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WORKSHOP MANUAL
TRACTOR

M130X

Kubota

KiSC issued 03, 2014 A

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TO THE READER

This Workshop Manual tells the servicing personnel about the mechanism, servicing and maintenance of the M130X. It contains 4 parts: **"Information"**, **"General"**, **"Mechanism"** and **"Servicing"**.

■ **Information**

This section contains information below.

- Safety First
- Safety Decal
- Specification
- Dimension

■ **General**

This section contains information below.

- Engine Identification
- Model Identification
- General Precautions
- Maintenance Check List
- Check and Maintenance
- Special Tools

■ **Mechanism**

This section contains information on the structure and the function of the unit. Before you continue with the subsequent sections, make sure that you read this section.

Refer to the latest version of Workshop Manual (Code No. 9Y021-01870 / 9Y021-18200) for the diesel engine / tractor mechanism that this workshop manual does not include.

■ **Servicing**

This section contains information below.

- Troubleshooting
- Servicing Specifications
- Tightening Torques
- Checking, Disassembling and Servicing

Regarding the servicing of Common Rail System (CRS), refer to "DIAGNOSIS MANUAL (CD-ROM)" (9Y130-00531) at the end of this manual.

All illustrations, photographs and specifications contained in this manual are of the newest information available at the time of publication.

KUBOTA reserves the right to change all information at any time without notice.

Since this manual includes many models, information or illustrations and photographs can show more than one model.

February, 2010

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Record of Revisions

For pdf, use search function {Search word} to find all the revised locations.

Last digit of the Code No.	Issue month	Main Revised Point and Corrective Measures {Search word}	Reference Page
4	2013.10	Correction of errors, Glow Plug Adaptor Length L	G-48

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I INFORMATION

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INFORMATION

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4. TRAVELING SPEEDS I-10
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1. SAFETY FIRST

⚠ SAFETY FIRST

- **This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully.**
- **It is essential that you read the instructions and safety regulations before you try to repair or use this unit.**

⚠ DANGER
- **Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

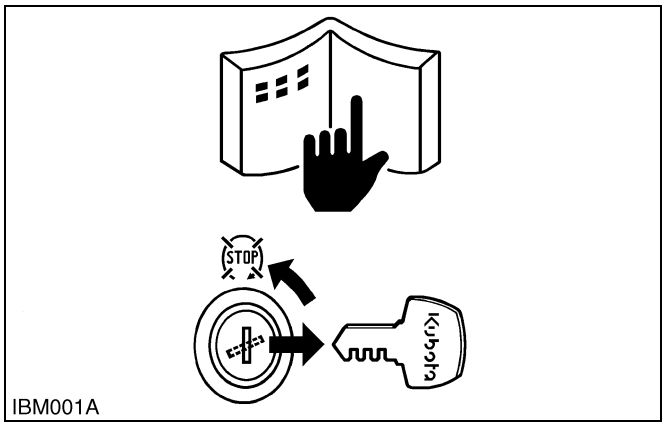
⚠ WARNING
- **Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

⚠ CAUTION
- **Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.**

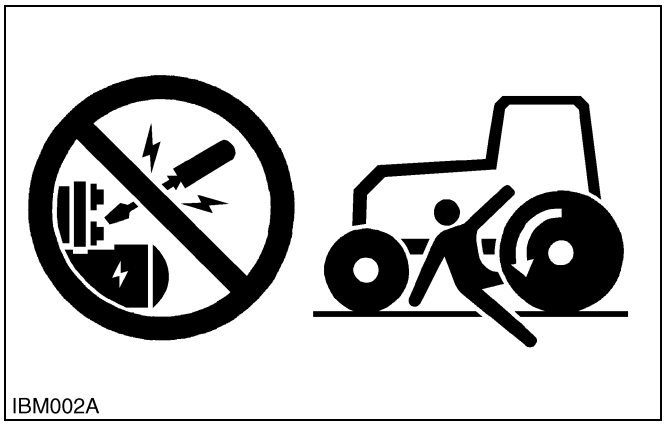
■ IMPORTANT
- **Indicates that equipment or property damage could result if instructions are not followed.**

■ NOTE
- **Gives helpful information.**

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BEFORE YOU START SERVICE

- Read all instructions and safety instructions in this manual and on your machine safety decals.
- Clean the work area and machine.
- Park the machine on a stable and level ground, and set the parking brake.
- Lower the implement to the ground.
- Stop the engine, then remove the key.
- Disconnect the battery negative cable.
- Hang a **"DO NOT OPERATE"** tag in the operator station.

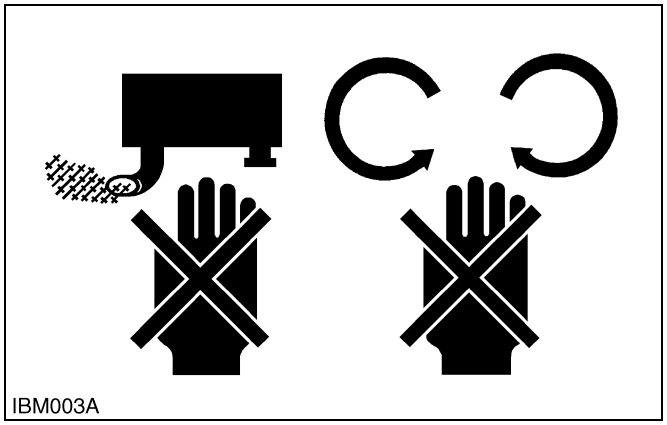
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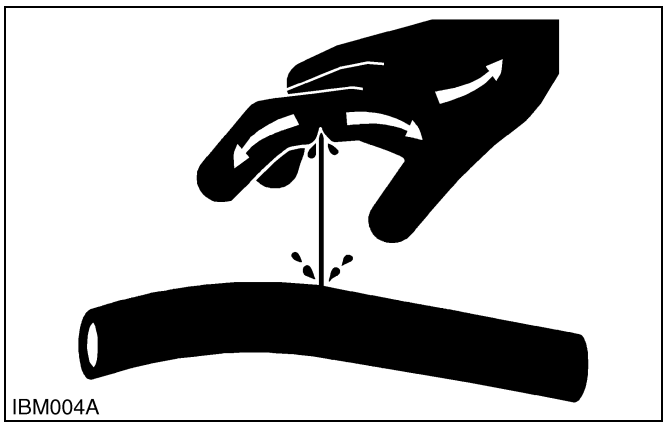
START SAFELY

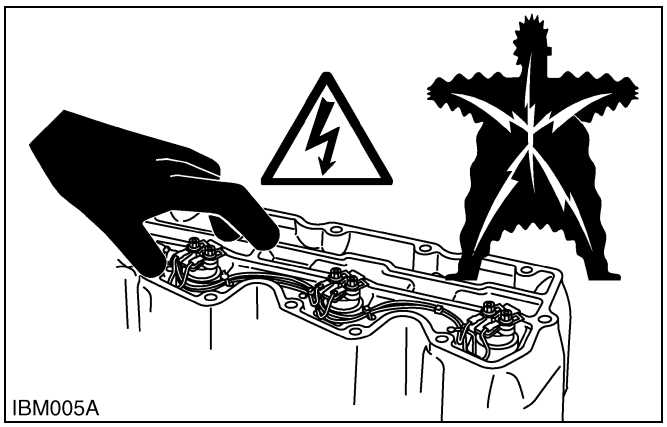
- Do not do the procedures below when you start the engine.
  - short across starter terminals
  - bypass the safety start switch
- Do not alter or remove any part of machine safety system.
- Before you start the engine, make sure that all shift levers are in neutral positions or in disengaged positions.
- Do not start the engine when you stay on the ground. Start the engine only from operator's seat.

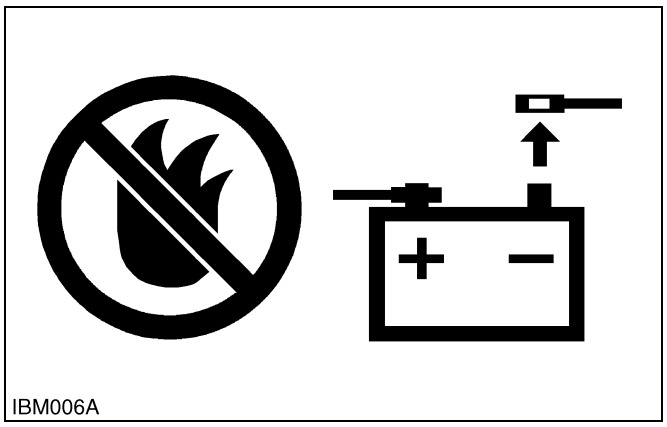
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OPERATE SAFELY

- Do not use the machine after you consume alcohol or medication or when you are tired.
- Put on applicable clothing and safety equipment.
- Use applicable tools only. Do not use alternative tools or parts.
- When 2 or more persons do servicing, make sure that you do it safely.
- Do not operate below the machine that only a jack holds. Always use a safety stand to hold the machine.
- Do not touch the hot parts or parts that turn when the engine operates.
- Do not remove the radiator cap when the engine operates, or immediately after it stops. If not, hot water can spout out from the radiator. Only remove the radiator cap when it is at a sufficiently low temperature to touch with bare hands. Slowly loosen the cap to release the pressure before you remove it fully.
- Released fluid (fuel or hydraulic oil) under pressure can cause damage to the skin and cause serious injury. Release the pressure before you disconnect hydraulic or fuel lines. Tighten all connections before you apply the pressure.
- Do not open a fuel system under high pressure. The fluid under high pressure that stays in fuel lines can cause serious injury. Do not disconnect or repair the fuel lines, sensors, or any other components between the fuel pump and injectors on engines with a common rail fuel system under high pressure.
- Put on an applicable ear protective device (earmuffs or earplugs) to prevent injury against loud noises.
- Be careful about electric shock. The engine generates a high voltage of more than DC100 V in the ECU and is applied to the injector.

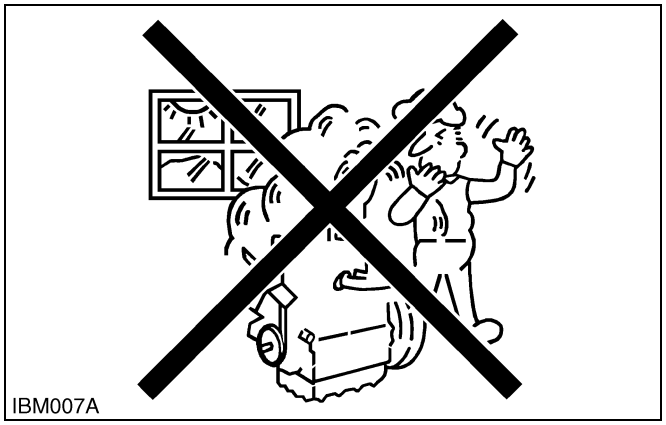
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PREVENT A FIRE

- Fuel is very flammable and explosive under some conditions. Do not smoke or let flames or sparks in your work area.
- To prevent sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- The battery gas can cause an explosion. Keep the sparks and open flame away from the top of battery, especially when you charge the battery.
- Make sure that you do not spill fuel on the engine.

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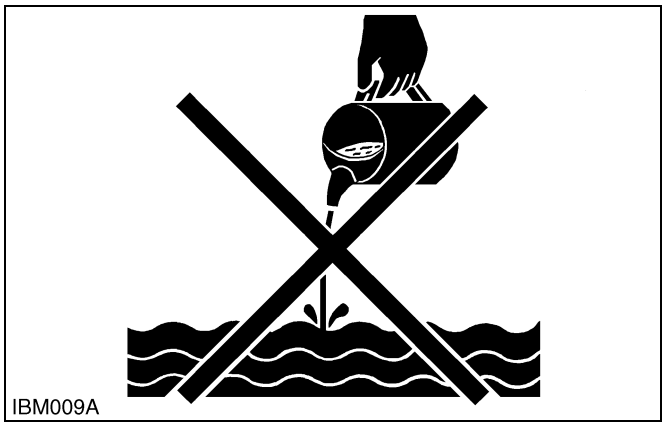
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KEEP A GOOD AIRFLOW IN THE WORK AREA

- If the engine is in operation, make sure that the area has good airflow. Do not operate the engine in a closed area. The exhaust gas contains poisonous carbon monoxide.

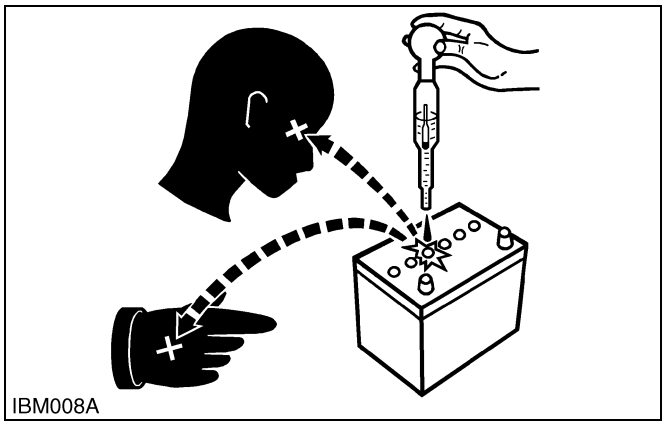
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DISCARD FLUIDS CORRECTLY

- Do not discard fluids on the ground, down the drain, into a stream, pond, or lake. Obey related environmental protection regulations when you discard oil, fuel, coolant, electrolyte and other dangerous waste.

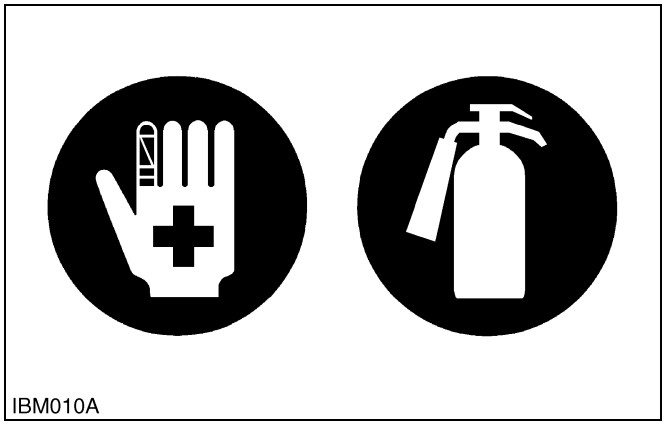
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PREVENT ACID BURNS

- Keep electrolyte away from your eyes, hands and clothing. Sulfuric acid in battery electrolyte is poisonous and it can burn your skin and clothing and cause blindness. If you spill electrolyte on yourself, clean yourself with water, and get medical aid immediately.

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PREPARE FOR EMERGENCIES

- Keep a first aid kit and fire extinguisher ready at all times.
- Keep the emergency contact telephone numbers near your telephone at all times.

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2. SAFETY DECALS

The following safety decals (pictorial safety labels) are installed on the machine. If a decal becomes damaged, illegible or is not on the machine, replace it. The decal part number is listed in the parts list.

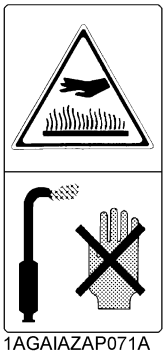
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(1) Part No. TA040-4957-1
Do not open or remove safety shields while engine is running.



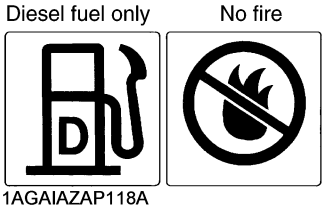
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(2) Part No. 3N300-4958-1
Do not touch hot surfaces.



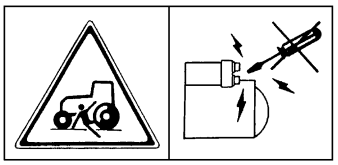
1AGAIAZAP071A

(3) Part No. TA040-4956-2



1AGAIAZAP118A

(4) Part No. K3512-4718-1
Start engine from operator's seat only.

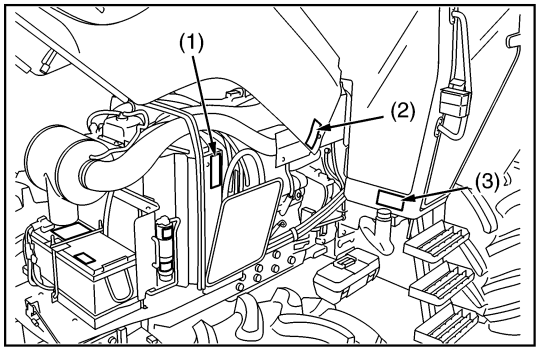


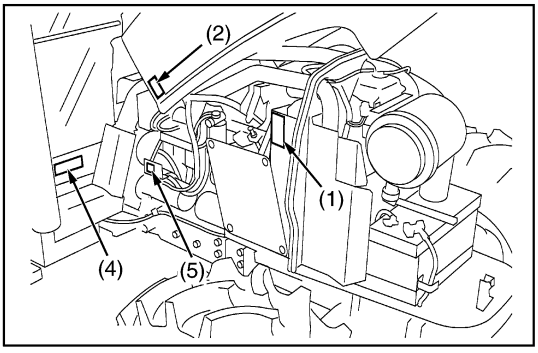
1BDABANAP083B

(5) Part No. 3N600-4958-1
Do not touch hot surface like supply pump, etc..



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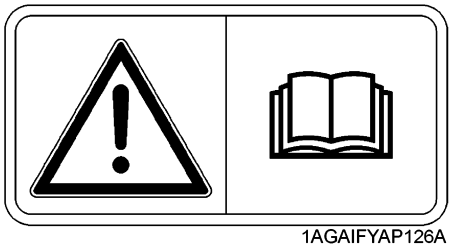


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(1) Part No. 3P903-9837-1



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DANGER/POISON

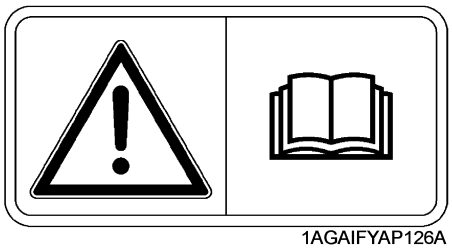
- Shield eyes.
  Explosive gases can cause blindness or injury.
- No sparks, flames, smoking.
- Sulfuric acid can cause blindness or severe burns.

KEEP OUT OF REACH CHILDREN.
DO NOT TIP. DO NOT OPEN BATTERY.

- Flush eyes immediately with water.
- Get medical help fast.

WASH HANDS AFTER HANDLING

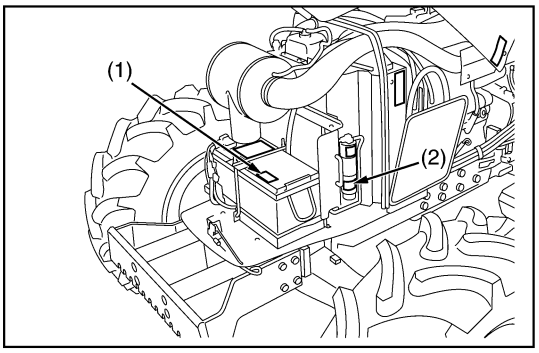
(2) Part No. 3P903-9837-1



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REFRIGERANT UNDER HIGH PRESSURE

Improper service methods may cause personal injury.
This air conditioning system should be serviced by your dealer or any other qualified service shop.
See Repair Manual for detail.



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9Y1210447INI0002US0

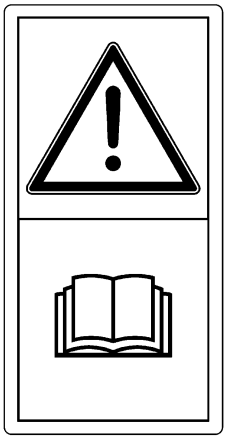
https://truckmanualshub.com/

(1) Part No. 3P903-4902-1
Seat belt should be used.



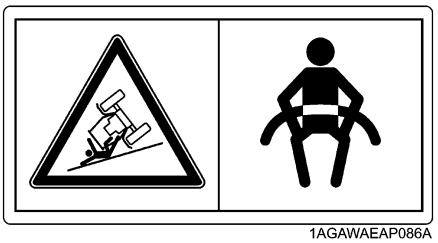
1AGAIFYAP086A

(2) Part No. TD179-3491-1
Carefully read operator's manual before handling the machine. Observe instructions and safety rules when operating.



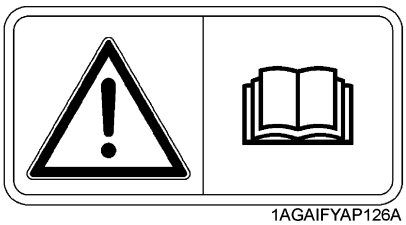
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(3) Part No. TD179-4902-1
Seat belt should be used.

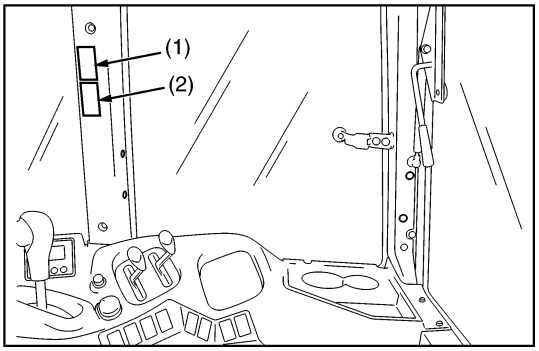


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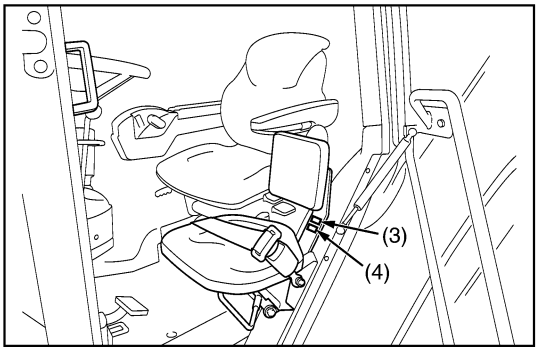
(4) Part No. 3P903-9837-1
Carefully read operator's manual before using a passenger seat.



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[Passenger seat (if equipped)]



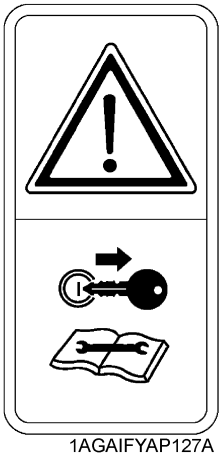
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(1) Part No. 3P903-9883-1

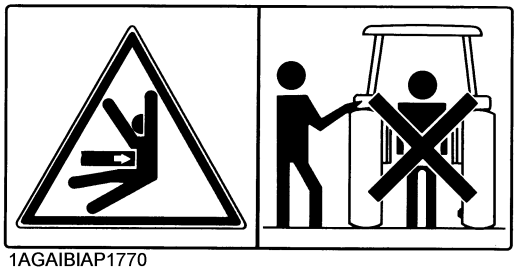
Hazardous high voltage.
Turn the starter switch to the OFF position if it is necessary to check or repair the computer, harness, or connectors.



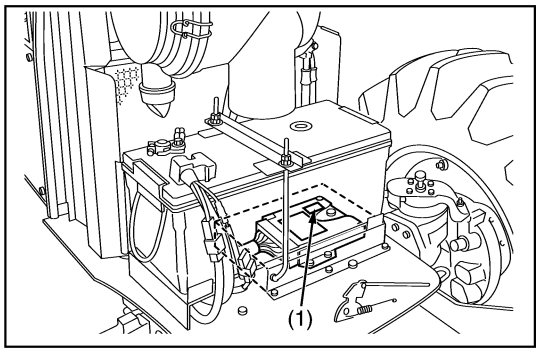
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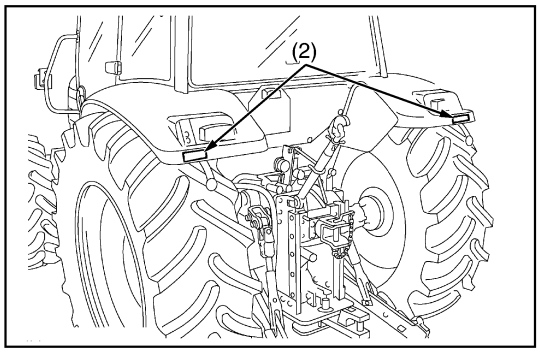
(2) Part No. 3F240-9819-1

Do not stand by IMPLEMENT or between implement and tractor while operating remote hitch switch.



1AGAIBIAP1770



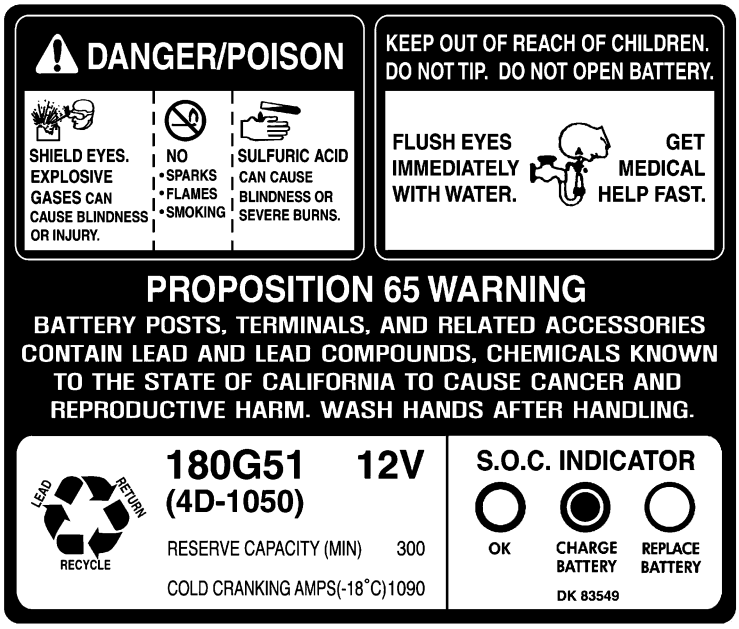


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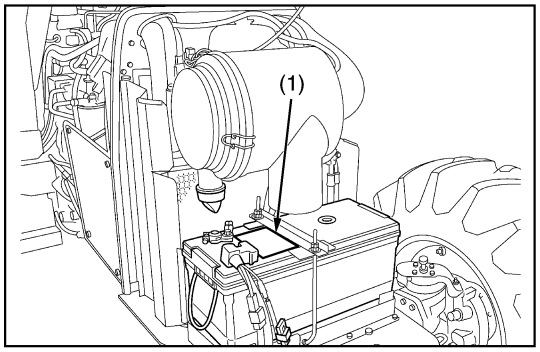
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(1) Part No. 3P903-9892-2



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CARE OF PICTORIAL SAFETY LABELS

1. Keep pictorial safety labels clean and free from obstructing material.
2. Clean pictorial safety labels with soap and water, dry with a soft cloth.
3. Replace damaged or missing pictorial safety labels with new labels.
4. If a component with pictorial safety label(s) affixed is replace with new part, make sure new label(s) is (are) attached in the same locations(s) as the replace component.
5. Mount new pictorial safety labels by applying on a clean dry surface and pressing any bubbles to outside edge.

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3. SPECIFICATIONS

Model			M130X
Engine	Model		V6108-TIE3-GQ
	Type		Direct injection, with turbocharger, Intercooler, water-cooled 4-cycle diesel
	Number of cylinder		4
	Total displacement		6124 cm^3 (374 cu.in.)
	Bore and stroke		118 × 140 mm (4.65 × 5.51 in.)
	Net power		96.9 kW (132 HP)*
	PTO power (factory observe)		84.3 kW (115 HP)* / 2200 min^{-1} (rpm)
	Maximum torque		540 N·m (55.1 kgf·m, 398 lbf·ft) / 1100 to 1300 min^{-1} (rpm)
	Battery capacity		12 V, 160 Ah at 20 hours, 1090CCA
	Fuel		Diesel fuel No. 1-D [below −10 °C (14 °F] Diesel fuel No. 2-D [above −10 °C (14 °F)]
	Fuel tank capacity		190 L (50.2 U.S.gal, 41.8 Imp.gals)
	Engine oil capacity		14.6 L (15.4 U.S.qts, 12.8 Imp.qts)
	Coolant capacity		15 L (16 U.S.qts, 13 Imp.qts)
Dimensions	Overall length		4400 mm (173.2 in.)
	Overall width (min. tread)		2175 mm (85.6 in.)
	Overall height		2750 mm (108.3 in.)
	Wheel base		2690 mm (105.9 in.)
	Tread	Front	1660 to 1770 mm (65.36 to 69.68 in.)
		Rear	1660 to 1755 mm (65.36 to 69.09 in.)
	Crop clearance		515 mm (20.3 in.)
Weight			4390 kg (9678 lbs)
Traveling system	Standard tire size	Front	420/70R24
		Rear	520/70R38
	Clutch		Multiple wet disc, Electronic Hydraulically operated
	Steering		Hydrostatic power steering
	Braking system		Hydraulically operated wet disk
	Differential		Bevel gears with differential lock (Front, Rear)
Hydraulic system	Hydraulic control system		Electronic draft control
	Pump capacity		77.2 L (20.4 U.S.gals, 17.0 Imp.gals) / min.
	Three point hitch		SAE Category 2
	Max. lifting force	At lift points**	5800 kg (12790 lbs) at lower link end with links horizontal
		24 in. behind lift points	4900 kg (10800 lbs)
	Remote hydraulic control		Two remote valve with detent and self-canceling
	System pressure		19.7 MPa (201 kgf/cm^2 , 2857 psi)
	Traction system		Swinging drawbar, adjustable in direction
PTO system	Live PTO (Independent)	Direction of turning	Clockwise, viewed from tractor rear
		Standard PTO	6 splines: 540 min^{-1} / 1994 min^{-1} 21 splines: 1000 min^{-1} / 2050 min^{-1}

■ **NOTE**

- ***Manufacture's estimate**
  **** At lower link and with links horizontal.**
  The company reserves the right to change the specifications without notice.

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4. TRAVELING SPEEDS

Forward and Reverse

Model	M130X	
Tire size (Rear)	520/70R38	
Range	km/h	mph
C1	0.37	0.23
C2	0.47	0.29
C3	0.59	0.37
C4	0.79	0.49
C5	0.91	0.57
C6	1.15	0.715
C7	1.44	0.895
C8	1.94	1.21
1	2.07	1.29
2	2.62	1.63
3	3.29	2.0
4	4.41	2.74
5	5.07	3.15
6	6.42	3.99
7	8.06	5.01
8	10.80	6.711
9	7.24	4.50
10	9.16	5.69
11	11.50	7.146
12	15.43	9.588
13	17.71	11.00
14	22.42	13.93
15	28.15	17.49
16*	39.64	24.32

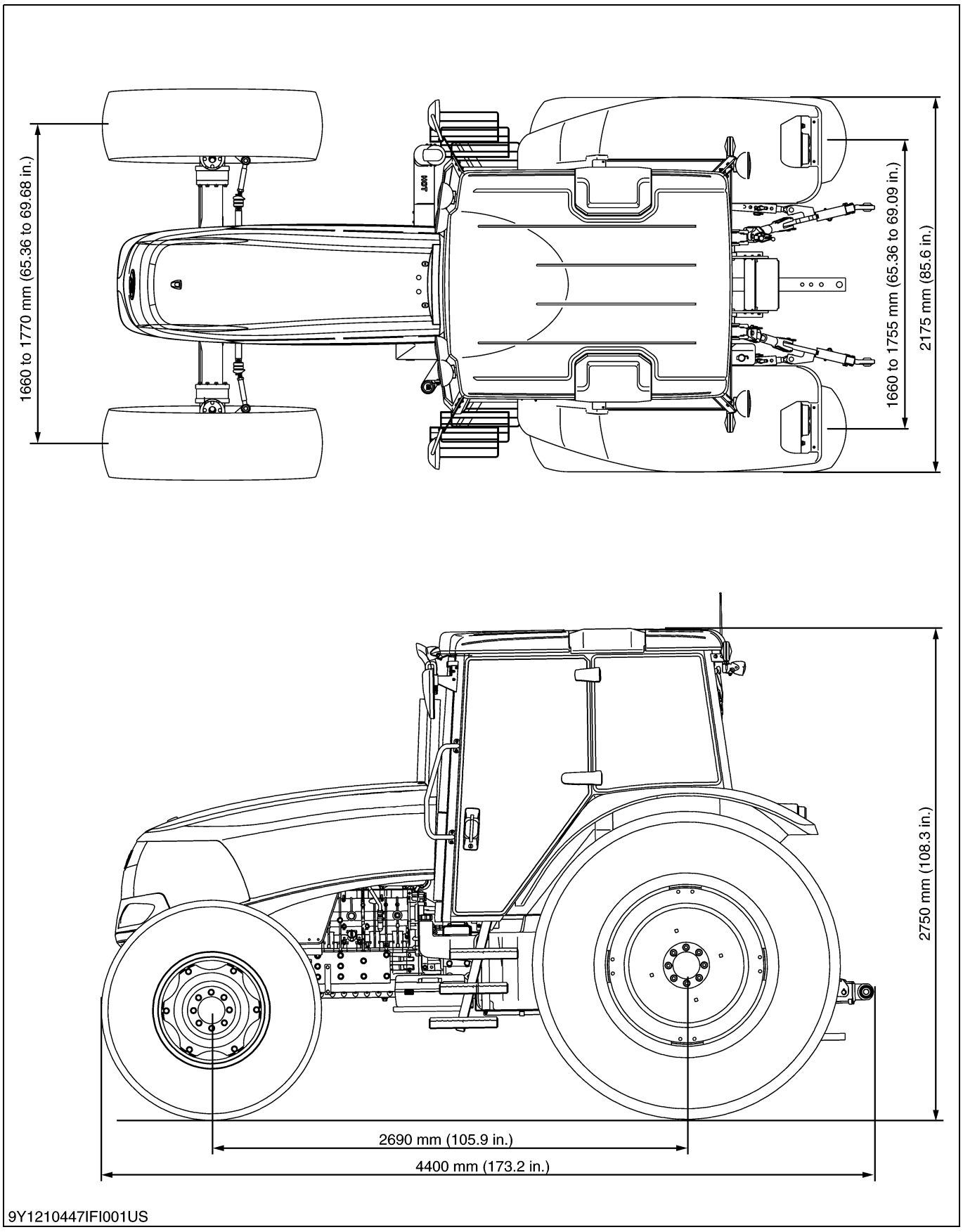
(At rated engine rpm)

The company reserves the right to change the specifications without notice.
*At maximum engine rpm

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5. DIMENSIONS



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G GENERAL

https://truckmanualshub.com/

GENERAL

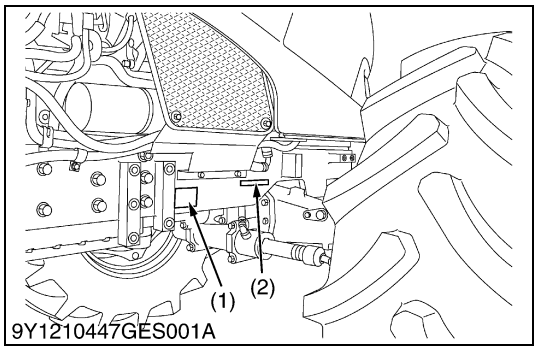
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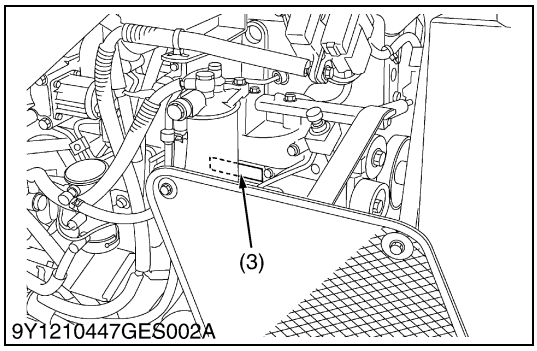
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   [2] BATTERY G-7
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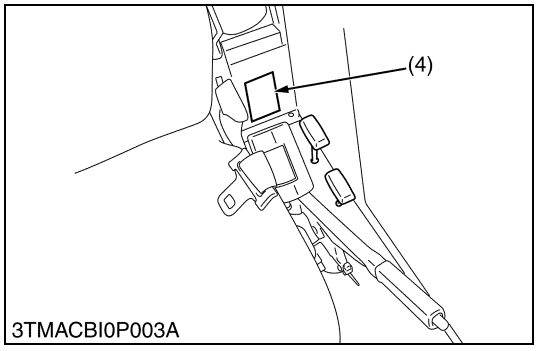
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1. TRACTOR IDENTIFICATION

[1] MODEL NAME AND SERIAL NUMBER







When contacting the manufacture or your local KUBOTA distributor, always specify engine serial number, tractor serial number and hourmeter reading.

The engine model and its serial number need to be identified before the engine can be serviced or parts replaced.

■ Engine Serial Number

The engine serial number is an identified number for the engine. It is marked after the engine model number.

It indicates month and year of manufacture as follows.

Year of manufacture

Alphabet or Number	Year	Alphabet or Number	Year
1	2001	F	2015
2	2002	G	2016
3	2003	H	2017
4	2004	J	2018
5	2005	K	2019
6	2006	L	2020
7	2007	M	2021
8	2008	N	2022
9	2009	P	2023
A	2010	R	2024
B	2011	S	2025
C	2012	T	2026
D	2013	V	2027
E	2014		

(1) Tractor Identification Plate
(2) Tractor Serial Number
(3) Engine Serial Number
(4) Cabin Identification Plate (Cabin Serial Number)

(To be continued)

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(Continued)

Month of manufacture

Month	Engine Lot Number	
January	A0001 ~ A9999	B0001 ~ BZ999
February	C0001 ~ C9999	D0001 ~ DZ999
March	E0001 ~ E9999	F0001 ~ FZ999
April	G0001 ~ G9999	H0001 ~ HZ999
May	J0001 ~ J9999	K0001 ~ KZ999
June	L0001 ~ L9999	M0001 ~ MZ999
July	N0001 ~ N9999	P0001 ~ PZ999
August	Q0001 ~ Q9999	R0001 ~ RZ999
September	S0001 ~ S9999	T0001 ~ TZ999
October	U0001 ~ U9999	V0001 ~ VZ999
November	W0001 ~ W9999	X0001 ~ XZ999
December	Y0001 ~ Y9999	Z0001 ~ ZZ999

* Alphabetical letters **"I"** and **"O"** are not used.

e.g.

- V6108-T (a) - 7 (b) V (c) A001 (d)

(a) Engine Model Name: **V6108-T**
(b) Year: **7** indicates **2007**
(c) Month: **U** or **V** indicates **October**
(d) Lot Number: (**0001 ~ 9999** or **A001 ~ Z999**)

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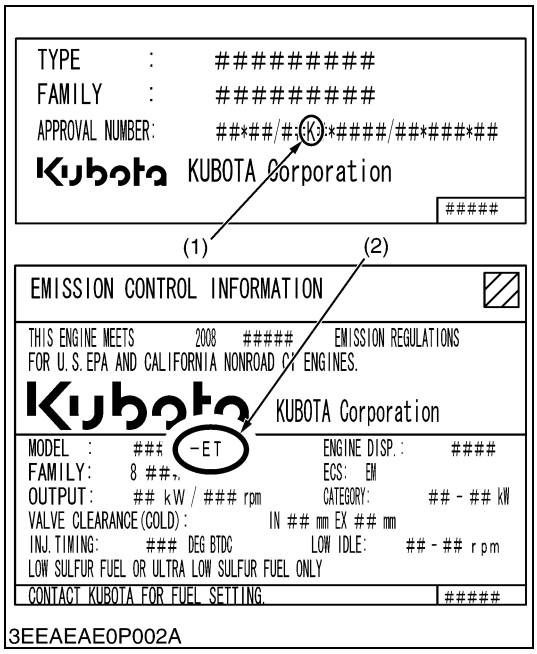
[2] E3 ENGINE

[Example: Engine Model Name V6108-TIE3-XXXX]

The emission controls previously implemented in various countries to prevent air pollution will be stepped up as Non-Road Emission Standards continue to change. The timing or applicable date of the specific Non-Road Emission regulations depends on the engine output classification.

Over the past several years, KUBOTA has been supplying diesel engines that comply with regulations in the respective countries affected by Non-Road Emission regulations. For KUBOTA Engines, E3 will be the designation that identifies engine models affected by the next emission phase (See the table below).

When servicing or repairing ###-E3 series engines, use only replacement parts for that specific E3 engine, designated by the appropriate E3 KUBOTA Parts List and perform all maintenance services listed in the appropriate KUBOTA Operator's Manual. Use of incorrect replacement parts or replacement parts from other emission level engines (for example: E2 engines), may result in emission levels out of compliance with the original E3 design and EPA or other applicable regulations. Please refer to the emission label located on the engine head cover to identify Output classification and Emission Control Information. E3 engines are identified with "ET" at the end of the Model designation, on the US EPA label. Please note: E3 is not marked on the engine.



3EEAEAE0P002A

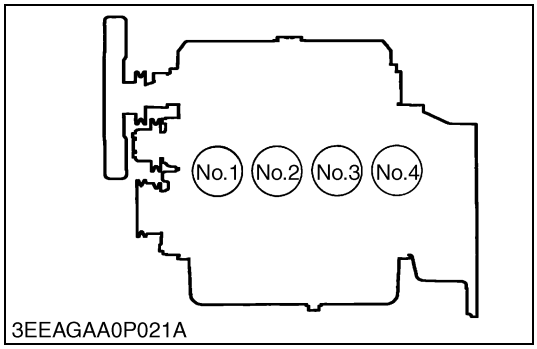
Category (1)	Engine output classification	EU regulation
K	From 19 to less than 37 kW	STAGE IIIA
J	From 37 to less than 75 kW	STAGE IIIA
I	From 75 to less than 130 kW	STAGE IIIA

Category (2)	Engine output classification	EPA regulation
ET	Less than 19kW	Tier 4
	From 19 to less than 56 kW	Interim Tier 4
	From 56 to less than 75 kW	Tier 3
	From 75 to less than 130 kW	Tier 3

(1) EU regulation engine output classification category
(2) "E3" engines are identified with "ET" at the end of the Model designation, on the US EPA label.
"E3" designates Tier 3 and some Interim Tier 4 / Tier 4 models, depending on engine output classification.

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[3] CYLINDER NUMBER



3EEAGAA0P021A

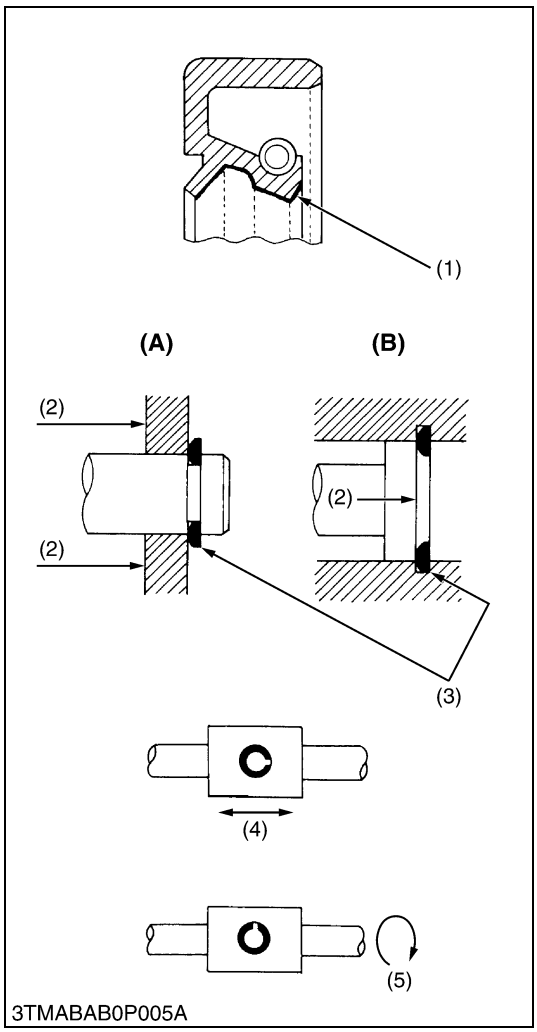
The cylinder numbers of kubota diesel engine are designated as shown in the figure.

The sequence of cylinder numbers is given as No. 1, No. 2, No. 3 and No. 4 starting from the front cover side.

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2. GENERAL PRECAUTIONS



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- When you disassemble, carefully put the parts in a clean area to make it easy to find the parts. You must install the screws, bolts and nuts in their initial position to prevent the reassembly errors.
- When it is necessary to use special tools, use KUBOTA special tools. Refer to the drawings when you make special tools that you do not use frequently.
- Before you disassemble or repair machine, make sure that you always disconnect the ground cable from the battery first.
- Remove oil and dirt from parts before you measure.
- Use only KUBOTA genuine parts for replacement to keep the machine performance and to make sure of safety.
- You must replace the gaskets and O-rings when you assemble again. Apply grease (1) to new O-rings or oil seals before you assemble.
- When you assemble the external or internal circlips, make sure that the sharp edge (3) faces against the direction from which force (2) is applied.
- When inserting spring pins, their splits must face the direction from which a force is applied. See the figure on the left side.
- To prevent damage to the hydraulic system, use only specified fluid or equivalent.

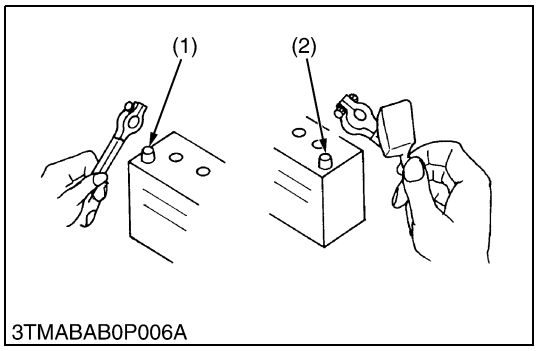
(1) Grease
(2) Force
(3) Sharp Edge
(4) Axial Force
(5) Rotating Movement

(A) External Circlip
(B) Internal Circlip

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3. HANDLING PRECAUTIONS FOR ELECTRICAL PARTS AND WIRING



3TMABAB0P006A

To ensure safety and prevent damage to the machine and surrounding equipment, obey the following precautions in handling electrical parts and wiring.

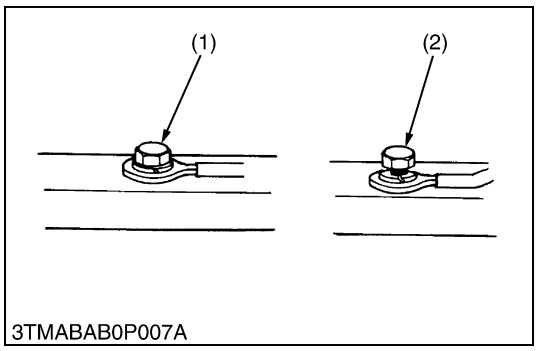
■ **IMPORTANT**

- **Check electrical wiring for damage and loosened connection every year. To this end, educate the customer to do his or her own check and at the same time recommend the dealer to perform periodic check for a fee.**
- **Do not try to modify or remodel any electrical parts and wiring.**
- **When removing the battery cables, disconnect the negative cable first. When installing the battery cables, connect the positive cable first.**

(1) Negative Terminal (2) Positive Terminal

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[1] WIRING

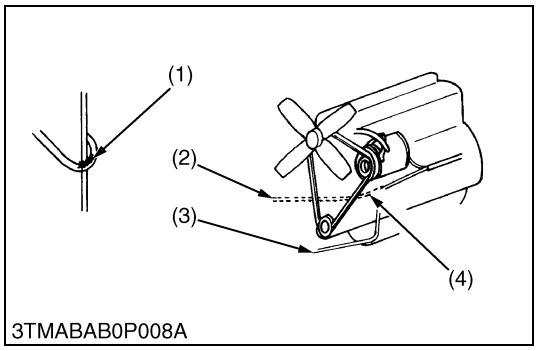


3TMABAB0P007A

- Securely tighten wiring terminals.

(1) Correct (Securely Tighten) (2) Incorrect (Loosening Leads to Faulty Contact)

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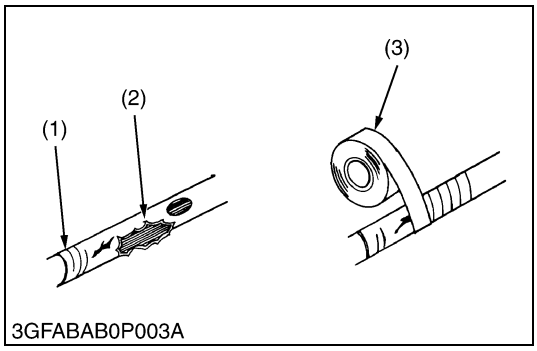


3TMABAB0P008A

- Do not let wiring contact dangerous part.

(1) Dangerous Part (Sharp Edge) (3) Wiring (Correct)
(2) Wiring (Incorrect) (4) Dangerous Part

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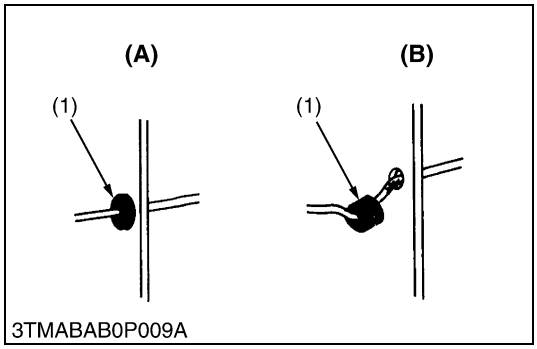
3GFABAB0P003A

- Repair or change torn or aged wiring immediately.

(1) Aged (3) Insulating Vinyl Tape
(2) Torn

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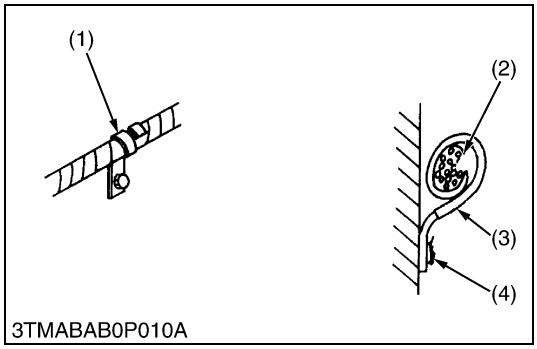
3TMABAB0P009A

- Securely insert grommet.

(1) Grommet

(A) Correct
(B) Incorrect

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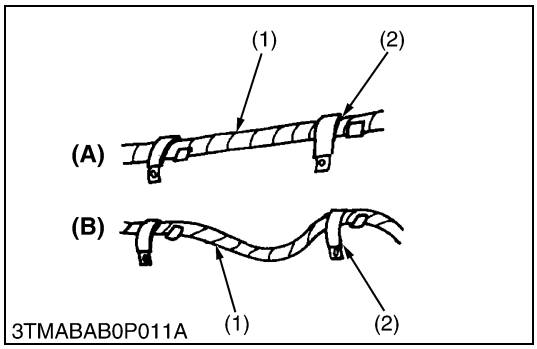


3TMABAB0P010A

- Securely clamp, being careful not to damage wiring.

(1) Clamp
(Wind Clamp Spirally)
(2) Wire Harness
(3) Clamp
(4) Welding Dent

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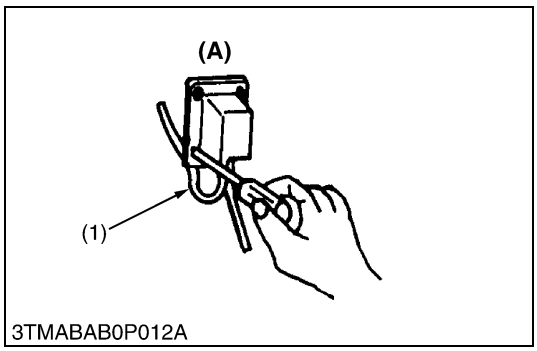
3TMABAB0P011A

- Clamp wiring so that there is no twist, unnecessary sag, or excessive tension, except for movable part, where sag be required.

(1) Wiring
(2) Clamp

(A) Correct
(B) Incorrect

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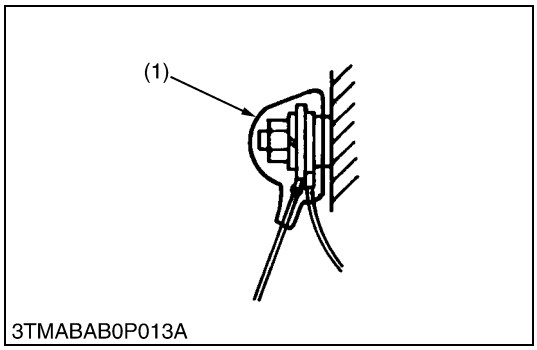
3TMABAB0P012A

- In installing a part, be careful not to get wiring caught by it.

(1) Wiring

(A) Incorrect

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3TMABAB0P013A

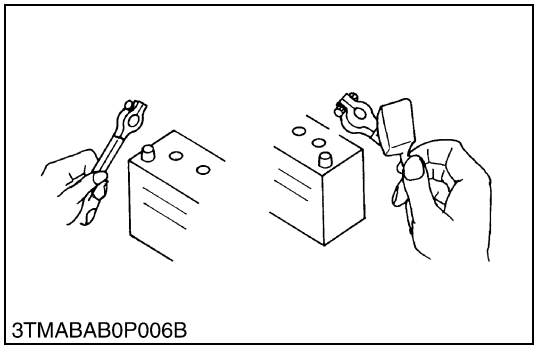
- After installing wiring, check protection of terminals and clamped condition of wiring.

(1) Cover
(Securely Install Cover)

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[2] BATTERY


3TMABAB0P006B

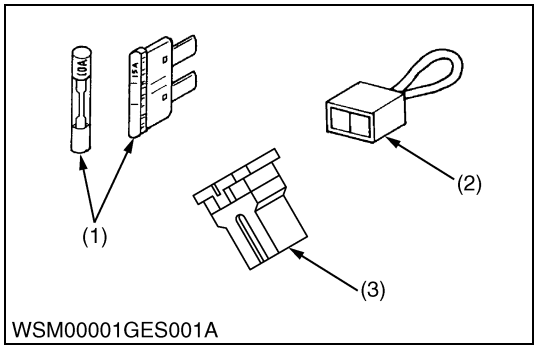
- Be careful not to confuse positive and negative terminal posts.
- When you remove battery cables, disconnect negative cable first. When you install battery cables, check for polarity and connect positive cable first.
- Do not install any battery with capacity other than is specified (Ah).
- After you connect cables to battery terminal posts, apply high temperature grease to them and securely install terminal covers on them.
- Do not allow dirt and dust to collect on battery.

CAUTION

- **Be careful not to let battery liquid spill on your skin and clothes. If contaminated, wash it off with water immediately.**
- **Before you recharge the battery, remove it from the machine.**
- **Before you recharge, remove cell caps.**
- **Recharge in a well-ventilated place where there is no open flame nearby, as hydrogen gas and oxygen are formed.**

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[3] FUSE



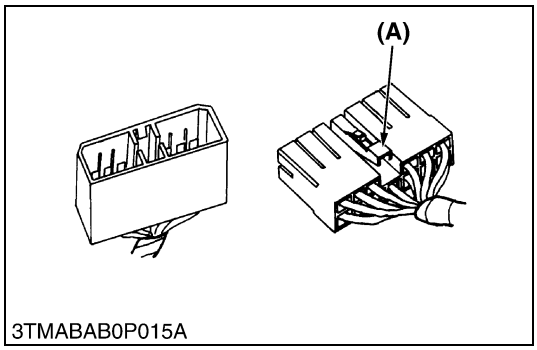
WSM00001GES001A

- Use fuses with specified capacity.
  Neither too large nor small capacity fuse is acceptable.
- Never use steel nor copper wire in place of fuse.
- Do not install working light, radio set, etc. on machine which is not provided with reserve power supply.
- Do not install accessories if fuse capacity of reserve power supply is exceeded.

(1) Fuse
(2) Fusible Link
(3) Slow Blow Fuse

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[4] CONNECTOR

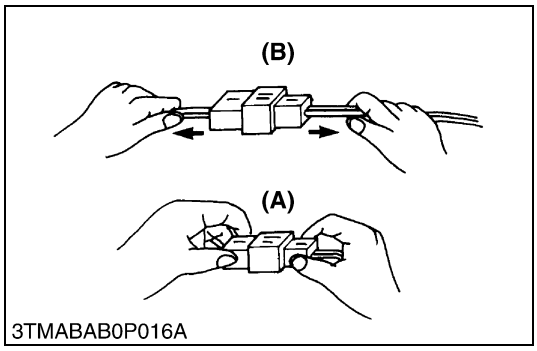


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- For connector with lock, push lock to separate.

(A) Push

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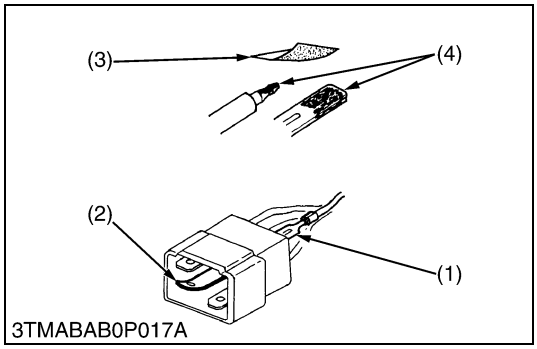
3TMABAB0P016A

- In separating connectors, do not pull wire harnesses.
- Hold connector bodies to separate.

(A) Correct
(B) Incorrect

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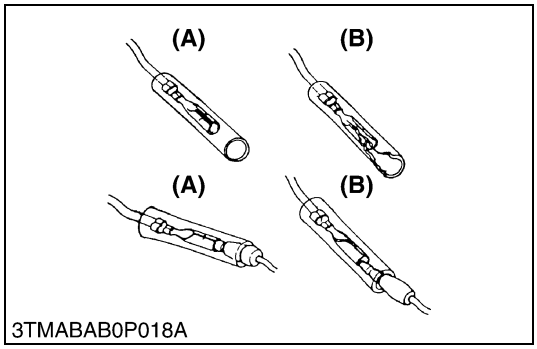


3TMABAB0P017A

- Use sandpaper to remove rust from terminals.
- Repair deformed terminal. Make sure that there is no terminal being exposed or displaced.

(1) Exposed Terminal
(2) Deformed Terminal
(3) Sandpaper
(4) Rust

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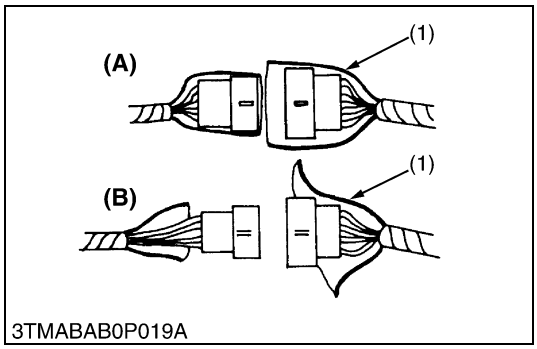


3TMABAB0P018A

- Make sure that there is no female connector being too open.

(A) Correct
(B) Incorrect

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3TMABAB0P019A

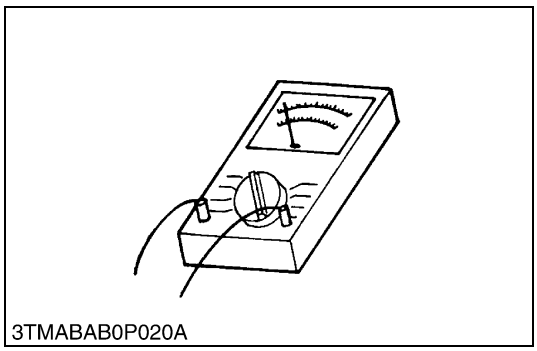
- Make sure that plastic cover is large enough to cover whole connector.

(1) Cover

(A) Correct
(B) Incorrect

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[5] HANDLING OF CIRCUIT TESTER

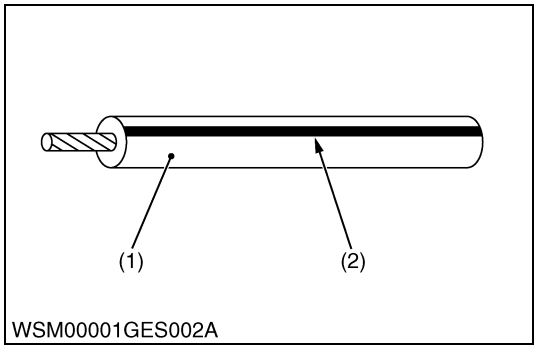

3TMABAB0P020A

- Use tester correctly following manual provided with tester.
- Check for polarity and range.

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[6] COLOR OF WIRING



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- Colors of wire are specified to the color codes.
- This symbol of "/" shows color with stripe(s).

(An example)

Red stripe on white color: W/R

Color of wiring	Color code
Black	B
Brown	Br
Green	G
Gray	Gy or Gr
Blue	L
Light Green	Lg
Orange	Or
Pink	P
Purple	Pu or V
Red	R
Sky Blue	Sb
White	W
Yellow	Y

(1) Wire Color (2) Stripe

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4. LUBRICANTS, FUEL AND COOLANT

No.	Place	Capacity	Lubricants, fuel and coolant
		M130X	
1	Fuel	190 L 50.2 U.S.gals 41.8 Imp.gals	• No. 2-D diesel fuel • No. 1-D diesel fuel if temperature is below –10 °C (14 °F)
2	Cooling system (including recovery tank)	15 L 16 U.S.qts 13 Imp.qts	Fresh clean soft water with anti-freeze
	Recovery tank	1.5 L 1.6 U.S.qts 1.4 Imp.qts	
3	Washer liquid	1.3 L 1.4 U.S.qts 1.1 Imp.qts	Automobile washer liquid
4	Engine crankcase (with filter)	14.6 L 15.4 U.S.qts 12.8 Imp.qts	**Engine oil** API Service Classification: CF or CI-4 [External **EGR** type engine] • Above 25 °C (77 °F) SAE30, SAE10W-30 or 15W-40 • 0 to 25 °C (32 to 77 °F) SAE20, SAE10W-30 or 15W-40 • Below 0 °C (32 °F) SAE10W, SAE10W-30 or 15W-40
5	Transmission case	60 L 63.4 U.S.qts 52.8 Imp.qts	KUBOTA UDT or SUPER UDT fluid*
6	Brake oil (reservoir and lines)	0.3 L 0.3 U.S.qts 0.3 Imp.qts	KUBOTA UDT or SUPER UDT fluid* or Turbine oil 32 (See below) regular type, multipurpose straight mineral oil Mobil DTE Oil #32 TEXACO Regal Oil #32 CHEVRON -GST Oil #32 TERESSO OIL #32 Never use automotive brake oil.
7	Front differential case oil	12.0 L 12.7 U.S.qts 10.6 Imp.qts	KUBOTA UDT or SUPER UDT fluid* or SAE80, SAE90 gear oil
	Front axle gear case oil	4.5 L 4.8 U.S.qts 4.0 Imp.qts	

■ **NOTE**

- ***KUBOTA original transmission hydraulic fluid.**

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Greasing				
No.	**Place**	**No. of greasing point**	**Capacity**	**Type of grease**
8	Top link	2	Until grease overflows	Multipurpose type grease
	Lift rod	3		
	Front wheel case support	2		
	Front axle support	2		
	Steering joint shaft	1		
	Assist cylinder	2		
	Battery terminal	2	A small amount	

■ **NOTE**

- ***KUBOTA original transmission hydraulic fluid.**

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■ **NOTE**

Engine Oil

- **Oil used in the engine should have an American Petroleum Institute (API) service classification and Proper SAE Engine Oil according to the ambient temperatures as shown above:**
- **With the emission control now in effect, the CF-4 and CG-4 lubricating oils have been developed for use of a low-sulfur fuel on on-road vehicle engines. When an off-road vehicle engine runs on a high-sulfur fuel, it is advisable to employ the "CF or better" lubricating oil with a high Total Base Number (TBN of 10 minimum).**
- **Refer to the following table for the suitable API classification engine oil according to the engine type (with internal EGR, external EGR or non-EGR) and the fuel (low-sulfur or high-sulfur fuel).**

Fuel used	Engine oil classification (API classification)	
	Oil class of engines except external EGR	Oil class of engines with external EGR
High Sulfur Fuel (≥ 500 ppm)	**CF** (If the "CF-4, CG-4, CH-4, or CI-4" lubricating oil is used with a high-sulfur fuel, change the lubricating oil at shorter intervals. (approximately half))	—
Low Sulfur Fuel (< 500 ppm) or Ultra Low Sulfur Fuel (< 15 ppm)	**CF**, **CF-4**, **CG-4**, **CH-4** or **CI-4**	**CF** or **CI-4** (Class CF-4, CG-4 and CH-4 engine oils cannot be used on EGR type engines)

EGR: Exhaust Gas Re-circulation

- **The CJ-4 engine oil is intended for DPF (Diesel Particulate Filter) type engines, and cannot be used on this tractor.**

Fuel

- **Cetane number of 45 minimum. Cetane number greater then 50 is preferred, especially for temperatures below −20 °C (−4 °F) or elevations above 1500 m (5000 ft).**
- **If diesel fuel with sulfur content greater than 0.5 % sulfur content in used, reduce the service interval for engine oil and filter by 50%.**
- **DO NOT use diesel fuel with sulfur content greater than 1.0 %.**
- **Diesel fuels specified to EN 590 or ASTM D975 are recommended.**
- **No.2-D is a distillate fuel of lower volatility for engine in industrial and heavy mobile service. (SAE J313 JUB87)**
- **Since this engine adopts EPA Tier 4 and Interim Tier 4 standards, the use of low sulfur fuel or ultra low sulfur fuel is mandatory in EPA regulated area (North America). Therefore, please use No.2-D S500 or S15 diesel fuel as an alternative to No.2-D, or use No.1-D S500 or S15 diesel fuel as an alternative to No.1-D if outside air temperature is below −10 °C (14 °F).**

Transmission oil

- **The oil used to lubricate the transmission is also used as hydraulic fluid. To insure proper operation of the hydraulic system and to complete lubrication of the transmission, it is important that a multi-grade transmission fluid is used in this system. We recommend the use of KUBOTA UDT or SUPER UDT fluid for optimum protection and performance.**
  Do not mix different brands together.

■ **Indicated capacities of water and oil are manufacturer's estimate.**

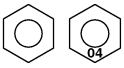
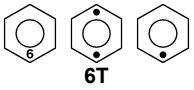
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5. TIGHTENING TORQUES

[1] GENERAL USE SCREWS, BOLTS AND NUTS

Tighten screws, bolts and nuts whose tightening torques are not specified in this Workshop Manual according to the table below.

Indication on top of bolt	 No-grade or 4T						 7T						 9T		
Indication on top of nut	 No-grade or 4T												 6T		
Material of opponent part	Ordinariness			Aluminum			Ordinariness			Aluminum			Ordinariness		
Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.8	7.9 to 8.8	0.80 to 0.90	5.8 to 6.5	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31	7.9 to 8.8	0.80 to 0.90	5.8 to 6.5	12.3 to 14.2	1.25 to 1.45	9.05 to 10.4
M8	18 to 20	1.8 to 2.1	13 to 15	17 to 19	1.7 to 2.0	13 to 14	24 to 27	2.4 to 2.8	18 to 20	18 to 20	1.8 to 2.1	13 to 15	30 to 34	3.0 to 3.5	22 to 25
M10	40 to 45	4.0 to 4.6	29 to 33	32 to 34	3.2 to 3.5	24 to 25	48 to 55	4.9 to 5.7	36 to 41	40 to 44	4.0 to 4.5	29 to 32	61 to 70	6.2 to 7.2	45 to 52
M12	63 to 72	6.4 to 7.4	47 to 53	–	–	–	78 to 90	7.9 to 9.2	58 to 66	63 to 72	6.4 to 7.4	47 to 53	103 to 117	10.5 to 12.0	76.0 to 86.7
M14	108 to 125	11.0 to 12.8	79.6 to 92.5	–	–	–	124 to 147	12.6 to 15.0	91.2 to 108	–	–	–	167 to 196	17.0 to 20.0	123 to 144
M16	167 to 191	17.0 to 19.5	123 to 141	–	–	–	197 to 225	20.0 to 23.0	145 to 166	–	–	–	260 to 304	26.5 to 31.0	192 to 224
M18	246 to 284	25.0 to 29.0	181 to 209	–	–	–	275 to 318	28.0 to 32.5	203 to 235	–	–	–	344 to 402	35.0 to 41.0	254 to 296
M20	334 to 392	34.0 to 40.0	246 to 289	–	–	–	368 to 431	37.5 to 44.0	272 to 318	–	–	–	491 to 568	50.0 to 58.0	362 to 419

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[2] STUD BOLTS

Material of opponent part	Ordinariness			Aluminum		
Unit	N·m	kgf·m	lbf·ft	N·m	kgf·m	lbf·ft
M8	12 to 15	1.2 to 1.6	8.7 to 11	8.9 to 11	0.90 to 1.2	6.5 to 8.6
M10	25 to 31	2.5 to 3.2	18 to 23	20 to 25	2.0 to 2.6	15 to 18
M12	30 to 49	3.0 to 5.0	22 to 36	31	3.2	23
M14	62 to 73	6.3 to 7.5	46 to 54	–	–	–
M16	98.1 to 112	10.0 to 11.5	72.4 to 83.1	–	–	–
M18	172 to 201	17.5 to 20.5	127 to 148	–	–	–

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[3] HYDRAULIC FITTINGS

(1) Hydraulic Hose Fittings

Hose size	Thread side	Tightening torque		
		N·m	kgf·m	lbf·ft
02	1/8	13.8 to 15.6	1.40 to 1.60	10.2 to 11.5
03	1/4	22.6 to 27.4	2.30 to 2.80	16.7 to 20.2
04				
05	3/8	45.2 to 52.9	4.60 to 5.40	33.3 to 39.0
06				

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(2) Hydraulic Pipe Cap Nuts

Pipe size	Tightening torque		
	N·m	kgf·m	lbf·ft
ϕ4 × t1.0	19.7 to 29.4	2.00 to 3.00	14.5 to 21.6
ϕ6 × t1.0	24.6 to 34.3	2.50 to 3.50	18.1 to 25.3
ϕ8 × t1.0	29.5 to 39.2	3.00 to 4.00	21.7 to 28.9
ϕ10 × t1.0	39.3 to 49.0	4.00 to 5.00	29.0 to 36.1
ϕ12 × t1.5	49.1 to 68.6	5.00 to 7.00	36.2 to 50.6
ϕ15 × t1.6	108 to 117	11.0 to 12.0	79.6 to 86.7
ϕ18 × t1.6	108 to 117	11.0 to 12.0	79.6 to 86.7

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(3) Adaptors, Elbows and Nuts

Item	Thread side	Tightening torque		
		N·m	kgf·m	lbf·ft
Fitting with O-ring	G 1/8	45 to 53	4.5 to 5.5	33 to 39
	G 1/4	74 to 83	7.5 to 8.5	55 to 61
	G 3/8	93.2 to 102	9.50 to 10.5	68.8 to 75.9
	G 1/2	113 to 122	11.5 to 12.5	83.2 to 90.4
Elbow with O-ring	G 1/8	23 to 26	2.3 to 2.7	17 to 19
	G 1/4	36 to 43	3.6 to 4.4	26 to 31
	G 3/8	54 to 63	5.5 to 6.5	40 to 47
	G 1/2	73 to 83	7.4 to 8.5	54 to 61
Adapter	G 1/8	9.8 to 14	1.0 to 1.5	7.3 to 10
	G 1/4	30 to 34	3.0 to 3.5	22 to 25
	G 3/8	49 to 68	5.0 to 7.0	37 to 50
	G 1/2	69 to 88	7.0 to 9.0	51 to 65

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6. MAINTENANCE

No.	Item		Service Interval														Since then	Important		Reference page
			50	100	150	200	250	300	350	400	450	500	550	600	650	700				
1	Hydraulic oil filter (suction side)	Replace	★					☆						☆			every 300 Hr			G-19
2	Hydraulic oil filter (return side)	Replace	★					☆						☆			every 300 Hr			G-19
3	Engine oil	Change	★							☆							every 400 Hr			G-20
4	Engine oil filter	Replace	★							☆							every 400 Hr			G-20
5	Fan / Air-conditioner belt	Check	★							☆							every 400 Hr			G-32
6	Transmission fluid	Change	★											☆			every 600 Hr			G-21
7	Engine start system	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr			G-21
8	Wheel bolt torque	Check	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	☆	every 50 Hr			G-22
9	Battery condition	Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr	*4		G-23
10	Greasing	–		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-28
11	Brake pedal	Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-26
12	Parking brake lever	Adjust		☆		☆		☆		☆		☆		☆		☆	every 100 Hr			G-26
13	Fuel line	Check		☆		☆		☆		☆		☆		☆		☆	every 100 Hr		@	G-27
		Replace															every 2 years			G-27
14	Air cleaner element [Double type] Primary element	Clean		☆		☆		☆		☆		☆		☆		☆	every 100 Hr	*1	@	G-25
		Replace															every 1 year	*2		G-25
	Secondary element	Replace															every 1 year			G-25
15	Toe-in	Adjust				☆				☆				☆			every 200 Hr			G-30
16	Oil cooler line	Check				☆				☆				☆			every 200 Hr			G-29
		Replace															every 2 years			G-29
17	Power steering oil line	Check				☆				☆				☆			every 200 Hr			G-29
		Replace															every 2 years			G-29
18	Radiator hose and clamp	Check				☆				☆				☆			every 200 Hr			G-29
		Replace															every 2 years			G-29
19	Intake air line	Check				☆				☆				☆			every 200 Hr		@	G-29
		Replace															every 2 years	*3		G-29
20	Fuel tank water	Drain				☆				☆				☆			every 200 Hr			G-31
21	Inner air filter	Clean				☆				☆				☆			every 200 Hr			G-30
22	Fresh air filter	Clean				☆				☆				☆			every 200 Hr			G-30
23	Air conditioner condenser	Clean				☆				☆				☆			every 200 Hr			G-31

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No.	Item		Service Interval														Since then	Important		Reference page
			50	100	150	200	250	300	350	400	450	500	550	600	650	700				
24	Fuel filter	Replace								☆							every 400 Hr		@	G-32
25	Fuel solenoid pump	Clean								☆							every 400 Hr			G-33
26	Water separator	Clean								☆							every 400 Hr			G-33
27	Front differential case oil	Change												☆			every 600 Hr			G-34
28	Front axle case oil	Change												☆			every 600 Hr			G-34
29	Brake oil	Change												☆			every 600 Hr		@	G-35
30	Front axle pivot	Adjust												☆			every 600 Hr		@	G-35
31	King-pin pivot	Adjust												☆			every 600 Hr			G-35
32	Engine valve clearance	Adjust															every 800 Hr			G-36
33	Fuel injector active test	Check															every 1500 Hr		@	G-36
34	Turbocharger	Check															every 3000 Hr		@	G-36
35	Supply pump	Check															every 3000 Hr		@	G-36
36	Air conditioner pipes and hoses	Check															every 1 year			G-36
		Replace															every 2 years			G-39
37	Cabin isolation cushion	Check															every 1 year			G-36
38	Cooling system	Flush															every 2 years			G-37
39	Coolant	Change															every 2 years			G-37
40	Parking brake cable	Replace															every 2 years			G-39
41	Brake hose / Brake tank hose	Replace															every 2 years			G-39
42	Clutch hose	Replace															every 2 years			G-39
43	Front differential lock hose	Replace															every 2 years			G-39
44	Master cylinder kit	Replace															every 2 years			G-39
45	Equalizer kit	Replace															every 2 years			G-39
46	Brake seal 1 and 2	Replace															every 2 years			G-39
47	Assist cylinder hose	Replace															every 2 years			G-39
48	Fuel system	Bleed															Service as required			G-40
49	Brake system	Bleed																		G-40
50	Clutch housing water	Drain																		G-40
51	Fuse	Replace																		G-42
52	Light bulb	Replace																		G-44
53	Washer liquid	Add																		G-44
54	Refrigerant (gas)	Check																		G-45

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■ **IMPORTANT**

- **The jobs indicated by ★ must be done after the first 50 hours of operation.**
- ***1: Air cleaner should be cleaned more often in dusty conditions than in normal conditions.**
- ***2: Every year or every 6 times of cleaning.**
- ***3: Replace only if necessary.**
- ***4: When the battery is used for less than 100 hours per year, check the battery condition by reading the indicator annually.**
- **The items listed above (@ marked) are registered as emission related critical parts by KUBOTA in U.S.EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.**
  Please see the Warranty Statement in detail.

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7. CHECK AND MAINTENANCE

CAUTION

- **Be sure to check and service the tractor on a flat place with engine shut off, the parking brake on and chock the wheels.**

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[1] DAILY CHECK

To prevent trouble from occurring, it is important to know the condition of the tractor. Check the following items before starting.

Checking

- Check areas where previous trouble was experienced.
- Walk around the tractor.

1. Check the tire pressure, and check for wear and damage.
2. Check for oil and water leak.
3. Check the engine oil level.
4. Check the transmission fluid level.
5. Check the coolant level.
6. Check the brake oil level.
7. Check the washer liquid level.
8. Check the water separator.
9. Check air cleaner evacuator valve (when used in a dusty place).
10. Check the condition of seat belt.
11. Check and clean the radiator screen, grill intercooler and oil cooler.
12. Check and clean the air conditioner condenser screen.
13. Check the nuts of the tires are tight.
14. Check the number plate or SMV emblem for damage and replace as necessary if equipped.
15. Care of danger, warning and caution labels.
16. Clean around the exhaust manifold and the muffler of the engine.

- While sitting in the operator's seat.

1. Check the throttle pedal, brake pedals and clutch pedal.
2. Check the throttle lever and shuttle lever.
3. Check the parking brake.
4. Check the steering wheel.
5. Check the seat belt.

- Turning the key switch.

1. Check the performance of the Easy Checker™ lights.
2. Check head lights, turn signal lights, hazard lights and other light equipment. Clean if necessary.
3. Check the performance of the meters and gauges.

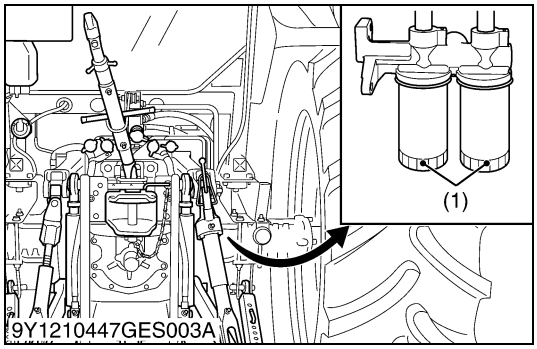
- Starting the engine.

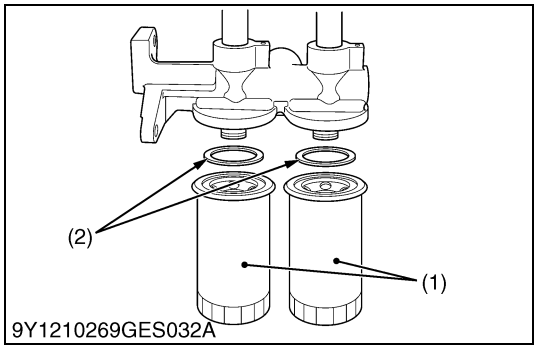
1. Check to see that the lights on the Easy Checker™ go off.
2. Check the color of the exhaust.
3. Check the brakes for proper operation.

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[2] CHECK POINTS OF INITIAL 50 HOURS





Replacing Hydraulic Oil Filter (Suction Side)

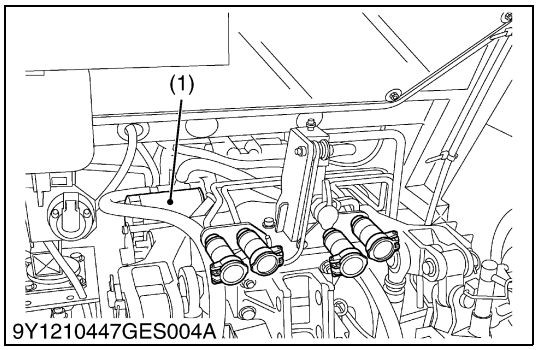
CAUTION
- **Be sure to stop the engine before changing the oil filter cartridge.**
- **Allow engine to cool down sufficiently, oil can be hot and can burn.**

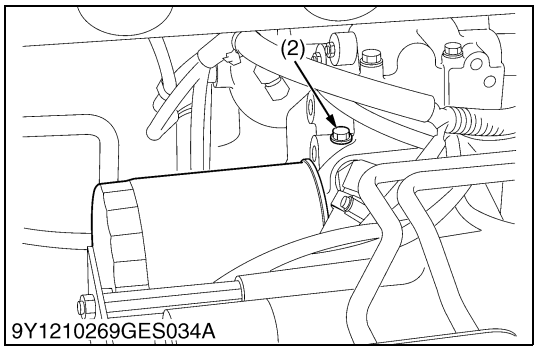
1. Remove the two oil filters.
2. Clean off metal filings with clean rags at the magnetic filters.
3. Put a film of clean transmission oil on rubber seal of new filters.
4. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
5. After the new filter has been replaced, the transmission fluid level will decrease a little. Make sure that the transmission fluid does not leak through the seal, and check the fluid level. Top up if necessary.

■ **IMPORTANT**
- **To prevent serious damage to the hydraulic system, use only a KUBOTA genuine filter.**

(1) Hydraulic Oil Filter (2) Magnetic Filter (Clean off Metal Filings)

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Replacing Hydraulic Oil Filter (Return Side)

CAUTION
- **Be sure to stop the engine before changing the oil filter cartridge.**
- **Allow engine to cool down sufficiently, oil can be hot and can burn.**

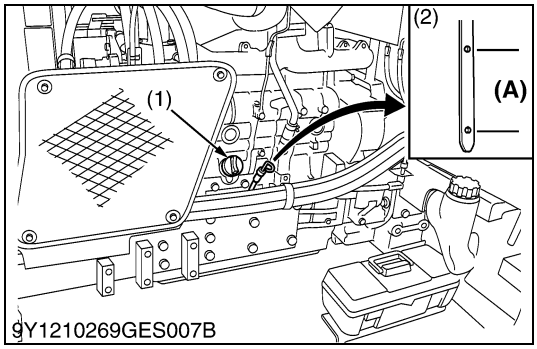
1. Remove the breather plug. Two to Three minutes later, remove the filter with the filter wrench.
2. Put a film of clean transmission oil on rubber seal of new filters.
3. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
4. Install the breather plug.
5. After the new filter has been replaced, the transmission fluid level will decrease a little. Make sure that the transmission fluid does not leak through the seal, and check the fluid level. Top up if necessary.

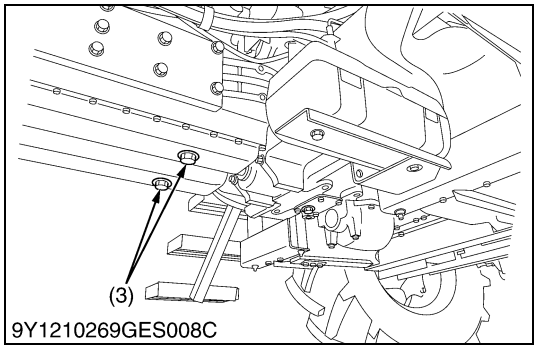
■ **IMPORTANT**
- **To prevent serious damage to the hydraulic system, use only a KUBOTA genuine filter.**

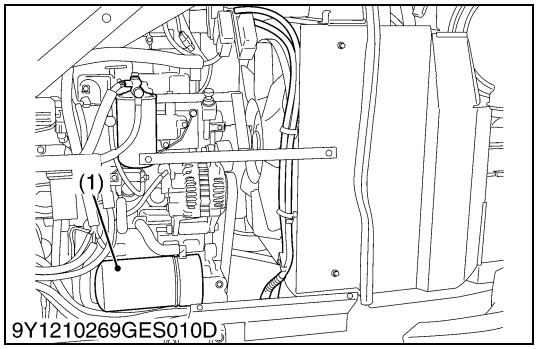
(1) Hydraulic Oil Filter Cartridge (2) Breather Plug

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Changing Engine Oil

CAUTION
- **Be sure to stop the engine before changing the oil.**
- **Allow engine to cool down sufficiently, oil can be hot and can burn.**

1. To drain the used oil, remove the drain plug at the bottom of the engine and drain the oil completely into the oil pan.
   All the used oil can be drained out easily when the engine is still warm.
2. After draining reinstall the drain plug.
3. Fill with the new oil up to the upper notch on the dipstick. (See "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.)

Engine oil	Capacity	14.6 L 15.4 U.S.qts 12.8 Imp.qts

(1) Oil Inlet
(2) Dipstick
(3) Drain Plug
(A) Oil level is acceptable within this range.

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Replacing Engine Oil Filter

CAUTION
- **Be sure to stop the engine before changing the oil filter cartridge.**
- **Allow engine to cool down sufficiently, oil can be hot and can burn.**

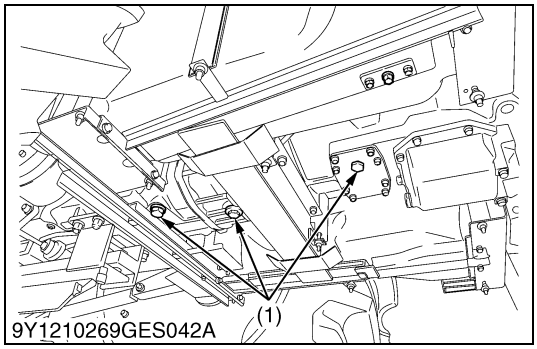
1. Remove the oil filter.
2. Put a film of clean engine oil on the rubber seal of the new filter.
3. Tighten the filter quickly until it contacts the mounting surface.
4. After the new filter has been replaced, the engine oil normally decreases a little. Make sure that the engine oil does not leak through the seal and be sure to check the oil level on the dipstick. Then, fill the engine oil up to the prescribed level.

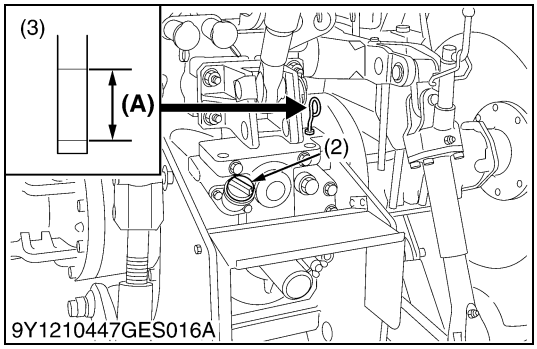
■ **IMPORTANT**
- **To prevent serious damage to the engine, use only a KUBOTA genuine filter.**

(1) Engine Oil Filter

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Changing Transmission Fluid

CAUTION

- **Allow engine to cool down sufficiently, otherwise oil can be hot and can burn.**

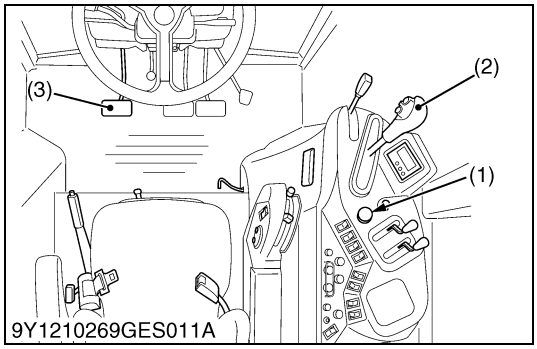
1. To drain the used oil, remove the drain plug at the bottom of the transmission case and drain the oil completely into the oil pan.
2. After draining the oil, reinstall the drain plug.
3. Fill with the new KUBOTA SUPER UDT fluid up to the upper notch on the dipstick. (See "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.)
4. After running the engine for a few minutes, stop it and check the oil level again; add oil to prescribed level.

Transmission fluid	Capacity	60 L 63.4 U.S.qts 52.8 Imp.qts

(1) Drain Plug
(2) Oil Filling Plug
(3) Dipstick
(A) Oil level is acceptable within this range.

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[3] CHECK POINTS OF EVERY 50 HOURS



Checking Engine Start System

CAUTION

- **Do not allow anyone near the tractor while testing.**
- **If the tractor does not pass the test do not operate the tractor.**

■ **Preparation before testing**

1. Place all control lever in the **"NEUTRAL"** position.
2. Set the parking brake and stop the engine.

■ **Test: Switch for Power Shift / Range Shift Lever**

1. Sit on the operator's seat.
2. Shift the power shirt / range shift lever to the desired position.
3. Depress the clutch pedal fully.
4. Disengage the PTO clutch control switch.
5. Turn the key to **"START"** position.
6. The engine must not crank.

■ **Test: Switch for PTO Clutch Control Switch**

1. Sit on the operator's seat.
2. Engage the PTO clutch control switch.
3. Depress the clutch pedal fully.
4. Shift the power shift / range shift lever to the **"NEUTRAL"** position.
5. Turn the key to **"START"** position.
6. The engine must not crank.

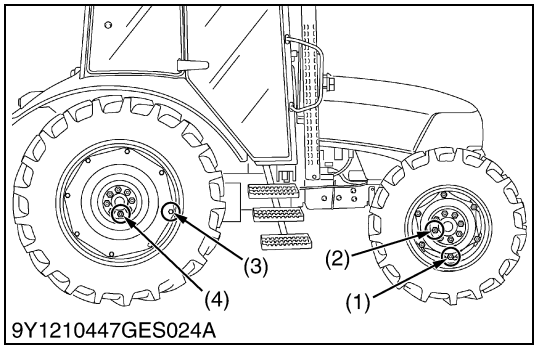
■ **Test: Checking Operator Presence Control (OPC) System**

1. Sit on the seat.
2. Turn the key to **"ON"** position.
3. Shift the PTO clutch control switch to **"ON"**.
   Make sure the warning buzzer does not whistle
4. Stand up from the seat.
5. The warning buzzer whistles about one second after standing up. If whistles for 10 seconds.

(1) PTO Clutch Control Switch
(2) Power Shift / Range Shift Lever
(3) Clutch Pedal

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Checking Wheel Bolt Torque

CAUTION

- **Never operate tractor with a loose rim, wheel or axle.**
- **Any time bolts and nuts are loosened, retighten to specified torque.**
- **Check all bolts and nuts frequently and keep them tight.**

1. Check wheel bolts and nuts regularly especially when new. If they are loose, tighten them as follows.

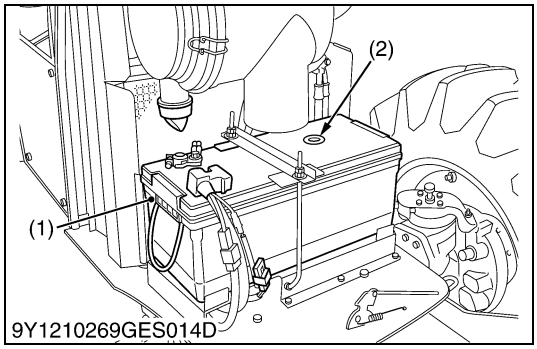
Tightening torque	Front rim and disc mounting nut	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft
	Front wheel mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 192 to 224 lbf·ft
	Rear rim and disc mounting nut	260 to 304 N·m 26.5 to 31.0 kgf·m 192 to 224 lbf·ft
	Rear wheel mounting nut	343 to 401 N·m 35.0 to 41.0 kgf·m 254 to 297 lbf·ft

(1) Front Rim and Disc Mounting Nut
(2) Front Wheel Mounting Nut
(3) Rear Rim and Disc Mounting Nut
(4) Rear Wheel Mounting Nut

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[4] CHECK POINTS OF EVERY 100 HOURS



Checking Battery Condition

DANGER

- **Do not use or charge the refillable type battery if the fluid level is below the LOWER (lower limit level) mark. Otherwise, the battery component parts may prematurely deteriorate, which may shorten the battery's service life or cause an explosion. Check the fluid level regularly and add distilled water as required so that the fluid level is between the UPPER and LOWER levels.**

CAUTION

- **Never remove the battery cap while the engine is running.**
- **Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash it away completely with water immediately and get medical attention.**
- **Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.**
- **Wear eye protection and rubber gloves when working around battery.**

Mishandling the battery shortens the service life and adds to maintenance costs.

The original battery is maintenance free, but needs some servicing. If the battery is weak, the engine will be difficult to start and the lights will be dim. It is important to check the battery periodically.

■ **How to read the indicator**

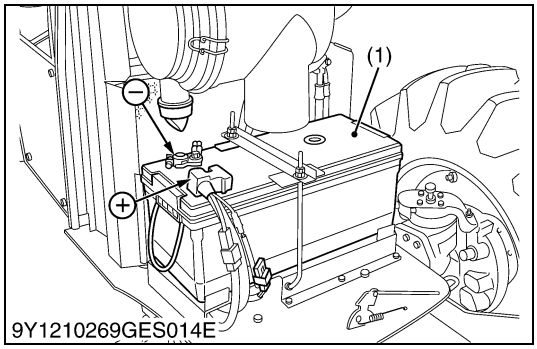
Check the battery condition by reading the indicator.

Color of Indicator	State of indicator display
Green	Specific gravity of electrolyte and quality of electrolyte are both in good condition.
Black	Needs charging battery.
White	Needs changing battery.

(1) Battery (2) Indicator

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Battery Charging

CAUTION

- **When the battery is being activated, hydrogen and oxygen gases in the battery are extremely explosive. Keep open sparks and flames away from the battery at all times, especially when charging the battery.**
- **When charging battery, ensure the vent caps are securely in place (if equipped).**
- **When disconnecting the cable from the battery, start with the negative terminal first.**
  When connecting the cable to the battery, start with the positive terminal first.
- **Never check battery charge by placing a metal object across the posts.**
  Use a voltmeter or hydrometer.

1. To slow charge the battery, connect the battery positive terminal to the charger positive terminal and the negative to the negative, then recharge in the standard fashion.
2. A boost charge is only for emergencies. It will partially charge the battery at a high rate and in a short time.
   When using a boost-charged battery, it is necessary to recharge the battery as early as possible.
   Failure to do this will shorten the battery's service life.
3. The battery is charged if the indicator display turns green from black.
4. When exchanging an old battery into new one, use battery of equal specification shown in table.

Table

Battery type	Volts (V)	Capacity at 20H.R (A.H)	Reserve capacity (min.)	Cold Cranking Amps (SAE)	Normal Charging Rate (A)
180G51	12	160	300	1090	8

(1) Battery

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Direction for Storage

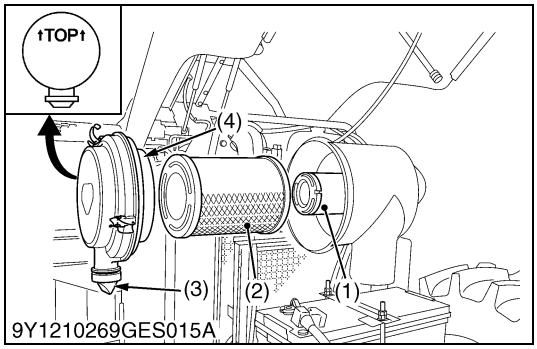
1. When storing the tractor for long periods of time, remove the battery from tractor, adjust the electrolyte to the proper level and store in a dry place out of direct sunlight.
2. The battery self-discharges while it is stored.
   Recharge it once every three months in hot seasons and once every six months in cold seasons.

NOTE

- **In checking and refilling the battery, be careful not to spill battery fluid. Split battery fluid may affect the engine controller (ECU) located below the battery, resulting in damage.**

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Cleaning Air Cleaner Primary Element

1. Remove the air cleaner cover and primary element.
2. Clean the primary element:
   – When dry dust adheres to the element, blow compressed air from the inside, turning the element. Pressure of compressed air must be under 205 kPa (2.1 kgf/cm^2, 30 psi).
   – When carbon or oil adheres to the element, soak the element in detergent for 15 minutes then wash it several times in water, rinse with clean water and dry it naturally. After element is fully dried, inspect inside of the element with a light and check if it is damaged or not.
3. Replace air cleaner primary element:
   Once yearly or after every sixth cleaning, whichever comes first.

■ **NOTE**
- **Check to see if the evacuator valve is blocked with dust.**

■ **IMPORTANT**
- **The air cleaner uses a dry element, never apply oil.**
- **Do not run the engine with filter element removed.**
- **Be sure to refit the cover with the arrow ↑ (on the rear of cover) upright. If the cover is improperly fitted, evacuator valve will not function and dust will adhere to the element.**
- **Do not touch the secondary element except in cases where replacing is required. (See "Replacing Air Cleaner Secondary Element")**

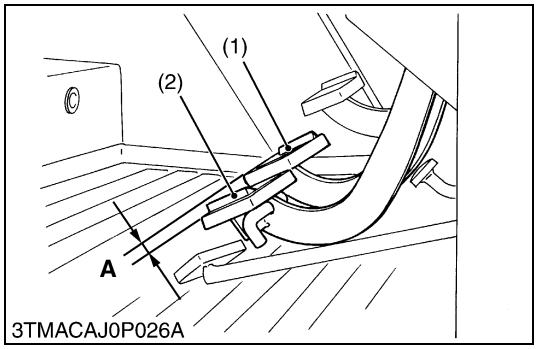
■ **Evacuator Valve**

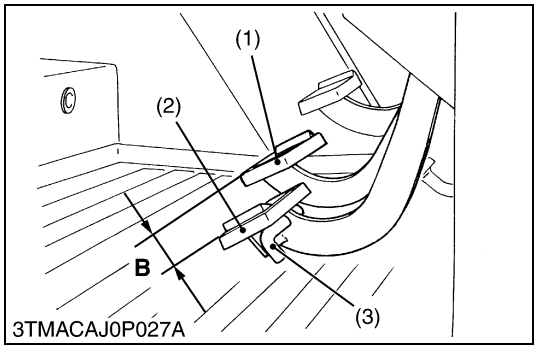
Open the evacuator valve once a week under ordinary conditions - or daily when used in a dusty place - to get rid of large particles of dust and dirt.

(1) Secondary (Safety) Element
(2) Primary Element
(3) Evacuator Valve
(4) Cover

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Adjusting Brake Pedal Free Travel

CAUTION

- **Stop the engine and chock the wheels before checking brake pedal.**
- **To prevent uneven braking, the specification must be within the recommended limit.**

1) Checking Brake Pedal Free Travel

1. Release the parking brake.
2. Slightly depress the brake pedals and measure free travel at the top of pedal stroke.

■ **NOTE**

- **Brake pedals should be equal when depressed.**

Brake pedal free travel **"A"**	Factory specification	7 to 14 mm 0.3 to 0.6 in.

2) Checking Brake Pedal Stroke

1. Disengage the brake pedal lock.
2. Step on the right-hand pedal and measure the level difference (pedal stroke) between this pedal and the left-hand pedal.
3. Do the same for the left-hand pedal.

Brake pedal stroke **"B"**	Factory specification	Less than 100 mm 3.9 in.

3) Checking Equalizer Working level (Anti-imbalance Device)

1. Gently step on both the brake pedals at once.
2. Further step on the right-hand pedal (the left-hand pedal slightly raises itself) and measure the level difference between the pedals.
3. Do the same for the left-hand pedal.

Equalizer working level	Factory specification	10 mm 0.4 in.

(1) Brake Pedal (L.H.)
(2) Brake Pedal (R.H.)
(3) Brake Pedal Lock

A: Free Travel
B: Pedal Stroke

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Checking and Adjusting Parking Brake Lever

■ **Adjusting Procedure**

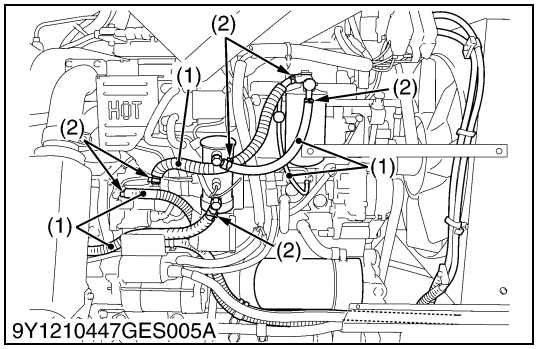
1. Release the parking brake.
2. Loosen the lock nut, and adjust the cable wire length.
3. Tighten the lock nut, and check the free play.

Parking brake lever free play	Factory specification	2 notches

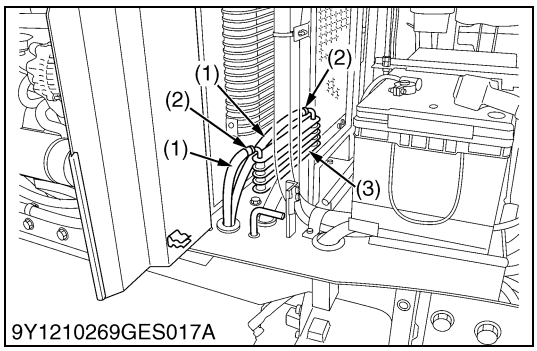
(1) Parking Brake Lever
(2) Lock Nut

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Checking Fuel Line

1. Check to see that all lines and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once.

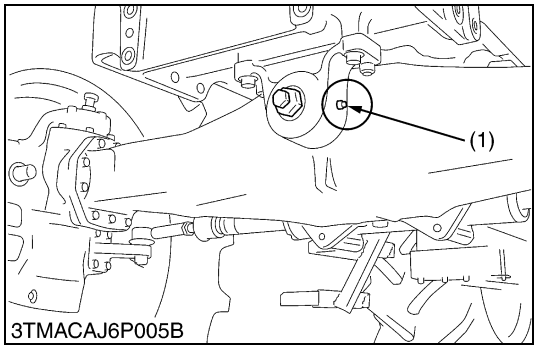
■ **NOTE**

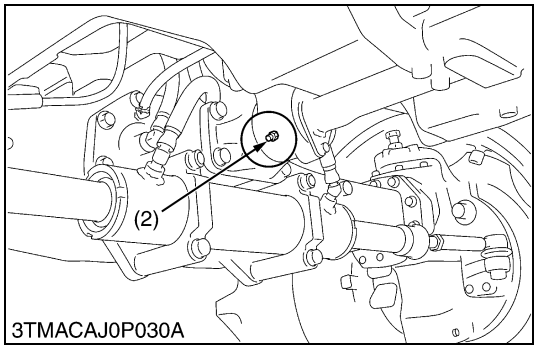
- **If the fuel line is removed, be sure to properly bleed the fuel system. (Refer to "Bleeding Fuel System" at "[14] OTHERS" section.)**

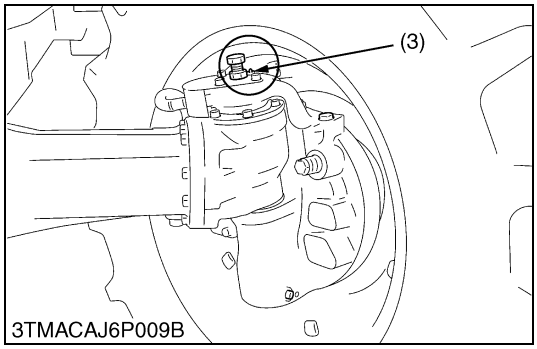
(1) Fuel Line
(2) Clamp Band
(3) Fuel Cooler

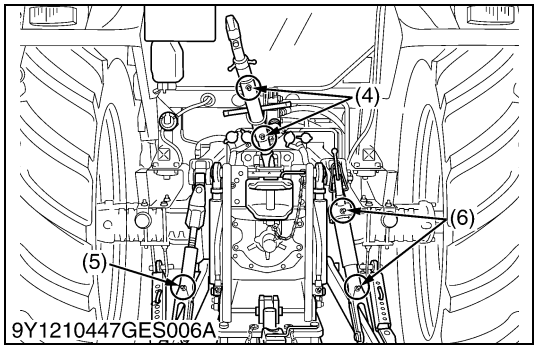
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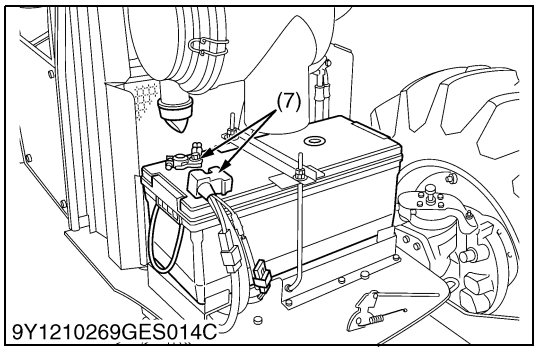
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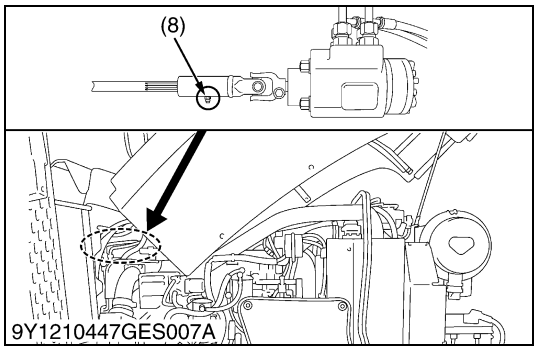


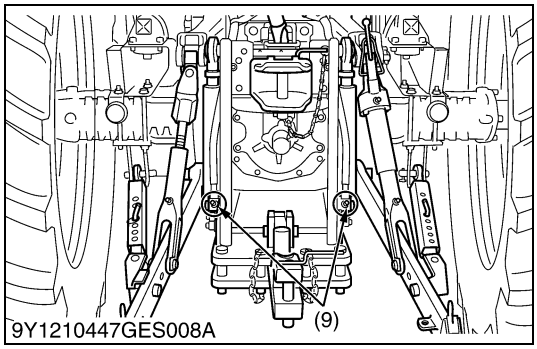




Lubricating Grease Fitting

1. Apply a small amount of multipurpose grease to the following points every 100 hours.
2. If you operated the machine in extremely wet and muddy conditions, lubricate grease fittings more often.



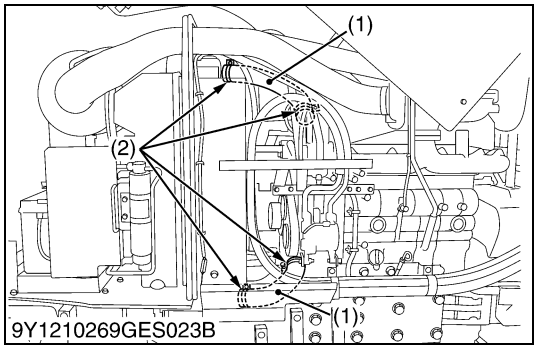


(1) Grease Fitting (Front Axle Support)
(2) Grease Fitting (Front Axle Support)
(3) Grease Fitting (Front Axle Gear Cae Support) [R.H., L.H.]
(4) Grease Fitting (Top Link)
(5) Grease Fitting (Lifting Rod) [L.H.]
(6) Grease Fitting (Lifting Rod) [R.H.]
(7) Battery Terminal
(8) Grease Fitting (Steering Joint Shaft)
(9) Grease Fitting (Assist Cylinder) (if equipped)

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[5] CHECK POINTS OF EVERY 200 HOURS



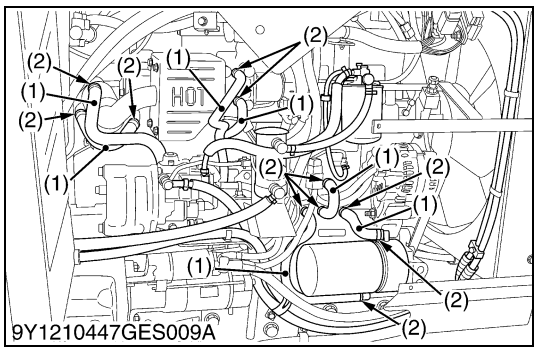
Checking Radiator Hose and Clamp

Check to see if radiator hoses are properly fixed every 200 hours of operation or six months, whichever comes first.

1. If the hose clamps are loose or water leaks, tighten the bands securely.
2. Replace the hoses and tighten the hose clamps securely, if the radiator hoses are swollen, hardened or cracked.
   Replace the hoses and hose clamps every 2 years or earlier if checked and found that hoses are swollen, hardened or cracked.

(1) Radiator Hose (2) Clamp Band

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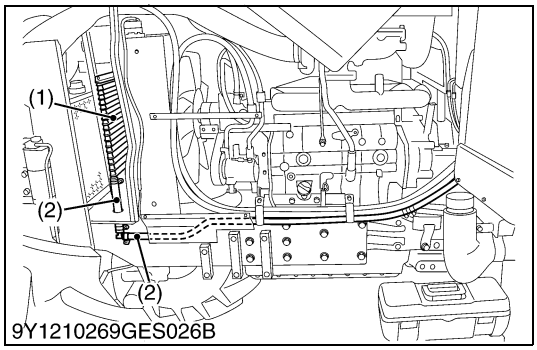


Checking Oil Cooler Line

1. Check to see that all lines and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once

(1) Oil Cooler (2) Oil Cooler Line

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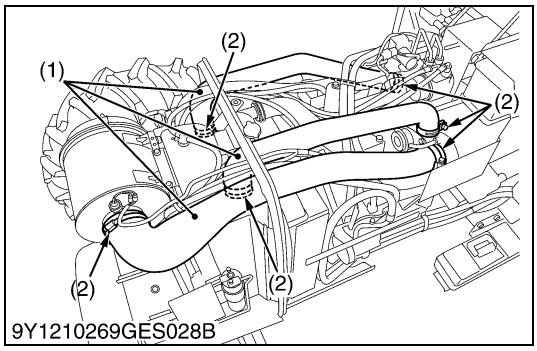


Checking Intake Air Line

1. Check to see that hoses and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once.

(1) Hose (2) Hose Clamp

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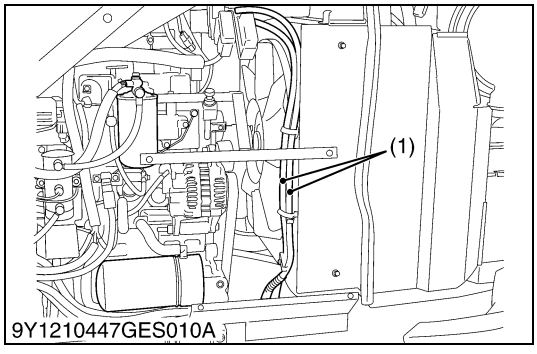


Checking Power Steering Line

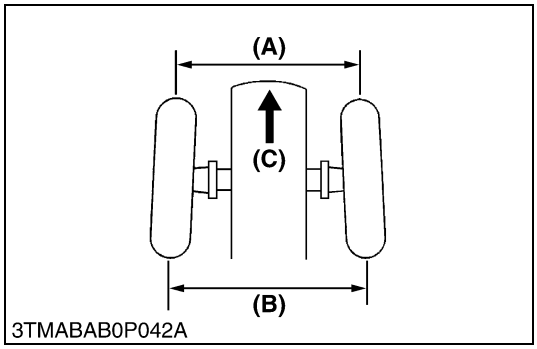
1. Check to see that all lines and hose clamps are tight and not damaged.
2. If hoses and clamps are found worn or damaged, replace or repair them at once.

