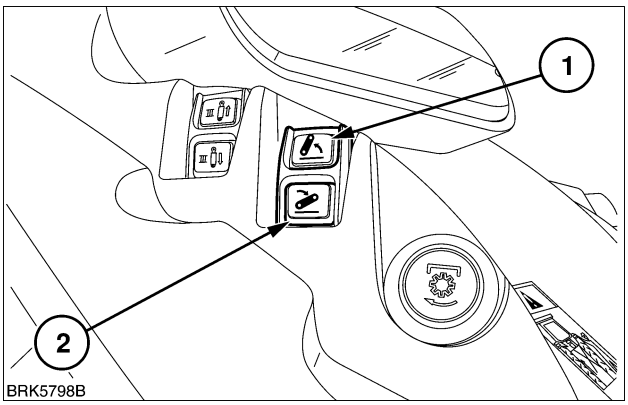
DRAFT CONTROL **(4)** (Figure **8**)

Located on the armrest instrument panel, the draft control knob determines the allowable draft load on the draft sensing pins and hence the implement working depth when operating in draft control. Selecting position 10 will allow maximum draft load and hence maximum depth.

INCHING SWITCHES **(3)** (Figure **8**)

When the EDC is operating (raising or lowering) and whilst the operation is in progress, a lamp on the instrument panel will be on to indicate the EDC is moving.

FENDER RAISE/WORK SWITCH (Figure **9**)