(1) Power Steering Pressure Hose

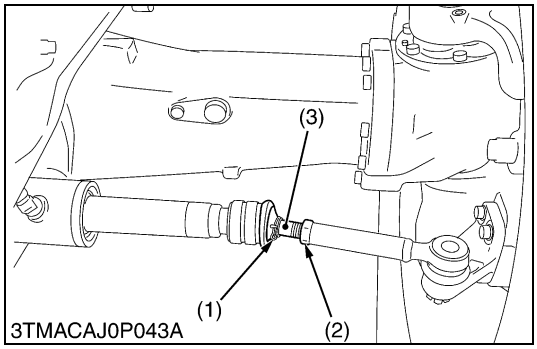
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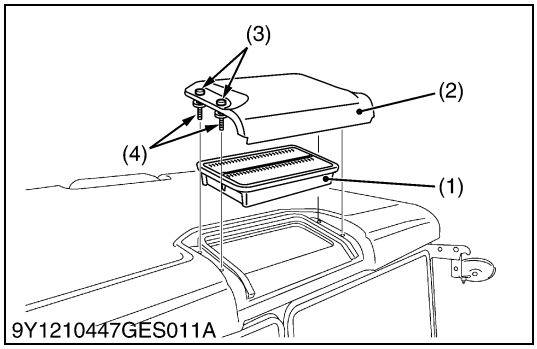
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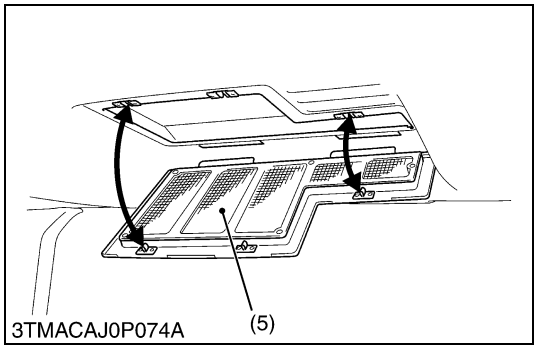
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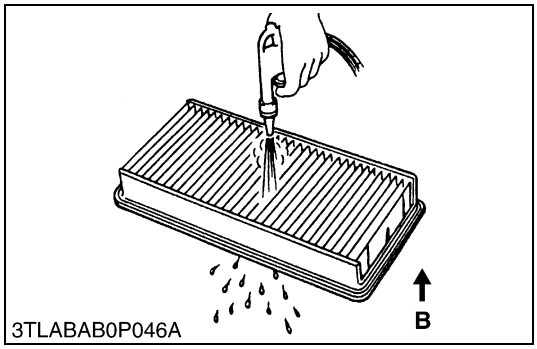
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3TMACAJ0P074A



3TLABAB0P046A

Adjusting Toe-in

1. Park the tractor on a flat place.
2. Turn steering wheel so the front wheels are in the straight ahead position.
3. Lower the implement, lock the parking brake and stop the engine.
4. Measure distance between tire beads at front of tire, hub height.
5. Measure distance between tire beads at rear of tire, hub height.
6. Front distance should be 2 to 8 mm (0.08 to 0.31 in.) less than rear distance. If not, adjust tie-rod length.

■ **Adjusting procedure**

1. Detach the snap ring.
2. Loosen the tie-rod nut.
3. Turn the tie-rod joint to adjust the rod length until the proper toe-in measurement is obtained.
4. Retighten the tie-rod nut.
5. Attach the snap ring of the tie-rod joint.

(1) Snap Ring
(2) Tie-rod Nut
(3) Tie-rod Joint
(A) Wheel-to-wheel distance at front
(B) Wheel-to-wheel distance at rear
(C) "FRONT"

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Cleaning Air Filter

CAUTION

- **When removing and attaching the filter, apply parking brake, stop the engine and remove the key.**
- **Check the filter using the strong and stable ladder to stand on.**
  Never check it while standing on a tire or fender.

1. Remove the knob bolts and pull out the filter.

■ **NOTE**

- **Attach the filter and cover as the figure left.**

■ **Cleaning Air Filter**

- Normal Use:
  Blow air from the opposite direction to the filter's normal air flow. Pressure of compressed air must be under 205 kPa (2.1 kgf/cm^2, 30 psi).
- If the filter is very dirty:
  Dip the filter in lukewarm water with mild dish washing detergent.
  Move it up and down as well as left and right to loosen dirt. Rinse the filter with clean water and let it air-dry.

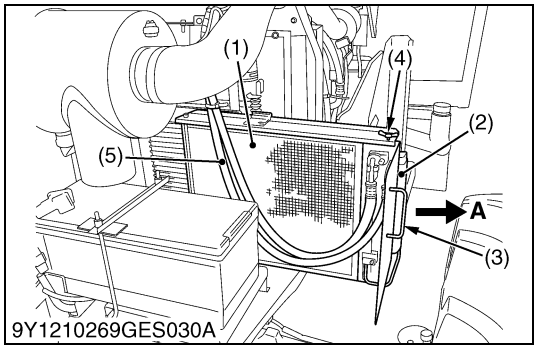
■ **IMPORTANT**

- **Do not use gasoline, thinner or similar chemicals to clean the filter as damage to the filter may occur.**
- **It may also cause an unpleasant odor in the cabin when the system is used next.**
- **Do not hit the filter. If the filter becomes deformed, dust may enter into the air-conditioner, which may cause damage and malfunction.**

(1) Fresh Air Filter
(2) Cover
(3) Knob Bolt
(4) Rubber Seal
(5) Inner Air Filter
A: Air Inlet Port
B: Air Conditioner Air Flow

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Checking Air Conditioner Condenser

Check air conditioner condenser to be sure it is clean of debris.

CAUTION

- **Be sure to stop the engine before removing the screen.**
- **The condenser and receiver become hot while the air conditioner is running. Before checking or cleaning them, wait long enough until they cool down.**

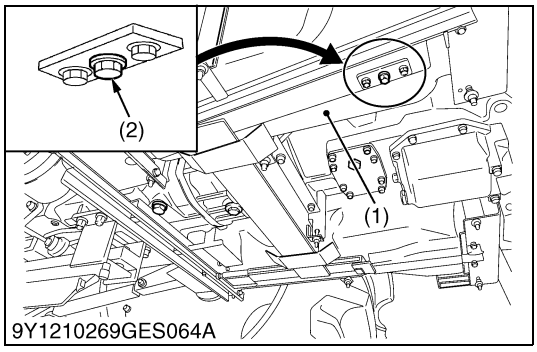
1. Loosen the wing bolt.
2. Hold the handle, slide the air conditioner condenser assembly toward yourself.

IMPORTANT

- **Do not hold the air conditioner receiver or the air conditioner pipes when sliding out the condenser for cleaning.**

(1) Air Conditioner Condenser **A: Pull**
(2) Receiver
(3) Handle
(4) Wing Bolt
(5) Air Conditioner Hose

9Y1210447GEG0085US0



Draining Fuel Tank Water

1. Loosen the drain plug (2) to let sediments, impurities and water out of the fuel tank.
2. Tighten up the drain plug (2).

IMPORTANT

- **If the fuel contains poor qualities with much water in it, drain the fuel tank at shorter intervals.**
- **Drain the fuel tank before operating the tractor after a long period of storage.**
- **The fuel tank is made of plastic. Be careful not to overtighten the bolts.**

(1) Fuel Tank, R.H. (2) Drain Plug

9Y1210447GEG0086US0

[6] CHECK POINTS OF EVERY 300 HOURS

Replacing Hydraulic Oil Filter (Suction Side)

• See page G-19

9Y1210447GEG0018US0

Replacing Hydraulic Oil Filter (Return Side)

• See page G-19

9Y1210447GEG0019US0

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[7] CHECK POINTS OF EVERY 400 HOURS

Changing Engine Oil

- See page G-20.

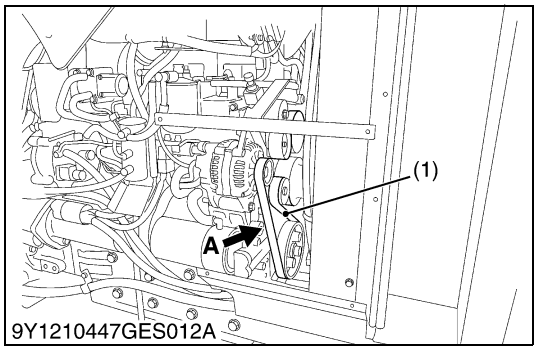
9Y1210447GEG0020US0

Replacing Engine Oil Filter

- See page G-20.

9Y1210447GEG0021US0

Checking Fan / Air-conditioner Belt Tension



CAUTION

- **Be sure to stop the engine before checking belt tension.**

1. Push on the belt between the pulleys with a finger. A deflection of 9 to 11 mm (0.35 to 0.47 in.) under a 10 kgf (22 lbf) load is appropriate.

NOTE

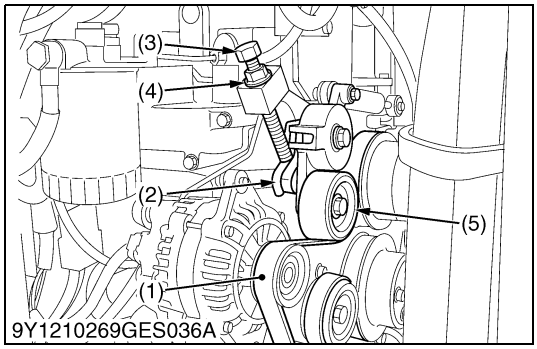
- **Replacing new belt, a deflection of 7 to 9 mm (0.28 to 0.35 in.) under a 10 kgf (22 lbf) load is appropriate.**
- **The belt is a kind of self-tension type and needs no readjustment.**

(1) Fan / Air-conditioner Belt

A: Deflection:
9 to 11 mm (0.35 to 0.47 in.)
New belt:
7 to 9 mm (0.28 to 0.35 in.)

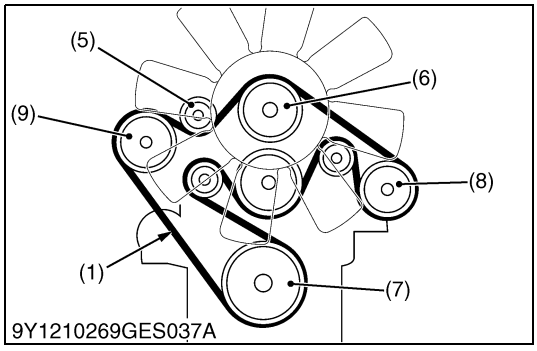
9Y1210447GEG0022US0

Replacing the Belt (If Necessary)



1. Loosen the lock nut first and then fully loosen the tension belt.
2. Lift the tension pulley and remove the belt.
3. Fit the new belt.
4. Tighten the tension bolt until the tension spring end comes in close contact with the engine body. Finally tighten up the lock nut.

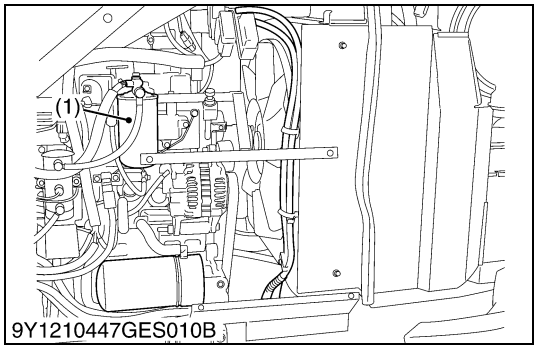
Tightening torque	Tension bolt	Below 15 N·m 1.53 kgf·m 11.1 lbf·ft
	Lock nut	123.6 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108.4 lbf·ft



(1) Belt
(2) Tension Spring End
(3) Tension Bolt
(4) Lock Nut
(5) Self-tension Pulley
(6) Fan Pulley
(7) Drive Pulley
(8) Air-conditioner compressor
(9) Alternator

9Y1210447GEG0072US0

Replacing Fuel Filter

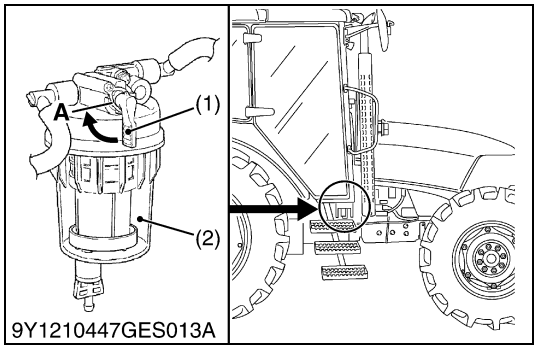


1. Remove the fuel filter.
2. Put a film of clean fuel on rubber seal of new filter.
3. Tighten the filter quickly until it contacts the mounting surface. Tighten filter by hand an additional 1/2 turn only.
4. Bleed the fuel system.
   (Refer to "Bleeding Fuel System" at "[14] OTHERS" section.)

(1) Fuel Filter

9Y1210447GEG0023US0

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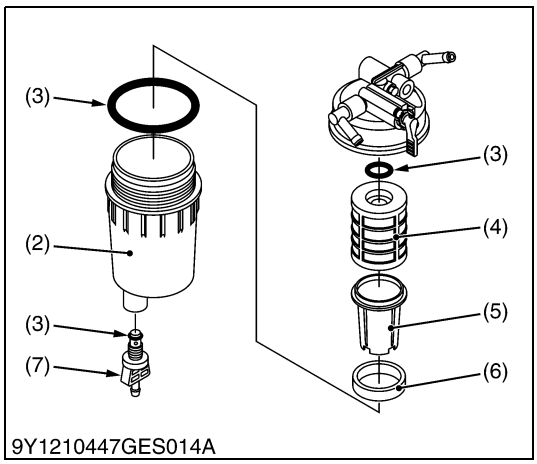


9Y1210447GES013A

Cleaning Water Separator

This job should not be done in the field, but in a clean place.

1. Close the fuel cock.
2. Unscrew the retainer ring and remove the cup, and rinse the inside with kerosene.
3. Take out the element and dip it in the kerosene to rinse.
4. After cleaning, reassemble the water separator, keeping out dust and dirt.
5. Bleed the fuel system.
   (Refer to "Bleeding Fuel System" at "[14] OTHERS" section.)

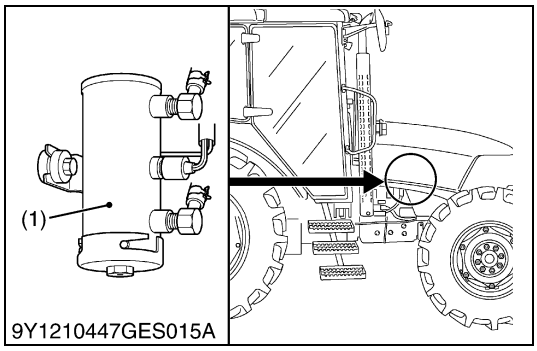


9Y1210447GES014A

(1) Fuel Cock
(2) Cup
(3) O-ring
(4) Element
(5) Element Cup
(6) Red Float
(7) Drain Plug

A: Close

9Y1210447GEG0024US0



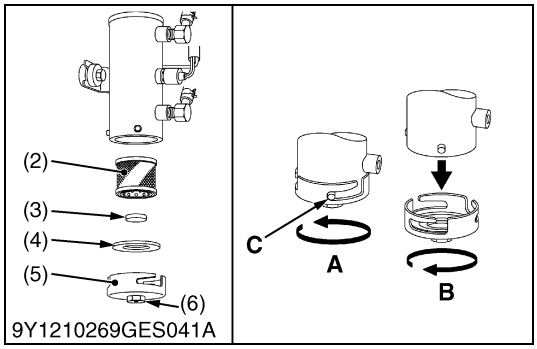
9Y1210447GES015A

Cleaning Fuel Solenoid Pump Element

1. Close the fuel cock.
2. Unscrew the cover's nut and remove the cover from the fuel solenoid pump.
3. Remove the cover, magnet, and element and clean with kerosene.
4. Refer to the diagram below and reassemble the parts as they were before.
5. Open the fuel cock.

■ **IMPORTANT**

- **When assembling the parts, be careful that no dirt or dust contacts them.**
- **Be sure to install the cover securely.**
- **After assembly, be sure to bleed the air from the fuel system. (Refer to "Bleeding Fuel System" at "[14] OTHERS" section.)**



9Y1210269GES041A

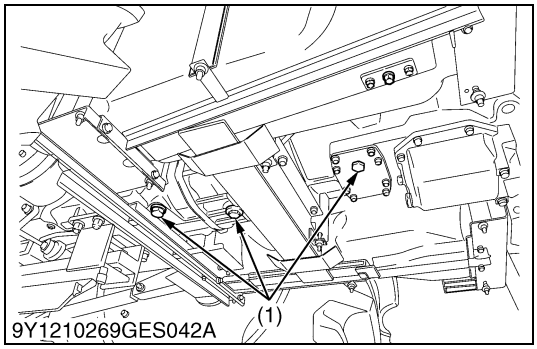
(1) Fuel Solenoid Pump
(2) Element
(3) Magnet
(4) Gasket
(5) Cover
(6) Nut

A: Tighten
B: Loosen
C: Pin

9Y1210447GEG0025US0

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[8] CHECK POINTS OF EVERY 600 HOURS



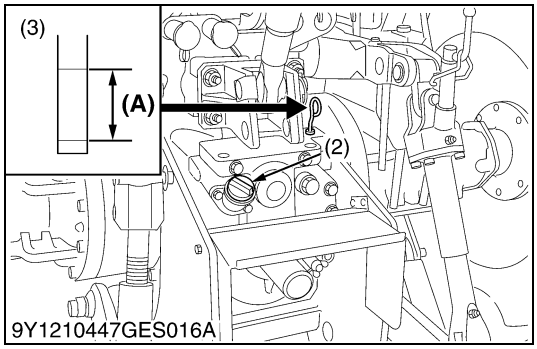
Changing Transmission Fluid

CAUTION

- **Allow engine to cool down sufficiently, otherwise oil can be hot and can burn.**

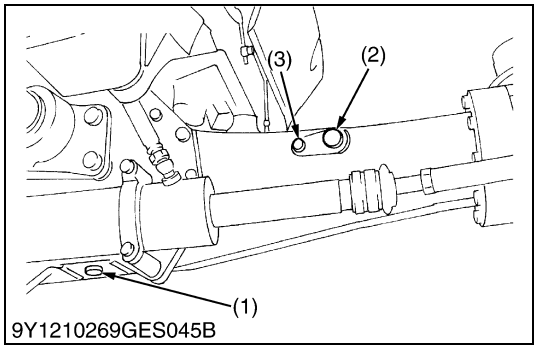
1. To drain the used oil, remove the drain plug at the bottom of the transmission case and drain the oil completely into the oil pan.
2. After draining the oil, reinstall the drain plug.
3. Fill with the new KUBOTA SUPER UDT fluid up to the upper notch on the dipstick. (See "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.)
4. After running the engine for a few minutes, stop it and check the oil level again; add oil to prescribed level.

Transmission fluid	Capacity	60 L 63.4 U.S.qts 52.8 Imp.qts



(1) Drain Plug
(2) Oil Filling Plug
(3) Dipstick
(A) Oil level is acceptable within this range.

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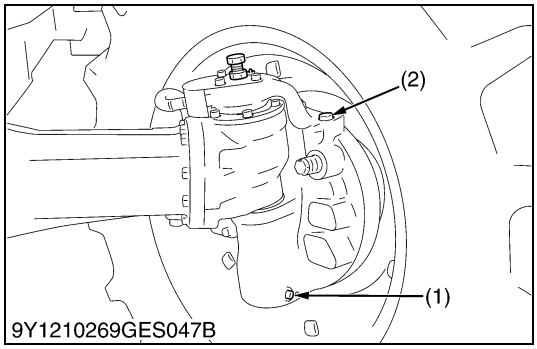
Changing Front Differential Case Oil

1. To drain the used oil, remove the drain and filling plug at the front differential case and drain the oil completely into the oil pan.
2. After draining the oil, reinstall the drain plug.
3. Remove the oil level check plug.
4. Fill with the new oil up to the lower rim of check plug port. (See "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.)
5. After filling the oil, reinstall the filling plug and check plug.

Front differential case oil	Capacity	12.0 L 12.7 U.S.qts 10.6 Imp.qts

(1) Drain Plug
(2) Filling Plug
(3) Check Plug

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Changing Front Axle Gear Case Oil

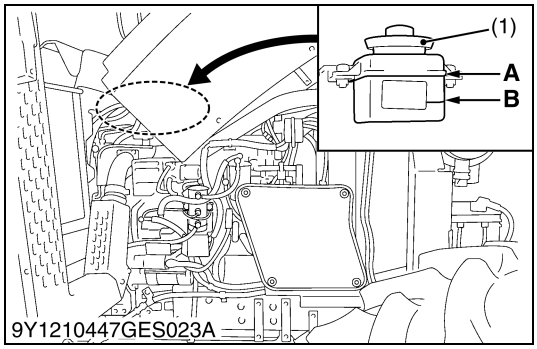
1. To drain the used oil, remove the right and left drain plugs and filling plugs at the front axle gear case and drain the oil completely into the oil pa.
2. After draining the oil, reinstall the drain plugs.
3. Fill with the new oil up to the filling plug port. (See "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.).
4. After filling reinstall the filling plugs.

Front axle gear case oil	Capacity	4.5 L 4.8 U.S.qts 4.0 Imp.qts

(1) Drain Plug
(2) Filling Plug

9Y1210447GEG0028US0

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Charging Brake Oil

1. Make sure that the brake oil reservoir is filled with the specified amount of brake oil.
2. If the brake oil is insufficient, fill the specified brake oil.

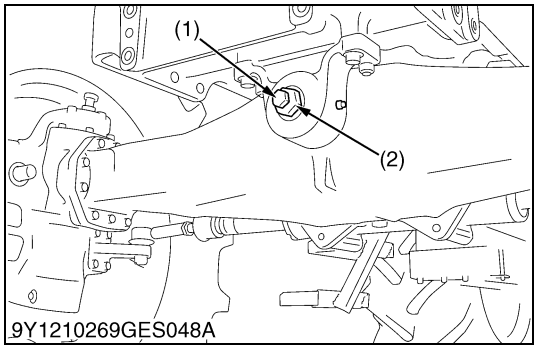
■ **IMPORTANT**

- **Never operate the tractor, if the brake oil is below the "MIN" line.**
- **Wipe the oil reservoir cap (1) and its surrounding before removing it.**
- **When pouring the brake oil, be sure to use the filter and take care not to allow dust or water to enter.**
- **Be sure to use the recommended mineral type brake oil (see "4. LUBRICANTS, FUEL AND COOLANT" in "G. GENERAL" section).**
  Never use automotive brake oil. This will cause brake failure.
- **When filling brake oil, use the same quality of oil as the one already in the tank. Adding an oil of different make or type can cause damage, and must be avoided.**

Brake Oil	Capacity	0.3 L 0.32 U.S.qts 0.26 Imp.qts

(1) Reservoir Cap
A: MAX Level
B: MIN Level

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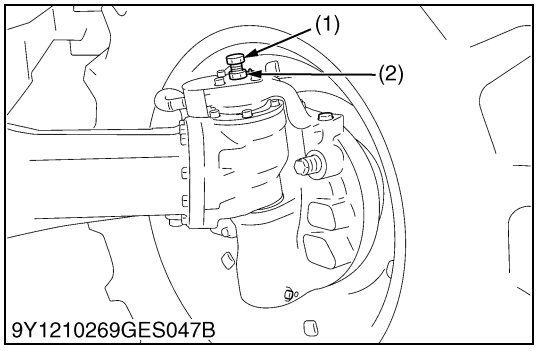


Adjusting Front Axle Pivot

1. Loosen the lock nut, tighten the adjusting screw all the way, and then tighten the screw by 1/6 turn.
2. Retighten the lock nut.

(1) Adjusting Screw (2) Lock Nut

9Y1210447GEG0087US0



Adjusting King-pin Pivot

1. Loosen the lock nut and tighten the adjusting screw.

Tightening torque	Adjusting screw	4.9 to 9.8 N·m 0.5 to 1.0 kgf·m 3.62 to 7.24 lbf·ft
	Lock nut	98.1 to 147.1 N·m 10.0 to 15.0 kgf·m 72.3 to 108.5 lbf·ft

(1) Adjusting Screw (2) Lock Nut

9Y1210447GEG0088US0

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[9] CHECK POINT OF EVERY 800 HOURS

Adjusting Engine Valve Clearance

- Refer to "[1] CHECKING AND ADJUSTING" at "1. ENGINE" section.

9Y1210447GEG0029US0

[10] CHECK POINT OF EVERY 1500 HOURS

Checking Fuel Injection Nozzle (Active Test)

- See diagnosis manual "Common Rail System Engine".

9Y1210447GEG0030US0

[11] CHECK POINTS OF EVERY 3000 HOURS

Checking Turbocharger

- Refer to "[1] CHECKING AND ADJUSTING" in "1. ENGINE" section.

9Y1210447GEG0031US0

Checking Supply Pump

- See diagnosis manual "Common Rail System Engine".

9Y1210447GEG0032US0

[12] CHECK POINTS OF EVERY 1 YEAR

Replacing Air Cleaner Primary Element and Secondary Element

- See "Cleaning Air Cleaner Primary Element".

9Y1210447GEG0034US0

Checking Air Conditioner Pipe and Hose

- Check to see that all lines and hose clamps are tight and not damaged.

9Y1210447GEG0035US0

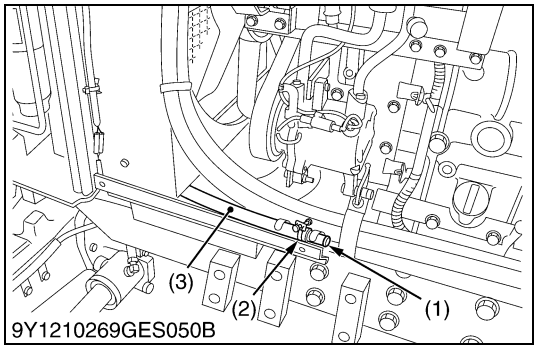
Checking Cabin Isolation Cushion

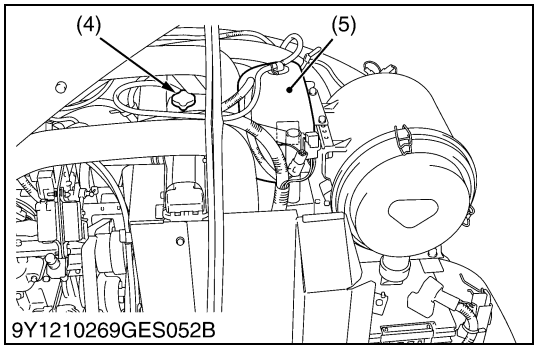
1. Check the cushion for any breakage or fatigue.
2. Replace them if they are deteriorated

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[13] CHECK POINTS OF EVERY 2 YEARS





Flushing Cooling System and Changing Coolant

CAUTION

- **Do not remove radiator cap while coolant is hot. When cool, slowly rotate cap to the first stop and allow sufficient time for excess pressure to escape before removing the cap completely.**

1. Stop the engine and let it cool down.
2. To drain the coolant, remove the radiator drain plug and remove the radiator cap. The radiator cap must be removed to completely drain the coolant.
3. After all coolant is drained, install the drain plug.
4. Fill with clean soft water and cooling system cleaner.
5. Follow directions of the cleaner instruction.
6. After flushing, fill with clean soft water and anti-freeze until the coolant level is just below the radiator cap.
   Install the radiator cap securely.
7. Fill with coolant up to the **"FULL"** mark of recovery tank.
8. Start and operate the engine for few minutes.
9. Stop the engine, remove the key and let cool.
10. Check coolant level of recovery tank and add coolant if necessary.
11. Properly dispose of used coolant.

■ **IMPORTANT**

- **Do not start engine without coolant.**
- **Use clean, fresh soft water and anti-freeze to fill the radiator and recovery tank.**
- **When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50 %.**
- **Securely tighten radiator cap. If the cap is loose or improperly fitted, water may leak out and the engine could overheat.**

■ **NOTE**

- **On cabin type machines, coolant circulates through the heater. This means that one more liter or so of coolant is required.**
  In changing coolant, pour coolant up to the filler port of the recovery tank. Turn ON the heater (shift the temperature control lever toward WARM), and run the engine for a while in order to warm coolant. Then stop the engine.
  When coolant has cooled down, some of the coolant in the recovery tank is sucked. Now the recovery tank is appropriately filled with coolant.

Coolant	Capacity	15 L 16 U.S.qts 13 Imp.qts

(1) Drain Plug
(2) Clamp Band
(3) Radiator Hose
(4) Radiator Cap
(5) Recovery Tank

(To be continued)

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(Continued)

■ **Anti-Freeze**

If coolant freezes, it can damage the cylinders and radiator. If the ambient temperature falls below 0 °C (32 °F) or before a long-term storage, let out coolant completely, or mix coolant with long-life coolant and fill the radiator and recovery tank with the mixture.

1. Long-life coolant (hereafter LLC) comes in several types. Use ethylene glycol (EG) type for this engine.
2. Before employing LLC-mixed cooling water, fill the radiator with fresh water and empty it again.
   Repeat this procedure 2 or 3 times to clean up the inside.
3. Mixing the LLC
   Put the LLC cooling water in the percentage (%) for a target temperature. When mixing, stir it up well, and then fill into the radiator.
4. The procedure for the mixing of water and anti-freeze differs according to the make of the anti-freeze and the ambient temperature. Refer to SAE J1034 standard, more specifically also to SAE J814c.

■ **IMPORTANT**

- **When the anti-freeze is mixed with water, the anti-freeze mixing ratio must be less than 50 %.**

Vol % Anti-freeze	Freeze Point		Boiling Point*	
	°C	°F	°C	°F
40	−24	−12	106	223
50	−37	−34	108	226

*At 1.013 × 10^5 Pa (760 mmHg) pressure (atmospheric). A higher boiling points is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.

5. Adding the LLC
   – Add only water if the mixture reduces in amount by evaporation.
   – If there is a mixture leak, add the LLC of the same manufacturer and type in the same mixture percentage.
     * Never add any long-life coolant of different manufacturer. (Different brands may have different additive components, and the engine may fail to perform as specified.)
6. When the LLC is mixed, do not employ any radiator cleaning agent. The LLC contains anticorrosive agent. If mixed with the cleaning agent, sludge may build up, adversely affecting the engine parts.
7. KUBOTA's genuine long-life coolant has a service life of 2 years. Be sure to change the coolant every 2 years.

■ **NOTE**

- **The above data represent industry standards that necessitate a minimum glycol content in the concentrated anti-freeze.**
- **When the coolant level drops due to evaporation, add water only to keep the anti-freeze mixing ratio less than 50 %. In case of leakage, add anti-freeze and water in the specified mixing ratio before filling in to the radiator.**

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Replacing Radiator Hose (Water Pipes)

- Replace the hoses and clamps.
  (See "Checking Radiator Hose and Clamp".) (See page G-29.)

9Y1210447GEG0038US0

Replacing Power Steering Hose

- Refer to "Checking Power Steering Line". (See page G-29.)

9Y1210447GEG0039US0

Replacing Fuel Hose

- Refer to "Checking Fuel Line". (See page G-27.)

9Y1210447GEG0040US0

Replacing Oil Cooler Line

- Refer to "Checking Oil Cooler Line". (See page G-29.)

9Y1210447GEG0041US0

Replacing Intake Air Line

- Refer to "Checking Intake Air Line". (See page G-29.)

9Y1210447GEG0042US0

Replacing Parking Brake Cable

- Refer to "Checking and Adjusting Parking Brake Lever".
  (See page G-26.)

9Y1210447GEG0043US0

Replacing Brake Hose / Brake Tank Hose

- Refer to "5. BRAKES".

9Y1210447GEG0044US0

Replacing Clutch Hose

- Refer to "2. CLUTCH".

9Y1210447GEG0045US0

Replacing Front Differential Lock Hose

- Refer to "6. FRONT AXLE".

9Y1210447GEG0046US0

Replacing Master Cylinder Kit

- Refer to "5. BRAKES".

9Y1210447GEG0047US0

Replacing Equalizer Kit

- Refer to "5. BRAKES".

9Y1210447GEG0048US0

Replacing Brake Seal 1 and 2

- Refer to "5. BRAKES".

9Y1210447GEG0049US0

Replacing Assist Cylinder Hose

- Refer to "8. HYDRAULIC SYSTEM" section.

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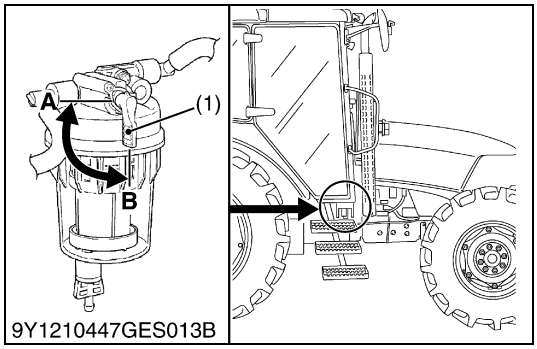
Replacing Air Conditioner Hose

- Refer to "10. CABIN" section.

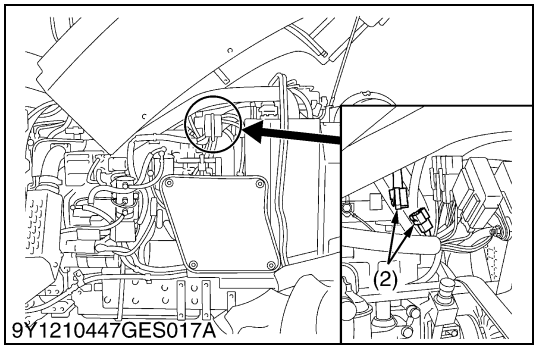
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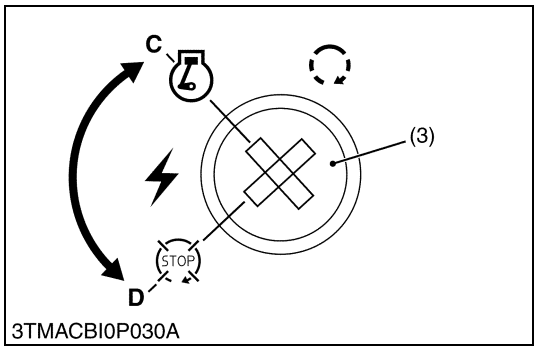
[14] OTHERS



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9Y1210447GES017A



3TMACBI0P030A

Bleeding Fuel System

Air must be removed;
1. When the fuel filter or lines are removed.
2. When water is drained from water separator.
3. When tank is completely empty.
4. After the tractor has not been used for a long period of time.

■ **Bleeding procedure is as follows:**
1. Fill the fuel tank with fuel, and open the fuel cock (1).
2. Disconnect the heater connector (2).

■ **IMPORTANT**
- **Do not try air-bleeding with the heater in operation. Otherwise the battery may get damaged.**

3. Turn **ON** and **OFF** the key switch repeatedly 10 times or so at the following intervals. This lets the air out of the fuel line.
   - Key switch **ON** time: 30 seconds
   - Key switch **OFF** time: 15 seconds
4. Connect the heater connector.
5. Set the hand throttle lever at the maximum speed position, turn the key switch to start the engine and then reset the throttle lever at the mid speed (around 1500 min^{-1} (rpm)) position.
   If engine does not start, try it several times at 30 second intervals.

■ **IMPORTANT**
- **Do not hold key switch at engine start position for more than 10 seconds continuously. If more engine cranking is needed, try again after 30 seconds.**

6. Accelerate the engine to remove the small portion of air left in the fuel system.
7. If air still remains and the engine stops, repeat the above steps.

(1) Fuel Cock
(2) Connector
(3) Key Switch

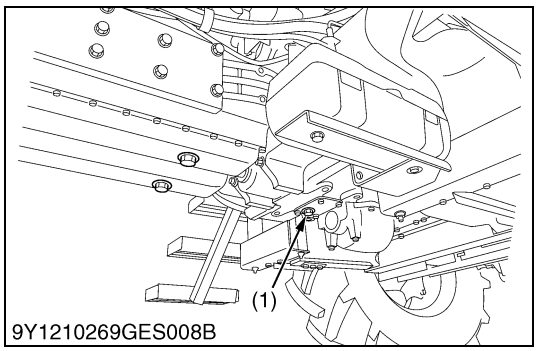
A: CLOSE
B: OPEN
C: ON
D: OFF

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Bleeding Brake System

• See page 5-S12.

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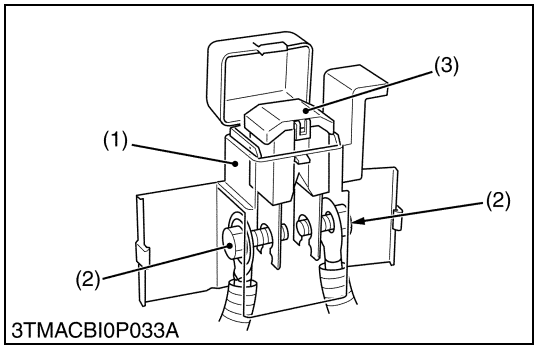
Draining Clutch Housing Water

1. The tractor is equipped with a drain plug under the clutch housing.
2. After operating in rain, snow or tractor has been washed, water may get into the clutch housing.
3. Remove the drain plug and drain the water, then install the plug again.

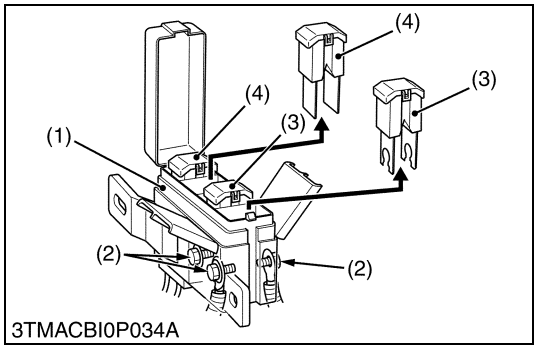
(1) Water Drain Plug

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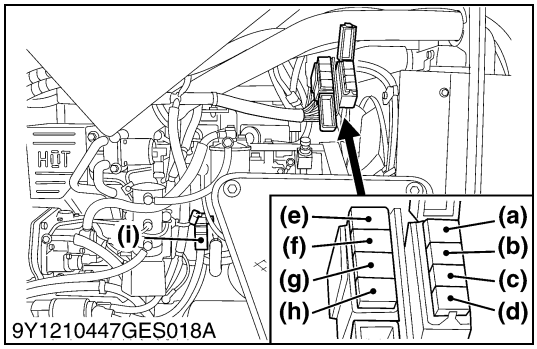
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Replacing Slow Blow Fuse

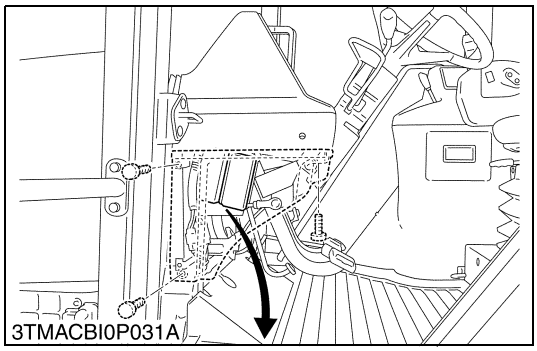
1. Disconnect the negative cord of the battery.
2. Remove the bolts of fuse box holder.
3. Pull down the fuse boxes off the holder.
4. For the center slow blow fuse in each fuse box, open the box cover and draw out the fuse. For the slow blow fuses at both sides, open the box cover, remove the bolts and draw out the fuses.

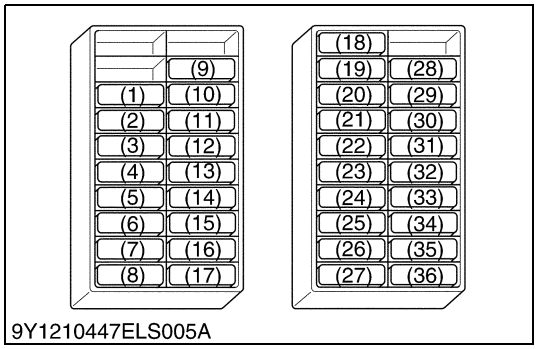
Fuse No.	Capacity (A)	Protected Circuit	Type
(a)	30	Main Key Switch	Non bolt-fixed
(b)	30	Hazard	Non bolt-fixed
(c)	40	Compressor	Bolt-fixed
(d)	60	Engine Preheat	Bolt-fixed
(e)	40	Work Light (Front) Head Lamp	Bolt-fixed
(f)	40	Work Light (Rear) Beacon Light	Bolt-fixed
(g)	30	Electrical Outlet	Non bolt-fixed
(h)	40	Defogger Cigarette Lighter	Non bolt-fixed
(i)	100	Alternator	Bolt-fixed

(1) Fuse Box
(2) Bolt
(3) Bolt Fixed Slow-blow Fuse
(4) Non Bolt Fixed Slow-blow Fuse

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Fuses

1. The tractor electrical system is protected from potential damage by fuses.
2. A blown fuse indicates that there is an overload or short somewhere in the electrical system.
3. If any of the fuses should blow, replace with a new one of the same capacity.

■ **IMPORTANT**

- **Before replacing a blown fuse, determine why the fuse blew and make any necessary repairs. Failure to follow this procedure may result in serious damage to the tractor electrical system.**

(To be continued)

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(Continued)

Fuse No.	Capacity (A)	Protected Circuit
(1)	5	ECU (SW)
(2)	20	Defogger (Side)
(3)	20	Defogger (Rear)
(4)	10	Brake Lamp
(5)	5	Radio
(6)	5	Air Conditioner (Fan Control)
(7)	15	Wiper
(8)	5	Starter Relay
(9)	5	Switch (Transmission Control)
(10)	5	Switch (Hitch Control)
(11)	10	ECU (Main)
(12)	5	Panel
(13)	5	4WD, Bi-speed, Differential Lock
(14)	5	Engine Control, PTO Valve
(15)	10	Turn Signal
(16)	15	Loader Power Auxiliary Socket
(17)	5	Display
(18)	15	Work Light (Front Outside)
(19)	15	Work Light (Front Inside)
(20)	10	Head Lamp (Left)
(21)	10	Head Lamp (Right)
(22)	10	Option Lamp
(23)	15	Work Light (Rear)
(24)	10	Work Light (Front Side)
(25)	15	Seat Compressor
(26)	15	Cigarette Lighter
(27)	15	Work Light (Option)
(28)	20	Air Conditioner Fan Motor (Left)
(29)	20	Air Conditioner Fan Motor (Right)
(30)	10	Air Conditioner Compressor
(31)	15	Tail Lamp Spot Light
(32)	15	Hazard
(33)	10	Dome Light Radio
(34)	10	Horn
(35)	5	Glow Relay
(36)	5	Back Up (ECU, Meter)

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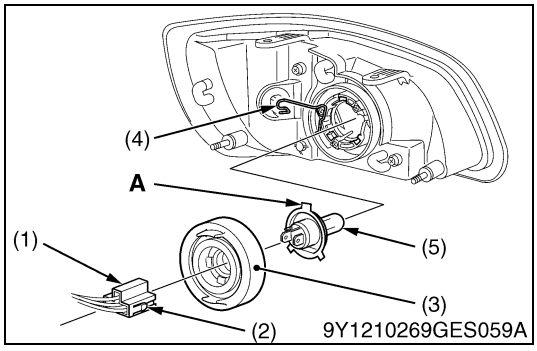
Replacing Light Bulb

1. Head lights:
   Take the bulb out of the light body and replace with a new one.
2. Other lights:
   Detach the lens and replace the bulb.

Light	Capacity
Head Light	60 / 55 W
Turn Signal Light (Front)	21 W
Turn Signal Light (Rear)	21 W
Position Light (Front)	5 W
Position Light (Rear)	10 W
Spot Light	21 W
Rear Registration Light	5 W
Work Light	55 W
Side Lamp (Work Light)	21 W
Dome Light (Room Light)	10 W
Spot Light	7.5 W

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Replacing Head Lamp



CAUTION

- **Be careful no to drop the bulb, hit anything against the lamp, apply excess force, and get the lamp scratched. If broken, glass may cause injury. Pay more attentions to halogen lamps in particular, which have high pressure inside.**
- **Before replacing the lamp, be sure to turn off the light and wait until the bulb cools down, otherwise, you may get burned.**

1. While pushing the right and left lock buttons, pull and remove the electrical connector.
2. Remove the rubber boot.
3. Remove the clamping fixture and take out the bulb.
4. Replace with a new bulb and reinstall the head lamp assembly in the reverse order.

IMPORTANT

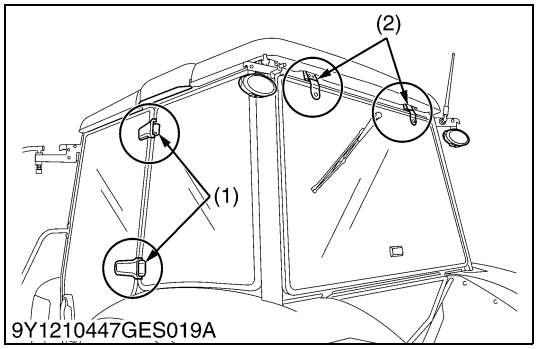
- **Be sure to use a new bulb of the specified wattage.**
- **Never touch the bulb surface (glass) with bare hands. Fingerprints, for example, may break the bulb.**

(1) Electrical Connector
(2) Lock Buttons
(3) Rubber Boot
(4) Clamping Fixture
(5) Bulb

A: Base's wider projection face upward

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Lubricating Door and Rear Window Hinge

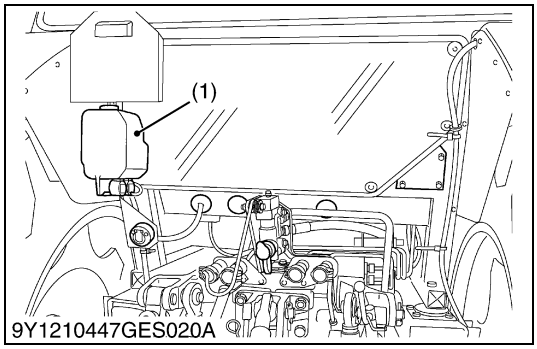


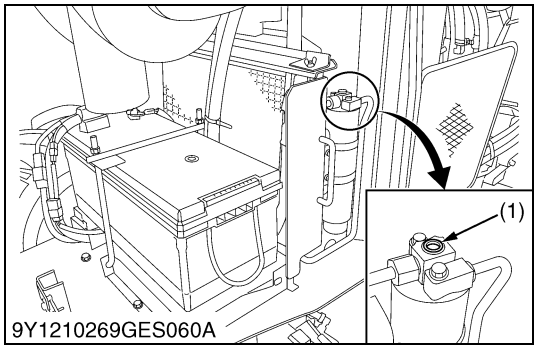
1. Apply oil to door hinge and rear window hinge.

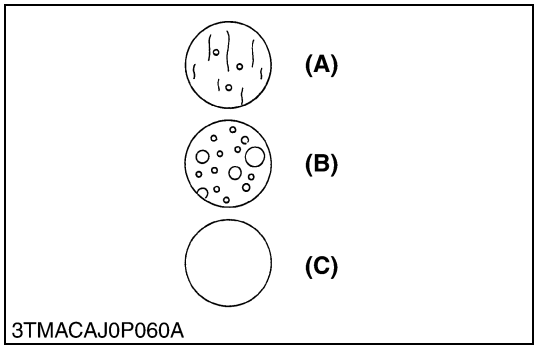
(1) Door Hinge
(2) Rear Window Hinge

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Adding Washer Liquid

1. Add a proper amount of automobile washer liquid to washer liquid tank (1).

Washer liquid tank	Capacity	1.3 L 1.4 U.S.qts 1.1 Imp.qts

(1) Washer Liquid Tank

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Checking Amount of Refrigerant (Gas)

CAUTION

- **Liquid contact with eyes or skin may cause frostbite.**
- **In the event of a leakage, wear safety goggles. Escaping refrigerant can cause severe injuries to eyes.**
- **In contact with a flame, R134a refrigerant gives a toxic gas.**
- **Do not disconnect any part of the refrigeration circuit of the air conditioning system.**

A shortage of refrigerant impairs the air-conditioner performance. Check the following points. If it is indicated that the amount of refrigerant is extremely low, inspect and charge. (See page 10-S22.)

■ Checking Procedure

1. Run the air-conditioner in the following conditions.
   – Engine speed: About 1500 min^{-1} (rpm)
   – Temperature control lever: Maximum cooling position (leftmost)
   – Fan switch: Highest blow (**HI**)
   – Air-conditioner switch: **ON**
2. Look into the sight glass to see if the refrigerant is flowing through its circuit.

■ IMPORTANT

- **Charge only with R134a not R12 refrigerant (gas).**

(1) Side Glass

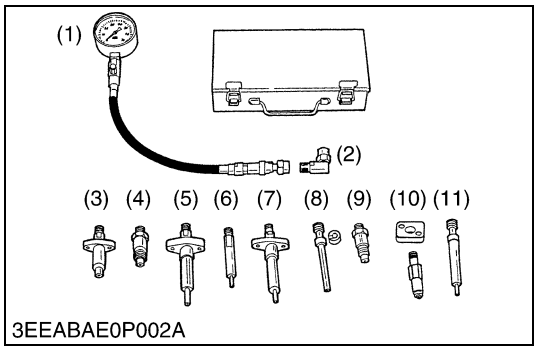
(A) Proper: Little or no air bubbles in the refrigerant flow.
(B) Low: Lots of air bubbles in the refrigerant flow (air bubbles or foam passing continuously).
(C) Overfull or no refrigerant: Colorless and transparent.

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8. SPECIAL TOOLS

[1] SPECIAL TOOLS FOR ENGINE



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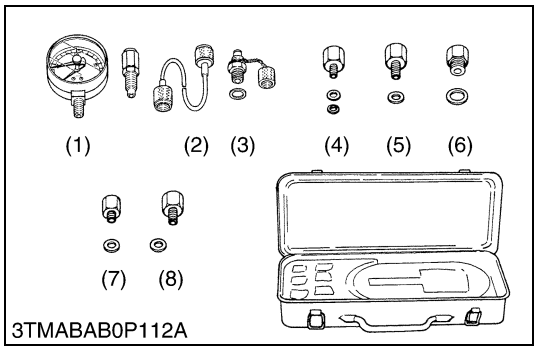
Diesel Engine Compression Tester (for Injection Nozzle)

Code No.
- 07909-30208 (Assembly)
- 07909-30934 (**A** to **F**)
- 07909-31211 (**E** and **F**)
- 07909-31231 (**H**)
- 07909-31251 (**G**)
- 07909-31271 (**I**)
- 07909-31281 (**J**)

Application
- Use to measure diesel engine compression and diagnostics of need for major overhaul.

(1) Gauge
(2) **L** Joint
(3) Adaptor **A**
(4) Adaptor **B**
(5) Adaptor **C**
(6) Adaptor **E**
(7) Adaptor **F**
(8) Adaptor **G**
(9) Adaptor **H**
(10) Adaptor **I**
(11) Adaptor **J**

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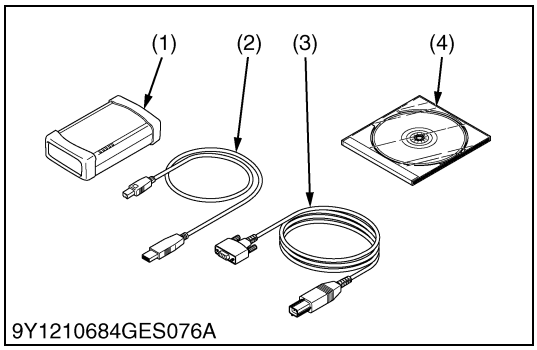
Oil Pressure Tester

Code No.
- 07916-32032

Application
- Use to measure lubricating oil pressure.

(1) Gauge
(2) Cable
(3) Threaded Joint
(4) Adaptor **1**
(5) Adaptor **2**
(6) Adaptor **3**
(7) Adaptor **4**
(8) Adaptor **5**

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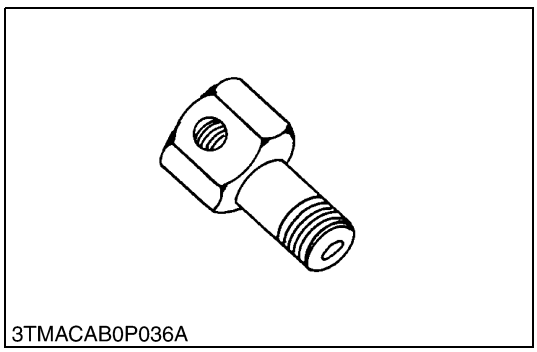
Diagnosis Tool Kit

Code No.
- 1J574-90014

Application
- Use to check on the trouble of the common rail diesel engine.

(1) Interface (DST-i)
(2) Cable (USB)
(3) Cable (VEH)
(4) Diagnosis Software CD-ROM

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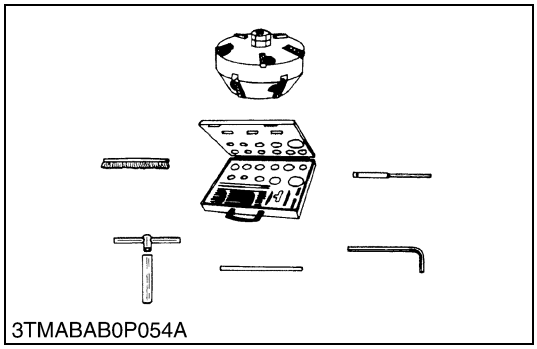
Adaptor 7

Code No.
- 07916-32591

Application
- Use to measure lubricating oil pressure.

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Valve Seat Cutter

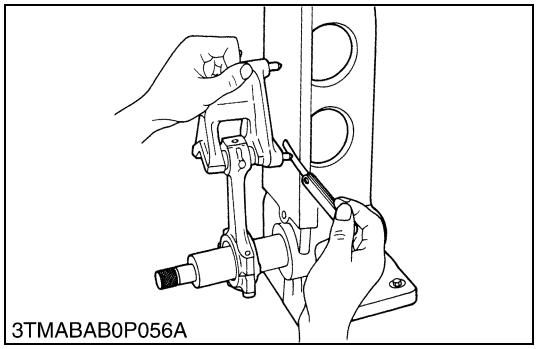
Code No.
- 07909-33102

Application
- Use to reseat valves.

Angle
- 0.79 rad (45 °)
- 0.26 rad (15 °)

Diameter
- 28.6 mm (1.13 in.)
- 31.6 mm (1.24 in.)
- 35.0 mm (1.38 in.)
- 38.0 mm (1.50 in.)
- 41.3 mm (1.63 in.)
- 50.8 mm (2.00 in.)

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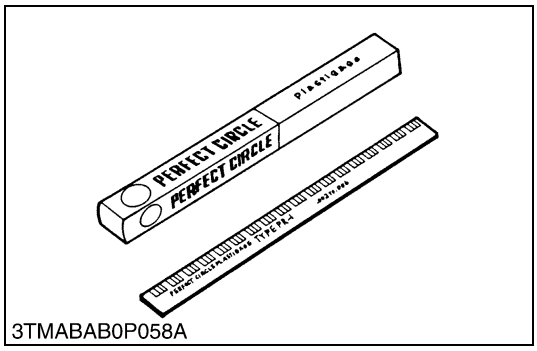
Connecting Rod Alignment Tool

Code No.
- 07909-31661

Application
- Use to check the connecting rod alignment.

Applicable range
- Connecting rod big end I.D.
  30 to 75 mm dia. (1.2 to 2.9 in. dia.)
- Connecting rod length
  65.0 to 300 mm (2.56 to 11.8 in.)

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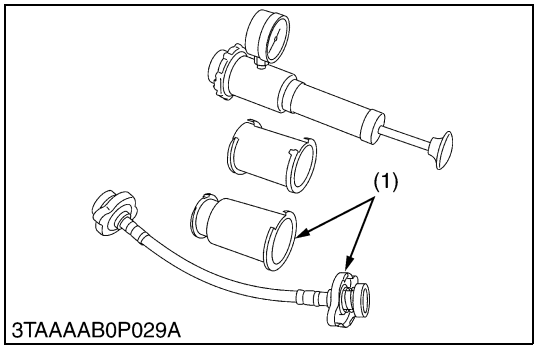
Plastigauge

Code No.
- 07909-30241

Application
- Use to check the oil clearance between crankshaft and bearing, etc..

Measuring range
- Green: 0.03 to 0.07 mm (0.001 to 0.003 in.)
- Red: 0.05 to 0.1 mm (0.002 to 0.006 in.)
- Blue: 0.1 to 0.2 mm (0.004 to 0.009 in.)

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3TAAAAB0P029A

Radiator Tester

Code No.
- 07909-31551

Application
- Use to check of radiator cap pressure, and leaks from cooling system.

Remarks
- Adaptor (1) BANZAI Code No. RCT-2A-30S.

(1) Adaptor

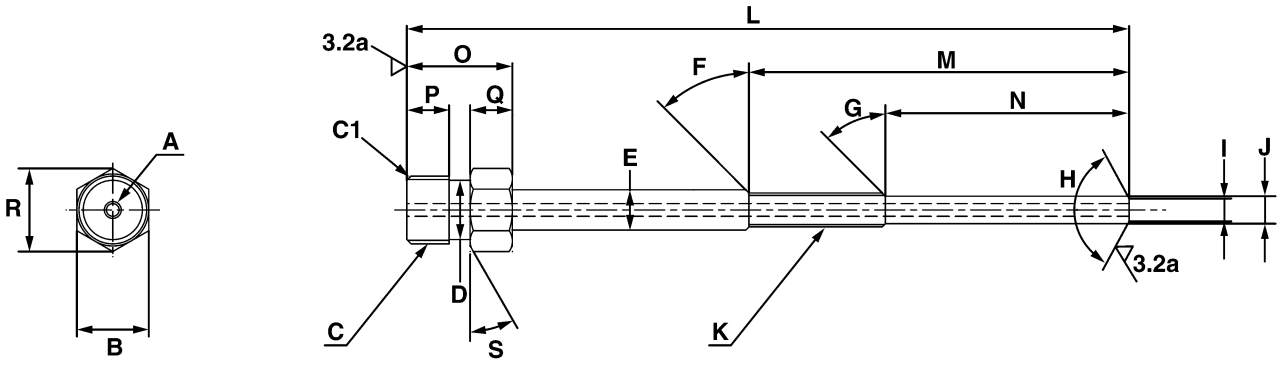
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Glow Plug Adaptor

Application

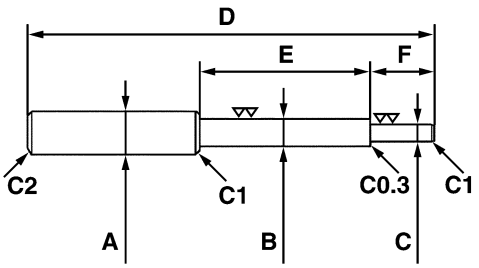
- Use to check compression pressure through glow plug hole.



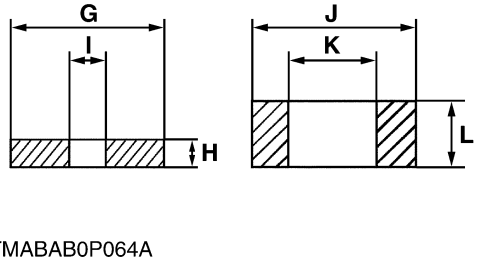
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A	3 mm dia. (0.118 in. dia.) through hole	**K**	M8 × 1.0
B	17 mm (0.669 in.)	**L**	171 mm (6.73 in.)
C	M16 × 1.5	**M**	90 mm (3.54 in.)
D	14 mm dia. (0.551 in. dia.)	**N**	57.6 to 58.0 mm (2.260 to 2.283 in.)
E	9.5 mm dia. (0.374 in. dia.)	**O**	25 mm (0.984 in.)
F	0.785 rad (45 °)	**P**	10 mm (0.394 in.)
G	0.785 rad (45 °)	**Q**	10 mm (0.394 in.)
H	2.12 to 2.18 rad (121 to 125 °)	**R**	19.63 mm (0.7728 in.)
I	4.9 to 5.5 mm dia. (0.193 to 0.217 in. dia.)	**S**	0.52 rad (30 °)
J	6.3 to 6.5 mm dia. (0.248 to 0.255 in. dia.)	**C1**	Chamfer 1.0 mm (0.0394 in.)

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3TMABAB0P064A

Valve Guide Replacing Tool

Application

- Use to press out and press fit the valve guide.

A	20 mm dia. (0.79 in. dia.)
B	12.96 to 12.98 mm dia. (0.510 to 0.511 in. dia.)
C	7.50 to 7.70 mm dia. (0.295 to 0.303 in. dia.)
D	225 mm (8.86 in.)
E	80 mm (3.15 in.)
F	40 mm (1.57 in.)
G	14.5 to 15.5 mm dia. (0.57 to 0.61 in. dia.)
H	5 mm (0.197 in.)
I	8.0 to 8.1 mm dia. (0.31 to 0.32 in. dia.)
J	17.5 to 18.5 mm dia. (0.689 to 0.728 in. dia.)
K	13.1 to 13.2 mm dia. (0.516 to 0.520 in. dia.)
L	8.9 to 9.1 mm (0.350 to 0.358 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.3 mm (0.012 in.)

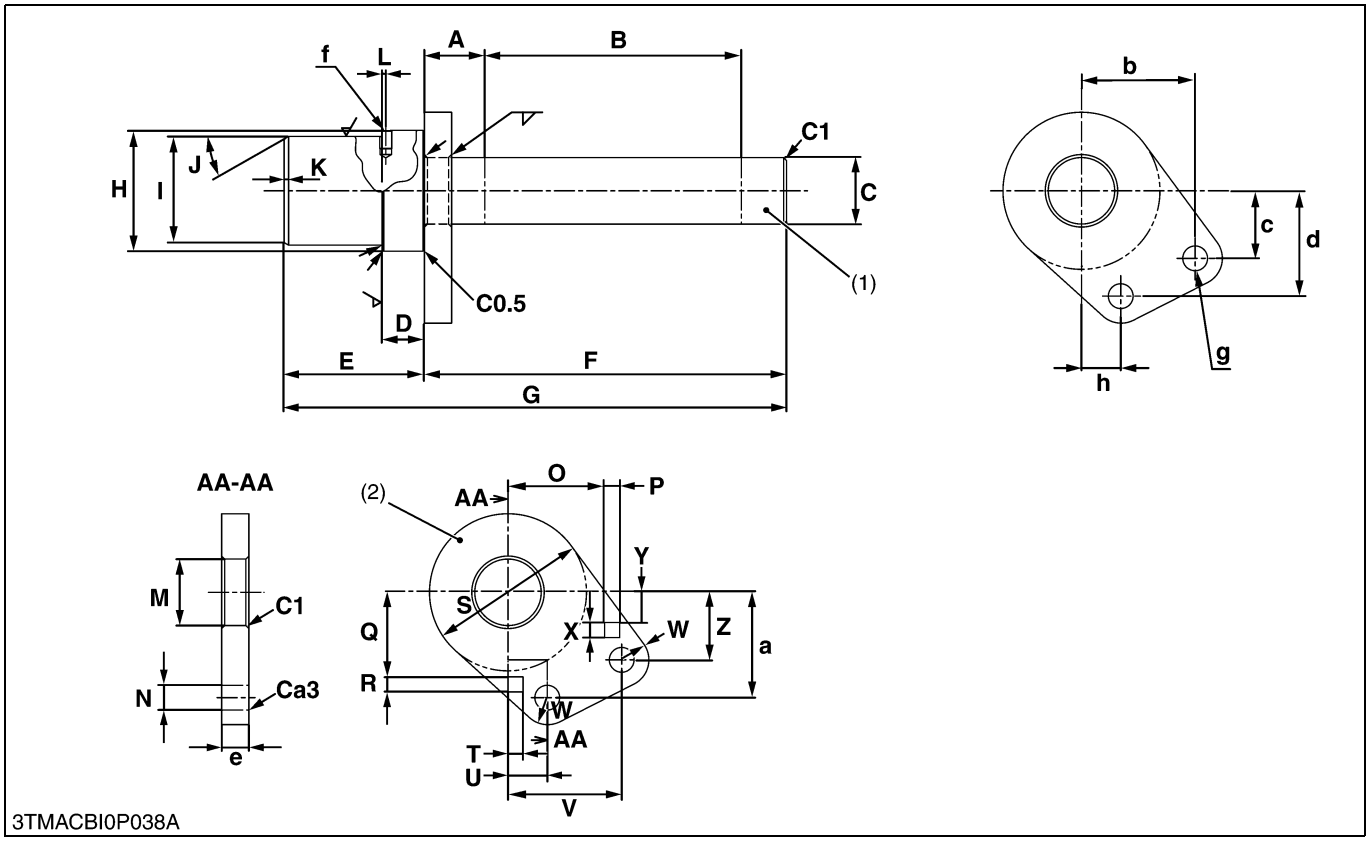
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Balancer Shaft Bearing Replacing Tool

Application

- Use to press fit the bearing.



A	20 mm (0.7874 in.)	**S**	52 mm (2.05 in.)
B	85 mm (3.35 in.)	**T**	5 mm (2.05 in.)
C	21.9 to 22.0 mm (0.8622 to 0.8661 in.)	**U**	13 mm (0.5118 in.)
D	13.5 to 14.5 mm (0.5315 to 0.5708 in.)	**V**	37.67 mm (1.4831 in.)
E	46.5 mm (1.831 in.)	**W**	9 mm (0.354 in.)
F	120 mm (4.72 in.)	**X**	5 mm (2.05 in.)
G	166.5 mm (6.555 in.)	**Y**	10 mm (0.394 in.)
H	39.5 to 39.7 mm dia. (1.556 to 1.562 in. dia.)	**Z**	22.36 mm (0.8803 in.)
I	35.8 to 35.9 mm dia. (1.410 to 1.413 in. dia.)	**a**	34.88 mm (1.3732 in.)
J	0.52 rad (30 °)	**b**	37.47 to 37.87 mm (1.4752 to 1.4909 in.)
K	1.5 mm (0.0591 in.)	**c**	22.16 to 22.56 mm (0.8725 to 0.8881 in.)
L	1.2 mm (0.0472 in.)	**d**	34.68 to 35.08 mm (1.3654 to 1.3811 in.)
M	22 mm dia. (0.866 in. dia.)	**e**	9 mm (0.354 in.)
N	2 × 8.2 mm dia. (2 × 0.323 in. dia.)	**f**	4.000 to 4.018 mm dia., 6 mm depth (0.1575 to 0.1582 in. dia., 0.236 in. depth)
O	32 mm (1.260 in.)	**g**	2 × 8.2 mm dia. (2 × 0.323 in. dia.)
P	5.0 mm (0.197 in.)	**h**	12.8 to 13.2 mm (0.5040 to 0.5196 in.)
Q	28 mm (1.10 in.)	**C0.5**	Chamfer 0.5 mm (0.0197 in.)
R	5 mm (0.197 in.)	**C1**	Chamfer 1.0 mm (0.0394 in.)

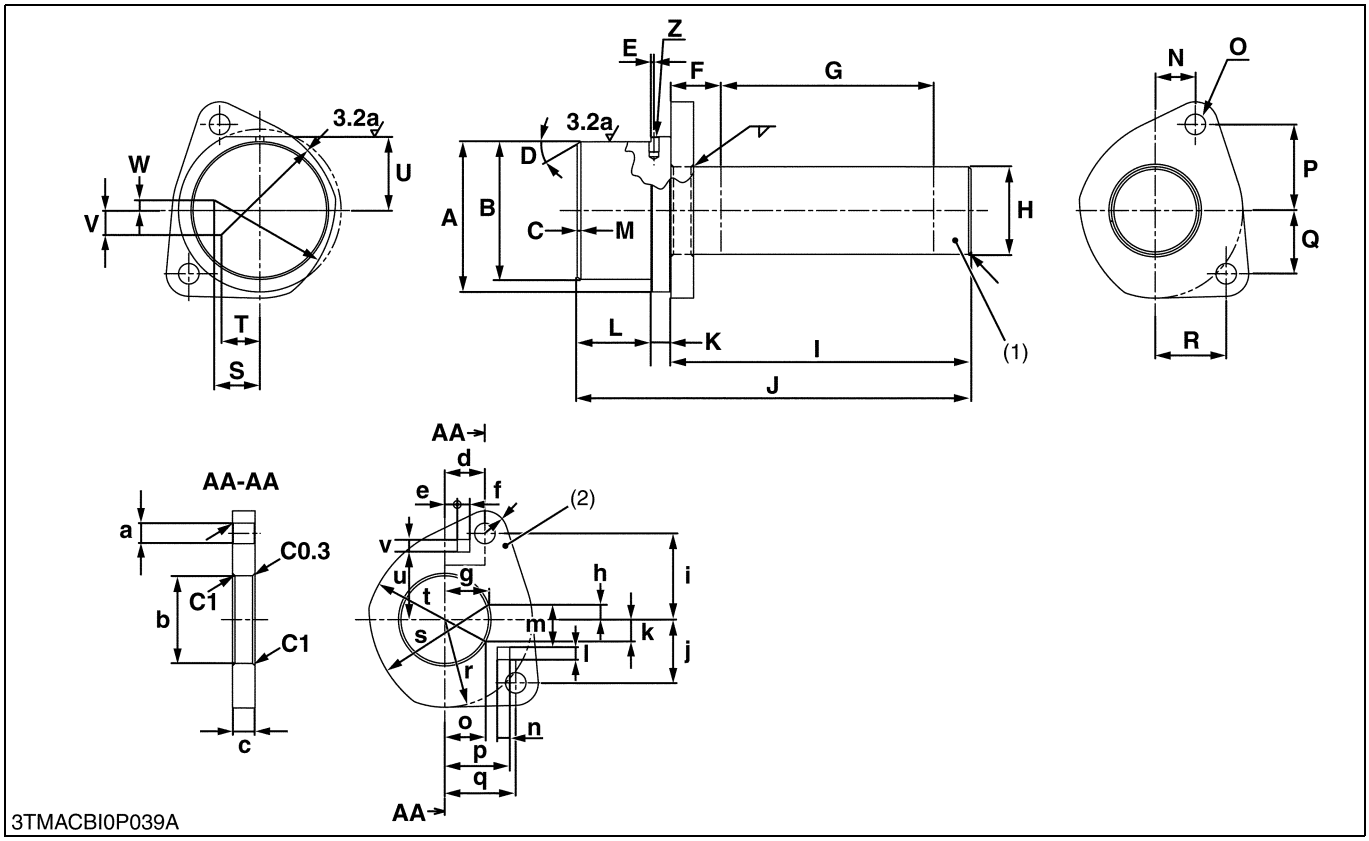
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Balancer Shaft 2 Bearing C Replacing Tool B

Application

- Use to press fit the bearing.



(1) Shaft (2) Stopper

(To be continued)

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(Continued)

A	65 mm dia. (2.559 in. dia.)	**a**	2 × 8 mm dia. (2 × 0.315 in. dia.)
B	54.8 to 54.9 mm dia. (2.158 to 2.161 in.)	**b**	35 mm dia. (1.378 in. dia.)
C	1.5 mm (0.0591 in.)	**c**	9 mm (0.354 in.)
D	0.523 rad (30 °)	**d**	16.06 mm (0.0323 in.)
E	1.2 mm (0.0472 in.)	**e**	5 mm (0.197 in.)
F	20 mm (0.7874 in.)	**f**	5 mm (0.197 in.)
G	85 mm (3.346 in.)	**g**	18.2 mm (0.7165 in.)
H	34.9 to 35.0 mm dia. (1.3741 to 1.3779 in. dia.)	**h**	4.99 mm (0.1965 in.)
I	120 mm (4.724 in.)	**i**	34.43 mm (1.3565 in.)
J	157.5 mm (6.201 in.)	**j**	25.26 mm (0.9945 in.)
K	8 mm (0.315 in.)	**k**	5 mm (0.197 in.)
L	29.5 mm (1.161 in.)	**l**	9.5 mm (0.3740 in.)
M	1.5 mm (0.0591 in.)	**m**	11 mm (0.4331 in.)
N	15.86 to 16.26 mm (0.6244 to 0.6401 in.)	**n**	5 mm (0.197 in.)
O	2 × 8.2 mm dia. (2 × 0.323 in. dia.)	**o**	16 mm (0.6299 in.)
P	34.23 to 34.63 mm dia. (1.348 to 1.363 in. dia.)	**p**	26 mm (1.024 in.)
Q	25.06 to 25.46 mm (0.9867 to 1.002 in.)	**q**	28.39 mm (1.1177 in.)
R	28.19 to 28.59 mm (1.110 to 1.125 in.)	**r**	35 mm (1.378 in.)
S	18.2 mm (0.7165 in.)	**s**	48.5 mm (1.9094 in.)
T	16 mm (0.6299 in.)	**t**	48.5 mm (1.9094 in.)
U	29.3 to 29.4 mm (1.154 to 1.157 in.)	**u**	27 mm (1.063 in.)
V	9.5 mm (0.3740 in.)	**v**	5 mm (0.197 in.)
W	4.99 mm (0.1965 in.)	**C0.3**	Chamfer 0.3 mm (0.012 in.)
Z	4.000 to 4.018 mm dia., 6 mm depth (0.1575 to 0.1582 in. dia., 0.236 in. depth)	**C1**	Chamfer 1.0 mm (0.0394 in.)

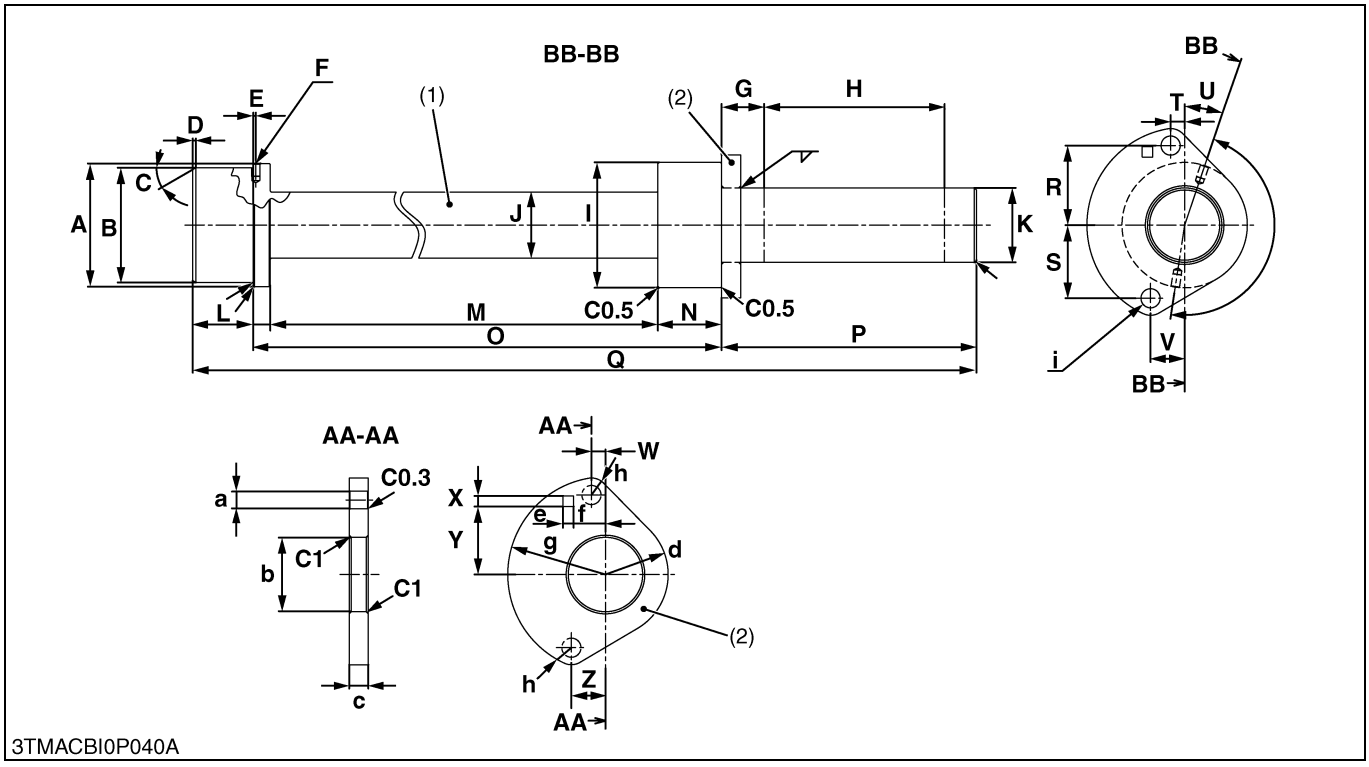
9Y1210269GEG0082US0

https://truckmanualshub.com/

Balancer Shaft Bearing Replacing Tool C

Application

- Use to press fit the bearing.



3TMACBI0P040A

(1) Shaft (2) Stopper

A	57.5 to 57.7 mm (2.264 to 2.271 in.)	**T**	6.4 to 6.8 mm (0.2520 to 0.2677 in.)
B	53.8 to 53.9 mm (2.119 to 2.122 in.)	**U**	0.326 rad (18.7 °)
C	0.523 rad (30 °)	**V**	16.4 to 16.8 mm (0.6457 to 0.6614 in.)
D	1.5 mm (0.0591 in.)	**W**	6.6 mm (0.260 in.)
E	1.2 mm (0.0472 in.)	**X**	5 mm (0.197 in.)
F	2 × 4.000 to 4.018 mm dia., 6 mm depth (2 × 0.1575 to 0.1582 in. dia., 0.236 in. depth)	**Y**	32 mm (1.260 in.)
G	20 mm (0.7874 in.)	**Z**	16.06 mm (0.6559 in.)
H	85 mm (3.346 in.)	**a**	2 × 8.2 mm dia. (2 × 0.323 in. dia.)
I	58.5 to 58.7 mm dia. (2.304 to 2.311 in. dia.)	**b**	35 mm dia. (1.378 in. dia.)
J	31 mm dia. (1.220 in. dia.)	**c**	9 mm (0.354 in.)
K	35 mm dia. (1.378 in. dia.)	**d**	29.5 mm (1.161 in.)
L	28.5 mm (1.122 in.)	**e**	5 mm (0.197 in.)
M	222.5 mm (8.7598 in.)	**f**	15 mm (0.591 in.)
N	30 mm (1.181 in.)	**g**	46 mm (1.81 in.)
O	260 mm (10.24 in.)	**h**	8 mm (0.315 in.)
P	120 mm (4.724 in.)	**i**	2 × 8.2 mm dia. (2 × 0.323 in. dia.)
Q	409 mm (16.10 in.)	**C0.3**	Chamfer 0.3 mm (0.012 in.)
R	37.22 to 37.62 mm (1.4654 to 1.4811 in.)	**C0.5**	Chamfer 0.5 mm (0.0197 in.)
S	34.24 to 34.64 mm (1.3481 to 1.3637 in.)	**C1**	Chamfer 1.0 mm (0.0394 in.)

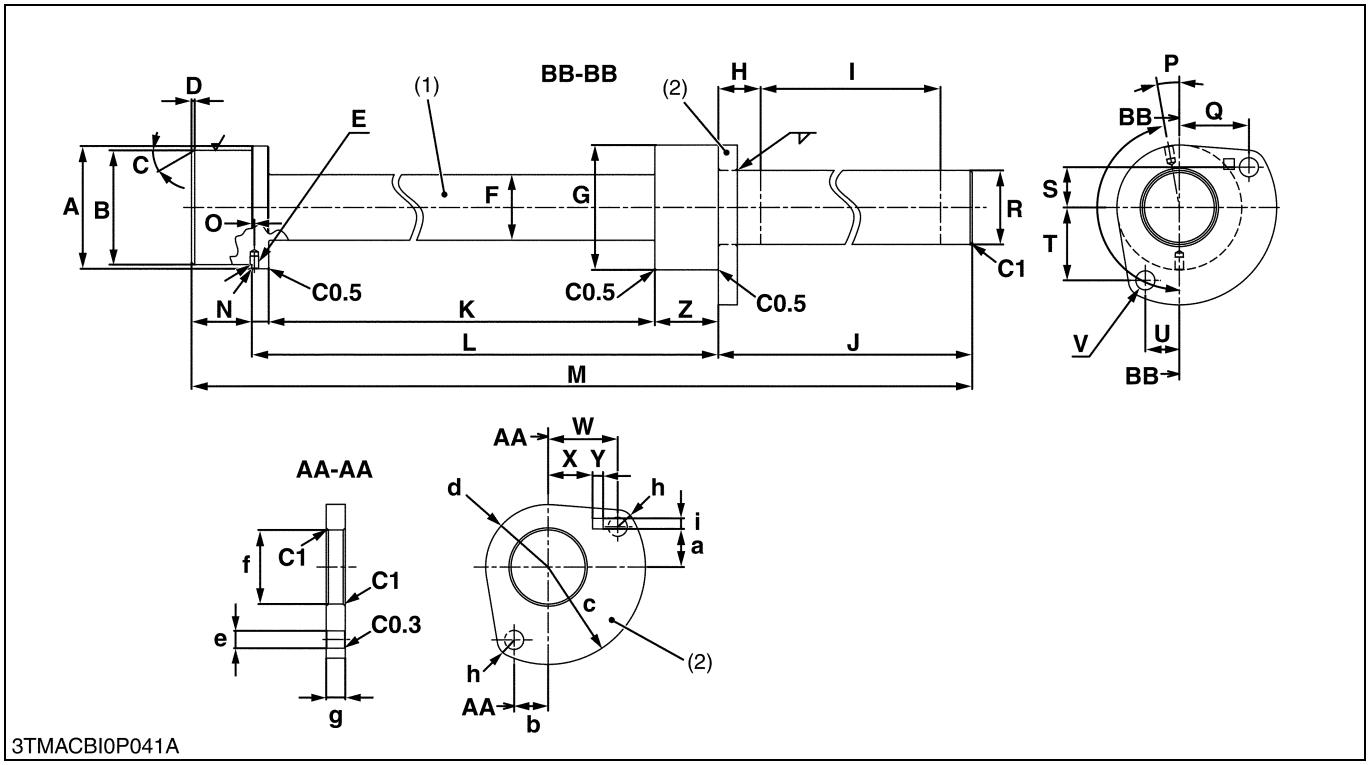
9Y1210269GEG0083US0

https://truckmanualshub.com/

Balancer Shaft Bearing Replacing Tool D

Application

- Use to press fit the bearing.



(1) Shaft (2) Stopper

A	57.5 to 57.7 mm (2.264 to 2.271 in.)	**T**	34.24 to 34.64 mm (1.348 to 1.363 in.)
B	53.8 to 53.9 mm (2.119 to 2.122 in.)	**U**	15.86 to 16.26 mm (0.0244 to 0.6401 in.)
C	0.523 rad (30 °)	**V**	2 × 8.2 mm dia. (2 × 0.323 in. dia.)
D	1.5 mm (0.0591 in.)	**W**	32.91 mm (1.296 in.)
E	2 × 4.000 to 4.018 mm dia., 6 mm depth (2 × 0.1575 to 0.1582 in. dia., 0.236 in. depth)	**X**	21 mm (0.827 in.)
F	31 mm dia. (1.220 in. dia.)	**Y**	5 mm (0.197 in.)
G	58.5 to 58.7 mm dia. (2.304 to 2.311 in. dia.)	**Z**	30 mm (1.181 in.)
H	20 mm (0.787 in.)	**a**	18 mm (0.709 in.)
I	135 mm (5.315 in.)	**b**	16.06 mm (0.6323 in.)
J	170 mm (6.693 in.)	**c**	46 mm (1.81 in.)
K	222.5 mm (8.760 in.)	**d**	29.5 mm (1.161 in.)
L	260 to 261 mm (10.24 to 10.27 in.)	**e**	2 × 8.2 mm dia. (2 × 0.323 in. dia.)
M	409 mm (16.10 in.)	**f**	35 mm dia. (1.378 in. dia.)
N	28.5 mm (1.122 in.)	**g**	9 mm dia. (0.354 in. dia.)
O	1.2 mm (0.0472 in.)	**h**	8 mm (0.315 in.)
P	0.175 rad (10 °)	**i**	5 mm (0.197 in.)
Q	32.71 to 33.11 mm (1.288 to 1.303 in.)	**C0.3**	Chamfer 0.3 mm (0.012 in.)
R	35 mm dia. (1.378 in. dia.)	**C0.5**	Chamfer 0.5 mm (0.0197 in.)
S	18.8 to 19.2 mm (0.7402 to 0.7559 in.)	**C1**	Chamfer 1.0 mm (0.0394 in.)

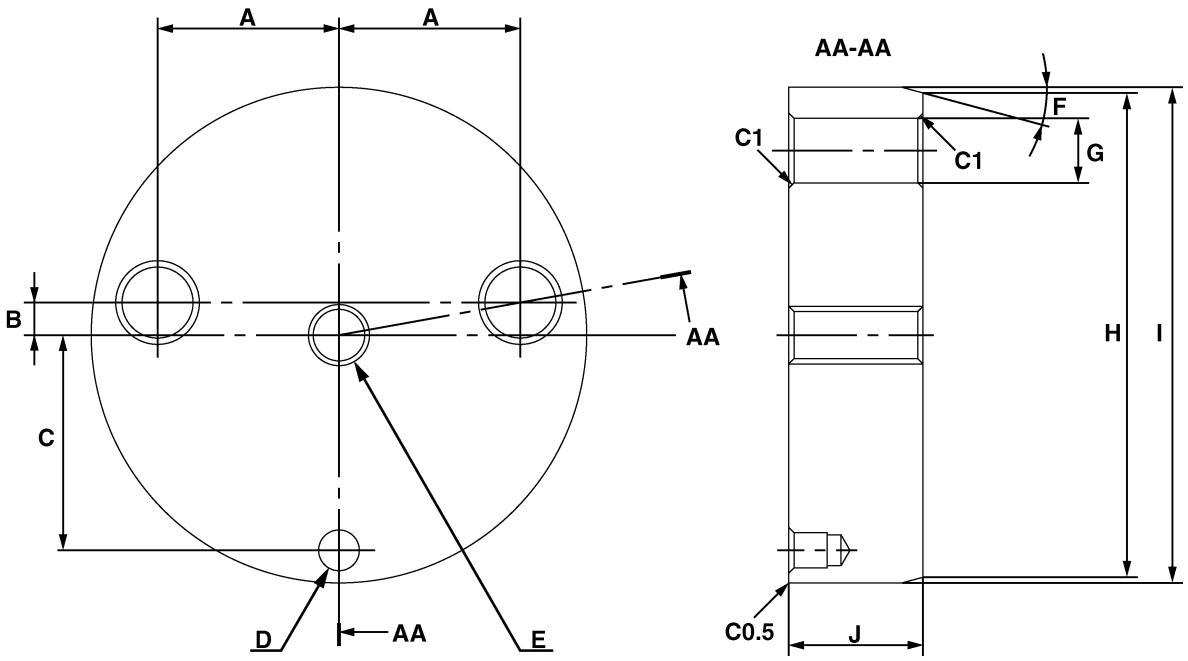
9Y1210269GEG0084US0

https://truckmanualshub.com/

Oil Seal Installing Tool A

Application

- Use for installing crankshaft oil seal.



9Y1210269GES061A

A	36.93 mm (1.454 in.)	**F**	0.262 rad (15 °)
B	6.512 mm (0.2564 in.)	**G**	14.2 mm dia. (0.559 in.dia.)
C	43.5 mm (1.71 in.)	**H**	98.5 mm dia. (3.878 in.dia.)
D	8.015 mm dia. (0.3156 in. dia.)	**I**	99.293 to 99.380 mm dia. (3.9092 to 3.9125 in.dia.)
E	M16 × 1.5	**J**	27.5 mm (1.083 in.)

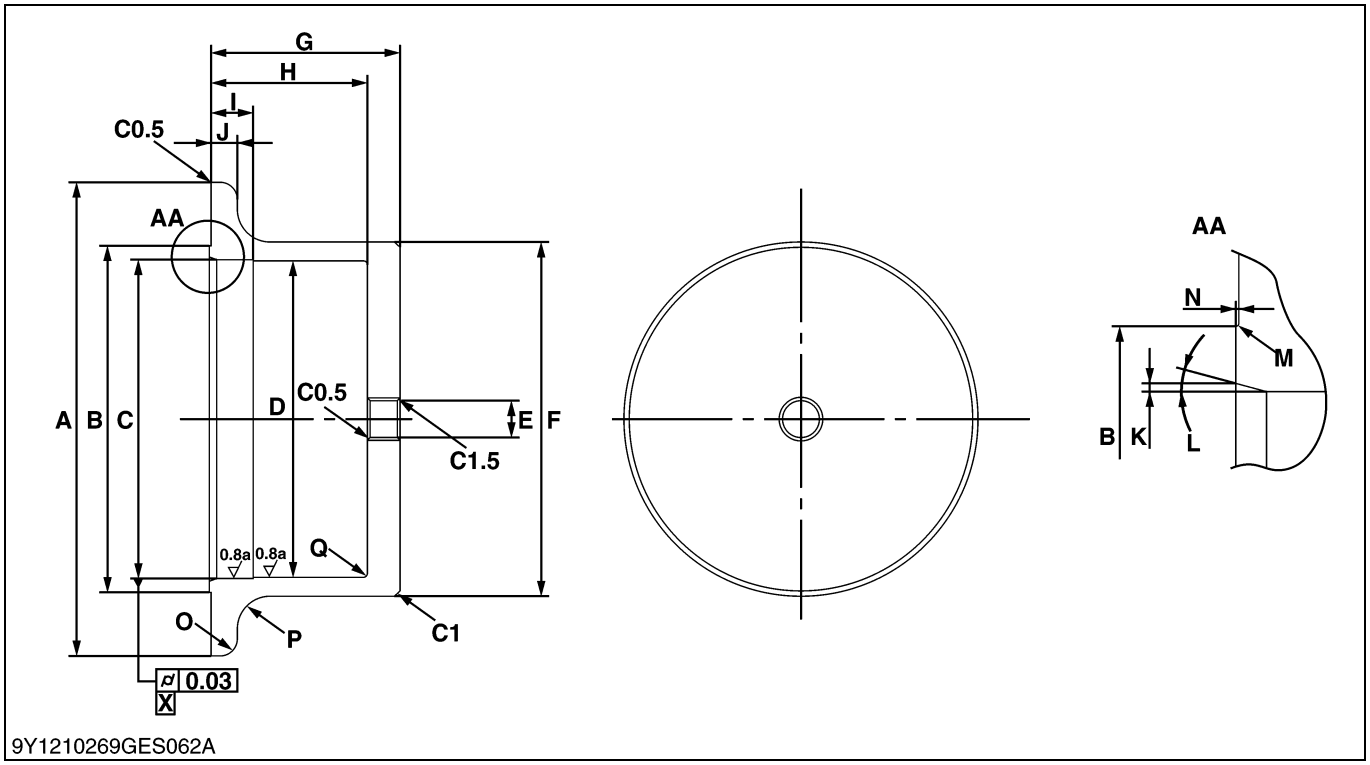
9Y1210447GEG0074US0

https://truckmanualshub.com/

Oil Seal Installing Tool B

Application

- Use for installing crankshaft oil seal.



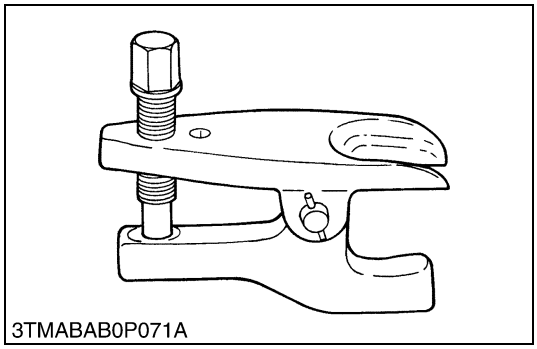
9Y1210269GES062A

A	148 mm dia. (5.83 in.dia.)	**J**	8 mm (0.31 in.)
B	108 mm dia. (4.252 in.dia.)	**K**	0.5 mm (0.020 in.)
C	100.036 to 100.71 mm dia. (3.93843 to 3.93980 in.dia.)	**L**	0.262 rad (15 °)
D	99.55 to 99.60 mm dia. (3.9193 to 3.9212 in.dia.)	**M**	0.2 mm (0.0079 in.)
E	17 mm dia. (0.6693 in.dia.)	**N**	0.15 to 0.155 mm (0.00591 to 0.00610 in.)
F	110 mm dia. (4.331 in.dia.)	**O**	5 mm (0.20 in.)
G	59 mm (2.32 in.)	**P**	10 mm (0.394 in.)
H	49 mm (1.93 in.)	**Q**	1 mm (0.039 in.)
I	13 mm (0.512 in.)		

9Y1210447GEG0075US0

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[2] SPECIAL TOOLS FOR TRACTOR

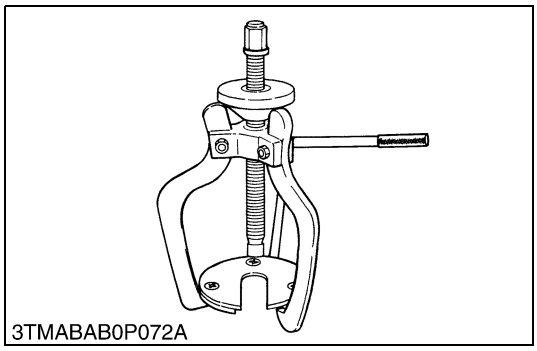

3TMABAB0P071A

Tie-rod End Lifter

Code No.
- 07909-39051

Application
- Use to remove the tie-rod end with ease.

WSM000001GEG0029US0

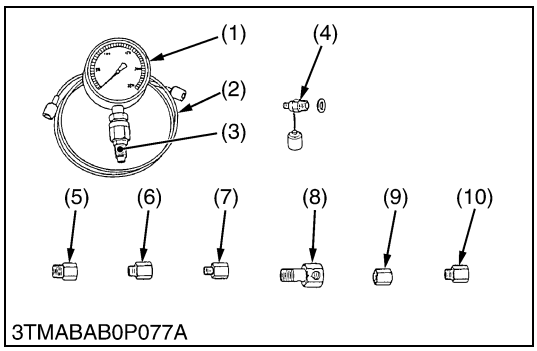

3TMABAB0P072A

Steering Wheel Puller

Code No.
- 07916-51090

Application
- Use to remove the steering wheel without damage to the steering shaft.

WSM000001GEG0030US0



3TMABAB0P077A

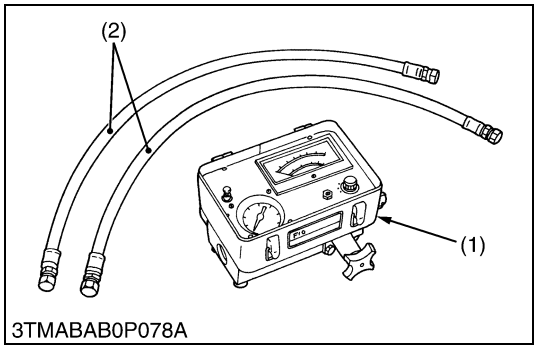
Relief Valve Pressure Tester

Code No.
- 07916-50045

Application
- This allows easy measurement of relief set pressure.

(1) Gauge (07916-50322)
(2) Cable (07916-50331)
(3) Threaded Joint (07916-50401)
(4) Threaded Joint (07916-50341)
(5) Adaptor **B** (M18 × P1.5) (07916-50361)
(6) Adaptor **C** (PS3/8) (07916-50371)
(7) Adaptor **D** (PT1/8) (07916-50381)
(8) Adaptor **E** (PS3/8) (07916-50392)
(9) Adaptor **F** (PF1/2) (07916-62601)
(10) Adaptor **58** (PT1/4) (07916-52391)

WSM000001GEG0027US0



3TMABAB0P078A

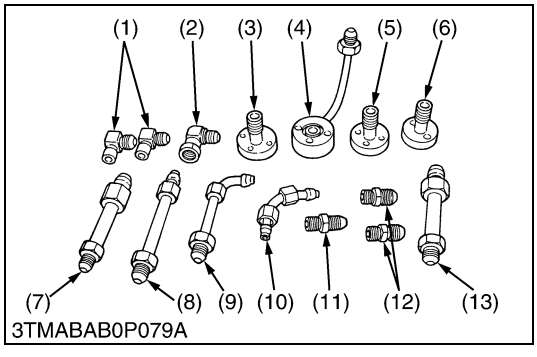
Flow Meter

Code No.
- 07916-52791 (Flow Meter)
- 07916-52651 (Hydraulic Test Hose)

Application
- This allows easy testing of hydraulic system.

(1) Flow Meter
(2) Hydraulic Test Hose

WSM000001GEG0036US0



3TMABAB0P079A

Adaptor Set for Flow Meter

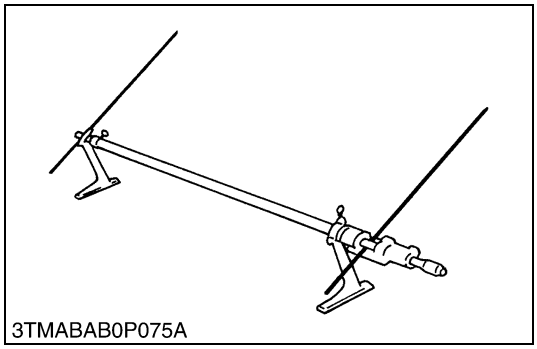
Code No.
- 07916-54031

Application
- Use for test of the hydraulic system.

(1) Adaptor **52**
(2) Adaptor **53**
(3) Adaptor **54**
(4) Adaptor **61**
(5) Adaptor **62**
(6) Adaptor **63**
(7) Adaptor **64**
(8) Adaptor **65**
(9) Adaptor **66**
(10) Adaptor **67**
(11) Adaptor **68**
(12) Adaptor **69**
(13) Hydraulic Adaptor **1**

WSM000001GEG0037US0

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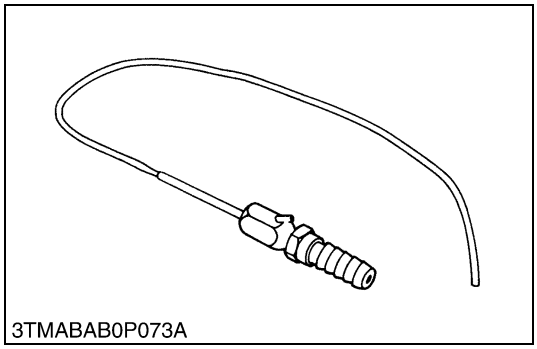

3TMABAB0P075A

Toe-in Gauge

Code No.
- 07909-31681

Application
- This allows easy measurement of toe-in for all machine models.

WSM000001GEG0034US0

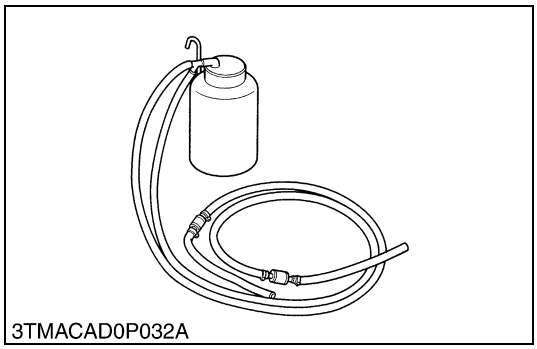

3TMABAB0P073A

Injector CH3

Code No.
- 07916-52501

Application
- Use to put calcium chloride solution into a rear wheel and to remove it.

WSM000001GEG0031US0

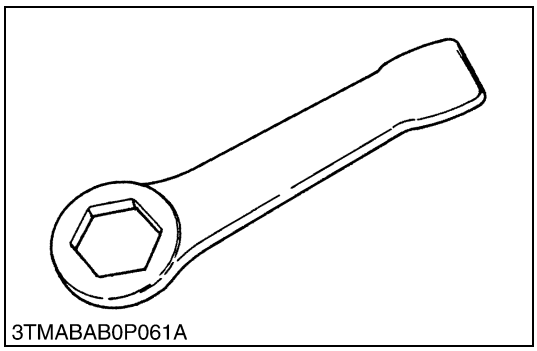

3TMACAD0P032A

Brake Air Bleeder

Code No.
- 07916-54001

Application
- This allows easy air bleed of the hydraulic brake.

WSM000001GEG0046US0

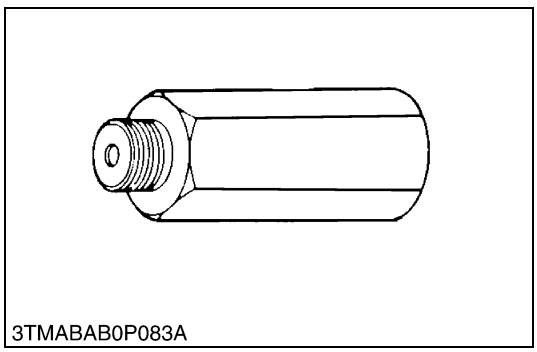

3TMABAB0P061A

Socket Wrench 50

Code No.
- 07916-31821

Application
- Use to remove the staking nut from the front bevel pinion shaft and to reassemble it.

WSM000001GEG0101US0


3TMABAB0P083A

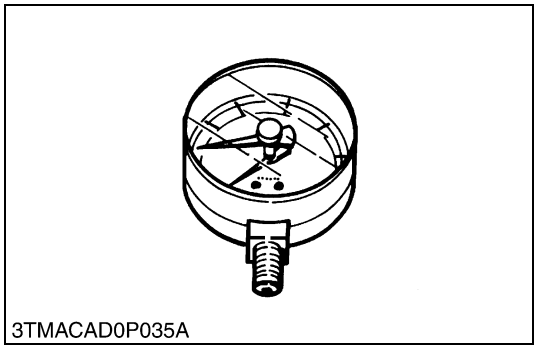
Relief Valve Setting Pressure Adaptor G

Code No.
- 07916-52751

Application
- This allows easy measurement of relief valve setting pressure from the hydraulic coupler. This is available with the relief valve setting pressure tester.

WSM000001GEG0041US0

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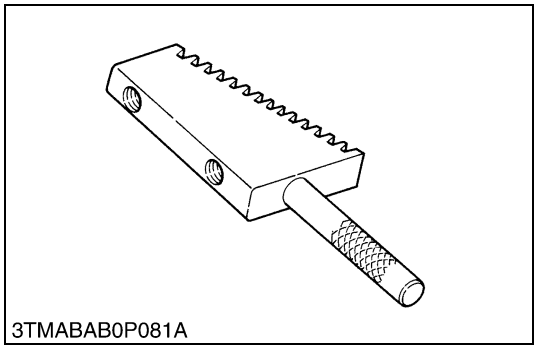

3TMACAD0P035A

Pressure Gauge 50

Code No.
- 07916-52961

Application
- This pressure gauge is to measure the low oil pressure.

WSM000001GEG0047US0

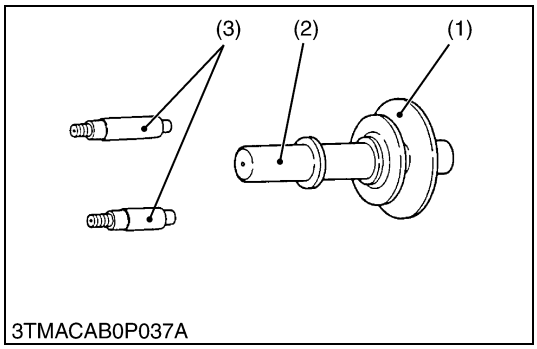

3TMABAB0P081A

Pinion Locking Tool

Code No.
- 07916-55311

Application
- Use to prevent the shaft from turning when you remove or tighten a staking nut of a bevel pinion shaft.

WSM000001GEG0039US0



3TMACAB0P037A

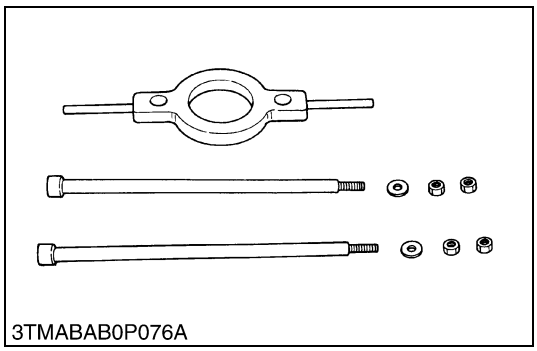
Clutch Tool B (Synchro Shuttle Model)

Code No.
- 07916-53041

Application
- Use to install the clutch to the flywheel.

(1) Gauge Ring
(2) Center Bar
(3) Centering Guide

WSM000001GEG0087US0

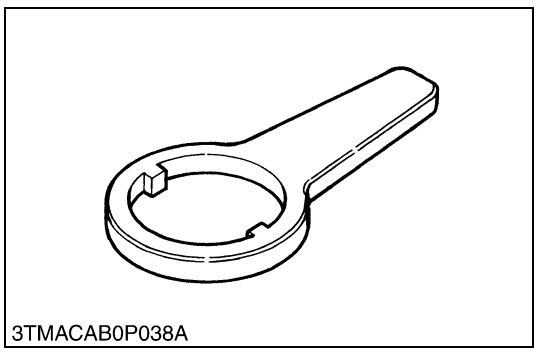

3TMABAB0P076A

Rear Axle Cover Puller

Code No.
- 07916-51041

Application
- Use to remove a rear axle cover from rear axle.

WSM000001GEG0035US0


3TMACAB0P038A

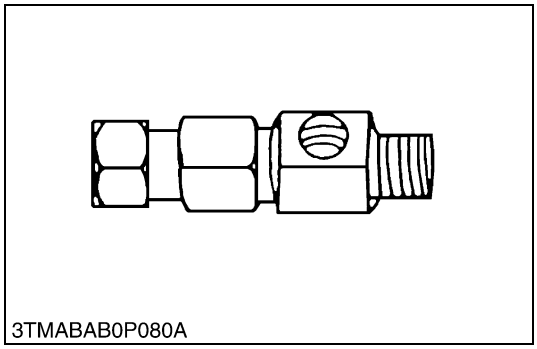
Rear Axle Nut Wrench 98

Code No.
- 07916-52521

Application
- Use to remove and tighten a rear axle nut.

WSM000001GEG0102US0

https://truckmanualshub.com/

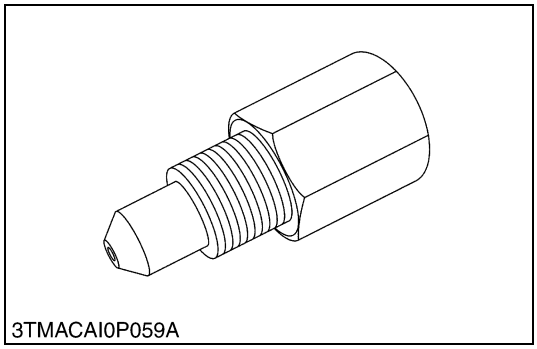

3TMABAB0P080A

Power Steering Adaptor

Code No.
- 07916-54021

Application
- Use to measure the relief valve setting pressure for power steering.

WSM000001GEG0038US0

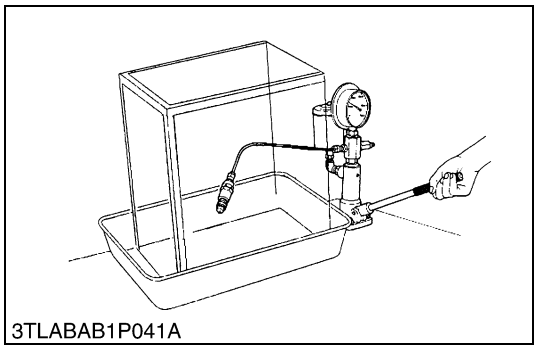

3TMACAI0P059A

Adaptor 56 (for Hydraulic Brake)

Code No.
- 07916-52970

Application
- Use for test of the hydraulic brake oil leakage.

WSM000001GEG0103US0


3TLABAB1P041A

Safety Valve Tester

Code No.
- 07909-31361

Application
- Use to check the safety valve setting pressure.

Measuring range
- 0 to 50 MPa (0 to 500 kgf/cm^2, 0 to 7200 psi)

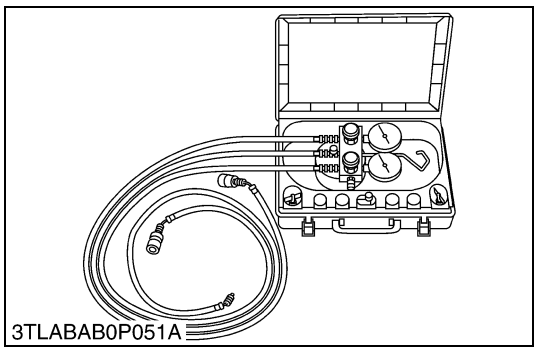
9Y1210447GEG0092US0

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■ **NOTE**

- **Special tools for R134a refrigerant air conditioning system introduced below are available from DENSO CO. LTD.**

9Y1210269GEG0088US0


3TLABAB0P051A

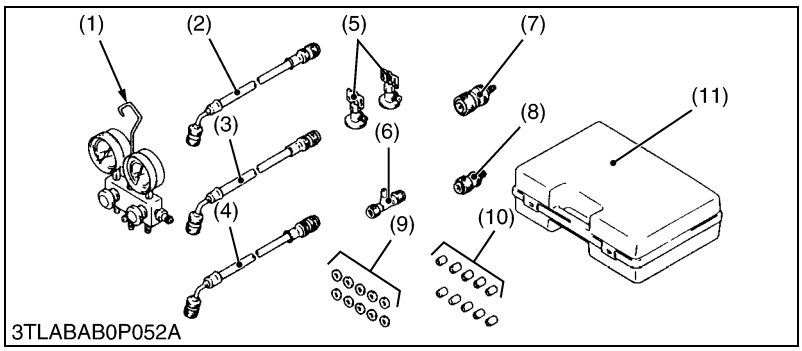
Air Conditioner Service Tool

Code No.

- DENSO 95048-00063

Application

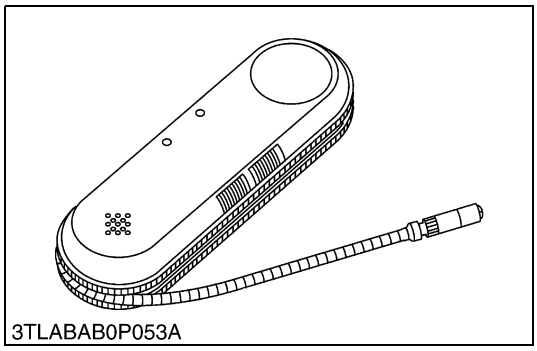
- Use for charge, test or discharge of the air conditioning system.



3TLABAB0P052A

(1) Manifold Gauge Assembly (95048-10090)
(2) Charging Hose (Red: HI) (95948-10270)
(3) Charging Hose (Blue: LO) (95948-10280)
(4) Charging Hose (Green) (95948-10260)
(5) Can Tap Valve (95048-10150)
(6) T Joint (95048-10160)
(7) Quick Coupler (HI) (95048-10130)
(8) Quick Coupler (LO) (95048-10140)
(9) Service Valve Packing (95906-10310)
(10) Charging Hose Packing (95906-10300)
(11) Tool Case (95949-10610)

WSM000001GEG0042US0


3TLABAB0P053A

Electric Gas Leak Tester

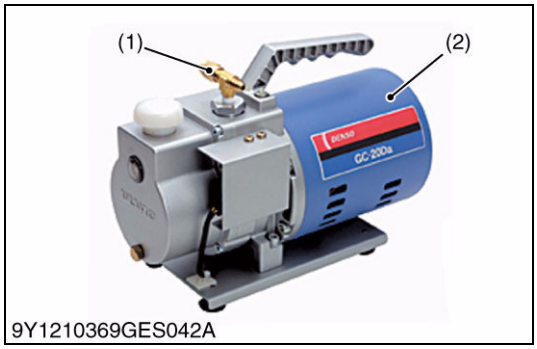
Code No.

- DENSO 95146-00060

Application

- Use for gas leak test of the air conditioning system.

WSM000001GEG0043US0



9Y1210369GES042A

Vacuum Pump

Code No.