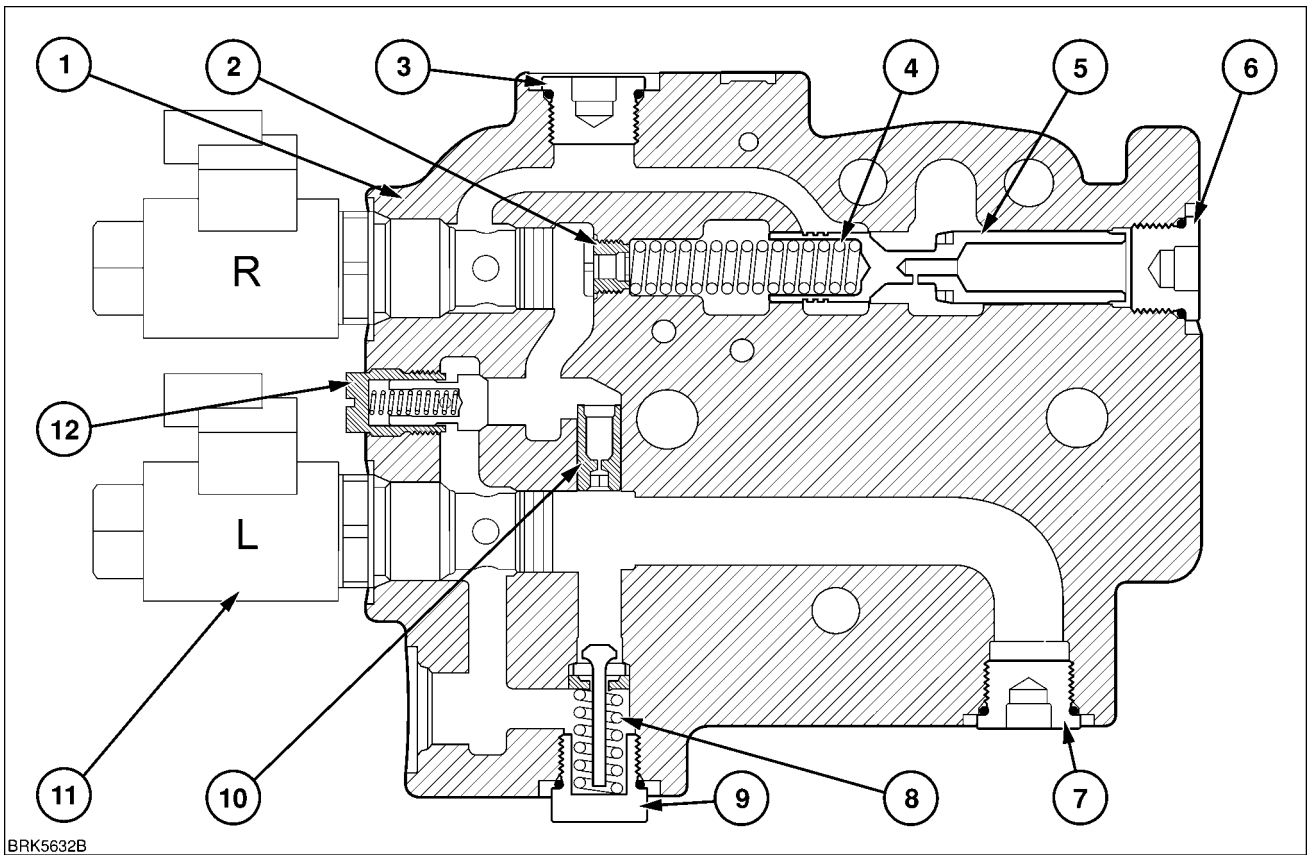


BAIL08CVT044ASA 9

A pair of push buttons (one to raise **(1)**, one to lower **(2)**) are located on each rear fender allowing external control of the rear linkage. Hitch movement is restricted by height limit, but not by position or draft setting.

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Control valve - Sectional view

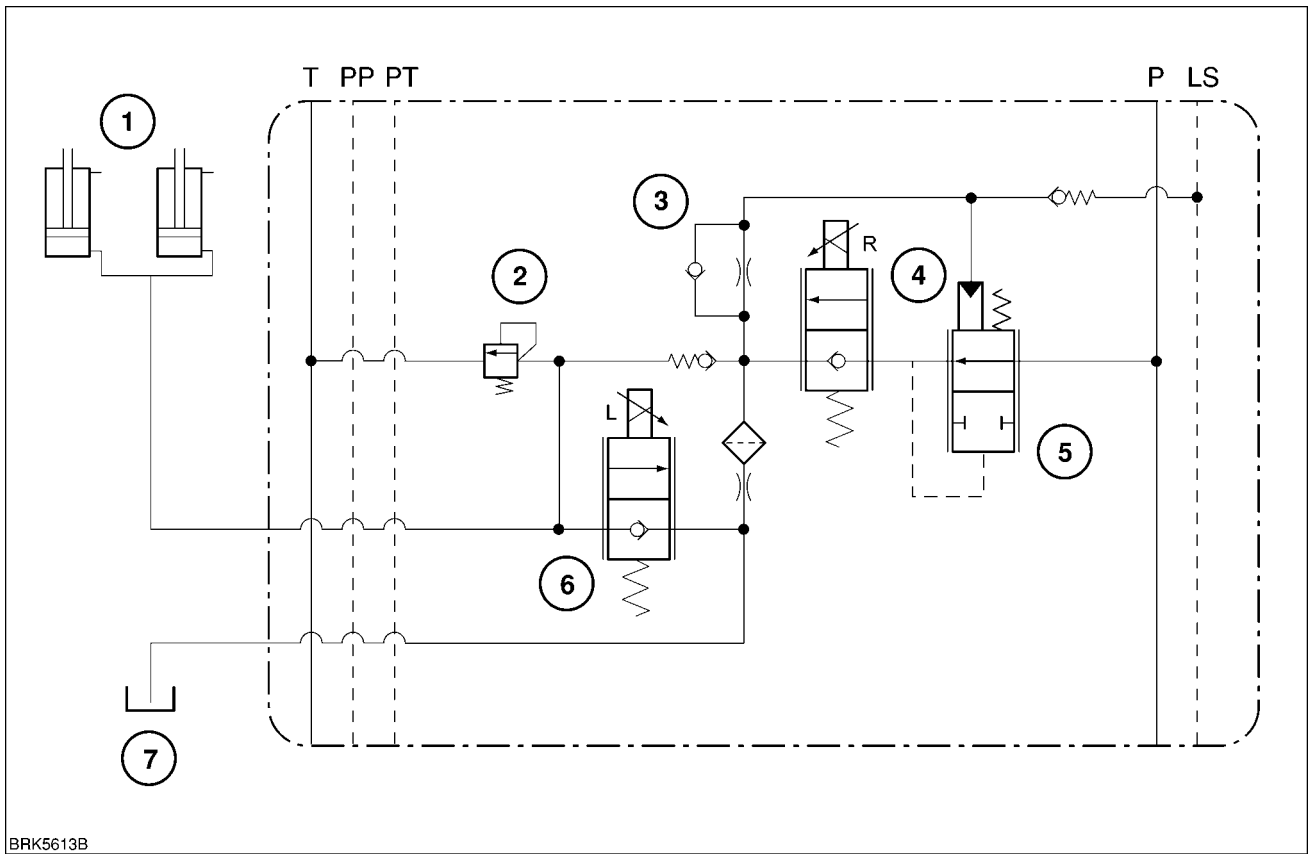


BAIL08CVT011FSA 1

1.Housing
2.Check valve assembly
3.Plug
4.Spring
5.Pressure compensating Spool
6.Plug
7.Plug
8.Relief valve assembly **221 bar** (**3204.5 psi**)
9.Check valve plug
10.Orifice
11.Solenoid
12.Logic check valve assembly