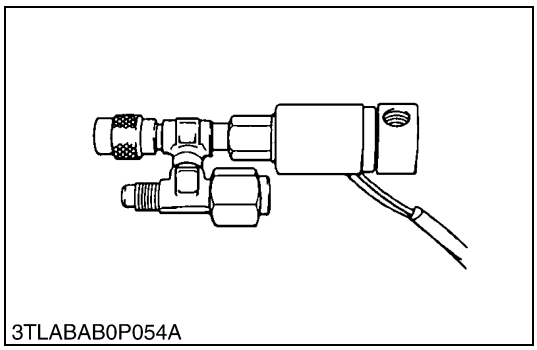
- DENSO 95046-00130 (AC220V)
- DENSO 95046-00140 (AC240V)

Application

- Use to evacuate the air conditioning system.

(1) Adaptor (For 134a) (2) Vacuum Pump

WSM000001GEG0044US0


3TLABAB0P054A

Adaptor (For R134a)

Code No.

- DENSO 95048-10190 (AC220V)
- DENSO 95048-10200 (AC240V)

Application

- Use to evacuate the air conditioning system.

WSM000001GEG0045US0

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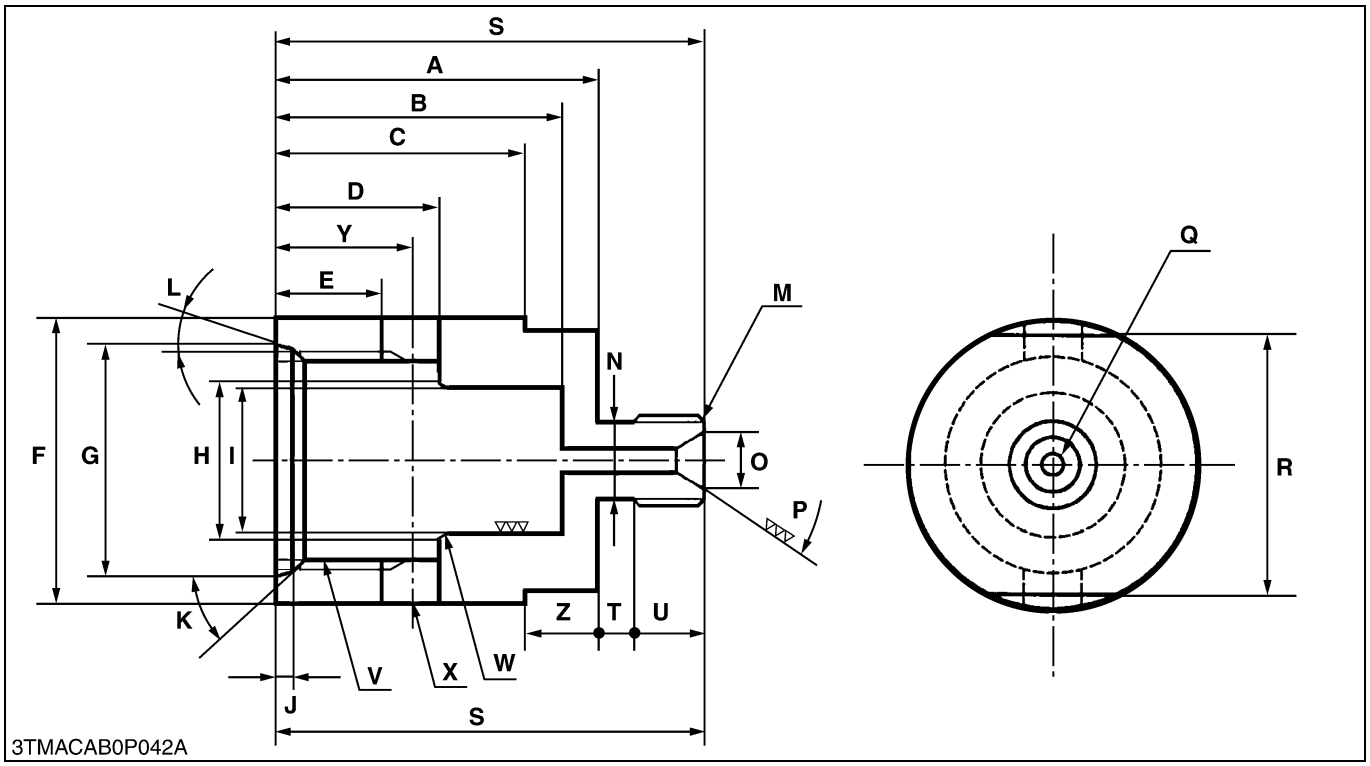
Cylinder Safety Valve Setting Pressure Adaptor

Application

- Use for setting the safety valve to the nozzle tester to measure cracking pressure and check oil tightness of the safety valves.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**

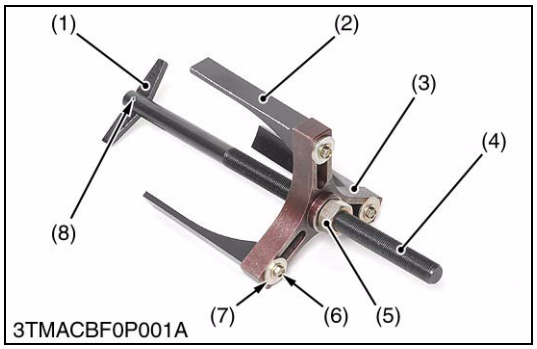


3TMACAB0P042A

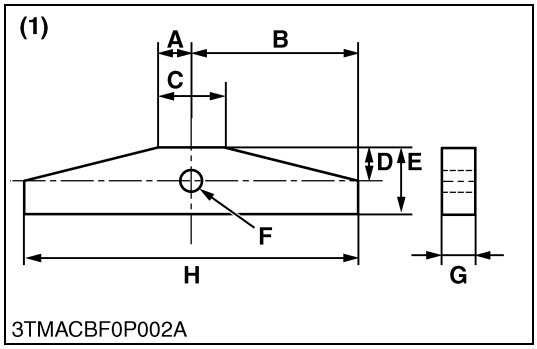
A	45 mm (1.77 in.)	**N**	10 mm dia. (0.39 in. dia.)
B	40 mm (1.58 in.)	**O**	7.5 mm dia. (0.3 in. dia.)
C	35 mm (13.8 in.)	**P**	1.05 rad (60 °)
D	23.0 to 23.3 mm (0.9055 to 0.9713 in.)	**Q**	3 mm dia. (1.18 in. dia.)
E	16 mm (0.63 in.)	**R**	36 mm (1.18 in.)
F	40 mm dia. (1.58 in. dia.)	**S**	60 mm (2.36 in.)
G	32.4 to 32.7 mm dia. (1.2756 to 1.2874 in. dia.)	**T**	5 mm (0.20 in.)
H	21 mm dia. (0.83 in. dia.)	**U**	10 mm (0.39 in.)
I	20.00 to 20.05 mm dia. (0.7874 to 0.7894 in. dia.)	**V**	M30 × P1.5
J	2.50 to 2.59 mm (0.0984 to 0.1097 in.)	**W**	0.52 rad (30 °)
K	0.79 rad (45 °)	**X**	8 mm dia. (0.32 in. dia.)
L	0.26 rad (15 °)	**Y**	19 mm (0.75 in.)
M	M12 × P1.5	**Z**	10 mm (0.39 in.)

9Y1210269GEG0089US0

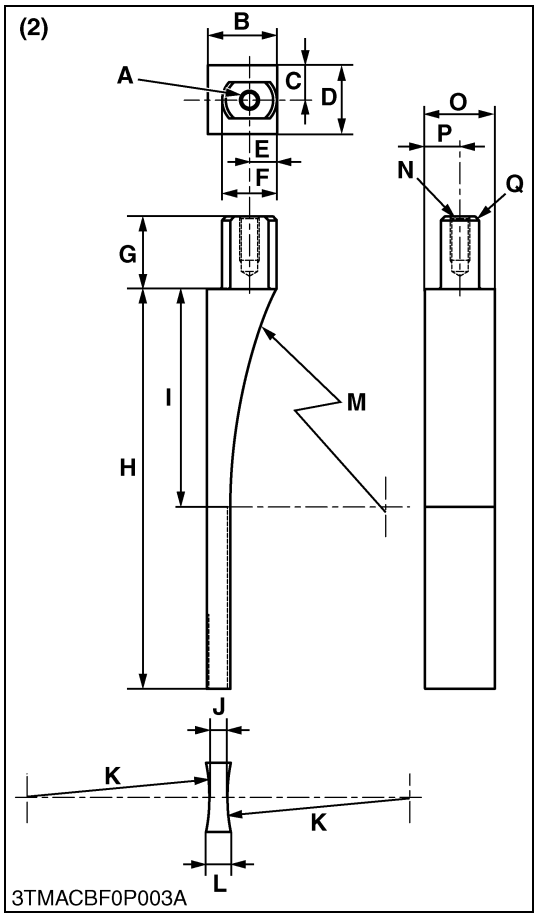
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3TMACBF0P002A



3TMACBF0P003A

Hydraulic Clutch Spring Compressor

Application

- Use exclusively to push the spring, to remove the circlip for hydraulic clutch.

(1) Tool 4 (Plate)
(2) Tool 3 (Claw)
(3) Tool 1 (Body)
(4) Tool 2 (Center Bar)
(5) Nut (M16 × P1.5 mm)
(6) Screw (M5 × P1.0 - L10 mm)
(7) Washer (M5)
(8) Spring Pin (5.0 mm dia. - L16 mm)

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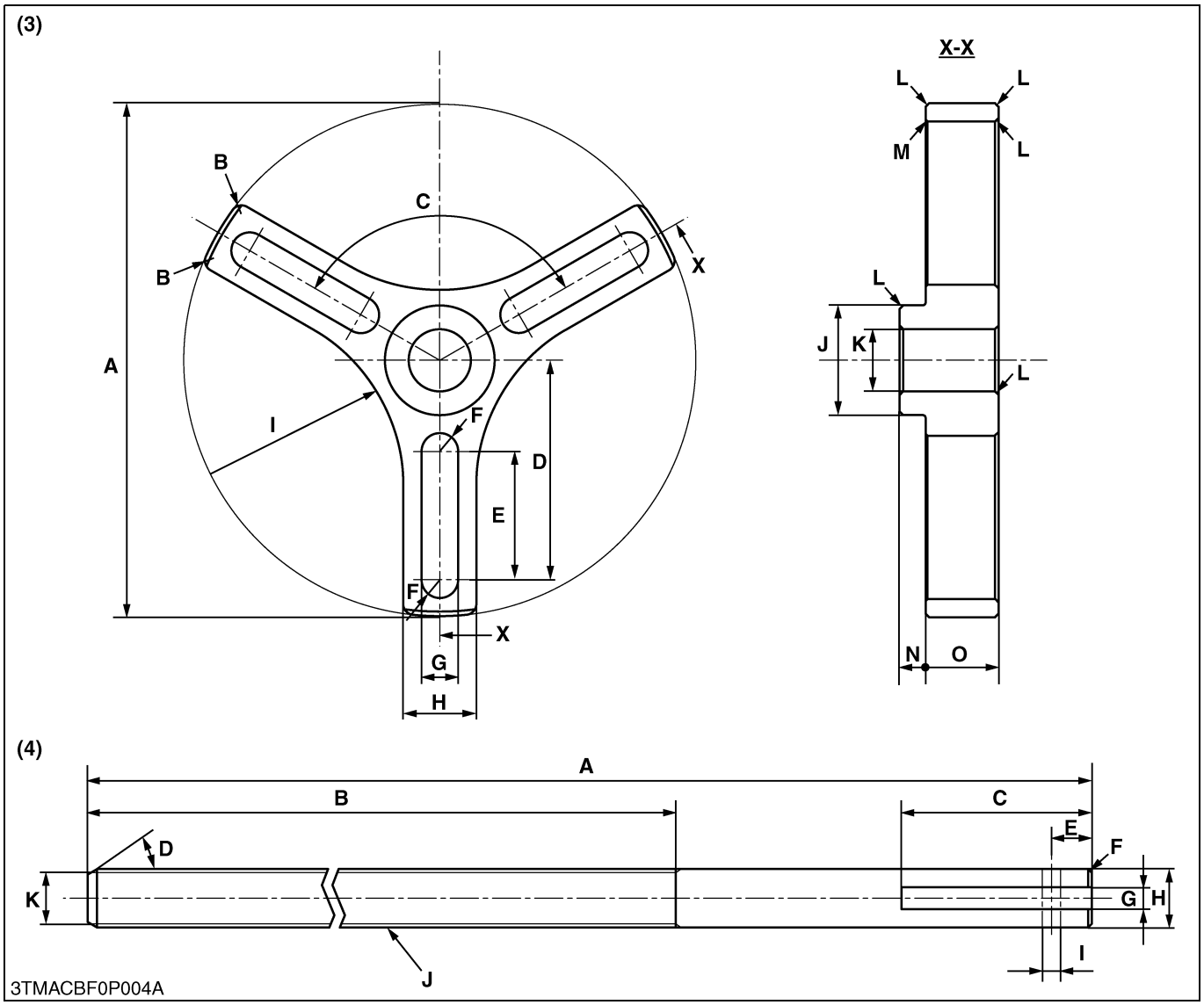
(1) Tool 4 (Plate)

A	8 mm (0.3 in.)
B	40 mm (1.6 in.)
C	16 mm (0.63 in.)
D	8 mm (0.3 in.)
E	16 mm (0.63 in.)
F	5.2 mm dia. (0.20 in. dia.)
G	5.70 to 5.90 mm (0.225 to 0.232 in.)
H	80 mm (3.1 in.)

(2) Tool 3 (Clow): 3 pcs.

A	M5 x P1.0 x 12 mm depth (0.47 in. depth)
B	19 mm (0.75 in.)
C	5 mm (0.2 in.)
D	9.73 to 10.0 mm (0.383 to 0.393 in.)
E	7.5 mm (0.30 in.)
F	15 mm dia. (0.59 in. dia.)
G	20.05 to 20.10 mm (0.7894 to 0.7913 in.)
H	110 mm (4.33 in.)
I	60 mm (2.4 in.)
J	5 mm (0.2 in.)
K	50 mm (2.0 in.)
L	6.8 mm (0.27 in.)
M	Radius 150 to 160 mm (5.91 to 6.29 in.)
N	4.2 mm dia. x 15 mm depth (0.17 in. dia. x 0.59 in. depth)
O	19 mm (0.75 in.)
P	9.5 mm (0.37 in.)
Q	Chamfer 1.0 mm (0.039 in.)

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(3) Tool 1 (Body)

A	140 mm dia. (5.51 in. dia.)	**I**	Radius 50 mm (2.0 in.)
B	Radius 3 mm (0.1 in.)	**J**	30 mm dia. (1.2 in. dia.)
C	2.09 rad (120 °)	**K**	17 mm dia. (0.67 in. dia.)
D	60 mm (2.4 in.)	**L**	Chamfer 1.0 mm (0.039 in.)
E	35 mm (1.4 in.)	**M**	Chamfer 0.5 mm (0.02 in.)
F	Radius 5 mm (0.2 in.)	**N**	7 mm (0.3 in.)
G	10.00 to 10.27 mm (0.3937 to 0.4043 in.)	**O**	20 mm (0.79 in.)
H	20 mm (0.79 in.)	**X (X-X)**	View direction

(4) Tool 2 (Center Bar)

A	330 mm (13.0 in.)	**G**	6.00 to 6.58 mm (0.237 to 0.259 in.)
B	210 mm (8.27 in.)	**H**	16 mm dia. (0.63 in. dia.)
C	52 mm (2.0 in.)	**I**	5.00 to 5.18 mm dia. (0.197 to 0.203 in. dia.)
D	0.52 rad (30 °)	**J**	M16 x P1.5 mm
E	11 mm (0.43 in.)	**K**	13 mm dia. (0.51 in. dia.)
F	Chamfer 1.0 mm (0.039 in.)		

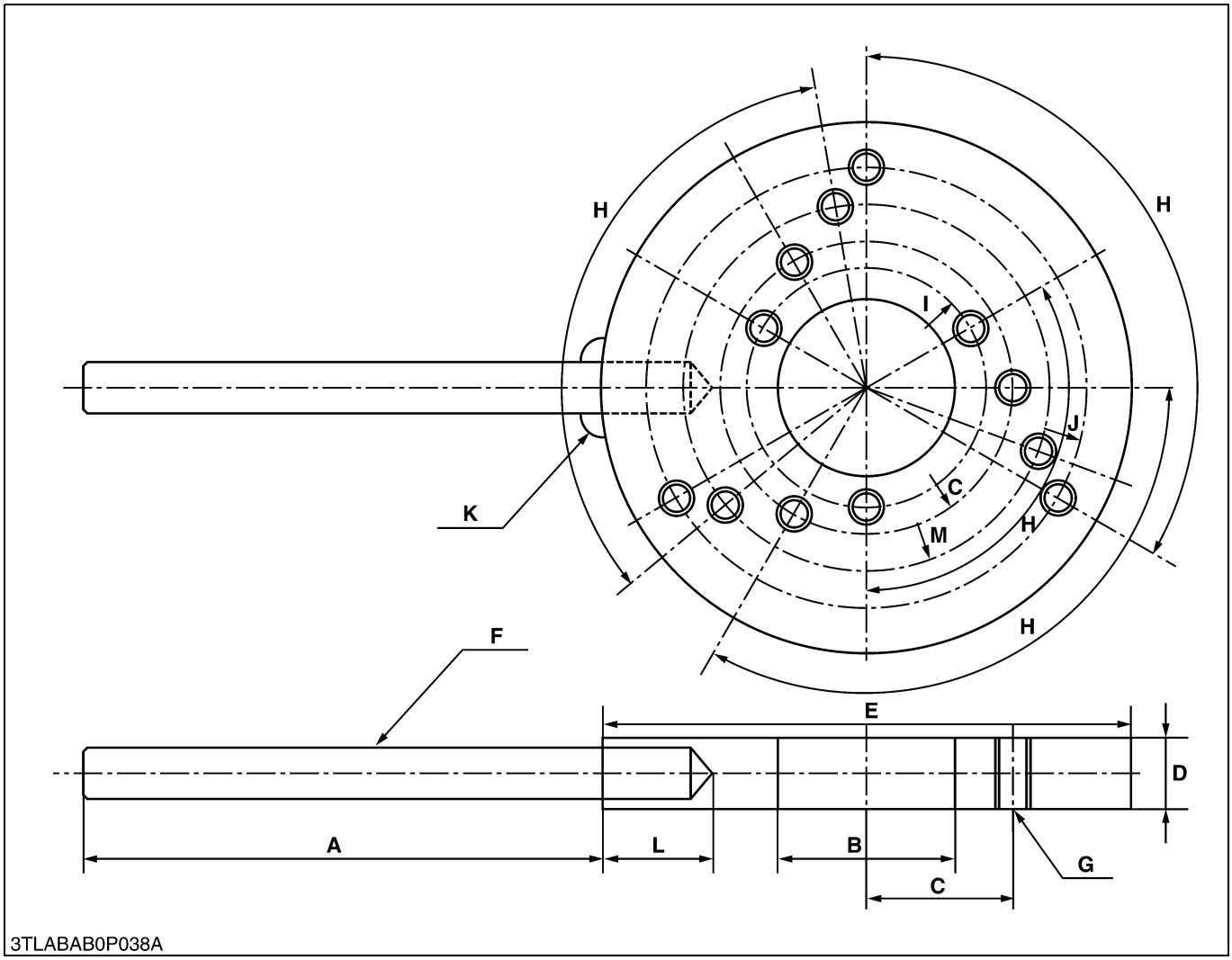
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Stopper Magnet Clutch (For A/C Compressor)

Application

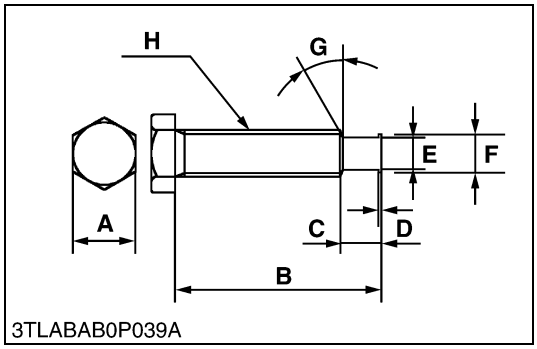
- Use for loosening and tightening the magnet clutch mounting nut.



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A	125 mm (4.92 in.)	**H**	4.52 rad (120 °)
B	40 mm dia. (1.57 in. dia.)	**I**	Radius 27 mm (Radius 1.06 in.)
C	Radius 33 mm (Radius 1.30 in.)	**J**	Radius 50 mm (Radius 1.97 in.)
D	16 mm (0.63 in.)	**K**	Weld all around
E	120 mm dia. (4.72 in. dia.)	**L**	20 mm (0.78 in.)
F	12 mm dia. (0.47 in. dia.)	**M**	Radius 41 mm (Radius 1.61 in.)
G	3 × M8 × 1.25 All screws		

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3TLABAB0P039A

Stopper Bolt (For A/C Compressor)

Application

- Use with the stopper magnet clutch.

A	12 mm (0.47 in.)	**E**	5.5 mm dia. (0.22 in. dia.)
B	35 mm (1.38 in.)	**F**	6.5 mm dia. (0.26 in. dia.)
C	7 mm (0.28 in.)	**G**	0.52 rad (30 °)
D	0.4 mm (0.016 in.)	**H**	M8 × P1.25

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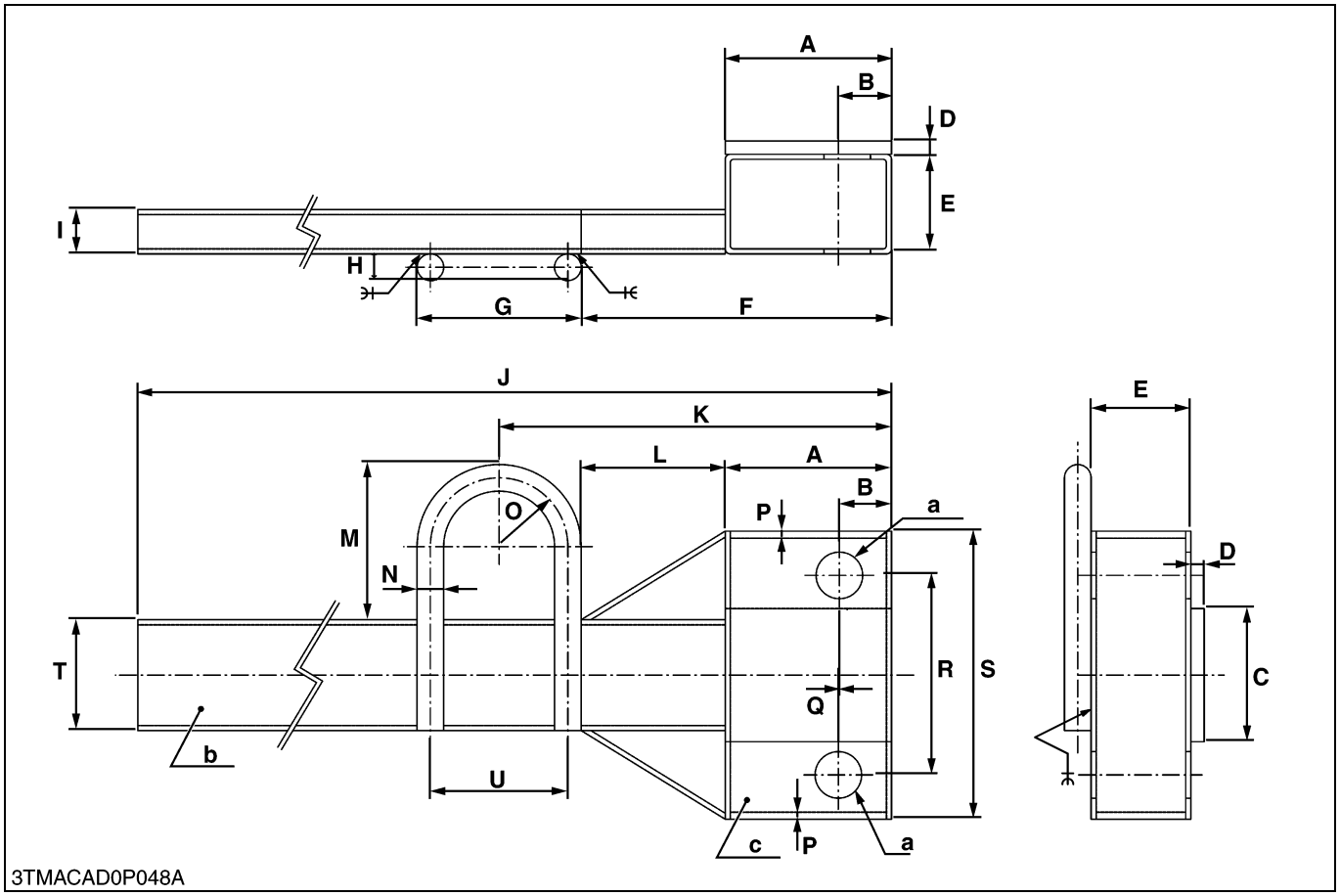
Hydraulic Cylinder Block Tool

Application

- Use for separating a hydraulic cylinder block.

■ **NOTE**

- **The sealing surface of the connecting parts must be welded.**

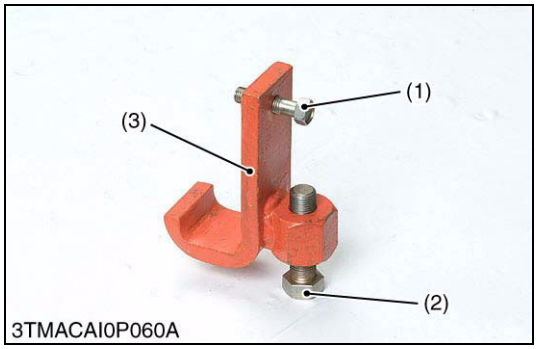


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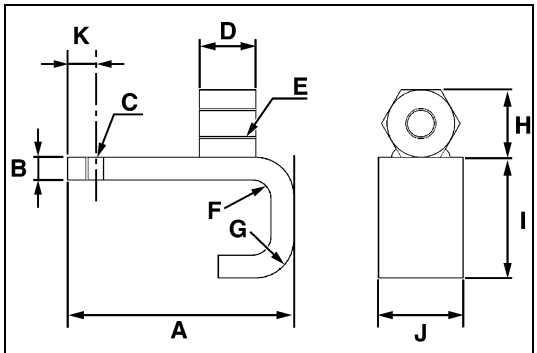
A	75 mm (2.95 in.)	**N**	12 mm dia. (0.47 in. dia.)
B	24 mm (0.94 in.)	**O**	31 mm radius (1.22 in. radius)
C	60 mm (2.36 in.)	**P**	t3.2 mm (t0.126 in.)
D	6 mm (0.24 in.)	**Q**	4 mm (0.16 in.)
E	45 mm (1.77 in.)	**R**	72.8 mm (2.87 in.)
F	140 mm (5.51 in.)	**S**	130 mm (5.12 in.)
G	74 mm (2.91 in.)	**T**	50 mm (1.97 in.)
H	12 mm (0.47 in.)	**U**	62 mm (2.44 in.)
I	20 mm (0.79 in.)		
J	1580 mm (62.2 in.)	**a**	26.0 mm dia. (1.02 in. dia.)
K	177 mm (6.97 in.)	**b**	Square steel tube 50 mm × 20 mm × t2.3 mm (Square steel tube 1.97 in. × 0.79 in. × t0.09 in.)
L	65 mm (2.56 in.)	**c**	Square steel tube 75 mm × 40 mm × t2.3 mm (Square steel tube 2.95 in. × 1.57 in. × t0.09 in.)
M	70 mm (2.76 in.)		

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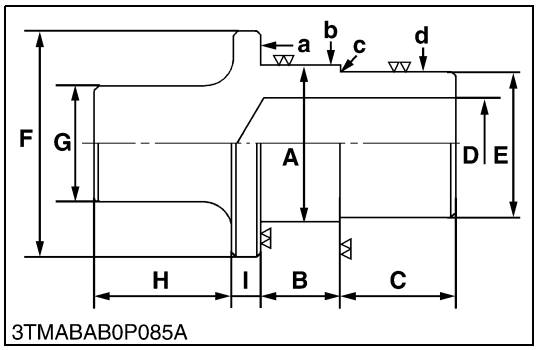
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3TMACAI0P061A



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Front Axle Rocking Restrictor

Application

- Use for locking the front axle case swinging.

A	110 mm (4.33 in.)
B	12 mm (0.72 in.)
C	M10 × P1.25
D	30 mm (1.18 in.)
E	M16 × P1.5
F	10 mm (0.39 in.)
G	20 mm (0.79 in.)
H	36 mm (1.42 in.)
I	66 mm (2.60 in.)
J	45 mm (1.77 in.)
K	30 mm (1.18 in.)

(1) Screw
M10 × P1.25 × L50 mm (2 in.)
(2) Screw
M16 × P1.5 × L50 mm (2 in.)
(3) Rocking Restrictor

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Hydraulic Arm Shaft Bushing Press-Fitting Tool

Application

- Use for replacing the hydraulic arm shaft bushings in the hydraulic cylinder body.

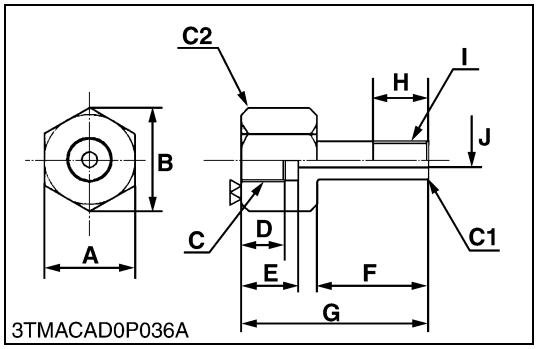
■ **NOTE**

- **Unless otherwise specified: All surface 12.5 µm (500 µin.)**

	Right	Left
A	64.75 to 64.85 mm (2.549 to 2.553 in.)	69.75 to 69.85 mm (2.746 to 2.750 in.)
B	65.90 to 66.10 mm (2.594 to 2.602 in.)	69.90 to 70.10 mm (2.752 to 2.760 in.)
C	79 mm (3.11 in.)	75 mm (2.95 in.)
D	40 mm (1.58 in.)	45 mm (1.77 in.)
E	59.97 to 59.99 mm (2.361 to 2.362 in.)	64.97 to 64.99 mm (2.558 to 2.559 in.)
F	78 mm dia. (3.07 in. dia.)	
G	40 mm dia. (1.57 in. dia.)	
H	50 mm (1.97 in.)	
I	205 mm (8.07 in.)	
a	6.3 µm (250 µin.)	
b	6.3 µm (250 µin.)	
c	6.3 µm (250 µin.)	
d	6.3 µm (250 µin.)	

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Power Shift Valve Adaptor

Application

- Use for measuring the system pressure of power shift valve.

A	24 mm (0.94 in.)
B	27.7 mm (1.09 in.)
C	G1/4
D	11 mm (0.43 in.)
E	15 mm (0.59 in.)
F	30 mm (1.18 in.)
G	50 mm (1.97 in.)
H	15 mm (0.59 in.)
I	R1/8
J	4 mm dia. (0.15 in. dia.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

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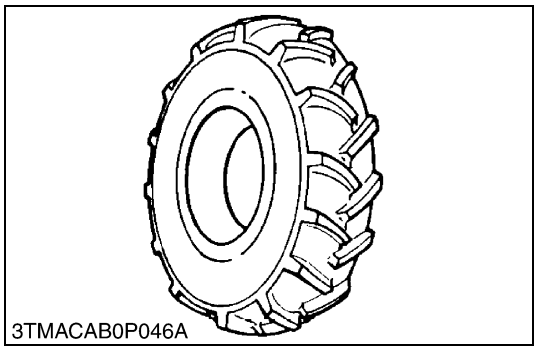
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9. TIRES

[1] TYPE OF TIRES

■ **IMPORTANT**

- **Do not use tires larger than specified.**



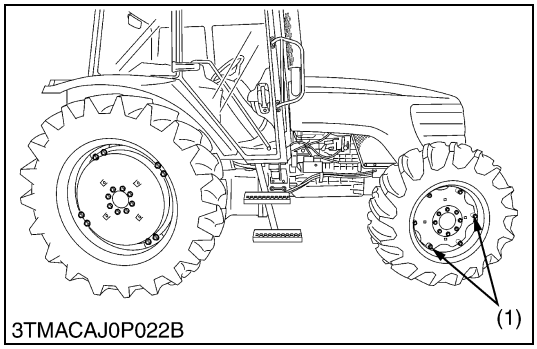
	Tire sizes
Front	14.9R24
	420/70R24
Rear	18.4R38
	520/70R38

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[2] TREAD ADJUSTMENT

(1) Front Wheel



Adjusting Front Tread (with Four Wheel Drive)

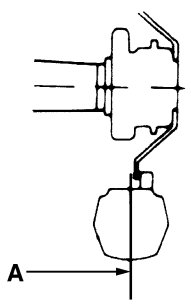
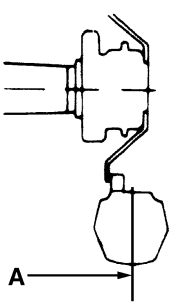
Front tread width can be adjusted as shown with the standard equipped tires.

To change the tread width.

1. Remove the wheel rim and disk mounting bolts.
2. Change the position of the rim and disk (right and left) to the desired position, and tighten the bolts.
3. Adjust the toe-in. (See page G-30.)

■ **IMPORTANT**

- **Always attach wheel as shown in the drawing.**
- **If not attached as illustrated, transmission parts may be damaged.**
- **When re-fitting or adjusting a wheel, tighten the bolts to the following torques then recheck after driving the tractor 200 m (200 yards) and thereafter according to service interval. Refer to "Check Wheel Mounting Nuts Tightening Torques". (See page G-22.)**

14.9R24, 420/70R24	
	
1660 mm 65.35 in.	1770 mm 69.68 in.

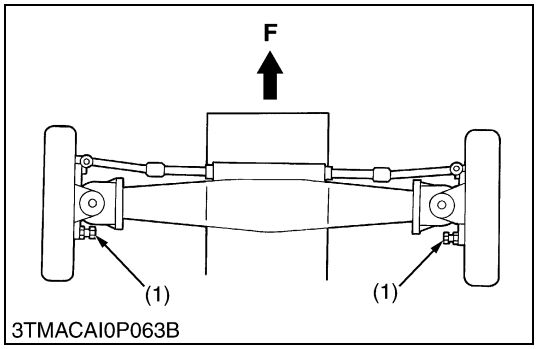
■ **NOTE**

- **Need to limit turning angle at 1580 mm (62.2 in.) width setting to 42 degrees. Refer to the chart provided for additional instructions.**

(1) Nut **A: Tread**

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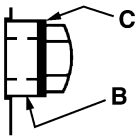
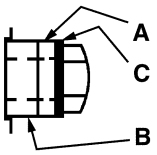
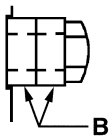
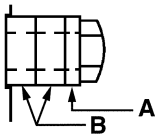
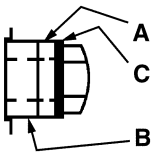
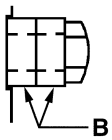
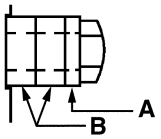
Adjusting Front Wheel Turning Stopper Bolt

■ **IMPORTANT**
- **Always check if tires contact with tractor or loader frame assemblies.**
- **Adjust turning angle with provided stoppers if necessary.**
- **Bi-speed will not activate if turning angle is less than 34 degree.**

(1) Stopper Bolt

F: Front

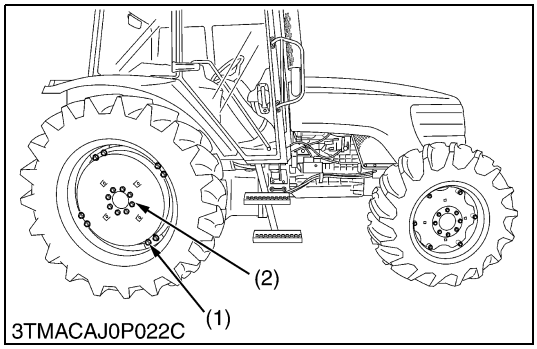
A: 5 mm (0.2 in.)
B: 7 mm (0.3 in.) Collar
C: 12.5 mm (0.5 in.) Collar

Tire size	Angle	0.84 rad (48 °)	0.79 rad (45 °)	0.70 rad (40 °)	0.65 rad (37 °)
14.9R24	Stopper				
420/70R24		–			

9Y1210447GEG0062US0

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(2) Rear Wheel



Adjusting Rear Tread

Rear tread width can be adjusted as shown with the standard equipped tires.

To change the tread width.

1. Remove the wheel rim and / or disk mounting bolts.
2. Change the position of the rim and / or disk (right and left) to the desired position, and tighten the bolts.

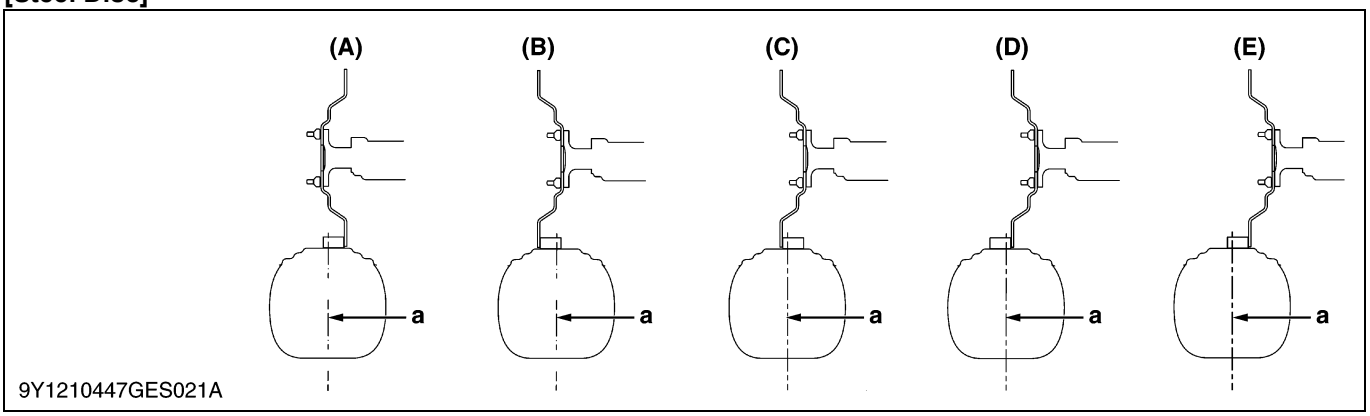
■ **IMPORTANT**

- **Always attach tires as shown in the drawings.**
- **If not attached as illustrated, transmission parts may be damaged.**
- **When re-fitting or adjusting a wheel, tighten the bolts to the following torques then recheck after driving the tractor 200 m (200 yards) and thereafter according to service interval. Refer to "Check Wheel Mounting Nuts Tightening Torque". (See page G-22.)**

(1) Rim Disk Nut (2) Wheel Nut

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[Steel Disc]



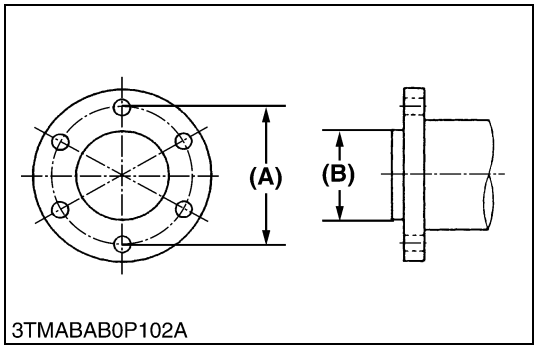
Tread "a"	(A)	(B)	(C)	(D)	(E)
18.4R38 520/70R38	1660 mm 65.36 in.	1755 mm 69.09 in.	1855 mm 73.03 in.	1960 mm 77.17 in.	2060 mm 81.10 in.

a: Tread

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[3] WHEEL HUB



3TMABAB0P102A

	Front wheel hub	Rear wheel hub
Screw circle diameter **(A)**	203.2 mm (8 in.)	203.2 mm (8 in.)
Number of screws	6	8
Screws	M16 × P1.5	M16 × P1.5
Hub pilot diameter **(B)**	152.4 mm (6 in.)	152.4 mm (6 in.)

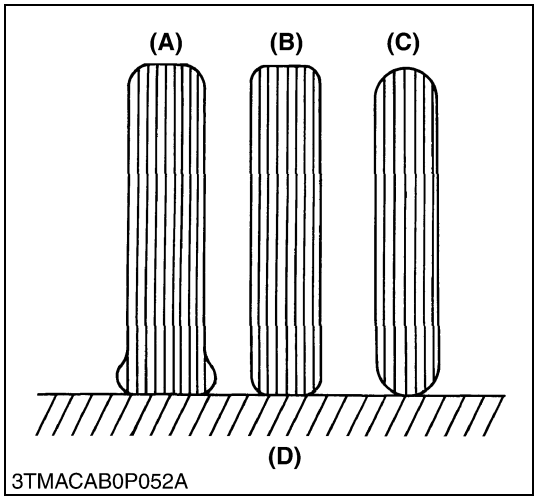
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[4] TIRE PRESSURE

CAUTION
- **Do not attempt to mount a tire. This should be done by a qualified person with the proper equipment.**

■ **IMPORTANT**
- **Do not use tires larger than specified.**
- **When you intend to mount different size of tires from equipped ones, consult your distributor about front drive gear ratio for detail.**
- **Excessive wear of tires may occur due to improper gear ratio.**

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Through the tire pressure is factory-set to the prescribed level, it naturally drops slowly in the course of time. Thus, check it every day and inflate as necessary.

To inflate the wheel tires, use an air compressor or hand pump.

■ **Recommended Inflation Pressure**
- Maintain the pressure shown below for normal use.

	Tire sizes	Inflation pressure
Front	14.9R24	160 kPa (1.6 kgf/cm^2, 23 psi)
	420/70 R24	160 kPa (1.6 kgf/cm^2, 23 psi)
Rear	18.4R38	160 kPa (1.6 kgf/cm^2, 23 psi)
	520/70 R38	160 kPa (1.6 kgf/cm^2, 23 psi)

■ **NOTE**
- **Maintain the maximum pressure in front tires, if using a front loader of when equipped with lots of front weight.**

(A) Insufficient
(B) Standard
(C) Excessive
(D) Ground

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[5] TIRE LIQUID INJECTION

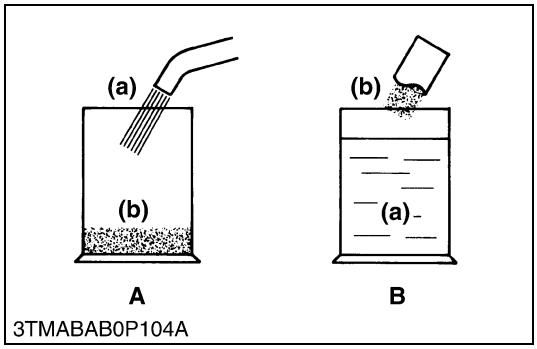
Auxiliary weights can be used to increase traction force for plowing in fields or clayey ground.

Another way is to inject water or another liquid, such as a calcium chloride solution in the tires. Water must not be used in winter since it freezes at 0 °C (32 °F). The calcium chloride solution will not freeze and moreover, affords higher effect than water since its specific gravity is higher than that of water by about 20 %. Below is an explanation of calcium chloride solution injection.

■ **IMPORTANT**

- **Do not fill the front tires with liquid.**

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Preparation of Calcium Chloride Solution

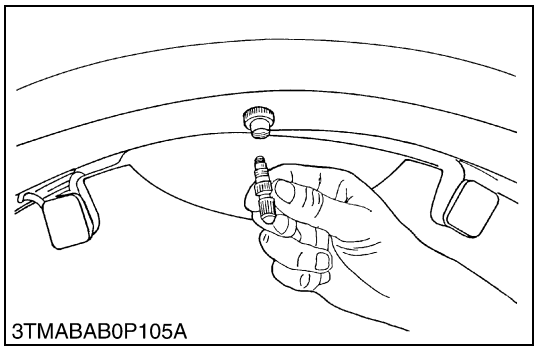
CAUTION

- **When making a calcium chloride solution, do not pour water over calcium chloride since this results in chemical reaction which will cause high temperature. Instead add a small amount of calcium chloride to the water at a time until the desired solution is achieved.**

Freezing temp.	Weight of $CaCl_2$ to be dissolved in 100 L (26.5 U.S.gals, 22.0 Imp.gals) of water
−5 °C (23 °F)	12 kg (26.4 lbs)
−10 °C (14 °F)	21 kg (46.3 lbs)
−15 °C (5 °F)	28 kg (61.7 lbs)
−20 °C (−4 °F)	34 kg (75.0 lbs)
−25 °C (−13 °F)	40 kg (88.2 lbs)
−33 °C (−27 °F)	44 kg (97.0 lbs)
−35 °C (−31 °F)	49 kg (108.0 lbs)
−40 °C (−40 °F)	52 kg (114.6 lbs)
−45 °C (−49 °F)	56 kg (123.5 lbs)
−50 °C (−58 °F)	61 kg (134.5 lbs)

(a) Water
(b) $CaCl_2$ (Calcium Chloride)
A: Bad
B: Good

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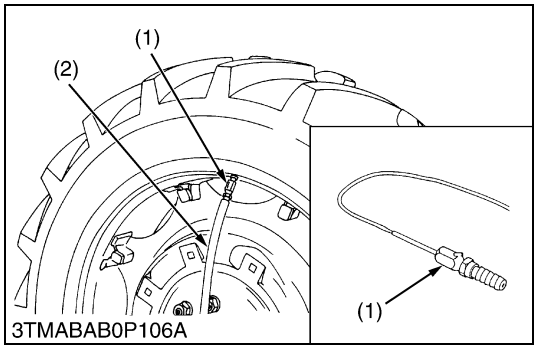

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Attaching Injector

1. Lift the rear tires off the ground.
2. Turn the tire so that the air valve is at the top.
3. Remove the air valve, and attach the injector. (Code No. 07916-52501)

(1) Injector (2) Hose

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Fig. 1

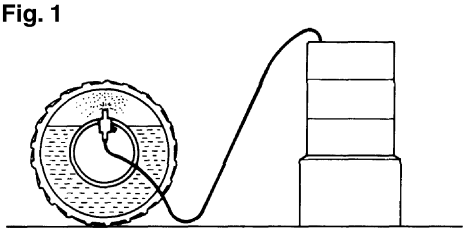


Fig. 2

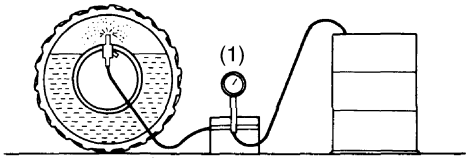
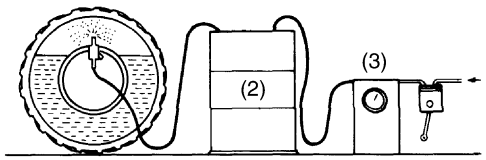
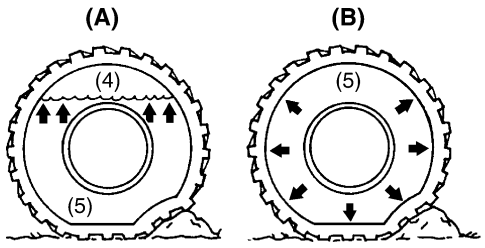


Fig. 3



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Injection

CAUTION

- **When a calcium chloride solution is used, cool it before pouring it into the tire.**
- **Do not fill tires with water or solution more than 75 % of full capacity (to the valve stem level).**

The following four ways can be used to inject water or a calcium chloride solution into tires.

1. Gravity injection (Fig. 1)
2. Pump injection (Fig. 2)
3. Pressure tank injection (Fig. 3)
4. Injection directly from tap (only when water is being used).

NOTE

- **Once injection is completed, reset the air valve, and pump air into the tire to the specified pressure.**

Weight of Calcium Chloride Solution Filling 75 % of Full Capacity of a Tire

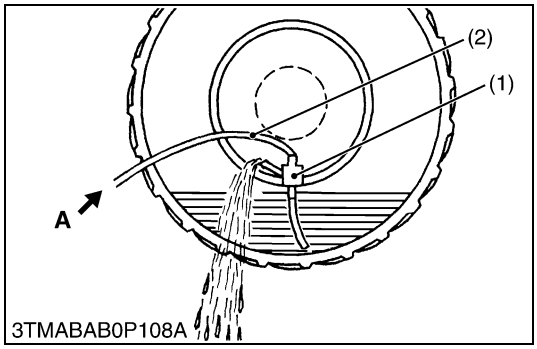
Tire sizes	18.4R38	520/70 R38
Slush free at −10 °C (14 °F) Solid at −30 °C (−22 °F) [Approx. 1 kg (2 lbs) $CaCl_2$ per 4 L (1 gal.) of water]	415 kg (915 lbs)	423 kg (933 lbs)
Slush free at −24 °C (−11 °F) Solid at −47 °C (−53 °F) [Approx. 1.5 kg (3.5 lbs) $CaCl_2$ per 4 L (1 gal.) of water]	473 kg (1040 lbs)	481 kg (1060 lbs)
Slush free at −47 °C (−53 °F) Solid at −52 °C (−62 °F) [Approx. 2.25 kg (5 lbs) $CaCl_2$ per 4 L (1 gal.) of water]	519 kg (1140 lbs)	528 kg (1160 lbs)

(1) Pump
(2) Pressure Tank
(3) Compressor
(4) Air
(5) Water

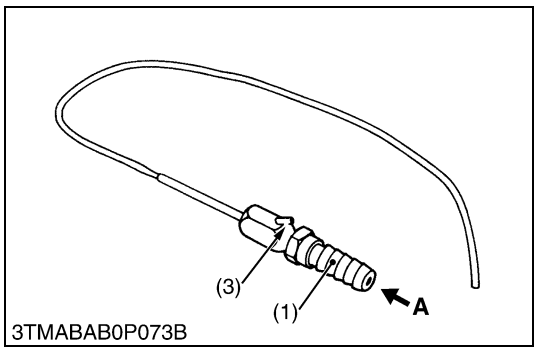
(A) Correct: 75 % Air Compresses Like A Cushion
(B) Incorrect: 100 % Full Water Can Not be Compressed

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3TMABAB0P073B

Draining Water or Solution

1. Lift the rear tires off the ground.
2. Turn the tire so that the air valve is at the bottom.
3. Remove the air valve, and drain liquid (liquid can only be drained to the level of the valve and liquid under that level remains inside).
4. To drain liquid completely, use the injector (1), and direct compressed air into the tire to force out the liquid through the injector's vent (3).

(1) Injector
(2) Hose
(3) Vent

A: Compressed Air

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10. IMPLEMENT LIMITATIONS

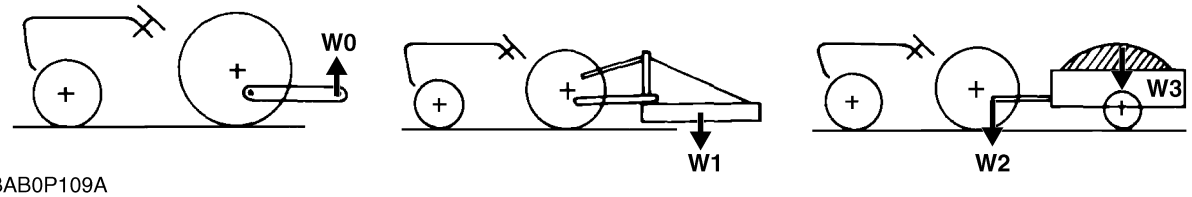
The KUBOTA Tractor has been thoroughly tested for proper performance with implements sold or approved by KUBOTA. Use with implements which are not sold or approved by KUBOTA and which exceed the maximum specifications listed below, or which are otherwise unfit for use with the KUBOTA Tractor may result in malfunctions or failures of the tractor, damage to other property and injury to the operator or others. [Any malfunctions or failures of the tractor resulting from use with improper implements are not covered by the warranty.]

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Tread (max. width)		Operating condition	Lower link end max. lifting capacity W0
Front	Rear		
1770 mm (69.68 in.)	1755 mm (69.09 in.)	■ **IMPORTANT** • **Tractor with front spacer option is not approved for use with front loader**	5800 kg (12790 lbs)

Actual figures		
Implement Weight W1 and / or size	**Max. Drawbar Load W2**	**Trailer loading weight W3 Max. capacity**
As in the following list (shown on the next page)		

Lower link end max,
hydraulic lifting capacity **W0**
Implement weight **W1**: The implement's weight which can be put on the lower link
Max. drawbar load **W2**
Trailer loading weight **W3**: The max. loading weight for trailer (without trailer's weight)



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■ **NOTE**
- **Implement size may vary depending on soil operating conditions.**

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No.	Implement		Remarks		M130X
1	Slurry Tank		Max. Tank Capacity		6000 L (1585 U.S.gals, 1319 Imp.gals
			Max. Load Capacity		7000 kg (15400 lbs)
2	Trailer		Max. Load Capacity		Shown on the page G-79
			Max. Drawbar Load		Shown on the page G-79
3	Mower	Rotary-Cutter	Max. Cutting Width		3200 mm (126 in.)
			Max. Weight		906 kg (2000 lbs)
		Flail Mower (Heavy)	Max. Cutting Width		4267 mm (168 in.)
			Max. Weight		1360 kg (3000 lbs)
		Sickle Bar	Max. Cutting Width		3050 mm (120 in.)
4	Sprayer		Max.Tank-capacity	Mid	1200 L (320 U.S.gals, 264 Imp.gals)
				Rear 3P	1400 L (370 U.S.gals, 308 Imp.gals)
				Drawbar	6000 L (1585 U.S.gals, 1319 Imp.gals)
5	Rotary Tiller		Max. Tilling Width		2700 mm (108 in.)
			Max. Weight		1200 kg (2645 lbs)
6	Bottom Plow		Max. Size		14 in. × 6 18 in. × 5 20 in. × 4 22 in. × 2 24 in. × 1
			Max. Weight		1100 kg (2425 lbs)
7	Disc-harrow	3P Type	Max. Size		24 in. × 30
			Max. Harrowing Width		3600 mm (144 in.)
			Max. Weight		1000 kg (2200 lbs)
		Drawbar Type	Max. Harrowing Width		4570 mm (180 in.)
8	Disc Plow		Max. Size		30 in. × 4
			Max. Weight		1000 kg (2200 lbs)
9	Subsoiler		Numbers of Cultivating Tines		3
			Cultivating Depth		600 mm (24 in.)
10	Cultivator		Max. Width		5490 mm (216 in.)
			Number of Rows		6
			Max. Weight		1000 kg (2200 lbs)
11	Front Blade*		Max. Cutting Width		2600 mm (102 in.)
			Max. Oil Pressure		18.1 MPa (185 kgf/cm^2, 2630 psi)
12	Rear Blade		Max. Cutting Width		2600 mm (102 in.)
			Max. Oil Pressure		18.1 MPa (185 kgf/cm^2, 2630 psi)
13	Front Loader[*1, *2]		Max. Lifting Capacity		1600 kg (3527 lbs)
			Max. Oil Pressure		20.5 MPa (209 kgf/cm^2, 2970 psi)

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No.	Implement	Remarks	M130X
14	Box Blade	Max. Cutting Width	2430 mm (96 in.)
		Max. Weight	800 kg (1760 lbs)
15	Back Hoe	Max. Digging Depth	3050 mm (120 in.)
		Max. Weight	1200 kg (2650 lbs)
16	Snow Blade	Max. Width	2600 mm (102 in.)
		Max. Weight	800 kg (1760 lbs)

■ **NOTE**

- **Implement size may vary depending on soil operating conditions.**

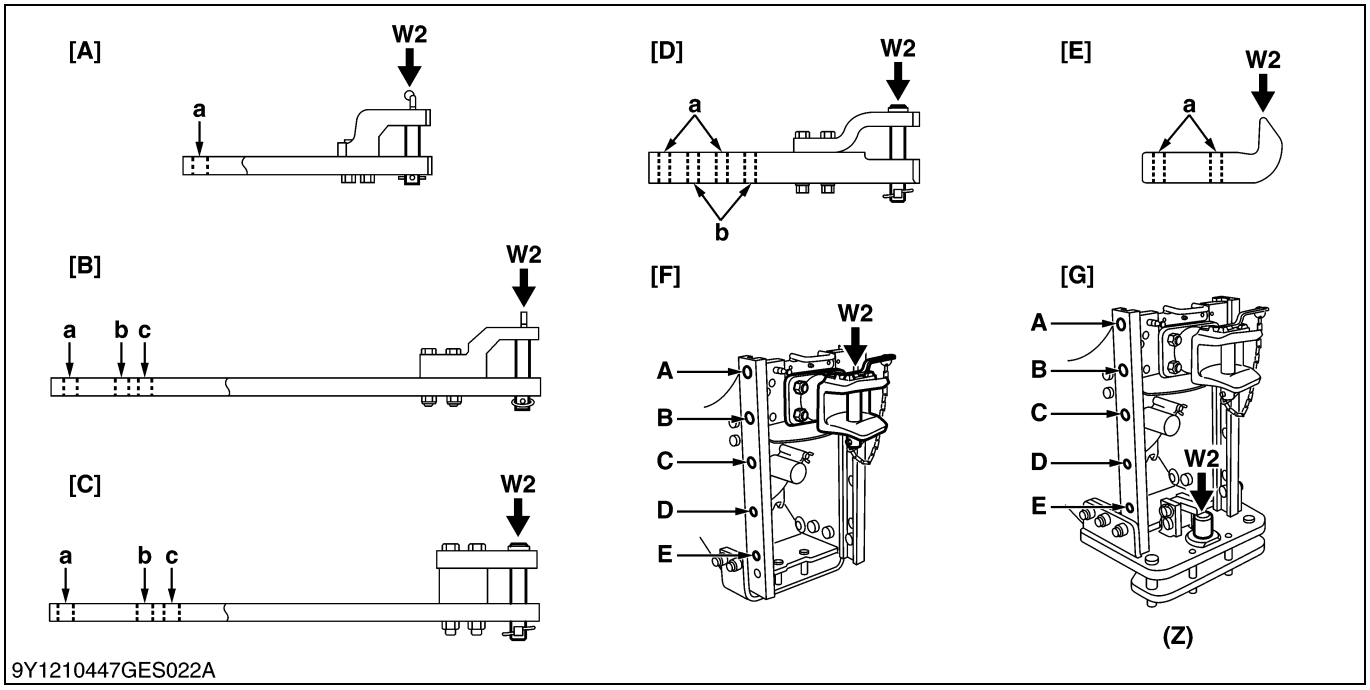
***1 Must remove front weight with this implement.**

***2 Need subframe.**

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Trailer Load Capacity



[A] Drawbar/Short Type
[B] Drawbar/Long Type
[C] Drawbar/CUNA Type
[D] Auto Hitch/Drawbar Type
[E] Auto Hitch/Two Hook Type
[F] High-Hitch
[G] Piton-Fix
(Z) When the tractor is equipped with piton-fix, the E hole of High-hitch cannot be used.

		Drawbar			
		Short	**Long**		**CUNA**
Vertical load **W2**	**A**	1835 kg (4045 lbs)	1375 kg (3031 lbs)		0 kg (0 lbs)
	B	–	1835 kg (4045 lbs)		
	C	–			
	D	–	–		–
	E	–	–		–
Trailer loading weight max. capacity **W3**	Unbraked towable mass	3000 kg (6614 lbs)	3000 kg (6614 lbs)		3000 kg (6614 lbs)
	Independently braked mass	8000 kg (17640 lbs)	8000 kg (17640 lbs)		6000 kg (13230 lbs)
	Inertia-braked towable mass				
	Towable mass when fitted with hydraulic or pneumatic braking	14000 kg 30865 lbs)	**a**	10000 kg (22046 lbs)	
			b	13500 kg (29762 lbs)	
			c	10000 kg (30865 lbs)	

(To be continued)

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(Continued)

		High-hitch				Piton-fix	Auto hitch	
		Normal	Automatic	CUNA C	CUNA D2		Drawbar	Tow hook
Vertical load **W2**	**A**	1540 kg (3395 lbs)	1520 kg (3351 lbs)	1500 kg (3307 lbs)	1600 kg (3527 lbs)	1835 kg (4045 lbs)	1665 kg (3677 lbs)	1800 kg (3968 lbs)
	B	1800 kg (3968 lbs)	1780 kg (3924 lbs)		1830 kg (4034 lbs)	–		–
	C	1830 kg (4034 lbs)	1830 kg (4034 lbs)			–	–	–
	D					–	–	–
	E					–	–	–
Trailer loading weight max. capacity **W3**	Unbraked towable mass	3000 kg (6614 lbs)	3000 kg (6614 lbs)	3000 kg (6614 lbs)	3000 kg (6614 lbs)	3000 kg (6614 lbs)	3000 kg (6614 lbs)	3000 kg (6614 lbs)
	Independently braked mass	8000 kg (17640 lbs)	8000 kg (17640 lbs)	6000 kg (13230 lbs)	8000 kg (17640 lbs)	8000 kg (17640 lbs)	8000 kg (17640 lbs)	8000 kg (17640 lbs)
	Inertia-braked towable mass							
	Towable mass when fitted with hydraulic or pneumatic braking	14000 kg (30865 lbs)	14000 kg (30865 lbs)		14000 kg (30865 lbs)	14000 kg (30865 lbs)	14000 kg (30865 lbs)	14000 kg (30865 lbs)

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1 ENGINE

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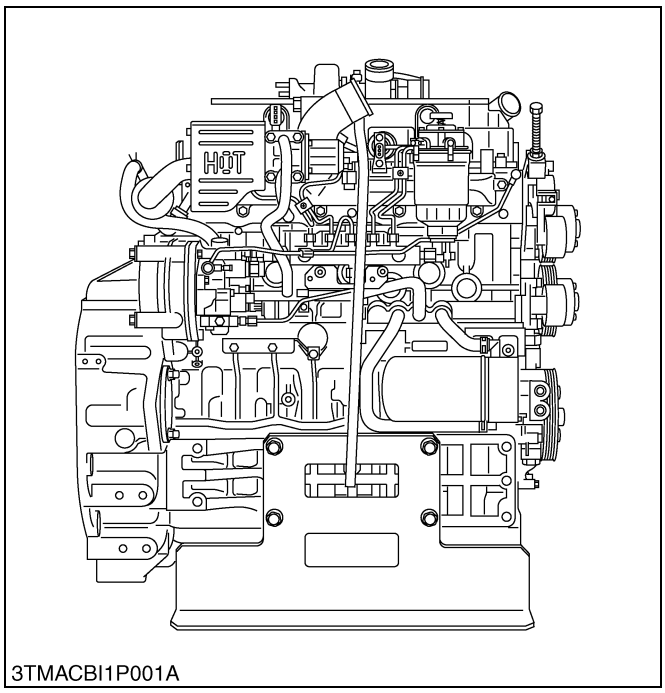
MECHANISM

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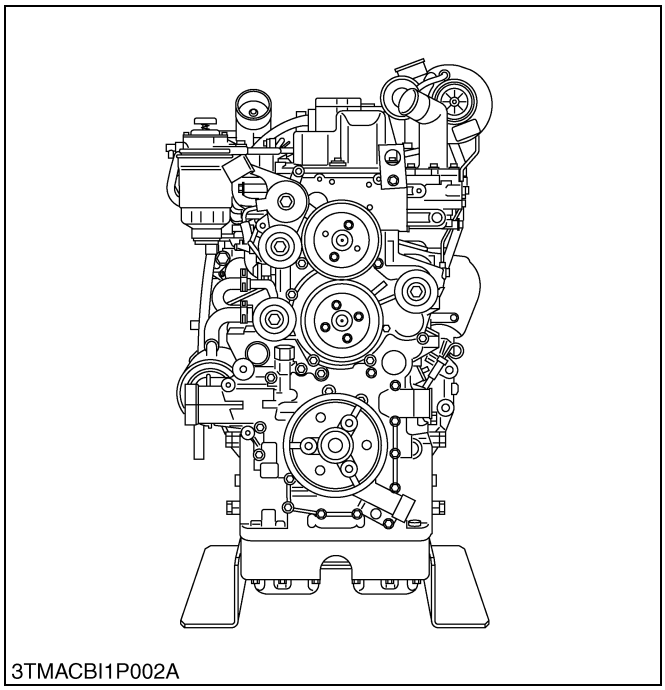
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1. FEATURE



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3TMACBI1P002A

The diesel engines have the feature of low cost and high efficiency. On the other hand, it is said that an amount of the nitrogen oxide (NOx) and particulate matter (PM) contained in their exhaust gas is relatively large, and the emission regulation by the EU Directive 2004/26/EC in Europe has been gradually strengthened. KUBOTA, which has been positively engaging in the strict emission regulations of the world, has developed the new engine conforming to the regulation of the EU Stage III A that becomes effective since January 2007, by adopting the CRS (Common Rail System) and the EGR (Exhaust Gas Recirculation) in the course of pursuing more clean exhaust gas.

The common rail system uses a type of accumulation chamber called a rail to store pressurized fuel, and injectors that contain electronically controlled solenoid valves to inject the pressurized fuel into the cylinders.

Because the engine ECU (Electronic Control Unit) controls the injection system (including the injection pressure, injection rate, and injection timing), the injection system is independent and thus unaffected by the engine speed or load.

Because the engine ECU can control injection quantity and timing to a high level of precision, even multi-injection (multiple fuel injections in one injection stroke) is possible.

This ensures a stable injection pressure at all times, even in the low engine speed range, and dramatically decreases the amount of black smoke ordinarily emitted by a diesel engine during start-up and acceleration.

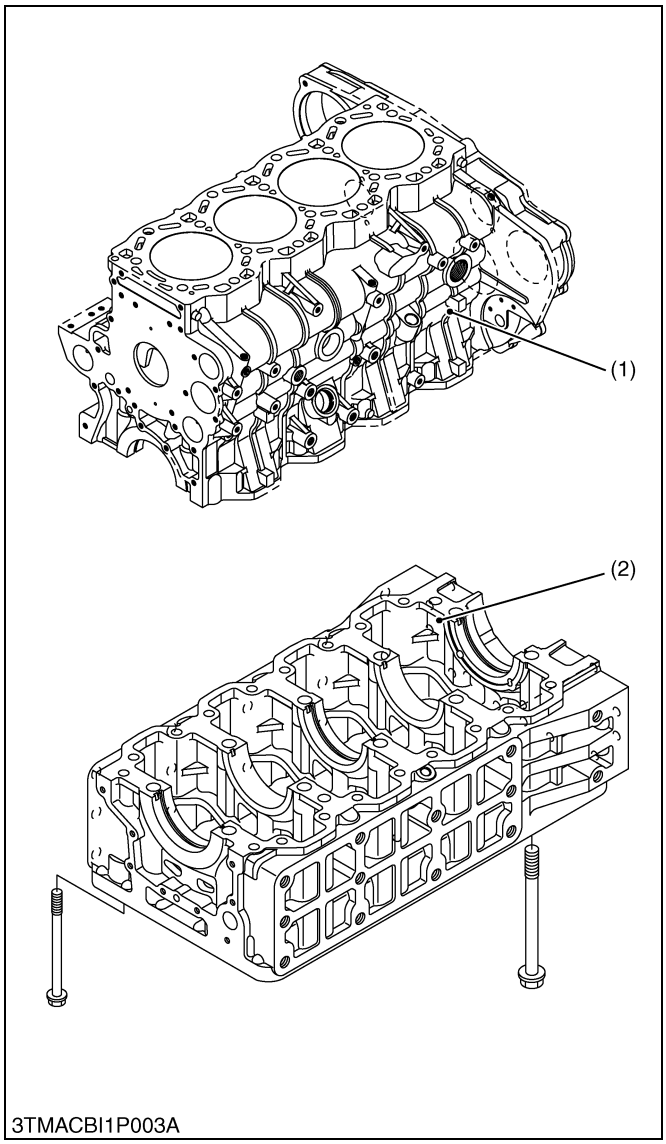
As a result, exhaust gas emissions are cleaner and reduced, and higher power output is achieved.

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2. ENGINE BODY

[1] CYLINDER BLOCK



3TMACBI1P003A

The 08 series TI engine employs ladder frame structure type crankcases - the crankcase 1 (1) with combustion part and the crankcase 2 (2) which supports the crankcase 1 (1).

The following benefits are in the ladder frame structure.

1. Minimizing parts.
2. Noise reduction.
3. Reduction of loss and dispersion on friction thanks to accuracy of axial concentricity.

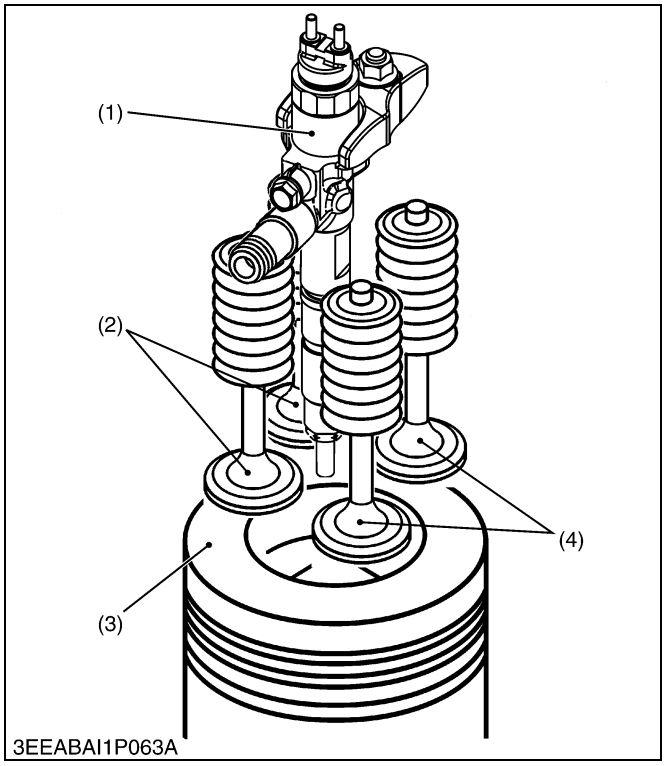
The cylinder is a linerless type which enables good cooling operation, less strain and good abrasion resistance.

(1) Crankcase 1
(2) Crankcase 2
(3) Oil Pan

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[2] CENTER DIRECT INJECTION SYSTEM (E-CDIS)



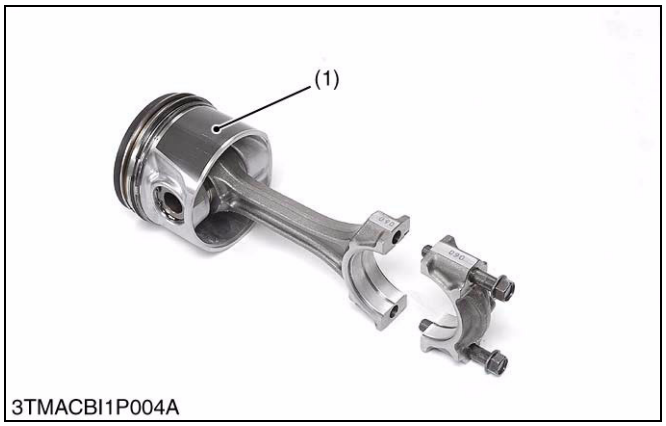
08 series TI engine adopts the Center Direct Injection System, in which the injection nozzle is positioned upright at the center of the cylinder.

This system serves to inject fuel directly at the center of the cylinder. By so doing, injected fuel and suction air can be mixed more uniformly, leading to more stable, higher combustion performance. In other words, cleaner emission, higher power output, lower fuel consumption, lower operating noise and higher start-up performance have been achieved.

(1) Injector
(2) Exhaust Valves
(3) Piston
(4) Intake Valves

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[3] PISTON



Piston's skirt is coated with molybdenum disulfide*, which reduces the piston slap noise and thus the entire operating noise.

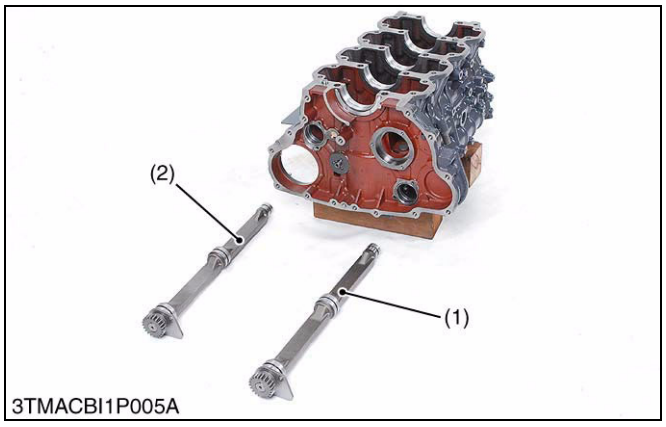
*** Molybdenum disulfide (MoS_2)**

The molybdenum disulfied serves as a solid lubricant, like a Graphite or Teflon. This material helps resist metal wears even with little lube oil.

(1) Molybdenum Disulfide

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[4] BALANCER



Engine is sure to vibrate by piston's reciprocation. Theoretically, three-cylinder engines are much less prone to cause vibration than four-cylinder ones (second inertia, etc.). However, any engine has many moving parts in addition to its pistons and cannot be completely free from vibration.

The four cylinder engine is fitted with balance weight on crankcase to absorb the second inertia mentioned above and reduce vibration.

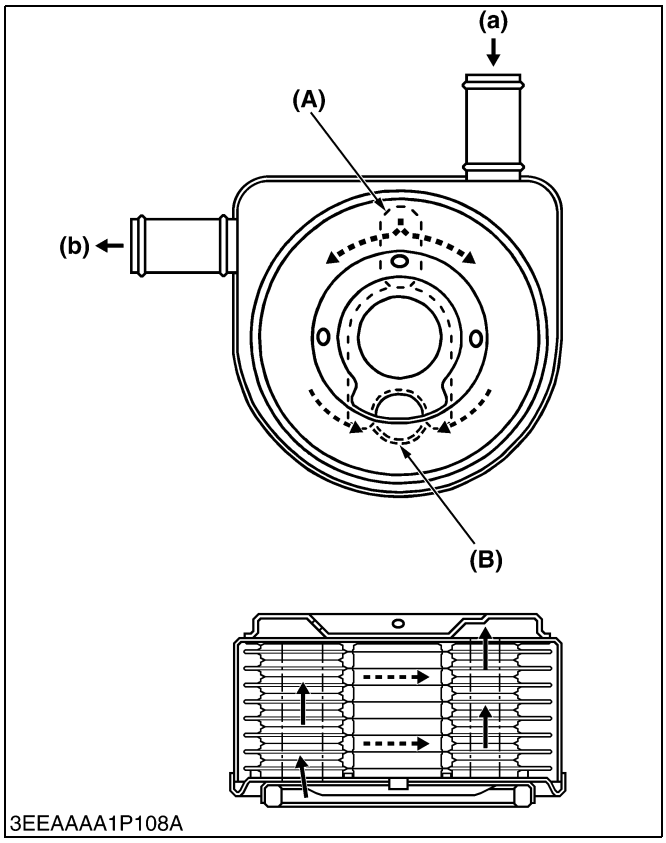
(1) Balancer Shaft 1
(2) Balancer Shaft 2

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3. LUBRICATING SYSTEM

[1] OIL COOLER



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08 series engine has a coolant-cooled oil cooler that not only cools hot oil, but also warms the cool engine oil shortly after start up.

As shown in the figure, the oil flows inside the connected cooler plate, whereas coolant is kept circulating outside the cooler plate, thereby cooling down or warming the oil.

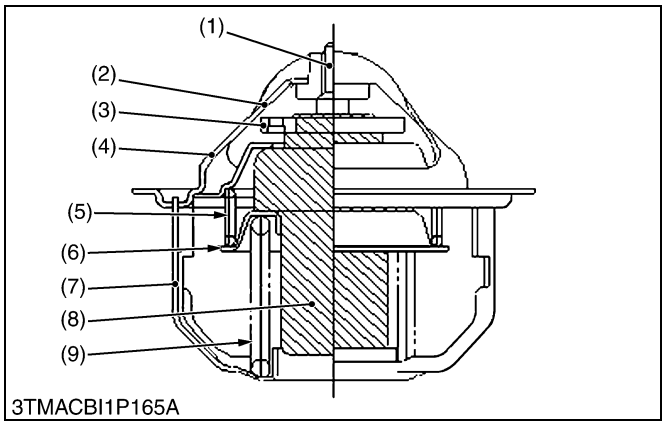
(A) Oil Inlet Port
(B) Oil Outlet Port
(a) Coolant Inlet Port
(b) Coolant Outlet Port

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4. COOLING SYSTEM

[1] THERMOSTAT



Purpose/Component Construction

Larger valve caliber size causes larger water pressure influence by opening the thermostat valve; resulting in opening-delay → over-shoot → hunching-phenomenon.

So, the smaller caliber valve (unsusceptible of water pressure) should be opened first to make water-pressure influence smaller, then the main valve should be opened. Also, reducing the flow at small lift will reduce the thermal shock at valve opening operation. (Refer to the following graph.) The operational details are as follows.

Component construction is shown on the left.

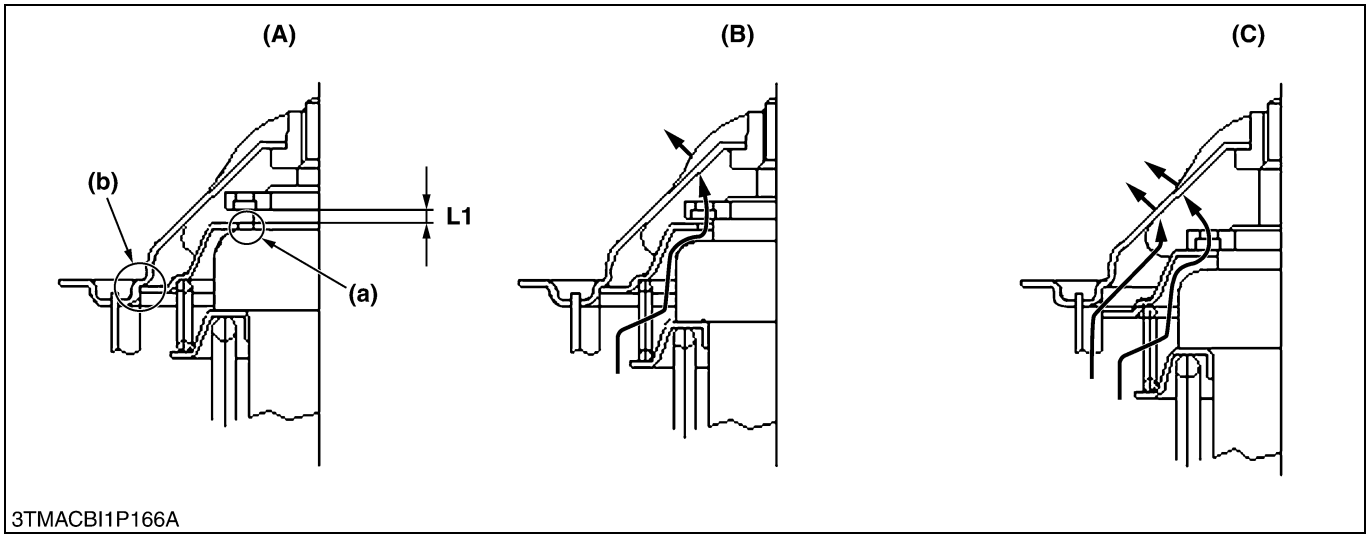
Compared with the conventional valves, a holder for the valve stopper at primary valve-opening time is installed on the pellet cover. A catch for the spring 2 (5) is installed for primary valve-opening mechanism at the valve closing time.

(1) Piston
(2) Seat
(3) Holder
(4) Valve
(5) Spring 2
(6) Catch
(7) Mounting Frame
(8) Pellet
(9) Spring 1

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Operational Principle



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L1: Lift Distance

(A) Valve Closure

Different from the conventional normal valves, another smaller diameter valve-mechanism is installed at **(a)**-part of the drawing above, which is seated (close-valve) at the shoulder of the pellet-caulking position at valve closing time.

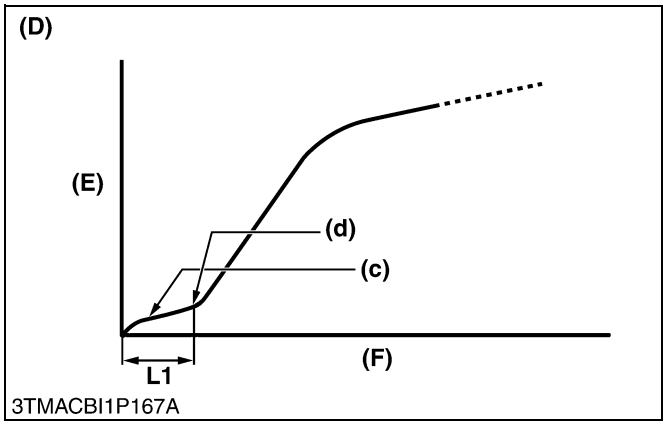
(B) Primary Valve-opening

The cooling water temperature becomes higher than the specified temperature and the piston-portion is elongated; which starts the opening operation. At this time, **(a)**-part of the drawing with small diameter-valve mechanism opens, through which cooling water flows into the radiator side.

(C) Secondary Valve-opening

When the cooling water temperature rises further to make valve lift larger than **L1**, **(a)**-part of the drawing above starts pushing the holder, which makes the **(b)**-part valve of the drawing below with larger caliber open. At this moment, water pressure influence is not large because there already exists water flow to radiator by the primary valve-opening.

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Flow Characteristic

Flow characteristic is shown in the left drawing, where flow-rate change gradient at low lift is small.

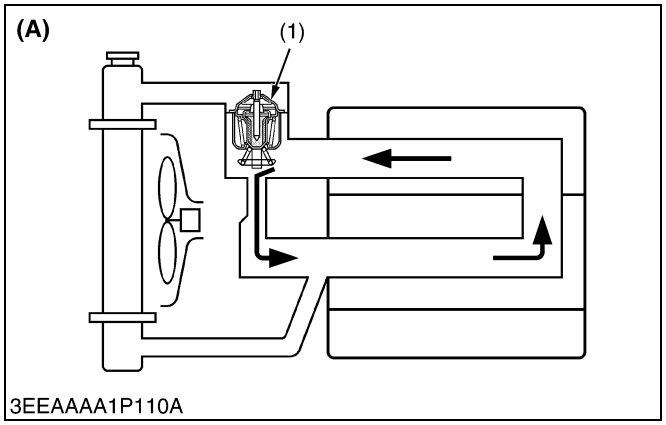
This makes the thermal shock to the engine small, by reducing flow-rate fluctuation caused by hunching at valve opening time.

(c) Primary Valve-opening (at Small Lift)	**(D) Lift-flow Characteristic**
(d) Secondary valve-opening	**(E) Flow Rate (l/min)**
	(F) Valve Lift (mm)

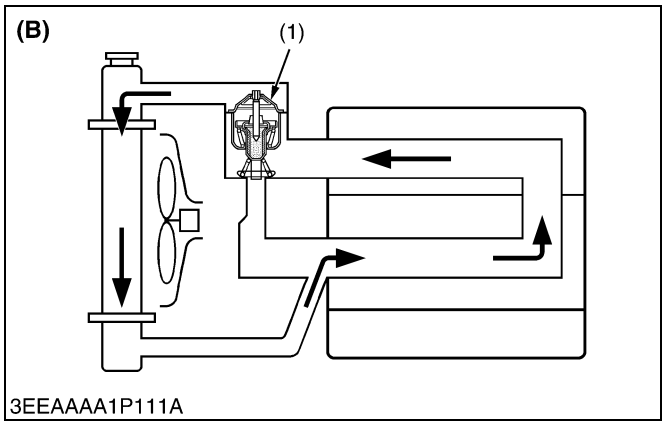
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[2] BOTTOM BYPASS SYSTEM



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Bottom bypass system is introduced in the V6108 engine for improving the cooling performance of the radiator.

While the temperature of coolant in the engine is low, the thermostat is held closed and the coolant is allowed to flow through the bypass pipe and to circulate in the engine.

When the temperature exceeds the thermostat valve opening level, the thermostat fully opens itself to prevent the hot coolant from flowing through the bypass into the engine.

In this way, the radiator can increase its cooling performance.

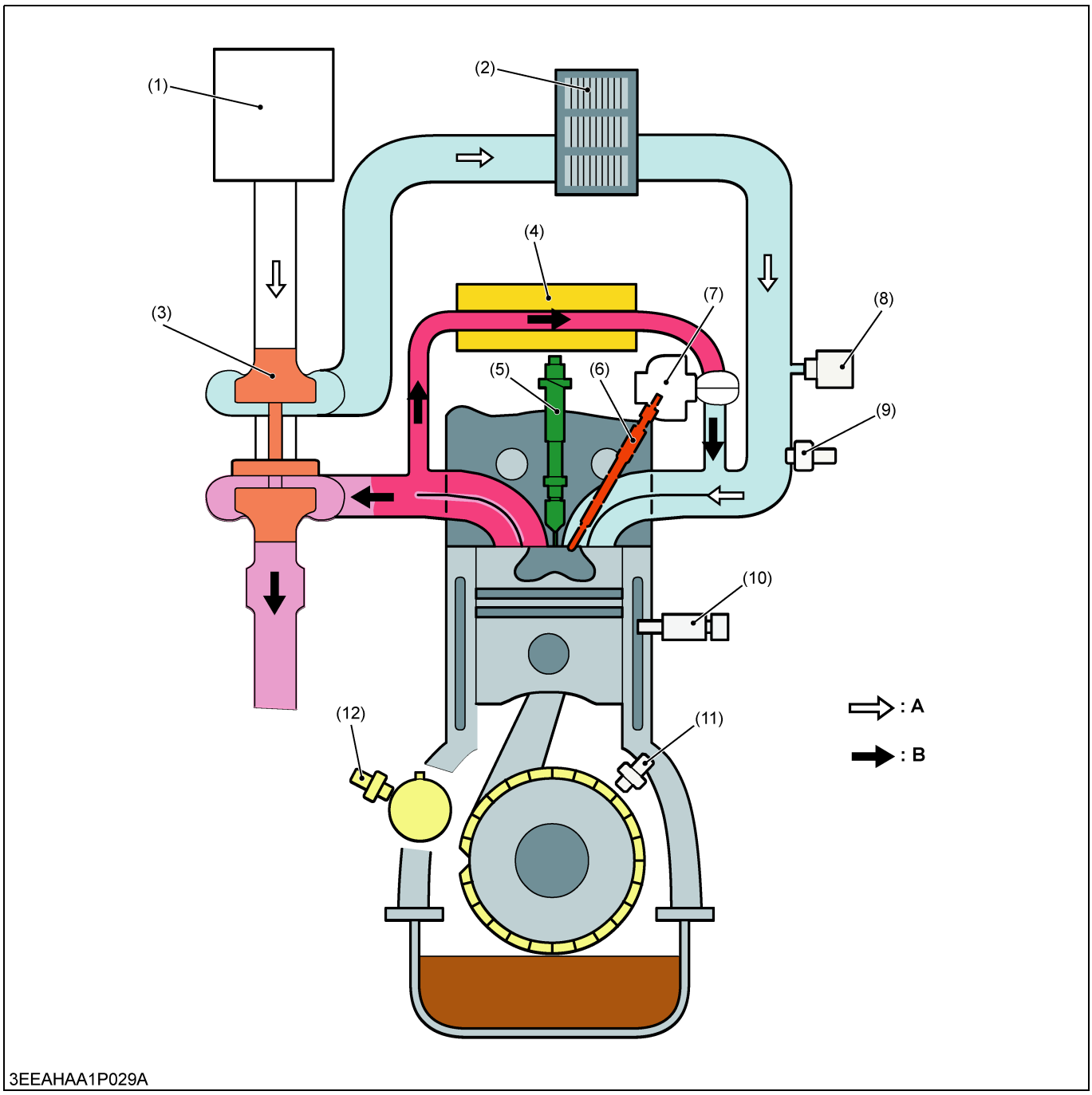
(1) Thermostat

(A) Bypass Opened
(B) Bypass Closed

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5. INTAKE AND EXHAUST SYSTEM



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(1) Air Cleaner
(2) Intercooler
(3) Turbocharger
(4) EGR Cooler
(5) Injector
(6) Glow Plug
(7) EGR Valve
(8) Intake Air Pressure Sensor
(9) Intake Air Temperature Sensor
(10) Coolant Temperature Sensor
(11) Crankshaft Position Sensor
(12) Camshaft Position Sensor

A: Intake Air Flow
B: Exhaust Gas Flow

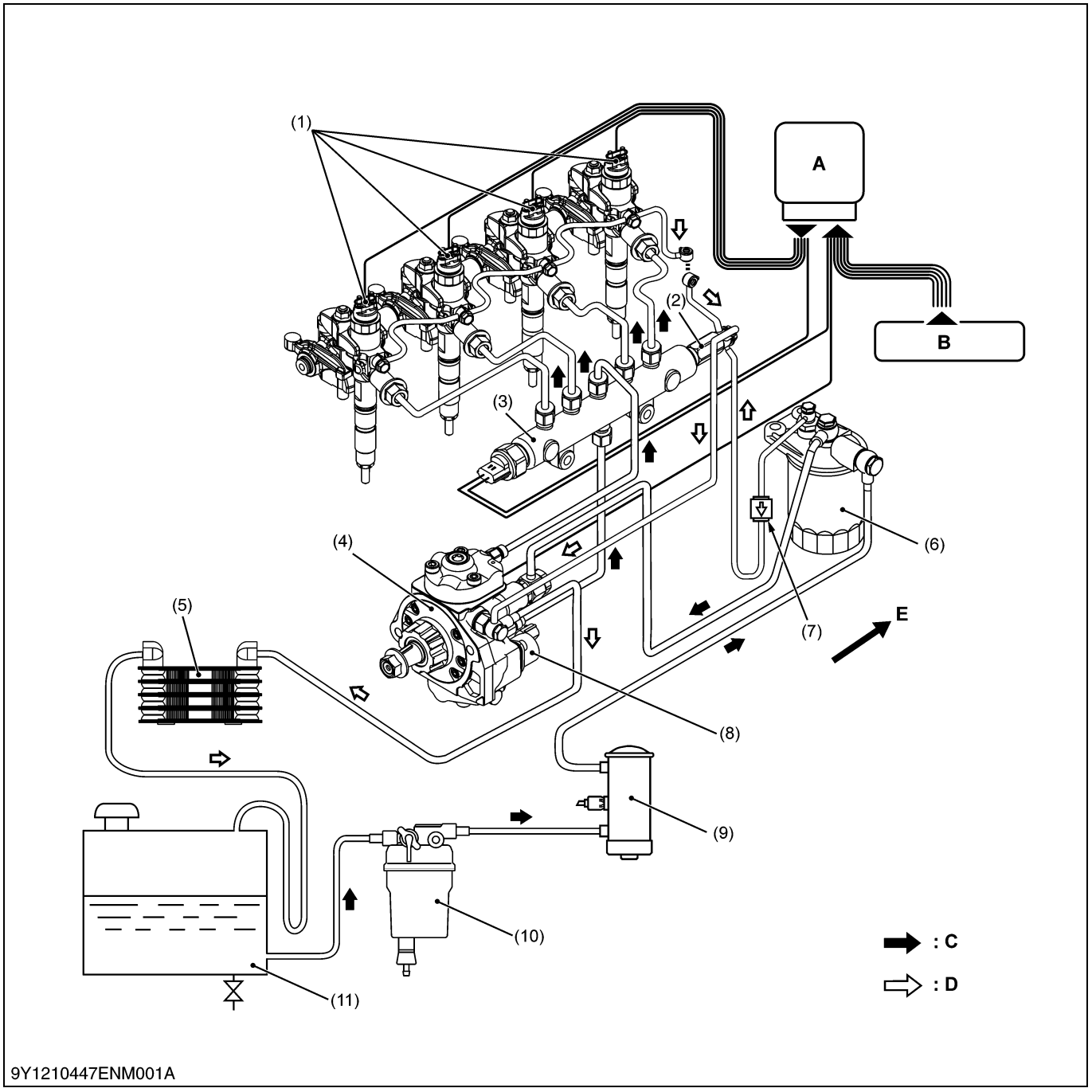
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6. COMMON RAIL SYSTEM (CRS)

[1] GENERAL

(1) Fuel System



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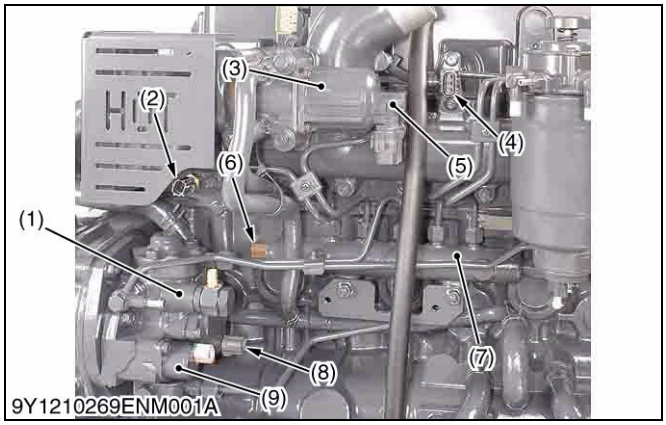
(1) Injector
(2) Pressure Limiter
(3) Rail
(4) Supply Pump
(5) Fuel Cooler
(6) Fuel Filter
(7) Check Valve
(8) SCV (Suction Control Valve)
(9) Fuel Pump
(10) Water Separator
(11) Fuel Tank

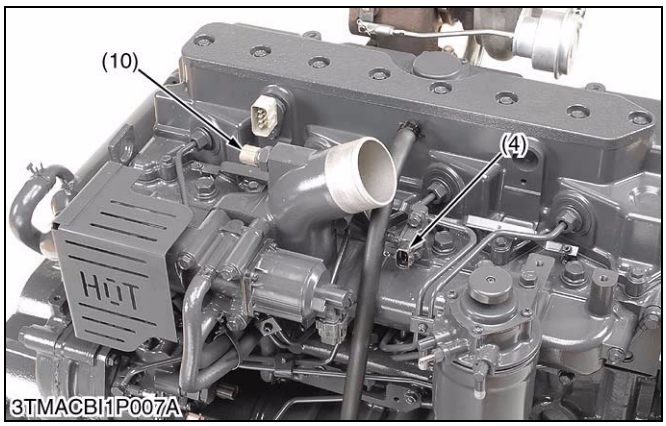
A: Engine ECU
B: Sensors
C: Injected Fuel Flow
D: Returned Fuel Flow

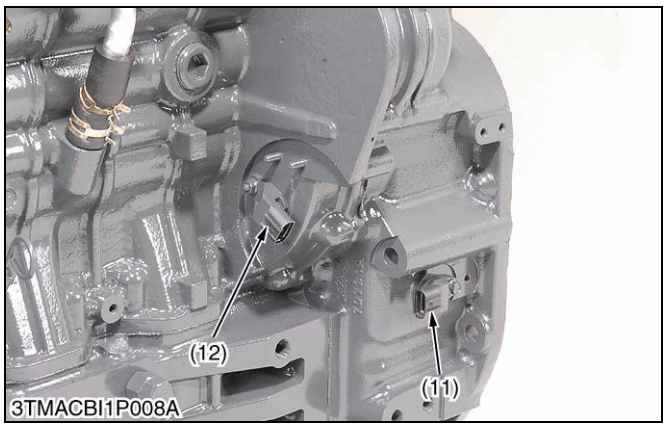
The common rail system adopted for the V6108-CR-TI is the combustion system which always controls the combustion state in cylinders optimally, by storing ultra high pressure fuel in the rail and performing ultra high pressure injection by the diesel engine. It has excellent combustion efficiency and realizes clean exhaust gas as well as low fuel consumption. It comprises the supply pump, the rail, the injectors, and the sensors that detects its operating state.

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The common rail control system can be broadly divided into the following three areas: sensors, engine ECU, and actuators.

■ **Sensors**

Sensor detects the condition of the engine and the pump. Refer to "[5] ENGINE CONTROL SYSTEM: (3) Sensors".

- Crankshaft Position Sensor (11)
- Camshaft Position Sensor (12)
- Intake Air Temperature Sensor (10)
- Coolant Temperature Sensor (2)
- Fuel Temperature Sensor (8)
- Intake Air Pressure Sensor (4)
- EGR Valve Lift Sensor (5)

■ **Engine ECU (Electronic Control Unit)**

Engine ECU receives signals from the sensors, calculates the proper injection quantity and injection timing for optimal engine operation, and sends the appropriate signals to the actuators. ECU enables the injectors to be actuated at high speeds. Refer to "[6] ENGINE CONTROL SYSTEM: (2) Engine ECU".

■ **Actuators (Supply pump, Injector, EGR valve)**

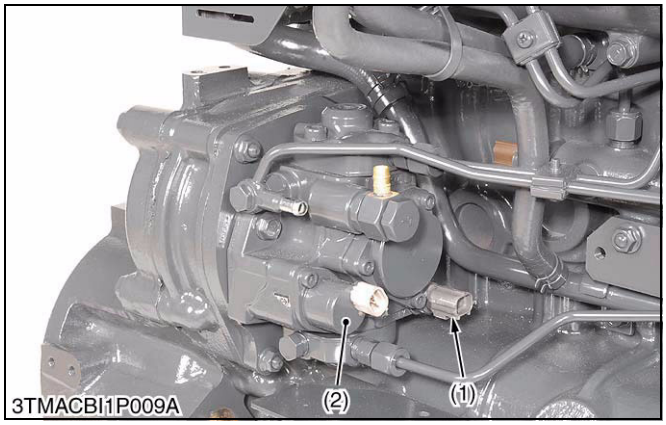
Actuators operate to provide optimal injection quantity and injection timing in accordance with the signals received from the engine ECU. Refer to "[3] SUPPLY PUMP", "[5] INJECTOR" and "7. EGR SYSTEM: [2] EGR VALVE".

(1) Supply Pump
(2) Coolant Temperature Sensor
(3) EGR Valve DC Motor
(4) Intake Air Pressure Sensor
(5) EGR Valve Lift Sensor
(6) Rail Pressure Sensor
(7) Rail
(8) Fuel Temperature Sensor
(9) Suction Control Valve (SCV)
(10) Intake Air Temperature Sensor
(11) Crankshaft Position Sensor
(12) Camshaft Position Sensor

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[2] SUPPLY PUMP



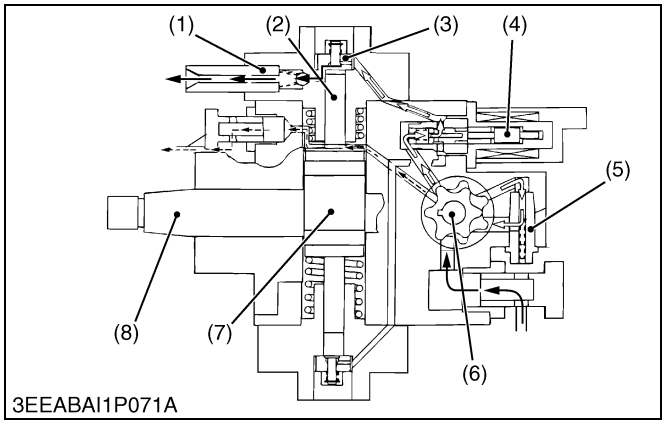
The supply pump is primarily composed of the pump unit (eccentric cam, ring cam, two plungers), the SCV (suction control valve) (2), the fuel temperature sensor and the fuel pump (trochoid type), and is actuated at 1/2 the engine crankshaft rotation.

The two compact pump unit plungers are positioned symmetrically above and below on the outside of the ring cam.

The fuel discharge quantity is controlled by the SCV, in order to reduce the actuating load and suppress the rise in fuel temperature. This system adopts the normally open type (the suction valve opens when not energized) SCV.

(1) Fuel Temperature Sensor (2) SCV (Suction Control Valve)

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The fuel is sucked by the fuel pump (6) from the fuel tank and sent to the SCV (4). At this time, the regulating valve (5) adjusts the fuel pressure to below a certain level. The fuel sent from the fuel pump (6) has the required discharge quantity adjusted by the SCV (4), and enters the pump unit through the suction valve (3). The fuel pumped by the pump unit is pumped through the delivery valve (1) to the rail.

■ Fuel Pump

The trochoid type fuel pump (6), which is integrated in the supply pump, draws fuel from the fuel tank and feeds it to the two plungers (2) via the fuel filter and the SCV (Suction Control Valve) (4). The drive shaft (8) actuates the outer/inner rotors of the fuel pump (6), thus causing the rotors to start rotating. In accordance with the space that increases and decreases with the movement of the outer and inner rotors, the fuel pump (6) draws fuel into the suction port and pumps fuel out the discharge port.

■ Regulating Valve

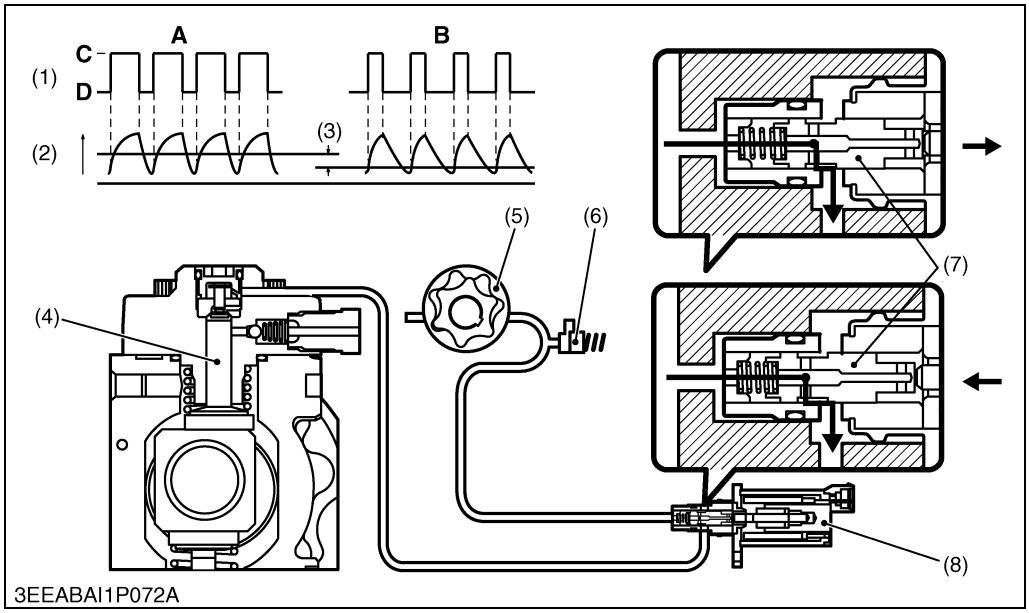
The regulating valve (5) keeps the fuel feed pressure (discharge pressure) below a certain level. If the pump speed increases and the feed pressure exceeds the preset pressure of the regulating valve (5), the valve opens by overcoming the spring force in order to return the fuel to the suction side.

(1) Delivery Valve
(2) Plunger
(3) Suction Valve
(4) SCV
(5) Regulating Valve
(6) Fuel Pump
(7) Ring Cam
(8) Drive Shaft

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SCV (Suction Control Valve)



(1) Actuating Voltage
(2) Current
(3) Average Current Difference
(4) Plunger
(5) Fuel Pump
(6) Regulating Valve
(7) Cylinder
(8) SCV

A: Low Suction Quantity
B: High Suction Quantity
C: ON
D: OFF

The SCV (8) uses a linear solenoid type electromagnetic valve to control the time for which current is applied from the ECU to the SCV (duty ratio control), and in this way controls the fuel flow quantity supplied to the high-pressure plunger (4). When current flows through the SCV (8), the internal armature moves according to the duty ratio. The fuel flow quantity changes in accordance with the armature operation, and is controlled in accordance with the size of the cylinder fuel passage opening. As a result, the intake fuel quantity is controlled to achieve the target rail pressure and the supply pump actuation load decreases.

1) Normally Open Type

When the solenoid is not energized, the return spring pushes the cylinder (7), completely opening the fuel passage and supplying fuel to the plungers (4). (Full quantity intake and full quantity discharge.)

When the solenoid is energized, the armature presses the cylinder (7), which compresses the return spring and closes the fuel passage.

The solenoid ON/OFF is actuated by duty ratio control. Fuel is supplied in an amount corresponding to the open surface area of the passage, which depends on the duty ratio, and then is discharged by the plungers (4).

2) Duty Ratio Control

The engine ECU outputs sawtooth wave signals with a constant frequency. The value of the current (2) is the effective (average) value of these signals (3). As the effective value increases, the valve opening decreases, and as the effective value decreases, the valve opening increases.

3) When the SCV Energized Duration (Duty ON Time) is Short

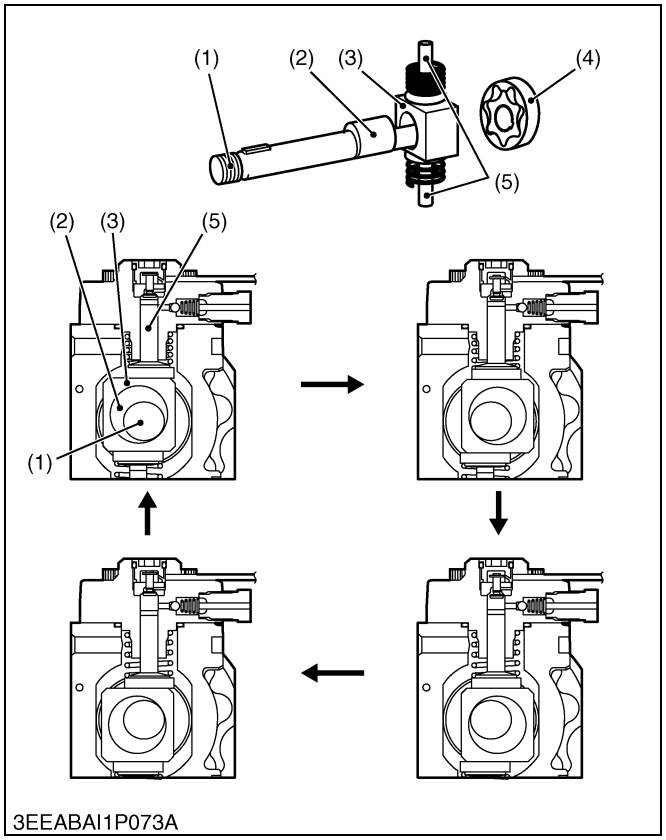
When the SCV energized duration is short, the average current flowing through the solenoid becomes small, the cylinder (7) is returned by the force of the spring, and the valve opening becomes large. As a result, the fuel suction quantity increases.

4) When the SCV Energized Duration (Duty ON Time) is Long

When the SCV energized duration is long, the average current flowing through the solenoid becomes large, the cylinder (7) is pressed out, and the valve opening becomes small. As a result, the fuel suction quantity decreases.

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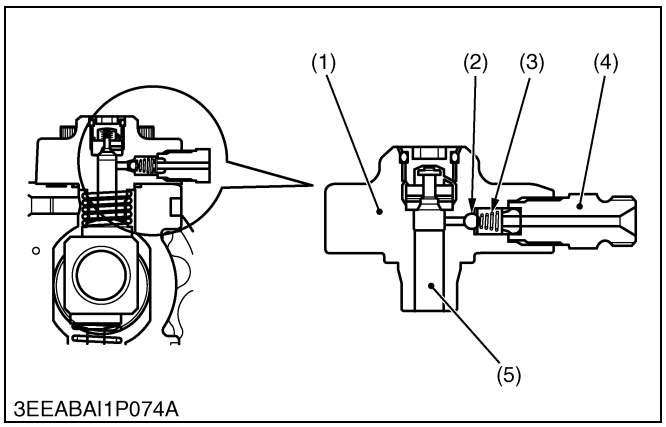
Pump Unit (Eccentric Cam, Ring Cam, Plunger)

The eccentric cam (2) is attached to the drive shaft (1) and the ring cam (3) is installed on the eccentric cam (2). There are two plungers (5) at positions symmetrical above and below the ring cam (3).

Because the rotation of the drive shaft (1) makes the eccentric cam (2) rotate eccentrically, the ring cam (3) follows this and moves up and down, and this moves the two plungers (5) reciprocally. (The ring cam (3) itself does not rotate.)

(1) Drive Shaft
(2) Eccentric Cam
(3) Ring Cam
(4) Fuel Pump
(5) Plunger

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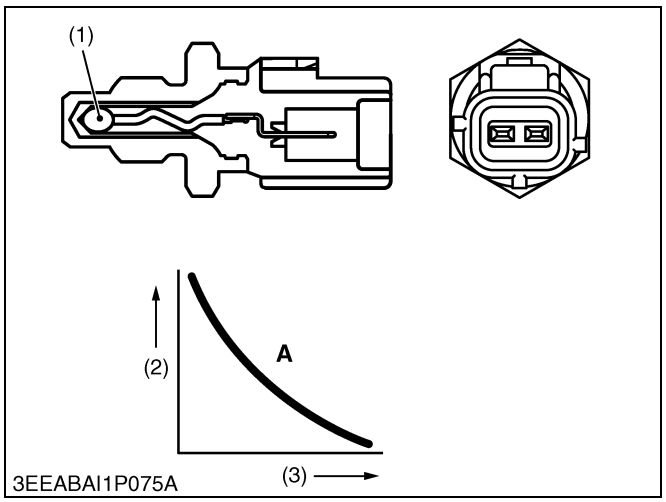
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Delivery Valve

The delivery valve has an integrated element (1) and is made up of the check ball (2), spring (3), and holder (4). When the pressure at the plunger (5) exceeds the pressure in the rail, the check ball (2) opens to discharge the fuel.

(1) Element
(2) Check Ball
(3) Spring
(4) Holder
(5) Plunger

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Fuel Temperature Sensor

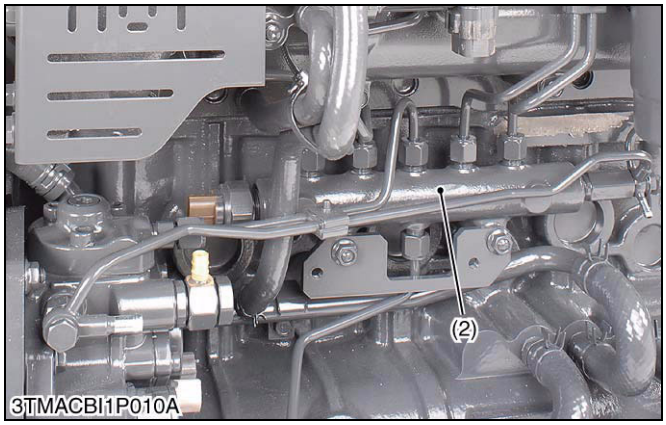
The fuel temperature sensor is installed on the fuel intake side and utilizes the characteristics of a thermistor (1) in which the electric resistance (2) changes with the temperature (3) in order to detect the fuel temperature.

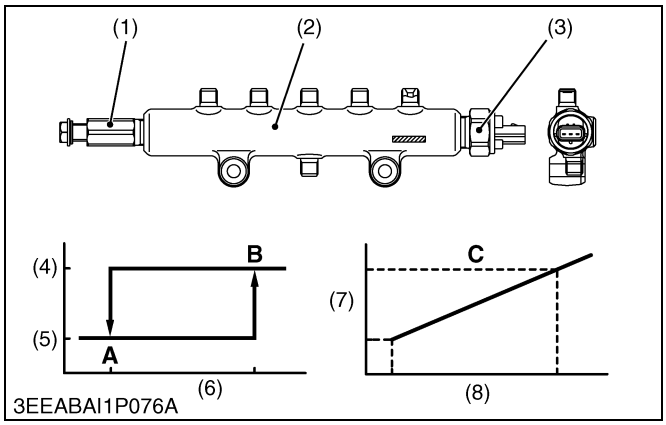
(1) Thermistor
(2) Resistance Value
(3) Temperate
A: Resistance – Temperature Characteristic

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[3] RAIL





The function of the rail (2) is to distribute fuel pressurized by the supply pump to each cylinder injector. The component parts are the pressure limiter (1) and the rail pressure sensor (3). The function of the pressure limiter (1) is to open the valve to release fuel pressure if the fuel pressure in the rail becomes abnormally high. The function of the rail pressure sensor (3) is to detect the fuel pressure in the rail.

■ Pressure Limiter

The pressure limiter (1) opens to release the fuel pressure if abnormally high pressure is generated **"B"**. If fuel pressure within the rail (2) becomes abnormally high, the pressure limiter (1) operates (opens). It resumes operation (closes) after the pressure falls to a certain level **"A"**. Fuel released by the pressure limiter (1) returns to the fuel tank.

The operating pressures for the pressure limiter (1) are approximately 200 MPa (2040 kgf/cm^2, 29000 psi) for the valve opening pressure, and approximately 50 MPa (510 kgf/cm^2, 7300 psi) for the valve closing pressure.

■ Rail Pressure Sensor

The rail pressure sensor (3) is installed on the rail (2). It detects the fuel pressure in the rail (2) and sends a signal to the engine ECU. This is a semi-conductor sensor that uses the piezo-electric effect of the electrical resistance varying when fuel pressure is applied to a silicon element.

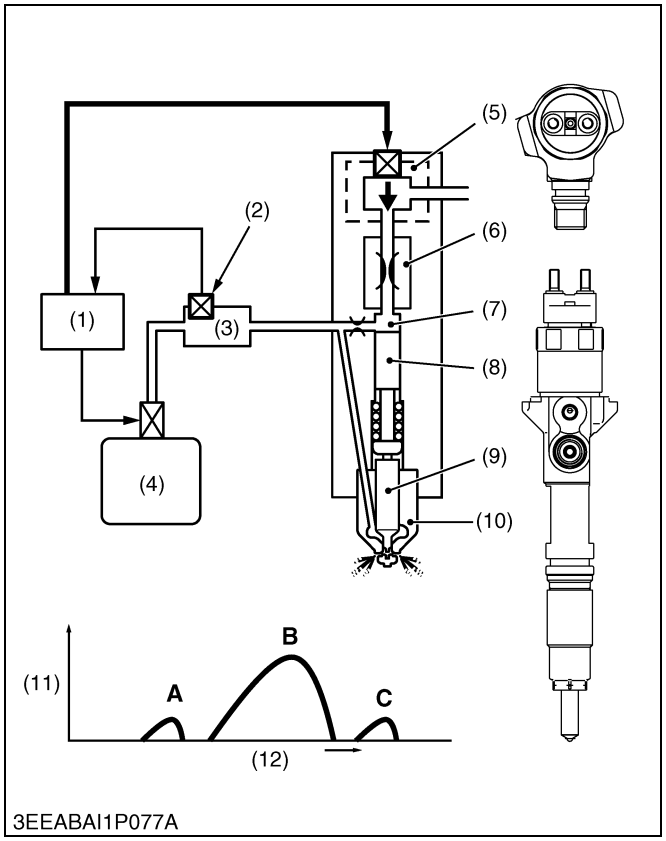
(1) Pressure Limiter
(2) Rail
(3) Rail Pressure Sensor
(4) Valve (Open)
(5) Valve (Close)
(6) Rail Pressure
(7) Output Voltage
(8) Rail Pressure

A: Return Pressure
B: Abnormally High Pressure
C: Output Voltage-Rail Pressure Characteristic

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[4] INJECTOR



The injector injects the pressurized fuel in the rail into the engine combustion chamber at the optimal injection timing, injection quantity, injection rate, and injection pattern, in accordance with signals from the engine ECU (Electronic Control Unit) (1).

Injection is controlled using a TWV (Two-Way Valve) (5) and orifice (6). The TWV (5) controls the fuel pressure in the control chamber (7) to control the start and end of injection. The orifice (6) controls the injection rate by restraining the speed at which the nozzle (10) opens.

The command piston (8) opens and closes the valve by transmitting the control chamber pressure to the nozzle needle (9). When the nozzle needle valve is open, the nozzle (10) atomizes the fuel and injects it.

■ **Injector Construction and Features**

The injector consists of a nozzle (10) similar to the conventional "nozzle and nozzle holder", an orifice (6) that controls the injection rate, the command piston (8), and a TWV (5).

To ensure high pressure, this injector has improved pressure strength, sealing performance and pressure wear resistance. It also has improved high-speed operability, enabling higher-precision injection control and multi-injection.

Multi-injection means that for the purpose of reducing exhaust gas emissions and noise, the main injection is accomplished with one to three injections of fuel without changing the injection quantity.

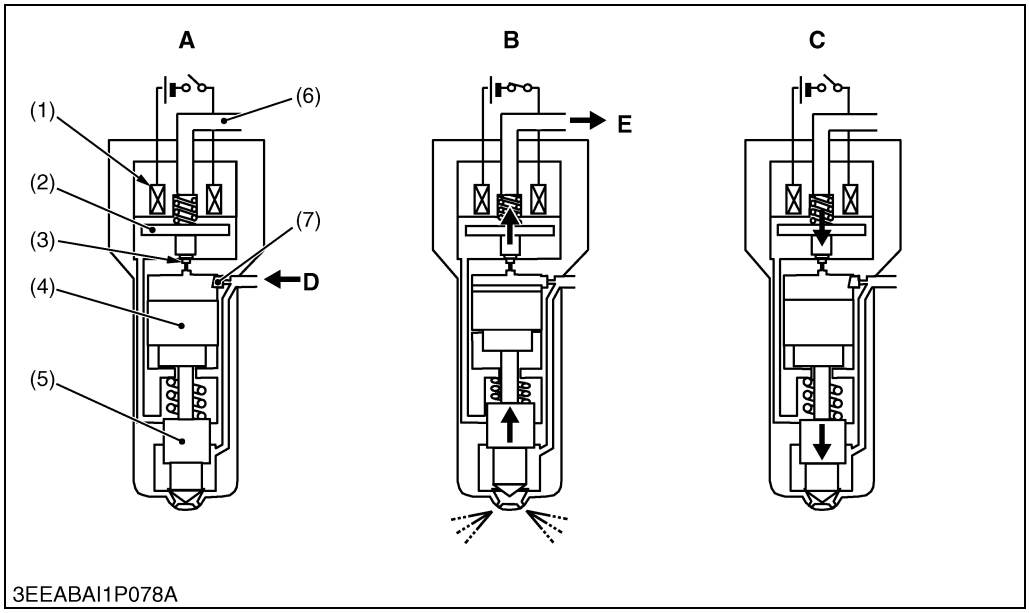
(1) Engine ECU
(2) Rail Pressure Sensor
(3) Rail
(4) Supply Pump
(5) TWV (Two-Way Valve)
(6) Orifice
(7) Control Chamber
(8) Command Piston
(9) Nozzle Needle
(10) Nozzle
(11) Injection Quantity
(12) Time

A: Pre-Injection
B: Main Injection
C: After Injection

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Injector Operation



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(1) Solenoid
(2) TWV (Two-Way Valve)
(3) Outlet Orifice
(4) Command Piston
(5) Nozzle
(6) Leak Passage
(7) Inlet Orifice

A: Non Injection
B: Injection
C: End of Injection
D: From Rail
E: To Fuel Tank

The injector controls injection through the fuel pressure in the control chamber. The TWV (Two-Way Valve) executes leak control of the fuel in the control chamber to control the fuel pressure within the control chamber. The TWV varies with the injector type.

1) Non-Injection

When the TWV (2) is not energized, the TWV (2) shuts off the leak passage (6) from the control chamber, so the fuel pressure in the control chamber and the fuel pressure applied to the nozzle needle are both the same rail pressure. The nozzle needle thus closes due to the difference between the pressure-bearing surface area of the command piston (4) and the force of the nozzle spring, and fuel is not injected.

For this type, the control chamber outlet orifice (3) is closed directly by the force of the spring.

2) Injection

When TWV energization starts, the TWV valve is pulled up, opening the leak passage (6) from the control chamber. When this leak passage (6) opens, the fuel in the control chamber leaks out and the pressure drops.

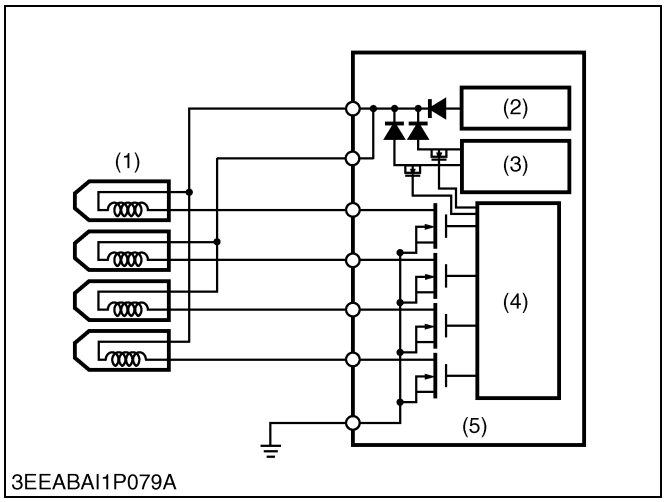
Because of the control chamber internal pressure drops, the pressure on the nozzle needle overcomes the force pressing down, the nozzle needle is pushed up, and injection starts. When fuel leaks from the control chamber, the flow quantity is restricted by the orifice, so the nozzle (5) opens gradually. The injection rate rises as the nozzle (5) opens. As the current continues to apply to the TWV (2), the nozzle needle eventually reaches the maximum amount of lift, which results in the maximum injection rate. Excess fuel is returned to the fuel tank through the path shown.

3) End of Injection

When TWV energization ends, the valve descends, closing the leak passage (6) from the control chamber. When the leak passage (6) closes, the fuel pressure within the control chamber instantly returns to the rail pressure, the nozzle (5) closes suddenly, and injection stops.

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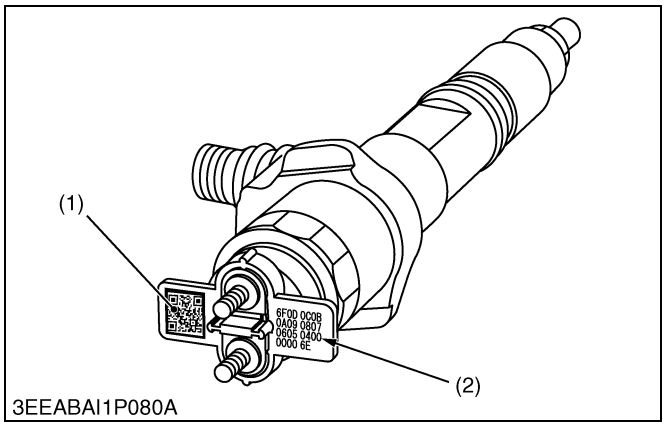
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Injector Actuation Circuit

In order to improve injector responsiveness, the actuation voltage has been changed to high voltage, speeding up both solenoid magnetization and the response of the TWV. The charge circuit in the engine ECU (5) raises each battery voltage to approximately 110 V, which is supplied to the injector (1) by signal from the engine ECU (5) to actuate the injector (1).

(1) Injector
(2) Constant Amperage Circuit
(3) High Voltage Generation Circuit
(4) Control Circuit
(5) Engine ECU

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Injector with QR Codes

QR (Quick Response) codes have been adopted to enhance correction precision. The QR code (1), which contains the correction data of the injector, is written to the engine ECU. QR codes have resulted in a substantial increase in the number of fuel injection quantity correction points, greatly improving injection quantity precision. In addition to injection quantity correction data, the QR code (1) contains the part number and the product number, which can be read at extremely high speeds.

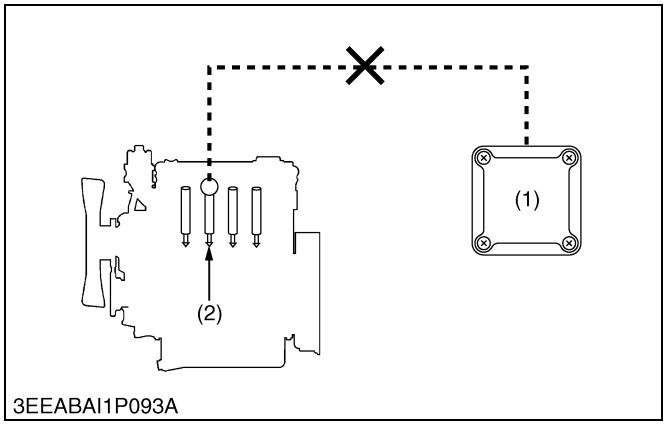
(1) QR Code
(2) ID Code

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Handling Injectors with QR Codes (Reference)

Injectors with QR codes have the engine ECU recognize and correct the injectors, so when an injector or the engine ECU is replaced, it is necessary to register the injector's ID code in the engine ECU.

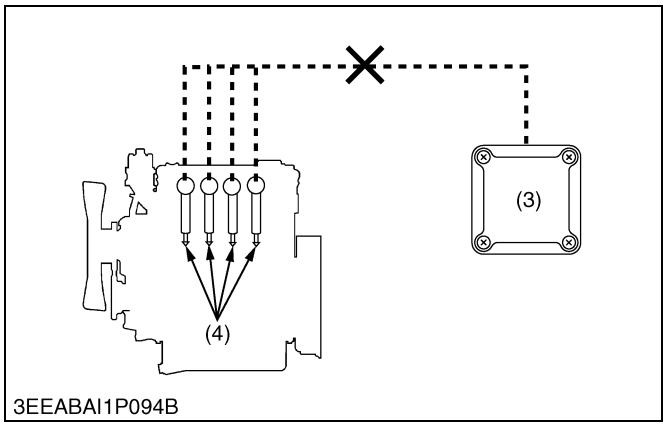


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1) Replacing the Injector

Engine ECU (1) cannot recognize the spare injector (2) electrically.

It is necessary to register the ID code of the spare injector (2) that has been replaced in the engine ECU (1).



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2) Replacing the Engine ECU

Spare engine ECU (3) cannot recognize the vehicle-side injectors (4) electrically.

It is necessary to register the ID codes of all the vehicle injectors (4) in the spare engine ECU (3).

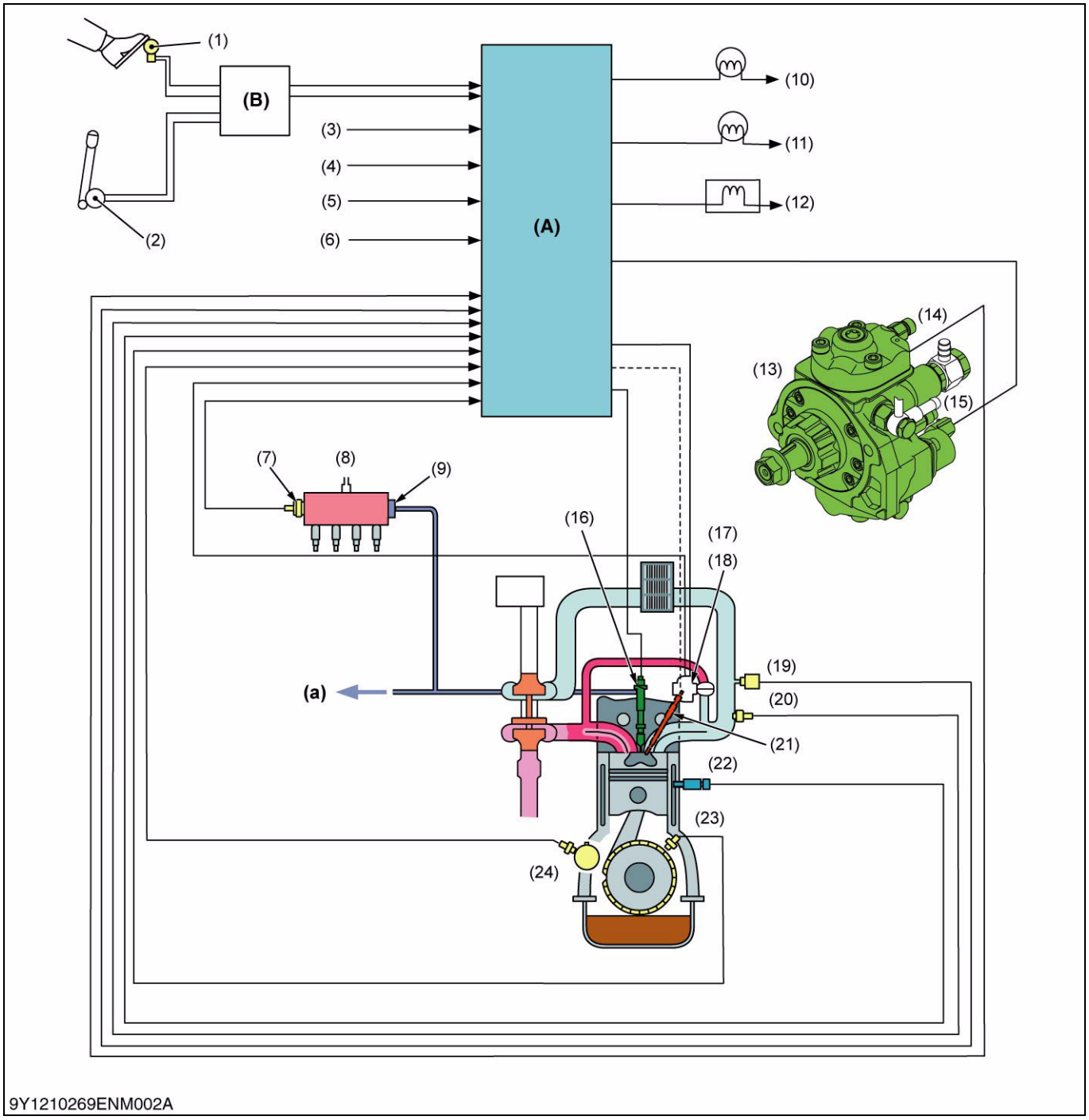
(1) Engine ECU
(2) Spare Injector
(3) Spare Engine ECU
(4) Vehicle-side Injectors

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[5] ENGINE CONTROL SYSTEM

(1) Engine Control System Diagram

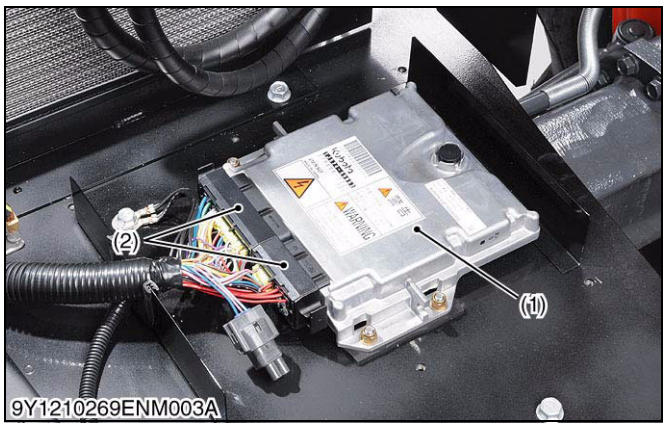


(1) Foot Throttle Sensor
(2) Hand Throttle Sensor
(3) Key Switch On Signal
(4) Starter Switch Signal
(5) Vehicle Speed Signal
(6) Neutral Switch Signal
(7) Rail Pressure Sensor
(8) Rail
(9) Pressure Limiter
(10) Engine Warning Light
(11) Glow Lamp
(12) Glow Relay
(13) Supply Pump
(14) Fuel Temperature Sensor
(15) Suction Control Valve
(16) Injector
(17) EGR DC Motor
(18) EGR Lift Sensor
(19) Intake Air Pressure Sensor
(20) Intake Air Temperature Sensor
(21) Glow Plug
(22) Coolant Temperature Sensor
(23) Crankshaft Position Sensor
(24) Camshaft Position Sensor
(A) ENGINE ECU
(B) MAIN ECU
(a) To Fuel Tank

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(2) Engine ECU (Electronic Control Unit)



The engine ECU constantly ascertains the status of the engine through signals from the sensors, calculates fuel injection quantities etc. appropriate to the conditions, actuates the actuators, and controls to keep the engine in an optimal state.

The injectors are actuated by the charge circuit in the engine ECU. The charge circuit is provided to enable high-speed actuation of the injectors. The charge circuit has a high-voltage generation device (DC/DC converter) and supplies high voltage to the injectors to actuate the injectors at high speed.

The engine ECU also has a diagnosis function for recording system troubles.

■ Fuel Injection Control

This system effects more appropriate control of the fuel injection quantity and injection timing than the mechanical governor or timer used in the conventional injection pump. The engine ECU performs the necessary calculations based on the signals that are received from the sensors located on the engine and the tractor.

Then, the engine ECU controls the timing and duration of the current that is applied to the injectors in order to obtain optimal injection timing and injection quantity.

■ Various Types of Fuel Injection Control Functions

1) Fuel Injection Quantity Control

This control replaces the function of the governor in the conventional injection pump. It achieves optimal injection quantity by effecting control in accordance with the engine speed and accelerator opening signals.

2) Fuel Injection Timing Control

This control replaces the function of the timer in the conventional injection pump. It achieves optimal injection timing by effecting control in accordance with the engine speed and the injection quantity.

3) Fuel Injection Rate Control (Pilot Injection Control)

This function controls the ratio of the fuel quantity that is injected from the orifice of the injector within a given unit of time.

4) Fuel Injection Pressure Control

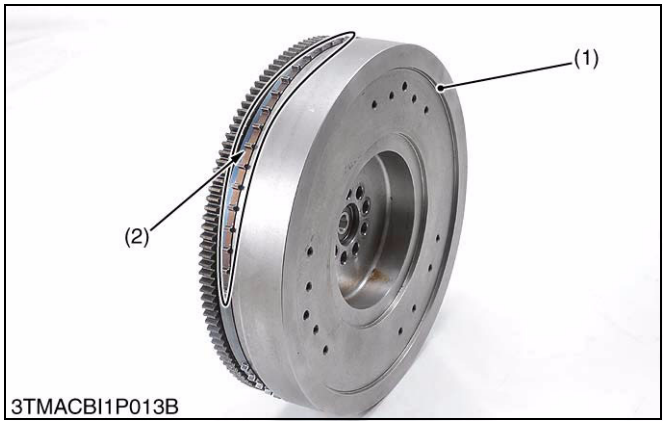
This control uses the rail pressure sensor to measure the fuel pressure, and it feeds this data to the engine ECU in order to control the pump discharge quantity.

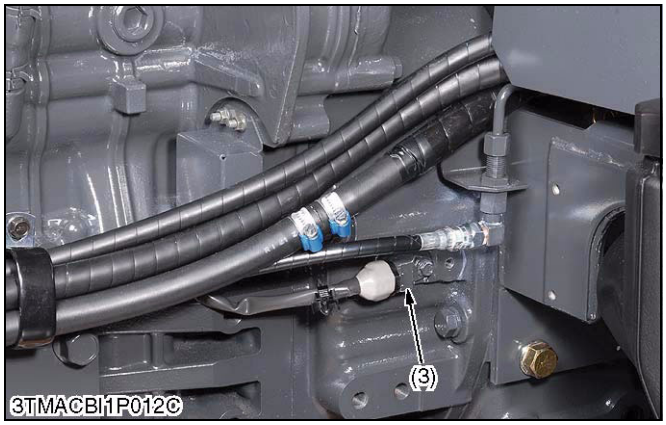
(1) Engine ECU (Electronic Control Unit) (2) ECU Connector

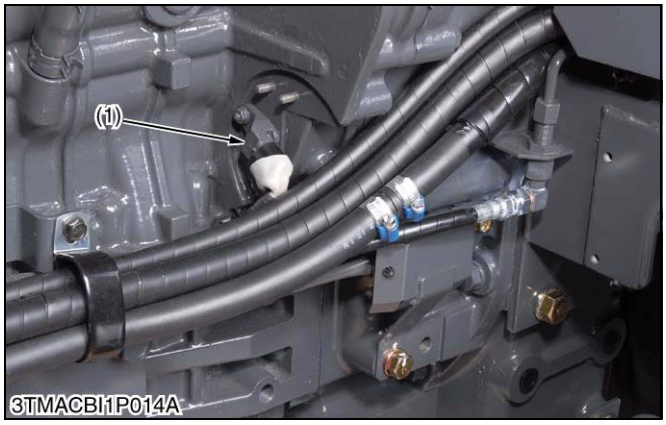
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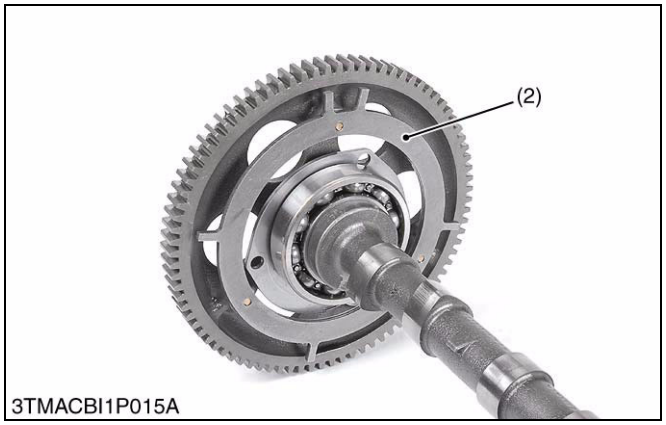
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(3) Sensors









Crankshaft Position Sensor (Engine Speed Sensor)

The crankshaft position sensor (3) is installed near the flywheel pulsar gear (2) on the flywheel (1) and detects the crankshaft angle and outputs the engine speed signal.

The sensor unit is a MRE (magnetic resistance element) type. For the MRE type, when the pulsar passes the sensor, the magnetic resistance changes and the voltage passing through the sensor changes. This change in voltage is amplified by the internal IC circuit and output to the engine ECU.

The number of pulses for the pulsar gear is 56.

(1) Flywheel
(2) Flywheel Pulsar Gear
(3) Crankshaft Position Sensor

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Camshaft Position Sensor (G Sensor)

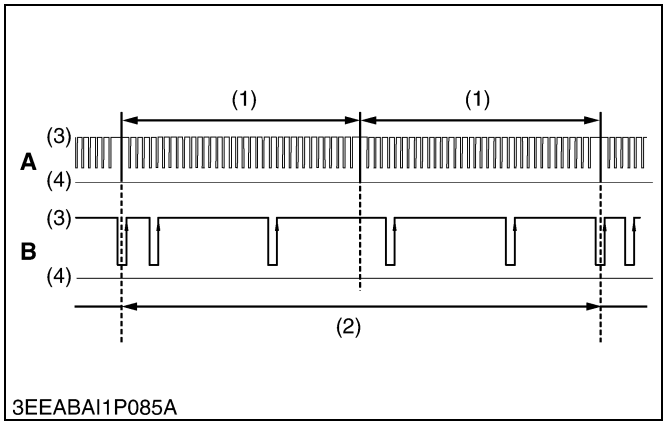
The camshaft position sensor (1) is installed near the camshaft pulsar gear (2) and identifies the cylinders. Sensor unit construction consists of the MRE type, which is the same as for the crankshaft position sensor.

The number of pulses for the pulsar gear is 5.

(1) Camshaft Position Sensor
(2) Camshaft Pulsar Gear

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This figure shows the pulse chart of the crankshaft position sensor output signal and camshaft position sensor output signal.

The camshaft pulsar gear rotates once when the crankshaft pulsar gear rotates twice (12.56 rad (720 °) crank angle).

There is a gearless section in the crankshaft pulsar gear. The ECU determines whether it is TDC if the camshaft position sensor signal is detected while the crankshaft position sensor is passing this gearless section.

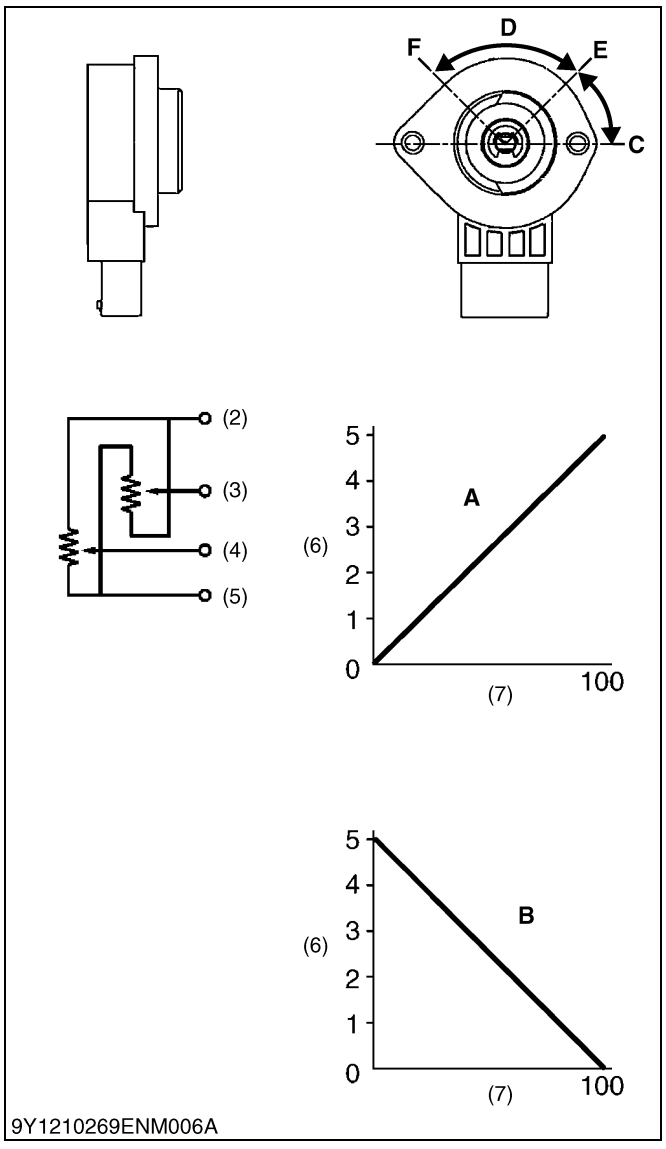
(1) 56 Pulses (6.28 rad (360 °) crank angle)
(2) 5 Pulses (12.56 rad (720 °) crank angle)
(3) 5 V
(4) 0 V

A: Crankshaft Position Sensor Output Voltage
B: Camshaft Position Sensor Output Voltage

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Foot Throttle Sensor

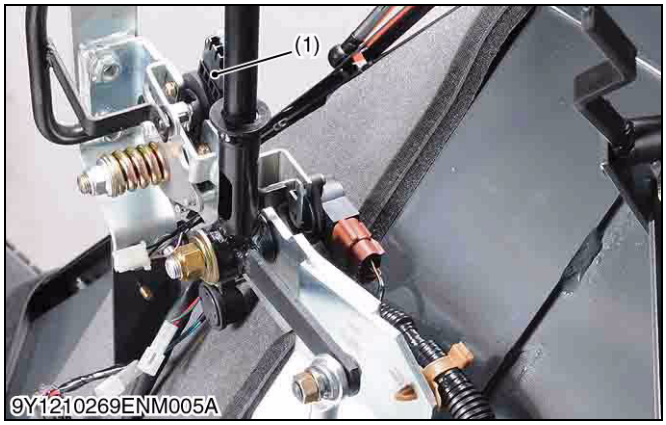
The foot throttle sensor (1) detects the opening angle of the accelerator pedal and converts the accelerator opening angle into an electric signal and outputs it to the main ECU.

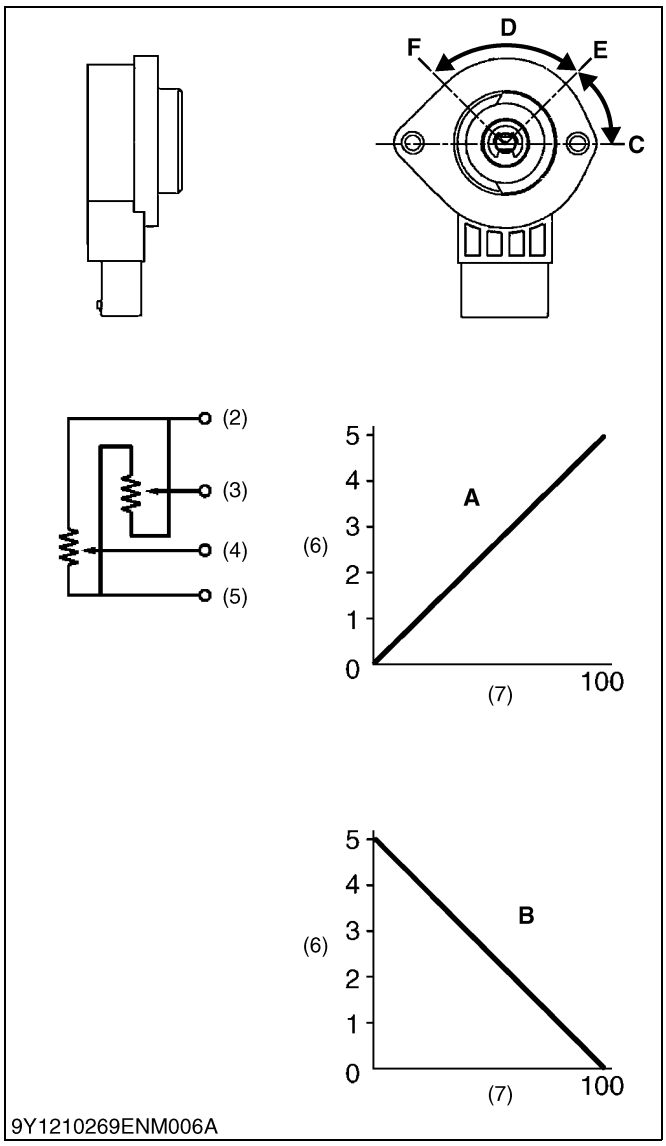
(1) Foot Throttle Sensor
(2) DC5V
(3) Sub Output Voltage
(4) Main Output Voltage
(5) GND
(6) Output Voltage (V)
(7) Ratio of Electrical Effective Angle (%)

A: Main Output Voltage – Operating Characteristic
B: Sub Output Voltage – Operating Characteristic
C: 0.79 rad (45 °)
D: 1.57 rad (90 °)
E: Ratio of Electrical Effective Angle 0 %
F: Ratio of Electrical Effective Angle 100 %

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Hand Throttle Sensor

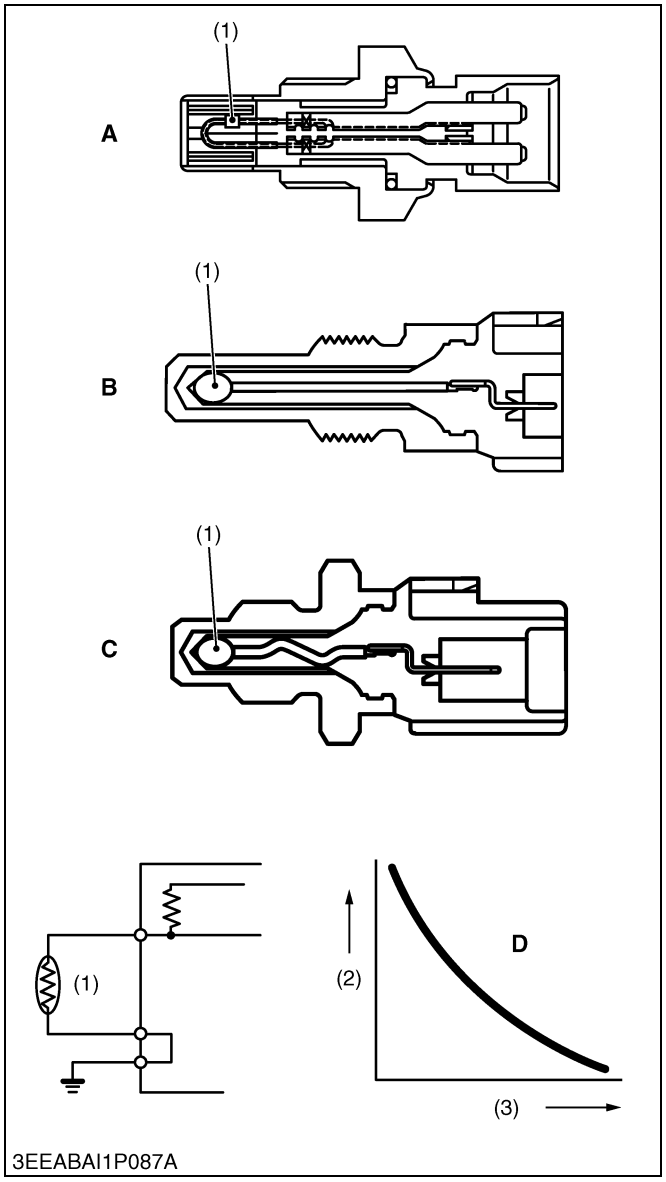
The hand throttle sensor (1) detects the opening angle of the accelerator pedal and converts the accelerator opening angle into an electric signal and outputs it to the main ECU.

(1) Hand Throttle Sensor
(2) DC5V
(3) Sub Output Voltage
(4) Main Output Voltage
(5) GND
(6) Output Voltage (V)
(7) Ratio of Electrical Effective Angle (%)

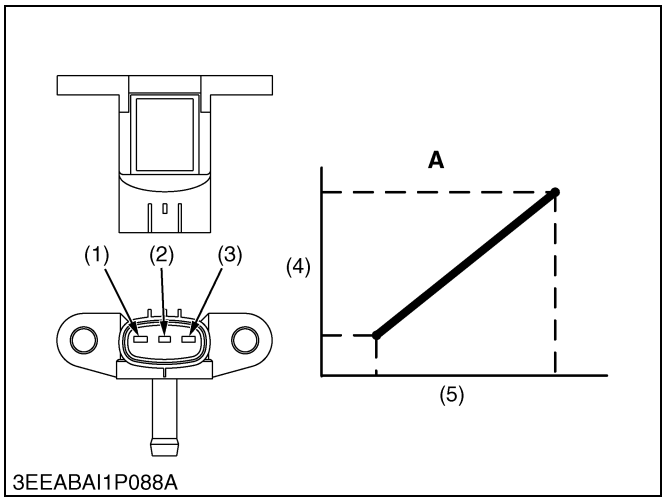
A: Main Output Voltage – Operating Characteristic
B: Sub Output Voltage – Operating Characteristic
C: 0.79 rad (45 °)
D: 1.57 rad (90 °)
E: Ratio of Electrical Effective Angle 0 %
F: Ratio of Electrical Effective Angle 100 %

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■ **Intake Air Temperature Sensor**

The intake air temperature sensor **"A"** detects the temperature of the intake air after it has passed the turbocharger. The sensor portion that detects the temperature contains a thermistor (1). The thermistor (1), which has an electrical resistance that changes with temperature, is used to detect the intake air temperature.

■ **Coolant Temperature Sensor**

The coolant temperature sensor **"B"** is installed near the thermostat and detects the engine coolant temperature. This sensor is a thermistor (1) type.

■ **Fuel Temperature Sensor**

The fuel temperature sensor **"C"** is installed on the fuel intake side of supply pump and utilizes the characteristics of a thermistor (1) in which the electric resistance changes with the temperature in order to detect the fuel temperature.

(1) Thermistor
(2) Resistance Value
(3) Temperature

A: Intake Air Temperature Sensor
B: Coolant Temperature Sensor
C: Fuel Temperature Sensor
D: Resistance – Temperature Characteristic

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Intake Air Pressure Sensor

This sensor is a semiconductor type sensor. It measures intake air pressure utilizing the piezoelectric effect that when the pressure on the silicon element in the sensor changes, its electrical resistance changes.

(1) Vcc
(2) Output
(3) GND
(4) Output Voltage
(5) Absolute Pressure

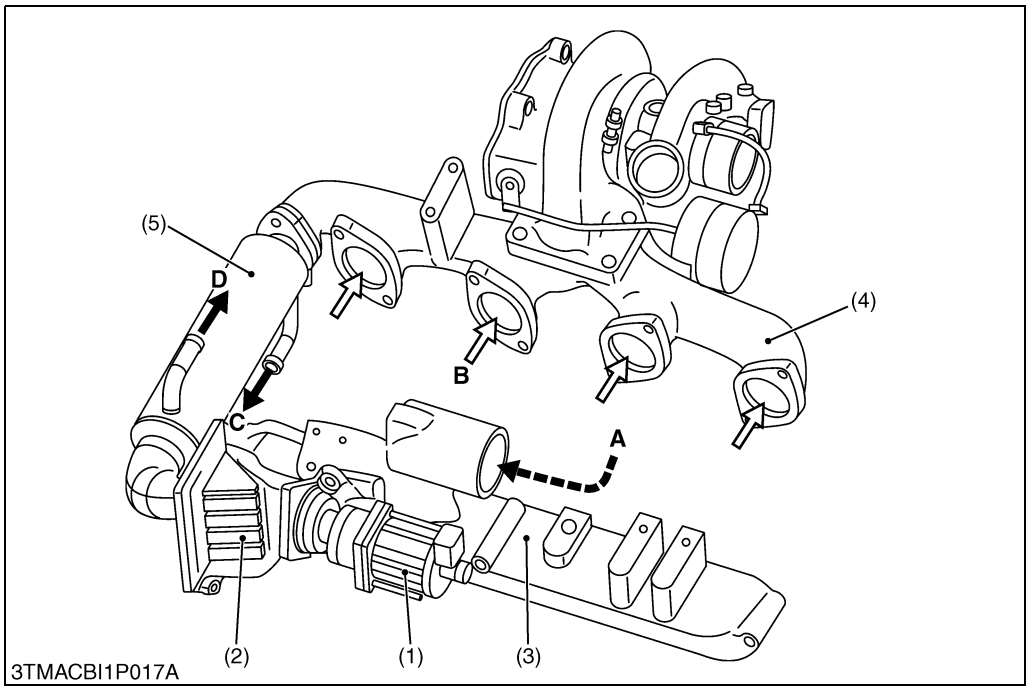
A: Output Voltage – Pressure Characteristic

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7. EXHAUST GAS RECIRCULATION (EGR) SYSTEM

[1] GENERAL



(1) EGR Valve
(2) Reed Valve
(3) Intake Manifold
(4) Exhaust manifold
(5) EGR Cooler

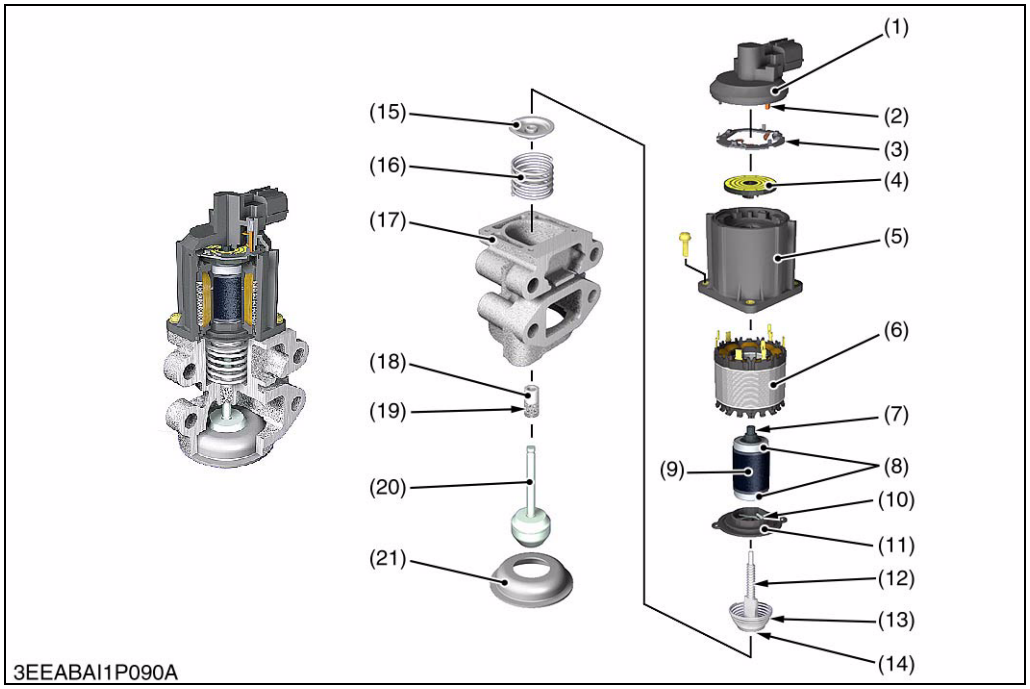
A: Intake Air
B: Exhaust Gas
C: Coolant Inlet Port
D: Coolant Outlet Port

In order to meet with the strict emission regulations, KUBOTA has adopted the EGR on the V6108-CR-TI. The nitrogen oxide (NOx) which is a hazardous component in exhaust gas is generated by oxidation of nitrogen in the air, due to rise of the combustion temperature in engine combustion chambers. The EGR is a system in which the exhaust gas with lean oxygen is cooled and returned to engine combustion chambers again in order to lower the combustion temperature. As a result, NOx can be decreased.

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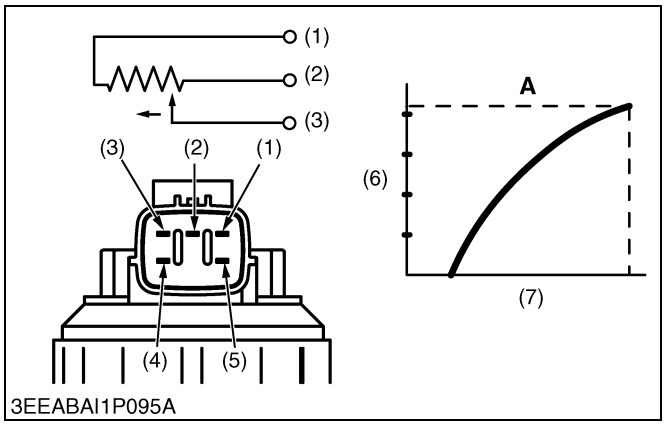
[2] EGR VALVE

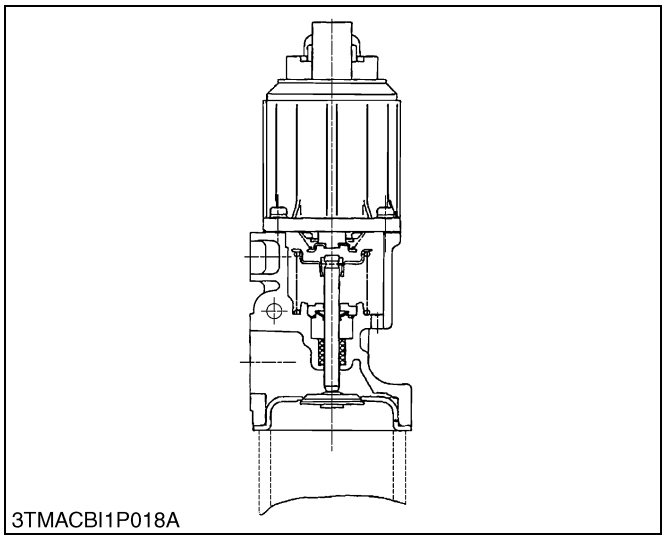


(1) Position Sensor
(2) Brush
(3) Circuit Sensor
(4) Commutator
(5) Motor Exterior
(6) Poki Poki Core
(7) Rotor
(8) Bearing
(9) Magnet
(10) Washer
(11) Boss
(12) Shaft
(13) Assist Spring
(14) Spring Holder
(15) Spring Holder
(16) Spring
(17) Housing
(18) Bush
(19) Filter
(20) Valve Assembly
(21) Valve Sheet

The motor incorporated in the EGR valve is a brush type DC motor (magnet rotating type brush motor) having the commutator which determines the power distribution pattern in accordance with rotation of the magnet, and is driven by switching over the conducting pattern of the coil that is arranged at the circumference. By adopting the DC motor, the rapid response and high driving force under the condition of large pressure difference is assured.

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EGR Valve Lift Sensor

The opening position detecting method of this EGR valve is used for detecting the movement of the motor shaft by means of the contact-type position sensor. The motor shaft engages with the female screw inside the rotating magnet, and it performs amplification of motor torque and conversion to translation motion by means of the screw type speed reduction mechanism.

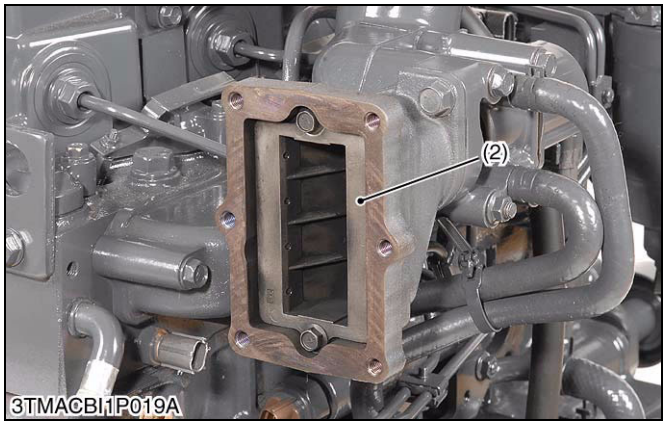
(1) Terminal Vcc
(2) Terminal GND
(3) Terminal Vout
(4) Terminal EGR DC Motor −
(5) Terminal EGR DC Motor +
(6) Exhaust Gas Flow
(7) Output Voltage

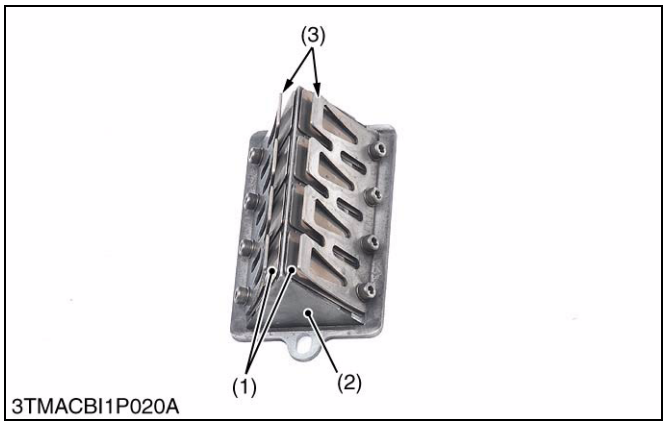
A: Exhaust Gas Flow-Output Voltage Characteristic

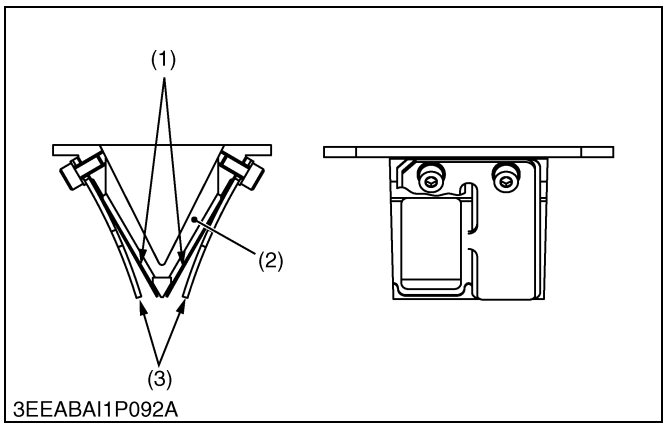
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[3] REED VALVE







The reed valve is provided at the confluence of exhaust gas after passing the EGR valve, and intake air. It operates by the pressure difference between inside of the crankcase and the atmosphere, and prevents backflow of the mixture of exhaust gas and intake air generated by the piston and valves. It is used as the secondary air introduction device for the countermeasure against exhaust gas of four-cycle engines.

(1) Valve
(2) Case
(3) Stopper
(4) Screw

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SERVICING

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1. TROUBLESHOOTING

■ **NOTE**

- **This troubleshooting shows only mechanical failures. Regarding the failures of common rail system (CRS), please refer to the diagnosis manual "COMMON RAIL SYSTEM ENGINE".**

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Start	No fuel	Fill	–
	Air in the fuel system	Bleed	G-40
	Water in the fuel system	Drain the water in fuel system	G-33
	Fuel pump malfunctioning	Replace	G-33
	Fuel hose clogged	Clean or replace	G-27
	Fuel filter clogged	Replace	G-32
	Excessively high viscosity of fuel or engine oil at low temperature	Use specified fuel or engine oil	G-10
	Fuel with low cetane number	Use specified fuel	G-10
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S28
	Injector clogged	Replace	1-S31
	Supply pump malfunctioning	Replace	1-S26
	Seizure of crankshaft, camshaft, piston, cylinder or bearing	Repair or replace	1-S57 1-S62 1-S63 1-S66
	Compression leak from cylinder	Replace head gasket, tighten cylinder head screw	1-S11 1-S48
	Improper valve timing	Correct or replace timing gear	1-S44 1-S55
	Piston ring and cylinder worn	Replace	1-S47 1-S62 1-S66
	Excessive valve clearance	Adjust	1-S12
Starter Does Not Run	Battery discharged	Charge or replace	G-24
	Starter malfunctioning	Repair or replace	9-S92
	Main key switch malfunctioning	Replace	9-S87
	Wiring disconnected	Connect	–

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Symptom	Probable Cause	Solution	Reference Page
Engine Revolution is Not Smooth	Fuel filter clogged or dirty	Replace	G-32
	Air cleaner clogged	Clean or replace	G-25
	Fuel leak due to loose injection pipe retaining nut	Tighten retaining nut	1-S28
	Supply pump malfunctioning	Repair or replace	1-S26
	Injector stuck or clogged	Replace	1-S31
	Turbocharger bearing worn out	Replace the turbocharger assembly	1-S24
	Turbocharger shaft bent	Replace the turbocharger assembly	1-S24
	Turbocharger fin or other part damaged due to foreign matter	Replace the turbocharger assembly	1-S24
Either White or Blue Exhaust Gas is Observed	Excessive engine oil	Reduce to specified level	G-20
	Piston ring and cylinder worn or stuck	Repair or replace	1-S47 1-S62 1-S66
Oil Leak into Exhaust Pipe or Suction Pipe	Waste oil pipe clogged or deformed	Repair or replace	–
	Turbocharger's piston ring seal faulty	Replace the turbocharger assembly	1-S24
Either Black or Dark Gray Exhaust Gas is Observed	Overload	Reduce the load	–
	Low grade fuel used	Use specified fuel	G-10
	Fuel filter clogged	Replace	G-32
	Air cleaner clogged	Clean or replace	G-25
	Deficient injection	Repair or replace injector	1-S31
Deficient Output	Engine's moving parts seem to be seizing	Repair or replace	–
	Supply pump malfunctioning	Repair or replace	1-S26
	Deficient injection	Replace injector	1-S31
	Compression leak	Check the compression and repair	1-S11 1-S48
	Gas leak from exhaust system	Repair or replace	1-S15 1-S24
	Air leak from compressor discharge side	Repair or replace	1-S15 1-S24
	Air cleaner dirty or clogged	Clean or replace	G-25
	Compressor wheel does not turn freely	Replace the turbocharger assembly	1-S24

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Symptom	Probable Cause	Solution	Reference Page
Excessive Engine Oil Consumption	Piston ring's gap facing the same direction	Shift ring gap direction	1-S61
	Oil ring worn or stuck	Replace	1-S47
	Piston ring groove worn	Replace piston	1-S46
	Valve stem and valve guide worn	Replace	1-S51
	Crankshaft bearing and crank pin bearing worn	Replace	1-S64
	Oil leaking due to defective seals or packing	Replace	–
Fuel Mixed into Engine Oil	Deficient injection	Replace injector	1-S31
	Fuel leak from overflow pipe inside of cylinder head cover	Replace the gasket	–
Water Mixed into Engine Oil	Head gasket defective	Replace	1-S34
	Cylinder block or cylinder head flawed	Replace	1-S33
Low Oil Pressure	Engine oil insufficient	Fill	G-20
	Oil strainer clogged	Clean	1-S45
	Relief valve stuck with foreign matter	Clean	1-S37
	Relief valve spring weak or broken	Replace	1-S37
	Excessive oil clearance of crankshaft bearing	Replace	1-S65
	Excessive oil clearance of crankpin bearing	Replace	1-S64
	Excessive oil clearance of rocker arm	Replace	1-S53
	Oil passage clogged	Clean	–
	Different type of oil	Use specified type of oil	G-10
	Oil pump defective	Replace	1-S67
High Oil Pressure	Different type of oil	Use specified oil	G-10
	Relief valve defective	Replace	1-S37
Engine Overheated	Engine oil level insufficient	Fill	G-20
	Fan belt broken or elongated	Replace or adjust	G-32
	Coolant level insufficient	Fill	G-37
	Radiator net and radiator fin clogged with dust	Clean	–
	Inside of radiator corroded	Clean or replace	–
	Coolant flow route corroded	Clean or replace	G-37
	Radiator cap defective	Replace	1-S14
	Overload running	Reduce the load	–
	Head gasket defective	Replace	1-S34
	Unsuitable fuel used	Use specified fuel	G-10

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2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Cylinder Head Surface	Flatness	–	0.05 mm 0.002 in.
Top Clearance		0.70 to 0.90 mm 0.0276 to 0.0354 in.	–
Compression		3.2 MPa / 140 min^{-1} (rpm) 33.0 kgf/cm^2 / 140 min^{-1} (rpm) 460 psi / 140 min^{-1} (rpm)	2.4 MPa / 140 min^{-1} (rpm) 24.0 kgf/cm^2 / 140 min^{-1} (rpm) 350 psi / 140 min^{-1} (rpm)
Variance Among Cylinders		–	10 % or less
Valve Seat	Angle (Intake)	1.0 rad 60 °	–
	Angle (Exhaust)	0.79 rad 45 °	–
	Width (Intake)	3.3 to 3.4 mm 0.130 to 0.133 in.	–
	Width (Exhaust)	3.2 to 3.3 mm 0.126 to 0.129 in.	–
Valve Face	Angle (Intake)	1.0 rad 60 °	–
	Angle (Exhaust)	0.79 rad 45 °	–
Valve Recessing	Intake	0.80 to 1.20 mm 0.0315 to 0.0472 in.	1.4 mm 0.0551 in.
	Exhaust	0.70 to 1.10 mm 0.0276 to 0.0433 in.	–
Valve Stem to Valve Guide	Clearance (Intake and Exhaust)	0.040 to 0.070 mm 0.0016 to 0.0027 in.	0.1 mm 0.0039 in.
• Valve Stem	O.D. (Intake and Exhaust)	7.960 to 7.975 mm 0.3134 to 0.3139 in.	–
• Valve Guide	I.D. (Intake and Exhaust)	8.015 to 8.030 mm 0.3156 to 0.3161 in.	–
Valve Clearance (Cold)		0.23 to 0.27 mm 0.0091 to 0.010 in.	–
Intake Valve Timing	Open	0.24 rad (14 °) before T.D.C.	–
	Close	0.63 rad (36 °) after B.D.C.	–

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Item		Factory Specification	Allowable Limit
Exhaust Valve Timing	Open	0.94 rad (54 °) before B.D.C.	–
	Close	0.24 rad (14 °) after T.D.C.	–
Valve Spring	Free Length (Intake and Exhaust)	41.93 to 42.20 mm 1.651 to 1.661 in.	41.2 mm 1.661 in.
	Tilt	–	1.0 mm 0.039 in.
Valve Spring	Setting Load / Setting Length (Intake and Exhaust)	118 N / 35.0 mm 12.0 kgf / 35.0 mm 26.5 lbf / 1.38 in.	100 N / 35.0 mm 10.2 kgf / 35.0 mm 22.5 lbf / 1.38 in.
Rocker Arm Shaft to Rocker Arm	Clearance	0.016 to 0.045 mm 0.0006 to 0.0018 in.	0.15 mm 0.0059 in.
• Rocker Arm Shaft	O.D.	17.9730 to 17.9840 mm 0.70760 to 0.70803 in.	–
• Rocker Arm	I.D.	18.000 to 18.018 mm 0.70867 to 0.70937 in.	–
Valve Arm Bridge and Valve Arm Bridge Shaft	Clearance	0.018 to 0.042 mm 0.0007 to 0.0016 in.	0.15 mm 0.0059 in.
• Valve Arm Bridge	I.D.	9.050 to 9.065 mm 0.3563 to 0.3568 in.	–
• Valve Arm Bridge Shaft	O.D.	9.023 to 9.032 mm 0.3553 to 0.3555 in.	–
Push Rod	Alignment	–	0.25 mm 0.0098 in.
Tappet to Tappet Guide	Clearance	0.032 to 0.061 mm 0.0013 to 0.0024 in.	0.07 mm 0.003 in.
• Tappet Guide Bore	I.D.	14.000 to 14.018 mm 0.55119 to 0.55188 in.	–
• Tappet	O.D.	13.957 to 13.968 mm 0.54949 to 0.54992 in.	–
Camshaft	Side Clearance	–	0.1 mm 0.0039 in.
	Alignment	–	0.01 mm 0.00039 in.
Cam Height	Intake	40.70 mm 1.6024 in.	40.20 mm 1.5827 in.
	Exhaust	42.20 mm 1.6614 in.	39.70 mm 1.5630 in.

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Item		Factory Specification	Allowable Limit
Camshaft	Oil Clearance	0.050 to 0.091 mm 0.0020 to 0.0035 in.	0.15 mm 0.0059 in.
• Camshaft Journal 1	O.D.	39.934 to 39.950 mm 1.5722 to 1.5728 in.	–
• Camshaft Block Bore 1	I.D.	40.000 to 40.025 mm 1.5748 to 1.5757 in.	–
• Camshaft Journal 2	O.D.	49.934 to 49.950 mm 1.9659 to 1.9665 in.	–
• Camshaft Block Bore 2	I.D.	50.000 to 50.025 mm 1.9685 to 1.9694 in.	–
Timing Gear • Crank Gear to Cam Gear	Backlash	0.031 to 0.123 mm 0.00122 to 0.00484 in.	0.22 mm 0.0087 in.
• Cam Gear to Balancer 1 Gear	Backlash	0.031 to 0.123 mm 0.00122 to 0.00484 in.	0.22 mm 0.0087 in.
• Cam Gear to Idle Gear	Backlash	0.031 to 0.123 mm 0.00122 to 0.00484 in.	0.22 mm 0.0087 in.
• Idle Gear to Supply Pump Gear	Backlash	0.030 to 0.123 mm 0.00119 to 0.00484 in.	0.22 mm 0.0087 in.
• Idle Gear to Balancer 2 Gear	Backlash	0.030 to 0.123 mm 0.00119 to 0.00484 in.	0.22 mm 0.0087 in.
Idle Gear Shaft 1, 2 to Idle Gear 1, 2 Bushing	Oil Clearance	0.050 to 0.091 mm 0.0020 to 0.0036 in.	0.10 mm 0.0039 in.
• Idle Gear 1, 2 Bushing	I.D.	45.025 to 45.050 mm 1.7727 to 1.7736 in.	–
• Idle Gear 1, 2 Shaft	O.D.	44.959 to 44.975 mm 1.7701 to 1.7706 in.	–
Idle Gear	Side Clearance	0.15 to 0.25 mm 0.0059 to 0.0098 in.	0.9 mm 0.0354 in.
Balancer Shaft 1, 2	Side Clearance	0.070 to 0.215 mm 0.00276 to 0.00846 in.	0.3 mm 0.0118 in.
	Alignment	–	0.02 mm 0.0008 in.
Balancer Shaft 1, 2	Oil Clearance	0.0700 to 0.159 mm 0.00276 to 0.00625 in.	0.2 mm 0.0079 in.
• Balancer Shaft 1, 2 Journal	O.D.	54.921 to 54.940 mm 2.1623 to 2.1629 in.	–
• Balancer Shaft 1, 2 Bearing	I.D.	55.010 to 55.080 mm 2.1658 to 2.1685 in.	–
Piston Pin Bore	I.D.	40.000 to 40.013 mm 1.5748 to 1.5753 in.	40.05 mm 1.5768 in.
Top Ring to Ring Groove	Clearance	0.090 to 0.130 mm 0.0035 to 0.0051 in.	0.15 mm 0.0059 in.

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Item		Factory Specification	Allowable Limit
Second Ring to Ring Groove	Clearance	0.050 to 0.090 mm 0.0020 to 0.0027 in.	0.20 mm 0.0079 in.
Oil Ring to Ring Groove	Clearance	0.030 to 0.070 mm 0.0012 to 0.0027 in.	0.15 mm 0.0059 in.
Piston Ring Gap	Top Ring	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.25 mm 0.0492 in.
	Second Ring	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.25 mm 0.0492 in.
	Oil Ring	0.20 to 0.40 mm 0.0078 to 0.0157 in.	1.25 mm 0.0492 in.
Connecting Rod	Alignment	–	0.05 mm 0.002 in.
Piston Pin to Small End Bushing	Oil Clearance	0.020 to 0.040 mm 0.0008 to 0.0016 in.	0.15 mm 0.0059 in.
• Piston Pin	O.D.	40.008 to 40.013 mm 1.5752 to 1.5753 in.	–
• Small End Bushing	I.D.	40.033 to 40.048 mm 1.5761 to 1.5766 in.	–
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.
	Alignment	–	0.20 mm 0.0008 in.
Crankshaft Journal to Crankshaft Bearing	Oil Clearance	0.030 to 0.075 mm 0.0012 to 0.0029 in.	0.20 mm 0.0079 in.
• Crankshaft Journal	O.D.	94.973 to 94.988 mm 3.7391 to 3.7396 in.	–
Crank Pin to Pin Bearing	Oil Clearance	0.018 to 0.051 mm 0.0007 to 0.0020 in.	0.20 mm 0.0079 in.
• Crank Pin	O.D.	69.977 to 69.990 mm 2.7550 to 2.7555 in.	–
Cylinder Bore	I.D.	118.000 to 118.035 mm 4.6456 to 4.6470 in.	118.15 mm 4.6516 in.
Cylinder Bore (Oversize)	I.D.	118.500 to 118.535 mm 4.6653 to 4.6667 in.	118.65 mm 4.6713 in.

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LUBRICATING SYSTEM

Item		Factory Specification	Allowable Limit
Engine Oil Pressure	At Idle Speed	–	50 kPa 0.5 kgf/cm^2 7 psi
	At Rated Speed	200 to 390 kPa 2.0 to 4.0 kgf/cm^2 29 to 56 psi	150 kPa 1.5 kgf/cm^2 21 psi
Inner Rotor to Outer Rotor	Clearance	0.030 to 0.090 mm 0.0012 to 0.0035 in.	0.3 mm 0.0118 in.
Outer Rotor to Pump Body	Clearance	0.100 to 0.184 mm 0.00394 to 0.00724 in.	0.3 mm 0.0118 in.
Inner Rotor to Cover	Clearance	0.025 to 0.075 mm 0.00099 to 0.0029 in.	0.225 mm 0.0089 in.

COOLING SYSTEM

Item		Factory Specification	Allowable Limit
Thermostat	Valve Opening Temperature	80 to 84 °C 176.0 to 183.2 °F	–
	Valve Opening Temperature (Opened Completely)	95 °C 203 °F	–
Radiator	Water Tightness	137 kPa 1.4 kgf/cm^2 20 psi	–
Radiator Cap	Air Leakage	More than 10 seconds for pressure fall from 88 to 59 kPa (from 0.9 to 0.6 kgf/cm^2 from 13 to 9 psi)	–
Fan Belt	Tension	9 to 11 mm / 98 N 0.36 to 0.43 in. / 98 N (10 kgf, 22 lbf)	–

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3. TIGHTENING TORQUES

Tightening torque of screws, bolts and nuts on the table below are especially specified.
(For general screws, bolts and nuts: See page G-13.)

Item	N·m	kgf·m	lbf·ft
Glow lead mounting nut	1.0 to 1.8	0.10 to 0.18	0.74 to 1.33
Glow plug	7.65 to 9.32	0.78 to 0.95	5.64 to 6.87
Injector clamp nut	24 to 27	2.4 to 2.8	18 to 20
Overflow pipe joint screw (M6 × 1.0)	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
Cylinder head cover 1 screw	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
Cylinder head cover 2 screw	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
Injection pipe retaining nut	23 to 36	2.3 to 3.7	17 to 26
Oil switch taper screw	15 to 19	1.5 to 2.0	11 to 14
Muffler mounting screw	24 to 27	2.4 to 2.8	18 to 20
Power steering hose retaining nut	21.6 to 27.4	2.2 to 2.8	16.0 to 20.2
Starter's terminal **B** mounting nut	9.8 to 11	1.0 to 1.2	7.3 to 8.6
ECU mounting screw	2.5	0.25	1.8
Front axle support mounting screw (M16, UBS)	260 to 304	26.5 to 31.0	192 to 224
Fan belt tension adjusting screw	Below 15	Below 1.53	Below 11.1
Fan belt tension adjusting screw lock nut	123.6 to 147	12.6 to 15.0	91.2 to 108.4
Engine and clutch housing mounting screw and nut (Standard)	124 to 147	12.6 to 15.0	91.2 to 108
Engine and clutch housing mounting nut (Wide)	167 to 196	17.0 to 20.0	123 to 144
Engine and clutch housing mounting stud bolt	39 to 45	3.9 to 4.6	29 to 33
Joint bolt for oil pipe	15.7 to 19.6	1.6 to 2.0	11.6 to 14.4
Turbocharger mounting nut	49.1 to 68.6	5.0 to 5.7	36.2 to 50.6
Supply pump base mounting nut	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Supply pump gear mounting nut	59 to 68	6.0 to 7.0	44 to 50
Injection pipe retaining nut	23 to 36	2.3 to 3.7	17 to 26
Overflow pipe joint screw (M10) (Rail side)	16 to 19	1.6 to 2.0	12 to 14
Overflow pipe joint screw (M10) (Supply pump side)	7.0 to 12	0.80 to 1.3	5.8 to 9.4
Supply pump mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Common rail mounting nut	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Injection pipe retaining nut	23 to 36	2.3 to 3.7	17 to 26
Coolant temperature sensor	15.7 to 19.6	1.6 to 2.0	11.6 to 14.4
Intake air temperature sensor	30 to 39	3.0 to 4.0	22 to 28
Camshaft and crankshaft position sensor mounting screw	4 to 6	0.4 to 0.6	3 to 4
Injector clamp nut	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Overflow pipe joint screw (M6 × 1.0)	9.81 to 11.2	1.0 to 1.15	7.24 to 8.31
Rocker arm bracket mounting screw and nut	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Cylinder head mounting screw	138 to 147	14.0 to 15.0	102 to 108
Tension pulley mounting screw	55.0 to 59.8	5.6 to 6.1	40.5 to 44.1
Water pump mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Oil cooler joint screw	39.2 to 44.1	4.0 to 4.5	28.9 to32.5

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Item	N·m	kgf·m	lbf·ft
Front cover mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Fan drive pulley mounting screw	255 to 274	26 to 28	188 to 202
Relief valve retaining screw	68.6 to 78.4	7.0 to 8.0	50.6 to 57.9
Oil pump cover mounting screw	7.65 to 9.12	0.78 to 0.93	5.65 to 6.72
Flywheel mounting screw	138 to 147	14.0 to 15.0	102 to 108
Crankshaft position sensor mounting screw	4.0 to 5.8	0.4 to 0.6	2.9 to 4.3
Flywheel housing mounting screw	103.0 to 117.6	10.5 to 12.0	76.0 to 86.7
Oil pan mounting screw	29.5 to 34.3	3.0 to 3.5	21.7 to 25.3
Connecting rod screw	138 to 147	14.0 to 15.0	102 to 108
Crankcase 2 mounting screw (M12)	103 to 117	10.5 to 12.0	76.0 to 86.7
Crankcase 2 mounting screw 2 (CC1 and CC2)	197 to 205	20.0 to 21.0	145 to 157
Camshaft mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Idle gear mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Balancer shaft mounting screw	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2

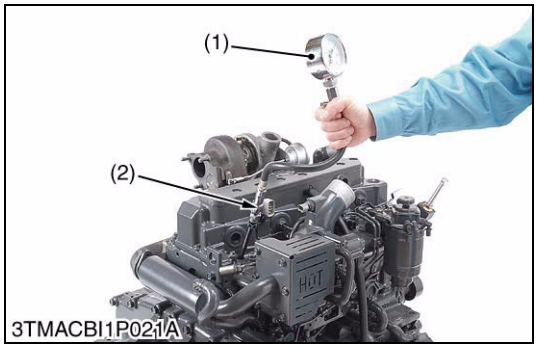
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4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Engine Body



Compression Pressure

1. After warming up the engine, shut it down and remove the air cleaner, the muffler, breather tube, glow lead and all glow plugs.
2. Install a compression tester (1) (Code No: 07909-30208) and glow plug adaptor (2) to glow plug hole. (Refer to "8. SPECIAL TOOLS" at "GENERAL" section.)
3. After making sure that the stop lever is set at the stop position (Non-injection), run the engine at 140 min^{-1} (rpm) with the starter.
4. Read the maximum pressure. Measure the pressure more than twice.

■ **NOTE**

- **Check the compression pressure with the specified valve clearance.**
- **Always use a fully charged battery for performing this test.**
- **Variances in cylinder compression values should be under 10 %.**

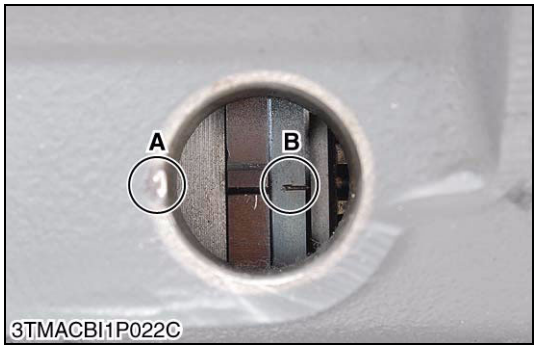
Compression pressure	Factory specification	3.2 MPa / 140 min^{-1} (rpm) 33.0 kgf/cm^2 / 140 min^{-1} (rpm) 460 psi / 140 min^{-1} (rpm)
	Allowable limit	2.4 MPa / 140 min^{-1} (rpm) 24.0 kgf/cm^2 / 140 min^{-1} (rpm) 350 psi / 140 min^{-1} (rpm)

Tightening torque	Glow lead mounting nut	1.0 to 1.8 N·m 0.10 to 0.18 kgf·m 0.74 to 1.33 lbf·ft
	Glow plug	7.65 to 9.32 N·m 0.78 to 0.95 kgf·m 5.64 to 6.87 lbf·ft

(1) Compression Tester (2) Glow Plug Adaptor

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Checking Valve Clearance

■ **IMPORTANT**

- **Valve clearance must be checked and adjusted when engine is cold.**

1. Remove the injection pipes, the cylinder head covers, overflow pipe and injectors.
2. Align the TC mark of flywheel and the convex of flywheel housing timing windows so that the first piston (front cover side) comes to the compression top dead center.
3. Loosen the lock nut of adjusting screw (push rod side) and insert the thickness gauge between the rocker arm and the bridge head. Set the adjusting screw to the specified value, then tighten the lock nut.

Valve clearance	Factory specification	0.23 to 0.27 mm 0.0091 to 0.010 in.

■ **NOTE**

- **After adjusting, tighten the lock nut (2) securely.**

Adjustment cylinder Location of piston		Valve arrangement	
		IN.	EX
When No.1 piston is at compression top dead center	1st	☆	☆
	2nd	☆	
	3rd		☆
	4th		
When No.1 piston is at overlap position	1st		
	2nd		☆
	3rd	☆	
	4th	☆	☆

Tightening torque	Injector clamp nut	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Overflow pipe joint screw (M6 × 1.0)	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Cylinder head cover 1 screw	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Cylinder head cover 2 screw	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Injection pipe retaining nut	23 to 36 N·m 2.3 to 3.7 kgf·m 17 to 26 lbf·ft

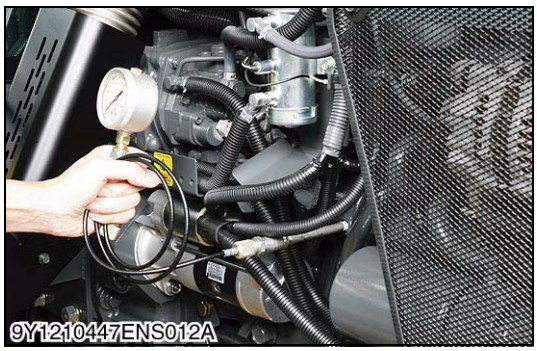
(1) Adjusting Screw
(2) Lock Nut

A: Convex
B: TC Mark of Flywheel

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(2) Lubricating System



Engine Oil Pressure

1. Remove the oil switch and set a pressure tester (Code No. 07916-32032).
2. Start the engine. After warming up, measure the oil pressure of both idling and rated speeds.
3. If the oil pressure is less than the allowable limit, check the following.
   - Engine oil level insufficient
   - Oil pump defective
   - Oil strainer clogged
   - Oil filter cartridge clogged
   - Oil gallery clogged
   - Excessive oil clearance
   - Foreign matter in the relief valve

(When reassembling)

- After checking the engine oil pressure, tighten the engine oil pressure switch to the specified torque.

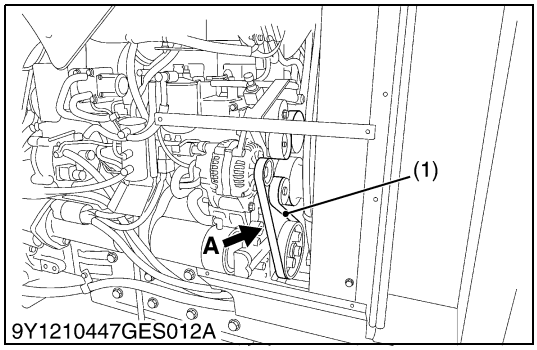
Engine oil pressure	At idle speed	Allowable limit	50 kPa 0.5 kgf/cm^2 7 psi
	At rated speed	Factory specification	200 to 390 kPa 2.0 to 4.0 kgf/cm^2 29 to 56 psi
		Allowable limit	150 kPa 1.5 kgf/cm^2 21 psi

Tightening torque	Oil switch taper screw	15 to 19 N·m 1.5 to 2.0 kgf·m 11 to 14 lbf·ft

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(3) Cooling System



Fan Belt Tension

1. Measure the deflection **"A"**, depressing the belt halfway between the fan drive pulley and alternator pulley at specified force 98 N (10 kgf, 22 lbf).
2. If the measurement is not within the factory specifications or the belt itself is found damaged, replace it with new one. (See page G-32)

Deflection **"A"**	Factory specification	9.0 to 11.0 mm 0.36 to 0.43 in.

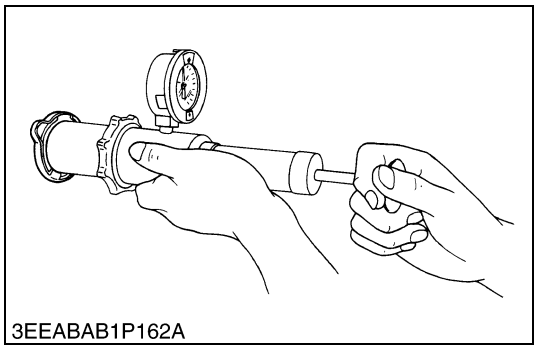
(1) Fan Belt **A: Deflection**

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CAUTION

- **When removing the radiator cap, wait at least ten minutes after the engine has stopped and cooled down. Otherwise, hot water may gush out, scalding nearby people.**

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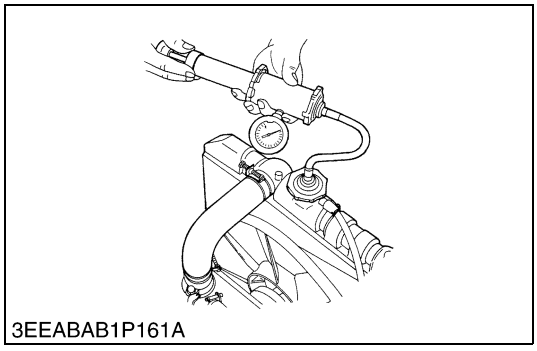


Radiator Cap Air Leakage

1. Set a radiator tester on the radiator cap.
2. Attach a radiator tester.
   Apply the specified pressure of 88 kPa (0.9 kgf/cm^2, 13 psi).
3. Check if the pressure drop to less than 59 kPa (0.6 kgf/cm^2, 9 psi) in 10 seconds.
4. If the pressure is less than the factory specification, replace it.

Pressure falling time	Factory specification	More than 10 seconds for pressure fall from 88 to 59 kPa (from 0.9 to 0.6 kgf/cm^2, from 13 to 9 psi)

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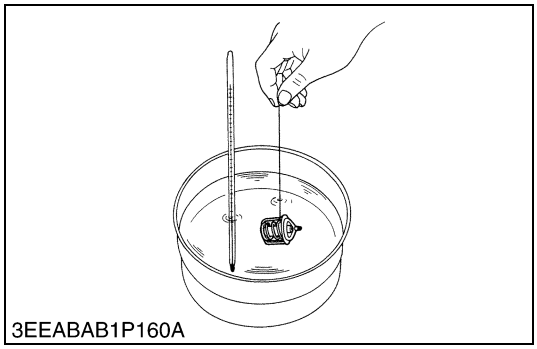
Radiator Water Leakage

1. Pour a specified amount of water into the radiator.
2. Attach a radiator tester.
   Increase water pressure to the specified pressure of 137 kPa (1.4 kgf/cm^2, 20 psi).
3. Check the radiator for water leaks.
4. When water leakage is excessive, replace the radiator. If water leakage is caused by a small pinhole, correct the radiator with radiator sealant.

Radiator water leakage test pressure	Factory specification	137 kPa 1.4 kgf/cm^2 20 psi

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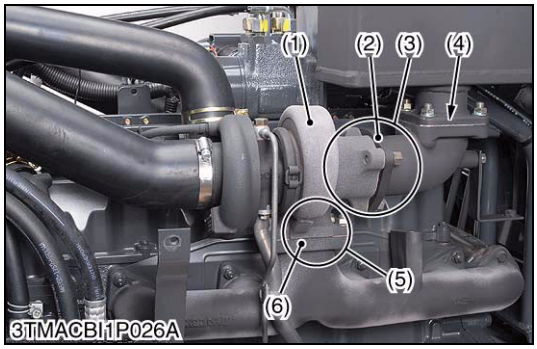
Thermostat Valve Opening Temperature

1. Push down the thermostat valve and insert a string between the valve and the valve seat.
2. Place the thermostat and a thermostat in a container with water and gradually heat the water.
3. Hold the string to suspend the thermostat in the water. When the water temperature rises, the thermostat valve will open, allowing it to fall down from the string.
   Read the temperature at this moment on the thermometer.
4. Continue heating the water and read the temperature when the valve has risen by about 8 mm (0.315 in.).
5. If the measurement is not acceptable, replace the thermostat.

Thermostat's valve opening temperature	Factory specification	80 to 84 °C 176.0 to 183.2 °F
Temperature at which thermostat completely opens	Factory specification	95 °C 203 °F

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(4) Turbocharger



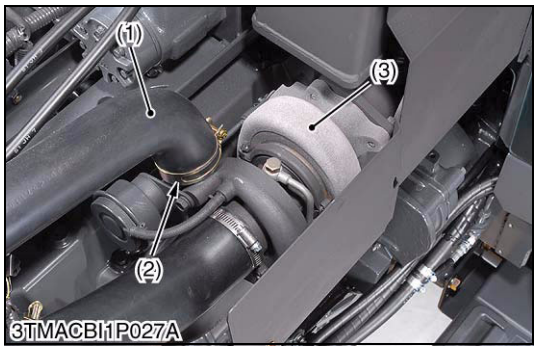
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Turbine Side

1. Check the exhaust port (3) and inlet port (5) side of turbine housing (1) to see if there is no exhaust gas leak.
2. If any gas leak is found, retighten the bolts and nuts or replace the gasket (2) / (4) / (6) with new one.

(1) Turbine Housing
(2) Gasket
(3) Exhaust Port
(4) Gasket
(5) Inlet Port
(6) Gasket

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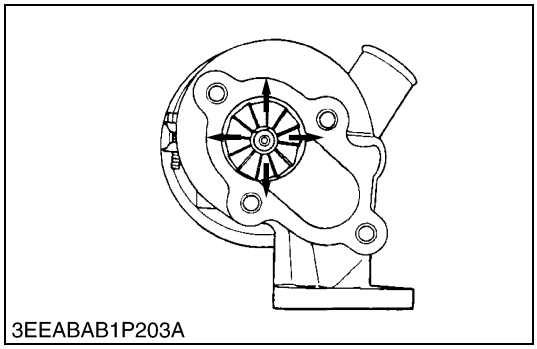
3TMACBI1P027A

Compressor Side

1. Check the inlet hose (1) of the compressor cover (3) to see if there is no air leak.
2. Check for loose connections or cracks in the suction side of the intake hose.
3. If any air leak is found, change the clamp (2) and or inlet hoses.

(1) Inlet Hose
(2) Clamp
(3) Compressor Cover

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Radial Clearance

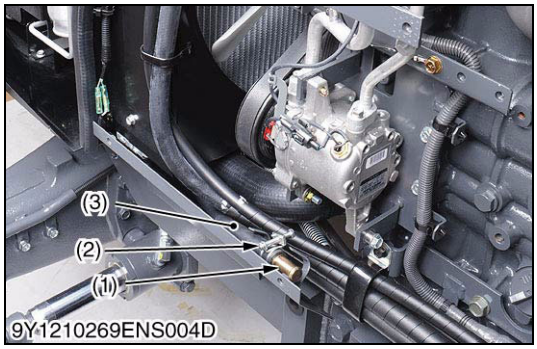
1. If the wheel contact to the housing, replace the turbocharger assembly with new one.

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[2] PREPARATION

(1) Separating Front Axle Support from Engine



Draining Coolant

CAUTION

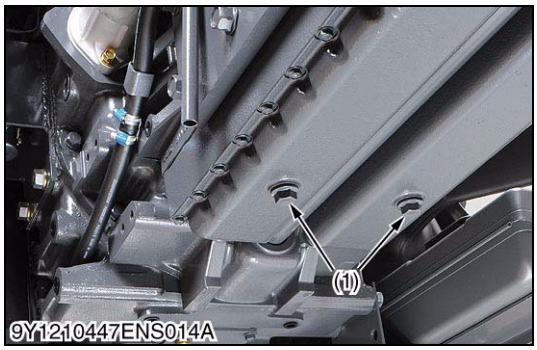
- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let cool down.
2. Loosen the hose clamp (2) and remove the drain plug (1) to drain the coolant.
3. Remove the radiator cap to completely, drain the coolant.
4. After all coolant is drained, reinstall the drain plug (1) and tighten the hose clamp (2).

Coolant	Capacity	15 L 16 U.S.qts 13 Imp.qts

(1) Drain Plug
(2) Hose Clamp
(3) Radiator Hose

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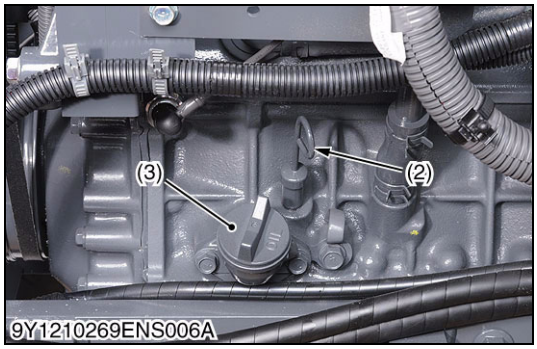
Draining Engine Oil

1. Start and warm up the engine for approx. 5 minutes.
2. Place an oil pan underneath the engine.
3. Remove the drain plugs (1) to drain oil.
4. After draining, screw in the drain plugs (1).

(When reassembling)

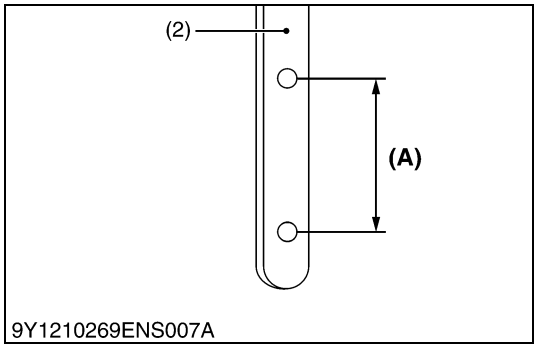
- Fill the engine oil up to the upper line on the dipstick (2).

Engine Oil	Capacity	14.6 L 15.4 U.S.qts 12.8 Imp.qts



IMPORTANT

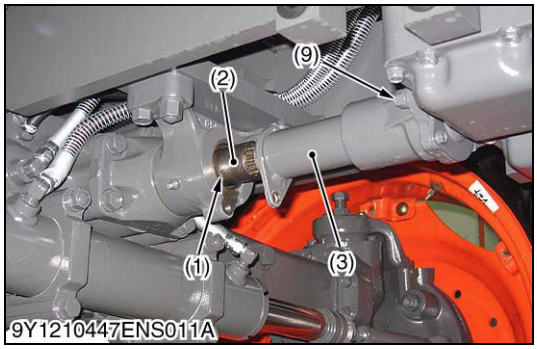
- **Never mix two different type of oil.**
- **Use the proper SAE Engine Oil according to ambient temperature.**
  Refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.

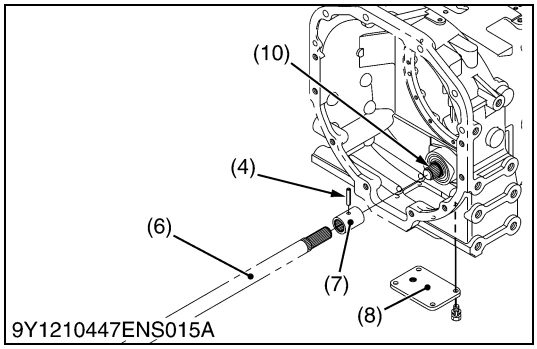


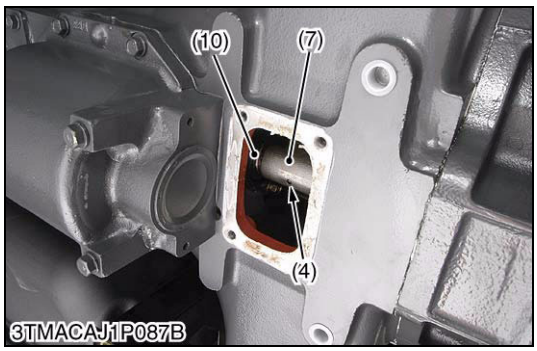
(1) Drain Plug
(2) Dipstick
(3) Oil Inlet Plug
(A) Oil level is acceptable within this range

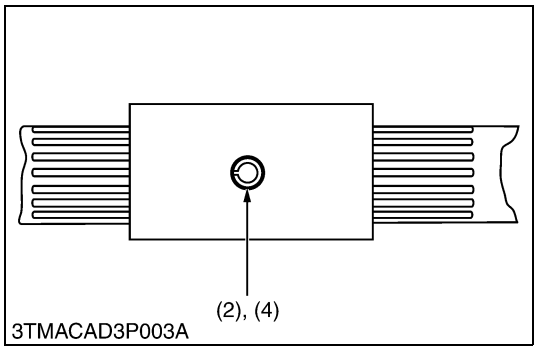
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Propeller Shaft

1. Slide the propeller shaft cover (3) after removing the screw (5).
2. Tap out the spring pins (2) and then slide the coupling (1) to the rear.
3. Remove the cover (8).
4. Tap out the spring pins (4) and then slide the coupling (7) forward.

(When reassembling)

- Please assemble the propeller shaft by following procedure.

1. Loosen the nuts (9).
2. Slide the coupling (7) and match the splines of the coupling (7) and front transmitting shaft (10) only by 10 mm (0.39 in.)
3. Match the spline of the coupling (1), propeller shaft (6) and pinion shaft (11). And then, tap in the spring pin (2) as shown in figure.

■ **NOTE**

- **Apply grease to the coupling (1) splines.**

4. Slide the coupling (7) and tap in the spring pin (4) as shown in figure.

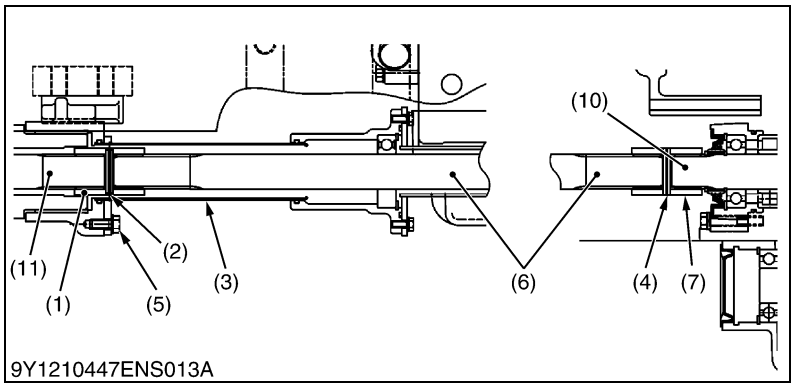
■ **NOTE**

- **Apply grease to the coupling (7) splines.**

5. Tighten the nuts (9).
6. Attach the cover (8).

■ **NOTE**

- **Apply liquid gasket (Three Bond 1206D or equivalent) to cover face and cover (8).**

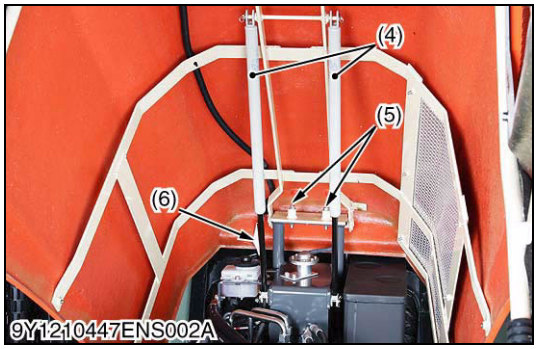


(1) Coupling
(2) Spring Pin
(3) Propeller Shaft Cover
(4) Spring Pin
(5) Screw
(6) Propeller Shaft
(7) Coupling
(8) Cover
(9) Nut
(10) Front Transmitting Shaft
(11) Pinion Shaft

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Muffler and Bonnet

1. Open the bonnet (1) and disconnect the battery (7) negative cable.
2. Disconnect the **8P** connector (6) for head light.
3. Remove the damper (4) and bonnet bracket mounting screws (5).
4. Remove the bonnet (1).
5. Remove the side cover (3).
6. Remove the muffler (2).

(When reassembling)

■ **NOTE**

- **Be sure to insert the muffler by 42 mm (1.7 in.).**

Tightening torque	Muffler mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

■ **IMPORTANT**

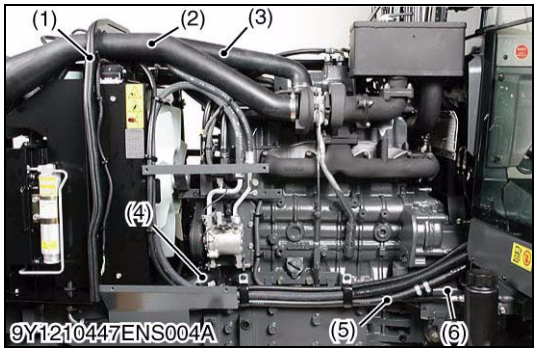
- **When disconnecting the battery cables, disconnect the negative cable first. When connecting, positive cable first.**

(1) Bonnet
(2) Muffler
(3) Side Cover
(4) Damper
(5) Screw
(6) **8P** Connector
(7) Battery

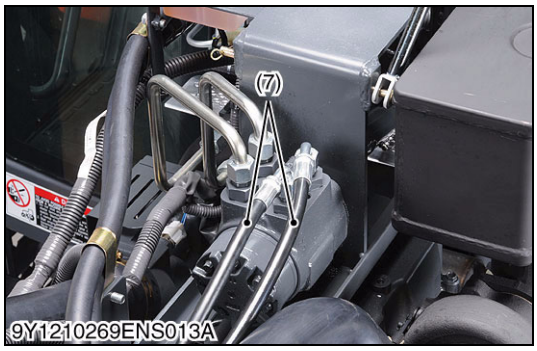
L: Insertion Length of the Muffler

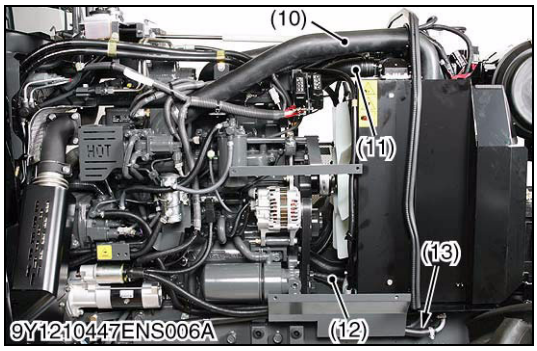
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Hoses and Plate

1. Remove the shield weather strip and plate (1).
2. Disconnect the air cleaner hoses (2), (3) from the turbocharger.
3. Disconnect the radiator hose (4).
4. Disconnect the oil cooler hose (5).
5. Disconnect the power steering hose (7).
6. Disconnect the fuel hose (8) from the fuel cooler (9).
7. Disconnect the front differential lock hose (6).
8. Disconnect the radiator hose (11), (12) and oil cooler hose (13).
9. Disconnect the intercooler hose (10).

(When reassembling)

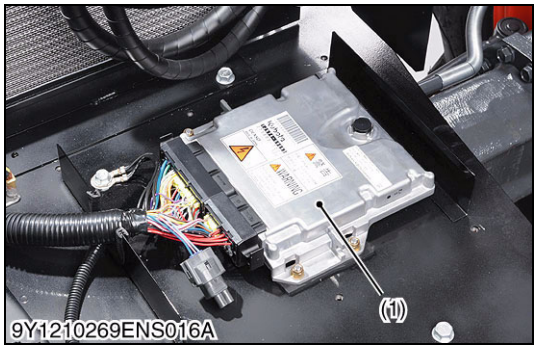
- Be sure to connect the power steering hoses to original position.

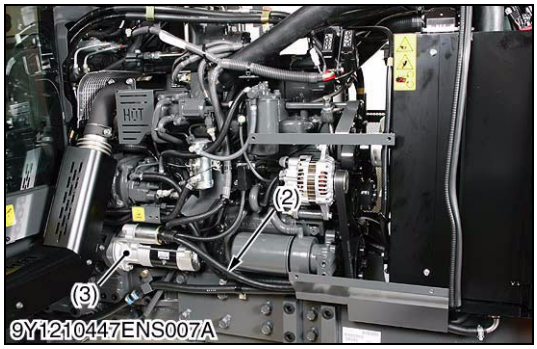
Tightening torque	Power steering hose retaining nut	21.6 to 27.4 N·m 2.2 to 2.8 kgf·m 16.0 to 20.2 lbf·ft

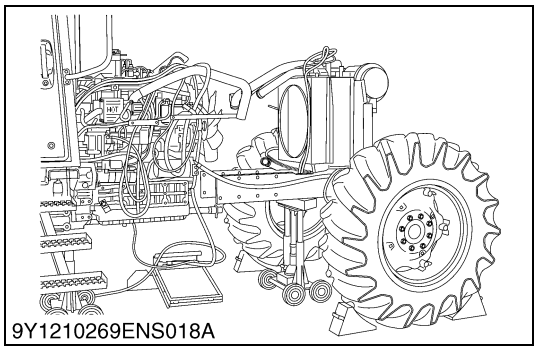
(1) Plate
(2) Air Cleaner Hose
(3) Air Cleaner Hose
(4) Radiator Hose
(5) Oil Cooler Hose
(6) Front Differential Lock Hose
(7) Power Steering Hose
(8) Fuel Hose
(9) Fuel Cooler
(10) Intercooler Hose
(11) Radiator Hose
(12) Radiator Hose
(13) Oil Cooler Hose

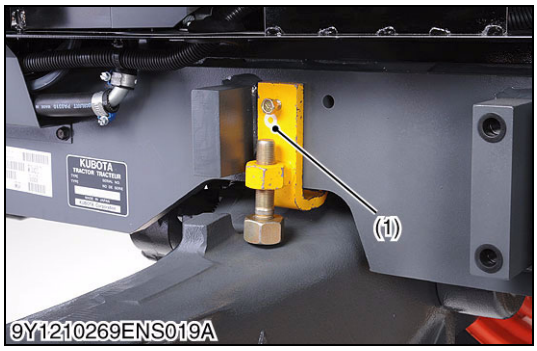
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ECU, Wiring Harness and Muffler

1. Remove the ECU mountings screws and ECU (1).
2. Disconnect the battery cable (2) from the starter motor (3).
3. Disconnect the **1P** connector from air cleaner sensor.
4. Disconnect the **1P** connector for front wheel turning angle switch.

(When reassembling)

■ **NOTE**

- **Take care not to damage to ECU.**

Tightening torque	Starter's terminal **B** mounting nut	9.8 to 11 N·m 1.0 to 1.2 kgf·m 7.3 to 8.6 lbf·ft
	ECU mounting screw	2.5 N·m 0.25 kgf·m 1.8 lbf·ft

(1) ECU
(2) Battery Cable
(3) Starter Motor

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Front Axle Support as a Unit

1. Check the front axle and clutch housing case are securely mounted on the disassembling stands.
2. Install the front axle rocking restrictor (1) (refer to "8. SPECIAL TOOLS" at "G. GENERAL" section) to the front axle bracket.
3. Separate the front axle support as a unit after removing the front axle support mounting screws.

(When reassembling)

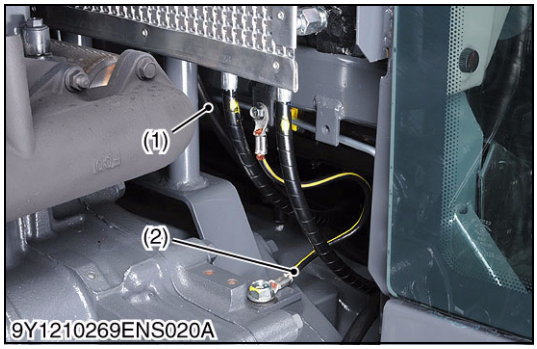
Tightening torque	Front axle support mounting screw (M16, UBS)	260 to 304 N·m 26.5 to 31.0 kgf·m 192 to 224 lbf·ft

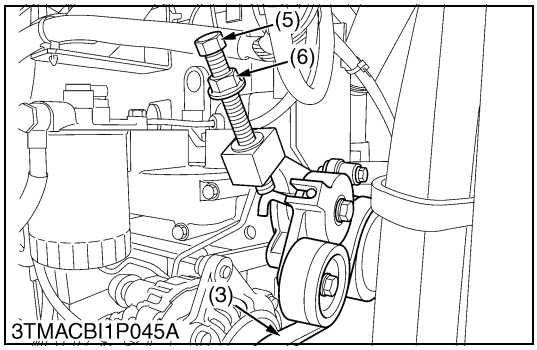
(1) Front Axle Rocking Restrictor

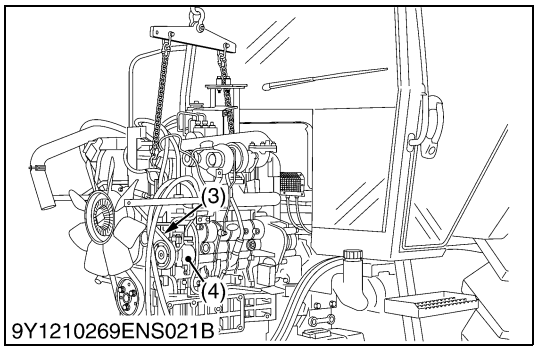
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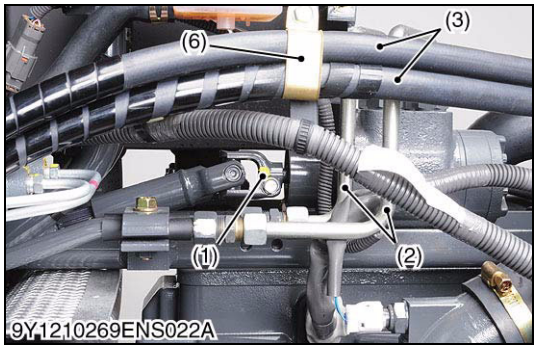
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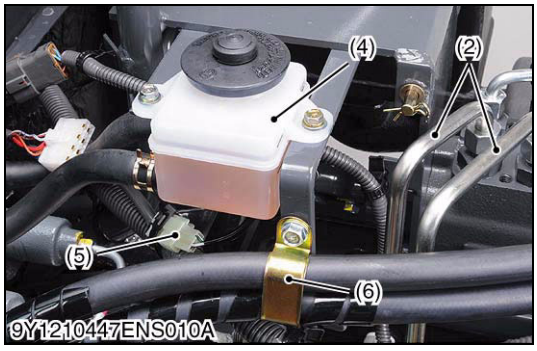
(2) Separating Engine from Clutch Housing











Compressor and Ground Cable

1. Disconnect the breather hose (1).
2. Remove the ground cable (2).
3. Loosen the lock nut (6) and adjusting screw (5) then remove the fan belt (3).
4. Disconnect the **1P** connector from compressor.
5. Remove the compressor bracket mounting screws.
6. Remove the compressor (4) and condenser with hoses.

(When reassembling)

- Take care not to damage the air condenser fin.
- After reassembling the compressor, be sure to adjust the fan belt tension.
  (Refer to "7. CHECK AND MAINTENANCE" at "G. GENERAL" section.

Tightening torque	Adjusting screw	Below 15 N·m 1.53 kgf·m 11.1 lbf·ft
	Lock nut	123.6 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108.4 lbf·ft

(1) Breather Hose
(2) Ground Cable
(3) Fan Belt
(4) Compressor
(5) Adjusting Screw
(6) Lock Nut

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Joint Shaft Hose and Oil Tank

1. Remove the steering joint shaft (1).
2. Disconnect the power steering delivery pipes (2).
3. Disconnect the heater hoses (3) and clamp (6).
4. Disconnect the connector (5) for brake oil level sensor and remove the brake oil tank (4).
5. Disconnect the breather hose.

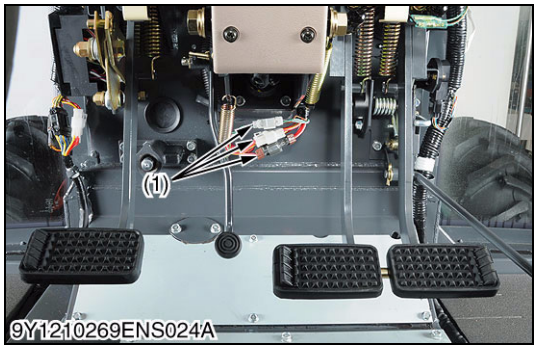
(When reassembling)

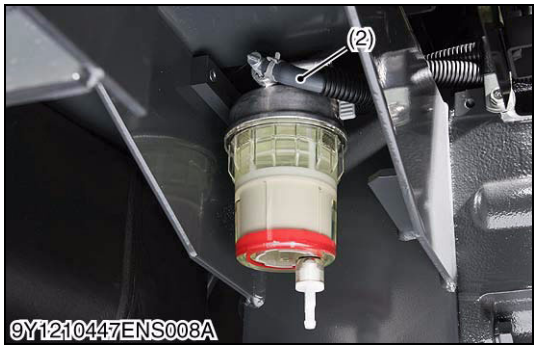
- Be sure to connect the heater hose to original position.

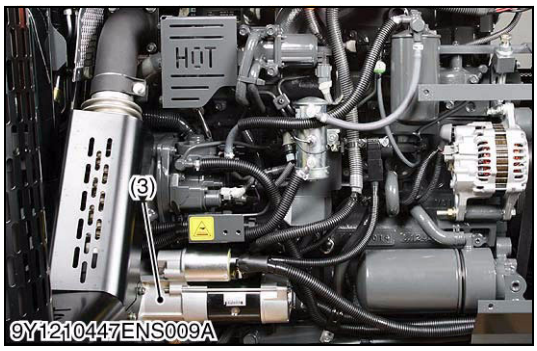
(1) Joint Shaft
(2) Delivery Pipe
(3) Heater Hose
(4) Brake Oil Tank
(5) Connector
(6) Clamp

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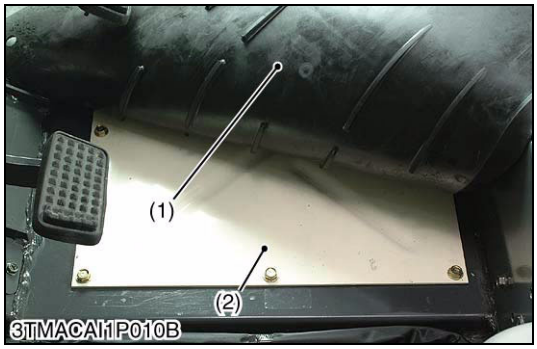
Connectors and Starter Motor

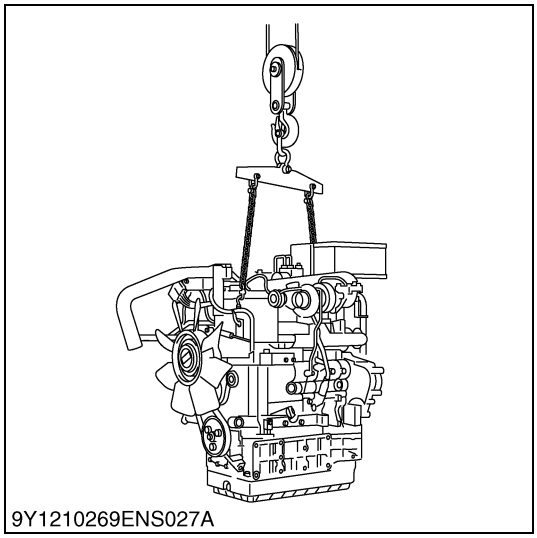
1. Disconnect the engine wiring harness connectors (1).
2. Disconnect the fuel hose (2).
3. Remove the starter motor (3).

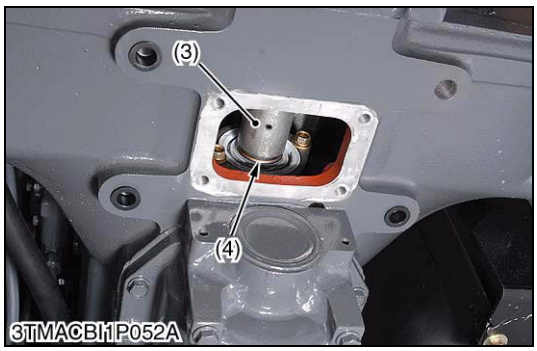
(1) Connector
(2) Fuel Hose
(3) Starter Motor

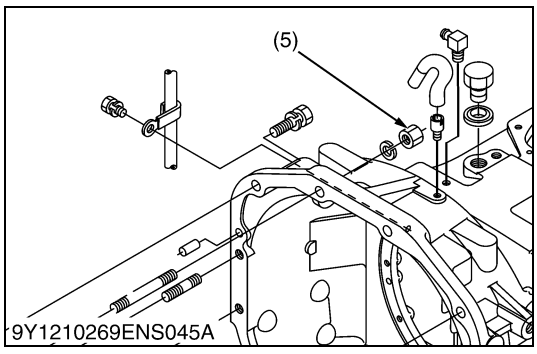
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Separating Engine from Clutch Housing

1. Remove the floor mat (1) and inspection plate (2).
2. Hoist the engine by hoist and chain.
3. Remove the engine mounting screws and nuts, and separate the engine from the clutch housing.