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Control valve - Hydraulic schema

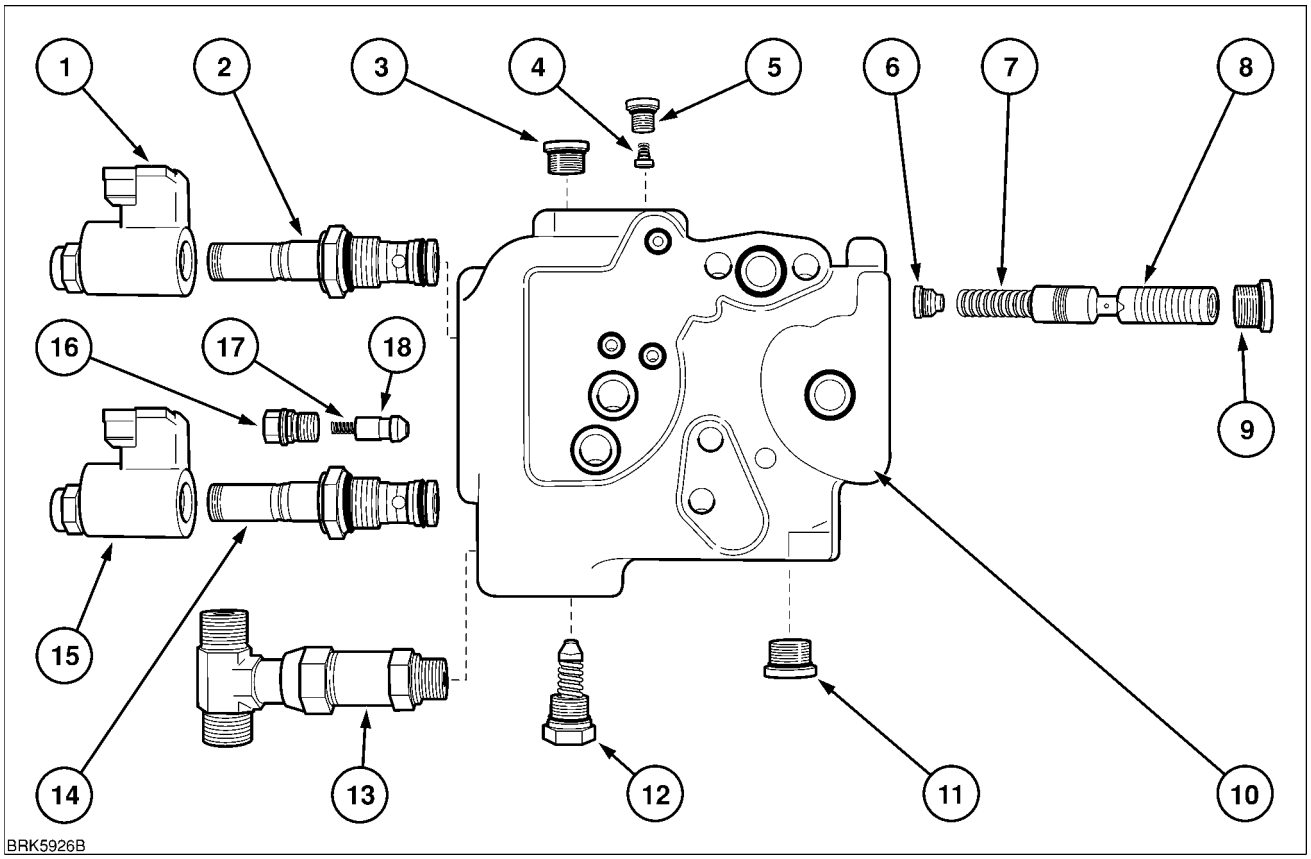


BAIL08CVT140FSA 1

1. Lift cylinders
2. Relief valve **221 bar** (**3204.5 psi**)
3. Check valve
4. Raise valve
5. Pressure compensating valve
6. Lower valve
7. Return to tank

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Control valve - Exploded view