(When reassembling)

- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the splines of clutch disc boss.
- Apply liquid gasket (Three Bond 1141, 1211 or equivalent) to joint face of the engine and clutch housing.
- When connecting the engine to the clutch housing, be sure to insert the coupling (3) to the front transmission shaft (4) side, then insert the coupling (3) to the propeller shaft after connecting.

Tightening torque	Engine and clutch housing mounting screw and nut (Standard)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 lbf·ft
	Engine and clutch housing mounting nut (Wide)	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft
	Engine and clutch housing mounting stud bolt	39 to 45 N·m 3.9 to 4.6 kgf·m 29 to 33 lbf·ft

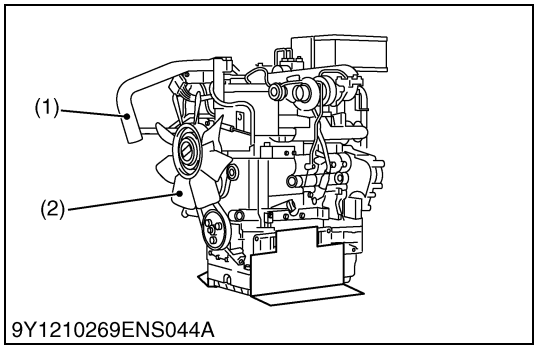
(1) Floor Mat
(2) Cover
(3) Coupling
(4) Front Transmission Shaft
(5) Engine and Clutch Housing Mounting Nut (Wide)

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[3] DISASSEMBLING AND ASSEMBLING

(1) External Components



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Outer Components

1. Remove the hose (1).
2. Remove the fan (2).
3. Remove the wiring harness.
4. Remove the alternator.

(1) Hose (2) Fan

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(2) Turbocharger

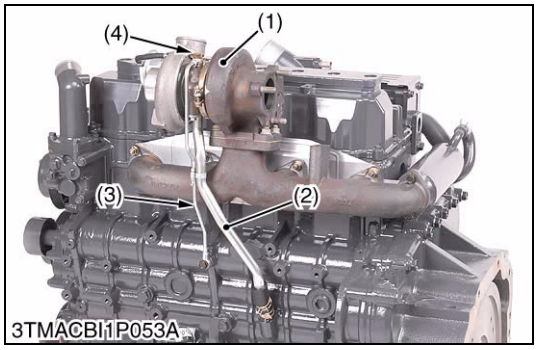
CAUTION

- **While the engine is running and or just after it stops, the turbocharger is hot, do not touch the turbocharger.**

NOTE

- **When detaching and attaching the turbocharger assembly, be very careful not to allow dust, dirt and other foreign matter in the oil pipes.**
- **When the turbocharger assembly has been replace, pour fresh engine oil through the oil filler port of the turbocharger.**
- **Before starting the engine, make sure that air cleaner is in position.**

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Oil Pipe

1. Remove the oil pipe (3).
2. Remove the return pipe (2).
3. Remove the turbocharger assembly (1) from the exhaust manifold.

(When reassembling)

- Pour fresh engine oil through the oil filler port of the turbocharger.
- Replace the gasket with new one.
- Be careful not to allow dust, dirt and other foreign matters in the oil pipes.

NOTE

- **Tape or plug all openings to prevent foreign matters from damaging the oil cavities in the turbocharger.**

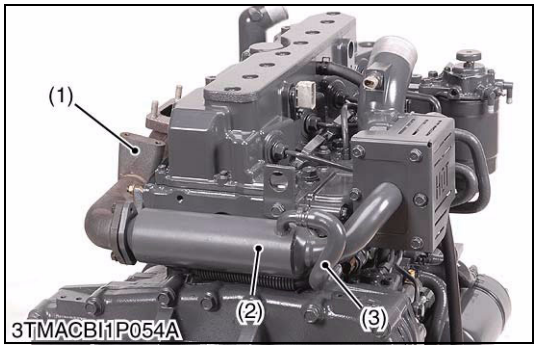
Tightening torque	Joint bolt for oil pipe (4)	15.7 to 19.6 N·m 1.6 to 2.0 kgf·m 11.6 to 14.4 lbf·ft
	Turbocharger mounting nut	49.1 to 68.6 N·m 5.0 to 5.7 kgf·m 36.2 to 50.6 lbf·ft

(1) Turbocharger Assembly (3) Oil Pipe
(2) Return Pipe (4) Joint Bolt

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(3) Exhaust Gas Recirculation (EGR)

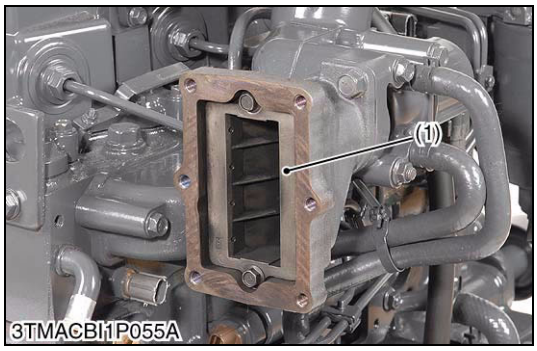


EGR Cooler

1. Remove the exhaust manifold (1).
2. Remove the hose (3).
3. Remove the EGR cooler mounting screws and EGR cooler (2).

(1) Exhaust Manifold
(2) EGR Cooler
(3) Hose

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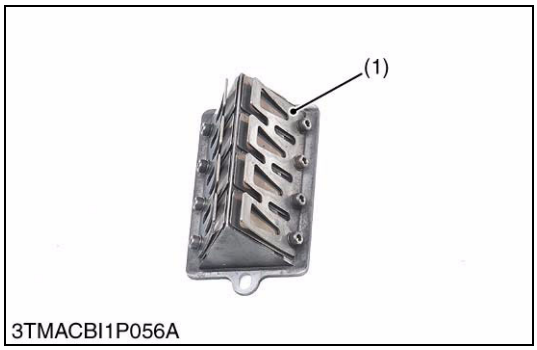


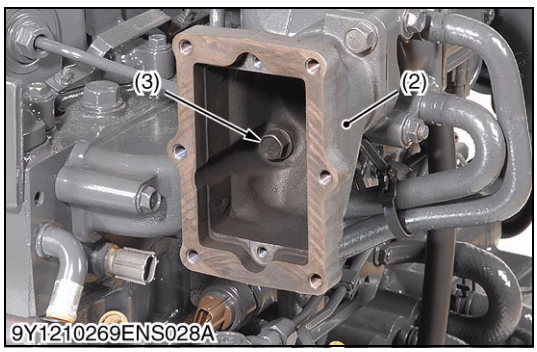
Reed Valve and Valve Case

1. Remove the lead valve (1).
2. Remove the valve case (2).

(1) Reed Valve
(2) Valve Case
(3) Screw

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EGR Valve

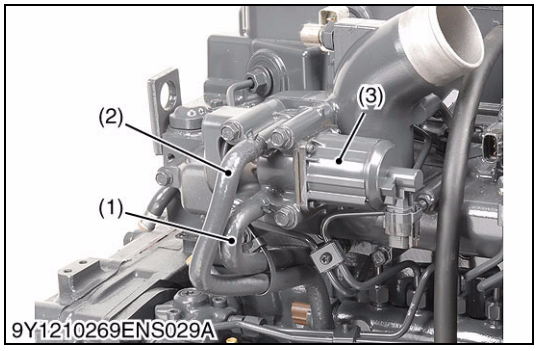
1. Remove the hose (1), (2).
2. Remove the EGR valve (3).

■ **NOTE**

- **Do not overhaul the EGR valve.**

(When reassembling)

- Replace the gasket with new one.

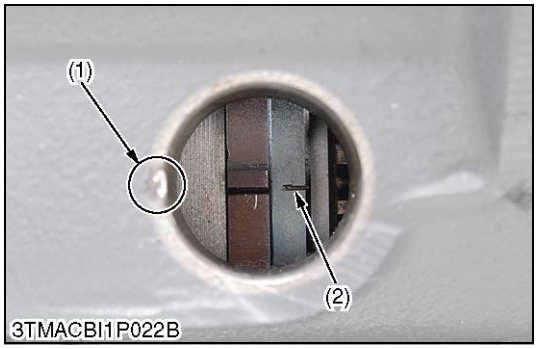


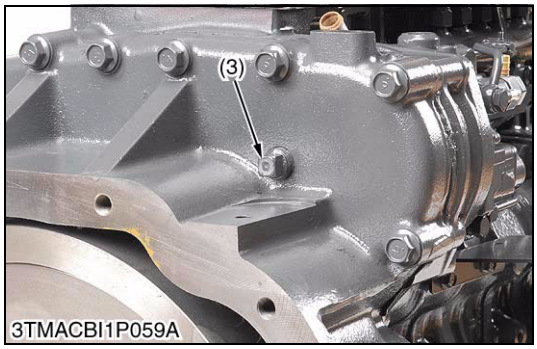
(1) Hose
(2) Hose
(3) EGR

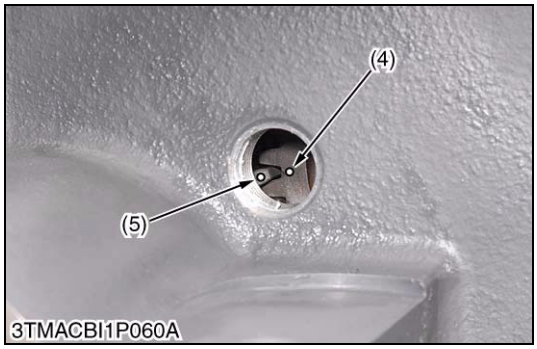
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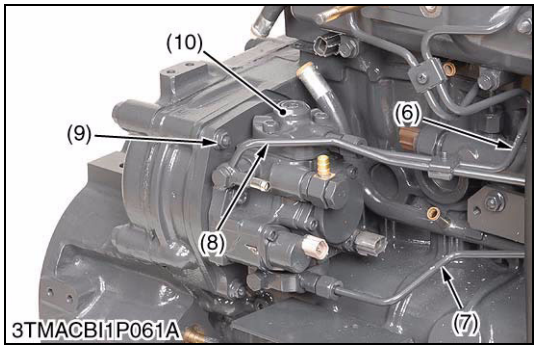
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(4) Common Rail System (CRS)









Supply Pump

1. Set the No. 4 piston at the top dead center.

■ **NOTE**
- **When setting the No. 4 piston at the top dead center, turn the flywheel counterclockwise and align the mark on the flywheel housing (1) and the TC mark on flywheel (2) temporarily.**

2. Remove the plug (3).
3. Put the mark on teeth of idle gear (5) and supply pump gear (4) with white pen temporarily.

■ **NOTE**
- **This white mark is very useful to align the timing between the supply pump gear and idle gear when reassembling.**

4. Remove the injection pipe (6), (7) and overflow pipe (8).
5. Remove the supply pump mounting nuts (9).
6. Remove the supply pump assembly (10).

■ **IMPORTANT**
- **Do not disassemble the supply pump.**
- **Keep the supply pump away from dust.**

7. Remove the supply pump gear mounting nut (13) and supply pump gear (12).
8. Remove the supply pump (10) from pump base (11).

(When reassembling)
- Replace the gasket with new one.
- Place the supply pump gear with aligning the timing marks between supply pump gear and idle gear (white temporary marks).

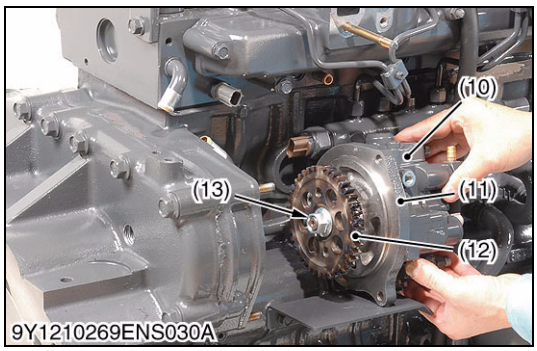
■ **NOTE**
- **When replacing new supply pump, after installing the new supply pump, it is required to initialize the characteristic data of previous supply pump on ECU and to learn the characteristic data of new supply pump with connecting K consultant. Refer to "Diagnosis Manual".**

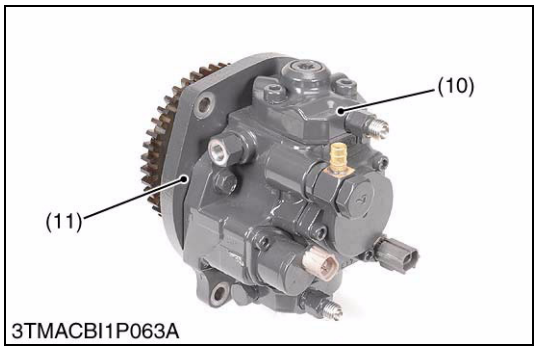
(1) Mark on Flywheel Housing
(2) TC Mark on Flywheel Housing
(3) Plug
(4) Mark on Teeth of Supply Pump Gear
(5) Mark on Teeth of Idle Gear
(6) Injection Pipe
(7) Injection Pipe
(8) Overflow Pipe
(9) Supply Pump Base Mounting Nut
(10) Supply Pump

(To be continued)

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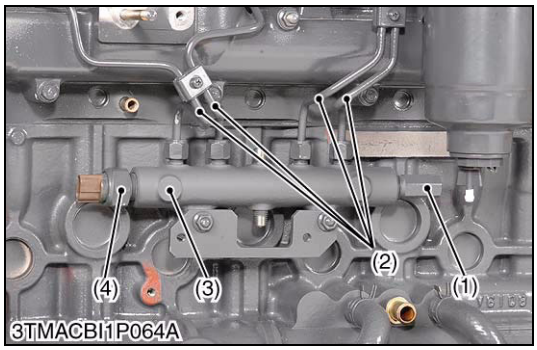


Tightening torque	Supply pump base mounting nut	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft
	Supply pump gear mounting nut	59 to 68 N·m 6.0 to 7.0 kgf·m 44 to 50 lbf·ft
	Injection pipe retaining nut	23 to 36 N·m 2.3 to 3.7 kgf·m 17 to 26 lbf·ft
	Overflow pipe joint screw (M10) (Rail side)	16 to 19 N·m 1.6 to 2.0 kgf·m 12 to 14 lbf·ft
	Overflow pipe joint screw (M10) (Supply pump side)	7.0 to 12 N·m 0.80 to 1.3 kgf·m 5.8 to 9.4 lbf·ft
	Supply pump mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft

(10) Supply Pump
(11) Supply Pump Base
(12) Supply Pump Gear
(13) Supply Pump Gear Mounting Nut

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Common Rail and Injection Pipes

■ **NOTE**
- **Do not loosen the injection pipe retaining nut when the fuel pressure is high.**
- **Do not remove the pressure limiter (1) and the rail pressure sensor (4) from the common rail (3).**
- **Do not hold the pressure limiter (1) or the rail pressure sensor (4) on common rail (3) when removing the common rail (3).**

1. Disconnect the injection pipes (2).
2. Remove the common rail (3).

■ **IMPORTANT**
- **Keep the injection pipes (2) away from dust.**
- **Keep the common rail (3) away from dust.**

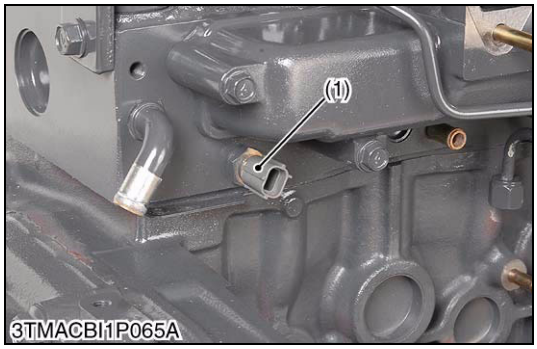
(When reassembling)

■ **NOTE**
- **Securely tighten the injection pipe retaining nut with specified torque.**

Tightening torque	Common rail mounting nut	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft
	Injection pipe retaining nut	23 to 36 N·m 2.3 to 3.7 kgf·m 17 to 26 lbf·ft

(1) Pressure Limiter
(2) Injection Pipe
(3) Common Rail
(4) Rail Pressure Sensor

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Coolant Temperature Sensor

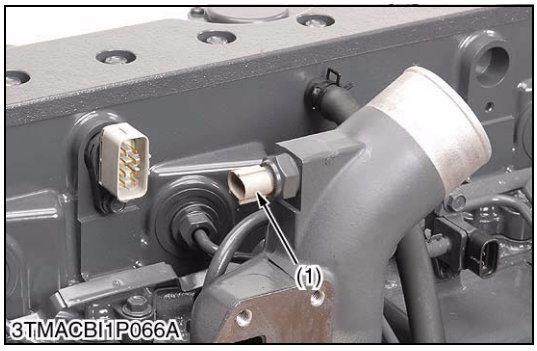
1. Remove the coolant temperature sensor.

(When reassembling)
- Replace the gasket with new one.

Tightening torque	Coolant temperature sensor	15.7 to 19.6 N·m 1.6 to 2.0 kgf·m 11.6 to 14.4 lbf·ft

(1) Coolant Temperature Sensor

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Intake Air Temperature Sensor

1. Remove the intake air temperature sensor (1).

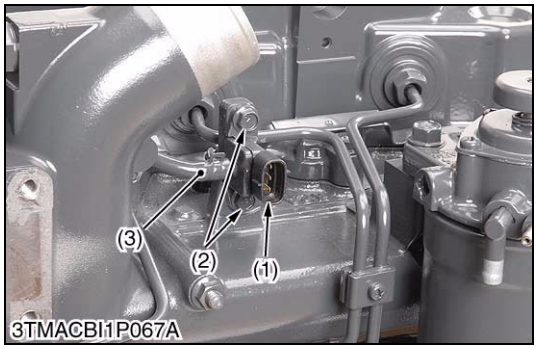
(When reassembling)
- Replace the gasket with new one.

Tightening torque	Intake air temperature sensor	30 to 39 N·m 3.0 to 4.0 kgf·m 22 to 28 lbf·ft

(1) Intake Air Temperature Sensor

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Intake Air Pressure Sensor

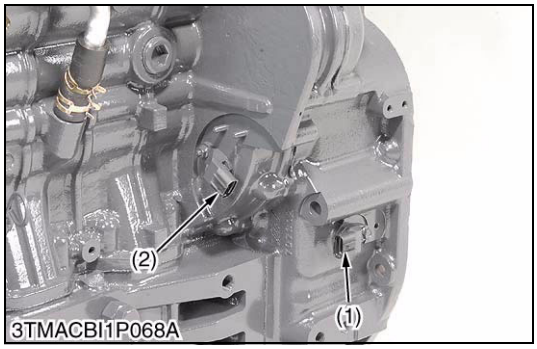
■ **IMPORTANT**
- **When you disconnect the intake air pressure hose from the intake air pressure sensor, be careful not to damage the intake air pressure sensor.**

1. Disconnect the intake air pressure hose (3) from the intake air pressure sensor (1).
2. Remove the intake air pressure sensor mounting screws (2).
3. Remove the intake air pressure sensor (1).

(When reassembling)
- If the intake air pressure hose is damage, replace the hose with new one.

(1) Intake Air Pressure Sensor
(2) Intake Air Pressure Sensor Mounting Screw
(3) Intake Air Pressure Hose

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Crankshaft Position Sensor and Camshaft Position Sensor

1. Remove the crankshaft position sensor (1).
2. Remove the camshaft position sensor (2).

(When reassembling)
- Replace the O-ring with new one.

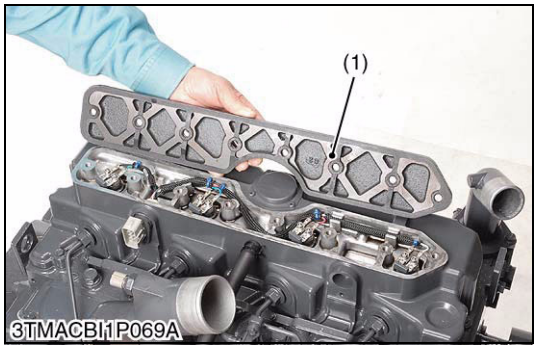
Tightening torque	Camshaft and crankshaft position sensor mounting screw	4 to 6 N·m 0.4 to 0.6 kgf·m 3 to 4 lbf·ft

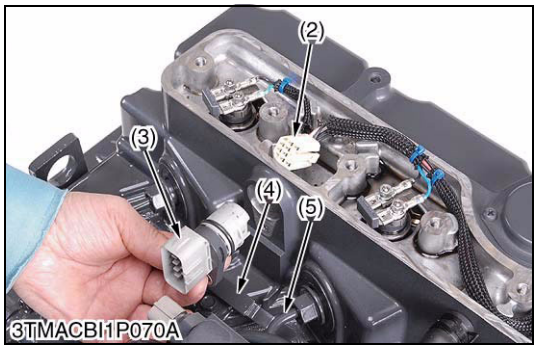
(1) Crankshaft Position Sensor
(2) Camshaft Position Sensor

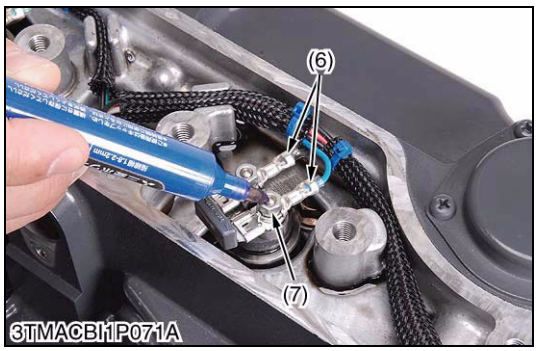
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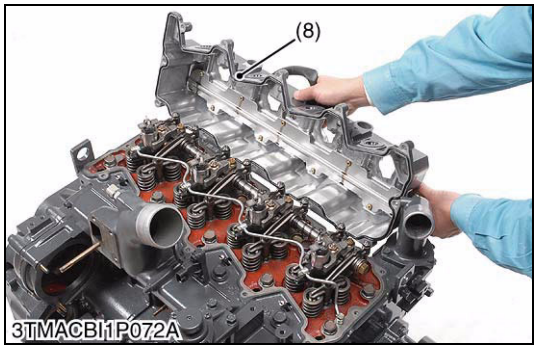
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(5) Cylinder Head and Valves









Cylinder Head Cover

1. Remove the cylinder head cover 2 (1).
2. Remove the coupler (3) from injector harness (2).
3. Remove the injection pipes (5).
4. Remove the lead for glow plug (4).
5. Mark the injector's terminal (7) and current lead (6) one side for preventing misconnection.
6. Remove the cylinder head cover 1 (8).

(When reassembling)

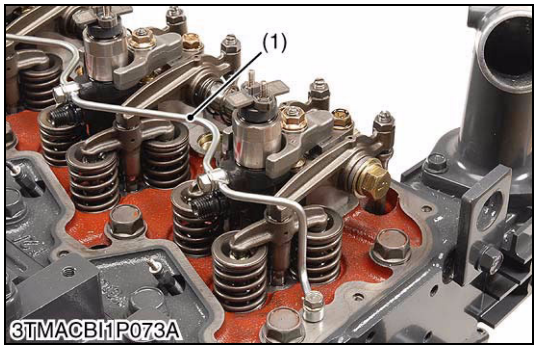
- Replace the cylinder head cover 2 (1) gasket with new one.
- Replace the cylinder head cover 1 (5) oil seal with new one.

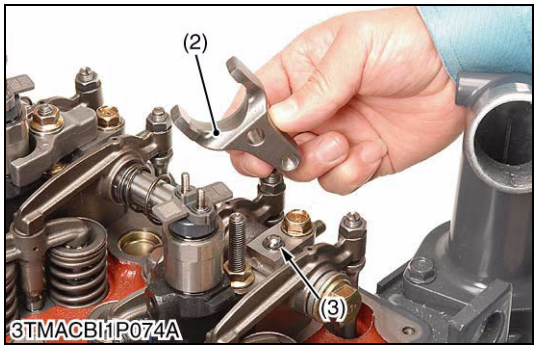
Tightening torque	Cylinder head cover 1 mounting screw	9.81 to 11.2 N·m 1.0 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Cylinder head cover 2 mounting screw	9.81 to 11.2 N·m 1.0 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Injection pipe retaining nut	23 to 36 N·m 2.3 to 3.7 kgf·m 17 to 26 lbf·ft

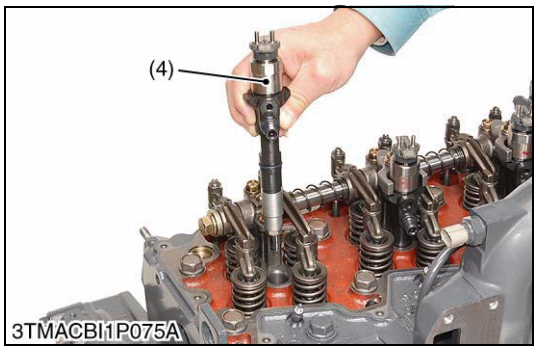
(1) Cylinder Head Cover 2
(2) Injector Harness
(3) Coupler
(4) Lead for Glow Plug
(5) Injection Pipe
(6) Current Lead
(7) Injection's Terminal
(8) Cylinder Head Cover 1

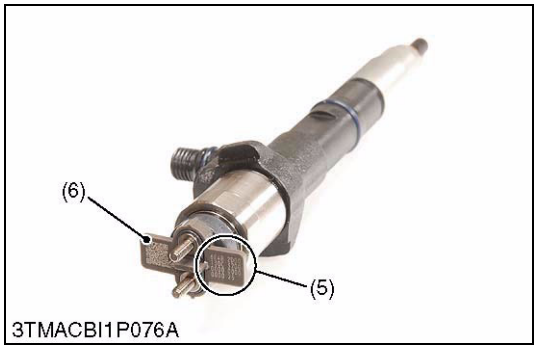
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Injectors

1. Remove the overflow pipe (1).
2. Remove the injector clamps (2).
3. Remove the injectors (4).

■ **IMPORTANT**

- **Do not disassemble the injector.**
- **Do not damage the injector's QR code tag (6).**
- **Do not lose the steel ball (3) on the rocker arm bracket.**
- **Do not mix the injectors' position order. If you mix the injectors' order, you must rewrite each injector's QR code (5) to ECU.**
- **Keep the injectors away from dust.**

(When reassembling)

- Replace the injectors' gaskets with new ones.
- When you set the injector's clamp (2), make sure that the steel balls sit on the rocker arm bracket.
- Securely tighten the injector's clamp nuts to the specified torque.
- When you set the overflow pipe (1) on the injectors, replace the gasket with new one.
- Securely tighten the overflow pipe (1) joint screws to the specified torque.
- When you set the cylinder head cover 1, do not damage the injector's QR code tag (6).

■ **NOTE**

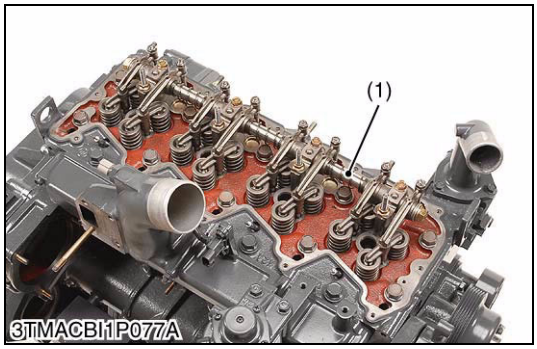
- **If you replace the injector(s) with new one(s), you must rewrite new injector(s)' QR code(s) (5) to ECU.**
  Please see the diagnosis manual "Common Rail System Engine".

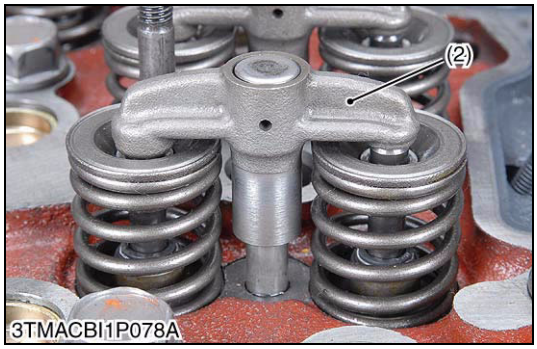
Tightening torque	Injector clamp nut	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft
	Overflow pipe joint screw (M6 × 1.0)	9.81 to 11.2 N·m 1.0 to 1.15 kgf·m 7.24 to 8.31 lbf·ft

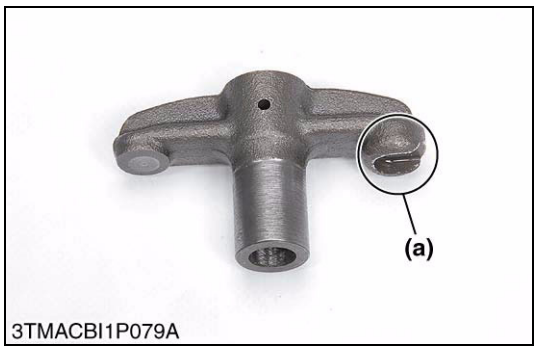
(1) Overflow Pipe
(2) Injector's Clamp
(3) Ball
(4) Injector
(5) Injector's QR Code
(6) Injector's QR Code Tag

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Rocker Arm and Push Rod

1. Remove the rocker arm (1) as a unit.
2. Remove the push rods.
3. Remove the bridge arm (2).

(When reassembling)

- When putting the push rods onto the tappets, check to see if their ends are properly engaged with the grooves.

■ **IMPORTANT**

- **After reassembling the rocker arm, be sure to adjust the valve clearance.**

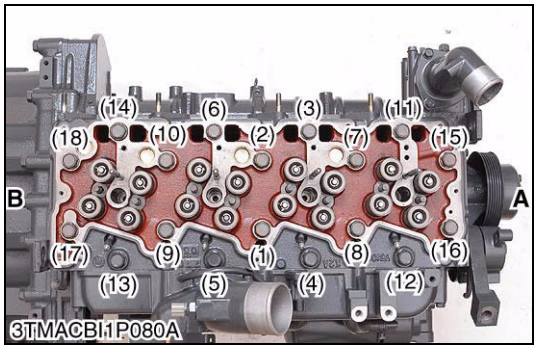
Tightening torque	Rocker arm bracket mounting screw and nut	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft

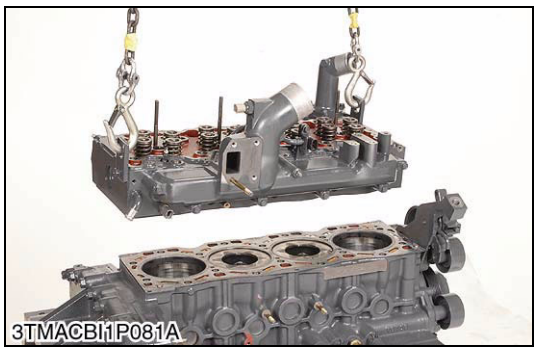
(1) Rocker Arm
(2) Bridge Arm

(a) Groove (Exhaust Valve Side)

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Cylinder Head

1. Remove the cylinder head screw in the order of (18) to (1), and remove the cylinder head.
2. Remove the cylinder head gasket.

(When reassembling)

- Replace the head gasket with a new one.
- When mounting the gasket, set it to the knock pin hole. Take care not to mount it reversely.
- The cylinder head should be free of scratches and dust.
- Take care for handling the gasket not to damage it.
- Install the cylinder head.
- Tighten the cylinder head screw gradually in the order of (1) to (18) after applying engine oil.
- Be sure to adjust the valve clearance. See the "Valve Clearance".
- It is not necessary to retighten the cylinder head screw after running the engine for 30 minutes.

■ **IMPORTANT**

- **When replacing the piston, piston pin bushing, connecting rod or crankpin bearing, select the cylinder head gasket thickness to meet with the top clearance. Refer to the "Selecting Cylinder Head Gasket".**

■ **NOTE**

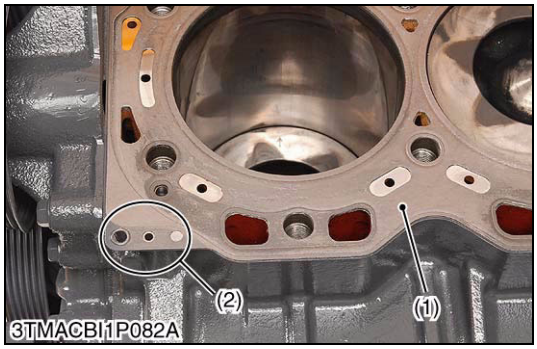
- **Mark the cylinder number to the tappets to prevent interchanging.**

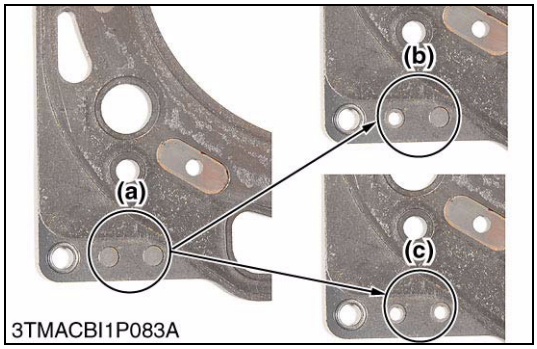
Tightening torque	Cylinder head mounting screw	138 to 147 N·m 14.0 to 15.0 kgf·m 102 to 108 lbf·ft

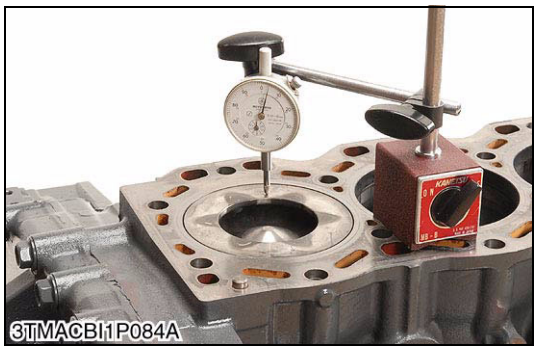
A: Front Cover Side **B: Flywheel Housing Side**

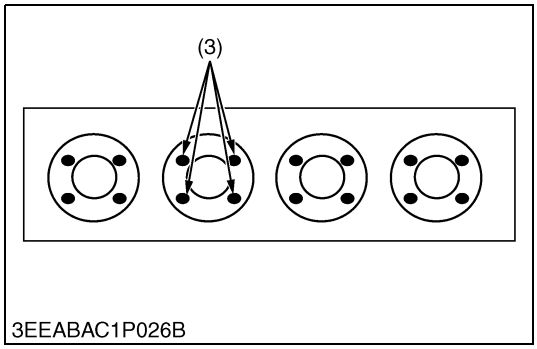
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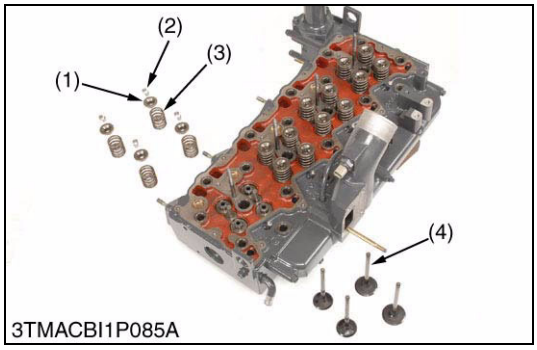
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Selecting Cylinder Head Gasket

■ Replacing the Cylinder Head Gasket

1. Make sure to note the hole **(a)**, **(b)** or **(c)** of cylinder head gasket (1) in advance.
2. Replace the same hole **(a)**, **(b)** or **(c)** as the original cylinder head gasket (1).

■ Selecting the Cylinder Head Gasket

- Select the cylinder head gasket (1) thickness to meet with the top clearance when replacing the piston, piston pin bushing, connecting rod or crankpin bearing.

1. Measure the piston head's protrusion or recessing from the crankcase cylinder face 4 spots per each piston and (average of four pistons) using the dial gauge as shown in figure.
2. Select the suitable cylinder head gasket refer to the table below.

Hole of Cylinder Head Gasket	Part Code	Piston Head's protrusion or recessing from the level of crankcase cylinder face. (average of 4 pistons)
Without hole **(a)**	1G410-03310	0.150 to 0.249 mm 0.00591 to 0.00980 in.
1 hole **(b)**	1G410-03600	0.250 to 0.349 mm 0.00985 to 0.0137 in.
2 holes **(c)**	1G410-03610	0.350 to 0.370 mm 0.0138 to 0.0145 in.

(1) Cylinder Gasket
(2) Identification Hole
(3) Measuring Point

(a) Without Notch
(b) 1 Hole
(c) 2 Holes

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Valve

1. Remove the valve spring collets (2) after compressing the valve spring (3) with the valve spring retainer (1).

(When reassembling)

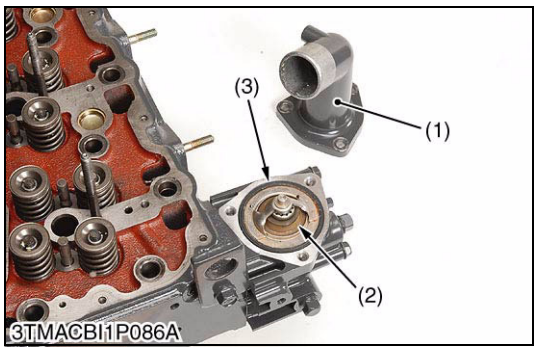
- Install the valve spring with its small-pitch end downward (at the head side).
- Wash the valve stem and valve guide hole, and apply engine oil sufficiently.
- After installing the valve spring collets (2), lightly tap the stem to assure proper fit with a plastic hammer.

(1) Valve Spring Retainer
(2) Valve Spring Collets
(3) Valve Spring
(4) Valve

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(6) Thermostat



Thermostat Assembly

1. Remove the thermostat cover (1).
2. Remove the thermostat assembly (2).

(When reassembling)

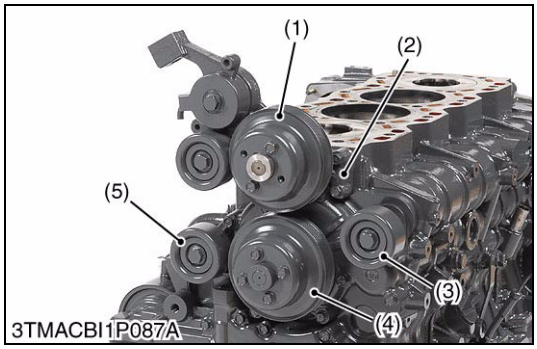
- Replace the rubber seal (3).

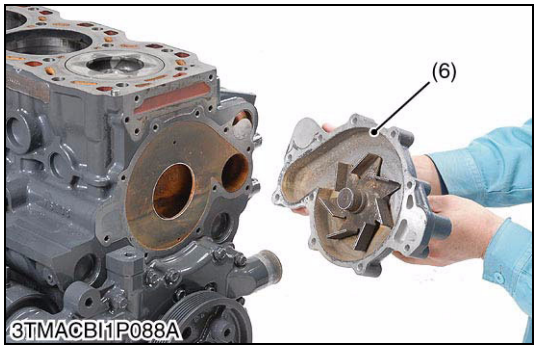
(1) Thermostat Cover
(2) Thermostat Assembly
(3) Rubber Seal

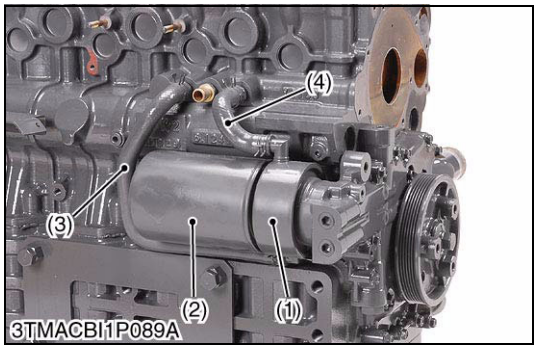
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(7) Water Pump and Oil Cooler







Water Pump (If Necessary)

1. Remove the V pulley (1), (4) and tension pulley (3), (5).
2. Remove the fan bracket (2).
3. Remove the water pump assembly (6).

(When reassembling)

- Replace the water pump gasket with new one.

Tightening torque	Tension pulley mounting screw	55.0 to 59.8 N·m 5.6 to 6.1 kgf·m 40.5 to 44.1 lbf·ft
	Water pump mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft

(1) V Pulley
(2) Fan Bracket
(3) Tension Pulley
(4) V Pulley
(5) Tension Pulley
(6) Water Pump Assembly

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Oil Cooler (If Necessary)

1. Disconnect the hoses (3), (4).
2. Remove the oil filter cartridge (2).
3. Remove the oil cooler joint screw and oil cooler (1).

(When reassembling)

- Put a film of clean engine oil on the rubber seal of the oil filter.

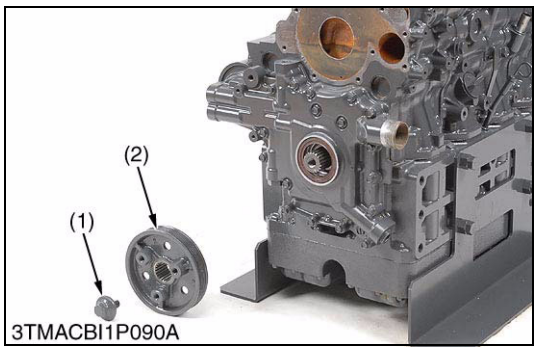
Tightening torque	Oil cooler joint screw	39.2 to 44.1 N·m 4.0 to 4.5 kgf·m 28.9 to 32.5 lbf·ft

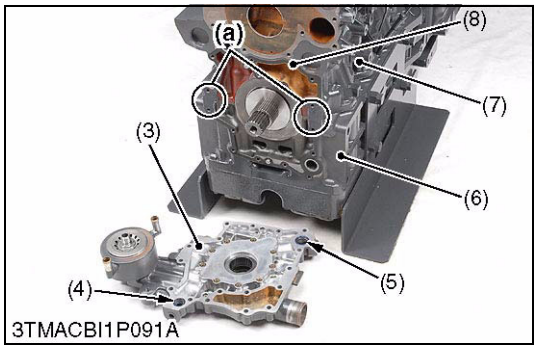
(1) Oil Cooler
(2) Oil Filter Cartridge
(3) Hose
(4) Hose

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(8) Front Cover





Front Cover

1. Set the stopper to the flywheel.
2. Remove the fan drive pulley mounting screw (1).
3. Draw out the fan drive pulley (2).
4. Remove the front cover (3).

(When reassembling)

- Replace the front cover gasket (8) with new one.
- Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.
- Check to see if there are two O-ring (4), (5) inside the front cover.

■ **NOTE**

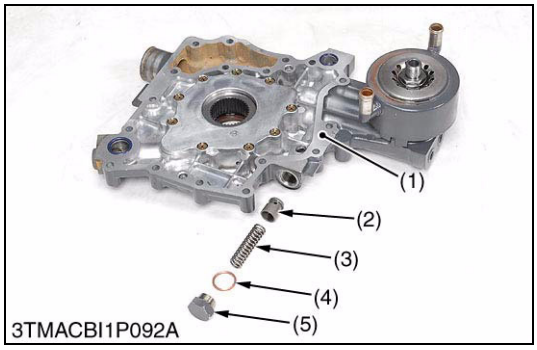
- **Assemble the adhesive-applied parts within ten minutes.**
- **Apply a liquid gasket (Three Bond 1217D) to the seam between crankcase 1 (7) and crankcase 2 (6).**

Tightening torque	Front cover mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft
	Fan drive pulley mounting screw	255 to 274 N·m 26 to 28 kgf·m 188 to 202 lbf·ft

(1) Screw
(2) Fan Drive Pulley
(3) Front Cover
(4) O-ring
(5) O-ring
(6) Crankcase 2
(7) Crankcase 1
(8) Gasket

(a) Liquid Gasket

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Relief Valve

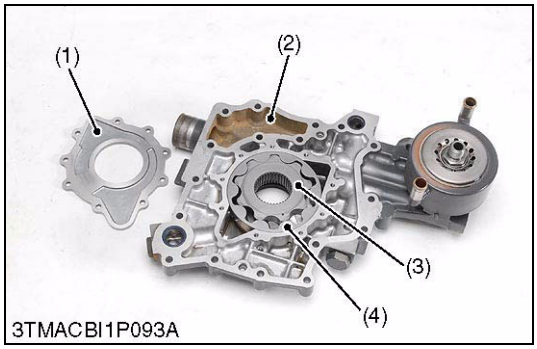
1. Remove the relief valve retaining screw (5).
2. Remove the relief valve (2), the spring (3) and the packing (4).

Tightening torque	Relief valve retaining screw	68.6 to 78.4 N·m 7.0 to 8.0 kgf·m 50.6 to 57.9 lbf·ft

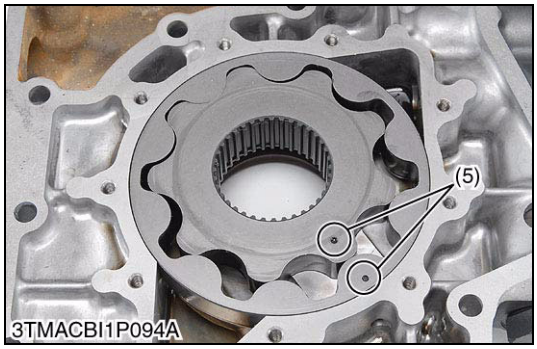
(1) Front Cover
(2) Relief Valve
(3) Spring
(4) Packing
(5) Relief Valve Retaining Screw

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3TMACBI1P093A



3TMACBI1P094A

Oil Pump

1. Remove the pump cover (1) from front cover (2).
2. Remove the inner rotor (3) and outer rotor (4).

(When reassembling)

- When reassembling the inner rotor and outer rotor, be sure to a align the mark on each rotor.

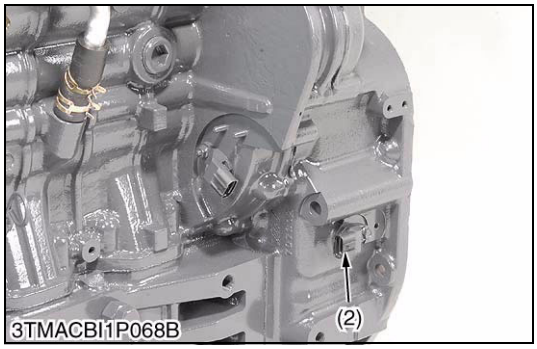
Tightening torque	Oil pump cover mounting screw	7.65 to 9.12 N·m 0.78 to 0.93 kgf·m 5.65 to 6.72 lbf·ft

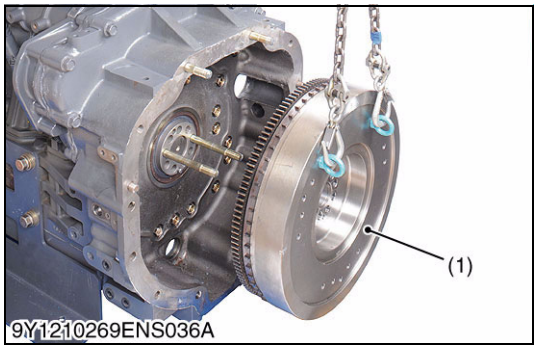
(1) Pump Cove
(2) Front Cover
(3) Inner Rotor
(4) Outer Rotor
(5) Mark

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(9) Flywheel and Flywheel Housing





Flywheel

1. Set the No. 4 piston at top dead center.
2. Install the stopper to the flywheel (1) so that the flywheel does not turn.
3. Remove the crankshaft position sensor (2).
4. Remove the flywheel (1).

■ **NOTE**
- **Do not use an impact wrench. Serious damage will occur.**

■ **IMPORTANT**
- **Be sure to set the No. 4 piston at top dead center.**
- **The crankshaft position sensor may very easily be damaged by the teeth of flywheel ring gear.**
- **The flywheel is very heavy, so securely hold the flywheel when removing.**

(When reassembling)
- Apply engine oil to the flywheel screws.
- Before fitting the flywheel and the crankshaft together, wipe oil, dust, and other foreign substances off their mating faces.
- The flywheel and the crankshaft fit together in just one position. Make sure they are securely fit and tighten the screws.
- Replace the O-ring of crankshaft position sensor with new one.
- Set the crankshaft position sensor.

■ **IMPORTANT**
- **Do not reuse the crankshaft position sensor when you drop the sensor.**

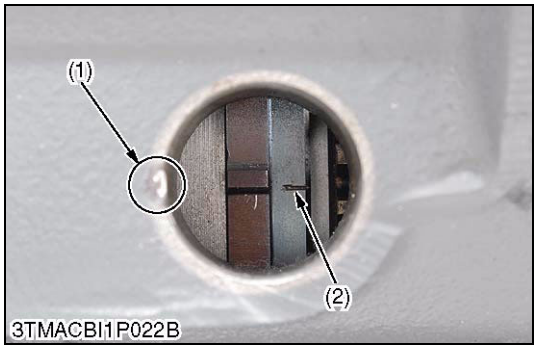
■ **NOTE**
- **After setting the flywheel, measure the gap of angles between crankshaft mechanical top dead center and crankshaft position sensor's electrical top dead center. You must rewrite the gap of angles to ECU. Refer to "Diagnosis Manual" for rewriting the gap of angles to ECU.**

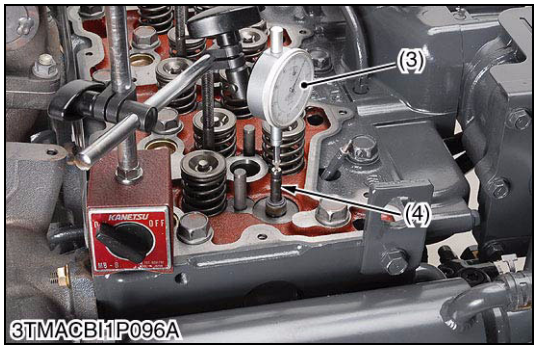
Tightening torque	Flywheel mounting screw	138 to 147 N·m 14.0 to 15.0 kgf·m 102 to 108 lbf·ft
	Crankshaft position sensor mounting screw	4.0 to 5.8 N·m 0.4 to 0.6 kgf·m 2.9 to 4.3 lbf·ft

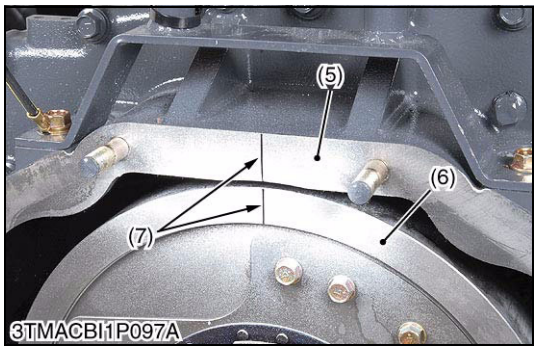
(1) Flywheel (2) Crankshaft Position Sensor

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Measuring the Gap of Angles between Crankshaft Mechanical Top Dead Center and Crankshaft Position Sensor's Electrical Top Dead Center

1. Remove the cylinder head covers, injectors, and rocker arm bracket.
2. Set the No. 4 piston at top dead center.
3. Remove one valve bridge and one valve spring.
4. Install small O-ring to the valve stem not to drop the valve inside of cylinder.
5. Set the dial indicator (3) on the top of valve stem.
6. Measure the valve stem's highest point with turning flywheel counterclockwise.
7. Stop to turn the flywheel at the valve stem's highest point.
8. Draw straight lines (7) on the flywheel housing (5) and the flywheel (6) with square ruler.

■ **IMPORTANT**

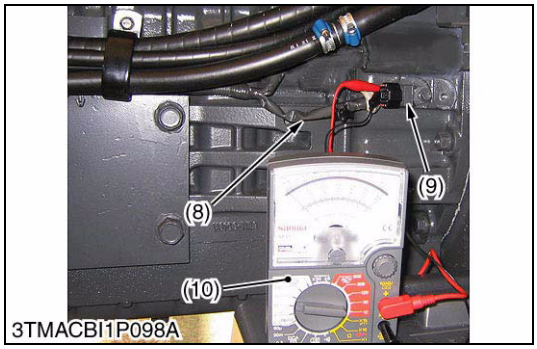
- **Be sure to set the No. 4 piston at top dead center.**
- **Do not drop the valve (4) inside of cylinder.**
- **Do not turn the flywheel clockwise for measuring the highest point of valve stem.**
  If exceeding the valve stem's highest point, turn back the flywheel and measure the valve stem's highest point again.
- **Straight lines (7) mean the crankshaft mechanical top dead center.**

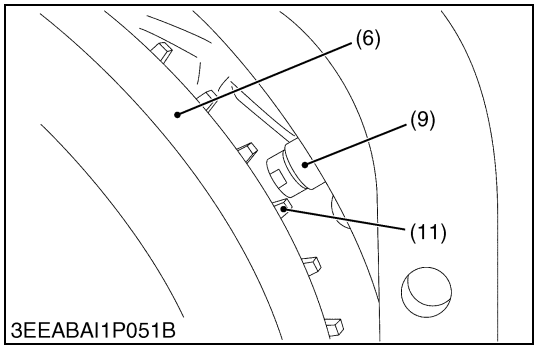
(1) TC Mark on Flywheel Housing
(2) TC Mark on Flywheel
(3) Dial Indicator
(4) Valve
(5) Flywheel Housing
(6) Flywheel
(7) Straight Line

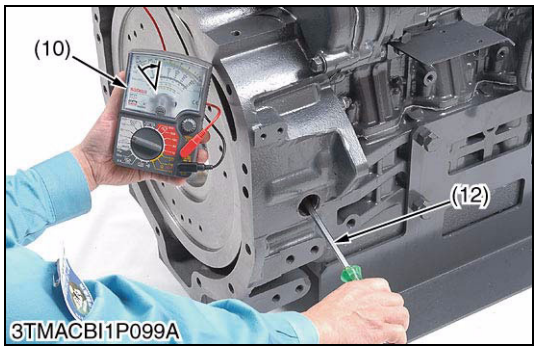
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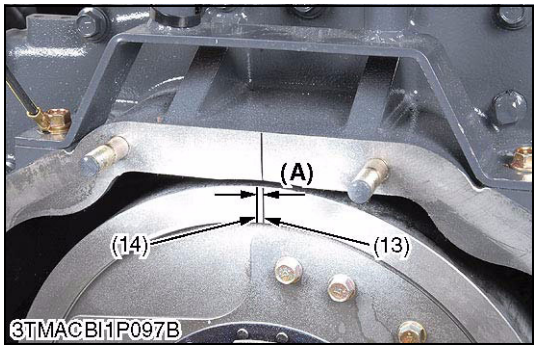
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(Continued)









1. Connect the engine harness and main switch.
2. Connect the battery.
3. Set a circuit tester (10) on the output terminal (Green / White lead) and ground terminal (Green / Black lead) of crankshaft position sensor (9).
4. Turn the main switch to **"ON"**.
5. Make sure that the voltage of crankshaft position sensor changes from 0 to 5 V or from 5 to 0 V with turning flywheel.
6. Set the flywheel at top dead center with aligning mechanical top dead center which measured.
7. Make sure that the 14th teeth of crankshaft position sensor's pulsar gear (11) from the teeth lack meets the crankshaft position sensor (9).
8. Turn the flywheel slowly counterclockwise until 5 V comes up. (When the 14th teeth of crankshaft position sensor's pulsar gear is passing away from crankshaft position sensor, 5 V is coming up.)
9. Draw a straight line on the flywheel.
10. Measure the distance between crankshaft mechanical top dead center (13) and crankshaft position sensor's electrical top dead center (14).
11. Calculate the actual gap of angles.
    Distance 1 mm: 0.28 °
    X angle = 0.28 ° × actual distance of gap
12. Rewrite the gap of angles to ECU.
    Refer to "Diagnosis Manual" for rewriting the gap of angles to ECU.

■ **IMPORTANT**

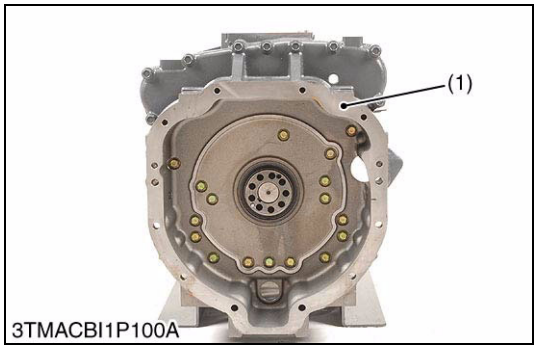
- **When the crankshaft position sensor detects the teeth of pulsar gear, the circuit tester indicates 0 V.**
- **This point coming up 5 V is crankshaft position sensor's electrical top dead center (14).**
- **Standard line is crankshaft mechanical top dead center (7). So, when the crankshaft position sensor's electrical top dead center is more advanced than crankshaft mechanical top dead center, it means minus. When the crankshaft position sensor's electrical top dead center is more retarded than crankshaft mechanical top dead center, it means plus.**

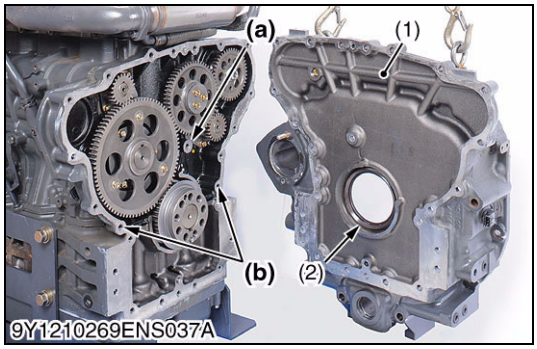
(6) Flywheel
(8) Engine Harness
(9) Crankshaft Position Sensor
(10) Circuit Tester
(11) Crankshaft Position Sensor's Pulsar Gear
(12) Screw Driver
(13) Crankshaft Mechanical Top Dead Center
(14) Crankshaft Position Sensor's Electrical Top Dead Center

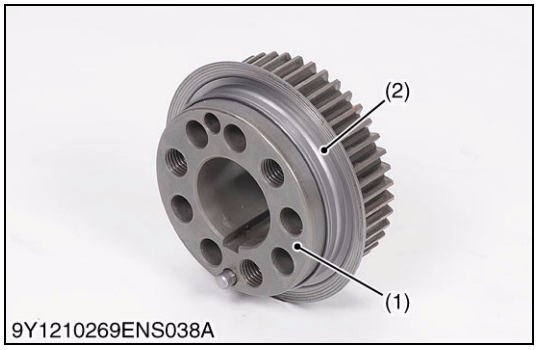
(A) Actual Distance of Gap

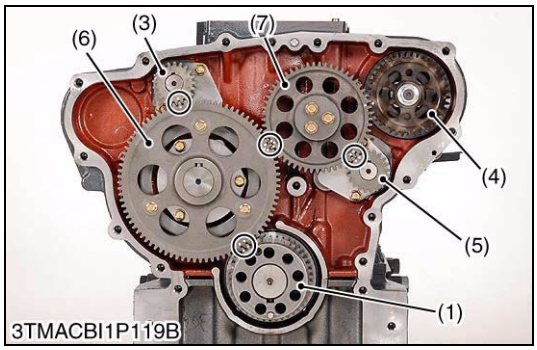
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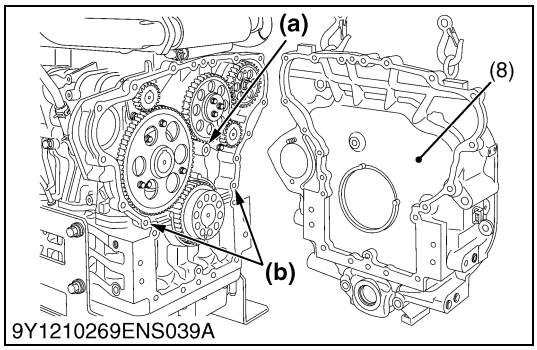
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Flywheel Housing

1. Remove the flywheel mounting screws.
2. Remove the flywheel housing (1).

(When reassembling)

- Replace the oil seal (2) with new one.
- Apply engine oil to the oil seal (2).
- Apply a liquid gasket (Three Bond 1217D) to the seam between crankcase 1 and crankcase 2.
- Assemble the adhesive-applied parts within ten minutes.

Tightening torque	Flywheel housing mounting screw	103.0 to 117.6 N·m 10.5 to 12.0 kgf·m 76.0 to 86.7 lbf·ft

(1) Flywheel Housing
(2) Oil Seal
(a) Liquid Gasket
(b) Liquid Gasket

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Replacing Oil Seal

1. Remove the crankshaft gear (1) with the oil sling (2).
2. Remove the oil slinger (2) from the crankshaft gear (1).
3. Install the crankshaft gear (1) with screws.

■ **NOTE**

- **When installing the crankshaft gear (1), align all mating marks on each gear to assemble the timing gears, set the idle gear last.**
- **Be sure to confirm the No. 4 piston is at top dead center.**
- **Do not scratch marks on the crankshaft gear. Oil leakage will occur.**

4. Install the flywheel housing (8).

■ **NOTE**

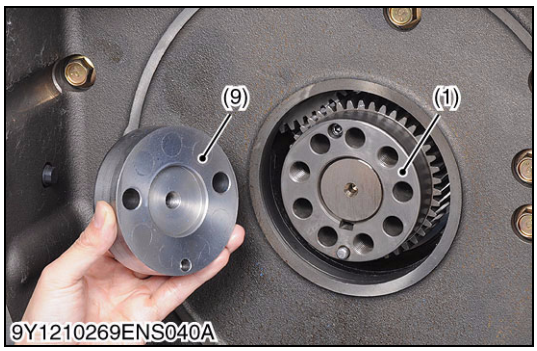
- **Apply a liquid gasket (Three Bond 1217D) to the seam between crankcase 1 and crankcase 2.**
- **Assemble the adhesive-applied parts within ten minutes.**

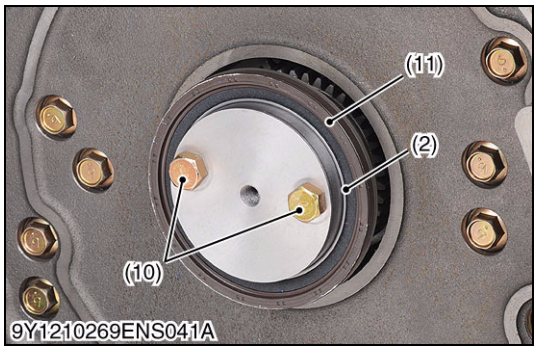
(1) Crankshaft Gear
(2) Oil Sling
(3) Screw
(4) Supply Pump Gear
(5) Balancer Gear
(6) Cam Shaft
(7) Idle Gear
(8) Flywheel Housing
(a) Liquid Gasket
(b) Liquid Gasket

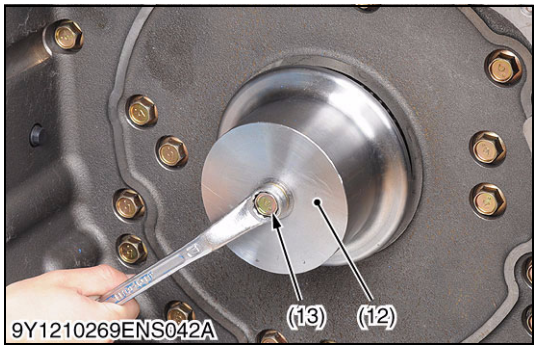
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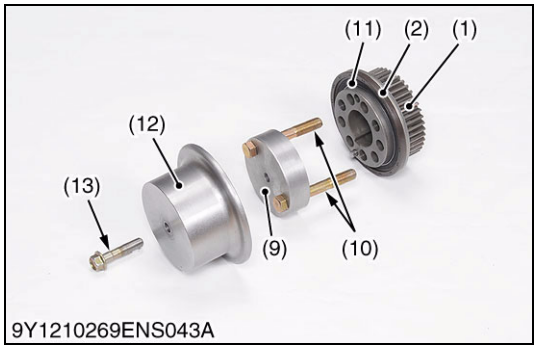
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(Continued)









5. Set the oil seal installing tool **A** (9) to the crankshaft gear (1) with screw (10), matching the knock pin position.
6. Set the oil seal (11) and the oil sling (2) to the oil seal installing tool **A** (9). (See page G-54.)

■ **NOTE**
- **Apply engine oil to the oil seal (11).**

7. Set the oil seal installing tool **B** (12) to the oil seal installing tool **A** (9). (See page G-54.)
8. Turn the screw (13) clockwise gradually to the end.

■ **NOTE**
- **Do not use an impact wrench. Serious damage will occur.**

9. Remove the oil seal installing tool **A** (9) and tool **B** (12), screw (13) and screws (10). (See page G-54, G-55.)

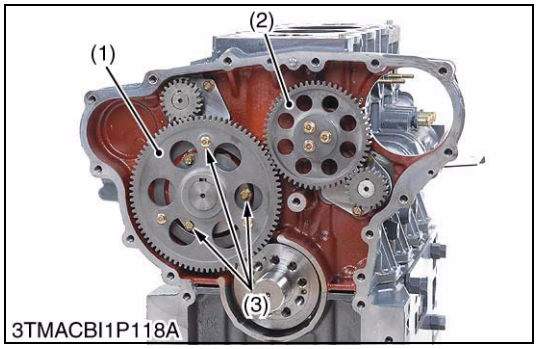
Tightening torque	Flywheel housing mounting screw	103.0 to 117.6 N·m 10.5 to 12.0 kgf·m 76.0 to 86.7 lbf·ft
	Camshaft mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft
	Idle gear mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft

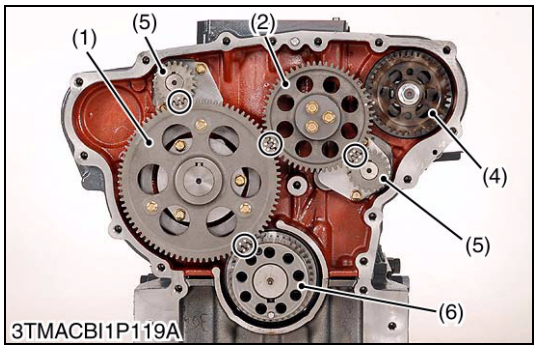
(1) Crankshaft Gear
(2) Oil Sling
(9) Oil Seal Installing Tool **A**
(10) Screw
(11) Oil Seal
(12) Oil Seal Installing Tool **B**
(13) Screw

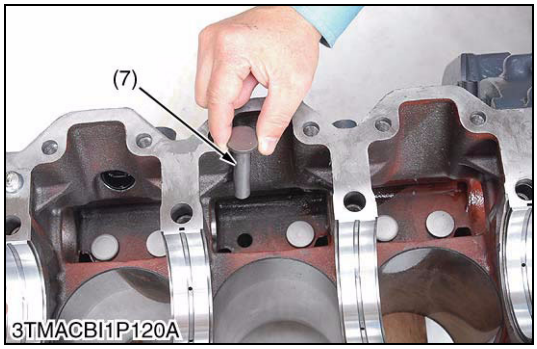
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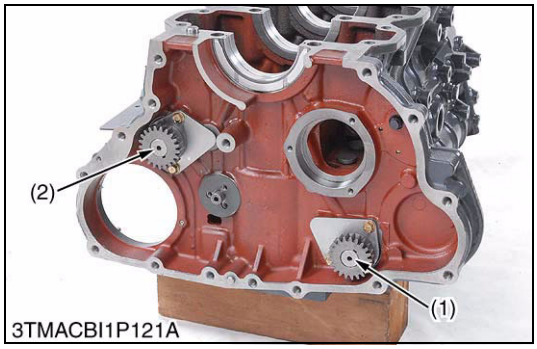
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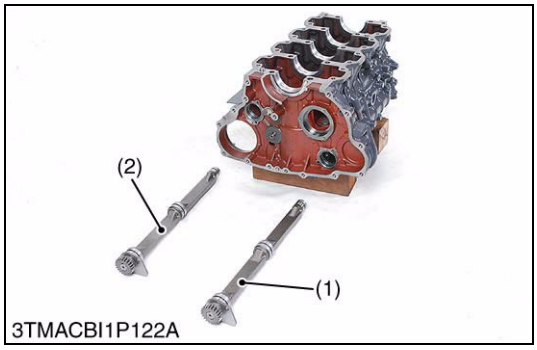
(10) Timing Gear











Camshaft and Idle Gear

1. Remove the idle gear mounting screws and draw out the idle gear (2).
2. Remove three set screws of the camshaft holder (3) and draw out the camshaft (1).
3. Take out the tappets (7) from the crankcase 1.

■ **NOTE**

- **If the cylinder head side of the engine crankcase does not become lower side, the tappets drop and become the trouble to the camshaft. The camshaft will not be able to be drawn out.**
- **Mark the cylinder number to the tappets to prevent interchanging.**

(When reassembling)

- When installing the idle gear (2) and cam gear (1), be sure to place the 4th cylinder piston at the top dead center in compression then, align all mating marks on each gear to assemble the timing gears, set the idle gear last.
- When installing the crankshaft gear, remove the oil sling.
- Before installing the tappets (7), apply engine oil thinly around them.

Tightening torque	Camshaft mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft
	Idle gear mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft

(1) Cam Shaft
(2) Idle Gear
(3) Screw
(4) Supply Pump Gear
(5) Balancer Gear
(6) Crankshaft Gear
(7) Tappet

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Balancer Shaft

1. Remove the balancer shaft 1 set screws and draw out the balancer shaft 1 (1).
2. Remove the balancer shaft 2 set screws and draw out the balancer shaft 2 (2).

(When reassembling)

- When installing the balancer shaft 1 (1) and 2 (2), be sure to place the 4th cylinders piston at the top dead center in compression then, align all mating marks on each gear to assemble the timing gears, set the idle gear last.

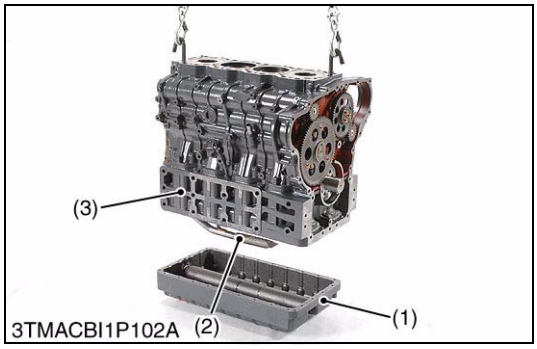
Tightening torque	Balancer shaft mounting screw	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft

(1) Balancer Shaft 1
(2) Balancer Shaft 2

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(11) Piston and Connecting Rod



Oil Pan and Oil Strainer

1. Remove the oil pan mounting screws and oil pan (1).
2. Remove the oil strainer (2).

(When reassembling)

- Apply liquid gasket (Three Bond 1217D) to the seam between crankcase 2 (3) and oil pan (1).
- Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.
- Carefully apply the adhesive evenly.

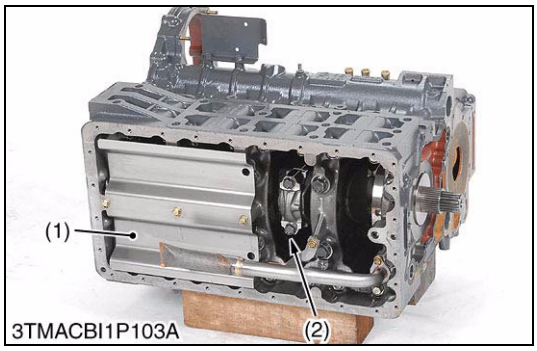
■ **NOTE**

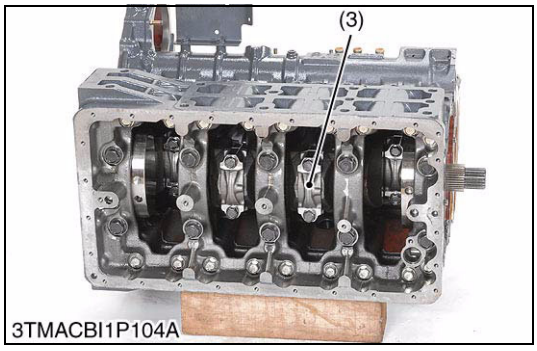
- **When mounting the adhesive-applied parts, take care to fit them to the mating parts.**
- **Assemble the adhesive-applied parts within ten minutes.**
- **To avoid uneven tightening, tighten mounting screws in diagonal order from the center.**
- **After cleaning the oil strainer, install it.**
- **Attach the oil pan so that the drain plugs will approach the flywheel housing side.**

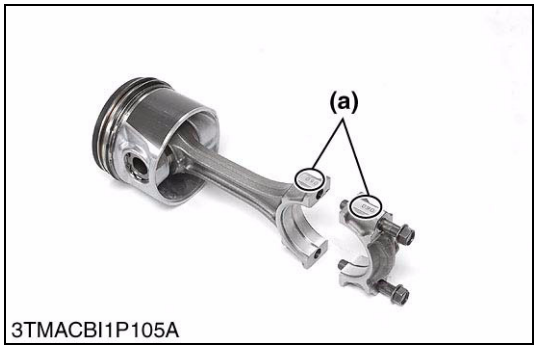
Tightening torque	Oil pan mounting screw	29.5 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft

(1) Oil Pan
(2) Oil Strainer
(3) Crankcase 2

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Connecting Rod Cap

1. Remove the plate (1).
2. Remove the connecting rod screws (2) from connecting rod cap.
3. Remove the connecting rod caps (3).

(When reassembling)

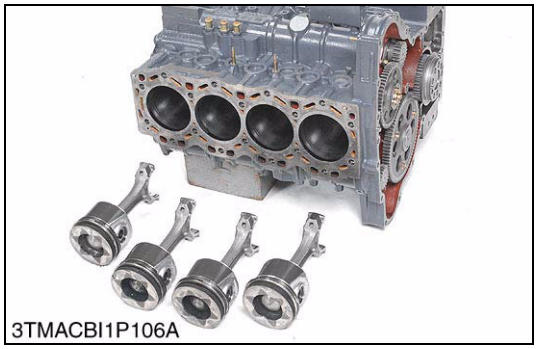
- Align the marks **(a)** with each other. (Face the marks toward the intake manifold.)
- Apply engine oil to the connecting rod screws and lightly screw it in by hand, then tighten it to the specified torque.
  If the connecting rod screw won't be screwed in smoothly, clean the threads.
  If the connecting rod screw is still hard to screw in, replace it.
- When using the existing crank pin metal again, put tally marks on the crank pin metal and the connecting rod in order to keep their positioning.
- Fit the crank pin metal in place: its centrally groove side toward the connecting rod, and the non-grooved side toward the cap.

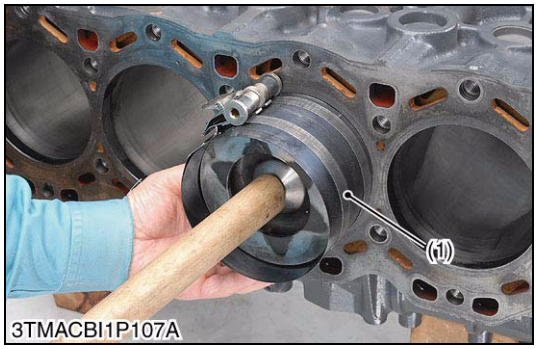
Tightening torque	Connecting rod screw	138 to 147 N·m 14.0 to 15.0 kgf·m 102 to 108 lbf·ft

(1) Plate
(2) Connecting Rod Screw
(3) Connecting Rod Cap
(a) Mark

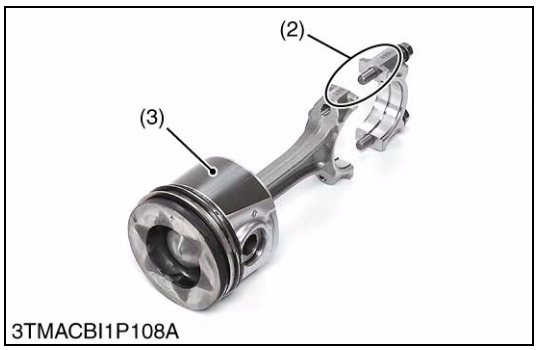
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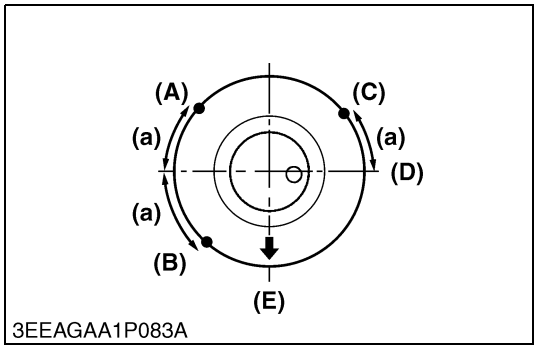

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3TMACBI1P108A



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Piston

1. Completely clean carbon in the cylinders.
2. Turn the flywheel and set a piston to the top dead center.
3. Pull out the piston upward by lightly tapping it from the bottom of the crankcase with the grip of a hammer.

(When reassembling)

- Before inserting the piston into the cylinder, apply enough engine oil to the cylinder.
- When inserting the piston into the cylinder, face the mark (2) on the connecting rod to the intake manifold.

■ **IMPORTANT**

- **Do not change the combination of cylinder and piston. Make sure of the position of each piston by marking. For example, mark "1" on the No. 1 position.**
- **When inserting the piston into the cylinder, place the gap of each piston ring like the figure.**
- **Carefully insert the pistons using a piston ring compressor (1). Otherwise, their chrome-plated section of piston rings may be scratched, causing trouble inside the liner.**
- **When inserting the piston in place, be careful not to get the molybdenum disulfide coating torn off its skirt (3). This coating is useful in minimizing the clearance with the cylinder liner. Just after the piston pin has been press-fitted, in particular, the piston is still hot and the coating is easy to peel off. Wait until the piston cools down.**

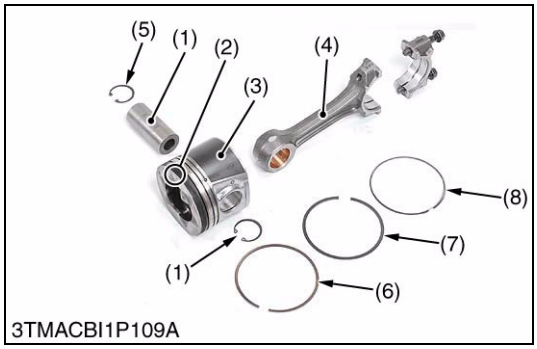
(1) Piston Ring Compressor
(2) Mark
(3) Molybdenum Disulfide Coating in piston skirt

(A) Top Ring Gap
(B) Second Ring Gap
(C) Oil Ring Gap
(D) Piston Pin Hole
(E) Injection Pump Side

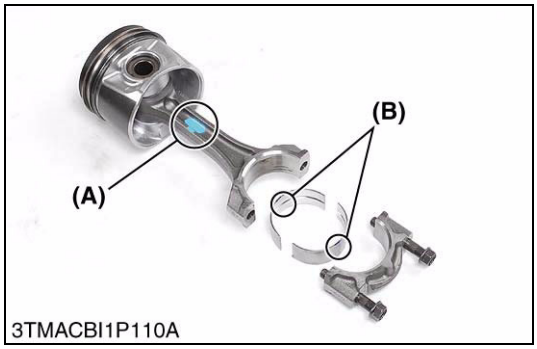
(a) 0.79 rad (45 °)

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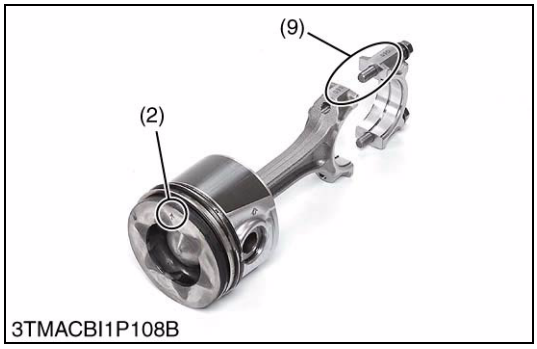
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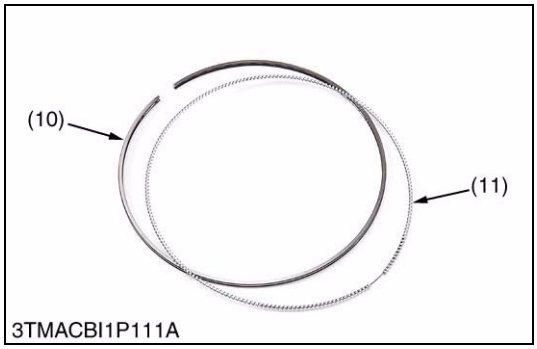
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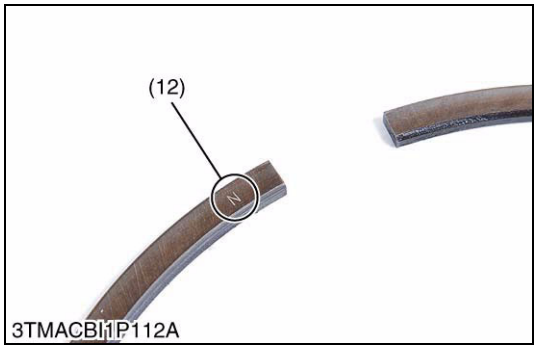
3TMACBI1P110A



3TMACBI1P108B



3TMACBI1P111A



3TMACBI1P112A

Piston Ring and Connecting Rod

1. Remove the piston rings using a piston ring tool.
2. Remove the piston pin (1), and separate the connecting rod (4) from the piston (3).

(When reassembling)

- Be sure to fix the crankpin bearing and the connecting rod are same I.D. colors.
- When installing the ring, assemble the rings so that the manufacture's mark (12) near the gap faces the top of the piston.
- When installing the oil ring onto the piston, place the expander joint (11) on the opposite side of the oil ring gap (10).
- Apply engine oil to the piston pin.
- When installing the piston pin, immerse the piston in 80 °C (176 °F) oil for 10 to 15 minutes and insert the piston pin to the piston.
- Assemble the piston to the connecting rod with the ↑ mark (2) and the connecting rod numbering mark (9) facing same side.
- The end faces of the oil ring are plated with hard chrome. In putting the piston into the cylinder, be careful not to get the oil ring scratched by the cylinder. Use the piston ring fitter to tighten up the oil ring. If the ring's planting is scratched, it may get stuck on the cylinder wall, causing a serious trouble.

■ **IMPORTANT**

- **Mark the same number on the connecting rod and the piston so as not to change the combination.**

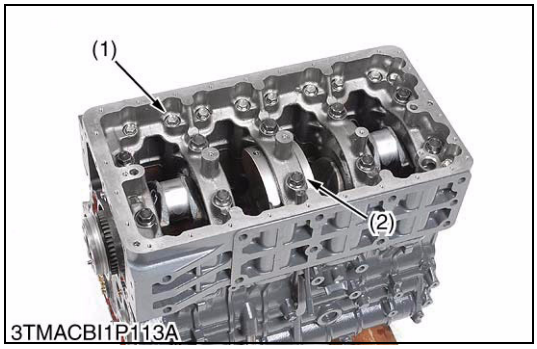
(1) Piston Pin
(2) Mark (↑)
(3) Piston
(4) Connecting Rod
(5) Piston Pin Snap Pin
(6) Top Ring
(7) Second Ring
(8) Oil Ring
(9) Numbering Mark
(10) Oil Ring Gap
(11) Expander Joint
(12) Manufacture's Mark

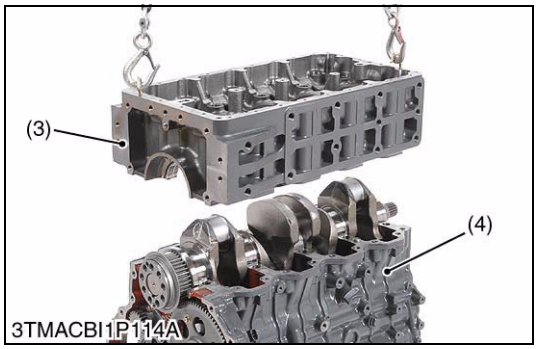
(A) Connecting Rod ID Color: Blue or without Color
(B) Crankpin Bearing ID Color: Blue or without Color

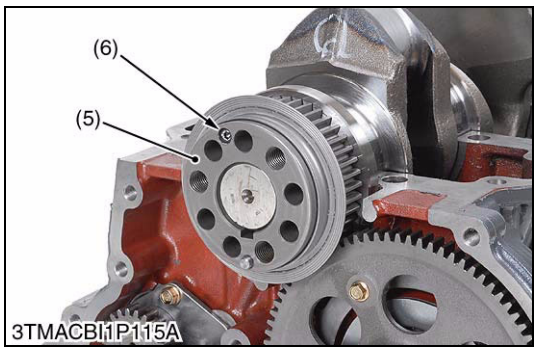
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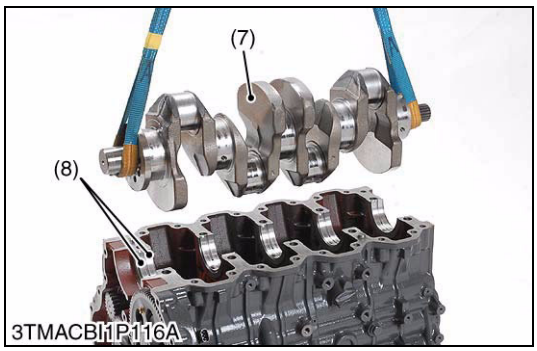
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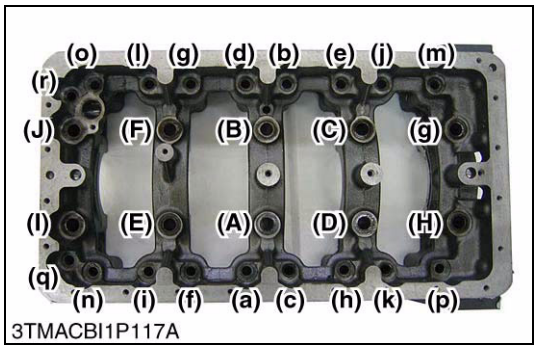
(12) Crankshaft and Crankcase











Crankshaft and Crankcase

1. Remove the crankcase 2 mounting screw 1 (1) in the order of **(r)** to **(a)**.
2. Remove the crankcase 2 mounting screw 2 (2) in the order of **(J)** to **(A)**.
3. Remove the crankcase 2 (3) from the crankcase 1 (4).
4. Remove the screw (6) and draw out the crankshaft gear (5).
5. Remove the crankshaft (7).

(When reassembling)

- Make sure the crankcase 1 (4) and 2 (3) are clean.
- Reassemble the thrust bearing (8), with the oil groove facing outside, into both flywheel housing edge journal side of the crankcase 1 (4) and 2 (3).
- Apply oil to the thrust bearing and set the crankshaft (7).
- Apply liquid gasket (Three Bond 1217D) to the seam between crankcase 1 (4) and crankcase 2 (3).
- Confirm that the liquid gasket coating surface is free of water, dust and oil in order to maintain sealing effect.
- Carefully apply the adhesive evenly.
- Match the crankcase 1 (4) and 2 (3), referring to the flywheel housing's contoured face.
- Tighten the crankcase mounting screws 2 (2) in the order of **(A)** to **(J)** and crankcase mounting screws 1 (1) in the order of **(a)** to **(r)**.

■ **NOTE**

- **When mounting the adhesive-applied parts, take care to fit them to the mating parts.**
- **Assemble the adhesive-applied parts within ten minutes.**

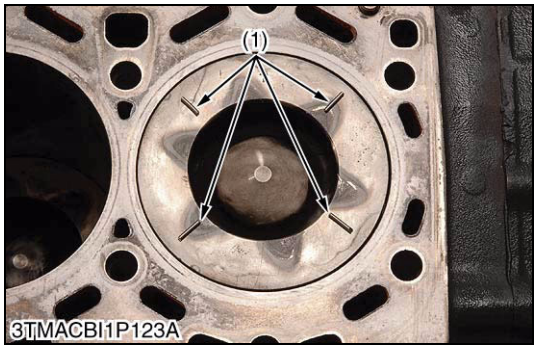
Tightening torque	Crankcase 2 mounting screw 1 **(a)** to **(r)**	103 to 117 N·m 10.5 to 12.0 kgf·m 76.0 to 86.7 lbf·ft
	Crankcase 2 mounting screw 2 **(A)** to **(J)**	197 to 205 N·m 20.0 to 21.0 kgf·m 145 to 157 lbf·ft

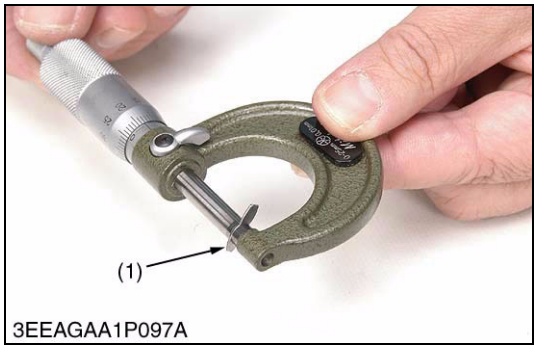
(1) Crankcase 2 Mounting Screw 1
(2) Crankcase 2 Mounting Screw 2
(3) Crankcase 2
(4) Crankcase 1
(5) Crankcase Gear
(6) Screw
(7) Crankshaft
(8) Thrust Bearing

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[4] SERVICING
(1) Cylinder Head and Valves





Top Clearance

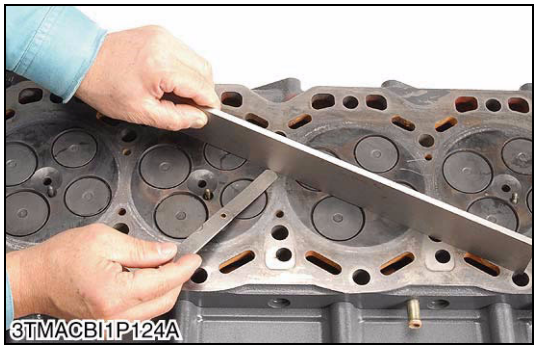
1. Remove the cylinder head (remove the cylinder head gasket completely).
2. Bring the piston to its top dead center, attach a strip of plastigauge (1.5 mm dia. × 5 to 7 mm long) to 3 to 4 spots on the piston top with grease so as to avoid the intake and exhaust valves and the combustion chamber ports.
3. Bring the piston to its middle position, install the cylinder head, and tighten the cylinder head screws to specification. (Head gasket must be changed to new one)
4. Turn the crankshaft until the piston exceeds its top dead center.
5. Remove the cylinder head, and measure squeezed plastigauge for thickness.
6. If the measurement is not within the specified value, check the oil clearance of the crankpin journal and the piston pin.

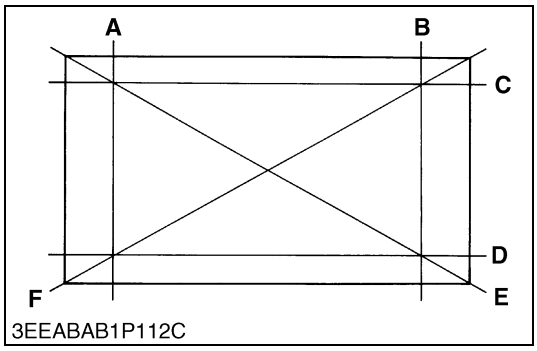
Top clearance	Factory specification	0.70 to 0.90 mm 0.0276 to 0.035 in.

Tightening torque	Cylinder head mounting screw	138 to 147 N·m 14.0 to 15.0 kgf·m 102 to 108 lbf·ft

(1) Plastigauge

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Cylinder Head Surface Flatness

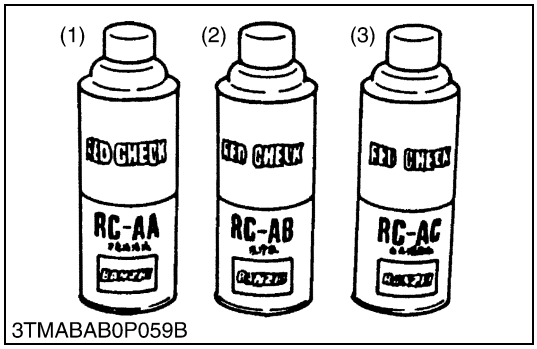
1. Clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides **"A"**, **"B"**, **"C"** and **"D"** and two diagonal **"E"** and **"F"** as shown in the figure.
   Measure the clearance with a feeler gauge.
3. If the measurement exceeds the allowable limit, correct it with a surface grinder.

■ **IMPORTANT**
- **Be sure to check the valve recessing after correcting.**

Cylinder head surface flatness	Allowable limit	0.05 mm 0.0020 in.

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Cylinder Head Flaw

1. Prepare an air spray red check.
2. Clean the surface of the cylinder head with the detergent (2).
3. Spray the cylinder head surface with the red permeative liquid (1). Leave it five to ten minutes after spraying.
4. Wash away the red permeative liquid on the cylinder head surface with the detergent (2).
5. Spray the cylinder head surface with the white developer (3).
6. If flawed, it can be identified as red marks.

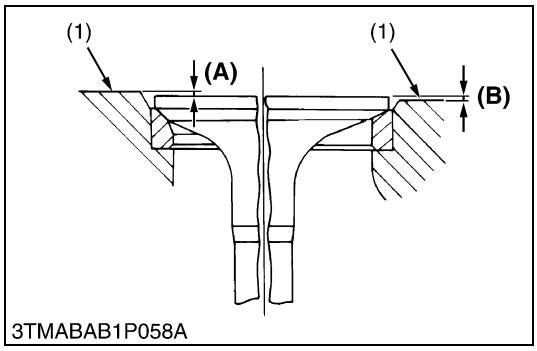
(1) Red Permeative Liquid
(2) Detergent
(3) White Developer

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Valve Recessing

1. Clean the cylinder head, the valve face and seat.
2. Insert the valve into the valve guide.
3. Measure the valve recessing with a depth gauge.
4. If the measurement exceeds the allowable limit, replace the valve.
   If it still exceeds the allowable limit after replacing the valve, replace the cylinder head.



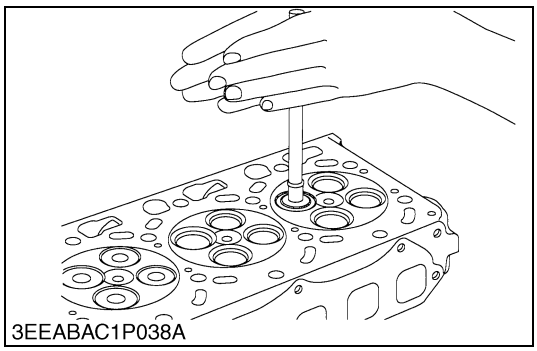
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Valve recessing	Factory specification	Intake valve	(recessing) 0.80 to 1.20 mm 0.0315 to 0.0472 in.
		Exhaust valve	(recessing) 0.70 to 1.10 mm 0.0276 to 0.0433 in.
	Allowable limit	(recessing) 1.4 mm 0.0551 in.	

(1) Cylinder Head Surface

(A) Recessing
(B) Protrusion

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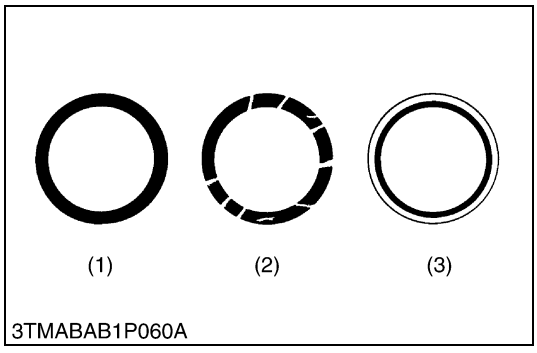

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Valve Lapping

1. Apply compound evenly to the valve lapping surface.
2. Insert the valve into the valve guide. Lap the valve onto its seat with a valve flapper or screwdriver.
3. After lapping the valve, wash the compound away and apply oil, then repeat valve lapping with oil.
4. Apply prussian blue to the contact surface to check the seated rate. If it is less than 70 %, repeat valve lapping again.

■ **IMPORTANT**

- **When valve lapping is performed, be sure to check the valve recessing and adjust the valve clearance after assembling the valve.**



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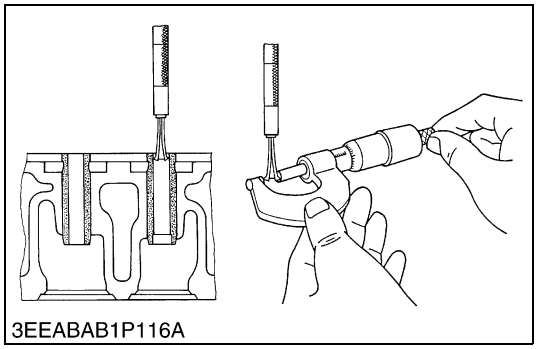
(1) Correct
(2) Incorrect
(3) Incorrect

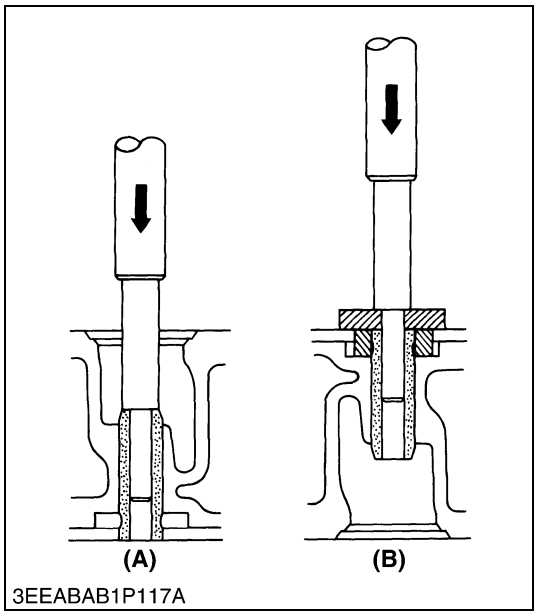
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3EEABAB1P116A



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Clearance between Valve Stem and Valve Guide

1. Remove carbon from the valve guide section.
2. Measure the valve stem O.D. with an outside micrometer.
3. Measure the valve guide I.D. of the cylinder head at the most wear part as shown in the figure below with a small hole gauge. And calculate the clearance.
4. If the clearance exceeds the allowable limit, replace the valves. If it still exceeds the allowable limit, replace the valve guide.

Clearance between valve stem and guide (Intake and exhaust)	Factory specification	0.040 to 0.070 mm 0.0016 to 0.0027 in.
	Allowable limit	0.1 mm 0.0039 in.

Valve stem O.D. (Intake and exhaust)	Factory specification	7.960 to 7.975 mm 0.3134 to 0.3139 in.
Valve guide I.D. (Intake and exhaust)	Factory specification	8.015 to 8.030 mm 0.3156 to 0.3161 in.

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Replacing Valve Guide

(When removing)

1. Using a valve guide replacing tool, press out the used valve guide. (Refer to "8. SPECIAL TOOLS" at "GENERAL" section.)

(When installing)

1. Clean a new valve guide, and apply engine oil to it.
2. Using a valve guide replacing tool, press in a new valve guide until it is flush with the cylinder head as shown in the figure.
3. Ream precisely the I.D. of the valve guide to the specified dimension.

Valve guide I.D. (Intake and exhaust)	Factory specification	8.015 to 8.030 mm 0.3156 to 0.3161 in.

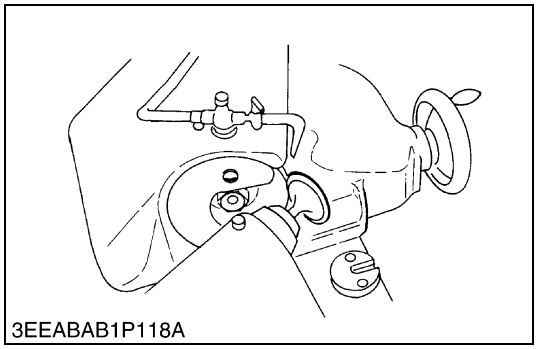
■ **IMPORTANT**

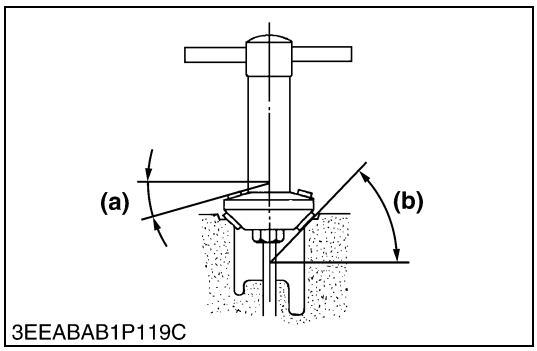
- **Do not hit the valve guide with a hammer, etc. during replacement.**

(A) When Removing **(B) When Installing**

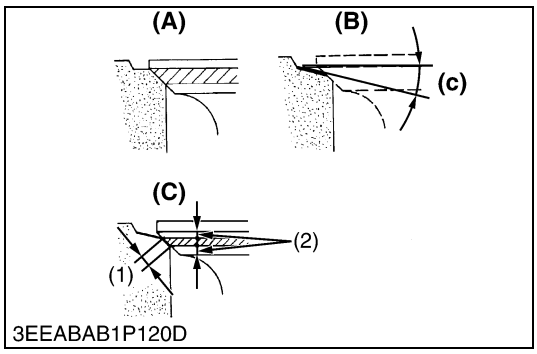
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Correcting Valve and Valve Seat

■ **NOTE**
- **Before correcting the valve and seat, check the valve stem and the I.D. of valve guide section, and repair them if necessary.**
- **After correcting the valve seat, be sure to check the valve recessing.**

1) Correcting Valve

1. Correct the valve with a valve refacer.

Valve face angle	Factory specification	IN.	1.0 rad 60 °
		EX.	0.79 rad 45 °

2) Correcting Valve Seat

1. Slightly correct the seat surface with a 1.0 rad (60 °) (intake valve) or 0.79 rad (45 °) (exhaust valve) valve seat cutter.
2. Resurface the seat surface with a 0.52 rad (30 °) valve seat cutter to intake valve seat and with a 0.26 rad (15 °) valve seat cutter to exhaust valve seat so that the width is close to specified valve seat width.

Valve seat width	Factory specification	IN.	3.3 to 3.4 mm 0.130 to 0.133 in.
		EX.	3.2 to 3.3 mm 0.126 to 0.129 in.

3. After resurfacing the seat, inspect for even valve seating, apply a thin film of compound between the valve face and valve seat, and fit them with a valve lapping tool.
4. Check the valve seating with prussian blue. The valve seating surface should show good contact all the way around.

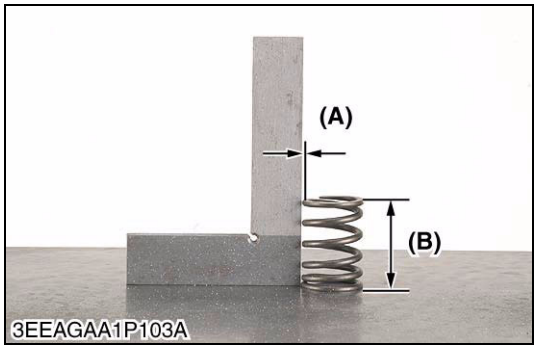
Valve seat angle	Factory specification	IN.	1.0 rad 60 °
		EX.	0.79 rad 45 °

(1) Valve Seat Width
(2) Identical Dimension

(A) Check Contact
(B) Correct Seat Width
(C) Check Contact
(a) 0.26 rad (15 °) or 0.52 rad (30 °)
(b) 0.79 rad (45 °) or 1.0 rad (60 °)
(c) 0.52 rad (30 °) or 0.26 rad (15 °)

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Free Length and Tilt of Valve Spring

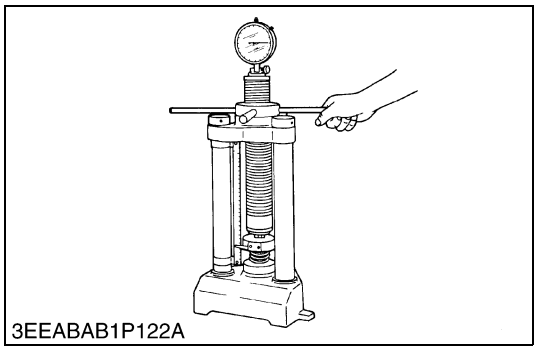
1. Measure the free length **(B)** with vernier calipers. If the measurement is less than the allowable limit, replace it.
2. Put the spring on a surface plate, place a square on the side of the spring, and check to see if the entire side is contact with the square. Rotate the spring and measure the maximum **(A)**. If the measurement exceeds the allowable limit, replace.
3. Check the entire surface of the spring for scratches. Replace it, if any.

Tilt **(A)**	Allowable limit	1.0 mm 0.039 in.

Free length **(B)**	Factory specification	41.93 to 42.20 mm 1.651 to 1.661 in.
	Allowable limit	41.2 mm 1.622 in.

(A) Tilt **(B) Free length**

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Valve Spring Setting Load

1. Place the valve spring on a tester and compress it to the same length it is actually compressed in the engine.
2. Read the compression load on the gauge.
3. If the measurement is less than the allowable limit, replace it.

Setting load / setting length	Factory specification	118 N / 35.0 mm 12.0 kgf / 35.0 mm 26.5 lbf / 1.38 in.
	Allowable limit	100 N / 35.0 mm 10.2 kgf / 35.0 mm 22.5 lbf / 1.38 in.

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Oil Clearance between Rocker Arm Shaft and Bearing

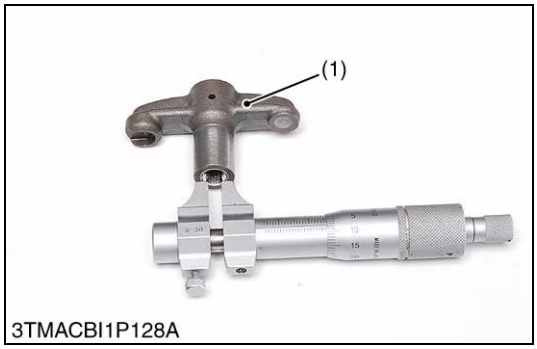
1. Measure the rocker arm bearing I.D. with an inside micrometer.
2. Measure the rocker arm shaft O.D. with an outside micrometer, and then calculate the oil clearance.
3. If the clearance exceeds the allowable limit, replace the rocker arm and measure the oil clearance again. If it still exceeds the allowable limit, replace also the rocker arm shaft.

Oil clearance of rocker arm shaft and bearing	Factory specification	0.016 to 0.045 mm 0.0006 to 0.0018 in.
	Allowable limit	0.15 mm 0.0059 in.

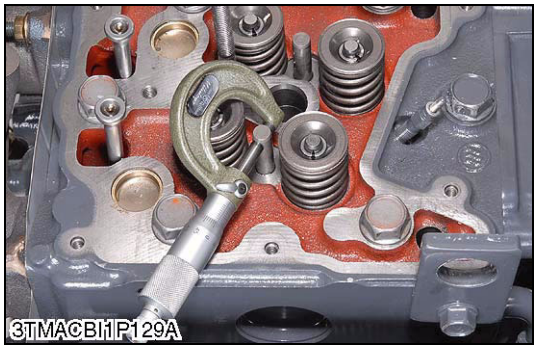
Rocker arm shaft O.D.	Factory specification	17.9730 to 17.9840 mm 0.70760 to 0.70803 in.
Rocker arm I.D. for shaft	Factory specification	18.000 to 18.018 mm 0.70867 to 0.70937 in.

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Oil Clearance between Bridge Arm and Bridge Arm Shaft

1. Measure the bridge arm (1) I.D. with an inside micrometer.
2. Measure the bridge arm shaft O.D. with an outside micrometer, and then calculate the oil clearance.
3. If the clearance exceeds the allowable limit, replace the bridge arm (1) and measure the oil clearance again. If it still exceeds the allowable limit, replace also the bridge arm shaft.

Oil clearance between bridge arm and bridge arm shaft	Factory specification	0.018 to 0.042 mm 0.0007 to 0.0016 in.
	Allowable limit	0.15 mm 0.0059 in.

Bridge arm shaft O.D.	Factory specification	9.023 to 9.032 mm 0.3553 to 0.3555 in
Bridge arm I.D.	Factory specification	9.050 to 9.065 mm 0.3563 to 0.3568 in.

(1) Bridge Arm

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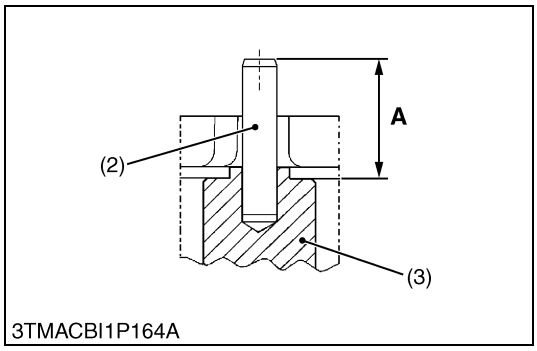
Replacing Bridge Arm Shaft

1. Remove the used bridge arm shaft.
2. Clean the bridge arm shaft mounting hole.
3. Press in the new shaft.

(1) Bridge Arm
(2) Bridge Arm Shaft
(3) Cylinder Head

A: 31.4 to 32.0 mm (1.24 to 1.25 in.)

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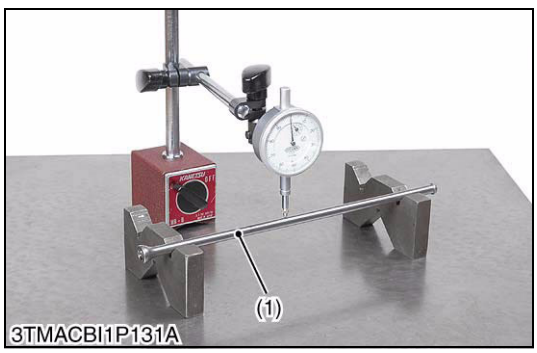
Push Rod Alignment

1. Place the push rod on V blocks.
2. Measure the push rod alignment.
3. If the measurement exceeds the allowable limit, replace the push rod.

Push rod alignment	Allowable limit	0.25 mm 0.0098 in.

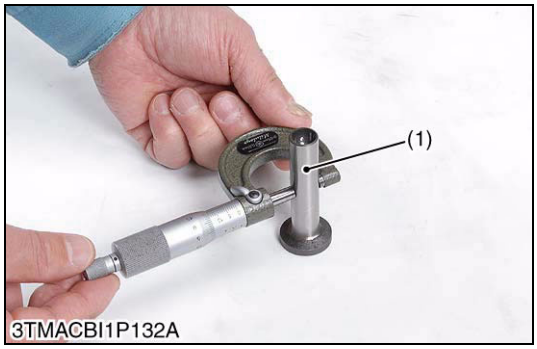
(1) Push Rod

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Oil Clearance between Tappet and Tappet Bore

1. Measure the tappet O.D. with an outside micrometer.
2. Measure the I.D. of the tappet bore at the most wear part with a small hole gauge.
3. If the oil clearance exceeds the allowable limit or the tappet is damaged, replace the tappet.

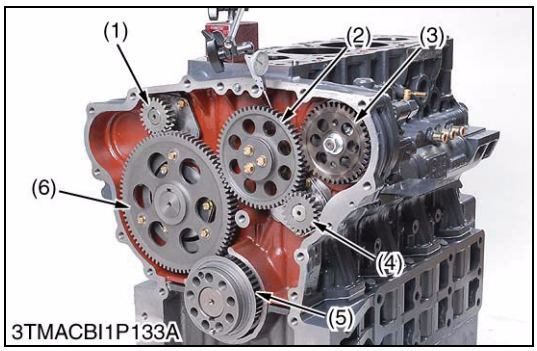
Oil clearance between tappet and tappet bore	Factory specification	0.032 to 0.061 mm 0.0013 to 0.0024 in.
	Allowable limit	0.07 mm 0.003 in.