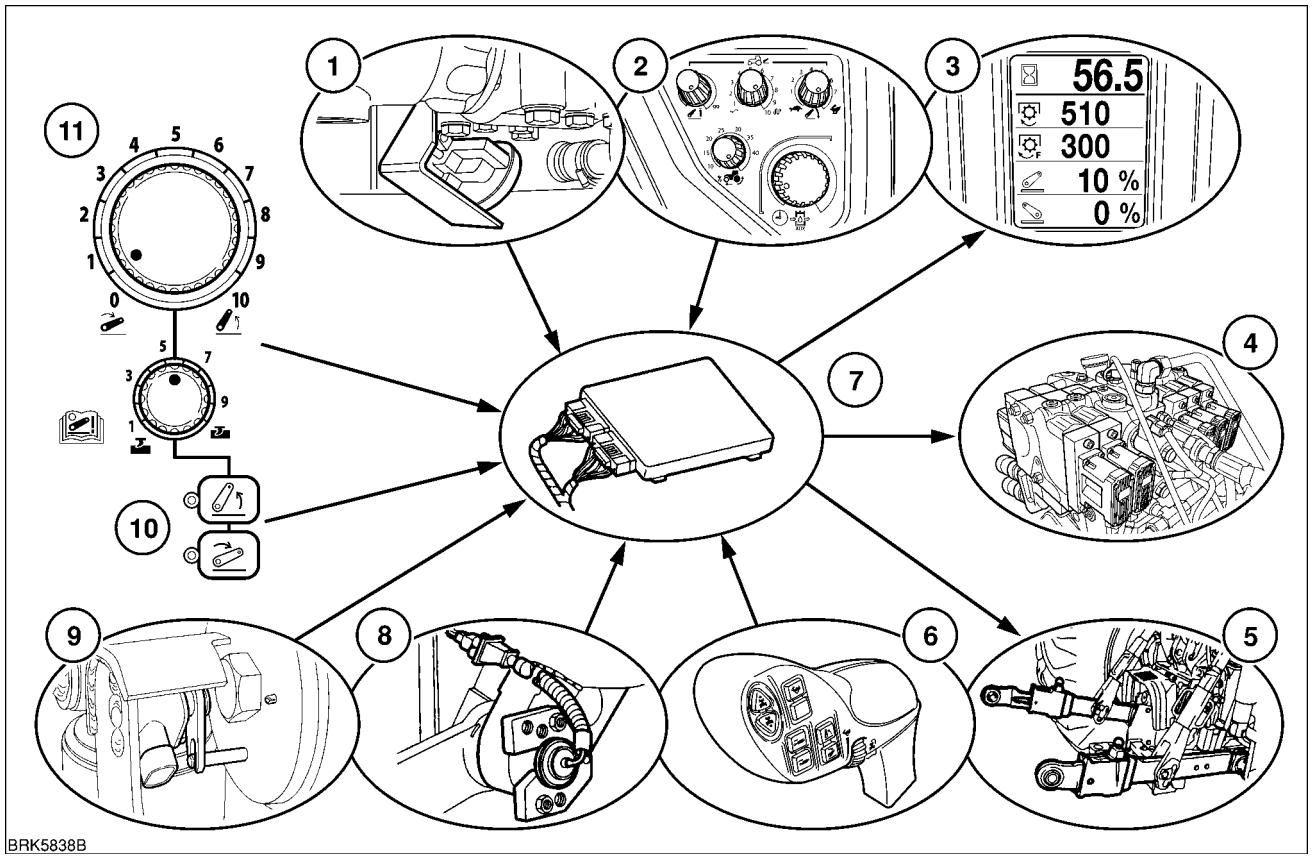
BAIL08CVT083ASA 1

Electronic draft control valve components

1.Solenoid body
2.Solenoid valve
3.Plug
4.Load sense check valve
5.Plug
6.Check valve
7.Spring
8.Pressure compensating spool
9.Plug
10.Manifold
11.Plug
12.Relief valve assembly **221 bar** (**3204.5 psi**)
13.Lift cylinder connection
14.Solenoid Valve
15.Solenoid Body
16.Plug
17.Spring
18.Logic check valve spool

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Electronic control - Exploded view



BAIL08CVT041FSA 1

1.Performance monitor radar
2.Electronic draft control panel
3.Instrument cluster display
4.Electronic draft control valve
5.3 point linkage
6.Multi function handle with raise/lower switch
7.Microprocessor
8.Load sensing pin
9.Lift arm position sensing potentiometer
10.Armrest raise/lower switch and indicator lamps
11.Implement depth and draft controls

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HITCH Electronic draft control - Calibrate EDC valve

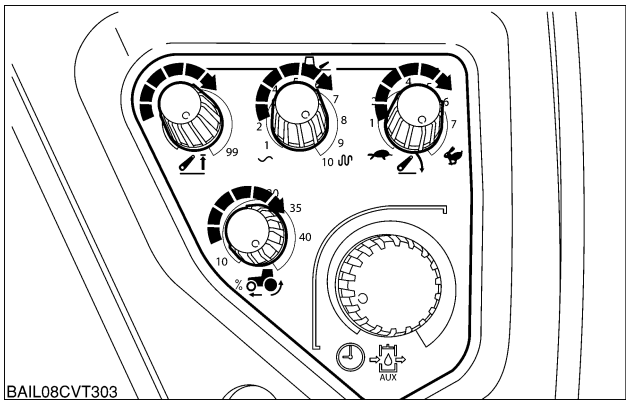
This procedure is required when either new EDC valves or EDC control module are fitted or if the previous calibration has been erased using the 'H8' procedure.