Tappet O.D.	Factory specification	13.957 to 13.968 mm 0.54949 to 0.54992 in.
Tappet bore I.D.	Factory specification	14.000 to 14.018 mm 0.55119 to 0.55188 in.

(1) Tappet

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(2) Timing Gears



Timing Gear Backlash

1. Set a dial indicator (lever type) with its tip on the gear tooth.
2. Move the gear to measure the backlash, holding its mating gear.
3. If the backlash exceeds the allowable limit, check the oil clearance of the shafts and the gear.
4. If the oil clearance is proper, replace the gear.

Backlash between crank gear and cam gear	Factory specification	0.031 to 0.123 mm 0.00122 to 0.00484 in.
	Allowable limit	0.22 mm 0.0087 in.

Backlash between cam gear and balancer 1 gear	Factory specification	0.031 to 0.123 mm 0.00122 to 0.00484 in.
	Allowable limit	0.22 mm 0.0087 in.

Backlash between cam gear and idle gear	Factory specification	0.031 to 0.123 mm 0.00122 to 0.00484 in.
	Allowable limit	0.22 mm 0.0087 in.

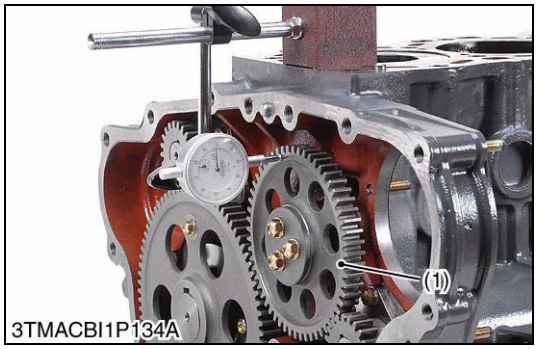
Backlash between idle gear and supply pump gear	Factory specification	0.030 to 0.123 mm 0.00119 to 0.00484 in.
	Allowable limit	0.22 mm 0.0087 in.

Backlash between idle gear and balancer 2 gear	Factory specification	0.030 to 0.123 mm 0.00119 to 0.00484 in.
	Allowable limit	0.22 mm 0.0087 in.

(1) Balancer 1 Gear
(2) Idle Gear
(3) Supply Pump Gear
(4) Balancer 2 Gear
(5) Crank Gear
(6) Cam Gear

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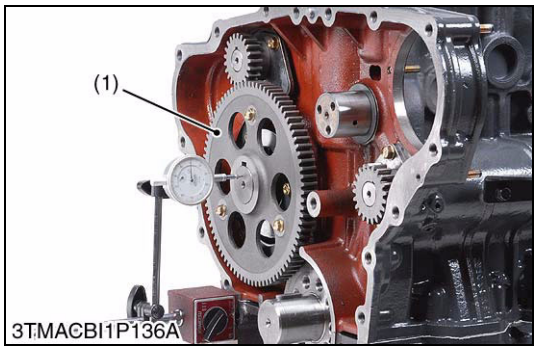
Idle Gear Side Clearance

1. Set a dial indicator with its tip on the idle gear (1).
2. Measure the side clearance by moving the idle gear (1) to the front and rear.
3. If the measurement exceeds the allowable limit, replace the idle gear collars.

Side clearance of idle gear	Factory specification	0.15 to 0.25 mm 0.0059 to 0.0098 in.
	Allowable limit	0.9 mm 0.0354 in.

(1) Idle Gear

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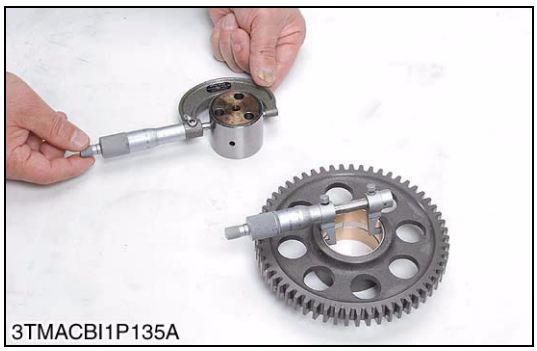
Camshaft Side Clearance

1. Set a dial indicator with its tip on the camshaft.
2. Measure the side clearance by moving the cam gear to the front and rear.
3. If the measurement exceeds the allowable limit, replace the camshaft stopper.

Side clearance of camshaft	Factory specification	0.1 mm 0.0039 in.

(1) Cam Gear

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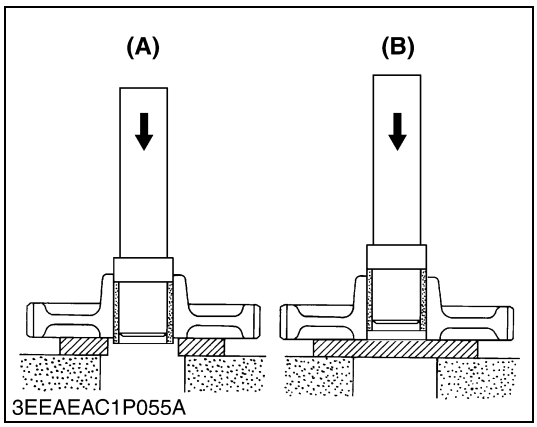
Oil Clearance between Idle Gear Shaft and Idle Gear Bushing

1. Measure the idle gear shaft O.D. with an outside micrometer.
2. Measure the idle gear bushings I.D. with an inside micrometer, and calculate the oil clearance.
3. If the oil clearance exceeds the allowable limit, replace the bushing.

Oil clearance between idle gear shaft and idle gear bushing	Factory specification	0.050 to 0.091 mm 0.0020 to 0.0036 in.
	Allowable limit	0.10 mm 0.0039 in.

Idle gear shaft O.D.	Factory specification	44.959 to 44.975 mm 1.7701 to 1.7706 in.
Idle gear bushing I.D.	Factory specification	45.025 to 45.050 mm 1.7727 to 1.7736 in.

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Replacing Idle Gear Bushing

(When removing)

1. Using an idle gear bushing replacing tool, press out the used bushing. (Refer to "8. SPECIAL TOOLS" at "GENERAL" section.)

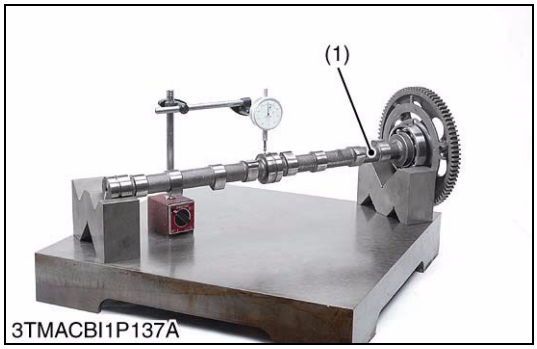
(When installing)

1. Clean a new idle gear bushing and idle gear bore, and apply engine oil to them.
2. Using an idle gear bushing replacing tool, press in a new bushing (service parts) to the specified dimension. (See figure.)

(A) When Removing **(B) When Installing**

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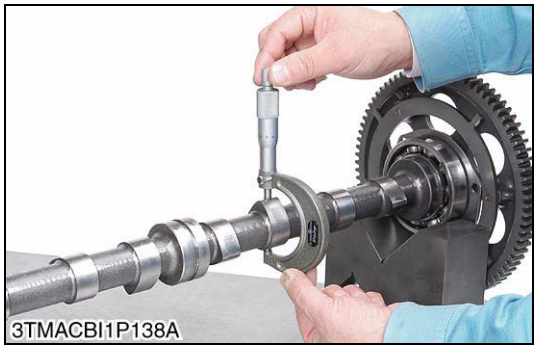
Camshaft Alignment

1. Support the camshaft (1) with V block on the surface plate and set a dial indicator with its tip on the intermediate journal at right angle.
2. Rotate the camshaft on the V blocks and get the misalignment (half of the measurement value).
3. If the misalignment exceeds the allowable limit, replace the camshaft.

Camshaft alignment	Allowable limit	0.01 mm 0.00039 in.

(1) Camshaft

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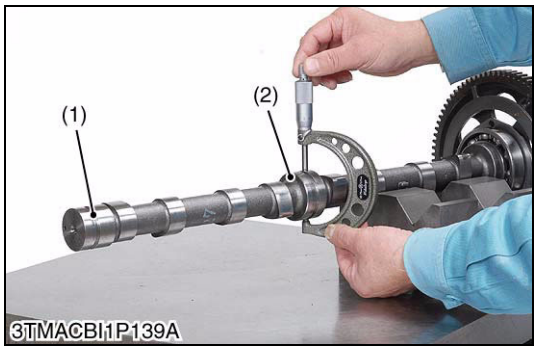


Cam Height

1. Measure the height of the cam at its highest point with an outside micrometer.
2. If the measurement is less than the allowable limit, replace the camshaft.

Intake and exhaust cam height	Factory specification	Intake valve	40.70 mm 1.6024 in.
		Exhaust valve	42.20 mm 1.6614 in.
	Allowable limit	Intake valve	40.20 mm 1.5827 in.
		Exhaust valve	39.70 mm 1.5630 in.

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Oil Clearance of Camshaft Journal

1. Measure the camshaft journal O.D. with an outside micrometer.
2. Measure the cylinder block bore I.D. for camshaft with an inside micrometer.
3. If the clearance exceeds the allowable limit, replace the camshaft.

Oil clearance of camshaft journal	Factory specification	0.050 to 0.091 mm 0.0020 to 0.0035 in.
	Allowable limit	0.15 mm 0.0059 in.

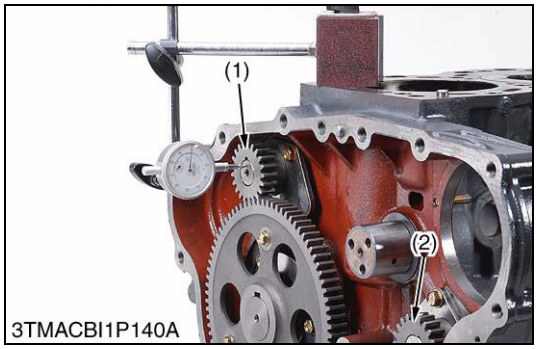
Camshaft journal 1 O.D.	Factory specification	39.934 to 39.950 mm 1.5722 to 1.5728 in.
Camshaft block bore 1 I.D.	Factory specification	40.000 to 40.025 mm 1.5748 to 1.5757 in.

Camshaft journal 2 O.D.	Factory specification	49.934 to 49.950 mm 1.9659 to 1.9665 in.
Camshaft block bore 2 I.D.	Factory specification	50.000 to 50.025 mm 1.9685 to 1.9694 in.

(1) Camshaft Journal 1 (2) Camshaft Journal 2

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Balancer Shaft Side Clearance

1. Set a dial indicator with tip on the balancer shaft.
2. Measure the side clearance by moving the balancer shaft to the front and rear.
3. If the measurement exceeds the allowable limit, replace the balancer shaft.

Side clearance of balancer shaft 1, 2	Factory specification	0.070 to 0.215 mm 0.00276 to 0.00846 in.
	Allowable limit	0.3 mm 0.0118 in.

(1) Balancer Shaft 1 (2) Balancer Shaft 2

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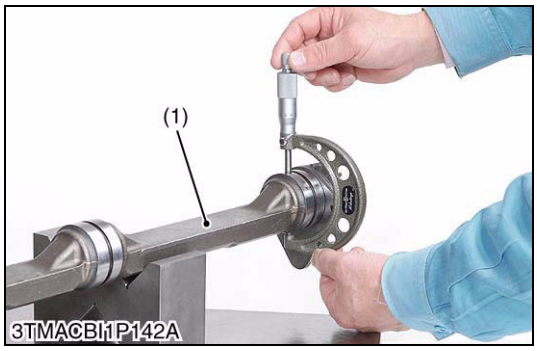


Balancer Shaft Alignment

1. Support the balancer shaft with V blocks on the surface plate and set a dial indicator with its tip on the intermediate journal at high angle.
2. Rotate the balancer shaft on the V block and get the misalignment (half of the measurement value).
3. If the misalignment exceeds the allowable limit, replace the balancer shaft.

Balancer shaft 1, 2 alignment	Allowable limit	0.02 mm 0.0008 in.

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Oil Clearance of Balancer Shaft Journal

1. Measure the balancer shaft journal O.D. with an outside micrometer.
2. Measure the cylinder block bore I.D. for balancer shaft with an inside micrometer.
3. If the clearance exceeds the allowable limit, replace the balancer shaft bearing. If it still exceeds the allowable limit, replace also the balancer shaft.

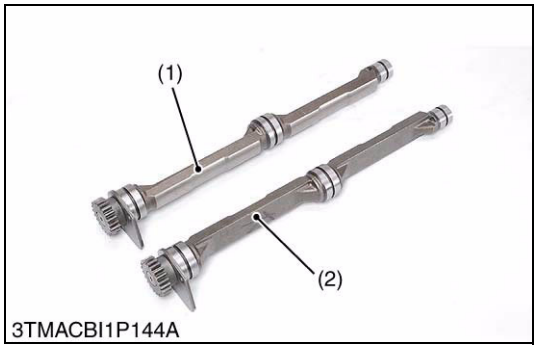
Oil clearance of balancer shaft 1 and 2 journal	Factory specification	0.070 to 0.159 mm 0.00276 to 0.00625 in.
	Allowable limit	0.2 mm 0.0079 in.

Balancer shaft 1 and 2 journal O.D.	Factory specification	54.921 to 54.940 mm 2.1623 to 2.1629 in.
Balancer shaft 1 and 2 bearing I.D.	Factory specification	55.010 to 55.080 mm 2.1658 to 2.1685 in.

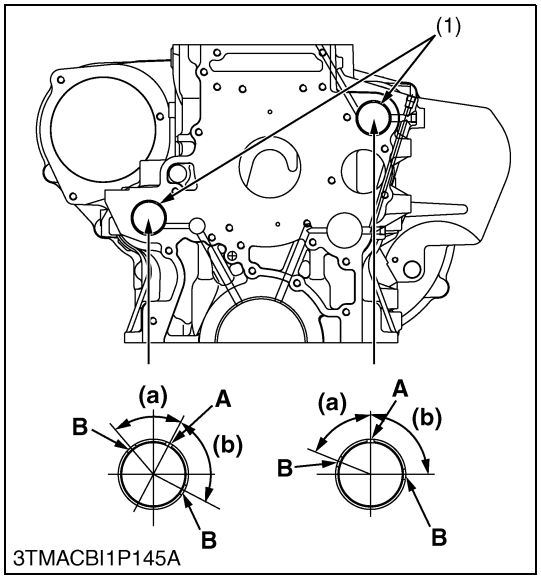
(1) Balancer Shaft 1 (2) Balancer Shaft 2

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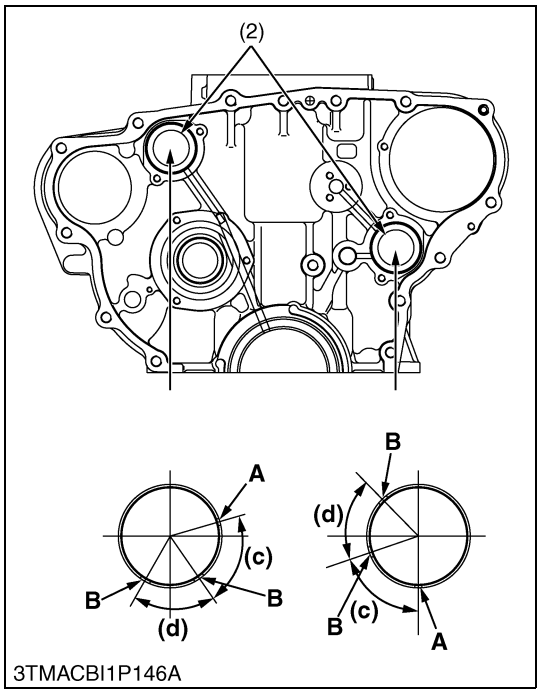




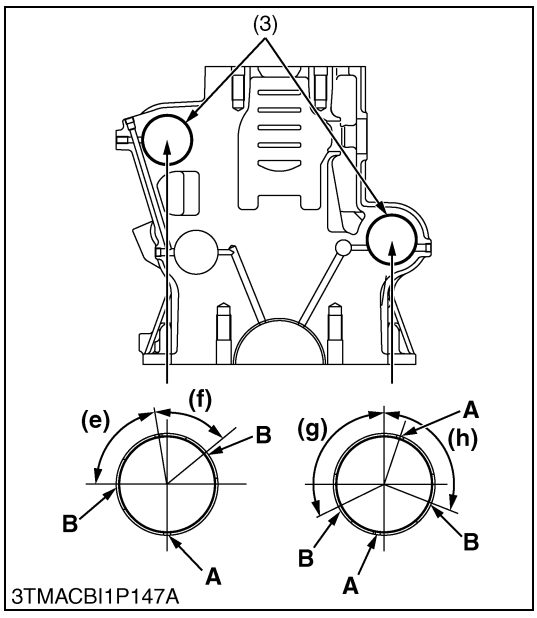
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3TMACBI1P146A



3TMACBI1P147A

Replacing Balancer Shaft Bearing

1. Remove the used balancer shaft bearings (1), (2), (3) and (4).
2. Set the new bearing to the balancer shaft bearing replacing tools. (Refer to "8. SPECIAL TOOLS" at "GENERAL" section.) Confirm that the cut off position of the bearing (C) matched with the pin of the replacing tool.
3. Install the new bearing (2), (3) from flywheel housing side.
4. Install the new bearing (1) from front cover side.

■ **IMPORTANT**

- **Be sure to align the oil hole of bearing and crankcase. Otherwise the balancer shaft may be seized and engine may get damaged.**
- **Apply engine oil to the bearing surface.**

(1) Bearing C
(2) Bearing A
(3) Bearing B

A: Cut Off Position of Bearing
B: Oil Hole Position of Bearing

(a) 1.2 rad (68 °)
(b) 1.6 rad (90 °)
(c) 1.25 rad (71.7 °)
(d) 1.11 rad (63.8 °)
(e) 1.4 rad (80 °)
(f) 1.09 rad (62.7 °)
(g) 1.895 rad (108.6 °)
(h) 1.897 rad (108.7 °)

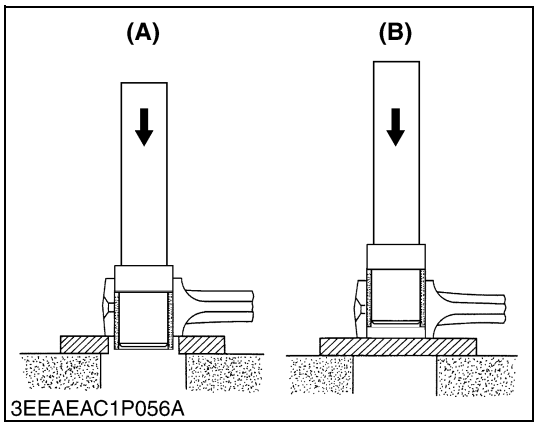
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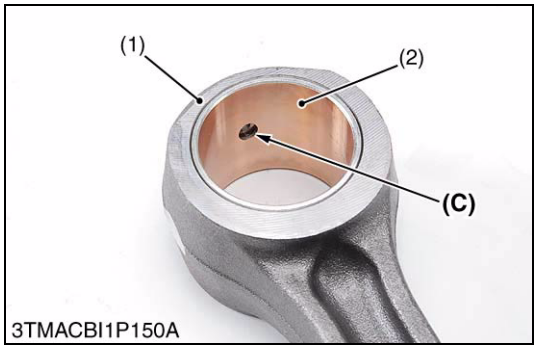
(3) Piston and Connecting Rod


3TMACBI1P148A


3TMACBI1P149A



3EEAEAC1P056A



3TMACBI1P150A

Piston Pin Bore I.D.

1. Measure the piston pin bore I.D. in both the horizontal and vertical directions with a cylinder gauge.
2. If the measurement exceeds the allowable limit, replace the piston.

Piston pin bore I.D.	Factory specification	40.000 to 40.013 mm 1.5748 to 1.5753 in.
	Allowable limit	40.05 mm 1.5768 in.

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Oil Clearance between Piston Pin and Small End Bushing

1. Measure the O.D. of the piston pin where it contacts the bushing with an outside micrometer.
2. Measure the I.D. of the piston pin bushing at the connecting rod small end with a inside micrometer.
   Calculate the oil clearance.
3. If the clearance exceeds the allowable limit, replace the bushing.
   If it still exceeds the allowable limit, replace the piston pin.

Oil clearance between piston pin and small end bushing	Factory specification	0.020 to 0.040 mm 0.0008 to 0.0016 in.
	Allowable limit	0.15 mm 0.0059 in.

Piston pin O.D.	Factory specification	40.008 to 40.013 mm 1.5752 to 1.5753 in.
Small end bushing I.D.	Factory specification	40.033 to 40.048 mm 1.5761 to 1.5766 in.

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Replacing Small End Bushing

(When removing)

1. Press out the used bushing using a small end bushing replacing tool. (Refer to "8. SPECIAL TOOLS" at "GENERAL" section.)

(When installing)

1. Clean a new small end bushing and bore, and apply engine oil to them.
2. Press fit the bushing using the bushing replacing tool.

■ **IMPORTANT**

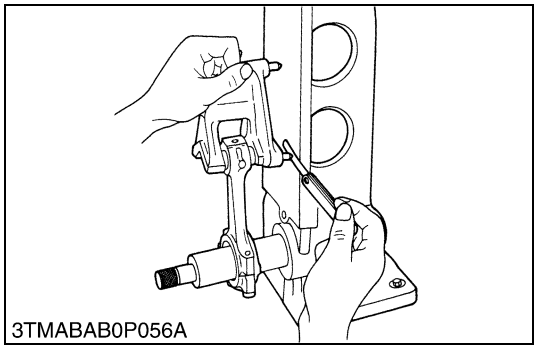
- **Be sure to align the oil hole of bushing and connecting rod.**

(1) Connecting Rod
(2) Bushing

(A) When Removing
(B) When Installing
(C) Oil Hole

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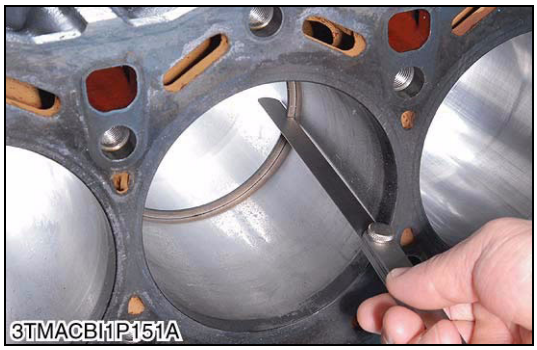
Connecting Rod Alignment

■ **NOTE**
- **Since the I.D. of the connecting rod small end bushing is the basis of this check, check the bushing for wear beforehand.**

1. Remove the piston pin from the piston.
2. Install the piston pin in the connecting rod.
3. Install the connecting rod on the connecting rod alignment tool.
4. Put a gauge over the piston pin, and move it against the face plate.
5. If the gauge does not fit squarely against the face plate, measure the space between the pin of the gauge and the face plate.
6. If the measurement exceeds the allowable limit, replace the connecting rod.

Connecting rod alignment	Allowable limit	0.05 mm 0.0020 in.

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Piston Ring Gap

1. Insert the piston ring into the lower part of the liner (the least worn part).
2. Measure the ring gap with a feeler gauge.
3. If the gap exceeds the allowable limit, replace the piston ring.

Top ring	Factory specification	0.30 to 0.45 mm 0.0118 to 0.0177 in.
	Allowable limit	1.25 mm 0.0492 in.
Second ring	Factory specification	0.30 to 0.45 mm 0.0118 to 0.0177 in.
	Allowable limit	1.25 mm 0.0492 in.
Oil ring	Factory specification	0.20 to 0.40 mm 0.0078 to 0.0157 in.
	Allowable limit	1.25 mm 0.0492 in.

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Clearance between Piston Ring and Groove

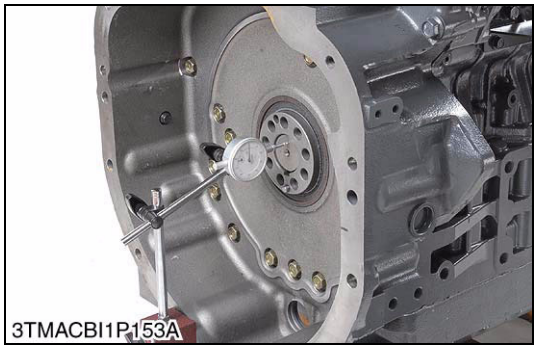
1. Remove carbon from the ring grooves.
2. Measure the clearance between the ring and the groove with a feeler gauge or depth gauge.
3. If the clearance exceeds allowable limit, check the new ring.
4. If clearance still exceeds the allowable limit after replacing the ring, replace the piston.

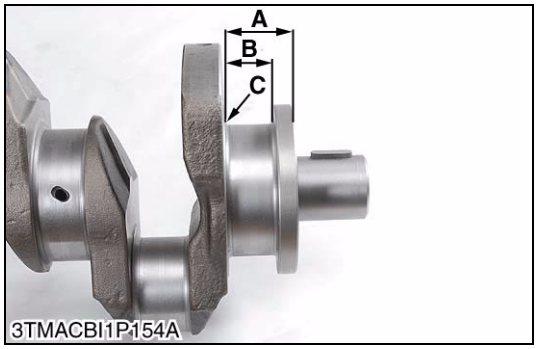
Top ring	Factory specification	0.090 to 0.130 mm 0.0035 to 0.0051 in.
	Allowable limit	0.15 mm 0.0059 in.
Second ring	Factory specification	0.050 to 0.090 mm 0.0020 to 0.0027 in.
	Allowable limit	0.20 mm 0.0079 in.
Oil ring	Factory specification	0.030 to 0.070 mm 0.0012 to 0.0027 in.
	Allowable limit	0.15 mm 0.0059 in.

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(4) Crankshaft





Crankshaft Side Clearance

1. Set a dial indicator with its tip on the end of the crankshaft.
2. Measure the side clearance by moving the crankshaft to the front and rear.
3. If the measurement exceeds the allowable limit, replace the thrust bearings.
4. If the same size bearing is out of specifications because of the crankshaft journal wear, replace it with an oversize one referring to the table and figure.

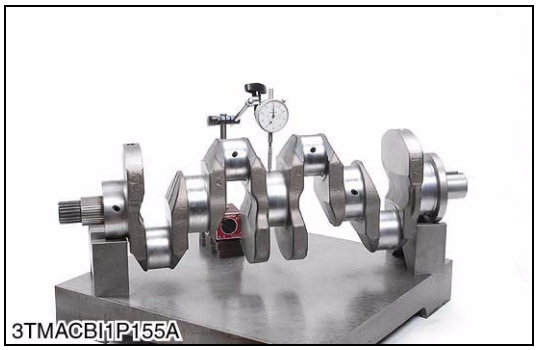
Side clearance of crankshaft	Factory specification	0.15 to 0.31 mm 0.0059 to 0.0122 in.
	Allowable limit	0.50 mm 0.0197 in.

(Reference)

- Oversize dimensions of crankshaft journal.

Oversize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension **"A"**	47.6 to 48.6 mm 1.8741 to 1.9133 in.	47.7 to 48.7 mm 1.8780 to 1.9173 in.
Dimension **"B"**	35.10 to 35.15 mm 1.3819 to 1.3838 in.	35.20 to 35.25 mm 1.3859 to 1.3877 in.
Dimension **"C"**	3.2 to 3.6 mm radius 0.1260 to 0.1417 in. radius	3.2 to 3.6 mm radius 0.1260 to 0.1417 in. radius
The crankshaft journal must be fine-finished to higher than Rmax = 0.8S.		

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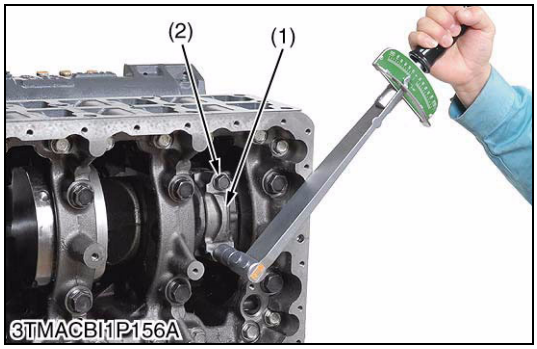
Crankshaft Alignment

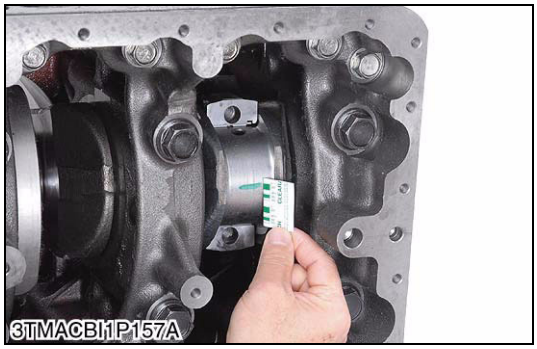
1. Support the crankshaft with V block on the surface plate and set a dial indicator with its tip on the intermediate journal at right angle.
2. Rotate the crankshaft on the V block and get the misalignment (half of the measurement value).
3. If the misalignment exceeds the allowable limit, replace the crankshaft.

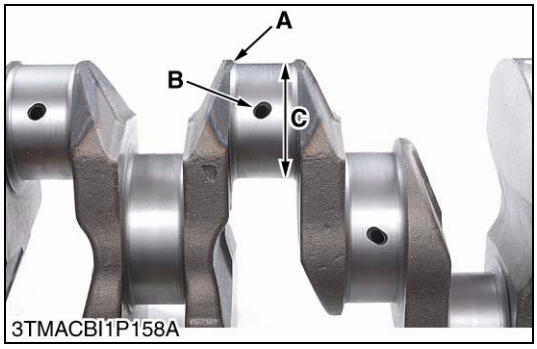
Crankshaft alignment	Allowable limit	0.02 mm 0.0008 in.

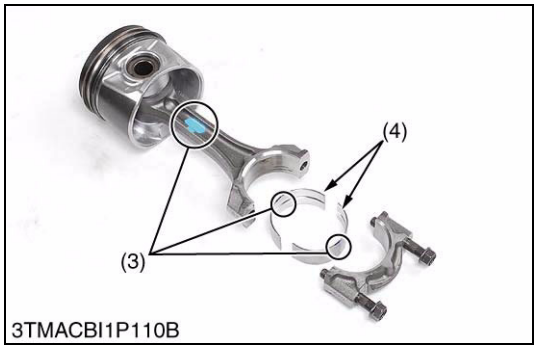
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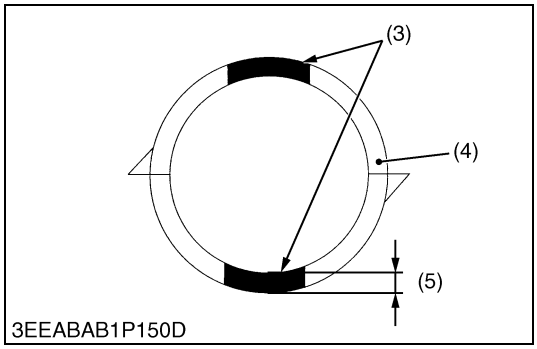
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Oil Clearance between Crankpin and Crankpin Bearing

1. Clean the crankpin and crankpin bearing.
2. Put a strip of plastigage on the center of the crankpin.
3. Install the connecting rod cap and tighten the connecting rod screws to the specified torque, and remove the cap again.
4. Measure the amount of the flattening with the scale, and get the oil clearance.
5. If the oil clearance exceeds the allowable limit, replace the crankpin bearing.
6. If the same size bearing is useless because of the crankpin wear, replace it with an undersize one referring to the table and figure.

■ **NOTE**

- **Never insert the plastigage into the crankpin oil hole.**
- **Be sure not to move the crankshaft while the connecting rod screws are tightened.**

Crankpin O.D.	Factory specification	69.977 to 69.990 mm 2.7550 to 2.7555 in.

Oil clearance between crankpin and crankpin bearing	Factory specification	0.018 to 0.051 mm 0.0007 to 0.0020 in.
	Allowable limit	0.20 mm 0.0079 in.

■ **IMPORTANT**

- **STD size crankpin bearing.**
  To replace it with a specific STD service part, make sure the crankpin bearing has the same ID color as the connecting rod.

ID Color	Connecting rod	Crankpin bearing		
	Large-end in. dia.	Class	Part code	Center wall thick
Blue	74.010 to 74.020 mm 2.9138 to 2.9141 in.	L	1G410-22310	1.9960 to 2.001 mm 0.0786 to 0.0788 in.
Without color	74.000 to 74.010 mm 2.9134 to 2.9137 in.	S	1G410-22330	1.9910 to 1.9960 mm 0.0783 to 0.0785 in.

(Reference)

- Undersize dimensions of crankpin

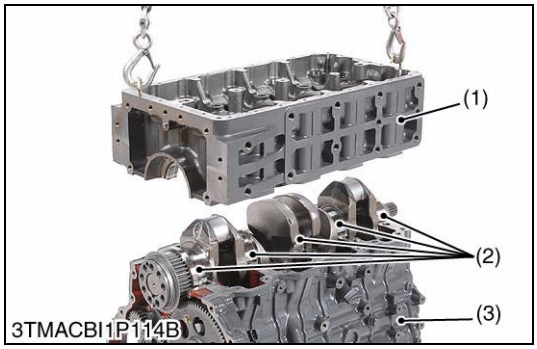
Undersize	0.2 mm 0.008 in.	0.4 mm 0.016 in.
Dimension **"A"**	3.8 to 4.2 mm radius 0.1496 to 0.1653 in. radius	3.8 to 4.2 mm radius 0.1496 to 0.1653 in. radius
*Dimension **"B"**	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief
Dimension **"C"**	69.777 to 69.790 mm dia. 2.7472 to 2.7476 in. dia.	69.577 to 69.590 mm dia. 2.7393 to 2.7397 in. dia.
The crankpin must be fine-finished to higher than Rmax = 0.8S. *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.0394 to 0.0591 in.) relief.		

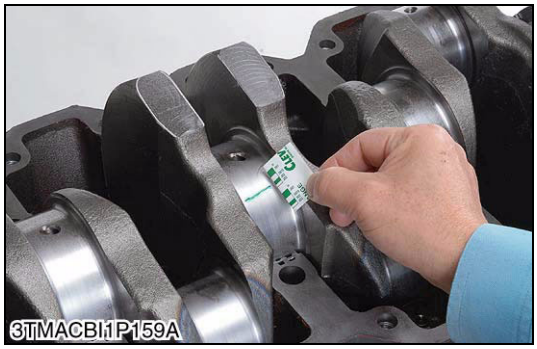
(1) Connecting Rod Cap
(2) Connecting Rod Screw
(3) ID Color
(4) Crankpin Bearing
(5) Center Wall Thick

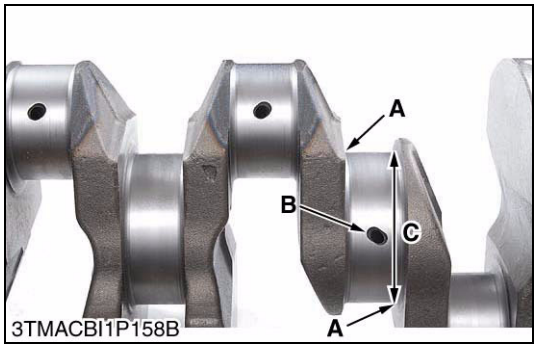
A: Dimension
B: Dimension
C: Dimension

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Oil Clearance between Crankshaft Journal and Crankshaft Bearing

1. Clean the crankshaft journal (2) and crankshaft bearing.
2. Put a strip of press gauge on the center of the journal.

■ **IMPORTANT**

- **Never insert the press gauge into the oil hole of the journal.**

3. Install the crankcase 2 (1) and tighten the crankcase 2 mounting screws to the specified torque, and remove the crankcase 2 (1) again.
4. Measure the amount of the flattening with the scale and get the oil clearance.
5. If the clearance exceeds the allowable limit, replace the crankshaft bearing.

Crankshaft journal O.D.	Factory specification	94.973 to 94.988 mm 3.7391 to 3.7396 in

Oil clearance between crankshaft journal and crankshaft bearing	Factory specification	0.030 to 0.075 mm 0.0012 to 0.0029 in.
	Allowable limit	0.20 mm 0.0079 in.

(Reference)

- Undersize dimensions of crankshaft journal.

Undersize	**0.2 mm 0.008 in.**	**0.4 mm 0.016 in.**
Dimension **"A"**	3.2 to 3.6 mm radius 0.1260 to 0.1417 in. radius	3.2 to 3.6 mm radius 0.1260 to 0.1417 in. radius
*Dimension **"B"**	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief	1.0 to 1.5 mm relief 0.0394 to 0.0591 in. relief
Dimension **"C"**	94.7730 to 94.7880 mm dia. 3.7313 to 3.7318 in. dia.	94.5730 to 94.5880 mm dia. 3.7234 to 3.7239 in. dia.
The crankshaft journal must be fine-finished to higher than Rmax = 0.8S. *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.0394 to 0.0591 in.) relief.		

(1) Crankcase 2
(2) Crankshaft Journal
(3) Crankcase 1

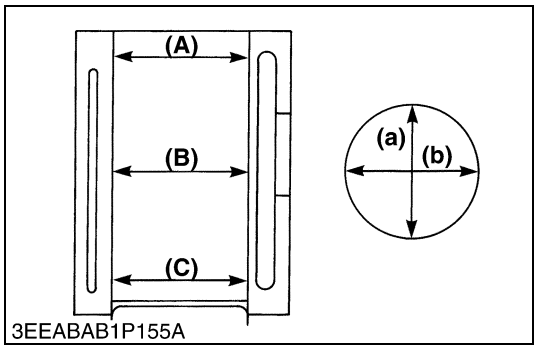
A: Dimension
B: Dimension
C: Dimension

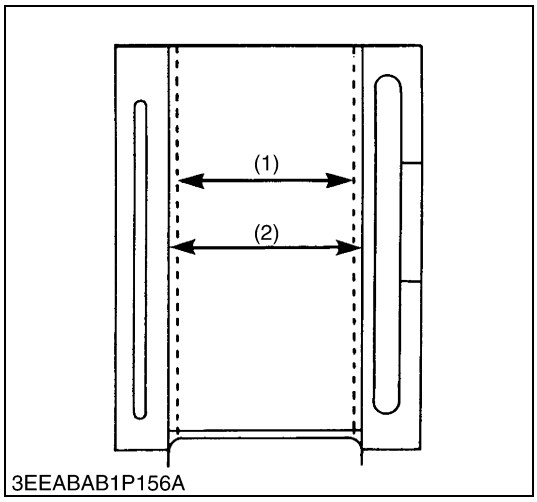
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(5) Cylinder







Cylinder Wear

1. Measure the I.D. of the cylinder at the six positions (see figure) with a cylinder gauge to find the maximum and minimum I.D.'s.
2. Get the difference (Maximum wear) between the maximum and the minimum I.D.'s.
3. If the wear exceeds the allowable limit, bore and hone to the oversize dimension. (Refer to "Correcting Cylinder".)
4. Visually check the cylinder wall for scratches. If deep scratches are found, the cylinder should be bored. (Refer to "Correcting Cylinder".)

Cylinder Bore I.D.	Factory specification	118.000 to 118.035 mm 4.6456 to 4.6470 in.
	Allowable limit	118.15 mm 4.6516 in.

(A) Top
(B) Middle
(C) Bottom (Skirt)
(a) Right-angled to piston pin
(b) Piston pin direction

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Correcting Cylinder (Oversize)

1. When the cylinder is worn beyond the allowable limit, bore and hone it to the specified dimension.

Cylinder I.D. (2)	Factory specification	118.500 to 118.535 mm 4.6653 to 4.6667 in.
Maximum wear	Allowable limit	118.65 mm 4.6713 in.
Finishing	Hone to 2.2 to 3.0 µm Rz (0.000087 to 0.00012 in. Rz)	

2. Replace the piston and piston rings with oversize 0.5 mm (0.0197 in.) ones.

■ **NOTE**

- **When the oversize cylinder is worn beyond the allowable limit, replace the cylinder block with a new one.**

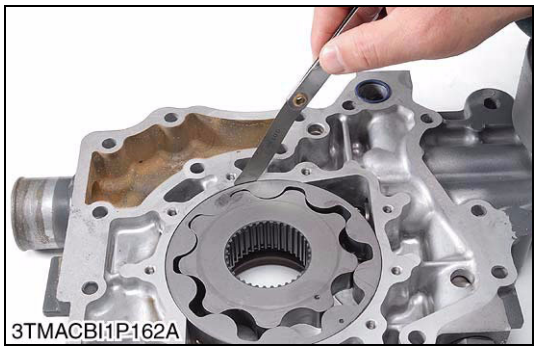
(1) Cylinder I.D. (Before Correction) (2) Oversize Cylinder I.D.

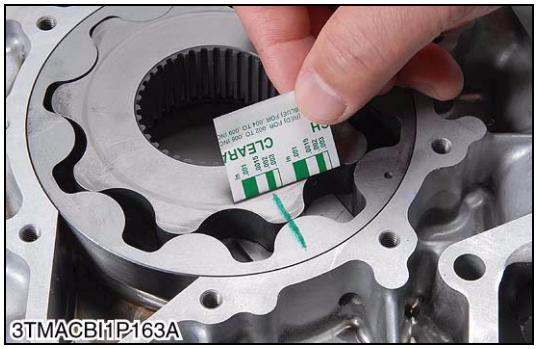
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(6) Oil Pump







Rotor Lobe Clearance

1. Measure the clearance between lobes of the inner rotor and the outer rotor with a feeler gauge.
2. If the clearance exceeds the allowable limit, replace the oil pump rotor assembly.

Clearance between inner rotor and outer rotor.	Factory specification	0.030 to 0.090 mm 0.0012 to 0.0035 in.
	Allowable limit	0.3 mm 0.0118 in.

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Clearance between Outer Rotor and Pump Body

1. Measure the clearance between the outer rotor and the pump body with a feeler gauge.
2. If the clearance exceeds the allowable limit, replace the oil pump rotor assembly.

Clearance between outer rotor and pump body	Factory specification	0.100 to 0.184 mm 0.00394 to 0.00724 in.
	Allowable limit	0.3 mm 0.0118 in.

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Clearance between Rotor and Cover

1. Put a strip of plastigauge onto the rotor face with grease.
2. Install the cover and tighten the screws with the specified torque.
3. Remove the cover carefully, and measure the amount of the flattening with the scale and get the clearance.
4. If the clearance exceeds the allowable limit, replace oil pump rotor assembly and the cover.

Clearance between rotor and cover	Factory specification	0.025 to 0.075 mm 0.00099 to 0.0029 in.
	Allowable limit	0.225 mm 0.0089 in.

Tightening torque	Oil pump cover screw	7.9 to 9.3 N·m 0.80 to 0.95 kgf·m 5.8 to 6.8 lbf·ft

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2 CLUTCH

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MECHANISM

CONTENTS

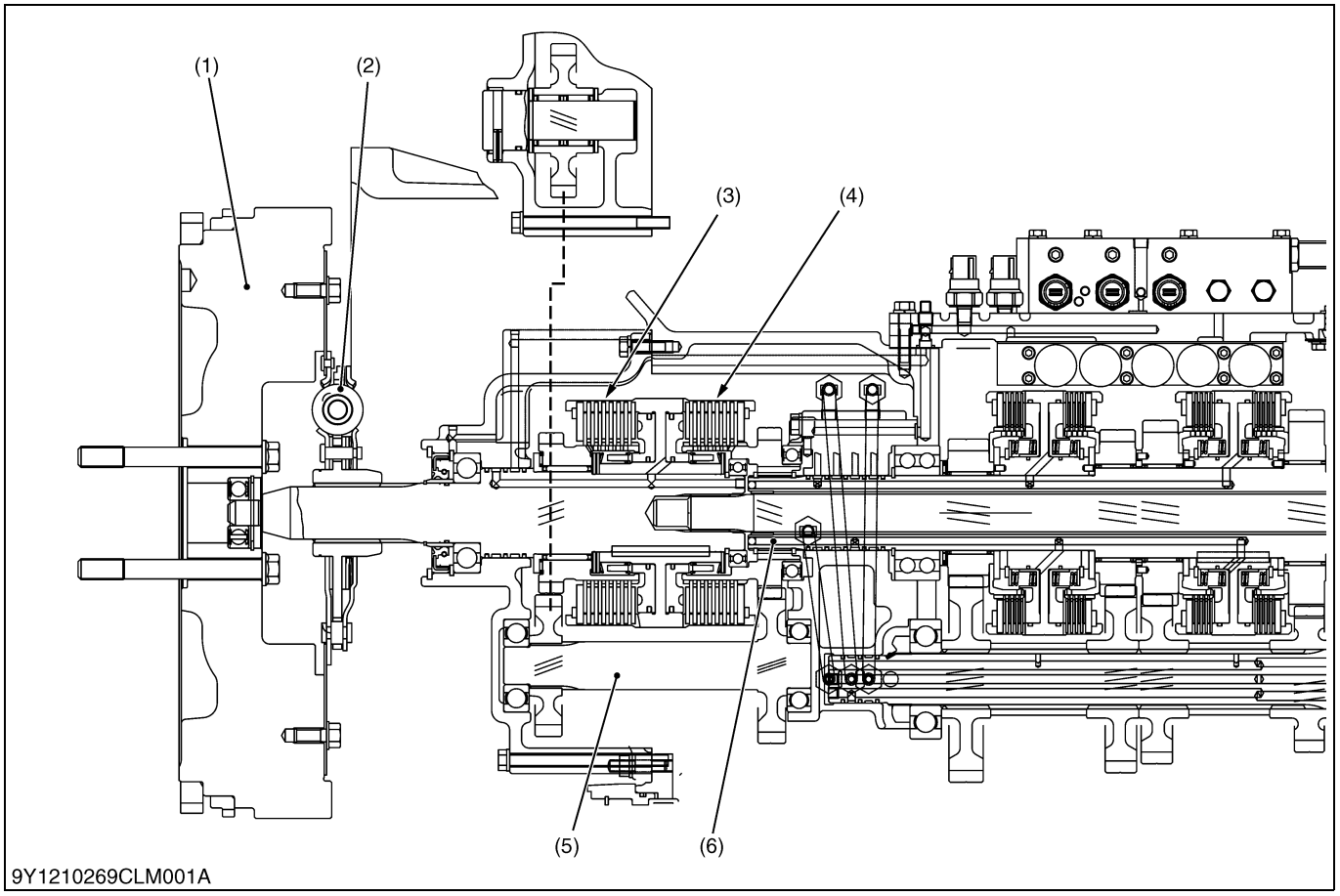
1. TRAVELING CLUTCH 2-M1
[1] STRUCTURE 2-M1
(1) Master Clutch (Forward and Reverse) 2-M1
(2) Clutch Safety Valve 2-M2
[2] MASTER CLUTCH CONTROL SYSYEM 2-M3
(1) Clutch Pedal Control 2-M3
(2) Master Clutch Protection Control 2-M3
(3) Machine Speed Check Control 2-M3
2. PTO CLUTCH 2-M4
[1] STRUCTURE 2-M4

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1. TRAVELING CLUTCH

[1] STRUCTURE

(1) Master Clutch (Forward and Reverse)



(1) Flywheel
(2) Damper Disc
(3) Master Clutch (Reverse)
(4) Master Clutch (Forward)
(5) Gear Shaft
(6) 1st Shaft

The master clutch is composed of forward and reverse hydraulic clutches, and the hydraulic clutches are switched over by turning on and off the solenoid valve.

A pressure of oil into the clutch is controlled by the solenoid proportional pressure reducing valve, allowing smooth engagement of the clutch.

By controlling pressure of the master clutch with an solenoid proportional reducing valve, the operation feels like a mechanical clutch.

On the other hand, operating the shuttle lever controls the master clutch to switch between forward and reverse.

■ **Clutch Engaged**

When the shuttle lever is operated, the solenoid proportional reducing valve is operated with the Main ECU. The clutch pressure is raised and master clutch is engaged.

In clutch pedal operation, the position of clutch pedal is detected with clutch pedal sensor electrically and the signal is sent to the microcomputer, then the microcomputer operates the solenoid proportional reducing valve to send the oil for master clutch and master clutch is engaged.

■ **Clutch Disengaged**

When shuttle lever is returned to neutral position, the solenoid valve is turned off. The oil in the master clutch is opened to the transmission and master clutch is disengaged.

On the other hand, when depressing the clutch pedal end of clutch safety valve, clutch valve is opened and oil in the master clutch back into the transmission case.

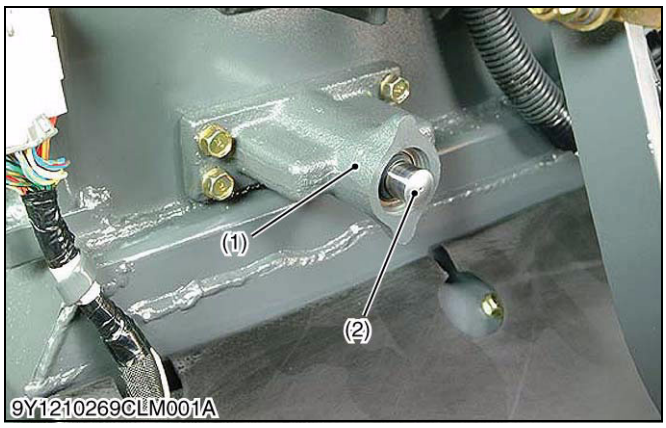
Therefore master clutch is disengaged.

And also the master clutch can be disengaged using the clutch button on the power shift lever.

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(2) Clutch Safety Valve



The safety valve reduces the pressure of the master clutch to disengage the master clutch when the clutch pedal is depressed.

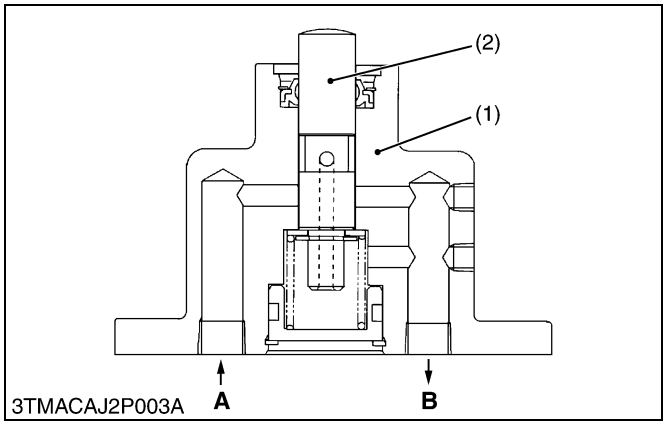
By depressing the clutch pedal, the tip of the spool is pressed and the pilot pressure of the main spool for the master clutch is directly returned to the transmission case.

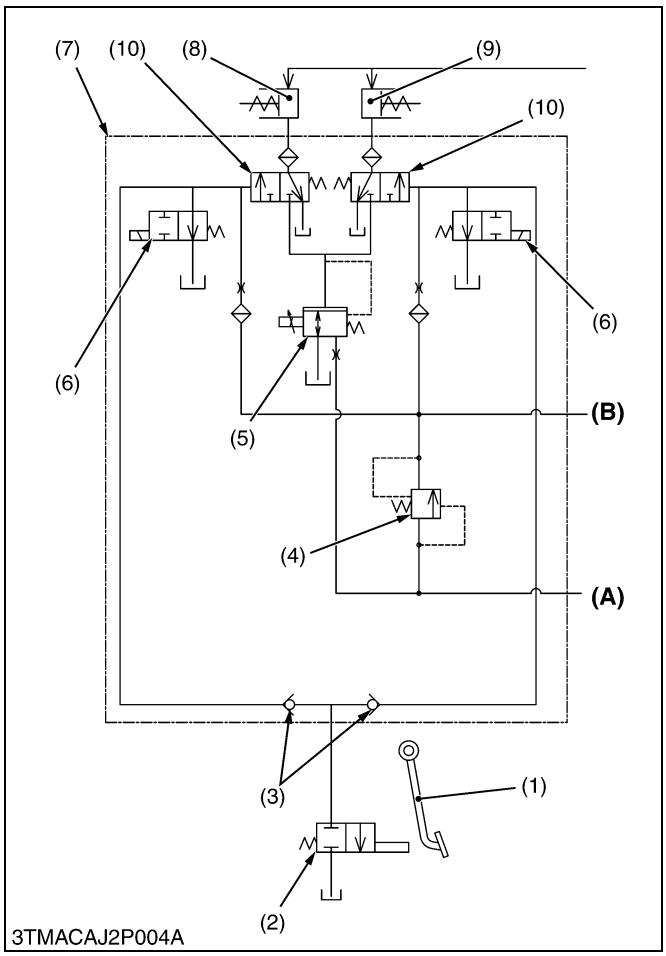
Therefore master clutch is disengaged.

(1) Clutch Safety Valve Body
(2) Spool

A: From Power Shift Valve
B: To Transmission Case

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Hydraulic Circuit

A smooth modulation of the clutch can be achieved with the use of the clutch pedal sensor, sending a variable electrical signal to the power shift control unit that will control clutch engagement and disengagement.

When the shuttle lever is operated to forward or reverse position, solenoid valve (6) is turned ON and the circuit to the tank is closed.

The oil which has been sent from power shift valve is regulated by pressure reducing valve (4) as pilot pressure and pilot pressure pushes the main spool (10) and opens the circuit to the master clutch (8) or (9).

Pressure of oil into the master clutch is controlled by solenoid proportional reducing valve (5) to allow the smooth engagement of master clutch then flow into master clutch (8) or (9).

When clutch pedal (1) is depressed, the safety valve (2) is opened.

Oil for pilot pressure of main spool (10) gets back to transmission case through the safety valve (2).

Therefore master clutch is disengaged.

(1) Clutch Pedal
(2) Clutch Safety Valve
(3) Check Valve
(4) Pressure Reducing Valve
(5) Solenoid Proportional Reducing Valve
(6) Solenoid Valve
(7) Power Shift Valve
(8) Master Clutch (Forward)
(9) Master Clutch (Reverse)
(10) Main Spool

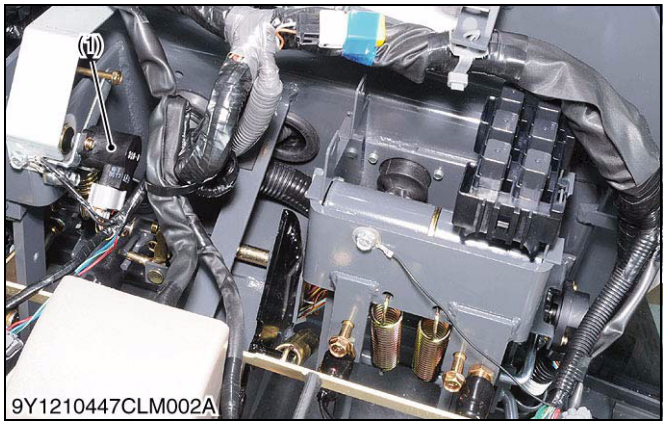
(A) From Regulator Valve
(B) To Differential Lock, 4WD/Bi-speed Valve

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[2] MASTER CLUTCH CONTROL SYSYEM

(1) Clutch Pedal Control



A wet hydraulic clutch is used for the traveling clutch (master clutch), which controls the clutch pressure by electronic control.

The clutch pedal sensor detects a position of the clutch pedal, and the pressure of the master clutch is controlled in response to the clutch pedal position.

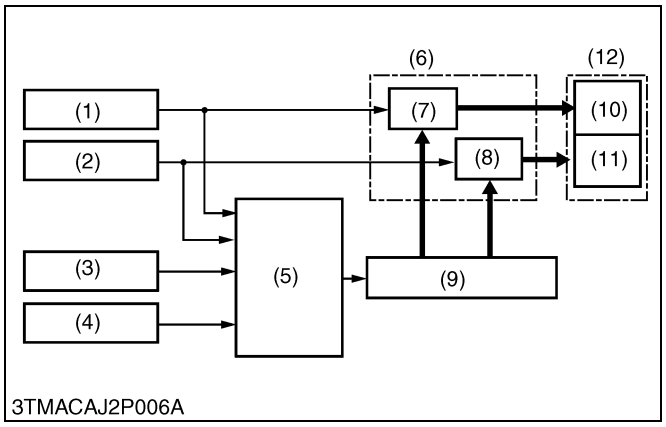
By controlling pressure of the master clutch with an solenoid proportional reducing valve, the operation feels like a mechanical clutch.

Besides the master clutch can be disengaged using the clutch button on the power shift lever.

(1) Clutch Pedal Sensor

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(2) Master Clutch Protection Control



To avoid damage on a clutch caused by a long-lasting half-clutch state by clutch pedal operation, this system disengages the clutch automatically and the alarm starts sounding.

To be returned to a normal control state, step on the clutch pedal, place the shuttle lever at neutral, or press the clutch button on the power shift lever.

(1) Shuttle Switch (F)
(2) Shuttle Switch (R)
(3) Clutch Pedal Sensor
(4) Clutch Button Switch
(5) ECU (MAIN)
(6) Solenoid ON/OFF Valve
(7) Forward Side
(8) Reverse Side
(9) Solenoid Proportional Reducing Valve (Master)
(10) Forward Side
(11) Reverse Side
(12) Master Clutch

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(3) Machine Speed Check Control



The shuttle rotation sensor detects the number of rotations on the master clutch output shaft to detect engagement status of the master clutch.

Also, traveling speed is calculated by the number of rotations of the master clutch output shaft for machine speed check control.

Operating the shuttle lever at a speed higher than 7.6 mph (11 km/h) results in disengaging the master clutch and sounding an warning buzzer.

Returning the shuttle lever to its original position engages the clutch again and stops the buzzer.

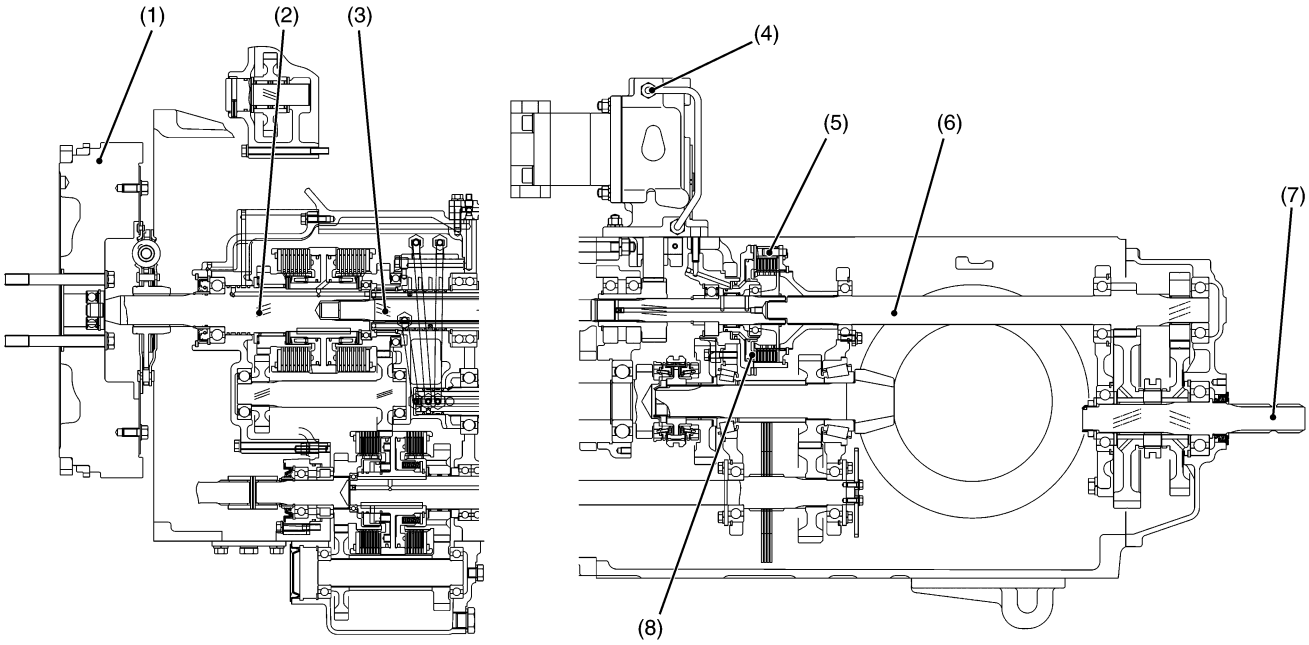
(1) Shuttle Rotation Sensor

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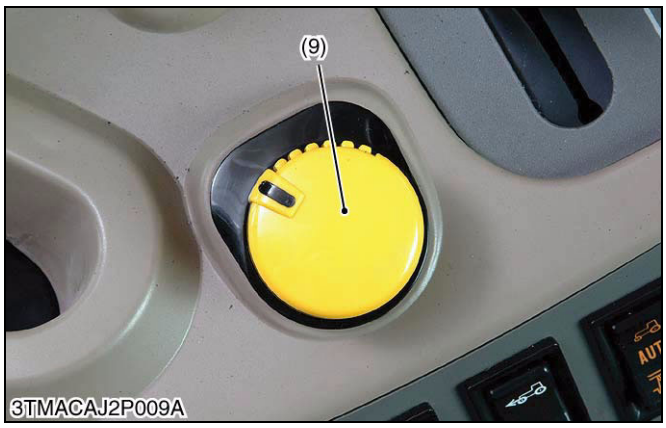
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2. PTO CLUTCH

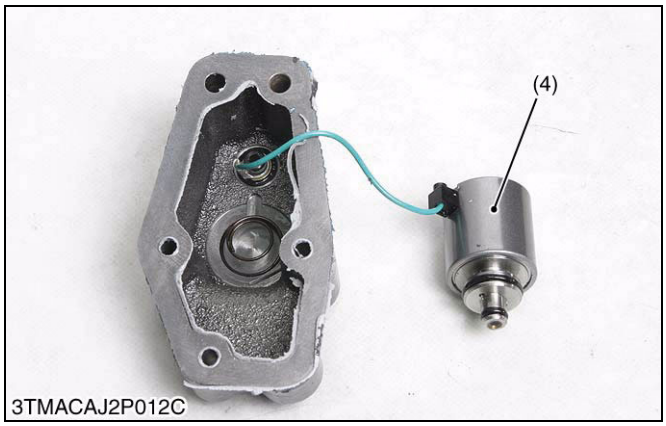
[1] STRUCTURE



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3TMACAJ2P009A



3TMACAJ2P012C

As shown in the figure above, the PTO propeller shaft (3) is splined to the input shaft (2) and is always rotated while the engine runs.

The PTO clutch valve is installed on the top of the hydraulic pump base that is solenoid valve controlled by PTO switch (9).

When turning the PTO switch (9) to **ON** position, solenoid valve (4) is operated. Oil from regulator valve is sent to PTO clutch (5).

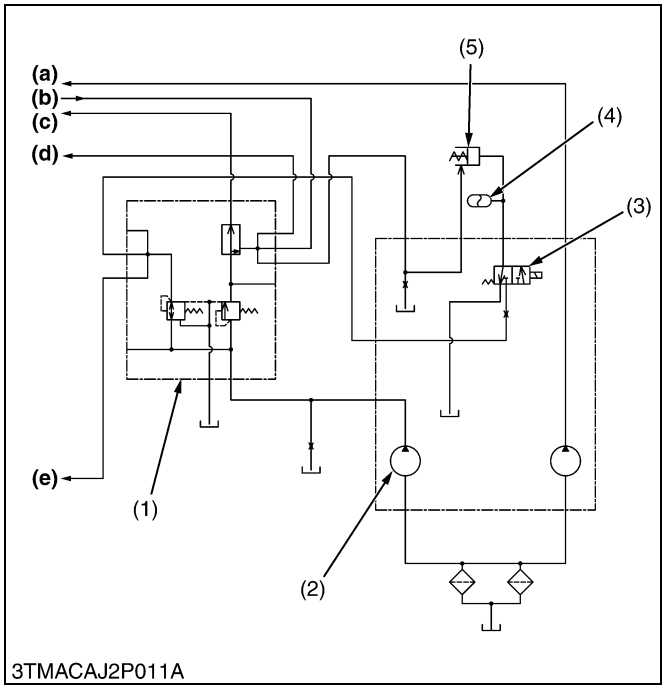
The clutch piston (8) actuated by hydraulic from PTO solenoid valve (4), tightly presses the clutch discs and drive plates toward the pressure plate.

As a result, the rotation of the PTO propeller shaft is transmitted to the gear shaft (6) through the PTO clutch pack (5).

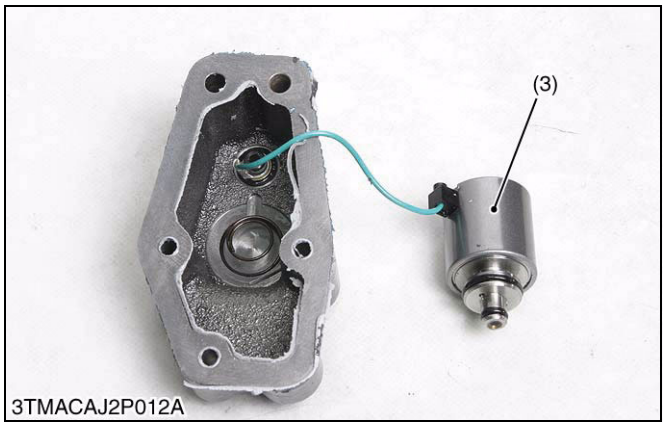
(1) Flywheel
(2) Input Shaft
(3) PTO Propeller Shaft
(4) PTO Solenoid Valve
(5) PTO Clutch
(6) Gear Shaft
(7) PTO Shaft
(8) Piston
(9) PTO Switch

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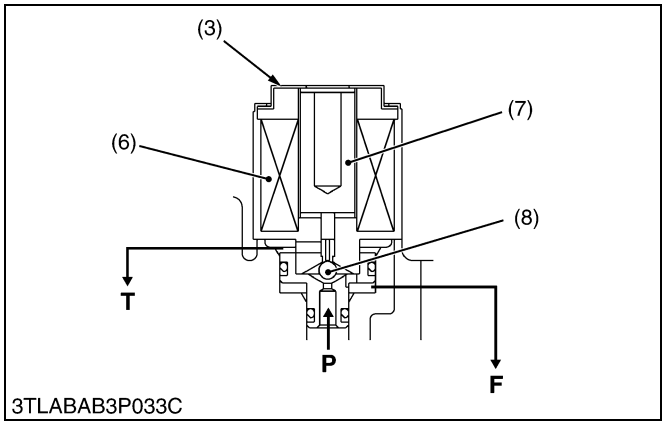
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3TMACAJ2P011A



3TMACAJ2P012A



3TLABAB3P033C

Hydraulic Circuit

The oil from the regulator valve flows into the PTO clutch solenoid valve (3).

When PTO switch is at **OFF** position, the oil flows is stopped by PTO solenoid valve (3).

When PTO switch is at **ON** position, the oil flows PTO clutch through the PTO solenoid valve and PTO clutch is engaged.

Accumulator (4) absorbs the engaging shock of clutch pack and allow smooth engagement of the PTO clutch (5).

(1) Regulator Valve
(2) Hydraulic Pump
(3) PTO Solenoid Valve
(4) Accumulator
(5) PTO Clutch
(6) Solenoid
(7) Plunger
(8) Ball

(a) To Control Valve for 3-point Hitch
(b) From Power Steering
(c) To Power Steering
(d) Lubrication for Clutch Packs
(e) To Power Shift Valve
P: IN Port
F: To PTO Clutch
T: Drain Port

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SERVICING

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3. TIGHTENING TORQUES....2-S3
4. CHECKING, DISASSEMBLING AND SERVICING....2-S4
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      (2) Removing PTO Clutch Pack....2-S12
      (3) Removing PTO Clutch Valve....2-S23
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      (1) Master Clutch....2-S24
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      (2) Master Clutch....2-S27
      (3) PTO Clutch....2-S28

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1. TROUBLESHOOTING

MASTER CLUTCH (SHUTTLE CLUTCH)

Symptom	Probable Cause	Solution	Reference Page
Master Clutch Slip	Operating pressure is low	Adjust	8-S15
	Master clutch valve malfunctioning	Replace	3-S22 8-S12
	Clutch disc or steel plate excessively worn	Replace	2-S25
	Deformation of piston or steel plate	Replace	2-S25
Master Clutch Operating Pressure Is Low	Transmission oil improper or insufficient	Fill or change	G-10
	Regulator valve malfunctioning	Adjust or replace	8-S9
Master Clutch Drags	Return spring weaken or broken	Replace	2-S25
	Deformation of piston or steel plate	Replace	2-S25

PTO CLUTCH

Symptom	Probable Cause	Solution	Reference Page
PTO Clutch Slip	Operating pressure is low	Adjust	8-S10
	PTO clutch valve malfunctioning	Repair or replace	2-S23
	Clutch disc or steel plate excessively worn	Replace	2-S26
	Deformation of piston or return spring	Replace	2-S26
PTO Shaft Does Not Rotate	PTO clutch malfunctioning	Repair or replace	2-S26
	PTO propeller shaft coupling disengaged	Engage	–
	PTO clutch valve malfunctioning		2-S23
PTO Clutch Operating Pressure Is Low	Transmission oil improper or insufficient	Fill or change	G-10
	Regulator valve malfunctioning	Adjust or replace	8-S9
PTO Clutch Drags	Brake plate excessively worn	Replace	2-S28
	Return spring weaken or broken	Replace	2-S29
	Deformation of plate or steel plate	Replace	2-S28

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2. SERVICING SPECIFICATIONS

MASTER CLUTCH (SHUTTLE CLUTCH)

Item		Factory Specification	Allowable Limit
Clearance between internal snap ring and pressure plate (Forward and Reverse side)	Clearance	2.0 to 2.2 mm 0.079 to 0.086 in.	3.6 mm 0.142 in.
Clutch Disc (3F750-23920)	Thickness	2.10 to 2.20 mm 0.083 to 0.087 in.	–
Clutch Disc (3F750-23680)	Thickness	2.30 to 2.40 mm 0.091 to 0.094 in.	–
Pressure Plate	Thickness	4.42 to 4.58 mm 0.174 to 0.18 in.	–
Piston	Thickness	11.79 to 11.8 mm 0.464 to 0.465 in.	–
Steel Plate (3P903-24480)	Thickness	2.52 to 2.68 mm 0.099 to 0.105 in.	–

DAMPER DISC

Item		Factory Specification	Allowable Limit
Damper Disc Boss	Backlash (Displacement around disc edge)	–	2.0 mm 0.079 in.

PTO CLUTCH

Item		Factory Specification	Allowable Limit
PTO Clutch Disc	Thickness	1.6 mm 0.063 in.	1.3 mm 0.051 in.
PTO Driven Plate	Thickness	2.3 mm 0.0906 in.	1.8 mm 0.0709 in.
Return Plate	Thickness	2.8 mm 0.1102 in.	2.3 mm 0.0906 in.
PTO Brake Ring	Thickness	4.0 mm 0.157 in.	3.7 mm 0.146 in.
PTO Piston	Flatness	–	0.15 mm 0.006 in.
PTO Return Plate	Flatness	–	0.3 mm 0.012 in.
PTO Plate Assembly	Flatness	–	0.3 mm 0.012 in.
Pressure Spring Tension	Spring Setting Load / Setting Length	265 N / 23.4 mm 27.0 kgf / 23.4 mm 59.5 lbf / 0.921 in.	245 N / 23.4 mm 25.0 kgf / 23.4 mm 55.1 lbf / 0.921 in.

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3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-13.)

Item	N·m	kgf·m	lbf·ft
Engine and clutch housing mounting screw and nut (Standard)	124 to 147	12.6 to 15.0	91.2 to 108
Engine and clutch housing mounting nut (Wide)	167 to 196	17.0 to 20.0	123 to 144
Engine and clutch housing mounting stud bolt	39 to 45	3.9 to 4.6	29 to 33
Front cover mounting screw and nut	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Damper disc mounting screw	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Clutch safety valve hose retaining nut	23.0 to 26.5	2.3 to 2.7	16.6 to 19.6
Cabin mounting screw and nut	69 to 88	7.0 to 9.0	50.6 to 65.1
Fuel tank support mounting screw	196.1 to 225.6	20.0 to 23.0	144.7 to 166.4
3P delivery hose retaining nut	45.1 to 53.0	4.6 to 5.4	33.3 to 39.0
Power steering pump delivery pipe retaining nut	107.9 to 117.7	11.0 to 12.0	79.6 to 86.8
Return pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.1 to 50.6
Creep case mounting screw	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Hydraulic pump base mounting nut	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Mid case and transmission case mounting screw and nut	103.0 to 117.7	10.5 to 12.0	76.0 to 86.8
Hydraulic cylinder assembly mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Rear PTO case mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Front differential lock hose retaining nut	19.7 to 29.4	2.0 to 3.0	14.5 to 21.6
Muffler mounting screw	24 to 27	2.4 to 2.8	18 to 20
Fan belt tension adjusting screw	Below 15	Below 1.53	Below 11.1
Fan belt tension adjusting screw lock nut	123.6 to 147	12.6 to 15.0	91.2 to 108.4
Starter **B** Terminal	17.7 to 24.5	1.8 to 2.5	13.1 to 18.0

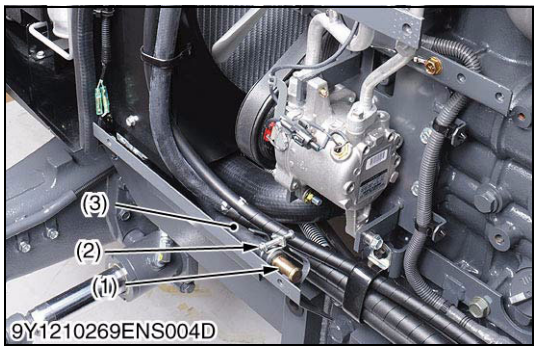
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4. CHECKING, DISASSEMBLING AND SERVICING

[1] PREPARATION

(1) Removing Master Clutch Assembly and Damper Disc



Draining Coolant

CAUTION

- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let cool down.
2. Loosen the hose clamp (2) and remove the drain plug (1) to drain the coolant.
3. Remove the radiator cap to completely, drain the coolant.
4. After all coolant is drained, reinstall the drain plug (1) and tighten the hose clamp (2).

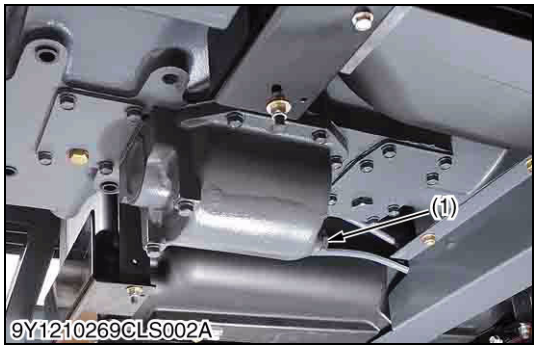
Coolant	Capacity	15 L 16 U.S.qts 13 Imp.qts

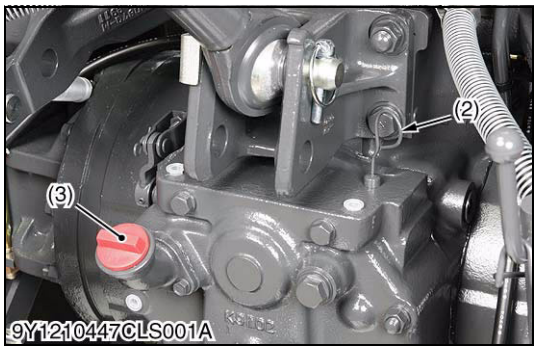
(1) Drain Plug
(2) Hose Clamp
(3) Radiator Hose

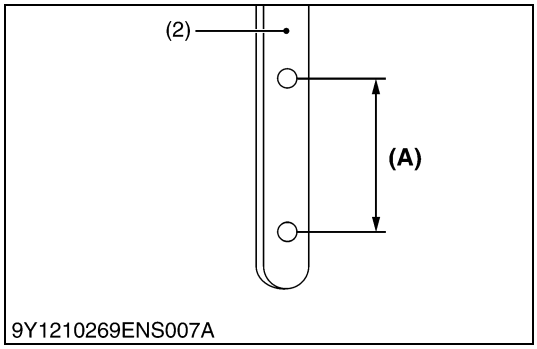
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Draining Transmission Fluid

1. Place an oil pan underneath the transmission case.
2. Remove the drain plugs (1).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1).

(When reassembling)

- Fill the transmission fluid up to the proper oil level after removing the filling plug (3).
- After running the engine for few minutes, stop it and check the fluid level again, add the fluid to prescribed level if it is not correct level.

■ **IMPORTANT**

- **Use KUBOTA UDT or KUBOTA SUPER UDT fluid. Use of other fluids may damage the transmission or hydraulic system.**
- **Refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.**
- **Do not mix different brands oil together.**

Transmission fluid	Capacity	60.0 L 63.4 U.S.qts 52.8 Imp.qts

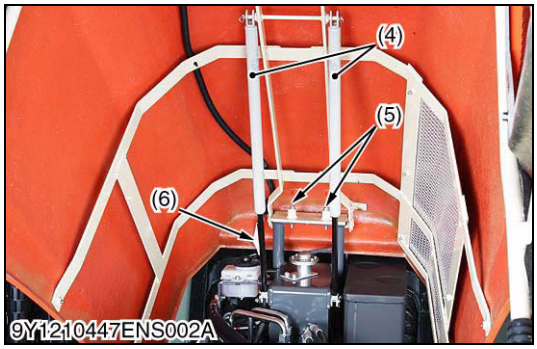
(1) Drain Plug
(2) Dipstick
(3) Filling Plug

(A) Oil level is acceptable within this range.

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Muffler and Bonnet

1. Open the bonnet (1) and disconnect the battery (7) negative cable.
2. Disconnect the **8P** connector (6) for head light.
3. Remove the damper (4) and bonnet bracket mounting screws (5).
4. Remove the bonnet (1).
5. Remove the side cover (3).
6. Remove the muffler (2).

(When reassembling)

■ **NOTE**

- **Be sure to insert the muffler by 42 mm (1.7 in.).**

Tightening torque	Muffler mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

■ **IMPORTANT**

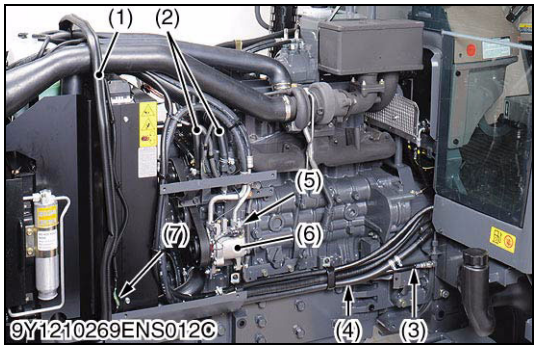
- **When disconnecting the battery cables, disconnect the negative cable first. When connecting, positive cable first.**

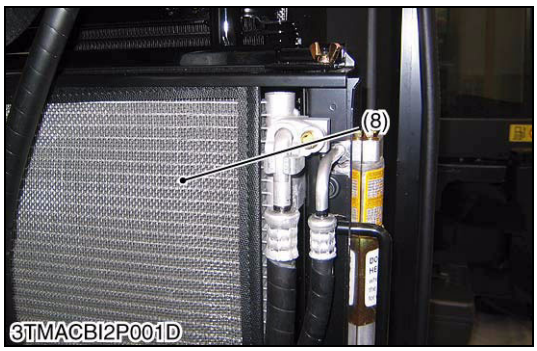
(1) Bonnet
(2) Muffler
(3) Side Cover
(4) Damper
(5) Screw
(6) **8P** Connector
(7) Battery

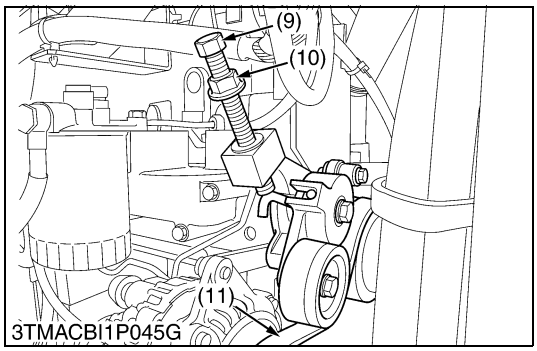
L: Insertion Length of the Muffler

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Hoses and Wiring Harness

1. Remove the shield weather strip and plate (1).
2. Disconnect the heater hoses (2).
3. Disconnect the **1P** connector (5) from compressor (6).
4. Disconnect the front differential lock hose (3) and breather hose from front differential case.
5. Disconnect the oil cooler hose (4).
6. Disconnect the **1P** connector (7).
7. Remove the air condenser slide stopper screw and slide out the air condenser (8).
8. Loosen the lock nut (10) and adjusting screw (9) of fan belt, then remove the fan belt (11) from the compressor (6).
9. Remove the compressor bracket mounting screws and compressor (6) with hoses.

(When reassembling)

- Take care not to damage the air condenser fan.
- Be sure to connect the heater hoses to original position.
- After reassembling the compressor, be sure to adjust the fan belt tension. (See page G-32)

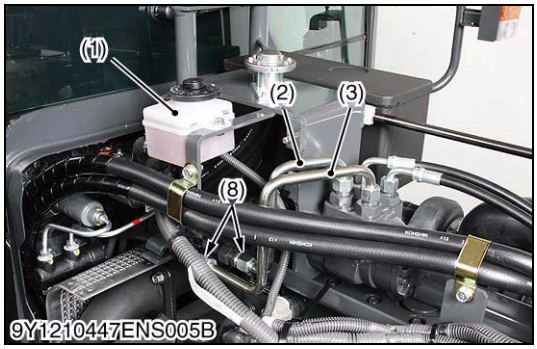
Proper belt tension	A deflection of between 9 to 11 mm (0.35 to 0.47 in.) when the belt is pressed (98 N (10 kgf, 22.1 lbf)) in the middle of the span. (New belt: 7 to 9 mm (0.28 to 0.35 in.))

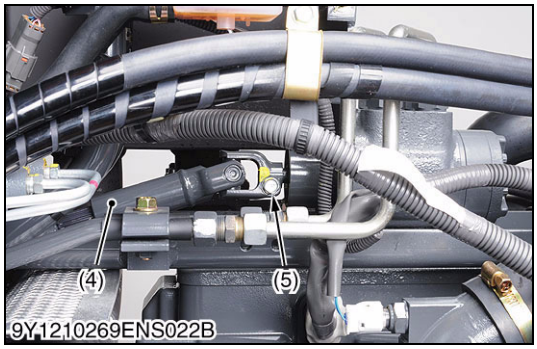
Tightening torque	Adjusting screw	Below 15 N·m 1.53 kgf·m 11.1 lbf·ft
	Lock nut	123.6 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108.4 lbf·ft
	Front differential lock hose retaining nut	19.7 to 29.4 N·m 2.0 to 3.0 kgf·m 14.5 to 21.6 lbf·ft

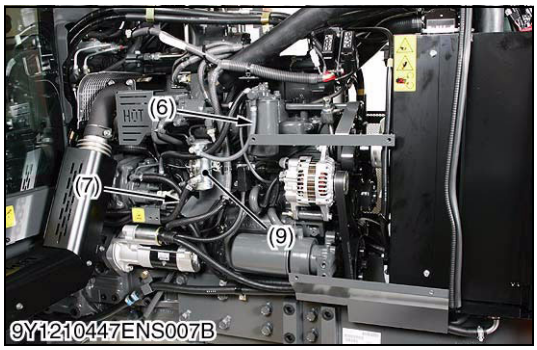
(1) Plate
(2) Heater Hose
(3) Front Differential Lock Hose
(4) Oil Cooler Hose
(5) **1P** Connector
(6) Compressor
(7) **1P** Connector
(8) Air Condenser
(9) Adjusting Screw
(10) Lock Nut
(11) Fan Belt

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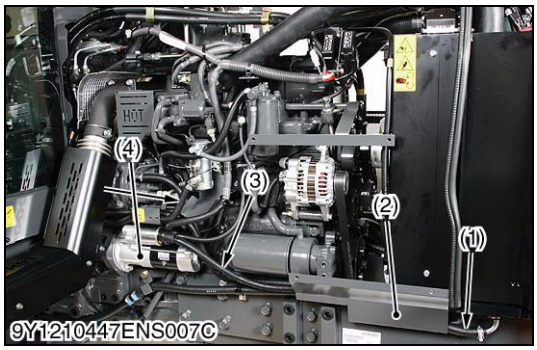


Hoses, Pipes, Steering Joint Shaft and Brake Oil Tank

1. Remove the brake oil tank mounting screws.
2. Remove the steering joint shaft mounting screw (5) and joint shaft (4).
3. Disconnect the pipes (2), (3) from the joint (8).
4. Remove the fuel hoses (6), (7).

(1) Brake Oil Tank
(2) Pipe
(3) Pipe
(4) Joint Shaft
(5) Steering Joint Mounting Screw
(6) Fuel Hose
(7) Fuel Hose
(8) Joint
(9) Fuel Pump

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Starter Motor and Hose

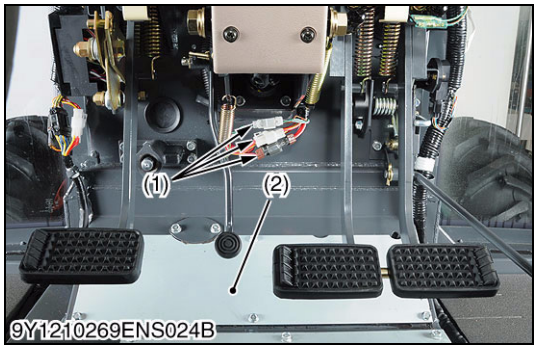
1. Remove the cover (2).
2. Disconnect the oil cooler hose (1) from oil cooler.
3. Disconnect the battery cable (3) from starter motor (4).
4. Remove the starter motor (4).

(When reassembling)

Tightening torque	Starter **B** terminal nut	17.7 to 24.5 N·m 1.8 to 2.5 kgf·m 13.1 to 18.0 lbf·ft

(1) Hose
(2) Cover
(3) Battery Cable
(4) Starter Motor

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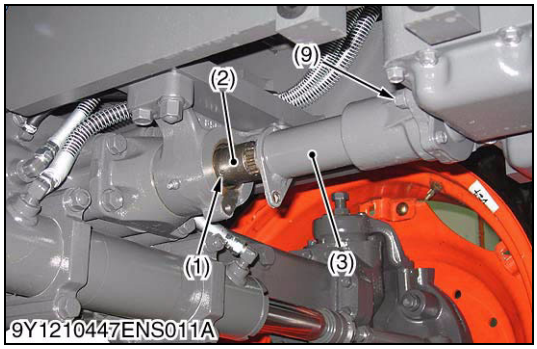
Wiring Harness Connector and Cover

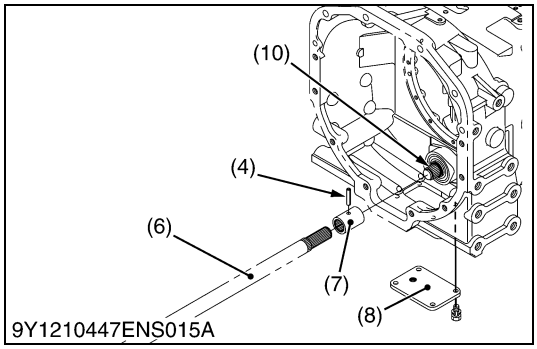
1. Disconnect the engine wiring harness connectors (1).
2. Remove the floor mat and cover (2).

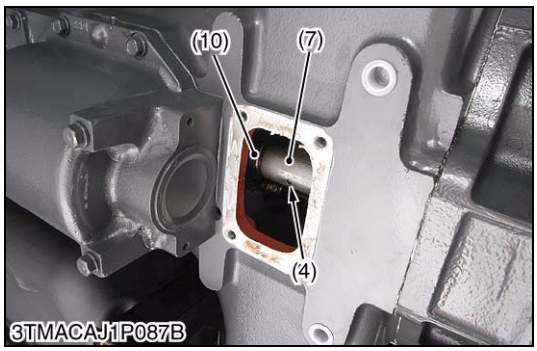
(1) Connector
(2) Cover

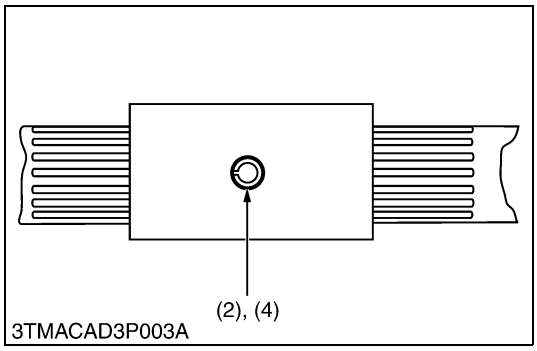
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Propeller Shaft

1. Slide the propeller shaft cover (3) after removing the screw (5).
2. Tap out the spring pins (2) and then slide the coupling (1) to the rear.
3. Remove the cover (8).
4. Tap out the spring pins (4) and then slide the coupling (7) forward.

(When reassembling)

- Please assemble the propeller shaft by following procedure.

1. Loosen the nuts (9).
2. Slide the coupling (7) and match the splines of the coupling (7) and front transmitting shaft (10) only by 10 mm (0.39 in.)
3. Match the spline of the coupling (1), propeller shaft (6) and pinion shaft (11). And then, tap in the spring pin (2) as shown in figure.

■ **NOTE**

- **Apply grease to the coupling (1) splines.**

4. Slide the coupling (7) and tap in the spring pin (4) as shown in figure.

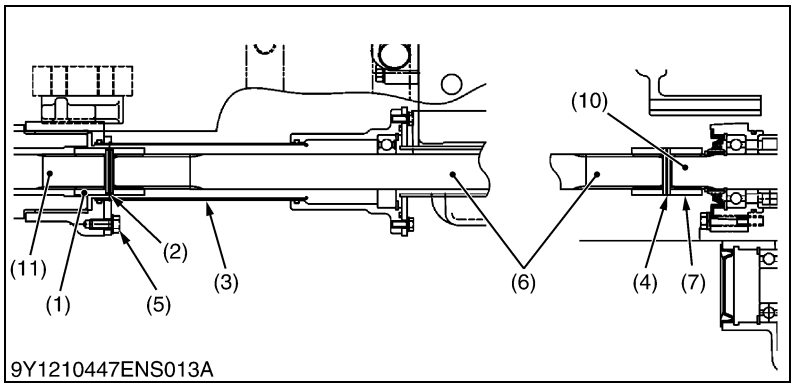
■ **NOTE**

- **Apply grease to the coupling (7) splines.**

5. Tighten the nuts (9).
6. Attach the cover (8).

■ **NOTE**

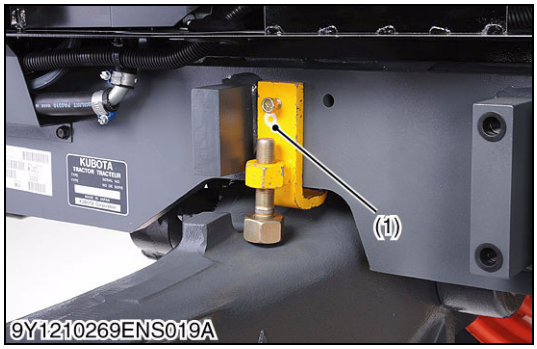
- **Apply liquid gasket (Three Bond 1206D or equivalent) to cover face and cover (8).**

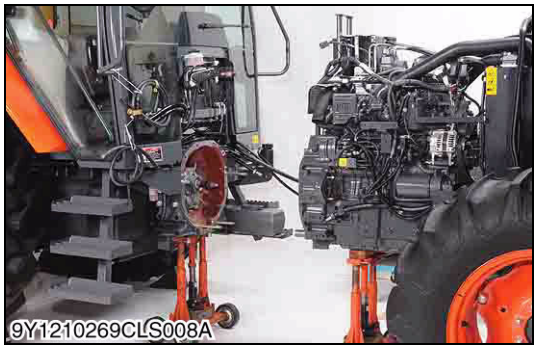


(1) Coupling
(2) Spring Pin
(3) Propeller Shaft Cover
(4) Spring Pin
(5) Screw
(6) Propeller Shaft
(7) Coupling
(8) Cover
(9) Nut
(10) Front Transmitting Shaft
(11) Pinion Shaft

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Separating Engine from Clutch Housing

1. Install the front axle rocking restrictor (1) to the front axle bracket R.H. and L.H..
2. Check the engine and clutch housing case are securely mounted on the disassembling stands.
3. Remove the engine mounting screws and nuts.
4. Separate the engine from clutch housing case.

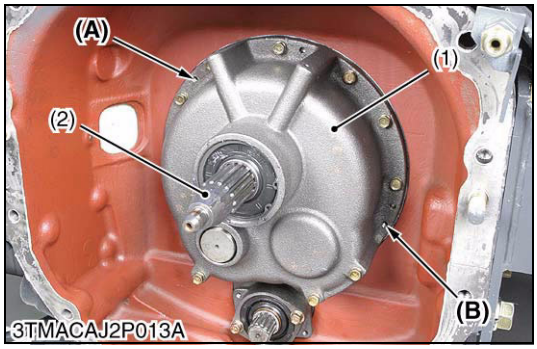
(When reassembling)

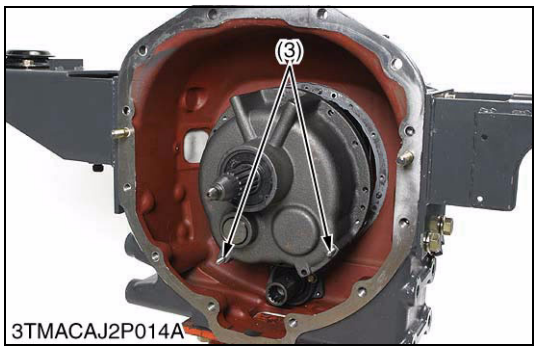
- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of damper disc boss.
- When connecting the engine to the clutch housing, be sure to align the input shaft spline to the damper disc hub center.
- Apply liquid gasket (Three Bond 1141, 1211 or equivalent) to joint face of the engine and clutch housing.
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of clutch housing and housing cover.

Tightening torque	Engine and clutch housing mounting screw and nut (Standard)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 lbf·ft
	Engine and clutch housing mounting nut (Wide)	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft
	Engine and clutch housing mounting stud bolt	39 to 45 N·m 3.9 to 4.6 kgf·m 29 to 33 lbf·ft

(1) Rocking Restrictor

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Front Cover Assembly

1. Remove the front cover (1) with the input shaft (2) by screwing M8 × Pitch 1.25 mm length 120 mm (4.7 in.) screws into holes **(A)** and **(B)**.

(When reassembling)

- Apply grease to the O-ring.
- Apply a liquid gasket (Three Bond 1206D or equivalent) to joint face of front cover and clutch housing.
- Be sure to use the stud bolt (3) as a guide when installing the front cover assembly to the clutch housing.

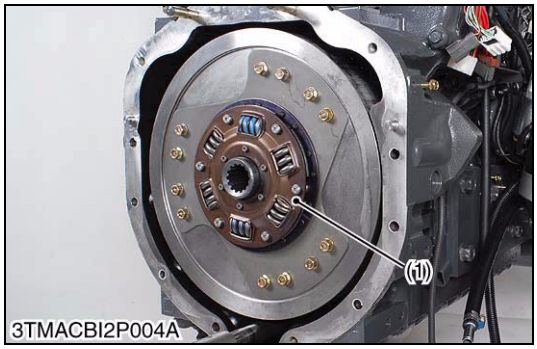
Tightening torque	Front cover mounting screw and nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft

(1) Front Cover
(2) Input Shaft
(3) Stud Bolt

(A) Hole for Jack Bolt
(B) Hole for Jack Bolt

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Damper Disc

1. Remove the damper disc mounting screw.

(When reassembling)

- Direct the shorter end of the damper disc boss toward the flywheel.
- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of damper disc boss.

■ **IMPORTANT**

- **Align the center of disc and flywheel by inserting the clutch center tool.**

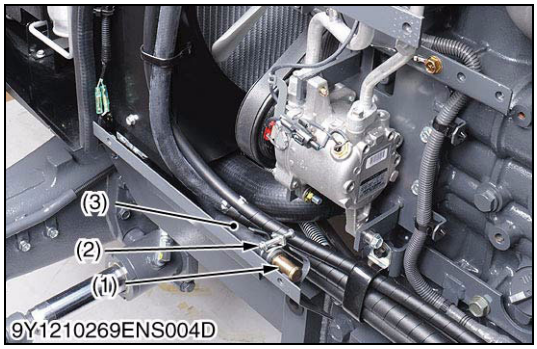
Tightening torque	Damper disc mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft

(1) Damper Disc

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(2) Removing PTO Clutch Pack



Draining Coolant

CAUTION

- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let cool down.
2. Loosen the hose clamp (2) and remove the drain plug (1) to drain the coolant.
3. Remove the radiator cap to completely, drain the coolant.
4. After all coolant is drained, reinstall the drain plug (1) and tighten the hose clamp (2).

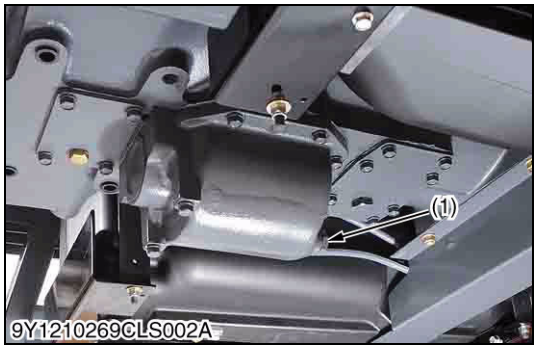
Coolant	Capacity	15 L 16 U.S.qts 13 Imp.qts

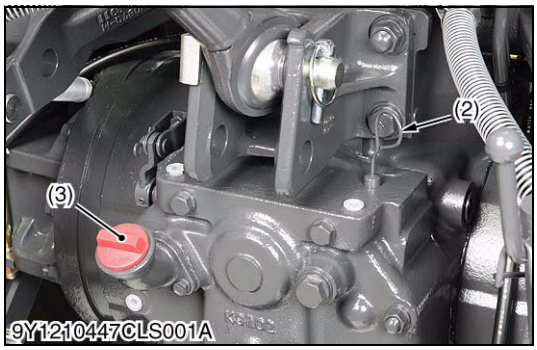
(1) Drain Plug
(2) Hose Clamp
(3) Radiator Hose

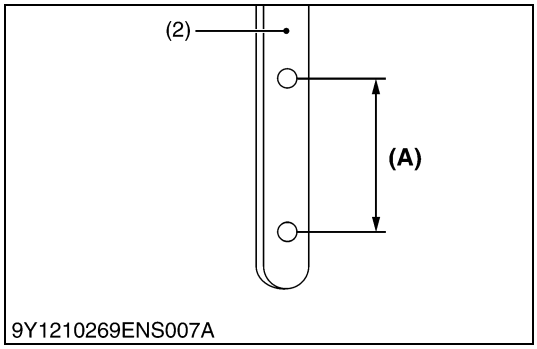
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Draining Transmission Fluid

1. Place an oil pan underneath the transmission case.
2. Remove the drain plugs (1).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1).

(When reassembling)

- Fill the transmission fluid up to the proper oil level after removing the filling plug (3).
- After running the engine for few minutes, stop it and check the fluid level again, add the fluid to prescribed level if it is not correct level.

■ **IMPORTANT**

- **Use KUBOTA UDT or KUBOTA SUPER UDT fluid. Use of other fluids may damage the transmission or hydraulic system.**
- **Refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.**
- **Do not mix different brands oil together.**

Transmission fluid	Capacity	60.0 L 63.4 U.S.qts 52.8 Imp.qts

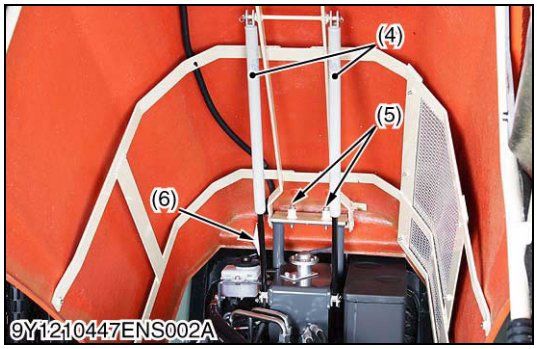
(1) Drain Plug
(2) Dipstick
(3) Filling Plug

(A) Oil level is acceptable within this range.

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Muffler and Bonnet

1. Open the bonnet (1) and disconnect the battery (7) negative cable.
2. Disconnect the **8P** connector (6) for head light.
3. Remove the damper (4) and bonnet bracket mounting screws (5).
4. Remove the bonnet (1).
5. Remove the side cover (3).
6. Remove the muffler (2).

(When reassembling)

■ **NOTE**

- **Be sure to insert the muffler by 42 mm (1.7 in.).**

Tightening torque	Muffler mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

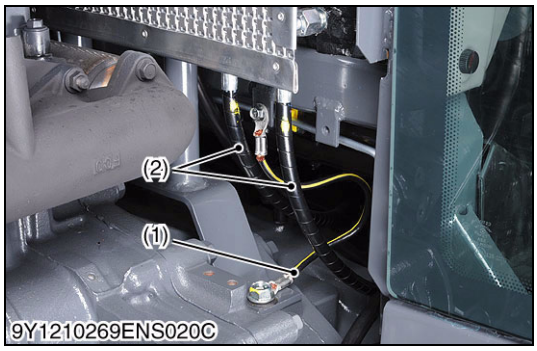
■ **IMPORTANT**

- **When disconnecting the battery cables, disconnect the negative cable first. When connecting, positive cable first.**

(1) Bonnet
(2) Muffler
(3) Side Cover
(4) Damper
(5) Screw
(6) **8P** Connector
(7) Battery

L: Insertion Length of the Muffler

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Clutch Safety Valve Hose and Ground Cable

1. Remove the ground cable (1).
2. Remove the clutch safety valve hoses (2).

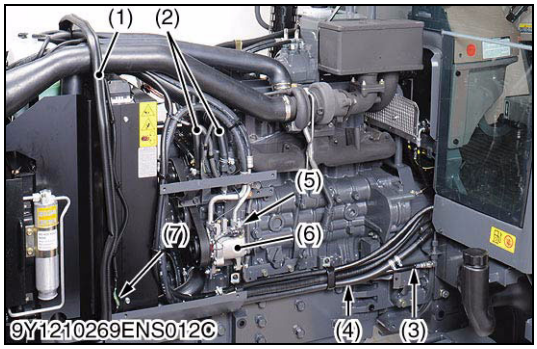
(When reassembling)

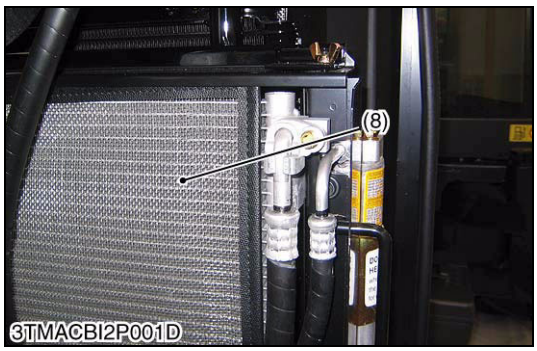
Tightening torque	Clutch safety valve hose retaining nut	23.0 to 26.5 N·m 2.3 to 2.7 kgf·m 16.6 to 19.6 lbf·ft

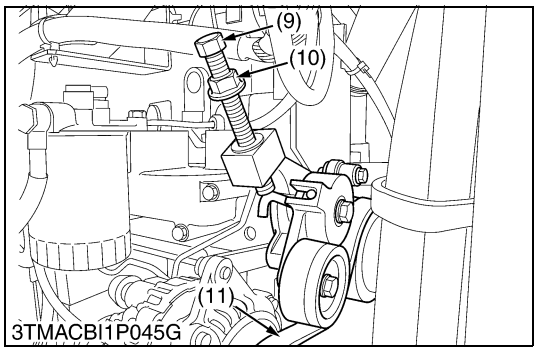
(1) Ground Cable
(2) Clutch Safety Valve Hose

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Hoses and Wiring Harness

1. Remove the shield weather strip and plate (1).
2. Disconnect the heater hoses (2).
3. Disconnect the **1P** connector (5) from compressor (6).
4. Disconnect the front differential lock hose (3) and breather hose from front differential case.
5. Disconnect the oil cooler hose (4).
6. Disconnect the **1P** connector (7).
7. Remove the air condenser slide stopper screw and slide out the air condenser (8).
8. Loosen the lock nut (10) and adjusting screw (9) of fan belt, then remove the fan belt (11) from the compressor (6).
9. Remove the compressor bracket mounting screws and compressor (6) with hoses.

(When reassembling)

- Take care not to damage the air condenser fan.
- Be sure to connect the heater hoses to original position.
- After reassembling the compressor, be sure to adjust the fan belt tension. (See page G-32)

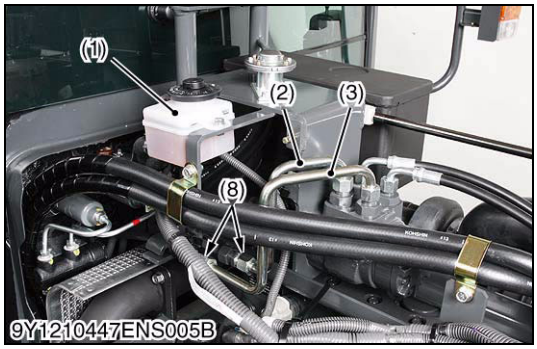
Proper belt tension	A deflection of between 9 to 11 mm (0.35 to 0.47 in.) when the belt is pressed (98 N (10 kgf, 22.1 lbf)) in the middle of the span. (New belt: 7 to 9 mm (0.28 to 0.35 in.))

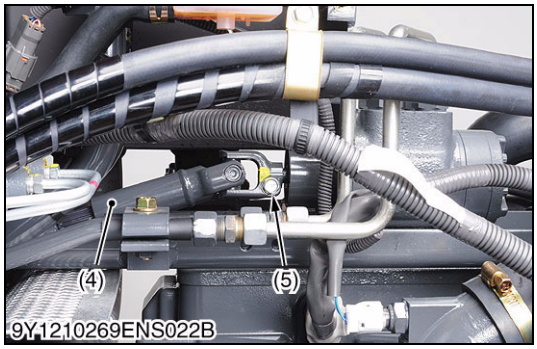
Tightening torque	Adjusting screw	Below 15 N·m 1.53 kgf·m 11.1 lbf·ft
	Lock nut	123.6 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108.4 lbf·ft
	Front differential lock hose retaining nut	19.7 to 29.4 N·m 2.0 to 3.0 kgf·m 14.5 to 21.6 lbf·ft

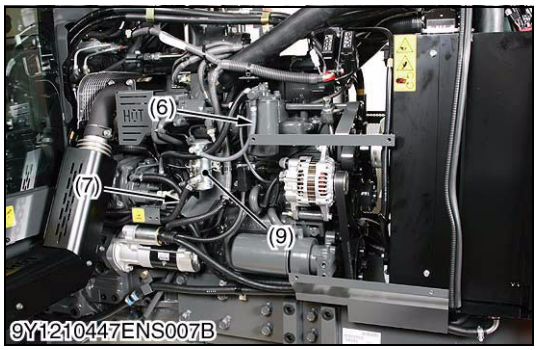
(1) Plate
(2) Heater Hose
(3) Front Differential Lock Hose
(4) Oil Cooler Hose
(5) **1P** Connector
(6) Compressor
(7) **1P** Connector
(8) Air Condenser
(9) Adjusting Screw
(10) Lock Nut
(11) Fan Belt

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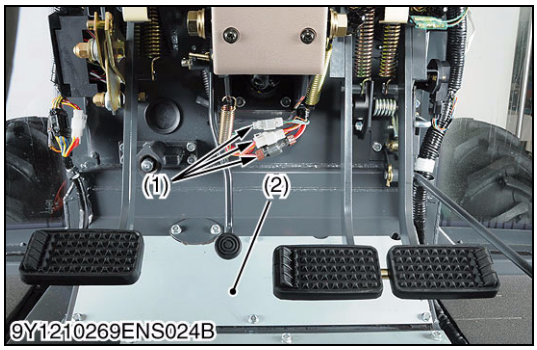


Hoses, Pipes, Steering Joint Shaft and Brake Oil Tank

1. Remove the brake oil tank mounting screws.
2. Remove the steering joint shaft mounting screw (5) and joint shaft (4).
3. Disconnect the pipes (2), (3) from the joint (8).
4. Remove the fuel hoses (6), (7).

(1) Brake Oil Tank
(2) Pipe
(3) Pipe
(4) Joint Shaft
(5) Steering Joint Mounting Screw
(6) Fuel Hose
(7) Fuel Hose
(8) Joint
(9) Fuel Pump

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Wiring Harness Connector and Cover

1. Disconnect the engine wiring harness connectors (1).
2. Remove the floor mat and cover (2).

(1) Connector
(2) Cover

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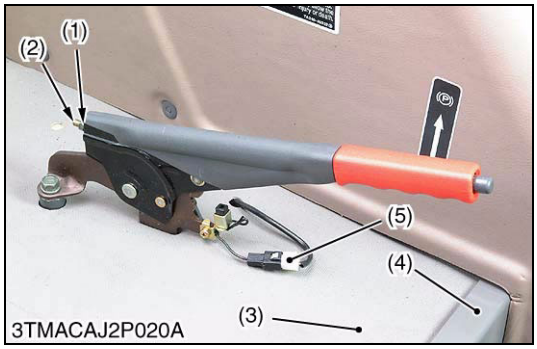
Seat and Hydraulic Lock Lever

1. Remove the side cover (2).
2. Disconnect the **2P** connectors and **10P** connector which come from seat and arm rest.
3. Remove the seat mounting nuts and seat (1).
4. Remove the hydraulic lock lever (3).

(1) Seat
(2) Side Cover
(3) Hydraulic Lock Lever

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Parking Brake Wire and Cover

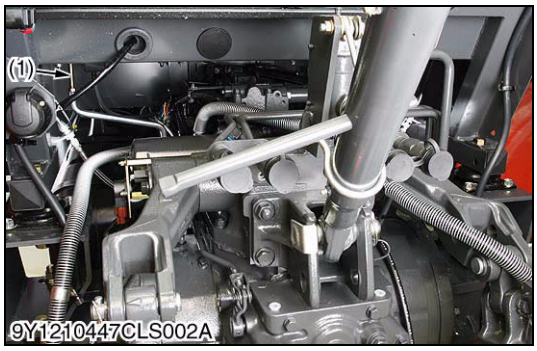
1. Remove the lock nuts (1) and parking brake wire (2) from brake lever.
2. Disconnect the parking brake switch connector (5).
3. Remove the cover (4).
4. Remove the floor mat (3) and floor cover.

(When reassembling)

Parking brake lever play (number of notches)	Factory specification	2 notches

(1) Lock Nut
(2) Parking Brake Wire
(3) Floor Mat
(4) Cover
(5) Connector

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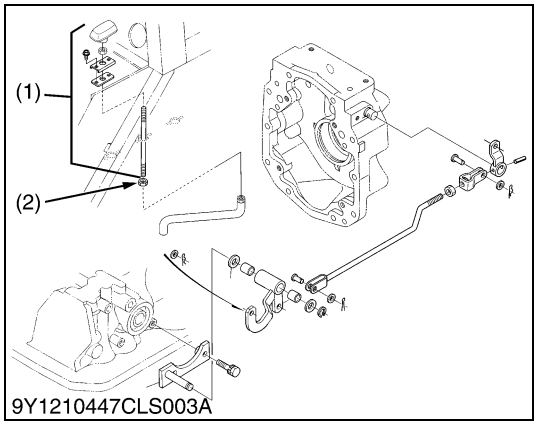


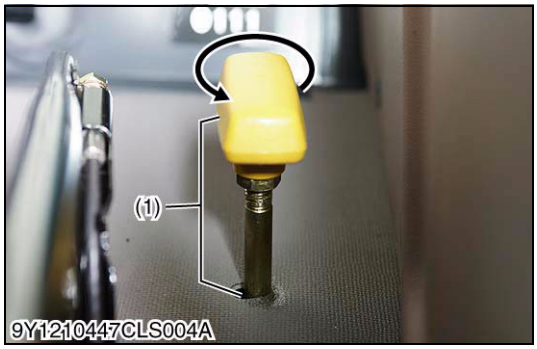
PTO Gear Shift Lever

1. Loosen the lock nut (2).
2. Turn the grip assembling (1) counterclockwise until disengaging.

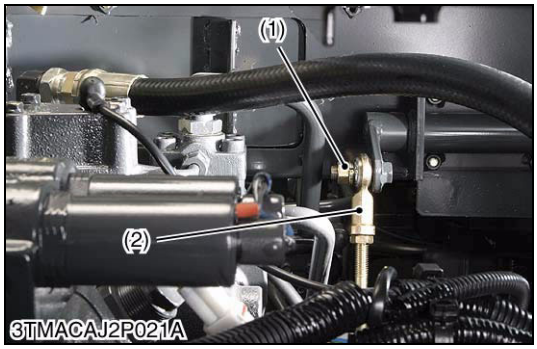
(1) Grip Assembling
(2) Lock Nut

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Auxiliary Shift Rod and Brake Hose

1. Remove the auxiliary shift rod mounting nut (1) and shift rod (2).
2. Disconnect the brake hoses (3) (R.H.)(L.H.).
3. Draw out the parking brake wire (4) from the cabin.

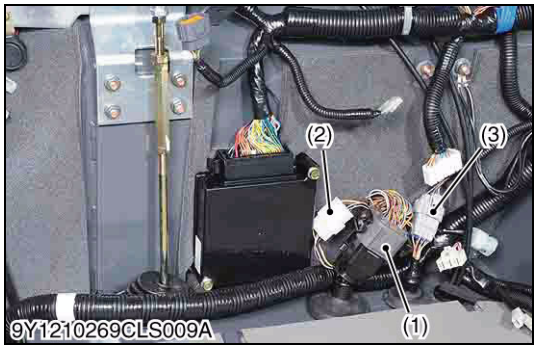
(When reassembling)

Tightening torque	Brake hose retaining nut	22.6 to 27.4 N·m 2.30 to 2.80 kgf·m 16.7 to 20.2 lbf·ft

(1) Nut
(2) Auxiliary Shift Rod
(3) Brake Hose
(4) Parking Brake Wire

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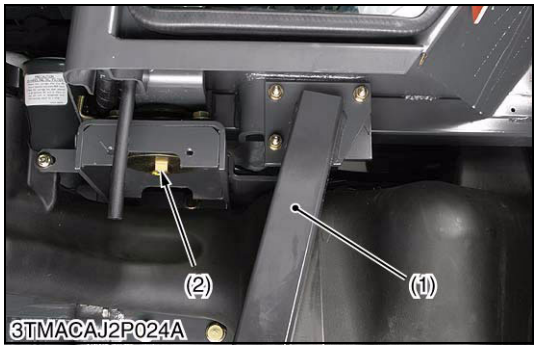


Cabin Harness Connector

1. Disconnect the cabin harness connectors (1), (2), (3).
2. Draw out the harness and connectors from the cabin.

(1) Connector
(2) Connector
(3) Connector

9Y1210269CLS0016US0



Dismounting Cabin

1. Remove the step mounting nuts (1) and steps (R.H.) (L.H.).
2. Remove the cabin mounting screws and nuts (2) (front) (rear).
3. Set the cabin dismounting tool (3) to the cabin.
4. Dismounting the cabin from tractor body.

(When reassembling)

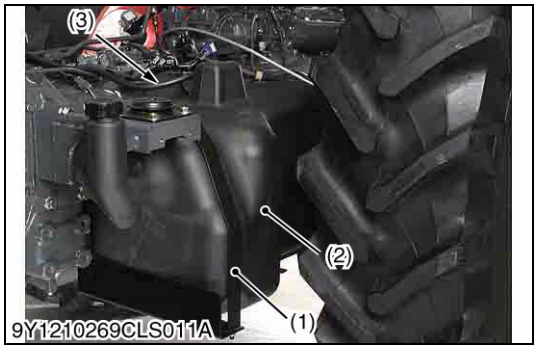
Tightening torque	Cabin mounting screw and nut	69 to 88 N·m 7.0 to 9.0 kgf·m 50.6 to 65.1 lbf·ft

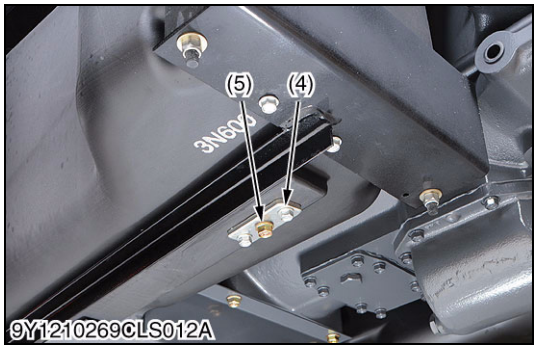
(1) Step
(2) Cabin Mounting Nut
(3) Cabin Dismounting Tool

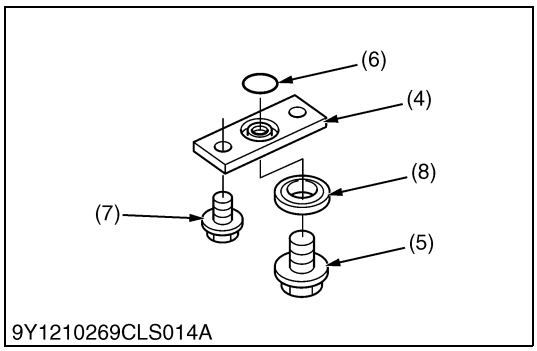
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Fuel Tank

1. Remove the drain cover (4) and drain the fuel.
2. Remove the tank bands (1).
3. Disconnect the fuel tank hose.
4. Disconnect the **2P** connector from fuel gauge.
5. Disconnect the hose (3).
6. Remove the fuel tank (2) and tank support.

(When reassembling)

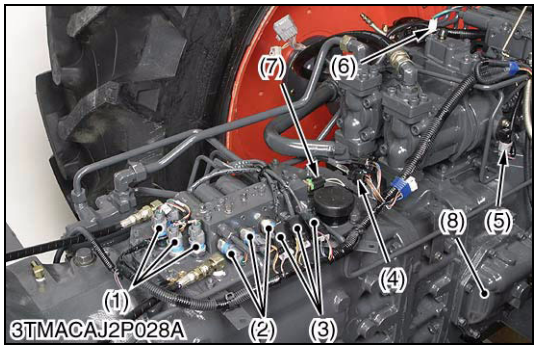
- Be sure to fix the O-ring (6) is in position on the drain cover (4).

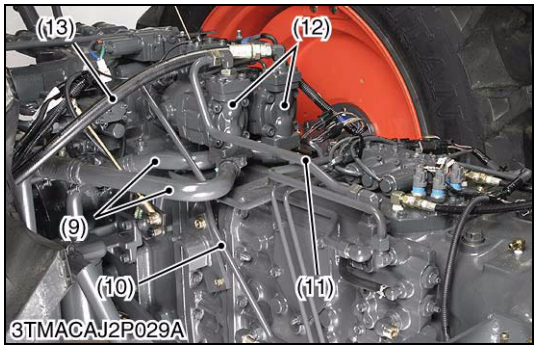
Tightening torque	Fuel tank support mounting screw	196.1 to 225.6 N·m 20.0 to 23.0 kgf·m 144.7 to 166.4 lbf·ft

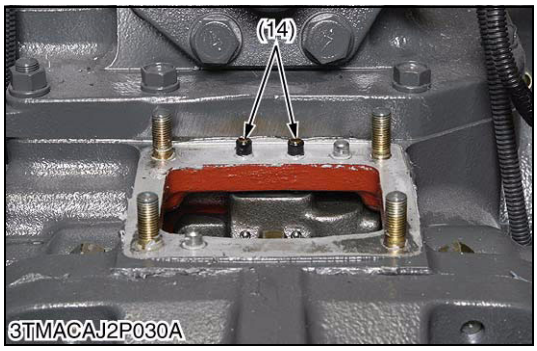
(1) Tank Band
(2) Fuel Tank
(3) Hose
(4) Drain Cover
(5) Screw
(6) O-ring
(7) Screw
(8) Washer with Rubber

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Connectors, Pipes and Hydraulic Pump

1. Disconnect the connectors (1), (2), (3), (4), (5), (6), (7).
2. Remove the creep case (8) from power shift valve assembly.
3. Remove the suction pipe (9).
4. Remove the delivery pipe (11) and return pipe (10).
5. Remove the delivery hose (13).
6. Remove the hydraulic pump assembly (12) with pump base.

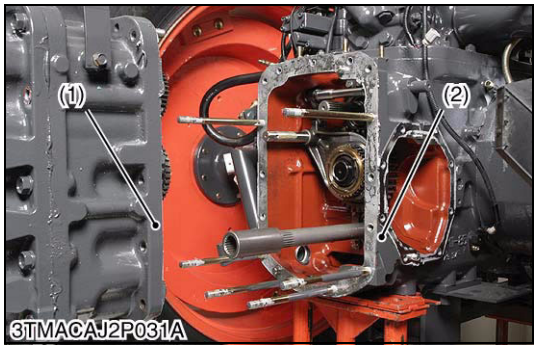
(When reassembling)

- Replace the oil pipes (14) with new ones.
- Apply oil to the pipes.
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the valve case and transmission case.

Tightening torque	3P delivery hose retaining nut	45.1 to 53.0 N·m 4.6 to 5.4 kgf·m 33.3 to 39.0 lbf·ft
	Power steering pump delivery pipe retaining nut	107.9 to 117.7 N·m 11.0 to 12.0 kgf·m 79.6 to 86.8 lbf·ft
	Return pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.1 to 50.6 lbf·ft
	Creep case mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
	Hydraulic pump base mounting nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.1 to 66.5 lbf·ft

(1) Connector
(2) Connector
(3) Connector
(4) Connector
(5) Connector
(6) Connector
(7) Connector
(8) Creep Case
(9) Suction Pipe
(10) Return Pipe
(11) Delivery Pipe (Power Steering)
(12) Hydraulic Pump Assembly
(13) Delivery Hose
(14) Oil Pipe

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Separating Mid Case from Transmission Case

1. Place the disassembling stands under the clutch housing case and transmission case.
2. Remove the mid case mounting screws and nuts.
3. Separate the mid case (1) from transmission case (2).

(When reassembling)

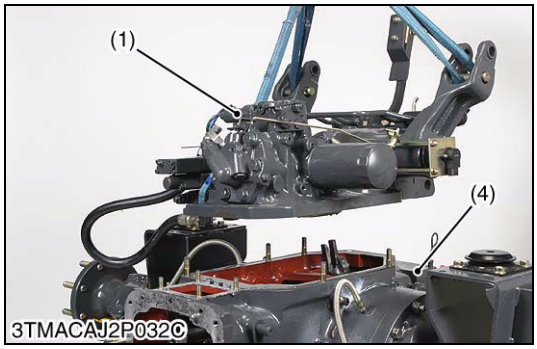
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of mid case and transmission case.

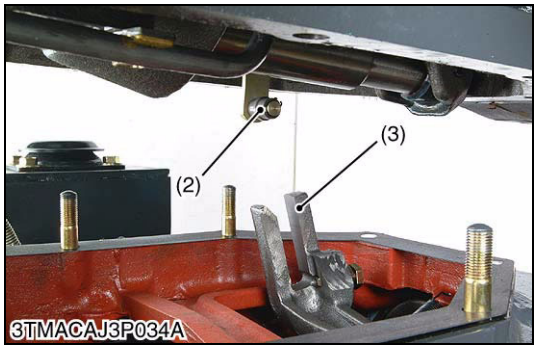
Tightening torque	Mid case and transmission case mounting screw and nut	103.0 to 117.7 N·m 10.5 to 12.0 kgf·m 76.0 to 86.8 lbf·ft

(1) Mid Case
(2) Transmission Case

9Y1210269CLS0020US0

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Separating Hydraulic Cylinder Assembly and Rear PTO Case

1. Remove the hydraulic cylinder assembly mounting screws and nuts.
2. Support the hydraulic cylinder assembly (1) with nylon lift strap and hoist, and then remove it.
3. Remove the PTO case mounting screws and rear PTO case assembly (4).

(When reassembling)

- Replace the gasket with new one.
- Be sure to put roller (2) in to the groove of draft link 1 (3).

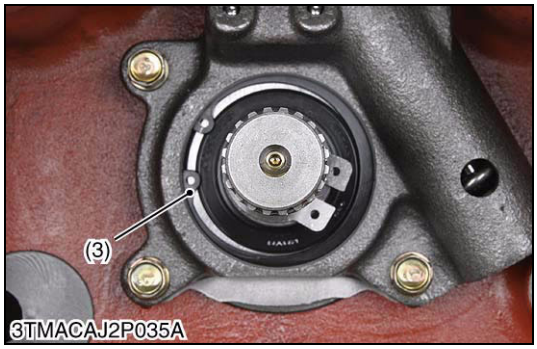
Tightening torque	Hydraulic cylinder assembly mounting screw and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft
	Rear PTO case mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

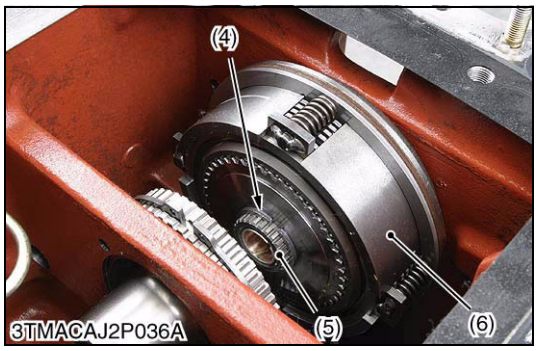
(1) Hydraulic Cylinder Assembly
(2) Roller
(3) Draft Link 1
(4) Rear PTO Case

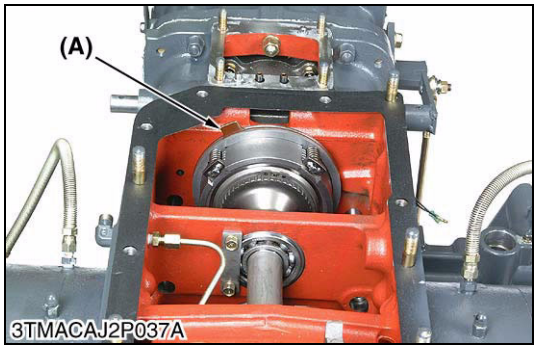
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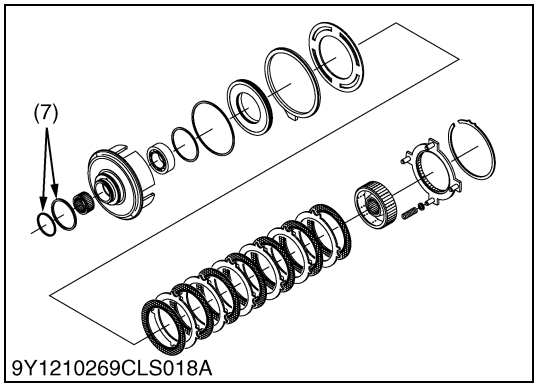
https://truckmanualshub.com/











PTO Clutch Assembly

1. Remove the bearing retainer (1) and ball bearing (2).
2. Remove the internal snap ring (3).
3. Remove the external snap ring (4).
4. Tap out the PTO clutch shaft (5) to the front and remove the PTO clutch assembly (6).

(When reassembling)

■ **IMPORTANT**

- **Replace the seal rings to new ones.**
- **Apply transmission fluid to the seal rings.**
- **When reassembling the PTO clutch assembly (6), direct the projection part of brake ring (A) to left side in view of the back.**
- **Confirm the piston to move smoothly when pressure air at 0.29 to 0.39 MPa (3 to 4 kgf/cm^2, 42 to 57 psi) is sent to clutch pack.**

(1) Bearing Retainer
(2) Ball Bearing
(3) Internal Snap Ring
(4) External Snap Ring
(5) PTO Clutch Shaft
(6) PTO Clutch Assembly
(7) Seal Rings

(A) Projection Part of Brake Ring

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(3) Removing PTO Clutch Valve

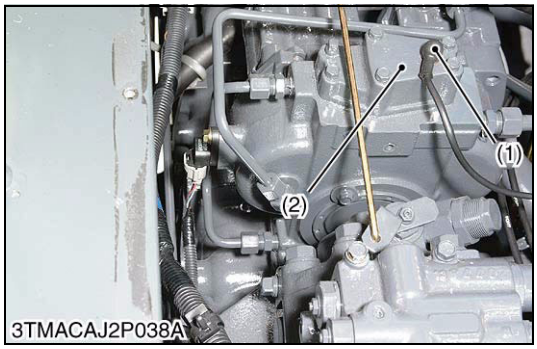


Seat and Floor Cover

1. Disconnect the battery negative cable.
2. Remove the side cover (2).
3. Disconnect the **2P** connectors and **10P** connector which come from seat and arm rest.
4. Remove the seat mounting nuts and seat (1).
5. Remove the hydraulic lock lever (3) and cover (5).
6. Remove the floor mat (4) and floor cover.

(1) Seat
(2) Side Cover
(3) Hydraulic Lock Lever
(4) Floor Mat
(5) Cover

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PTO Valve

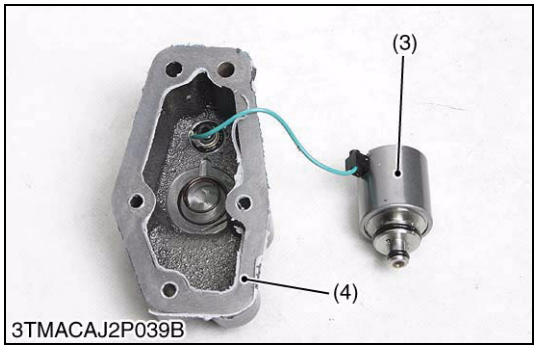
1. Disconnect the wiring harness (1) for PTO valve.
2. Remove the PTO valve cover mounting screws.
3. Remove the PTO valve cover (2).
4. Take out the PTO solenoid valve (3).

(When reassembling)

- Take care not to damage the O-ring.
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of pump case.

(1) Wiring Harness
(2) PTO Valve Cover
(3) PTO Solenoid Valve
(4) Pump Case

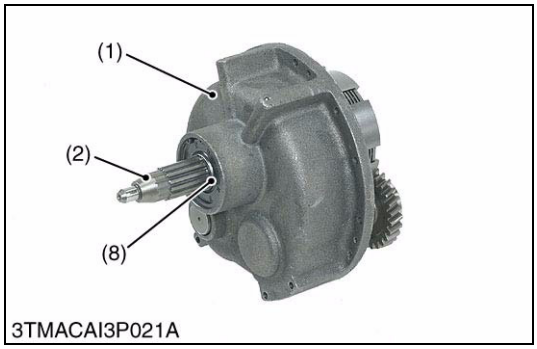
9Y1210269CLS0024US0



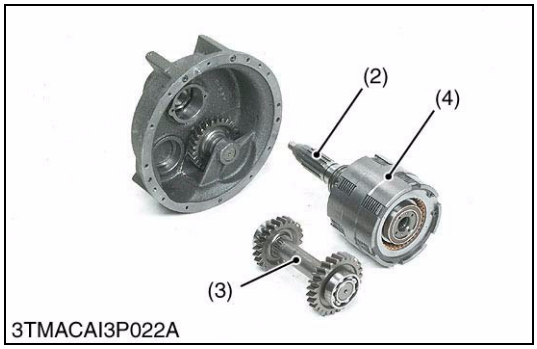
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[2] DISASSEMBLING AND ASSEMBLING

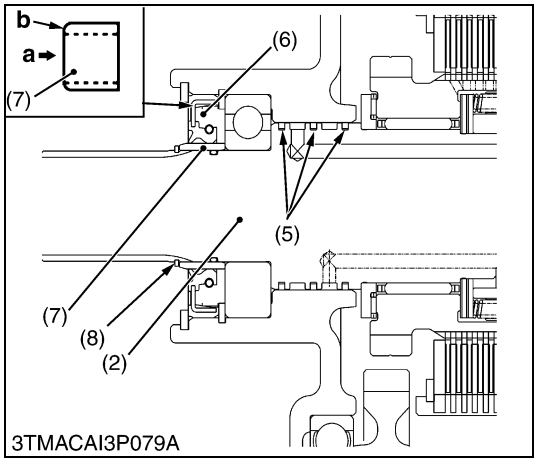
(1) Master Clutch



3TMACAI3P021A



3TMACAI3P022A



3TMACAI3P079A

Removing Master Clutch Assembly

1. Remove the external snap ring (8).
2. Tap out the input shaft (2) with shuttle clutch and 26T gear shaft (3) together.

(When reassembling)

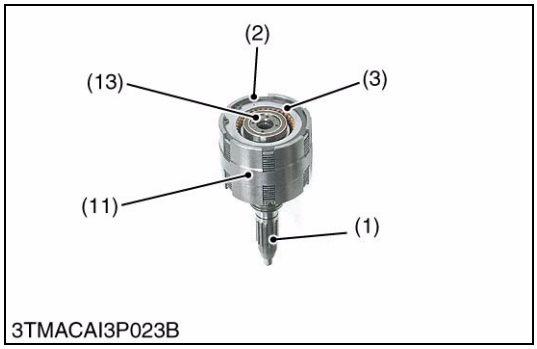
- Replace the seal rings (5), oil seal (6), sleeve (7) external snap rings (8) with new ones.
- Be sure to install sleeve (7) as shown in figure.
- Apply transmission fluid to seal rings (5) and bearings.
- Apply grease to oil seal and sleeve.

(1) Shuttle Case Assembly
(2) Input Shaft
(3) 26T Gear Shaft
(4) Shuttle Clutch Assembly
(5) Seal Ring
(6) Oil Seal
(7) Sleeve
(8) External Snap Ring

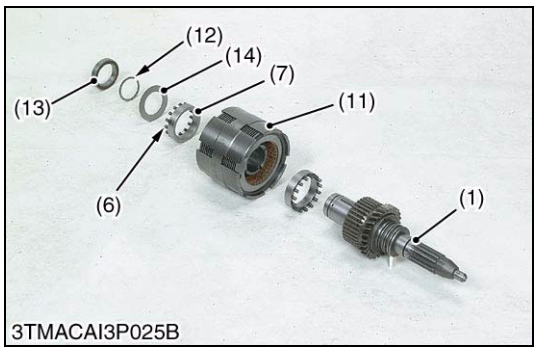
a: Front Side
b: Rounded Edge

9Y1210269CLS0028US0

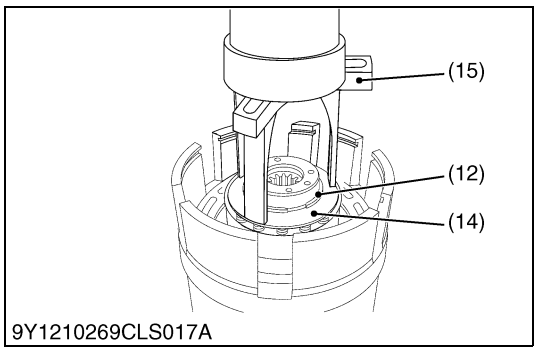
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3TMACAI3P023B



3TMACAI3P025B



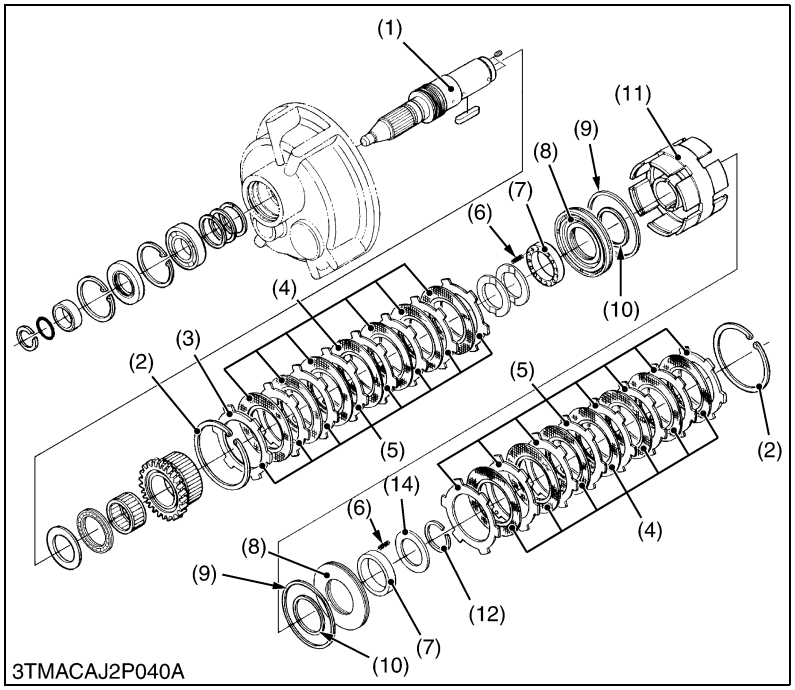
9Y1210269CLS017A

Disassembling Master Clutch

1. Remove the internal snap ring (2).
2. Remove the pressure plate (3), drive plates (5) and clutch discs (4).
3. Remove the bearing (13).
4. Press the thrust collar (14) lightly with hand press, using hydraulic clutch spring compressor (15) (see page G-62), and remove the external snap ring (12).
5. Tap out the input shaft (1) from clutch body (11).

(When reassembling)

- Replace the external snap rings (12) with new ones.
- Install the clutch discs (4) and drive plate (5) mutually.
- When installing the internal snap ring (2) to the clutch body, align its split portion to the notched portion of clutch body.
- Apply enough transmission fluid to the clutch discs (4).
- Do not confuse the pressure plate (3) and drive plate (5). The pressure plate (3) is thicker than the drive plate.
- Confirm that the piston (8) moves smoothly when pressure air at 0.5 to 1.0 MPa (5 to 10 kgf/cm^2, 73 to 140 psi) is sent to clutch pack.



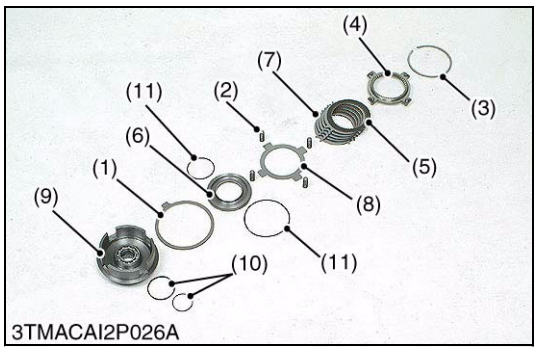
3TMACAJ2P040A

(1) Input Shaft
(2) Internal Snap Ring
(3) Pressure Plate
(4) Clutch Disc
(5) Drive Plate
(6) Spring
(7) Spring Holder
(8) Piston
(9) D-ring
(10) D-ring
(11) Clutch Body
(12) External Snap Ring
(13) Bearing
(14) Thrust Collar
(15) Hydraulic Clutch Spring Compressor

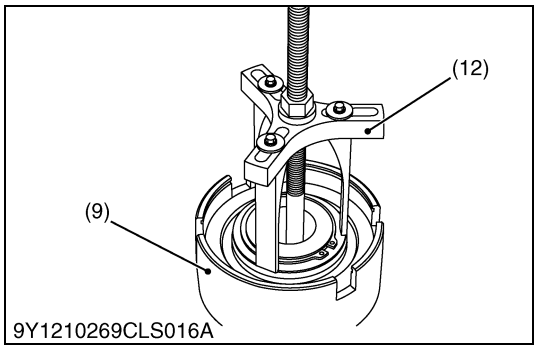
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(2) PTO Clutch



3TMACAI2P026A



9Y1210269CLS016A

Clutch Hub and Clutch Discs

1. Remove the internal snap ring (3) with the hydraulic clutch spring compressor (12). (See page G-62.)
2. Take out the plate assembly (4), clutch disc (5), drive plate (7), return plate (8), return spring (2), piston (6) and brake ring (1).

(When reassembling)

- Apply transmission fluid to the piston (6) and seal rings (10).
- Apply transmission fluid to the clutch discs (5).

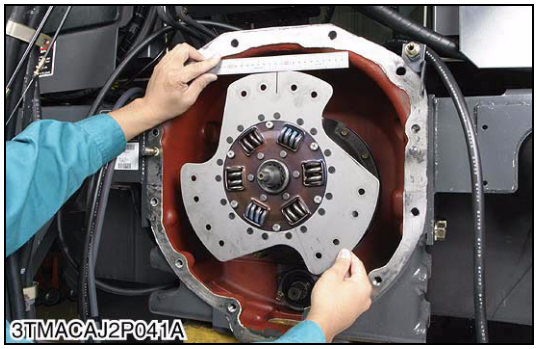
(1) Brake Ring
(2) Return Spring
(3) Internal Snap Ring
(4) Plate Assembly
(5) Clutch Disc
(6) Piston
(7) Drive Plate
(8) Return Plate
(9) Clutch Case
(10) Seal Ring
(11) Piston Ring
(12) Hydraulic Clutch Spring Compressor

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[3] SERVICING

(1) Damper Disc



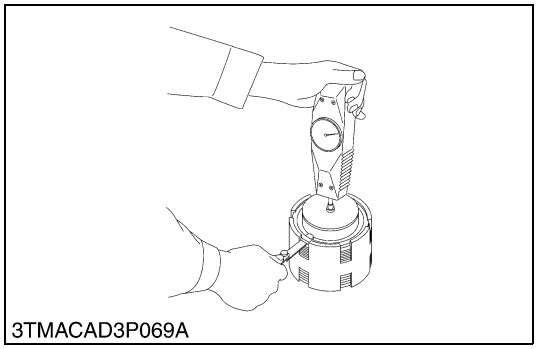
Backlash between Damper Disc Boss and Shaft

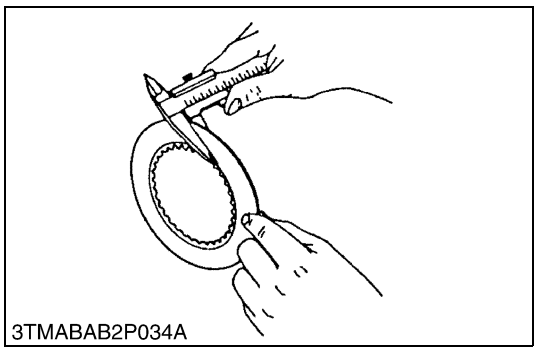
1. Mount the damper disc to the input shaft.
2. Hold the shaft so that it does not turn.
3. Rotate disc lightly and measure the displacement around the disc edge.
4. If the measurement exceeds the allowable limit, replace the damper disc.

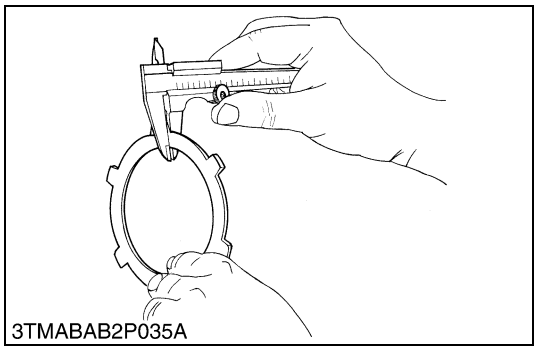
Displacement around disc edge	Allowable limit	2.0 mm 0.079 in.

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(2) Master Clutch







Clearance between Internal Snap Ring and Pressure Plate

1. Measure the clearance between internal snap ring and pressure plate with a feeler gauge while applying the specified force.
   Specified force: 176 to 296 N (18 to 30 kgf, 39.6 to 66.1 lbf)
2. Three points are measured, and the smallest value is assumed to be clearance.
3. If the clearance exceeds the allowable limit, measure the thickness of clutch disc and steel plate with vernier calipers.
4. If the thickness is less than the allowable limit, replace them.
5. Remeasure to confirm the correct clearance.

■ **NOTE**

- **Clearance between internal snap ring and pressure plate is adjusted by two kinds of clutch discs with different thickness. Therefore, use the one of the same thickness when you change clutch disc.**

Clearance between internal snap ring and pressure plate (F and R side)	Factory specification	2.0 to 2.2 mm 0.079 to 0.086 in.
	Allowable limit	3.6 mm 0.142 in.

(Reference)

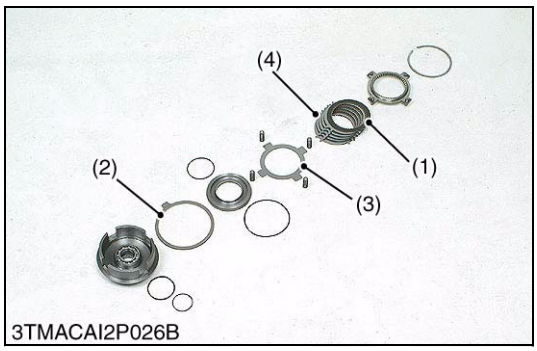
- There are two kinds of thickness of clutch discs.
- Thickness of plate, disc and piston.

Steel plate	Factory specification	2.52 to 2.68 mm 0.099 to 0.105 in.
Pressure plate		4.42 to 4.58 mm 0.174 to 0.180 in.
Clutch disc (3F750-23920)		2.10 to 2.20 mm 0.083 to 0.087 in.
Clutch disc (3F750-23680)		2.30 to 2.40 mm 0.091 to 0.094 in.
Piston		11.79 to 11.80 mm 0.464 to 0.465 in.

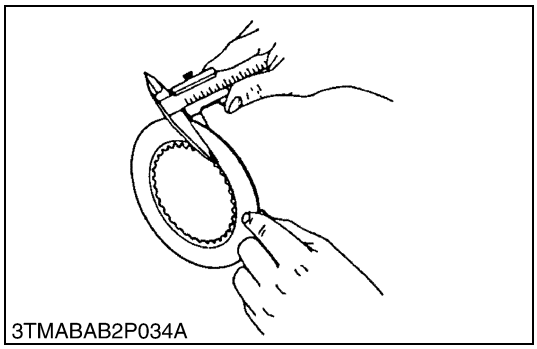
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(3) PTO Clutch



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3TMABAB2P034A

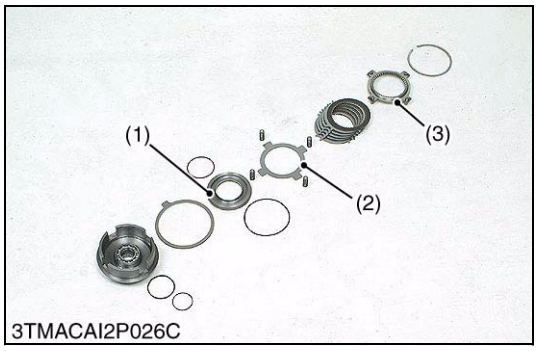
Wear of PTO Clutch Disc, Brake Ring, Return Plate and Driven Plate

1. Measure the thickness of PTO clutch discs (1), brake ring (2), return plate (3) and driven plate (4) with vernier calipers.
2. If the thickness is less than the allowable limit, replace it.

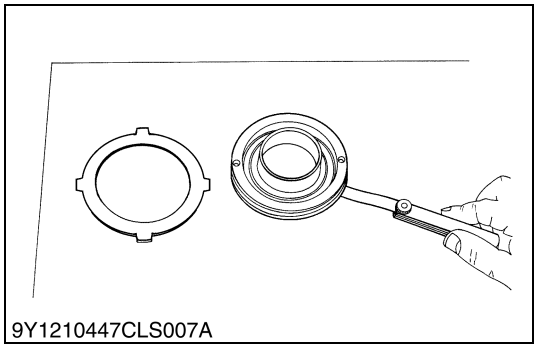
Thickness of clutch disc	Factory specification	1.6 mm 0.063 in.
	Allowable limit	1.3 mm 0.0512 in.
Thickness of driven plate	Factory specification	2.3 mm 0.0906 in.
	Allowable limit	1.8 mm 0.0709 in.
Thickness of return plate	Factory specification	2.8 mm 0.110 in.
	Allowable limit	2.3 mm 0.906 in.
Thickness of brake ring	Factory specification	4.0 mm 0.157 in.
	Allowable limit	3.7 mm 0.146 in.

(1) Clutch Disc
(2) Brake Ring
(3) Return Plate
(4) Drive Plate

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Flatness of PTO Piston, Return Plate and Plate Assembly

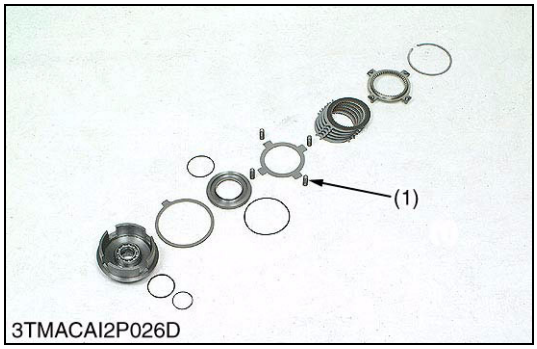
1. Place the PTO piston (1), return plate (2) and plate assembly (3) on a surface plate.
2. Insert a thickness gauge (allowable limit size) underneath it at least four points.
3. If the gauge can be inserted, replace it.

Flatness of PTO piston	Allowable limit	0.15 mm 0.006 in.
Flatness of PTO return plate	Allowable limit	0.30 mm 0.012 in.
Flatness of PTO plate assembly	Allowable limit	0.30 mm 0.012 in.

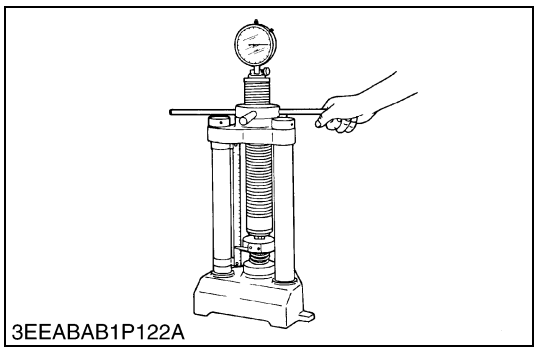
(1) Piston
(2) Return Plate
(3) Plate Assembly

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Pressure Spring Tension

1. Place the spring on the spring tester and compress it to 23.1 mm (0.909 in.)
2. Read the compression load on the gauge.
3. If the measurement is less than the allowable limit, replace it.

Spring setting load / Setting length	Factory specification	265 N / 23.4 mm 27.0 kgf / 23.4 mm 59.5 lbf / 0.921 in.
	Allowable limit	245 N / 23.4 mm 25.0 kgf / 23.4 mm 55.1 lbf / 0.921 in.

(1) Return Spring

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3 TRANSMISSION

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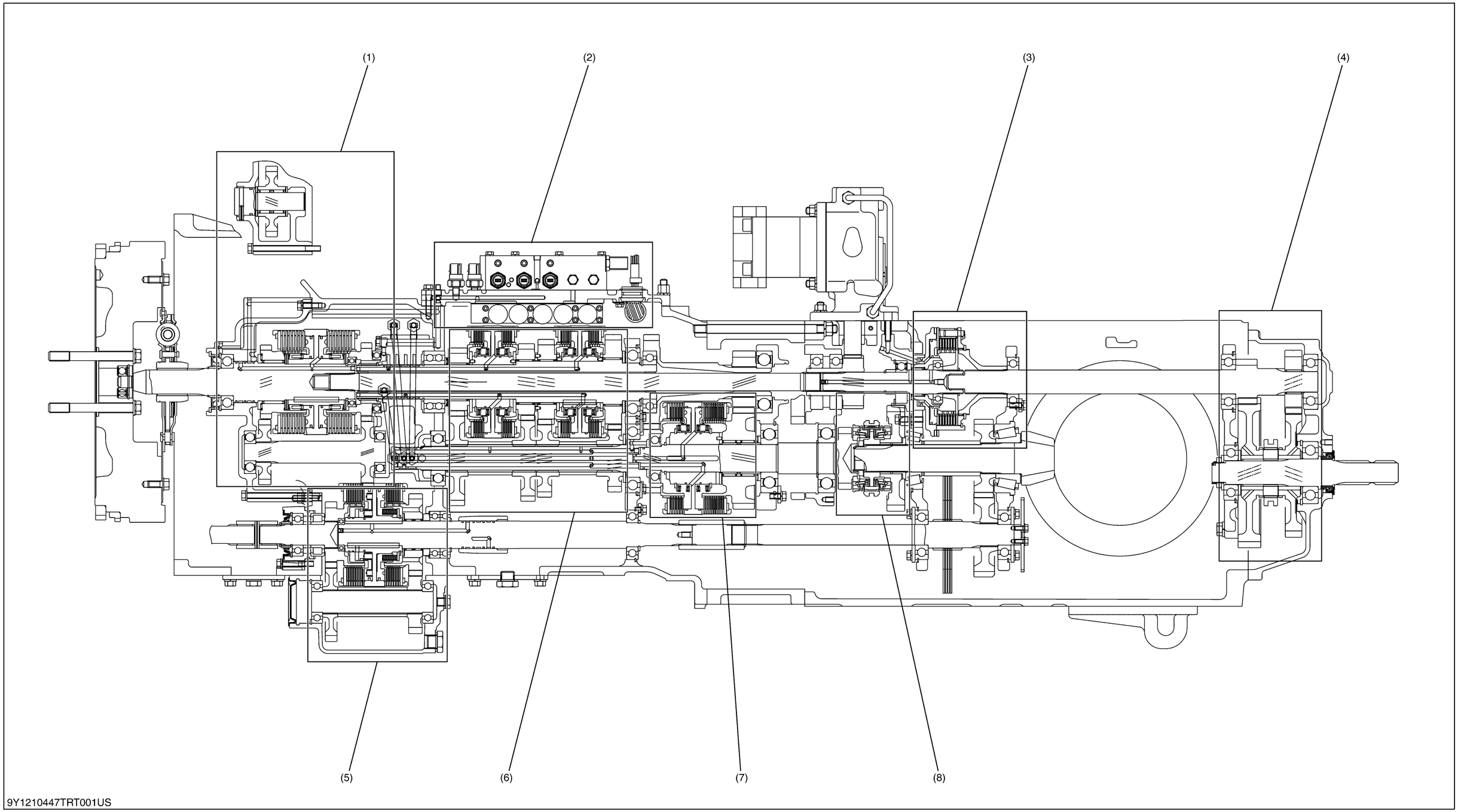
MECHANISM

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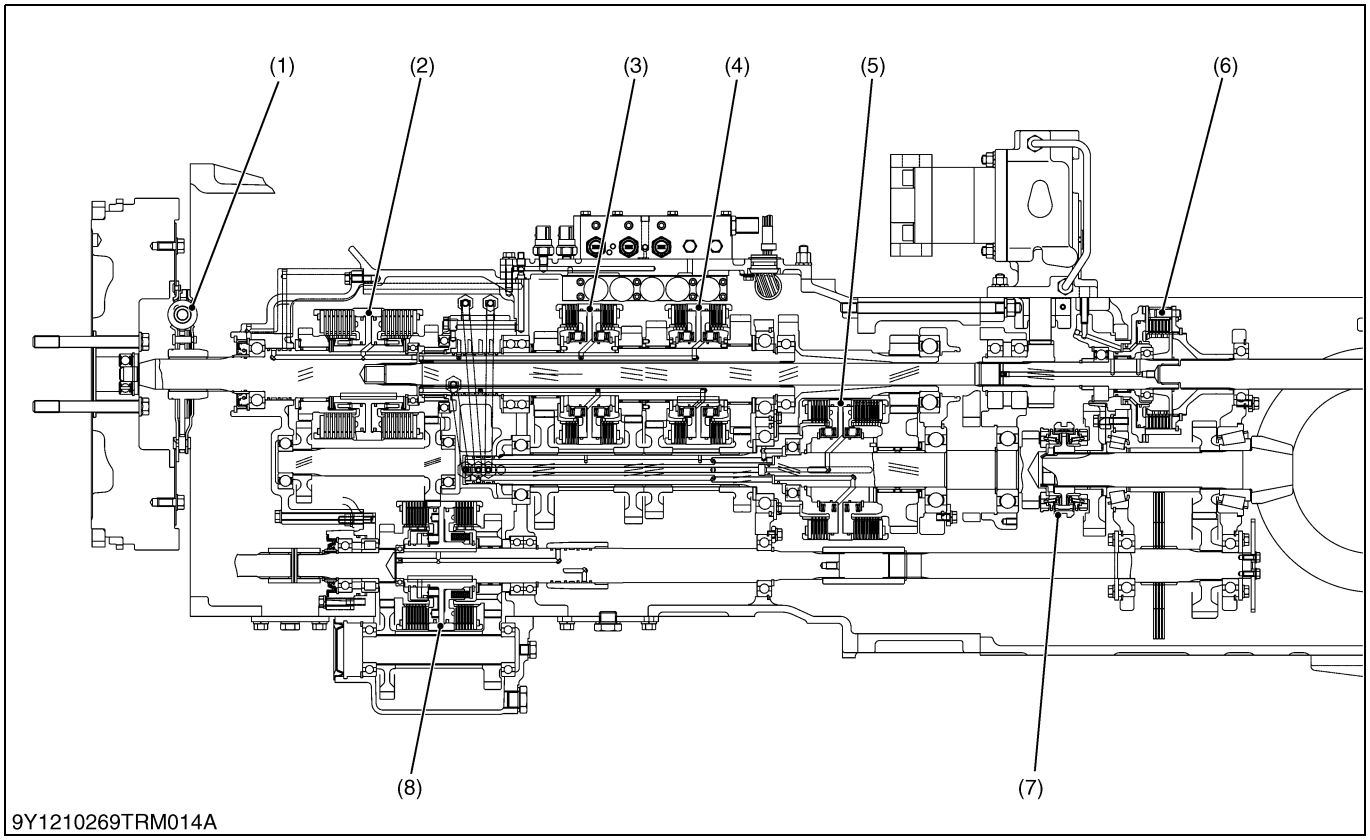
1. STRUCTURE



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(1) Master Clutch Section
(2) Power Shift Valve Section
(3) PTO Clutch Section
(4) PTO Speed Change Section
(5) 4WD / Bi-Speed Clutch Section
(6) Main Shift (1–4) Section
(7) Main Shift (L–H) Section
(8) Range Shift (L–H) Section

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(1) Damper Disc
(2) Master Clutch (**F-R**)
(3) Main Shift Clutch (**1-2**)
(4) Main Shift Clutch (**3-4**)
(5) Main Shift Clutch (**H-L**)
(6) PTO Clutch
(7) Range Shift (**H-L**)
(8) 4WD/Bi-speed Clutch

The transmission consists of a series of gears and shafts. It offers the most suitable speed for traveling and operation by combination of these gears. It transmits power to the front axle, rear axle and PTO shaft, which are classified respectively as the traveling system and PTO system.

■ **Traveling System**

As to M130X tractors, you can choose various combinations of transmission gears in accordance with your usage.

This specification employs the multi disc hydraulic clutch controlled by the Main ECU which performs speed change operation in 16 steps (non-clutch main speed change in 8 steps, forward and reverse shuttle speed change and lever speed change operation (range shift **H-L**) in 2 steps).

This transmission gear structure is shown in the figure above. When a tractor employs a creep kit (cassette creep) in accordance with your need, 8 steps speed change is added so that you can change a tractor speed in 24 steps in total.

■ **PTO System**

All models have live PTO (Independent PTO) which have their own clutch controls completely separated from the traveling clutch and transmission. This means that the PTO operation is independent of the tractor travel. This device have equipped with a hydraulic PTO clutch (wet multi-plates type clutch). (Refer to "2. CLUTCH" section.)

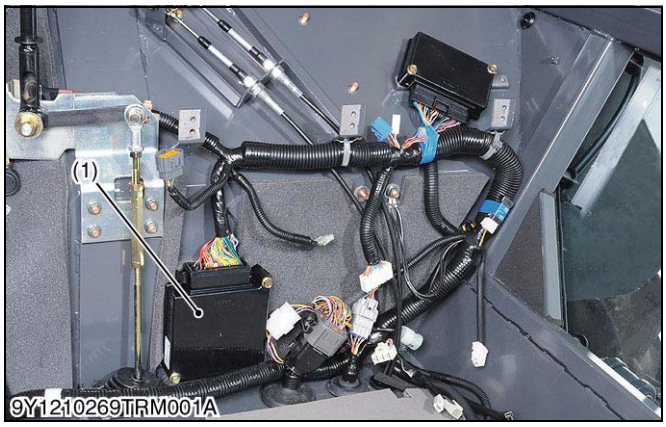
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2. POWER SHIFT SYSTEM

[1] CONSTRUCTION AND FUNCTION OF COMPONENTS

(1) Electrical Components



Power Shift Control Unit (MAIN ECU)

The power shift control unit includes the electronic circuits for power shift, 4WD and Bi-speed control functions.

The control unit processes and judges the input signals from the switches and sensors, and sends the signals to solenoid valves.

(1) ECU (Main)

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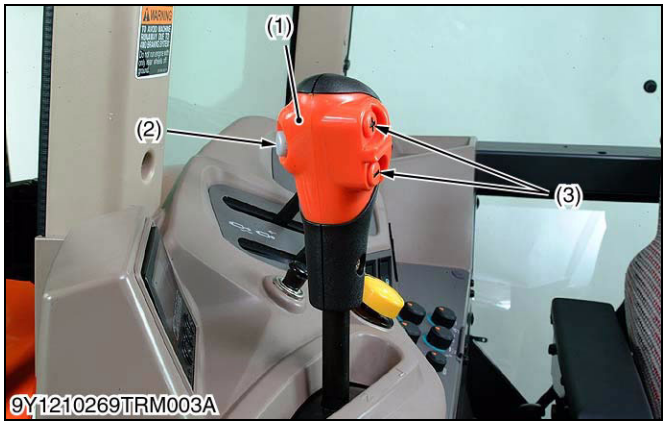
Auto Mode Switch

This switch is equipped with the automatic shifting mode between the field mode and travel mode and performs automatic shifting within an automatic shifting range.

- **Field Mode**
  For plowing, subsoiling and other tilling operations.
- **Travel Mode**
  For trailing and other hauling operations.

(1) Auto Mode Switch

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Power Shift / Range Shift Lever

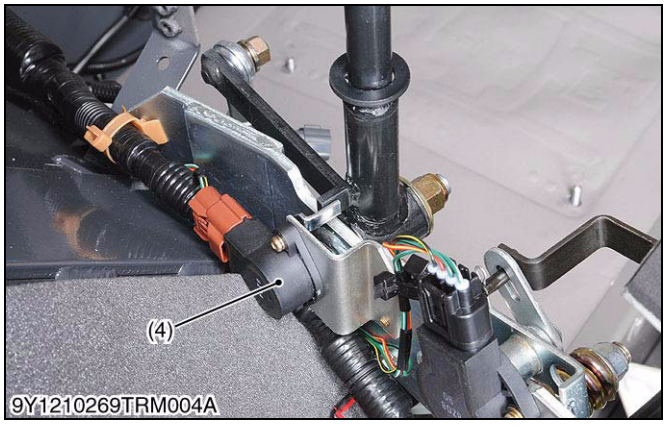
The power shift lever is equipped with shift (**UP / DOWN**) switches, clutch button and range shift lever sensor which detect **L/H** speed in range shift lever operation.

The construction of the lever, and the switches are mounted at the positions as shown in the picture. The speed change mode can be switched mechanically to the **Hi-Lo** speed change mode by moving this lever to the front or rear side.

- **Shift Up / Down Switch**
  Shifting up and down the travel speeds.
- **Clutch Button**
  Pressing the clutch button disengage the master clutch.
- **Range Shift Lever Sensor**
  The shift lever sensor detects position of range shift **(H-L)**.

(1) Power Shift / Range Shift Lever
(2) Clutch Button
(3) Shift Up / Down Switch
(4) Range Shift Lever Sensor

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Rev-limiter Control Dial

Rev-limiter control dial restricts the maximum engine speed.

When setting this dial, the engine speed will not exceed the set speed even if the hand throttle lever or foot throttle pedal is operated.

(1) Rev-limiter Control Dial

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RPM Dual Memory Switch

RPM dual memory switch can be set two different engine speeds, **A** and **B**.

(1) RPM Dual Memory Switch **A: Switch A**
B: Switch B

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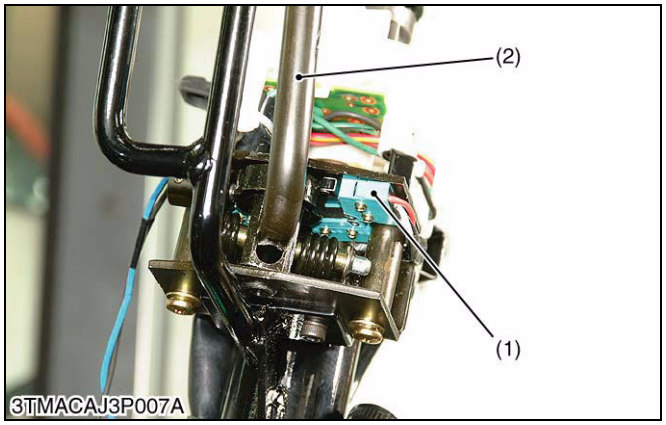
Constant RPM Management Switch

When turning on this switch, the engine speed is kept nearly constant in response to a certain level of load fluctuations.

There is a limit to the range within which a constant speed can be maintained.

(1) Constant RPM Management Switch **A: ON**

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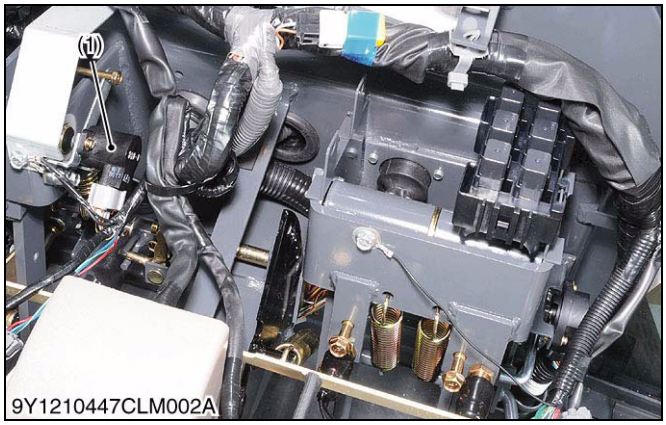
Shuttle Switch

In the power shift, switching of **Forward / Reverse** operation is effected electrically. Therefore, three micro-switches are provided on the shuttle lever shaft so that the position (**Forward-N-Reverse**) of the shuttle lever should be detected.

(1) Shuttle Switch (2) Shuttle Lever

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Clutch Pedal Sensor

The clutch pedal sensor detects the amount of depressing of the clutch pedal to control pressures of the master clutch.

This system allows clutch operation similar to a mechanical clutch.

(1) Clutch Pedal Sensor

9Y1210447TRM0007US0



Foot Throttle Sensor

The foot throttle sensor detects the amount of depressing of foot throttle pedal.

(1) Foot Throttle Sensor

9Y1210447ELM0022US0



Hand Throttle Sensor

The hand throttle sensor detects amount of hand throttle lever operation.

(1) Hand Throttle Sensor

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Shuttle Rotation Sensor

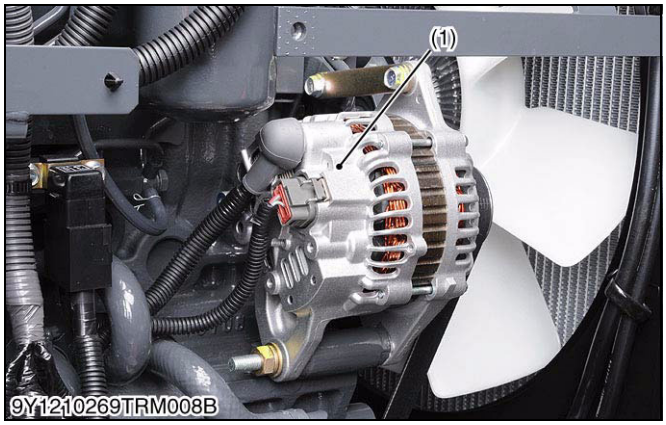
The shuttle rotation sensor detects the rotating speed of the master clutch output shaft and it is provided to detect the connection of master clutch.

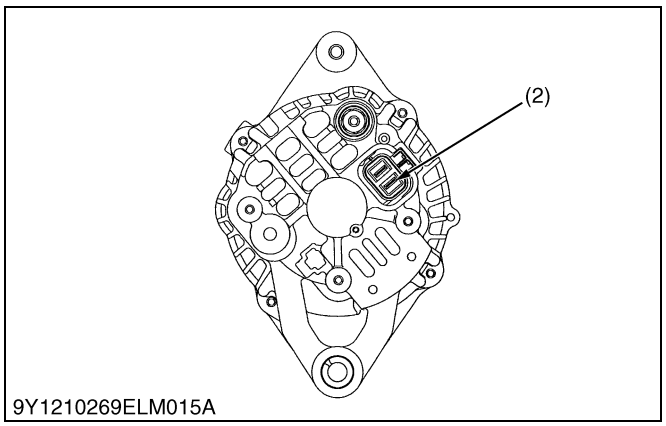
This sensor has a function to generate AC voltage in accordance with changes in the distance from the gear teeth. The ruggedness of the shuttle gear generate an AC voltage having frequency proportional to the rotating speed of the gear, and the rotating speed of the master clutch output is detected by the frequency.

(1) Shuttle Rotation Sensor

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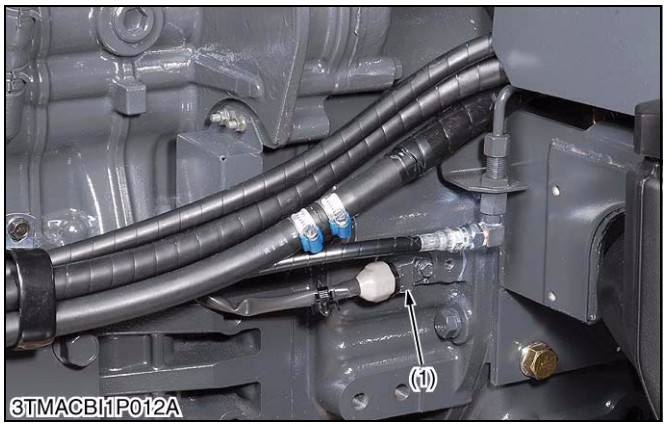
Alternator (L Terminal)

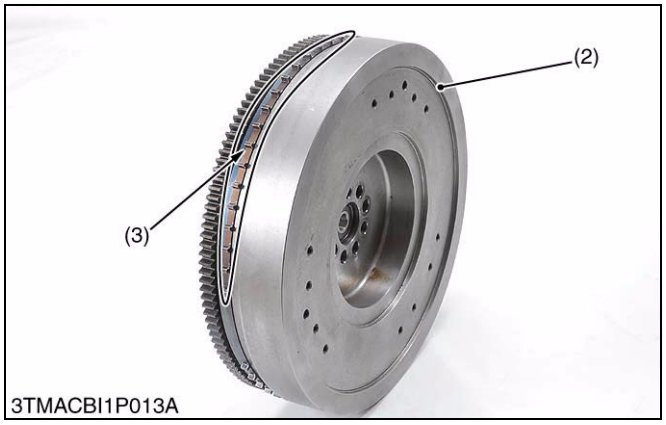
The power shift system detects the rotation of an engine by both engine speed sensor and alternator **L** terminal current which power generation of alternator after engine starts.

Even if the engine speed sensor is faulty, the **L** terminal voltage of the alternator allows detecting rotations on the engine and making operation of power shift possible.

(1) Alternator (2) Alternator **L** Terminal

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Crankshaft Position Sensor (Engine Speed Sensor)

The crankshaft position sensor (3) is installed near the flywheel pulsar gear (2) on the flywheel (1) and detects the crankshaft angle and outputs the engine speed signal.

The sensor unit is a MRE (magnetic resistance element) type. For the MRE type, when the pulsar passes the sensor, the magnetic resistance changes and the voltage passing through the sensor changes. This change in voltage is amplified by the internal IC circuit and output to the engine ECU.

The output signal is sent to main ECU through CAN communication.

The number of pulses for the pulsar gear is 56.

(1) Crankshaft Position Sensor (3) Flywheel Pulsar Gear
(2) Flywheel

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Traveling Speed Sensor

This sensor detects the traveling speed and it is equipped on the left bottom side of differential case.

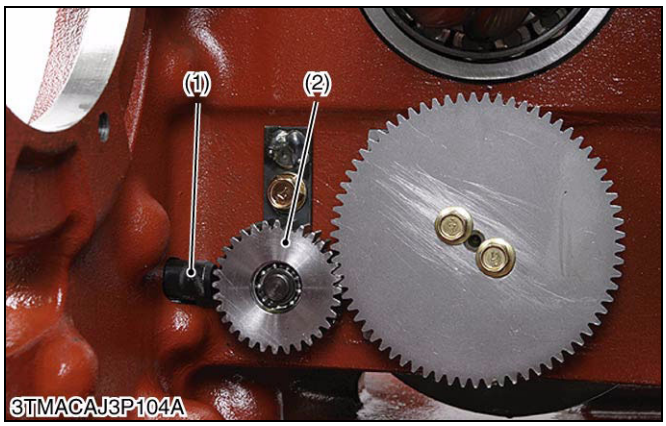
This sensor perceives tooth of the detection gear which is driven by drive gear on the 4WD shaft and emits pulse.

This pulse is sent to the electronic instrument panel and the traveling speed is calculated by the coefficient which is set according to the tire size.

The date of traveling speed is always sent to the MAIN ECU.

(1) Traveling Speed Sensor (2) Detection Gear

9Y1210447ELM0025US0



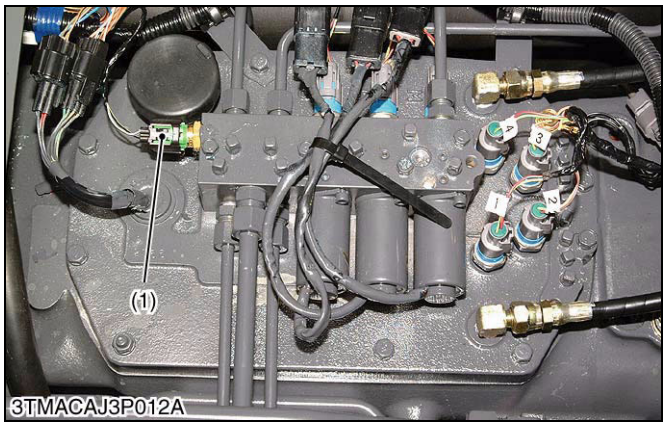
Hydraulic Oil Temperature Sensor

The oil temperature sensor detects a temperature of transmission fluid, and corrects operating time and current of the solenoid valve according to the temperature of transmission fluid.

This system makes master clutch to engage smoothly even if oil viscosity changes.

(1) Hydraulic Oil Temperature Sensor

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Pressure Switch

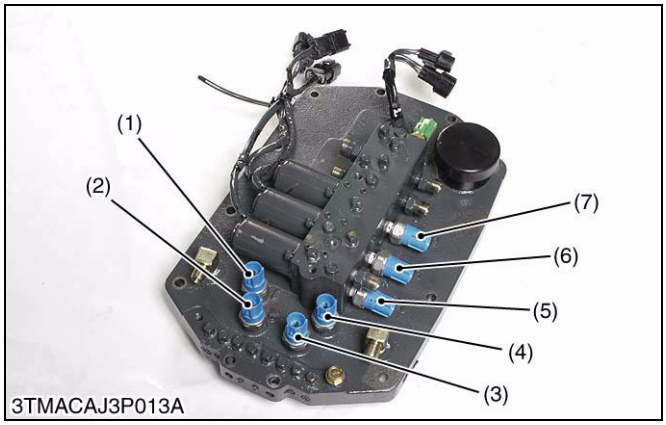
The pressure switch detects the operation of hydraulic clutches and is provided at the power shift valve. (7 pressure switch are provided.)

This switch is a Normal Open type switch which contact closes when the pressure is raised.

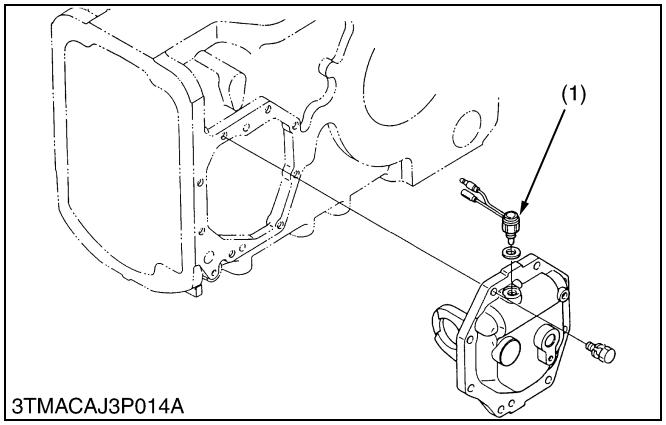
The contacts is closed at a pressure higher than 1.18 MPa (12 kgf/cm^2) and is opened at a pressure lower than 0.74 MPa (7.5 kgf/cm^2).

(1) For Main Shift **1**
(2) For Main Shift **2**
(3) For Main Shift **3**
(4) For Main Shift **4**
(5) For Master (**F-R**)
(6) For Main Shift **L**
(7) For Main Shift **H**

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Creep Speed Change Switch (Option)

The creep speed change switch detects the **ON / OFF** status of the creep speed change operation and it is provided inside the creep speed change gear case.When the creep speed change switch is turned **ON**, the operation changes to the creep speed change control mode which is different from the normal speed change control mode.When this switch is turned **OFF**, the tractor is operated in the normal speed change control mode.

When this switch is **OFF**, the tractor is operated in the normal speed change control mode.

(1) Creep Speed Change Switch

9Y1210447ELM0028US0



Auto Mode Sensitivity Adjustment Dial

This changes the shift conditions and timing of gear shift (up and down) for power shift auto control.

Turn the dial to the negative side	Higher sensitivity for shift-down and lower sensitivity for shift-up
Turn the dial to the positive side	Higher sensitivity for shift-up but the same sensitivity for shift-down

(1) Auto Mode Sensitivity Adjustment Dial

9Y1210447ELM0029US0



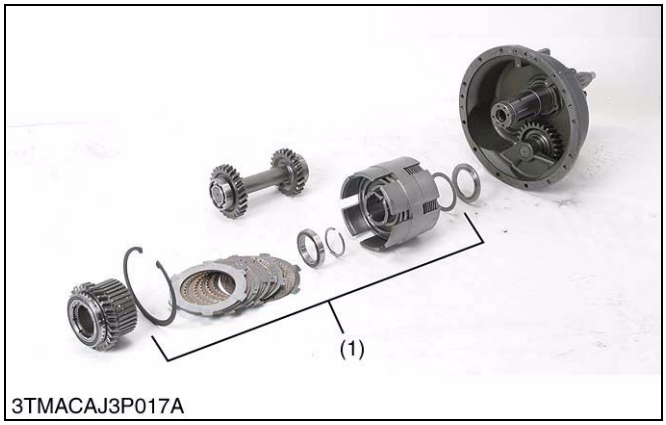
Instrument Panel

On the instrumental meter panel, the lamps are provided to indicate the power shift system such as the step of main speed change, **Forward / Reverse** position of shuttle lever and the **Neutral** position of range shift lever.

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(2) Hydraulic Components



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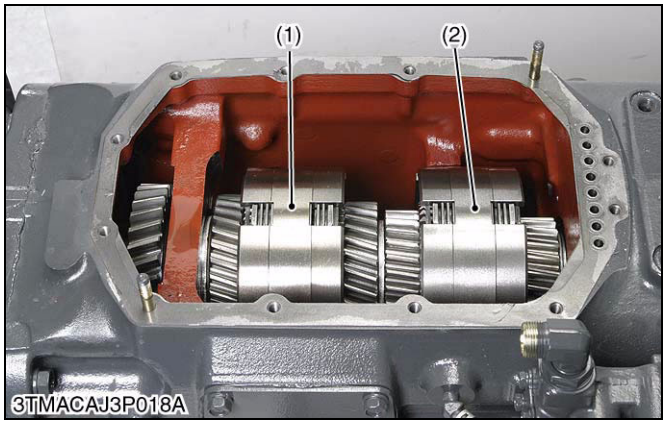
Master Clutch (Forward and Reverse)

The master clutch is composed of forward and reverse hydraulic clutches, and the hydraulic clutches are switched over by turning on and off the solenoid valve.

A pressure of oil into the clutch is controlled by the electromagnetic proportional pressure reducing valve, allowing smooth engagement of the clutch.

(1) Master Clutch

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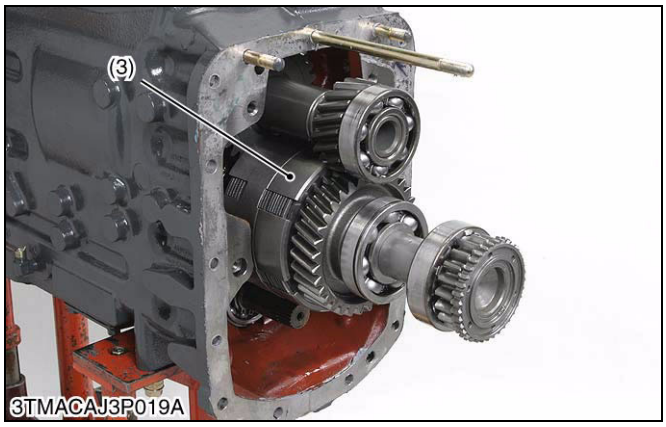
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Main Shift Clutch (1-4, L-H)

In power shift system, switching of 8 step seed shift for main speed change and **forward / reverse** operation is performed by 4 sets of 8 hydraulic clutches.

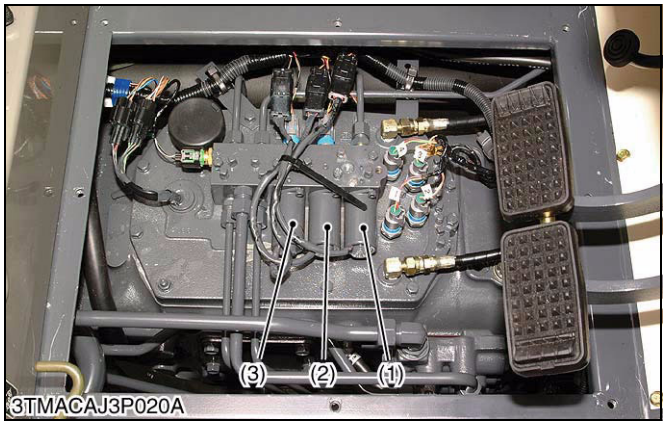
(1) Main Shift Clutch (**1-2**)
(2) Main Shift Clutch (**3-4**)
(3) Main Shift Clutch (**L-H**)

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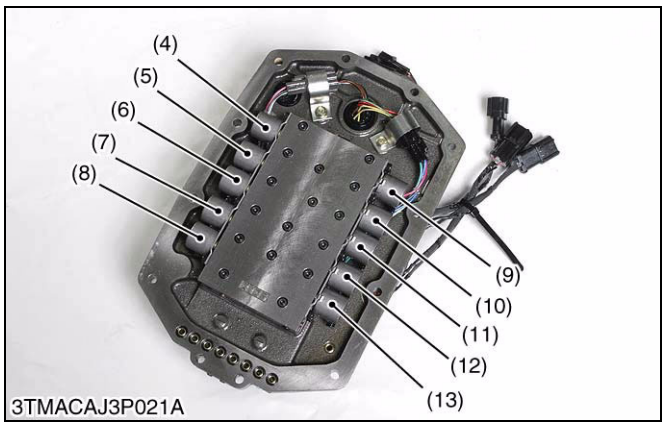


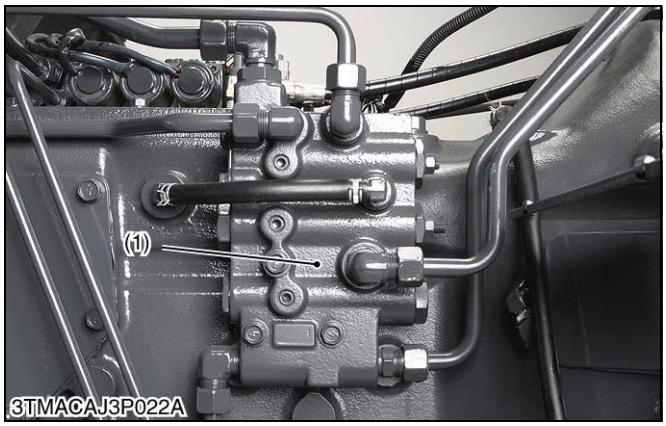
Power Shift Valve Assembly

The power shift valve comprises 10 sets of solenoid **ON / OFF** valve (4), (5), (6), (7), (8), (9), (10), (11), (12), (13) and 3 sets of solenoid proportional pressure reducing valve (1), (2), (3).

(1) Solenoid Proportional Pressure Reducing Valve for Master Clutch
(2) Solenoid Proportional Pressure Reducing Valve for Main Shift Clutch **L**
(3) Solenoid Proportional Pressure Reducing Valve for Main Shift Clutch **H**
(4) Rear Differential Lock Solenoid Valve
(5) Front Differential Lock Solenoid Valve
(6) Main Shift **3** Solenoid Valve
(7) Main Shift **4** Solenoid Valve
(8) Master Solenoid Valve (Forward)
(9) 4WD Solenoid Valve
(10) Bi-speed Solenoid Valve
(11) Main Shift **2** Solenoid Valve
(12) Main Shift **1** Solenoid Valve
(13) Master Solenoid Valve (Reverse)

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Regulator Valve

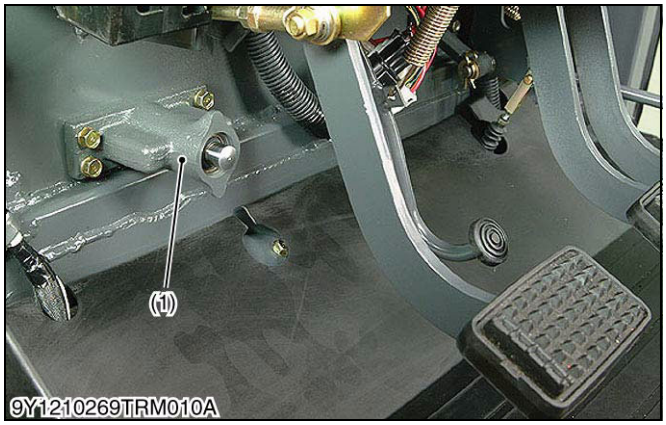
The regulator valve consists of flow priority valve, regulating valve and pressure reduction valve.

The oil from the hydraulic pump for power steering system flows to the power shift valve. Other oil flows to the power steering circuit.

The regulating valve controls the operating pressure of power shift valve to 2.06 to 2.25 MPa (21.0 to 23.0 kgf/cm^2, 298.7 to 327.1 psi)

(1) Regulator Valve

9Y1210269TRM0026US0



Clutch Safety Valve

This valve works to lower the master clutch (**F-R**) pressure surely when the clutch pedal is depressed.

The master clutch (**F-R**) pressure is lowered mechanically by thrusting the spool end by the clutch pedal to release the pilot pressure directly into the transmission case.

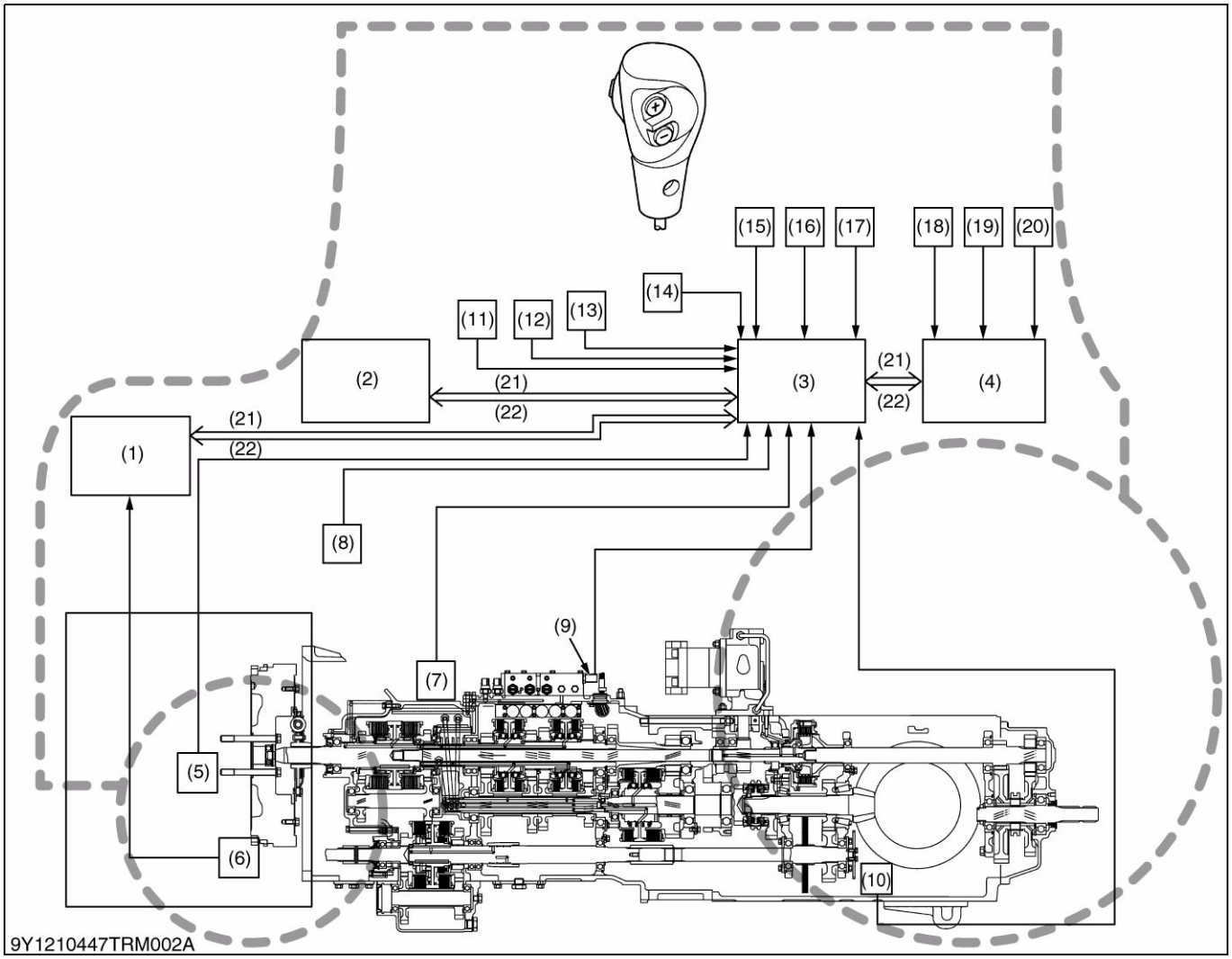
(1) Clutch Safety Valve

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[2] ELECTRIC CONTROL SYSTEM

(1) Control System



(1) ECU (CRS)
(2) INSTRUMENT PANEL ECU
(3) ECU (MAIN)
(4) ECU (SUB)
(5) Turning Angle Switch
(6) Crankshaft Position Sensor
(7) Shuttle Rotation Sensor
(8) Clutch Pedal Sensor
(9) Oil Temperature Sensor
(10) Traveling Speed Sensor
(11) Shuttle Switch
(12) Foot Throttle Sensor
(13) Hand Throttle Sensor
(14) Power Shift / Range Shift Lever Sensor
(15) Rev-limiter Control Dial
(16) RPM Dual Memory Switch
(17) Constant RPM Management Switch
(18) Auto Mode Switch
(19) Auto Mode Sensitivity Adjustment Dial
(20) Down Hill Control Switch
(21) CAN (Hi Side)
(22) CAN (Lo Side)

(To be continued)

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(Continued)

(General Information for ECU)

- ECU (MAIN) processes and judges the input signals from the switches and sensors, and sends the signals to solenoid valves concerned with the power shift control system.
- Therefore, ECU (MAIN) controls the engagement of the hydraulic clutches.
- ECU (SUB) processes and judges the input signals from the switches and sensors, and sends the signals to solenoid valves concerned with the 3-point hitch control system.
- Instrument panel ECU processes and judges the input signals from the switches and sensors, and sends the signals to the indicators and the display.
- ECU (CRS) processes and judges the input signals from the switches and sensors, and sends the signals to the injectors.
- All ECU shares information from switches and sensors connected with each ECU.
- For example, ECU (CRS) receives the input signals from switches and sensors. It converts them to ECU (MAIN) with CAN.
  In the same way, ECU (SUB) receives the input signals from switches and dials. It converts them to ECU (MAIN) with CAN.
  Therefore, ECU (MAIN) has all information about sensors, dials and switches which connect to ECU.
  The others have all information about sensors, dials and switches which connect to ECU, too.

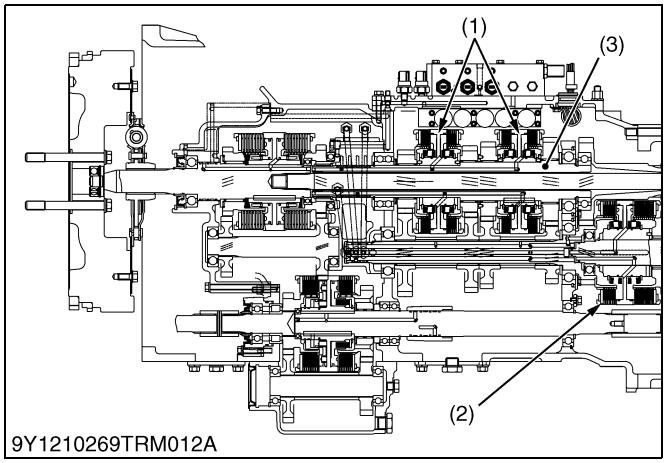
(CAN: Controller Area Network)

CAN is the abbreviation for Controller Area Network. CAN forms the area network connected with all ECU.
All information from sensors and switches are shared with all ECU by using CAN.

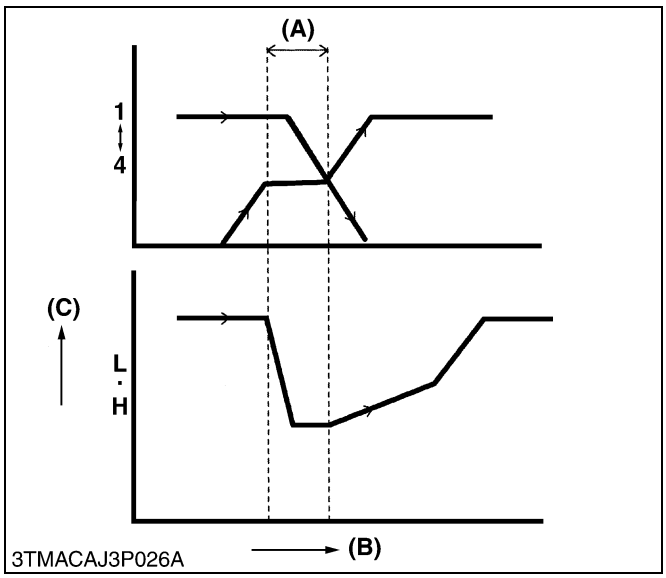
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(2) Power Shift Control



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3TMACAJ3P026A

The main shift clutch (**H-L**) and the main shift clutch (**1-4**) of power shift use hydraulic clutches.

When a shifting operation is performed during a run using the shift up / down button, the pressure on the main shift clutch (**L-H**) is reduced and the hydraulic clutch is switched over by overlapping the pressure of the main clutch (**1-4**).

The pressure on the main shift clutch (**L-H**) is modulation-controlled to reduce a shift shock.

A load on the engine is assessed by the output voltages from the throttle sensor and the engine speed sensor, and an optimum pressure for the engine load is calculated to control.

To improve workability, the power shift control provides the auto shift mode which shifts up and down automatically according to change of engine speed.

■ **Surely Stop Function**

To stop the main shaft (3) rotation by inertia force surely, both of the pressure on the main shift clutch (1st) and (4th) are rated pressure on the below condition.

Shuttle lever position: **Neutral**

Power shift lever position: **L**

(1) Main Shift Clutch (**1-4**)
(2) Main Shift Clutch (**L-H**)
(3) Main Shaft

(A) Overlapping
(B) Time
(C) Pressure
L: Main Shift (1st through 4th)
H: Main Shift (5st through 8th)

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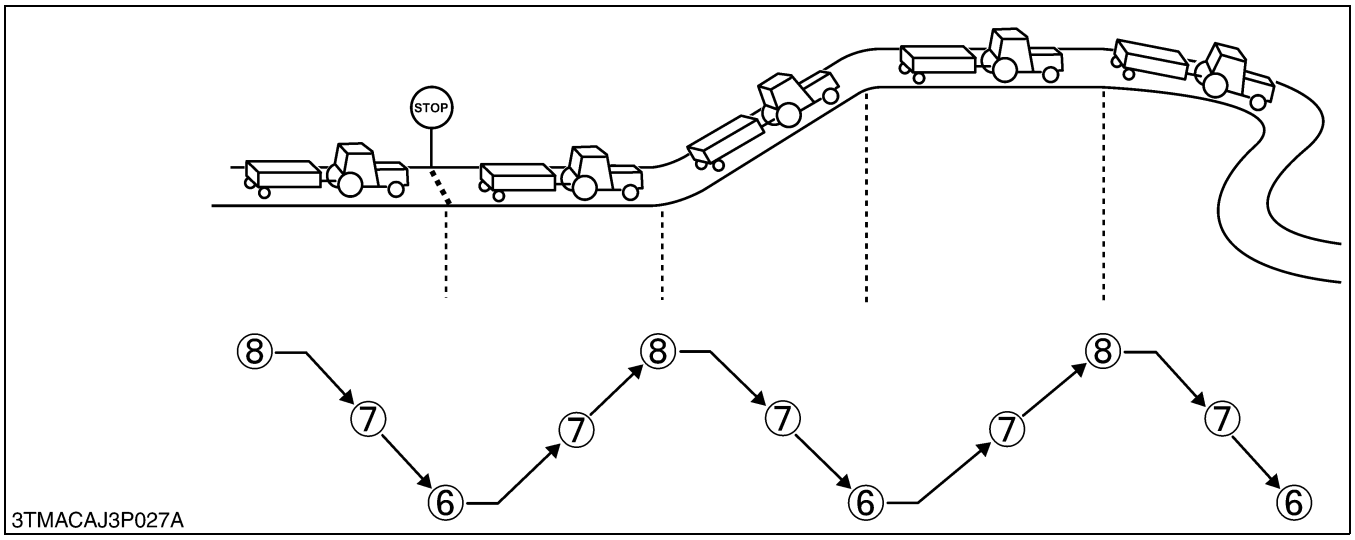
[3] AUTO SPEED CONTROL

The auto-mode is an automatic speed change function that is designed to shift up and down the travel speed in response to the load-dependent engine rpm fluctuations, attachment maneuvering, acceleration pedal movement and other factors. The auto-mode comes in two ways, "Travel Mode" and "Field Mode", according to the application.

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(1) Travel Mode

In trailing operation, the automatic shift-up/down is carried out within a predetermined range (factory-set for 2 shifts), responding to the acceleration pedal movement and rpm changes from load. The helps you avoid troublesome gear shifting.



[Example] Running at the automatic travel speeds (6), (7), (8)	**Acceleration pedal released** When the acceleration pedal is completely released, the hand throttle is in idle position, the automatic shift-down from speed (8) to speed (7) to (6) occurs.	**Tractor stopped** When the tractor pauses, the automatic shift-up from speed (6) occurs for smooth restarting.	**Uphill travel** On an uphill slope, an increase in load is sensed, prompting the automatic shift-down to speed (7) or (6) for more traction force.	**Traveling** Over the uphill slope, a decrease in load is sensed, prompting the automatic shift-up.	**Acceleration adjusted** On a downhill slope or along a curve, the automatic shift-down to speed (7) or (6) occurs, responding to the acceleration pedal movement.

■ **Execution Condition for Automatic Shifting**

Auto shift up or down is conducted when the following condition matches.

1. Power shift lever is in **L** or **H** position, and the neutral switch is not depressed.
2. The acceleration control increase or decrease is not being conducted.
3. The clutch pedal is not depressed.
4. The steering wheel is not being operated (turning angle switch is not turned on).
5. The machine is running forward.

■ **Auto Shift Down Function**

Tractor will auto shift down when the following condition are achieved.

1. The acceleration opening of the engine set without load is above 1300 min^{-1} (rpm).
2. Engine drop is above the preset value.
3. Engine is not on recovering condition.

(To be continued)

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(Continued)

■ **Auto Shift Up Function**

Tractor will auto shift up when the following conditions are achieved.

1. Engine rpm is not increased by pushing outer load.
2. When the engine rpm is accelerated from low speed to high speed quickly, auto shift up is conducted according to the engine rpm increase condition.
3. Auto shift up is conducted according to the acceleration set rpm, if the acceleration set rpm is gradually increased from the low rpm range, with the engine drop is within a certain value.
4. After manual shift is conducted, auto shift cannot be conducted unless acceleration pedal is depressed.

■ **Working Support Function**

There is support function as described below to support the gear change (shift up and down) operation.

1. Acceleration release to shift down function

For cornering or deceleration, when the operator release the acceleration control, shift down is conducted automatically down to the lowest gear if match to the conditions described below.

- Acceleration set rpm needs to low idle (rpm is lower than 1000 min^{-1} (rpm)).
- Actual engine rpm is not high side (rpm is lower than 2300 min^{-1} (rpm)).

2. Start Function from Stop

This function forces the gear engagement to be the lowest gear while parking. This function works, when the following condition meets.

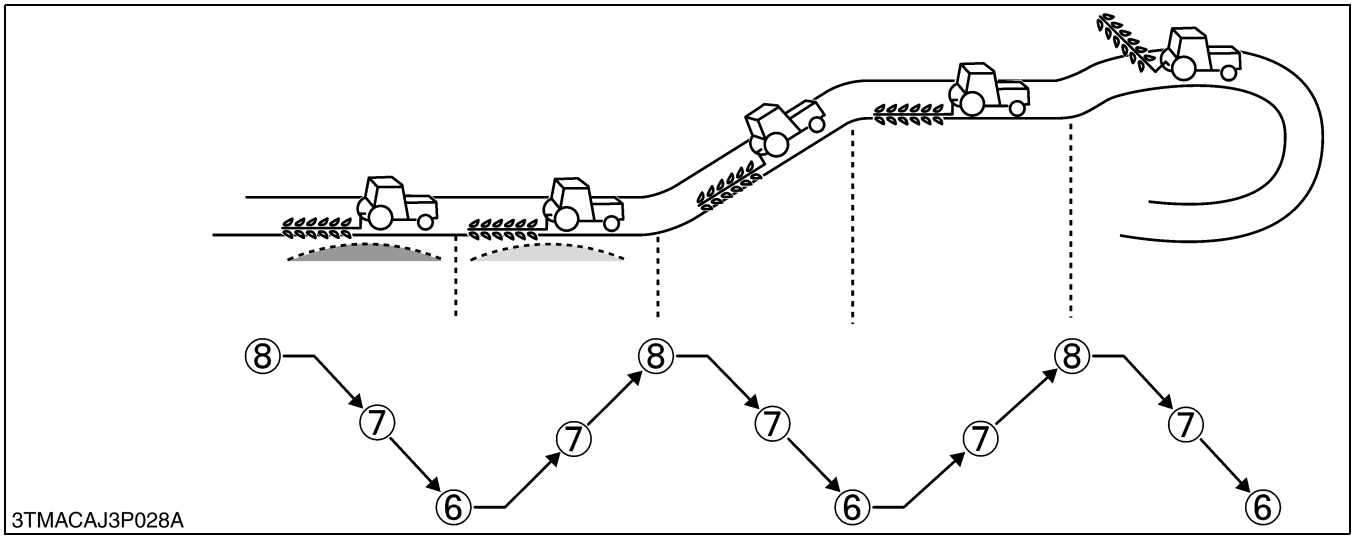
- Power shift lever is in **L** or **H** position, and the neutral switch is not depressed.
- Shuttle lever is not located on **R** position.
- Auto or manual gear shift is completed.
- Master clutch is not engaged.
- Tractor is not in motion (stopped).

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(2) Field Mode

In plowing operation, the automatic shift-up/down is carried out within a predetermined range (factory-set for 2 shifts), responding to the field condition, soil condition and other factors. When lifting the attachment using 3-point hitch, the automatic shift-down is made for easier turning.



[Example] Running at the automatic travel speeds (6), (7), (8)	**Hard farm ground** An increase in load is sensed due to a soil change, prompting the automatic shift-down from speed (8) to (7) to (6).	**Soft farm ground** A decrease in load is sensed due to a soil change, prompting the automatic shift-up.	**Uphill plowing** On an uphill slope, an increase in load is sensed, prompting the automatic shift-down to speed (7) or (6) for more traction force.	**Flat farm ground** Over the uphill slope, a decrease in load is sensed, prompting the automatic shift-up.	**Attachment lifted** When lifting the attachment with the 3-P.quick raise/lower switch or the hydraulic control lever, the automatic shift-down occurs for easier turning.

(To be continued)

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(Continued)

■ **Execution Condition for Automatic Shifting**

The condition to shift automatically is as follows.

1. Power shift is in **L** or **H** position, and the neutral switch is not depressed.
2. The throttle control increase or decrease is not being conducted.
3. The clutch pedal is not depressed.
4. The steering wheel is not being operated (turning angle switch is not turned on).
5. The machine is running forward.

■ **Auto Shift Down Function**

Tractor will auto shift down when the following conditions are achieved.

1. The throttle opening of the engine set without load is above 1300 min^{-1} (rpm).
2. Engine drop is above the preset value.
3. Engine is not on recovering condition.

■ **Auto Shift Up Function**

Tractor will auto shift up when the following conditions are achieved.

1. Throttle set rpm is above 1600 min^{-1} (rpm).
2. Engine rpm is not increased by pushing outer load.
3. Engine drop speed and range is smaller than preset value.

■ **Working Support Function**

There is support function as described below. However, while the 3-point hitch safety lock is on, support function does not work.

1. No auto shift up according to the 3-point hitch height

When the 3-point hitch is being raised, no auto up can be done. (assuming tillage work is not being conducted.)

2. Auto shift down function accordance with the 3-point hitch raising

Auto shift down to the lower limit is conducted when the 3-point hitch is raised.

3. Auto shift down function accordance with the PTO Switch

Sensitive Auto shift down is conducted when the PTO switch is ON.

■ **PTO Mode Function**

When turning PTO switches to **ON** position, engine rotational speed is kept as constant as possible with Auto shift UP and DOWN done sensitively.

PTO mode is given priority more than the other states regarding to Auto shift UP and DOWN Functions.

PTO rotational speed is proportioned to engine rotational speed.

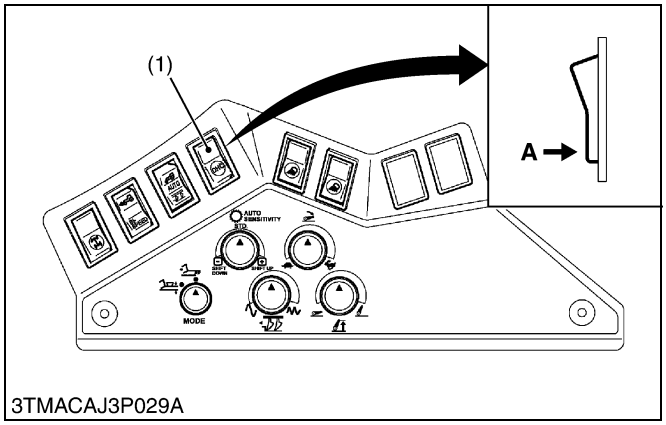
Therefore, PTO mode gives priority to keep PTO rotational speed constant rather than traveling speeds.

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[4] OTHER CONTROL

(1) Down-hill Control

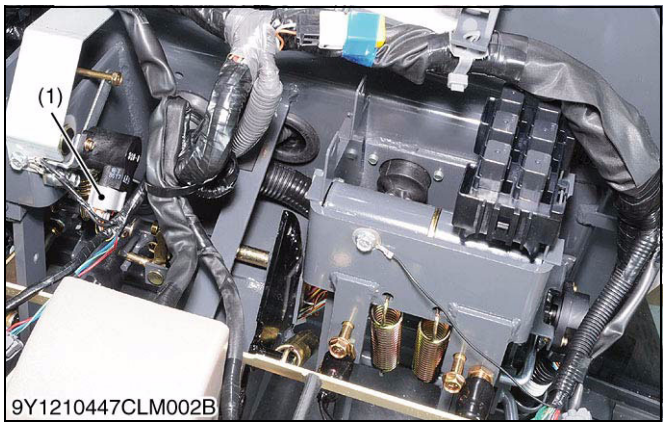


On this tractor, the engine load and other fluctuations are sensed and the speed is well controlled in response to the loads. Turn the DHC switch **"ON"** when using a traction PTO attachment (baler, etc.) on a slope. A well responsive speed control can be expected. In other applications, turn this switch **"OFF"**. Smooth speed change is available for comfortable ride.

(1) DHC Switch **A: Push to ON**

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(2) Clutch Pedal Control



The position of clutch pedal is detected by clutch pedal sensor and the master clutch pressure is controlled by solenoid proportional reducing valve according to the position of clutch pedal. Thus, it can be operated with a feeling similar to that of ordinary mechanical clutch. Moreover, since the master clutch pressure boosting pattern is set for each of the speed change steps, it can be operated with a same feeling at any step.

Besides the clutch can be shifted also by operation of the clutch button of the power shift lever. In this case, the pressure of master clutch is also controlled (modulated) in the effect for smooth clutch engagement.

(1) Clutch Pedal Sensor

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(3) Shuttle Control



The master (**F-R**) clutch is controlled to switch the forward / reverse operation by manipulating the shuttle lever. At this time, the forward / reverse operation can be switched smoothly by controlling (modulating) the pressure of the master clutch.

(1) Shuttle Lever

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(4) Auxiliary Control

■ **Master Clutch Protection Control**

To avoid damage on a clutch caused by a long-lasting half-clutch state by clutch pedal operation, this system disengages the clutch automatically and notifies it to a driver.

To return to a normal control state, step on the clutch pedal, place the shuttle lever at neutral, or press the clutch button on the power shift lever.

■ **Machine Speed Check Control**

Operating the shuttle lever at a speed higher than 11 km/h (7.6 m/h) results in disengaging the master clutch and sounding an warning buzzer.

Returning the shuttle lever to its original position engages the clutch again and stops the buzzer.

■ **Protection against Hard Start**

If the shuttle lever is at the forward or backward run position and the clutch pedal is not stepped on, placing the power shift lever at **L** or **H** position without pressing the shift button results in sounding a buzzer to warn an operator. By the safety control, the tractor does not start.

■ **Fail-safe Control**

If a sensor or a solenoid valve becomes faulty, a related control is stopped to avoid abnormal operations. At the same time, the shifting display blinks or lights on and a buzzer sounds.

Returning the power shift lever to the neutral position releases the failsafe function temporarily.

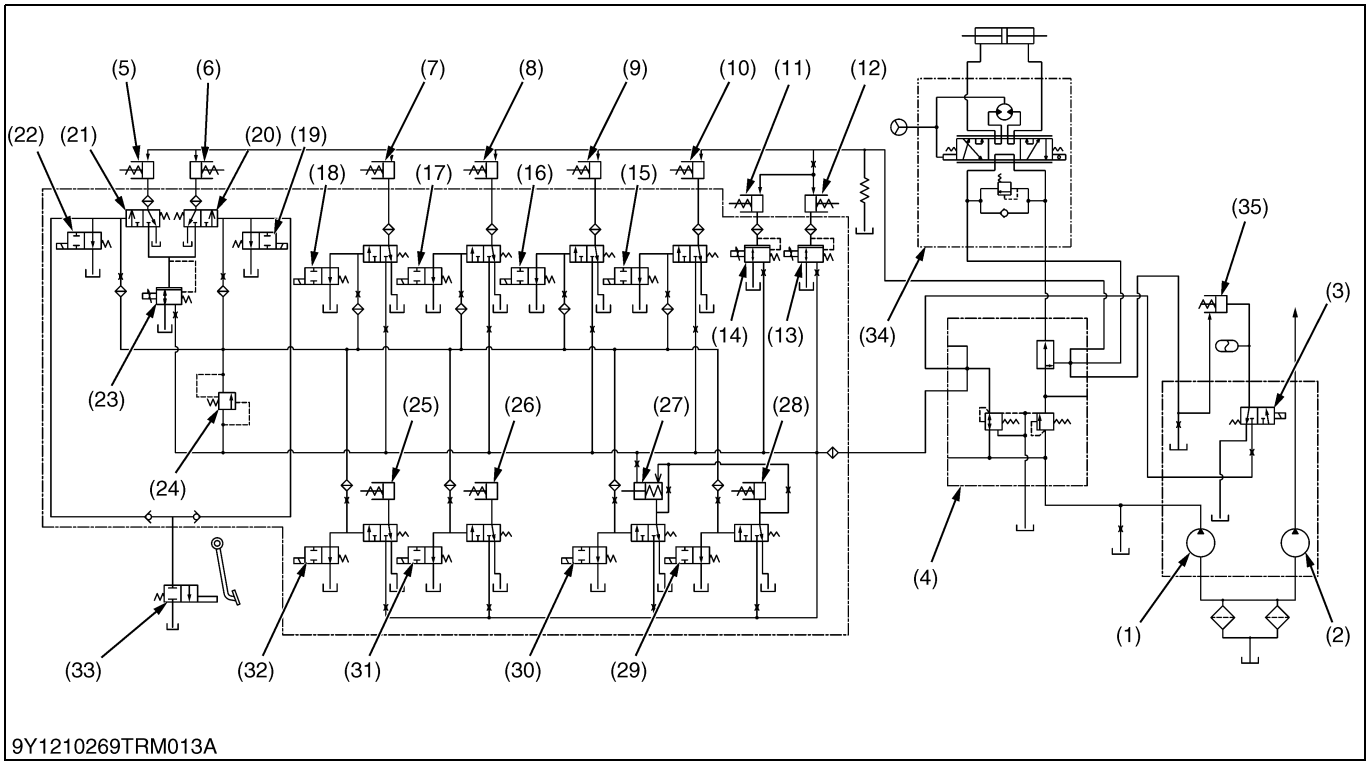
Depending on a condition of a failure, the tractor can still move at a certain speed.

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[5] HYDRAULIC CONTROL SYSTEM

(1) Hydraulic Circuit



(1) Hydraulic Pump
(2) Hydraulic Pump
(3) PTO Valve
(4) Regulator Valve
(5) Master Clutch (Forward)
(6) Master Clutch (Reverse)
(7) Main Shift Clutch **1**
(8) Main Shift Clutch **2**
(9) Main Shift Clutch **3**
(10) Main Shift Clutch **4**
(11) Main Shift Clutch L
(12) Main Shift Clutch **H**
(13) Solenoid Proportional Pressure Reducing Valve (Main Shift **H**)
(14) Solenoid Proportional Pressure Reducing Valve (Main Shift **L**)
(15) Solenoid ON/OFF Valve
(16) Solenoid ON/OFF Valve
(17) Solenoid ON/OFF Valve
(18) Solenoid ON/OFF Valve
(19) Solenoid ON/OFF Valve
(20) Main Spool
(21) Main Spool
(22) Solenoid ON/OFF Valve
(23) Solenoid Proportional Pressure Reducing Valve (Master)
(24) Pressure Reducing Valve
(25) Hydraulic Clutch (Front Differential Lock)
(26) Hydraulic Clutch (Rear Differential Lock)
(27) Hydraulic Clutch (4WD)
(28) Hydraulic Clutch (Bi-speed)
(29) Solenoid ON/OFF Valve
(30) Solenoid ON/OFF Valve
(31) Solenoid ON/OFF Valve
(32) Solenoid ON/OFF Valve
(33) Safety Valve
(34) Power Steering Controller
(35) PTO Clutch

The figure above shows the oil pressure circuit diagram of power shift system.

The oil coming out of hydraulic pump (1) enters the regulator valve (4).

Oil pressure is regulated to 2.06 to 2.25 MPa (21.0 to 23.0 kgf/cm^2, 298.7 to 327.1 psi) by means of the pressure reducing valve and then it is sent to the power shift valve and PTO valve. Other oil flows to the power steering circuit.

In the power shift valve, the oil flow channel and oil pressure are controlled by the each solenoid ON/OFF valve, main spool and solenoid proportional pressure reducing valve (13), (14), (23) and sent to hydraulic clutches.

In the power shift valve, this value 2.06 to 2.25 MPa (21.0 to 23.0 kgf/cm^2, 298.7 to 327.1 psi) is used as hydraulic clutch operating pressure.

As the pilot pressure for operating main spools, this pressure is also used after having been reduced to 0.78 MPa (8 kgf/cm^2, 113.8 psi) by the pressure reducing valve (24).

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SERVICING

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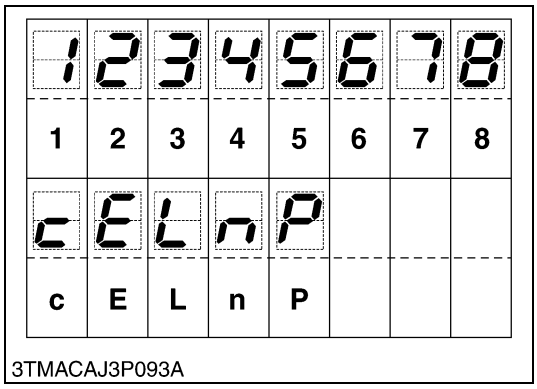
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1. TROUBLESHOOTING

[1] POWER SHIFT SYSTEM

(1) Indication of Trouble by Fail-safe Function



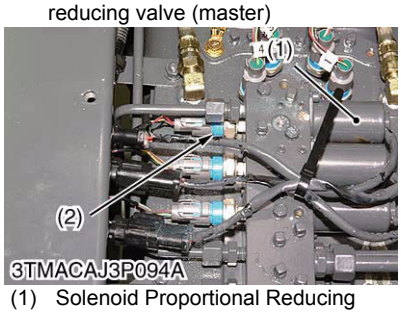
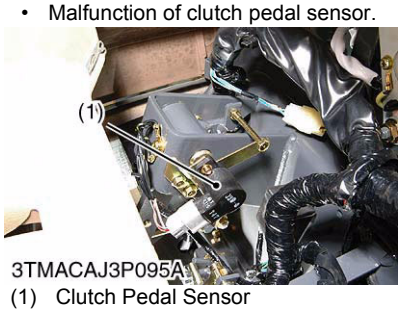
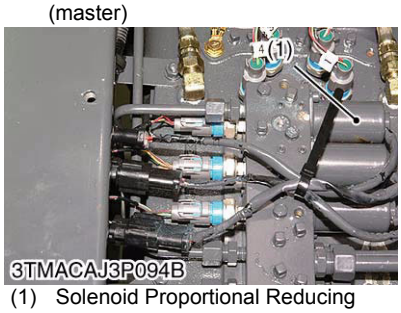


Since the system is equipped with a fail-safe function, if a sensor or solenoid valve becomes faulty, a related control is stopped to avoid abnormal operations.

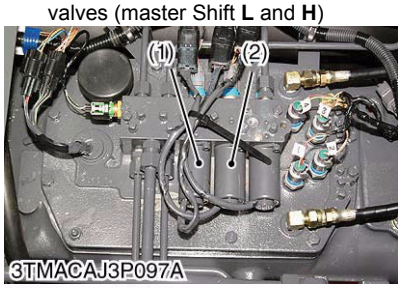
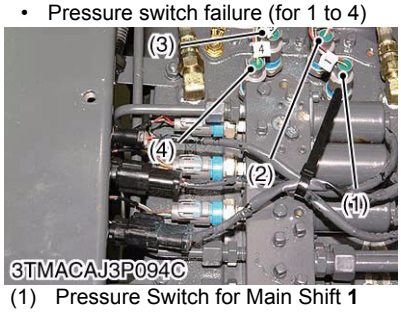
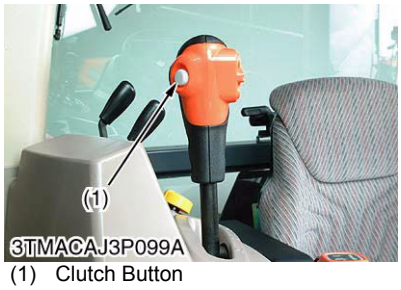
At the same time, the shifting display blinks or lights on and buzzer sound. If any of the following indications appears on the speed change display, find out the cause of trouble by referring the indication.