NOTE: *The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the wheels, front and rear. Check that the Ground speed display is Zero before commencing.*

1. Disconnect all implements from the rear PTO.
2. Lower the linkage using the position control lever and connect the two test weights.

NOTE: *The test weights must be sufficient to overcome any friction in the hydraulic lift assembly and enable the lift arms to lower without binding.*
The standard test weights of ***1111 - 1542 kg*** *(* ***2450 - 3400 lbs****) are recommended.*

3. Key OFF.
4. Set all EDC panel potentiometers fully clockwise.



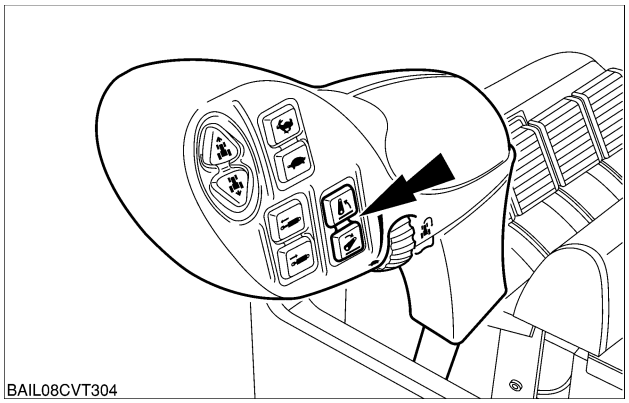
BAIL08CVT303 1

5. There are two methods to enter the calibration mode:
    1. Quick entry - Depress and hold the EDC fast lower switch on the hand controller whilst starting the engine.
    2. HH menu entry - Using the diagnostic connector **380000843** and H1 calibrations in the HH menu's.

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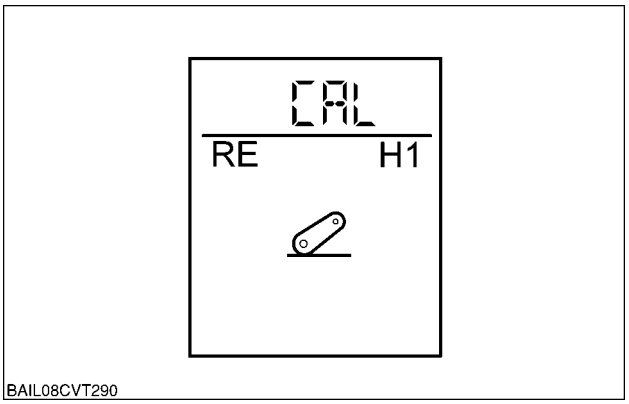
Quick Entry

6. Depress and hold the EDC fast lower switch on the hand controller whilst starting the engine.



BAIL08CVT304 2

7. The system being calibrated will be shown on the ICU3 and "CAL" will be shown on the top section of the display.

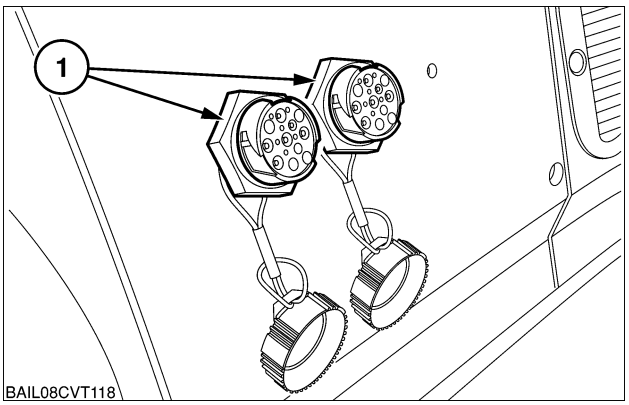


BAIL08CVT290 3

8. Continue from step 11..

HH Menu Entry

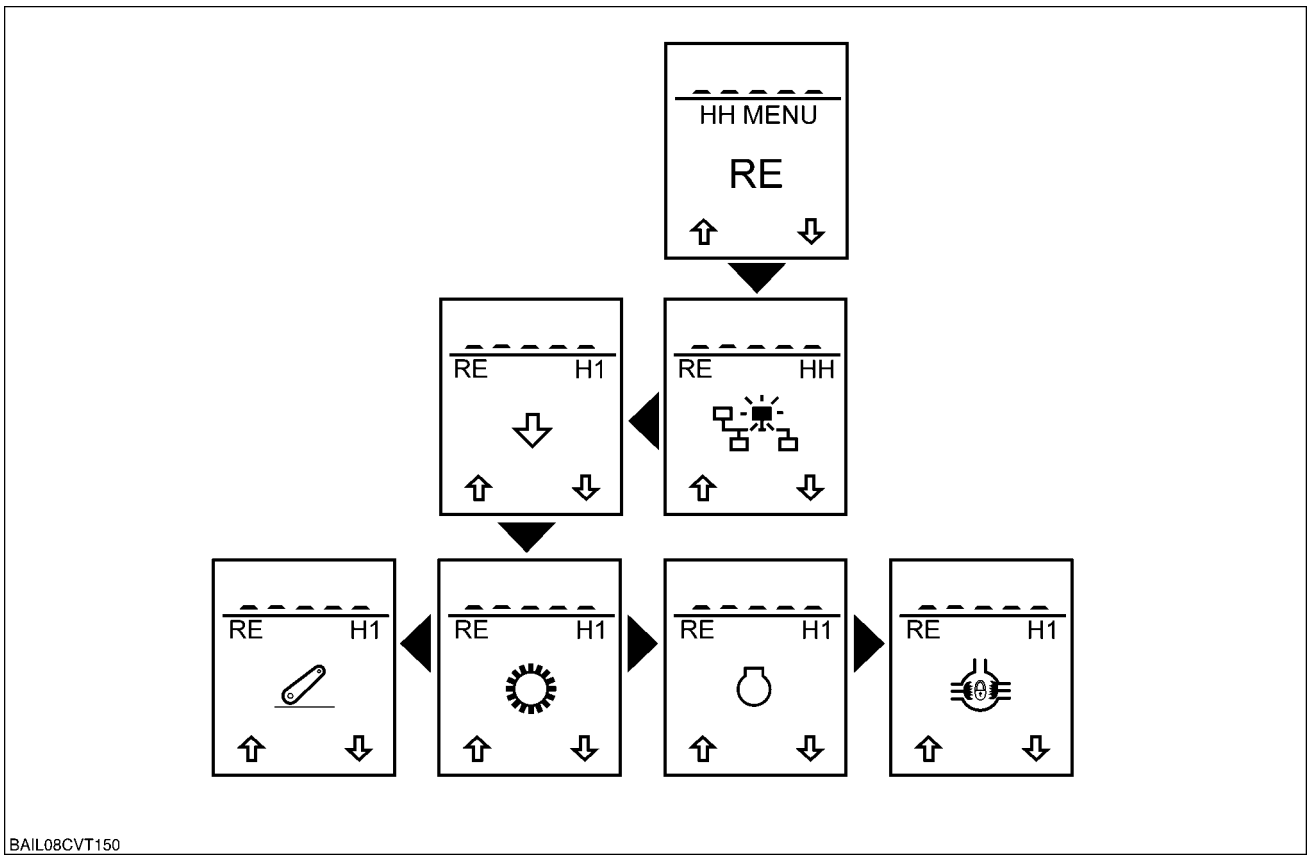
9. Install the diagnostic connector **380000843** into the diagnostic socket **(1)**.



BAIL08CVT118 4

10. Use the "up", "down" and "menu" keys on the ICU3 to navigate the HH menu's to H1 and the EDC symbol, the top section of the display will show "CAL".

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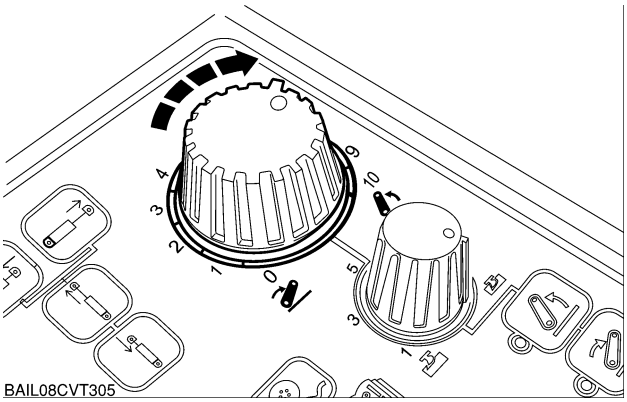


BAIL08CVT150 5

11. Set the engine speed to **1100 - 1300 RPM**, with no noticeable hunting or surging.

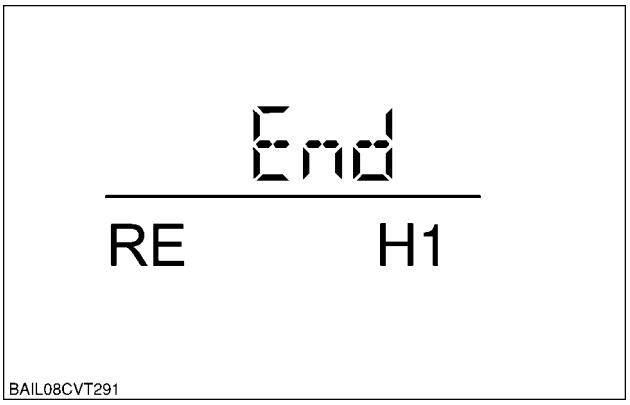
12. Raise the control lever to between **70 %** and **90 %** to start the calibration sequence.

NOTE: *The top section of the display will change from "CAL" to "0" to indicate the start of calibration. During calibration the linkage is automatically raised and lowered a small amount 3 times, within 2-3 minutes.*
Each raise and lower is accompanied by a count on the display from '0' to '2'.



BAIL08CVT305 6

13. When the top section of the display shows "End" the calibration is complete.



BAIL08CVT291 7

14. Lower the linkage using the position control lever.

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15. Key OFF to store the calibration values.

NOTE: *If an error occurs during calibration a "U" code will be displayed and the procedure will need to be repeated. Refer to the "U" code listing in* ***ELECTRONIC SYSTEM - Calibrate (A.50.A)****.*

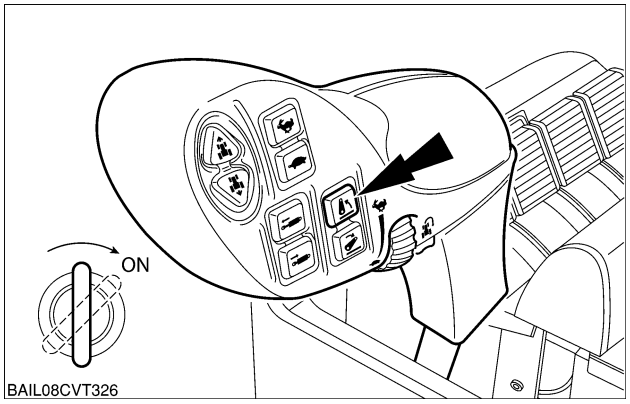
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HITCH Electronic draft control - Calibrate EDC Position Sensor

This procedure is required, prior to calibration of the EDC valve, if fault code 1024 is displayed, if the position sensor has been replaced or the previous calibration has been erased using the H8 procedure.

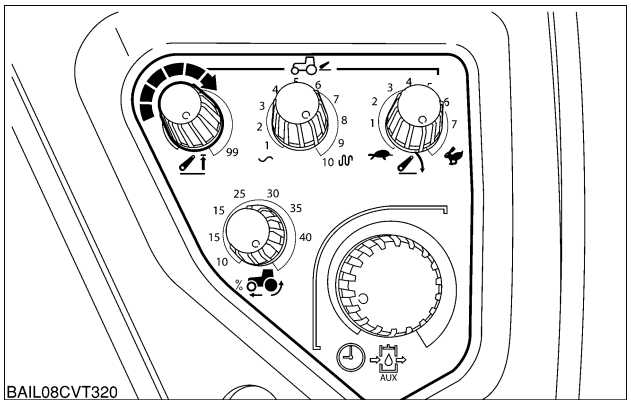
NOTE: *The calibration procedure is controlled by the electronic management system. To prevent inadvertent movement of the tractor, park the tractor away from any obstacles, firmly apply the parking brake and block the wheels, front and rear. Check that the Ground speed display is Zero before commencing.*

1. Remove any load from the hitch and ensure that the 'Automatic Pick Up Hitch' (APUH) lift rods, if fitted are disconnected.
2. Erase the previously stored calibration value by pressing and holding the fast raise switch on the hand controller and turning the ignition switch to the 'ON' position. Release the fast raise switch and turn off the ignition.



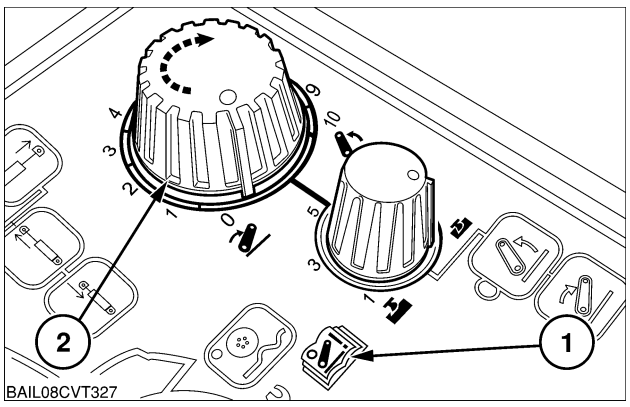
BAIL08CVT326 1

3. Ensure the correct lift ram size has been set, refer to the H3 'options and configurations' menu, **Control module - Configure (A.50.A)**, if no ram size is configured fault code 1070 will be displayed.
4. Ensure the height limit control is in the fully clockwise position. Fault code 1068 will be displayed if the control is not fully clockwise.



BAIL08CVT320 2

5. Start the engine, the 'EDC' status lamp on the armrest control panel should flash to indicate there is a fault present. Fully raise and then lower the hitch using the position control lever on the armrest.



BAIL08CVT327 3

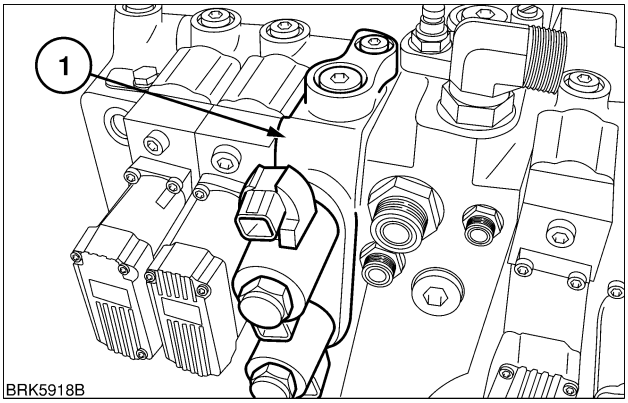
6. Turn the ignition off to store the calibration value. Refit the 'APUH rods if applicable.

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Control valve - Remove

Prior operation:
Battery - Disconnect (A.30.A)

1. Remove power beyond slice (where fitted) and remote valves 1 and 2. (Refer to **PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Remove (A.10.C)**).
2. Remove the electronic draft control valve **(1)** from the tie rods.



BAIL08CVT084ASA 1

⚠ **WARNING** ⚠

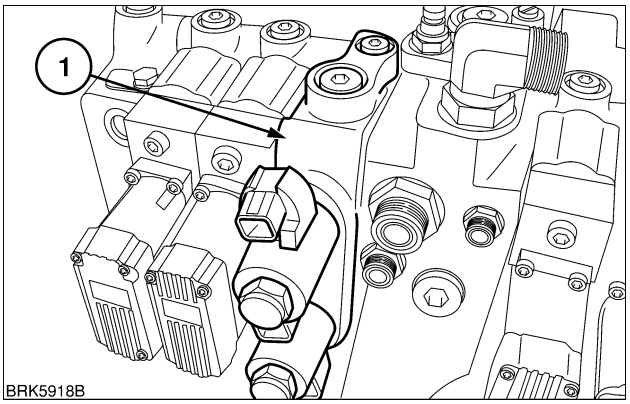
The component is heavy. ALWAYS use a hoist or get assistance to lift the component. Failure to comply could result in serious injury or death.

M944

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Control valve - Install

1. Install the electronic draft control valve **(1)** on to the tie rods and ensure that all O-rings are correctly seated. Install remote valves 1 and 2. (Refer to **PRIMARY HYDRAULIC POWER SYSTEM Electro-hydraulic remote valve - Install (A.10.C)**. Install power beyond (where fitted).



BAIL08CVT084ASA 1

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Control valve - Assemble

1. Check components for wear or damage before re-assembly. Replace O-rings.
2. Lubricate all parts with clean hydraulic fluid and install into valve manifold (refer to **Control valve - Exploded view (H.10.D)** and **Control valve - Torque (H.10.D)**

Next operation:
Control valve - Install (H.10.D)

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Control valve - Disassemble

Prior operation:
Control valve - Remove (H.10.D)

1. Place the valve on a clean work surface.
2. Remove components from valve manifold. (refer to **Control valve - Exploded view (H.10.D)**)

⚠ **WARNING** ⚠

A large spring is positioned beneath the plug, take extreme care when removing plugs.

B041

3. Check the solenoid valves for wear or damage and replace if necessary.
4. Check the pressure compensating spool for wear or damage. Replace complete valve assembly if spool is damaged.
5. Replace O-rings.

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