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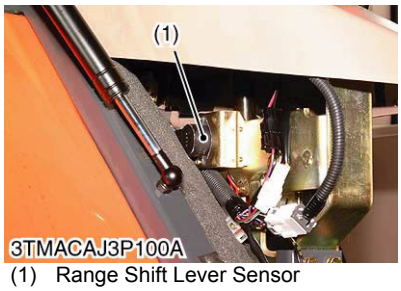
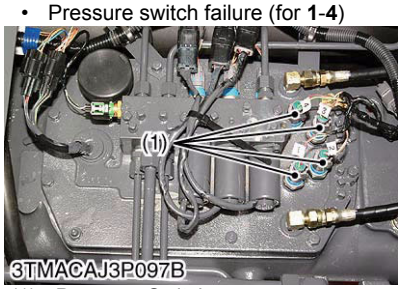
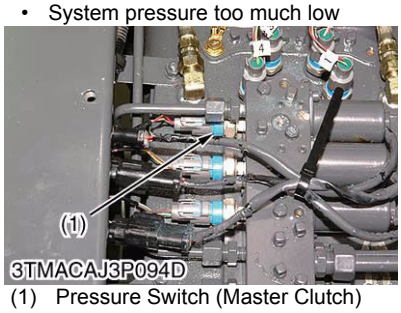
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Indication			Cause	Remarks (Emergency Solution etc.)	Reference page
Shift Indication	**Neutral Lamp**	**Alarm Buzzer**			
Alternate blinking of **L** and **1** to **8**	No indication	Three times continuous alarm sound	Pressure switch for master clutch is always **ON** state. • Pressure switch (master) is failure. • Malfunction of solenoid proportional reducing valve (master)  (1) Solenoid Proportional Reducing Valve (Master) (2) Pressure Switch (Master)	This problem occurs when operating clutch pedal or operating the clutch button or the shuttle lever. In this condition tractor move when shifting the power shift lever to **L** and main shift button to **1** to **4**.	9-S15 9-S16 9-S30 9-S36 9-S38 9-S55 9-S56
Alternate blinking of **C** and **1** to **8**	No indication	Three times continuous alarm sound	Output voltage of clutch pedal sensor is below 0.2 volts or above 4.8 volts. • Malfunction of clutch pedal sensor.  (1) Clutch Pedal Sensor	To release the fail-safe function, return the power shift lever to **Neutral** position once. The fail-safe function must be released, and then it is possible to move the tractor when shifting the power shift lever to L and the main shift button to 1 to 4	9-S15 9-S16 9-S19 9-S30 9-S34 9-S50
Blinking **c**	No indication	Three times continuous alarm sound	Solenoid proportional reducing valve (master) does not work. • Wire breakage or short-circuit of solenoid proportional reducing valve (master)  (1) Solenoid Proportional Reducing Valve (Master)	The tractor can not move.	9-S30 9-S36 9-S56
Blinking **c**	No indication	No alarm sound	Both shuttle switches (F and R) are **ON** at the same time. • Shuttle switches (F and R) are in **ON** defect.  (1) Shuttle Switch	It will become possible to move the tractor by setting both of the shuttle lamps so that they should not be lit simultaneously.	9-S47 9-S54

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Indication			Cause	Remarks (Emergency Solution etc.)	Reference page
Shift Indication	**Neutral Lamp**	**Alarm Buzzer**			
Blinking**1** to **8**	No indication	Three times continuous alarm sound	Related solenoid valves do not operate. • Solenoid ON/OFF valve is short-circuited. • Disconnection or short-circuiting of solenoid proportional reducing valves (master Shift **L** and **H**)   (1) Solenoid Proportional Reducing Valve (Master Shift **H**) (2) Solenoid Proportional Reducing Valve (Master Shift **L**) (3) 10 Sets of Solenoid ON/OFF Valve	This problem occurs when operating main shift button. It will become possible to move the tractor by returning the power shift lever to neutral position and setting it at other position.	9-S38 9-S56
Blinking**1** to **8**	No indication	No alarm sound	The pressure switches not related to the blinking indication are **ON**. • Pressure switch failure (for 1 to 4)  (1) Pressure Switch for Main Shift **1** (2) Pressure Switch for Main Shift **2** (3) Pressure Switch for Main Shift **3** (4) Pressure Switch for Main Shift **4**	It will become possible to move the tractor by retuning the power shift lever to the neutral position and setting it again at **L** or **H** position	9-S38 9-S55
Blinking **E**	No indication	No alarm sound	The clutch button does not turn **ON** even when the power shift lever is moved. • Clutch button failure.  (1) Clutch Button	This problem occurs when shifting power shift lever. The system function only properly when engine has got started and power shift lever is first operated.	9-S57

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Indication			Cause	Remarks (Emergency Solution etc.)	Reference page
Shift Indication	**Neutral Lamp**	**Alarm Buzzer**			
	Blinking		Range shift lever sensor (**L**-**H**-**N**) is failed  (1) Range Shift Lever Sensor	This problem occurs when shifting power shift lever.	9-S51
Blinking **P**		Three times continuous alarm sound	Related solenoid valves do not operate. • Related pressure switch is not turned on. • Pressure switch failure (for **1**-**4**)  (1) Pressure Switch	This problem occurs when operating shift button. For example, it will become possible to move the tractor by returning the power shift lever to neutral position and setting it at other position.	9-S38 9-S55
Blinking **n**		Three times continuous alarm sound	Pressure switch for master clutch does not turn **ON**. • Pressure switch failure. • System pressure too much low  (1) Pressure Switch (Master Clutch)	This problem occurs when moving the tractor by operating clutch pedal, shuttle lever or main shift button. In this case tractor can not be operated.	8-S8 9-S38 9-S55
Blinking **n**			Engine stalls. It is normal for blinking **n** to come on when the engine stalls.	Turn the main key switch **OFF** and restart the engine.	–

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(2) Except Fail-safe Function

Symptom	Probable Cause	Solution	Reference Page
Tractor Does Not Move All The Time	System pressure or pilot pressure is low – Regulator valve defective – Pressure switch (for main shift **L**-**H**) failure – Pressure switch (for master clutch) failure	 Replace Replace Replace	 8-S8 8-S12 9-S55
	Master clutch is disengaged state – Clutch button on power shift lever failure – Clutch pedal sensor failure	 Replace Replace	 9-S57 9-S50
	Crankshaft sensor and alternator both failure	Replace	–
	ECU (Main) failure	Replace	9-M14
	Wiring harness disconnected or improperly connected	Repair	9-S43
	Fuse blown	Replace	9-S42
	Ground cable poor contact with chassis	Repair	9-S43
Tractor Does Not Move Forward and Reverse	Pressure of master clutch does not rise – Disconnection of solenoid ON/OFF valve (**F**-**R**) – Malfunction of the main spool	 Replace Repair or replace	 9-S56 3-M10
	Shuttle switch failure	Replace	9-S47 9-S54
	Wiring harness disconnected or improperly connected between shuttle switch (**F**-**R**) and ECU (Main)	Repair	–
Tractor Fails to Move with Speed Range at L or H	Power shift/range shift lever sensor failure	Replace	9-S41 9-S42
Tractor Jolts When Shift the Main Shift Change	Incorrect initial adjustment	Readjust	9-S33
	Transmission fluid insufficient	Fill	G-10
	Abnormal system control	Repair	9-M14 3-M10
Tractor Jolts When Shift the Shuttle Lever	Incorrect initial adjustment	Readjust	9-S33
	Transmission fluid insufficient	Fill	G-10
	Oil temperature sensor failure	Replace	9-S54
	Shuttle rotation sensor failure	Replace	9-S53

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[2] TRANSMISSION AND DIFFERENTIAL GEAR

Symptom	Probable Cause	Solution	Reference Page
Excessive Transmission Noise	Transmission fluid insufficient	Fill	G-10
	Gear worn or damaged	Replace	3-S28
	Bearings worn or damaged	Replace	3-S28
	Shifter or shift fork worn or damaged	Replace	3-S20
	Improper backlash between spiral bevel gear and spiral bevel pinion shaft	Adjust	3-S43
	Collars or shims have not been installed	Reassemble	3-S41
	Counter shaft staking nut and spiral bevel pinion shaft staking nut improperly tightened	Tighten	3-S26 3-S28
	Torsion spring of damper disc damaged	Replace	2-S11
Hard Shifting	Shift linkage improperly adjusted	Adjust	–
	Shifter or shift fork worn or damaged	Replace	3-S20
	Shift fork bent or worn	Replace	3-S20
	Synchronizer unit damaged	Replace	3-S20
Gears Slip Out of Mesh	Shift linkage improperly adjusted	Adjust	–
	Shifter or shift fork worn or damaged	Replace	3-S20
	Synchronizer unit damaged	Replace	3-S20
	Shift fork or shift rod bent	Replace	3-S20
	Gear worn or damaged	Replace	3-S28
Rear Wheels Can Not Driven	Gears broken	Replace	3-S21 3-S23
	Rear differential gear broken	Replace	3-S19
	Planetary gears broken	Replace	4-S6
Differential Lock Can Not Be Set	Differential lock clutch tooth broken or worn	Replace	3-S35 6-S15
	Differential lock switch defective	Replace	9-S106
	Differential lock solenoid ON/OFF valve malfunctioning	Replace	3-M10
	Differential lock piston malfunctioning (D-ring)	Replace	3-S35 6-S15
	Wiring harness disconnect or improperly connected	Replace	–
Differential Lock Can Not Be Disengaged	Differential lock switch defective	Replace	9-S106
	Differential lock solenoid ON/OFF valve malfunctioning	Replace	3-M10
	Differential lock return spring weaken or damaged	Replace	3-S35 6-S15
	Wiring harness disconnect or improperly connected	Replace	–

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Shift Fork and Shifter Groove	Clearance	0.13 to 0.40 mm 0.0051 to 0.0157 in.	0.80 mm 0.031 in.
Internal Snap Ring and Pressure Plate (Main Shift Clutch 1st to 4th)	Clearance	1.6 to 1.8 mm 0.063 to 0.071 in.	3.2 mm 0.126 in.
Internal Snap Ring and Pressure Plate (Main Shift Clutch **L** Range Side)	Clearance	2.6 to 2.8 mm 0.102 to 0.110 in.	4.2 mm 0.165 in.
Internal Snap Ring and Pressure Plate (Main Shift Clutch **H** Range Side)	Clearance	1.8 to 2.1 mm 0.071 to 0.083 in.	3.5 mm 0.138 in.
Clutch Disc [3F250-28501] (Main Shift Clutch 1st to 4th)	Thickness	1.8 mm 0.071 in.	–
Clutch Disc [3F250-28501] (Main Shift Clutch **L** Range Side)	Thickness	1.8 mm 0.071 in.	–
Clutch Disc [3F750-28501] (Main Shift Clutch **H** Range Side)	Thickness	2.2 mm 0.087 in.	–
Drive Plate [3P200-28521] (Main Shift Clutch)	Thickness	1.6 mm 0.063 in.	–
Drive Plate [3P300-28541] (Main Shift Clutch)	Thickness	1.4 mm 0.055 in.	–
Pressure Plate [3F750-28561] (Main Shift Clutch 1st to 4th, **L-H**)	Thickness	4.0 mm 0.16 in.	3.6 mm 0.142 in.
Internal Snap Ring and Pressure Plate (4WD/Bi-speed Clutch)	Clearance	1.5 to 2.0 mm 0.059 to 0.079 in.	3.5 mm 0.138 in.
Clutch Disc (4WD/Bi-speed Clutch)	Thickness	2.2 mm 0.087 in.	1.8 mm 0.071 in.
Travel Speed Sensor and Detection Gear	Clearance	0.5 to 0.9 mm 0.0197 to 0.0354 in.	–
Pressure Plate [33740-24491] (4WD/Bi-speed Clutch)	Thickness	4.5 mm 0.177 in.	4.0 mm 0.157 in.
Pressure Plate [33980-24491] (4WD/Bi-speed Clutch)	Thickness	3.85 mm 0.152 in.	3.4 mm 0.134 in.
Drive Plate	Flatness	0.5 to 0.9 mm 0.0197 to 0.0354 in.	0.4 mm 0.0157 in.
Pressure Plate	Flatness	–	0.3 mm 0.0120 in.
Piston	Flatness	–	0.15 mm 0.0059 in.
Spiral Bevel Pinion Shaft Only	Turning Torque	1.47 to 1.96 N·m 0.15 to 0.20 kgf·m 1.10 to 1.45 lbf·ft	–
Spiral Bevel Pinion Shaft and Differential Assembly	Turning Torque	1.96 to 4.41 N·m 0.20 to 0.45 kgf·m 1.45 to 3.25 lbf·ft	–
Spiral Bevel Gear and Spiral Bevel Pinion Shaft	Backlash	0.15 to 0.25 mm 0.006 to 0.010 in.	0.4 mm 0.016 in.

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Item		Factory Specification	Allowable Limit
Differential Case Bore (Differential Case Cover Bore) and Differential Side Gear Boss	Clearance	0.070 to 0.169 mm 0.00276 to 0.00665 in.	0.35 mm 0.014 in.
• Differential Case Bore	I.D.	53.070 to 53.150 mm 2.08937 to 2.09252 in.	–
• Differential Case Cover	I.D.	53.070 to 53.150 mm 2.08937 to 2.09252 in.	–
• Differential Side Gear Boss	O.D.	52.954 to 53.000 mm 2.08480 to 2.08661 in.	–
Differential Pinion Shaft and Differential Pinion Gear	Clearance	0.080 to 0.122 mm 0.00315 to 0.00480 in.	0.25 mm 0.010 in.
• Differential Pinion Shaft	O.D.	25.939 to 25.960 mm 1.02122 to 1.02205 in.	–
• Differential Pinion Gear	I.D.	26.040 to 26.061 mm 1.02520 to 1.02602 in.	–

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3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-13.)

Item	N·m	kgf·m	lbf·ft
Muffler mounting screw	24 to 27	2.4 to 2.8	18 to 20
Fuel tank support mounting screw	196.1 to 225.6	20.0 to 23.0	144.7 to 166.4
Engine and clutch housing mounting screw and nut (Standard)	124 to 147	12.6 to 15.0	91.2 to 108
Engine and clutch housing mounting nut (Wide)	167 to 196	17.0 to 20.0	123 to 144
Engine and clutch housing mounting stud bolt	39 to 45	3.9 to 4.6	29 to 33
3P delivery hose retaining nut	45.1 to 53.0	4.6 to 5.4	33.3 to 39.1
Power steering pump delivery pipe retaining nut	107.9 to 117.7	11.0 to 12.0	79.6 to 86.8
PTO delivery pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Creep gear case mounting screw	48.1 to 55.8	4.9 to 5.7	35.5 to 41.2
Return pipe retaining nut	49.1 to 68.6	5.0 to 7.0	36.1 to 50.6
Hydraulic pump base mounting nut	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Mid case and transmission case mounting screw and nut	103.0 to 117.7	10.5 to 12.0	76.0 to 86.8
Hydraulic cylinder assembly mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5
Rear axle case mounting screw	124 to 147	12.0 to 15.0	91.2 to 108.5
Parking brake case mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Rear PTO case mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Differential bearing support mounting screw	48.1 to 55.8	4.9 to 5.7	35.5 to 42.0
Spiral bevel pinion staking nut	274.6 to 343.2	28.0 to 35.0	202.5 to 253.0
Delivery pipe retaining nut (for power steering)	49.0 to 68.6	5.0 to 7.0	36.1 to 50.6
Power shift valve mounting screw and nut	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
4WD/Bi-speed pipe retaining nut	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Front differential lock pipe retaining nut	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Mid case bearing cover mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Mid case and clutch housing mounting screw	103.0 to 117.7	10.5 to 12.0	76.0 to 86.8
Rear bearing support mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Front cover mounting screw and nut	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Support mounting screw (front)	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Bearing retainer mounting screw	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
Counter shaft staking nut	147.1 to 196.1	15.0 to 20.0	108.5 to 144.7
Bi-speed case mounting screw	48.1 to 55.9	4.9 to 5.7	35.5 to 41.2
Bearing support mounting screw (for 4WD/Bi-speed)	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
PTO gear case cover mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
PTO shaft staking nut	226 to 264	23 to 27	167 to 195
Spiral bevel gear mounting UBS screw	142.2 to 161.8	14.5 to 16.5	104.9 to 119.3

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4. CHECKING, DISASSEMBLING AND SERVICING

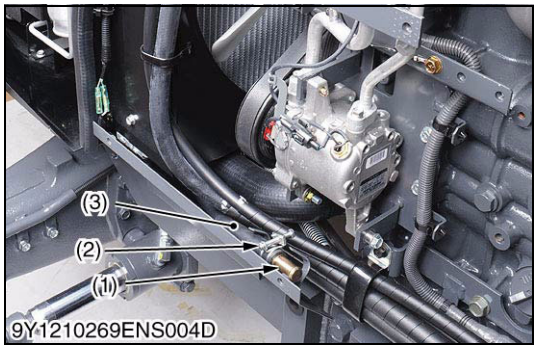
[1] CHECKING AND ADJUSTING

- Refer to checking "Pressure for Power Shift System" in "8. HYDRAULIC SYSTEM" section.

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[2] SEPARATION

(1) Separating Engine from Clutch Housing



Draining Coolant

CAUTION

- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

1. Stop the engine and let cool down.
2. Loosen the hose clamp (2) and remove the drain plug (1) to drain the coolant.
3. Remove the radiator cap to completely, drain the coolant.
4. After all coolant is drained, reinstall the drain plug (1) and tighten the hose clamp (2).

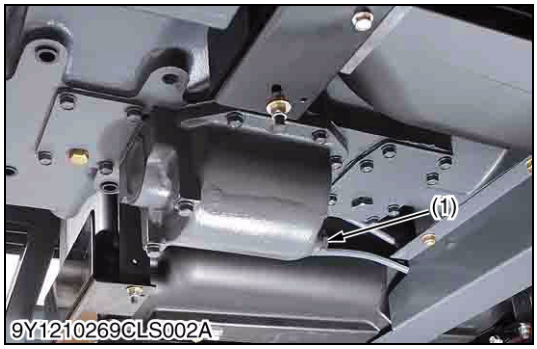
Coolant	Capacity	15 L 16 U.S.qts 13 Imp.qts

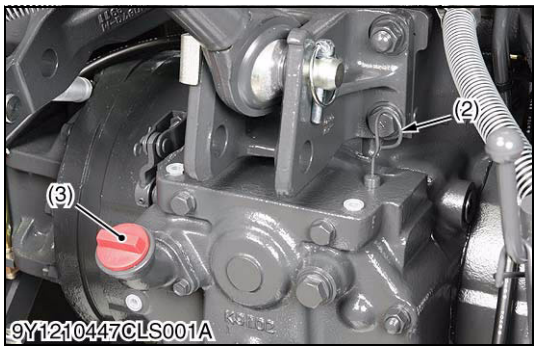
(1) Drain Plug
(2) Hose Clamp
(3) Radiator Hose

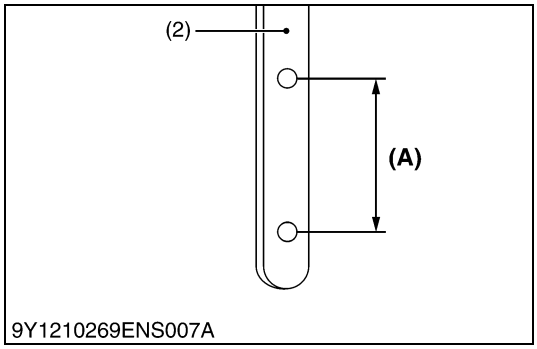
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Draining Transmission Fluid

1. Place an oil pan underneath the transmission case.
2. Remove the drain plugs (1).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1).

(When reassembling)

- Fill the transmission fluid up to the proper oil level after removing the filling plug (3).
- After running the engine for few minutes, stop it and check the fluid level again, add the fluid to prescribed level if it is not correct level.

■ **IMPORTANT**

- **Use KUBOTA UDT or KUBOTA SUPER UDT fluid. Use of other fluids may damage the transmission or hydraulic system.**
- **Refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.**
- **Do not mix different brands oil together.**

Transmission fluid	Capacity	60.0 L 63.4 U.S.qts 52.8 Imp.qts

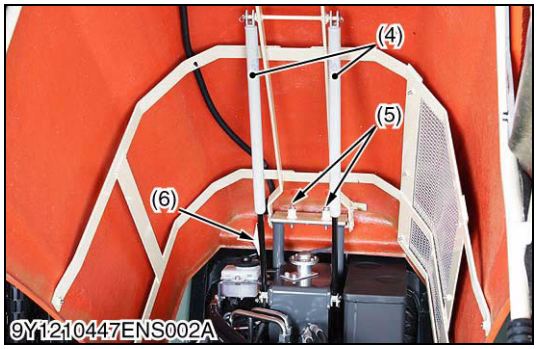
(1) Drain Plug
(2) Dipstick
(3) Filling Plug

(A) Oil level is acceptable within this range.

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Muffler and Bonnet

1. Open the bonnet (1) and disconnect the battery (7) negative cable.
2. Disconnect the **8P** connector (6) for head light.
3. Remove the damper (4) and bonnet bracket mounting screws (5).
4. Remove the bonnet (1).
5. Remove the side cover (3).
6. Remove the muffler (2).

(When reassembling)

■ **NOTE**

- **Be sure to insert the muffler by 42 mm (1.7 in.).**

Tightening torque	Muffler mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

■ **IMPORTANT**

- **When disconnecting the battery cables, disconnect the negative cable first. When connecting, positive cable first.**

(1) Bonnet
(2) Muffler
(3) Side Cover
(4) Damper
(5) Screw
(6) **8P** Connector
(7) Battery

L: Insertion Length of the Muffler

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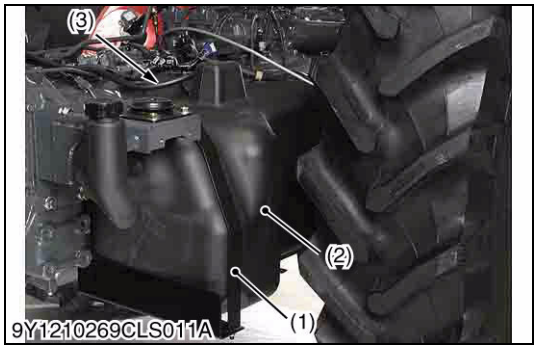
Dismounting Cabin

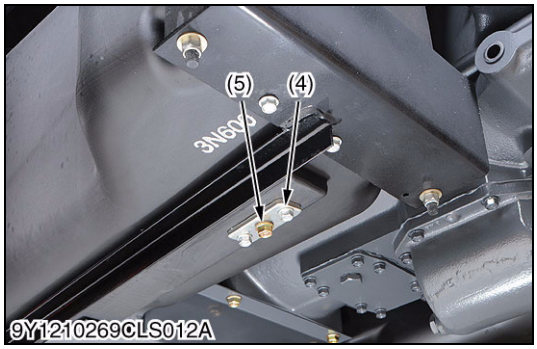
1. Refer to "Separating Cabin from Tractor" at "10. CABIN" section.

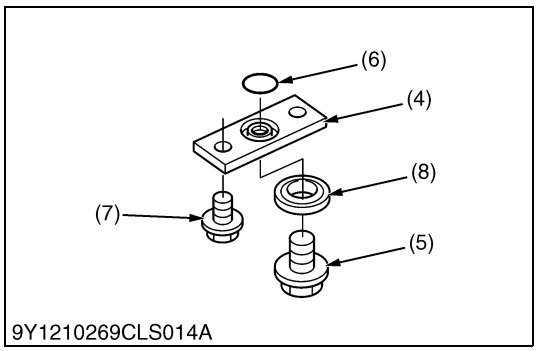
(1) Cabin Dismounting Tool

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Fuel Tank

1. Remove the drain cover (4) and drain the fuel.
2. Remove the tank bands (1).
3. Disconnect the fuel tank hose.
4. Disconnect the **2P** connector from fuel gauge.
5. Disconnect the hose (3).
6. Remove the fuel tank (2) and tank support.

(When reassembling)

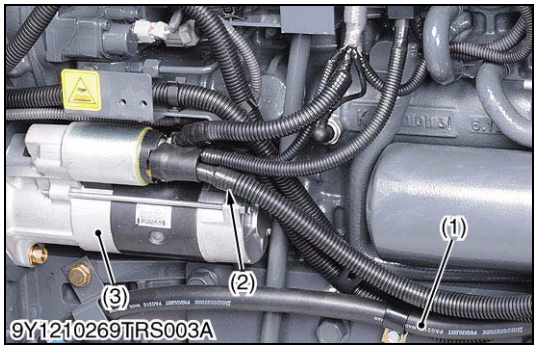
- Be sure to fix the O-ring (6) is in position on the drain cover (4).

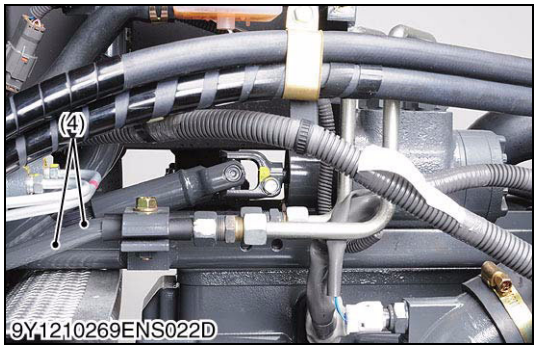
Tightening torque	Fuel tank support mounting screw	196.1 to 225.6 N·m 20.0 to 23.0 kgf·m 144.7 to 166.4 lbf·ft

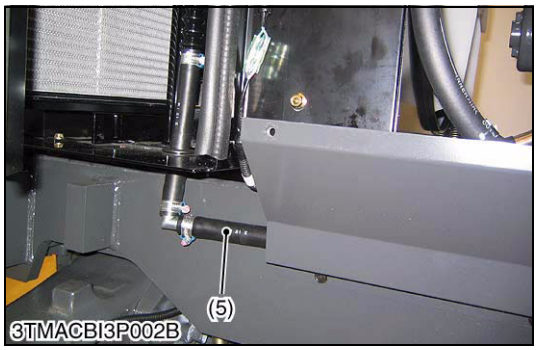
(1) Tank Band
(2) Fuel Tank
(3) Hose
(4) Drain Cover
(5) Screw
(6) O-ring
(7) Screw
(8) Washer with Rubber

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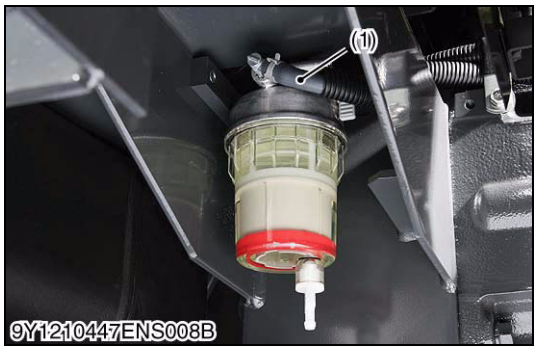


Starter Motor and Hoses

1. Disconnect the oil cooler hose (1).
2. Disconnect the battery cable (2) from starter motor (3).
3. Remove the starter motor (3).
4. Disconnect the power steering delivery pipes (4).
5. Disconnect the oil cooler hose (5).

(1) Hose
(2) Battery Cable
(3) Starter Motor
(4) Power Steering Delivery Pipes
(5) Hose

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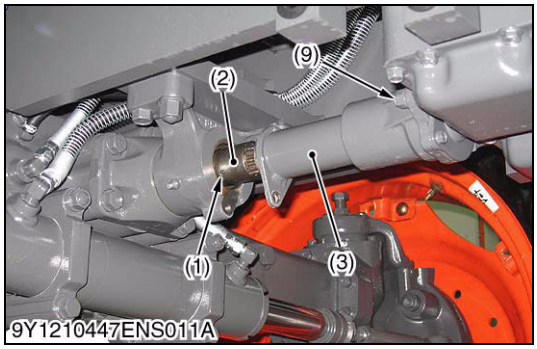
Hose

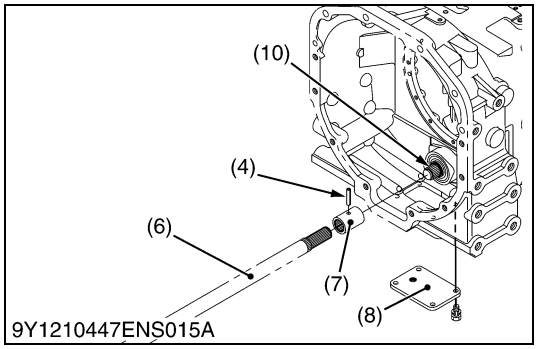
1. Disconnect the fuel hose (1).

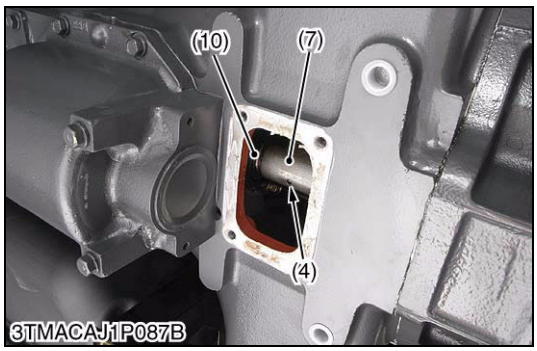
(1) Fuel Hose

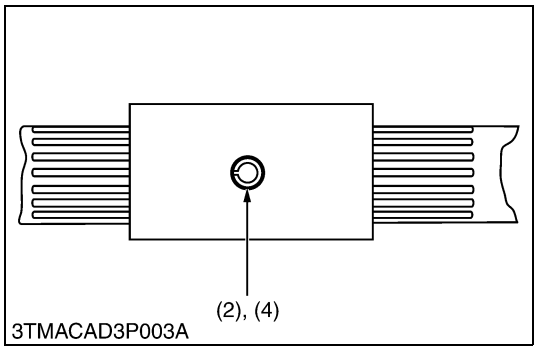
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Propeller Shaft

1. Slide the propeller shaft cover (3) after removing the screw (5).
2. Tap out the spring pins (2) and then slide the coupling (1) to the rear.
3. Remove the cover (8).
4. Tap out the spring pins (4) and then slide the coupling (7) forward.

(When reassembling)

- Please assemble the propeller shaft by following procedure.

1. Loosen the nuts (9).
2. Slide the coupling (7) and match the splines of the coupling (7) and front transmitting shaft (10) only by 10 mm (0.39 in.)
3. Match the spline of the coupling (1), propeller shaft (6) and pinion shaft (11). And then, tap in the spring pin (2) as shown in figure.

■ **NOTE**

- **Apply grease to the coupling (1) splines.**

4. Slide the coupling (7) and tap in the spring pin (4) as shown in figure.

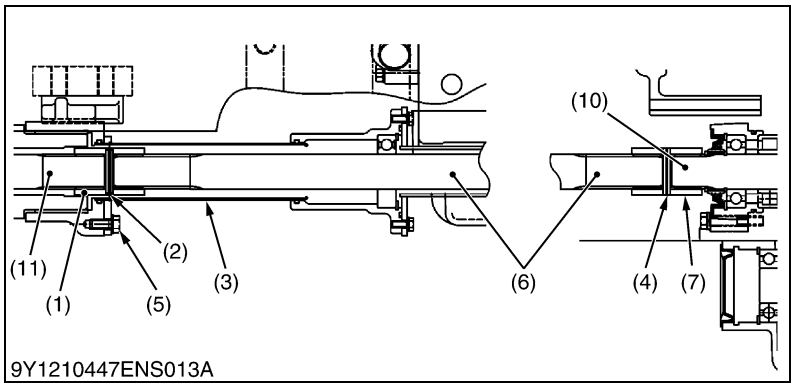
■ **NOTE**

- **Apply grease to the coupling (7) splines.**

5. Tighten the nuts (9).
6. Attach the cover (8).

■ **NOTE**

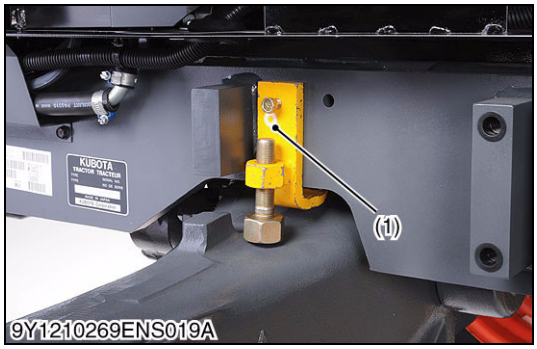
- **Apply liquid gasket (Three Bond 1206D or equivalent) to cover face and cover (8).**

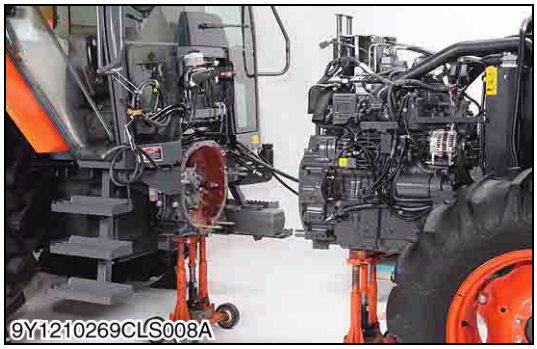


(1) Coupling
(2) Spring Pin
(3) Propeller Shaft Cover
(4) Spring Pin
(5) Screw
(6) Propeller Shaft
(7) Coupling
(8) Cover
(9) Nut
(10) Front Transmitting Shaft
(11) Pinion Shaft

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Separating Engine from Clutch Housing

1. Install the front axle rocking restrictor (1) to the front axle bracket R.H. and L.H..
2. Check the engine and clutch housing case are securely mounted on the disassembling stands.
3. Remove the engine mounting screws and nuts.
4. Separate the engine from clutch housing case.

(When reassembling)

- Apply molybdenum disulphide (Three Bond 1901 or equivalent) to the splines of damper disc boss.
- When connecting the engine to the clutch housing, be sure to align the input shaft spline to the damper disc hub center.
- Apply liquid gasket (Three Bond 1141, 1211 or equivalent) to joint face of the engine and clutch housing.
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of clutch housing and housing cover.

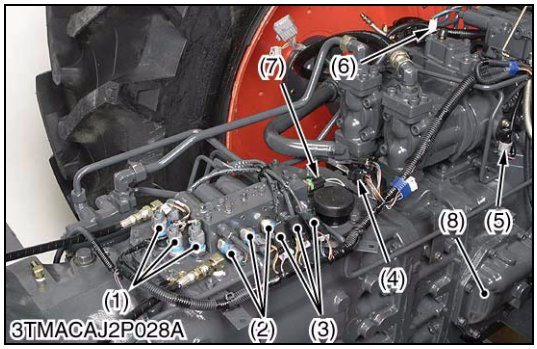
Tightening torque	Engine and clutch housing mounting screw and nut (Standard)	124 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108 lbf·ft
	Engine and clutch housing mounting nut (Wide)	167 to 196 N·m 17.0 to 20.0 kgf·m 123 to 144 lbf·ft
	Engine and clutch housing mounting stud bolt	39 to 45 N·m 3.9 to 4.6 kgf·m 29 to 33 lbf·ft

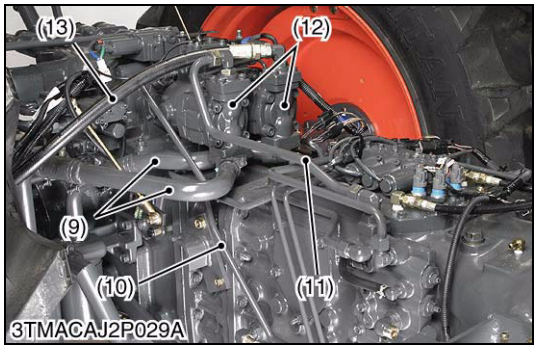
(1) Rocking Restrictor

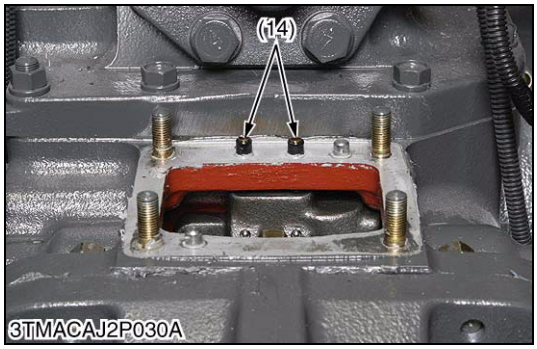
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(2) Separating Clutch Housing from Transmission Case







Connectors, Pipes and Hydraulic Pump

1. Disconnect the connectors (1), (2), (3), (4), (5), (6), (7).
2. Remove the creep case (8).
3. Remove the suction pipe (9).
4. Remove the delivery pipe (11) and return pipe (10).
5. Remove the delivery hose (13).
6. Remove the hydraulic pump assembly (12) with pump base.

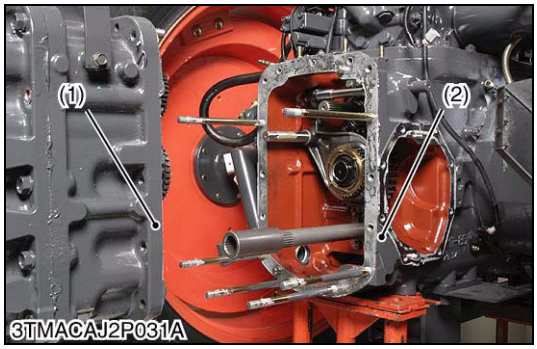
(When reassembling)

- Replace the oil pipes (14) with new ones.
- Apply oil to the pipes.
- Apply liquid gasket (Three Bond 1208D, 1216 or equivalent) to joint face of the valve case and transmission case.

Tightening torque	3P delivery hose retaining nut	45.2 to 52.9 N·m 4.6 to 5.4 kgf·m 33.3 to 39.1 lbf·ft
	Power steering pump delivery pipe retaining nut	108 to 117 N·m 11.0 to 12.0 kgf·m 79.6 to 86.7 lbf·ft
	Return pipe retaining nut	49.1 to 68.6 N·m 5.0 to 7.0 kgf·m 36.1 to 50.6 lbf·ft
	Creep case mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft
	Hydraulic pump base mounting nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

(1) Connector
(2) Connector
(3) Connector
(4) Connector
(5) Connector
(6) Connector
(7) Connector
(8) Creep Case
(9) Suction Pipe
(10) Return Pipe
(11) Delivery Pipe (Power Steering)
(12) Hydraulic Pump Assembly
(13) Delivery Hose
(14) Oil Pipe

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Separating Mid Case from Transmission Case

1. Place the disassembling stands under the clutch housing case and transmission case.
2. Remove the mid case mounting screws and nuts.
3. Separate the mid case (1) from transmission case (2).

(When reassembling)

- Apply liquid gasket (Three Bond 1208D, 1216 or equivalent) to joint face of mid case and transmission case.

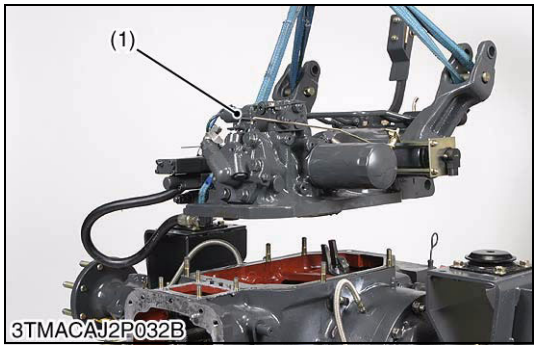
Tightening torque	3P delivery hose retaining nut	103.0 to 117.6 N·m 10.5 to 12.0 kgf·m 76.0 to 86.8 lbf·ft

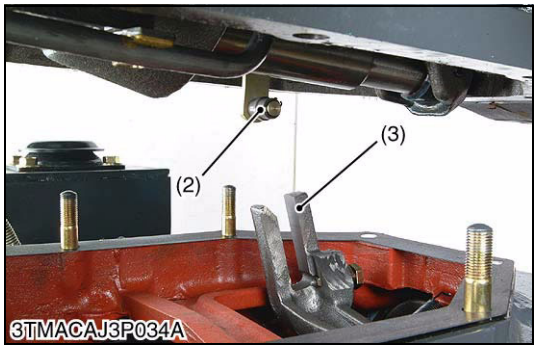
(1) Mid Case
(2) Transmission Case

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(3) Separating Hydraulic Cylinder and Rear Axle from Transmission Case





Dismounting Hydraulic Cylinder Assembly

1. Remove the hydraulic cylinder assembly mounting screws and nuts.
   Support the hydraulic cylinder assembly (1) with nylon lift strap and hoist, and then remove it.
2. Dismount the hydraulic cylinder assembly from transmission case.

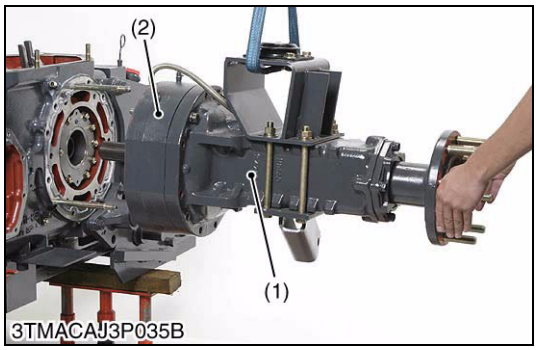
(When reassembling)

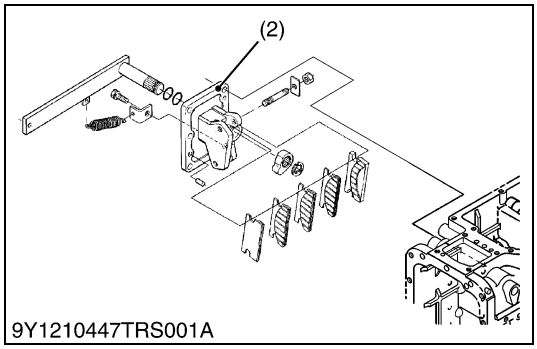
- Be sure to put roller (2) in to the groove of draft link 1 (3).
- Change the hydraulic cylinder gasket to new one.

Tightening torque	Hydraulic cylinder assembly mounting screw and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

(1) Hydraulic Cylinder Assembly
(2) Roller
(3) Draft Link 1

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Rear Axle Case and Parking Brake Case

1. Remove the rear axle case mounting screws and nuts.
2. Support the rear axle case with nylon lift strap and hoist.
3. Separate the rear axle case (1) from transmission case.
4. Remove the parking brake case.

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of the rear axle case and transmission case, after eliminate the water, oil and stuck liquid gasket.
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of parking brake case and transmission case.

Tightening torque	Rear axle case mounting screw	124 to 127 N·m 12.0 to 15.0 kgf·m 91.2 to 108.5 lbf·ft
	Parking brake case mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

(1) Rear Axle Case
(2) Brake Case

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(4) Separating Rear PTO Case from Transmission Case



Rear PTO Case

1. Remove the rear PTO case mounting screws and then remove the rear PTO case (1).

(When reassembling)

- Replace the rear PTO case gasket with new one.

Tightening torque	Rear cover mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

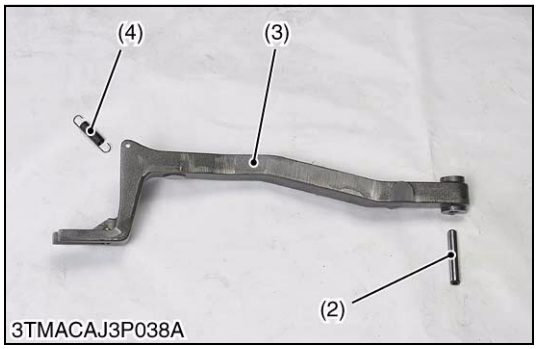
(1) Rear PTO Case

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(5) Removing Differential Gear Assembly and Pinion Shaft



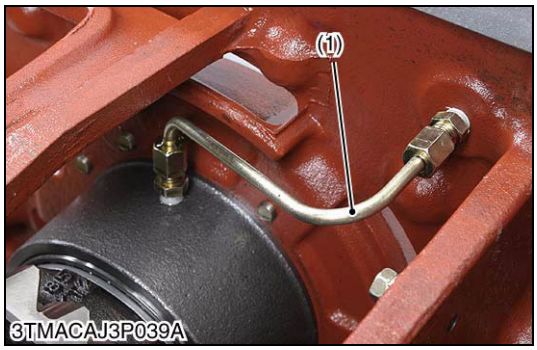


Draft Link 1

1. Remove the spring (4).
2. Remove the plug (1) and then take out the fulcrum pin (2).
3. Remove the draft link 1 (3).

(1) Plug
(2) Fulcrum Pin
(3) Draft Link 1
(4) Spring

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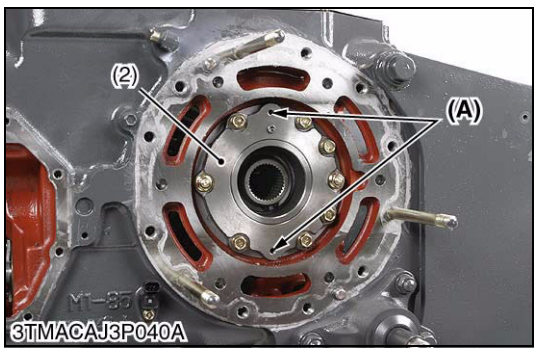
Differential Gear Assembly

1. Remove the differential lock pipe (1).
2. Remove the differential bearing support mounting screws.
3. Remove the differential bearing support (2) by screwing M8 × Pitch 1.25 mm screws into the hole **(A)**, noting the number of left and right shims.
4. Take out the differential gear (3).

(When reassembling)

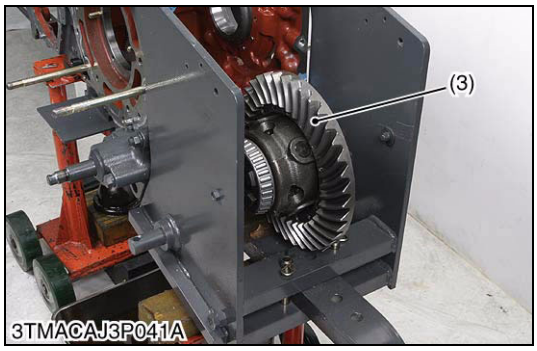
- Be sure to adjust the turning torque of spiral bevel pinion shaft and differential assembly combined. (See page 3-S42.)
- Be sure to adjust the backlash and tooth contact between the spiral bevel gear and spiral bevel pinion shaft. (See page 3-S43.)

Tightening torque	Differential bearing support mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 42.0 lbf·ft

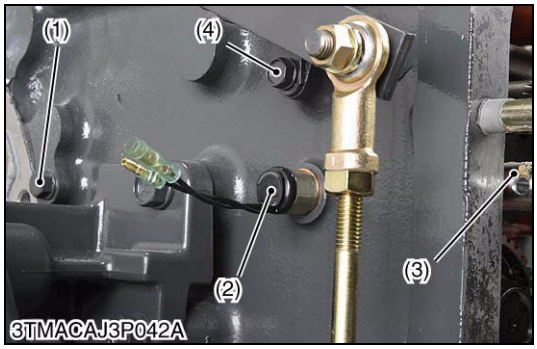


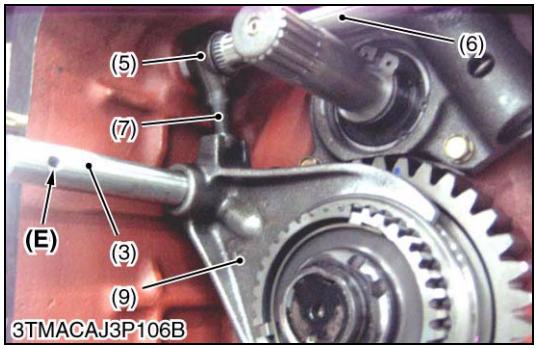
(1) Differential Pipe
(2) Differential Bearing Support
(3) Differential Gear Assembly
(A) Hole for Jack bolt

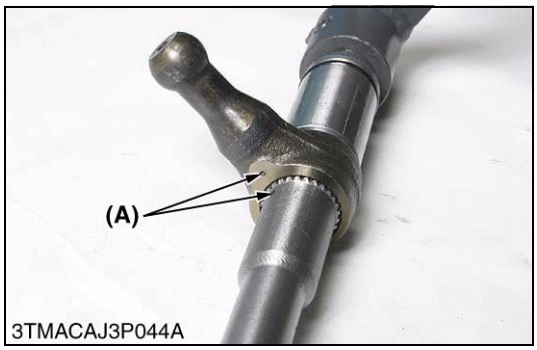
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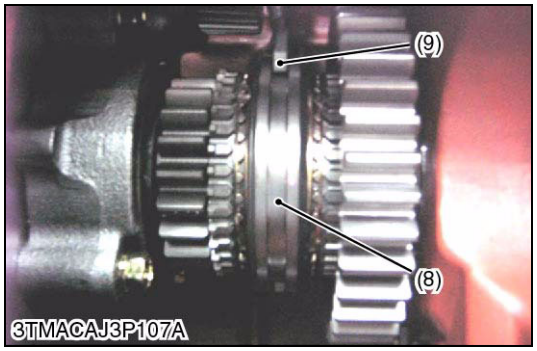


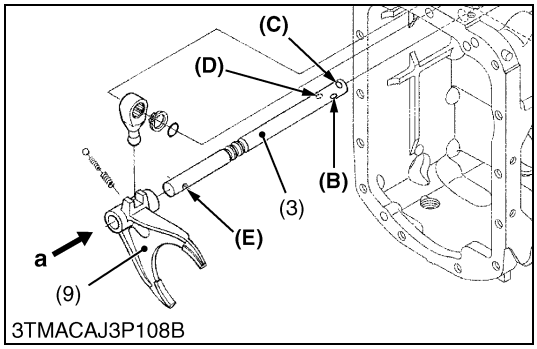
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Range Shift Rod and Shift Fork

1. Remove the setting screw (1) and safety switch (2).
2. Remove the screw (4) and slide the external snap ring (5).
3. Slide the cam (7) and remove the fork rod (3) with shift fork and shifter.
4. Remove the range shift shaft (6) and cam (7).

(When reassembling)

- When reassembling the range shift shaft (6) and cam (7), be sure to align the mating mark **(A)** as shown in the photo.
- After assembling the transmission, check to make sure the shifter (8) is centered in the neutral position when setting the range gear shift lever in its neutral position.
  If the neutral position of the shifter (8) is off center to the front or back, adjust the position by changing the setting hole **(B)**, **(C)**, **(D)** on the fork rod (3).

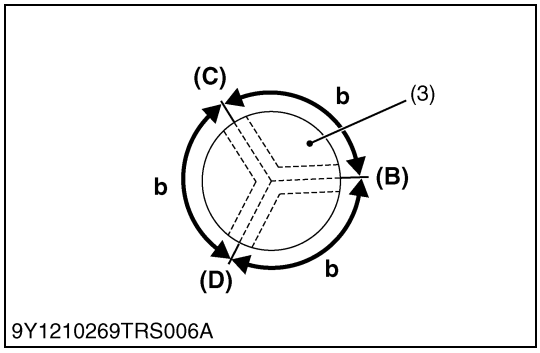
[Adjustment procedure]

1. Check to make sure the shifter (8) is in the neutral position.
2. Remove the setting screw (1).
3. Choose one of the fork rod's (3) setting hole, **(B)**, **(C)**, **(D)** and tighten the screw (1) such that the shifter (8) is in the center.
   – The setting hole **(B)** is for the standard position.
   – Use of the setting hole **(C)** moves the shifter 0.7 mm (0.03 in.) from the standard position **(B)** in the forward direction.
   – Use of the setting hole **(D)** moves the shifter 0.7 mm (0.03 in.) from the standard position **(B)** in the backward direction.

(Reference)

- When the setting hole for the standard position **(B)** is used, the discrimination hole **(E)** becomes horizontal.

4. After assembling the transmission, check the neutral position of the shifter (8) again.



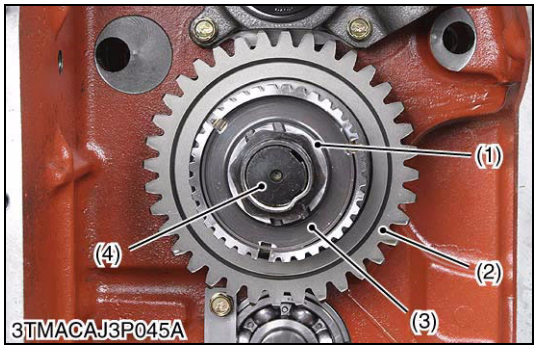
(1) Screw
(2) Safety Switch
(3) Fork Rod
(4) Screw
(5) External Snap Ring
(6) Range Shift Shaft
(7) Cam
(8) Shifter
(9) Shifter Fork

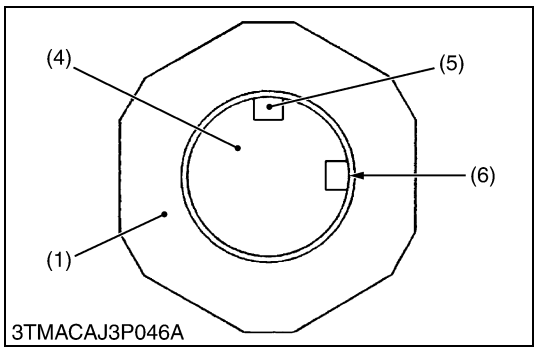
(A) Mating Mark
(B) Setting Hole (Standard)
(C) Setting Hole (Rear)
(D) Setting Hole (Front)
(E) Discrimination Hole

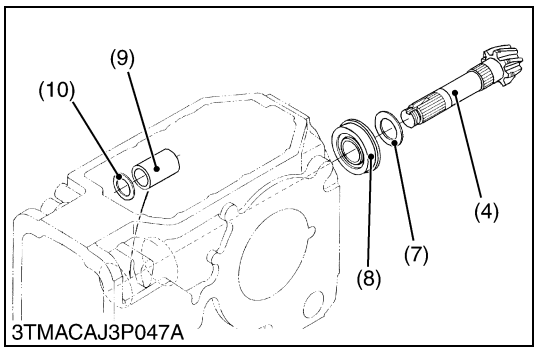
a: View
b: 2.09 rad (120 °)

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Spiral Bevel Pinion Shaft

1. Remove the stake of the staking nut.
2. Set the pinion locking tool (Code No. 07916-52311).
3. Remove the staking nut (1).
4. Remove the 36T gear and synchronizer assembly (3).
5. Tap out the pinion shaft (4) to the rear.

(When reassembling)

- Replace the staking nut with new one, and be sure to adjust the turning torque of spiral bevel pinion shaft only. (See page 3-S41.)
- Spiral bevel pinion shaft has two groove, and staking groove is right side groove see from front.

Tightening torque	Spiral bevel pinion staking nut	274.6 to 343.2 N·m 28 to 35 kgf·m 202.5 to 253.0 lbf·ft

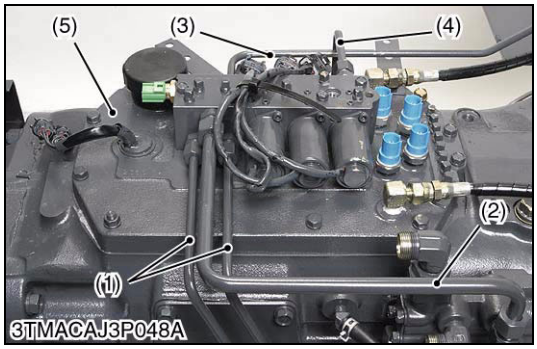
(1) Staking Nut
(2) 36T Gear
(3) Synchronizer Assembly
(4) Pinion Shaft
(5) For Lubrication
(6) For Staking
(7) Collar
(8) Bearing
(9) Collar
(10) Adjusting Collar

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[3] DISASSEMBLING AND ASSEMBLING

(1) Clutch Housing Case



Power Shift Valve Assembly

1. Remove the delivery pipe (2) and pipe (4).
2. Remove the 4WD/Bi-speed pipes (1) and front differential lock pipe (3).
3. Remove the power shift valve assembly (5).

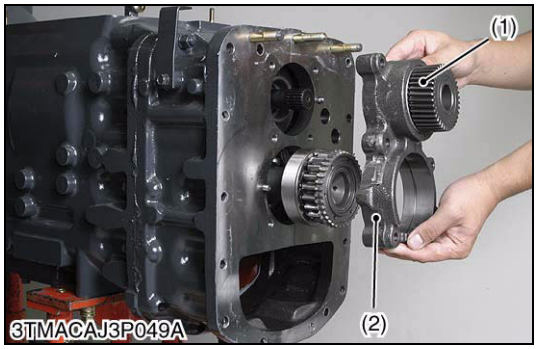
(When reassembling)

- Never use liquid gasket to joint face of clutch housing and power shift valve assembly.
- When reassembling the power shift valve assembly, be sure to change the O-ring and apply transmission fluid to O-ring.

Tightening torque	Power shift valve mounting screw and nut	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft
	Delivery pipe (2) retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.1 to 50.6 lbf·ft
	4WD/Bi-speed pipe (1), (4) retaining nut	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft
	Front differential lock pipe (3) retaining nut	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft

(1) Pipe for 4WD/Bi-speed
(2) Delivery Pipe (for Power Shift Valve)
(3) Pipe for Front Differential Lock
(4) Pipe
(5) Power Shift Valve Assembly

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Pump Drive Gear and Bearing Holder

1. Remove the bearing holder mounting screws.
2. Remove the pump drive gear (1) and bearing holder (2).
3. Remove the mid case mounting screws and then remove the mid case (3).

(When reassembling)

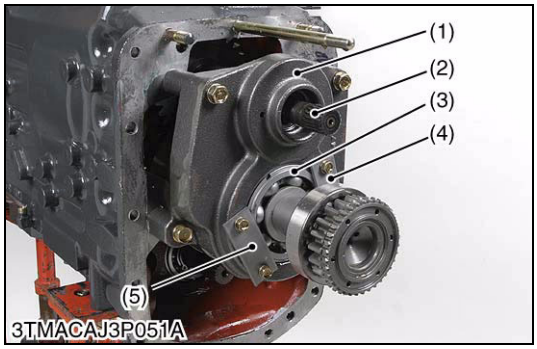
- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of mid case and clutch housing.

Tightening torque	Mid case bearing cover mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 lbf·ft
	Mid case and clutch housing mounting screw	103.0 to 117.7 N·m 10.5 to 12.0 kgf·m 76.0 to 86.8 lbf·ft

(1) Pump Drive Gear
(2) Bearing Cover
(3) Mid Case

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Rear Bearing Support

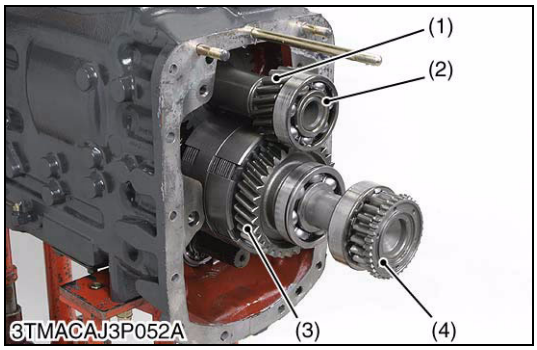
1. Take out the PTO shaft (2).
2. Remove the bearing retainer (4), (5).
3. Remove the external snap ring (3).
4. Remove the rear bearing support mounting screws.
5. Remove the rear bearing support (1).

(When reassembling)

Tightening torque	Rear bearing support mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

(1) Rear Bearing Support
(2) PTO Shaft
(3) External Snap Ring
(4) Bearing Retainer
(5) Bearing Retainer

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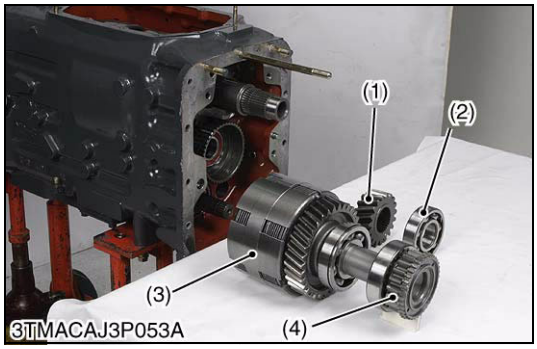


Main Shift Hydraulic Clutch (H-L) and 20T Gear Shaft

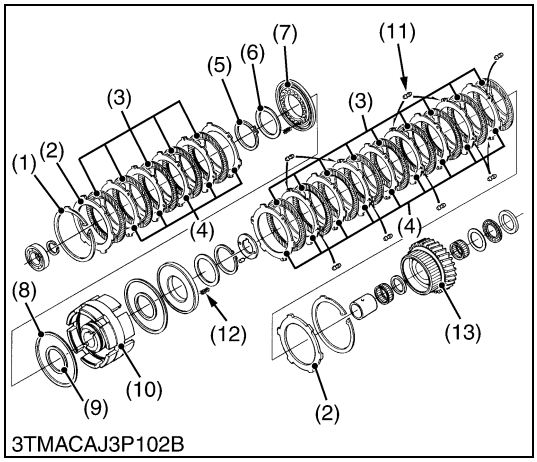
1. Remove the bearing (2) and 19T gear (1).
2. Remove the main shift **H-L** clutch assembly (3) and 20T gear shaft (4).

(1) 19T Gear
(2) Bearing
(3) Main Shift **H-L** Clutch Assembly
(4) 20T Gear Shaft

9Y1210269TRS0021US0



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3TMACAJ3P102B



3TMACAJ3P055A

Main Shaft Hydraulic Clutch (H-L)

1. Remove the internal snap ring (1).
2. Take out the pressure plate (2), clutch disc (3) and drive plate (4).
3. Remove the external snap ring (5) by using hydraulic hand press or hydraulic clutch spring compressor. (See page G-62.)
4. Take out the spring plate (6) and spring (12).
5. Take out the piston (7) by compression air.
6. Remove the parts for other side as above.

(When reassembling)

- When installing the internal snap ring (1) to the clutch body (10), align its split portion to the notched portion of clutch body.
- Apply transmission fluid to D-ring.
- Apply enough transmission fluid to the discs (3).
- Do not confuse the two types of drive plates.
  The drive plate with plug rubbers (11) and without plug rubbers.
- Do not confuse the pressure plate (2) and drive plates (4), (14), (15). The pressure plate (2) is thicker than the drive plate.

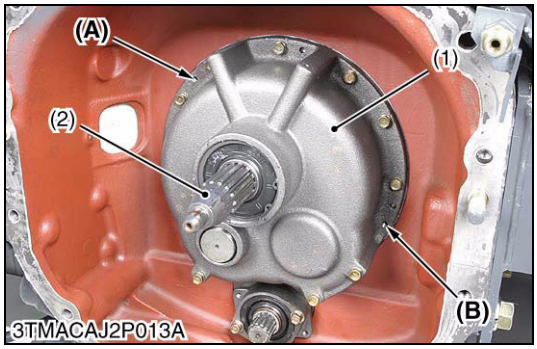
The order of assembling drive plate (main shift clutch L side)

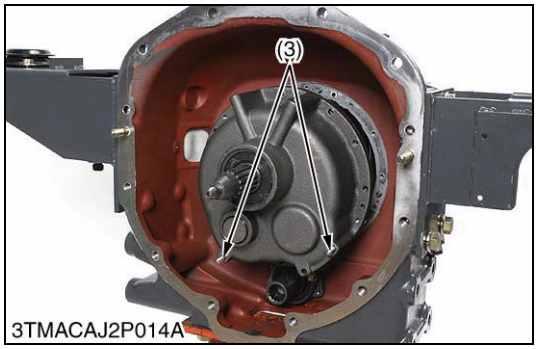
Plate position from piston side	Thickness
1st plate	Without rubbers (1.4 mm, 0.055 in.)
2nd plate	With rubbers (1.4 mm, 0.055 in.)
3rd plate	Without rubbers (1.6 mm, 0.063 in.)
4th plate	With rubbers (1.4 mm, 0.055 in.)
5th plate	Without rubbers (1.6 mm, 0.063 in.)
6th plate	With rubbers (1.4 mm, 0.055 in.)
7th plate	Without rubbers (1.6 mm, 0.063 in.)
8th plate	With rubbers (1.4 mm, 0.055 in.)
9th plate	With rubbers (1.4 mm, 0.055 in.)

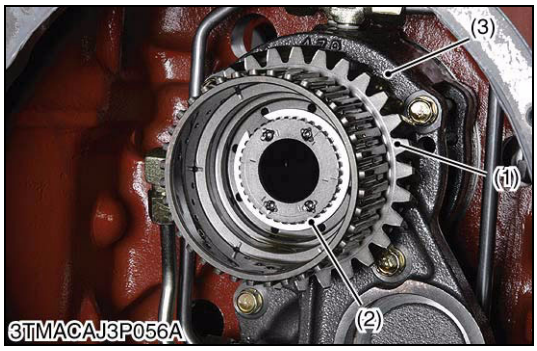
(1) Internal Snap Ring
(2) Pressure Plate
(3) Clutch Disc
(4) Drive Plate
(5) External Snap Ring
(6) Spring Plate
(7) Piston
(8) D-ring
(9) D-ring
(10) Clutch Body
(11) Plug Rubber
(12) Spring
(13) Gear
(14) Drive Plate
(15) Drive Plate

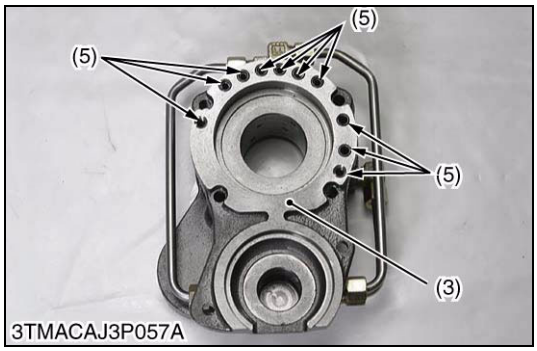
9Y1210447TRS0009US0

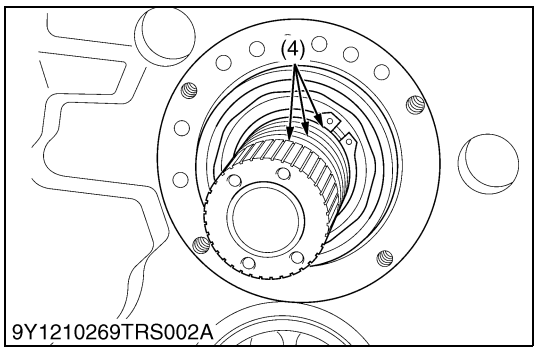
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Front Cover Assembly

1. Remove the front cover (1) with the input shaft (2) by screwing M8 × Pitch 1.25 mm length 120 mm screws into holes **(A)** and **(B)**.

(When reassembling)

- Apply grease to the O-ring.
- Apply a liquid gasket (Three Bond 1206D or equivalent) to joint face of front cover and clutch housing.
- Be sure to use the stud bolt (3) as a guide when install the front cover assembly to the clutch housing.

Tightening torque	Front cover mounting screw and nut	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft

(1) Front Cover
(2) Input Shaft
(3) Stud Bolt [M8 × Pitch 1.25 length 120 mm (4.7 in.)]

(A) Hole for Jack Bolt
(B) Hole for Jack Bolt

9Y1210269TRS0023US0

Support Assembly and Seal Ring

1. Remove the external snap ring (2) and 29T reverse gear (1).
2. Remove the support mounting screw.
3. Remove the support (3) by screwing M8 × Pitch 1.25 mm screws.
4. Remove the seal rings (4).

(When reassembling)

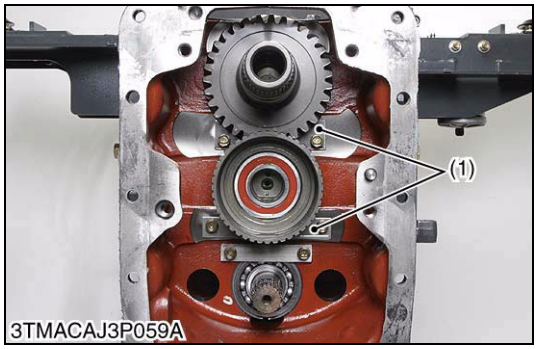
- When reassembling the support, be sure to change to change the seal rings.
- Apply grease to O-rings (5) and seal rings (4).
- Check the first shaft rotation smoothly after assembling the support.
- When insert the seal ring, do not mistake the groove of seal ring.

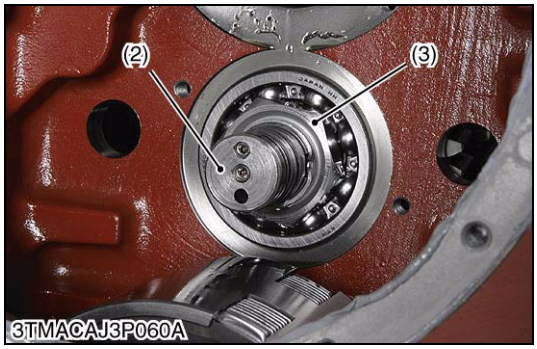
Tightening torque	Support mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft

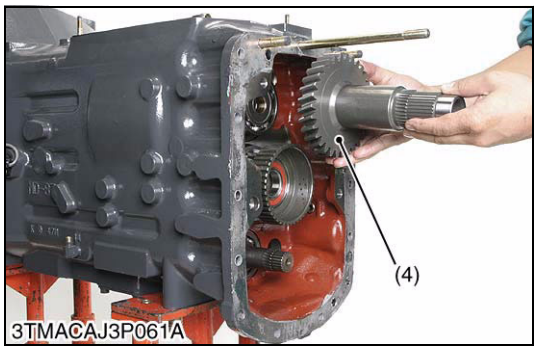
(1) 29T Reverse Gear
(2) External Snap Ring
(3) Support
(4) Seal Ring
(5) O-ring

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31T Gear Shaft

1. Remove the bearing retainers (1).
2. Set the pinion locking tool (Code No. 07916-52311) for locking the counter shaft (2).
3. Remove the staking nut (3) using a counter shaft nut socket.
4. Tap out the counter shaft (2) to the rear about 20 to 30 mm (0.8 to 1.2 in.).
5. Remove the 31T gear shaft (4).

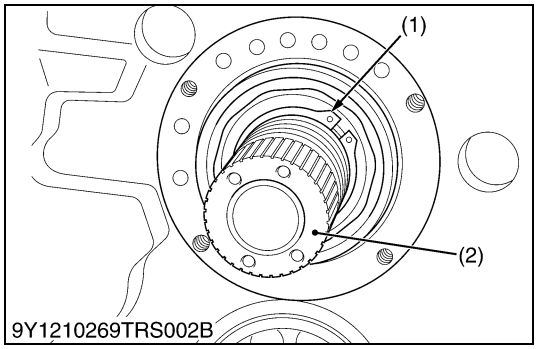
(When reassembling)

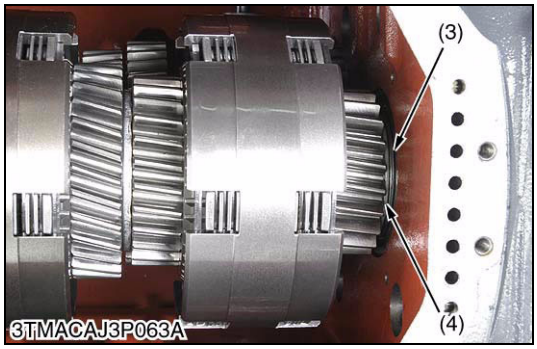
Tightening torque	Bearing retainer mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft
	Counter shaft staking nut	147.1 to 196.1 N·m 15 to 20 kgf·m 108.5 to 144.7 lbf·ft

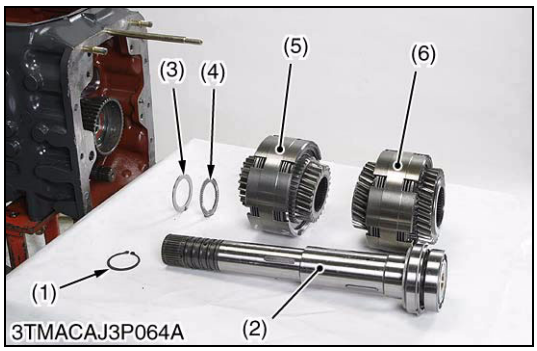
(1) Bearing Retainer
(2) Counter Shaft
(3) Staking Nut
(4) 31T Gear Shaft

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1st Shaft

1. Remove the external snap ring (1).
2. Tap out the 1st shaft (2) to rear.
3. Take out the clutch assembly (5), (6).

■ **NOTE**

- **When you tap out the 1st shaft, hold the thrust needle bearing (4) and bearing washer (3) to prevent the drop to groove of seal ring or oil line.**

(When reassembling)

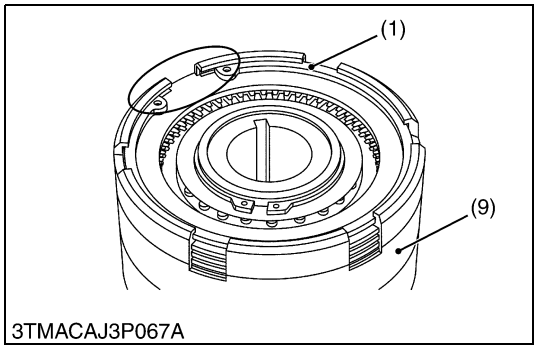
- Be sure to direct the grooved side of the thrust collar to the gear.

(1) External Snap Ring
(2) 1st Shaft
(3) Bearing Washer
(4) Thrust Needle Bearing
(5) Clutch Assembly (1-2)
(6) Clutch Assembly (3-4)

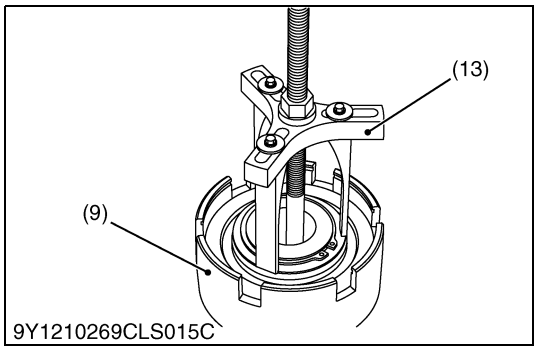
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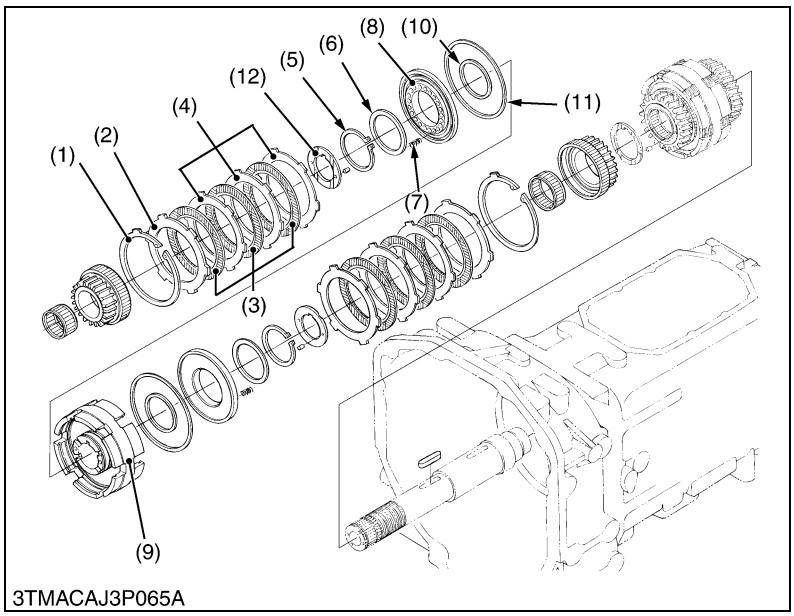
9Y1210269CLS015C

Clutch Assembly (1-2), (3-4)

1. Remove the internal snap ring (1).
2. Take out the pressure plate (2), clutch discs (3) and drive plates (4).
3. Remove the external snap ring (5) by using the hydraulic clutch spring compressor (13). (See page G-62.)
4. Take out the piston (8) and D-ring by compression air.
5. Remove the parts for other side as above.

(When reassembling)

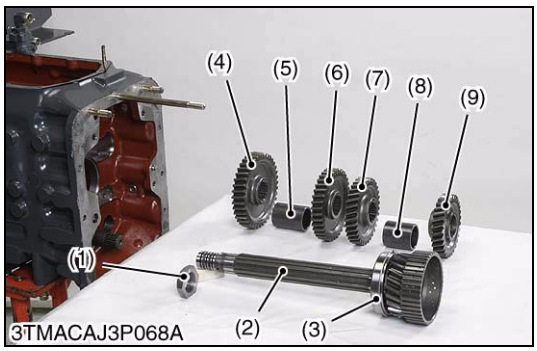
- Apply transmission fluid to D-ring (10) and square ring (11).
- Confirm the moving of the piston (8) smoothly when pressure air at 0.5 to 1.0 MPa (5 to 10 kgf/cm^2, 71 to 142 psi) is sent to clutch pack. (Refer to the photo left.)
- When install the internal snap ring (1) to the clutch body (9), align its split portion to the notched portion of clutch body.



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(1) Internal Snap Ring
(2) Pressure Plate
(3) Clutch Disc
(4) Drive Plate
(5) External Snap Ring
(6) Spring Guide
(7) Spring
(8) Piston
(9) Clutch Body
(10) D-ring
(11) Square Ring
(12) Thrust Collar
(13) Hydraulic Clutch Spring Compressor

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Counter Shaft

1. Tap out the counter shaft (2).
2. Take out the 39T gear (4), 37T gear (6), 33T gear (7), 29T gear (9) and collar (5), (8).

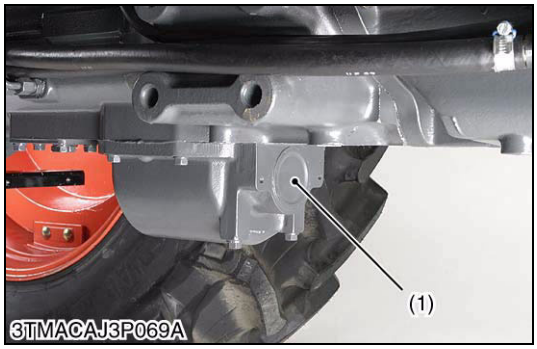
(When reassembling)

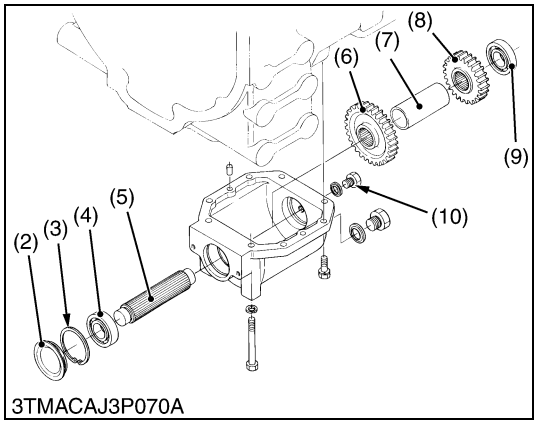
- When reassembling the counter shaft, put on the 31T gear to 1st shaft rear before assembly the counter shaft completely.
- After assembling the 1st shaft, be sure to stake the staking nut.

(1) Staking Nut
(2) Counter Shaft
(3) Bearing
(4) 39T Gear
(5) Collar
(6) 37T Gear
(7) 33T Gear
(8) Collar
(9) 29T Gear

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Bi-speed Case

1. Remove the bi-speed case mounting screw, and remove the bi-speed case (1).
2. Remove the plug (2) and internal snap ring (3).
3. Remove the plug (10).
4. Tap out the bi-speed shaft (5).

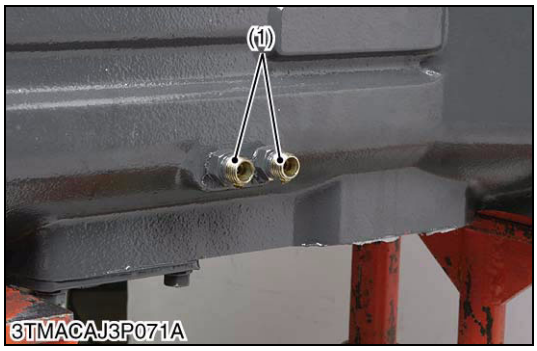
(When reassembling)

- Apply a liquid gasket (Three Bond 1206D or equivalent) to joint face of bi-speed case and clutch housing.

Tightening torque	Bi-speed case mounting screw	48.1 to 55.8 N·m 4.9 to 5.7 kgf·m 35.5 to 41.2 lbf·ft

(1) Bi-speed Case
(2) Plug
(3) Internal Snap Ring
(4) Bearing
(5) Bi-speed Shaft
(6) 27T Gear
(7) Collar
(8) 21T Gear
(9) Bearing
(10) Plug

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Oil Pipe and Joint

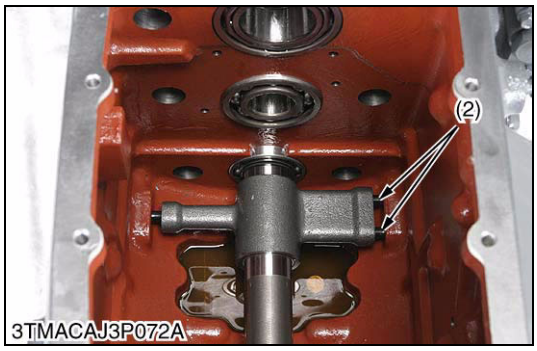
1. Remove the joint (1).
2. Install M6 × Pitch 1 mm screw on to the oil pipe (2) and pull out the oil pipes (2) by hand.

(When reassembling)

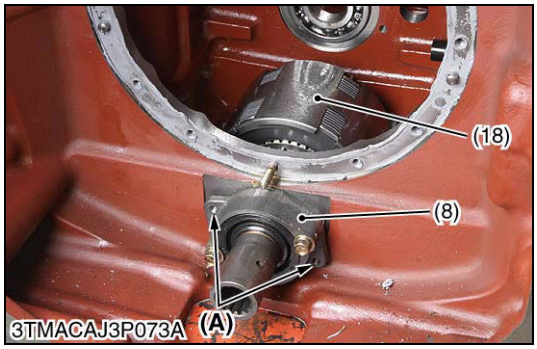
- Replace the oil pipes (2) with new one.
- Apply transmission fluid to oil pipes (2).

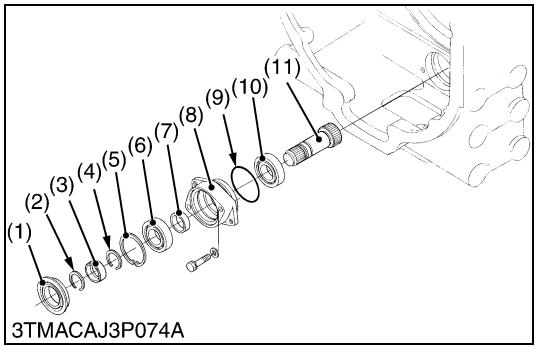
(1) Joint
(2) Oil Pipe

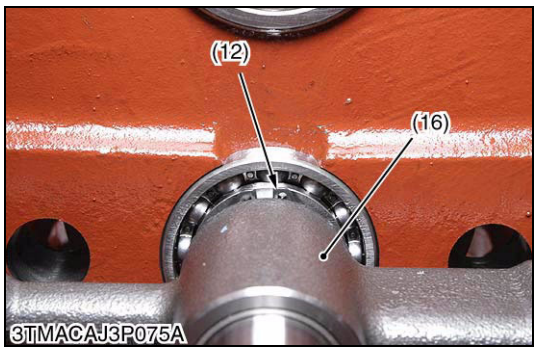
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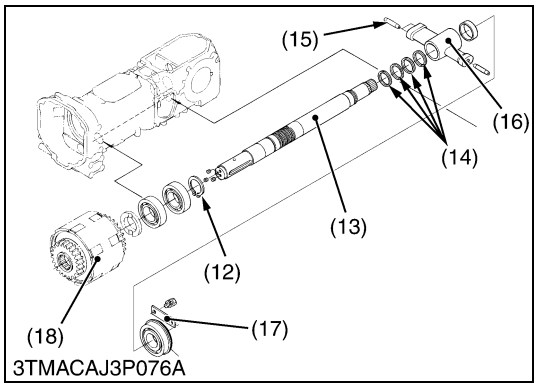


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Transmitting Shaft and Clutch Assembly

1. Remove the bearing support (front) mounting screws and remove the bearing support (8) with transmitting shaft (front) (11) by screwing M8 screws into holes **(A)**.
2. Remove the bearing retainer (rear) (17).
3. Remove the external snap ring (12).
4. Tap out the transmitting shaft (center) (13) to the rear.
5. Take out the hydraulic clutch assembly (18).
6. Take out the transmitting shaft (13) and support (16).

(When reassembling)

- Apply transmission fluid to the collars and bearings.
- Apply transmission fluid to the inner periphery of the support (16).
- Take care not to damage the seal rings (14) when installing the support.

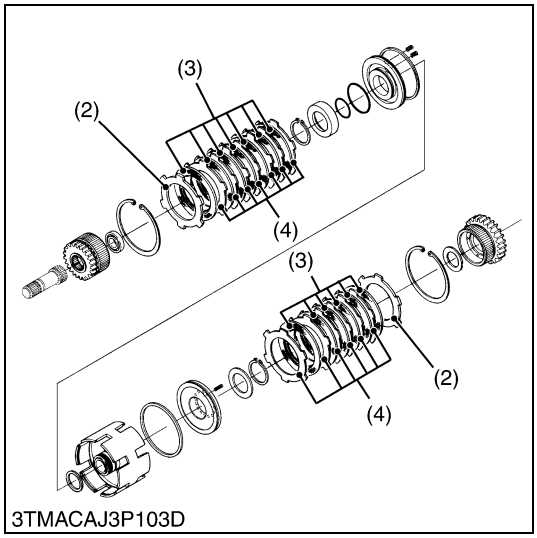
Tightening torque	Bearing support mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft

(1) Oil Seal
(2) External Snap Ring
(3) Sleeve
(4) External Snap Ring
(5) Internal Snap Ring
(6) Bearing
(7) Collar
(8) Bearing Support
(9) O-ring
(10) Bearing
(11) Transmitting Shaft (Front)
(12) External Snap Ring
(13) Transmitting Shaft (Center)
(14) Seal Ring
(15) Oil Pipe
(16) Support
(17) Bearing Retainer
(18) Clutch Assembly

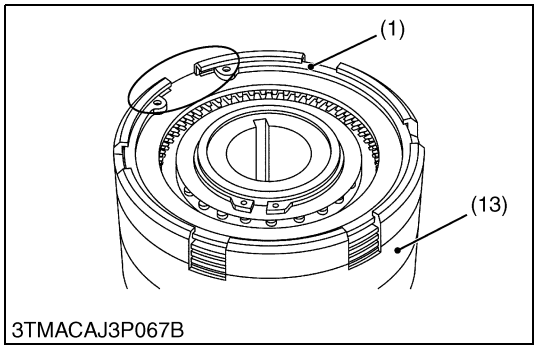
(A) Hole for Jack Bolt

9Y1210447TRS0019US0

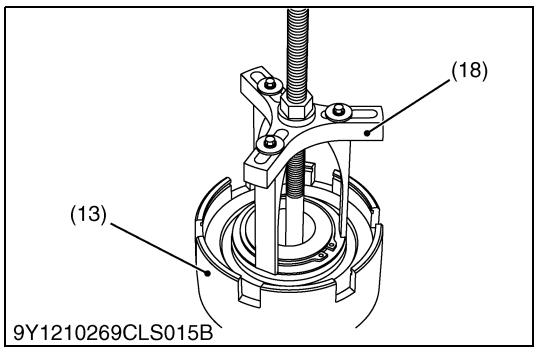
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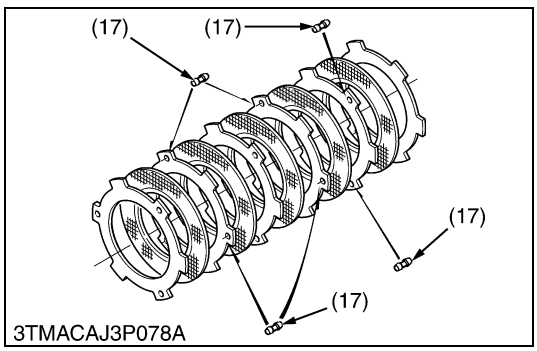
3TMACAJ3P103D



3TMACAJ3P067B



9Y1210269CLS015B



3TMACAJ3P078A

Hydraulic Clutch (4WD/Bi-speed) Assembly

1. Remove the internal snap ring (1).
2. Take out the pressure plate (2), clutch discs (3) and drive plates (4).
3. Remove the external snap ring (5) by using the hydraulic clutch spring compressor (18). (See page G-62.)
4. Take out the piston (9).
5. Remove the parts for other side as above.

(When reassembling)

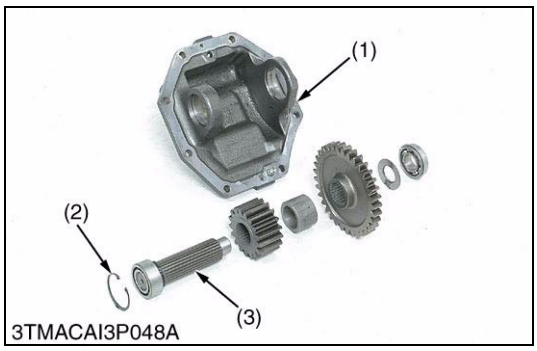
- When installing the internal snap ring (1) to the clutch body (13), align its split portion to the notched portion of clutch body.
- Do not confuse the two types of drive plate. The drive plates with plug rubbers and without plug rubbers.

(1) Internal Snap Ring
(2) Pressure Plate
(3) Clutch Disc
(4) Drive Plate
(5) External Snap Ring
(6) Collar
(7) O-ring
(8) O-ring
(9) Piston
(10) D-ring
(11) Spring
(12) D-ring
(13) Clutch Body
(14) Spring
(15) Washer Spring
(16) Drive Plate
(17) Plug Rubber
(18) Hydraulic Clutch Spring Compressor

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(2) Creep Gear Case

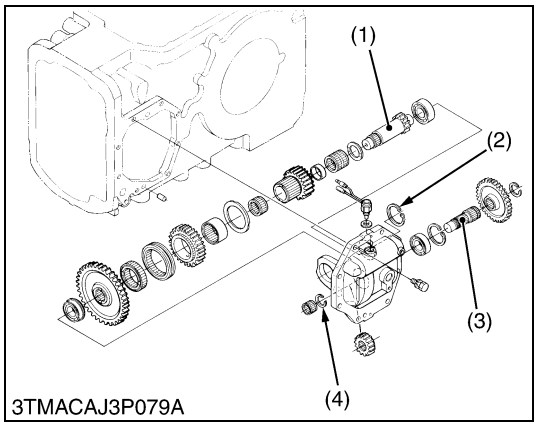


Disassembling Creep Gear Case

1. Remove the internal snap ring (2).
2. Tap out the gear shaft (3).

(1) Creep Gear Case
(2) Internal Snap Ring
(3) Gear Shaft

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Disassembling Creep Gear (Option)

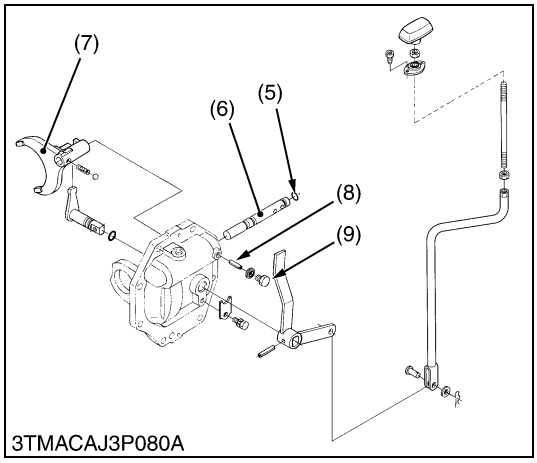
1. Remove the plug (9) and tap out the spring pin (8).
2. Remove the internal snap ring (2).
3. Tap out the gear shaft (1).
4. Draw out the shift rod (6).
5. Remove the external snap ring (4) and tap out the creep shaft (3).

(When reassembling)

- Take care not to damage the O-ring (5).

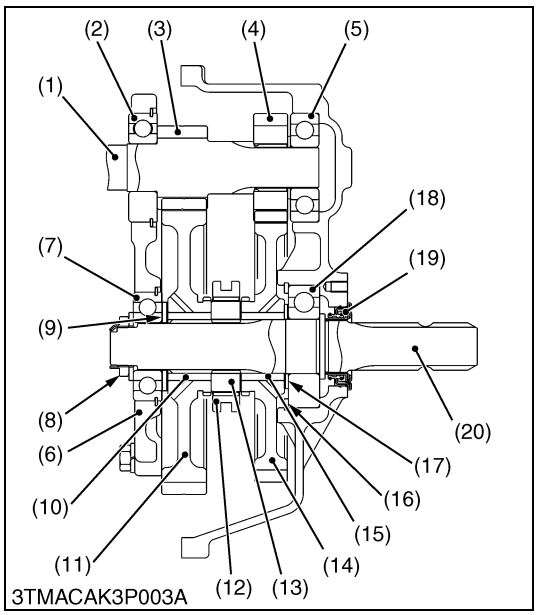
(1) Gear Shaft
(2) Internal Snap Ring
(3) Creep Shaft
(4) External Snap Ring
(5) O-ring
(6) Shift Rod
(7) Shift Fork
(8) Spring Pin
(9) Plug

9Y1210269TRS0034US0



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(3) Rear PTO Gear Case



Disassembling PTO Gear Case

1. Remove the PTO case cover mounting screws and then remove the PTO gear case cover (6).
2. Remove the stake of the staking nut (8), and then remove it.
3. Remove the bearing (7) by using the bearing puller.
4. Tap out the PTO shaft to the rear side.
5. Remove the gears (11), (14), thrust collars (9), (17), inner rings (10), (15), hub (13) and shifter (12).
6. Pull out the PTO drive shaft (1) as a unit.
7. Remove the PTO shift fork parts and PTO shift lever parts.

(When reassembling)

- Reinstall the reamer screw at correct position to mount the PTO cover case.
- Direct the grooves of thrust collars (9), (17) to the inner rings (10), (15) sides.
- Replace the PTO shaft staking nut (8) with new one, and stake it firmly after tightening.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner rings (10) and (15).
- Apply grease to the oil seal (19) and O-ring.

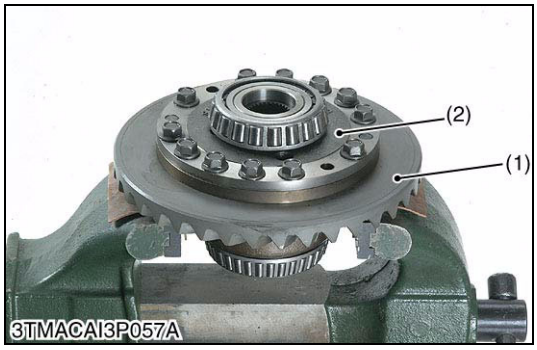
Tightening torque	PTO shaft staking nut	226 to 264 N·m 23 to 27 kgf·m 167 to 195 lbf·ft
	PTO gear case cover mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

(1) PTO Drive Shaft
(2) Ball Bearing
(3) Gear
(4) Gear
(5) Ball Bearing
(6) PTO Gear Case Cover
(7) Ball Bearing
(8) Staking Nut
(9) Thrust Collar
(10) Inner Ring
(11) Gear
(12) Shifter
(13) Hub
(14) Gear
(15) Inner Ring
(16) Internal Snap Ring
(17) Thrust Collar
(18) Ball Bearing
(19) Oil Seal
(20) PTO Shaft

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(4) Differential Gear



Spiral Bevel Gear

1. Remove the spiral bevel gear (1).

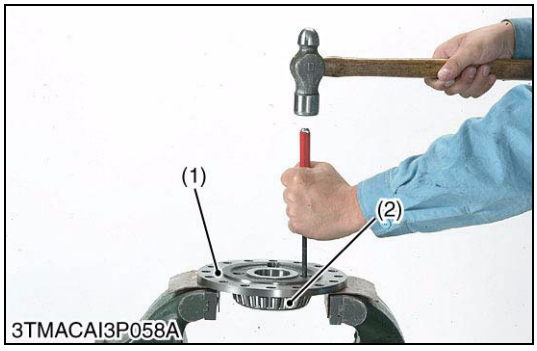
(When reassembling)

- Check the spiral bevel gear for wear or damage. If it is no longer serviceable, replace it. Then, also replace the spiral bevel pinion shaft.
- Apply liquid lock (Three Bond 1324B or equivalent) to the spiral bevel gear mounting UBS screws.

Tightening torque	Spiral bevel gear mounting UBS screw	142.2 to 161.8 N·m 14.5 to 16.5 kgf·m 104.9 to 119.3 lbf·ft

(1) Spiral Bevel Gear (2) Differential Cover

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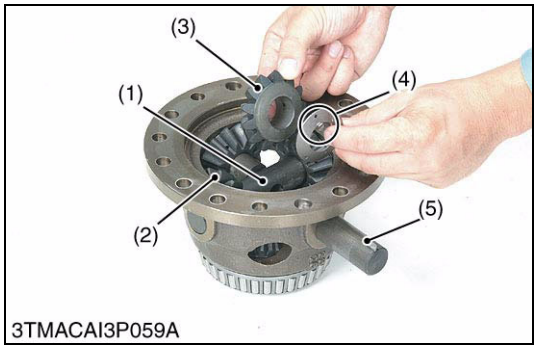


Taper Roller Bearing

1. Place the differential cover (1) on the vise.
2. Tap out the taper roller bearing (2) from the inside of the differential cap, taking care not to damage the outer race and separator.

(1) Differential Cover (2) Taper Roller Bearing

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Differential Pinon Shaft and Differential Pinion

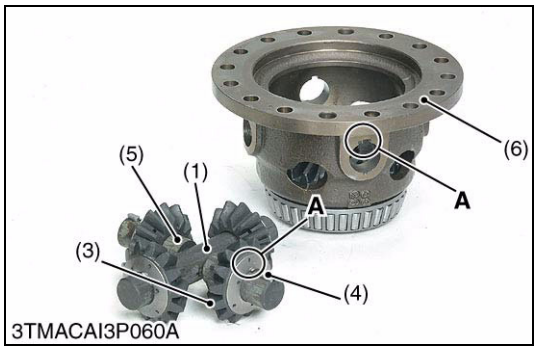
1. Draw out the differential pinion shaft 2 (5), and take out the differential pinion (3) and differential pinion washer (4).
2. Draw out the differential pinion shaft (1), and take out the differential pinion (2) and differential pinion washer (4).

■ **NOTE**

- **Arrange the parts to know their original position.**

(When reassembling)

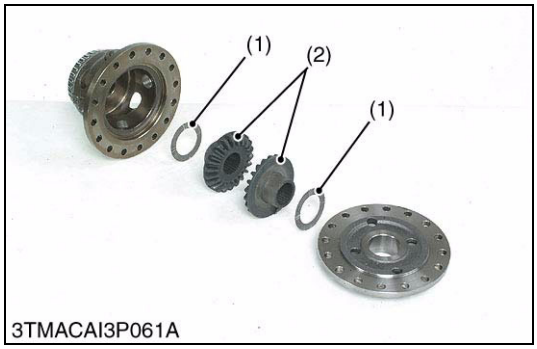
- Check the differential pinions (2) and (3), and pinion shaft (1) and (5) for excessive wear. If these parts are damaged or excessively worn, replace their parts they are in mesh with, or they sliding on.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential pinions.
- Install the parts to their original position.
- Install the differential pinion washer (4), noting its groove position **"A"**.



(1) Differential Pinion Shaft (5) Differential Pinion Shaft 2
(2) Differential Pinion (6) Differential Case
(3) Differential Pinion
(4) Differential Pinion Washer **A: Fit Groove**

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Differential Side Gear

1. Take out the differential side gear (2) and differential side gear washer (1).

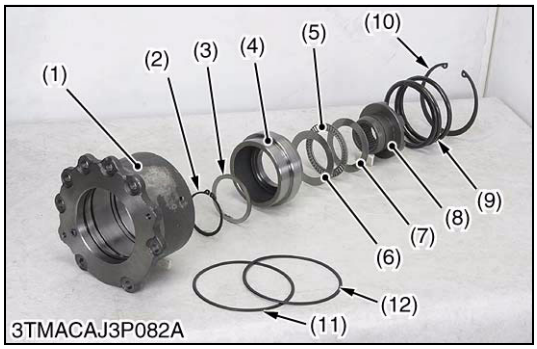
(When reassembling)

- Check the thrust and bearing surface of both differential side gears (2). If they are worn or damaged, bores in the differential case may also be damaged. Be sure to replace their parts.

(1) Differential Side Gear Washer (2) Differential Side Gear

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(5) Differential Lock Clutch



Disassembling Differential Lock Clutch

1. Remove the external snap ring (2).
2. Take out the differential lock clutch (8) and thrust bearing (5), bearing retainer (6), (7).
3. Remove the internal snap ring (10).
4. Take out the spring (9) and differential lock piston (4).

(When reassembling)

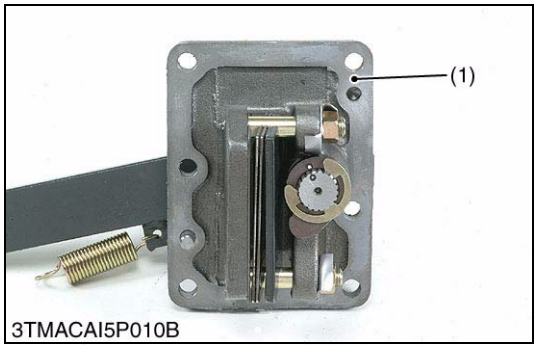
- Apply transmission fluid to the D-ring (11), (12).
- Replace the D-ring (11), (12) with new one.

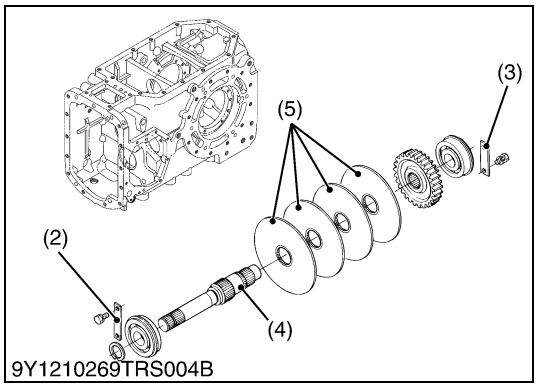
(1) Differential Bearing Support
(2) External Snap Ring
(3) Thrust Washer
(4) Differential Lock Piston
(5) Thrust Bearing
(6) Bearing Retainer
(7) Bearing Retainer
(8) Differential Lock Clutch
(9) Spring
(10) Internal Snap Ring
(11) D-ring
(12) D-ring

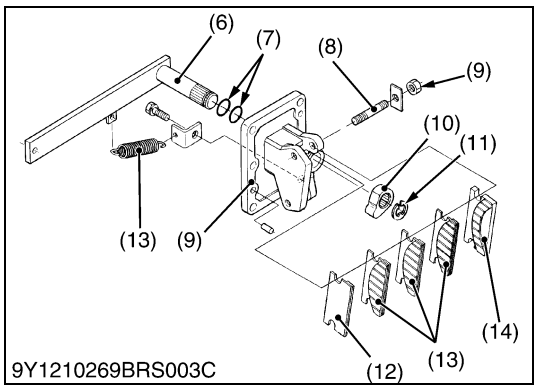
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(6) Rear Drive Shaft (Parking Brake Shaft) and Parking Brake







Rear Drive Shaft

1. Remove the parking brake case assembly (1) from transmission case.
2. Remove the bearing retainer (2), (3).
3. Tap out the rear drive shaft (4) to front.

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of transmission case and parking brake case.

Tightening torque	Parking brake case mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft
	Bearing retainer mounting screw	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft

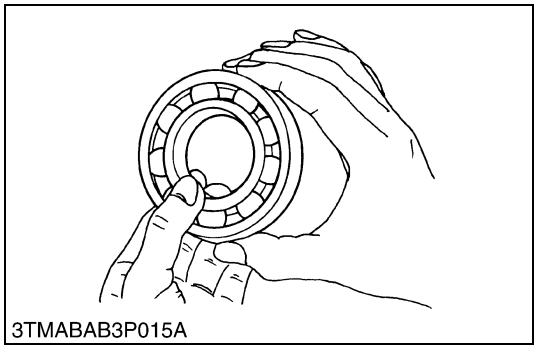
(1) Parking Brake Case Assembly
(2) Bearing Retainer
(3) Bearing Retainer
(4) Rear Drive Shaft
(5) Parking Brake Friction Plate
(6) Parking Brake Lever
(7) O-ring
(8) Stud Bolt
(9) Nut
(10) Cam
(11) External Snap Ring
(12) Brake Pad
(13) Brake Pad
(14) Parking Brake Plate

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[4] SERVICING

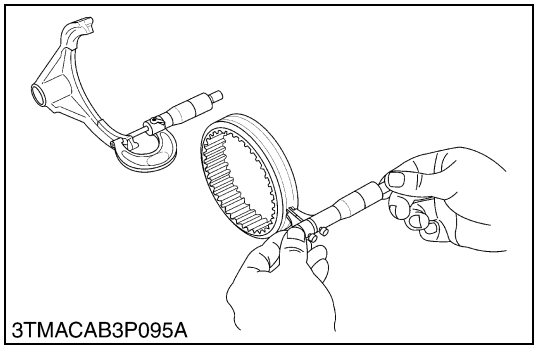
(1) Bearing, Shift Fork and Synchronizer


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Checking Bearing

1. Hold the inner race, and push and pull the outer race in all directions to check for wear and roughness.
2. Apply transmission fluid to the bearing, and hold the inner race. Then, turn the outer race to check rotation.
3. If there is any defect, replace it.

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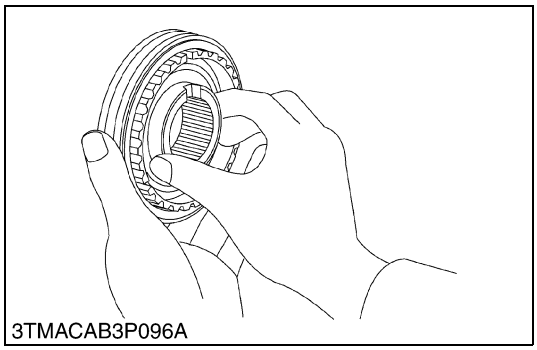

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Clearance between Shift Fork and Shifter Groove

1. Measure the width of shift fork.
2. Measure the shifter groove width, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

Clearance between shift fork and shifter groove	Factory specification	0.13 to 0.40 mm 0.0051 to 0.0157 in.
	Allowable limit	0.80 mm 0.031 in.

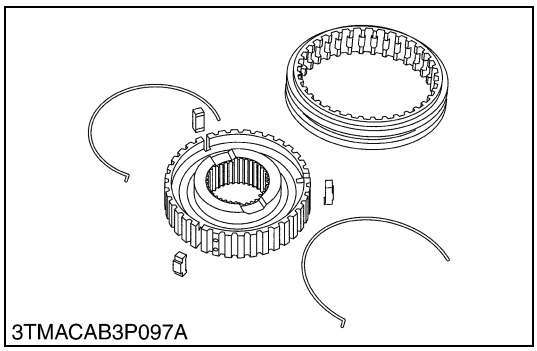
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Checking Contact between Coupling and Shifter

1. Check to see if there is flaw or wear on the spline of the coupling and shifter, and the key groove on the coupling.
2. Engage the shifter with the coupling, and check that they slide smoothly.
3. Similarly, check that there is any flaw or wear on the gear splines.
4. If there is any defect, replace them.

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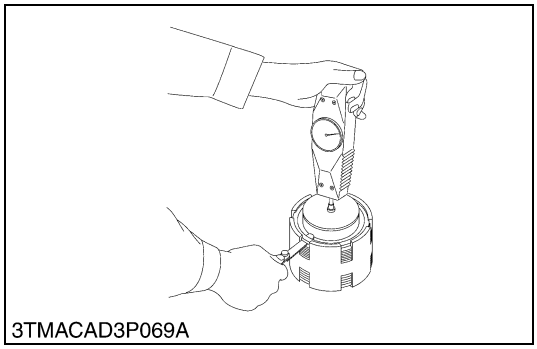
Flaw on synchronizer Key and Spring

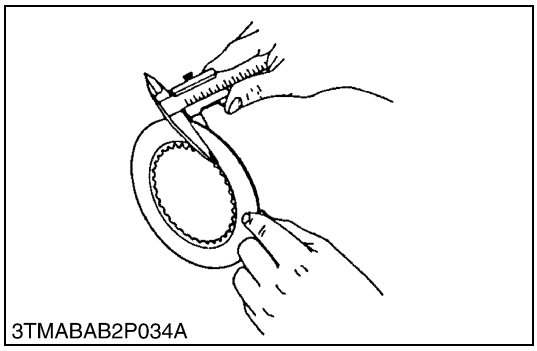
1. Check the projection in the center of the synchronizer key for wear.
2. Check the spring for fatigue or wear on the area where the spring contacts with the keys.
3. If there is any defect, replace them.

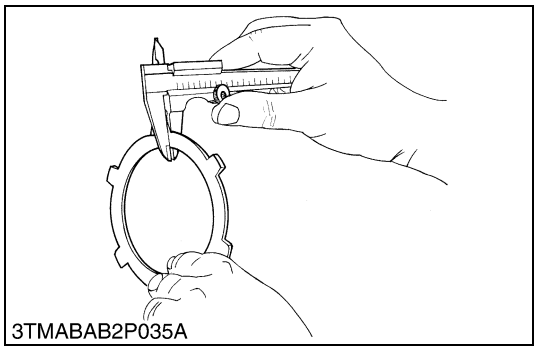
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(2) Main Shift Clutch


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Clearance between Internal Snap Ring and Pressure Plate

1. Measure the clearance between internal snap ring and pressure plate with a feeler gauge while applying the specified force. Specified force: 176 to 296 N (18 to 30 kgf, 39.6 to 66.1 lbf)
2. Three points are measured, and the smallest value is assumed to be clearance.
3. If the clearance exceeds the allowable limit, measure the thickness of clutch disc and steel plate with vernier calipers.
4. If the thickness is less than the allowable limit, replace them.
5. Remeasure to confirm the correct clearance.

■ **NOTE**

- **Clearance between internal snap ring and pressure plate is adjusted by two kinds of clutch discs with different thickness. Therefore, use the one of the same thickness when you change clutch disc.**

■ **Main Shift Clutch (1st to 4th)**

Clearance between internal snap ring and pressure plate	Factory specification	1.8 to 2.0 mm 0.071 to 0.078 in.
	Allowable limit	3.2 mm 0.126 in.

Item	Thickness	Number
Drive plate	1.4 mm (0.055 in.)	4
	1.6 mm (0.063 in.): Standard	4
Clutch disc	1.8 mm (0.071 in.)	4
Pressure plate	4.0 mm (0.157 in.)	1
Piston	10 mm (0.394 in.)	1

■ **Main Shift Clutch (L Range Side)**

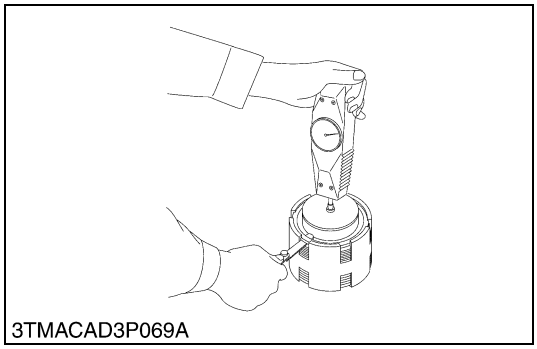
Clearance between internal snap ring and pressure plate	Factory specification	2.6 to 2.8 mm 0.102 to 0.110 in.
	Allowable limit	4.2 mm 0.165 in.

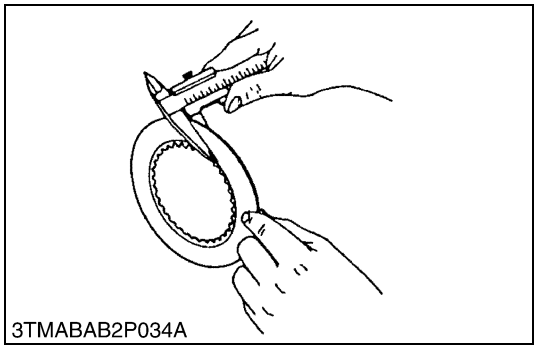
Item	Thickness	Number
Drive plate	1.4 mm (0.055 in.)	6
	1.6 mm (0.063 in.)	3
Clutch disc	1.8 mm (0.071 in.)	9
Pressure plate	4.0 mm (0.157 in.)	1
Piston	10 mm (0.394 in.)	1

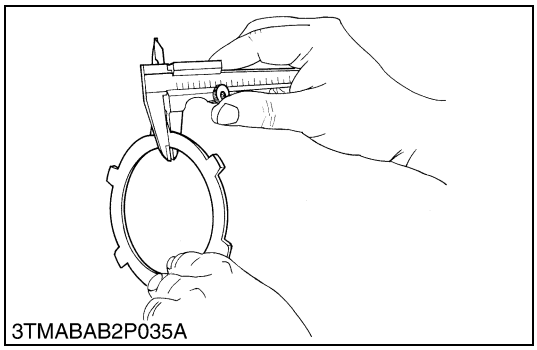
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■ Main Shift Clutch (H Range Side)

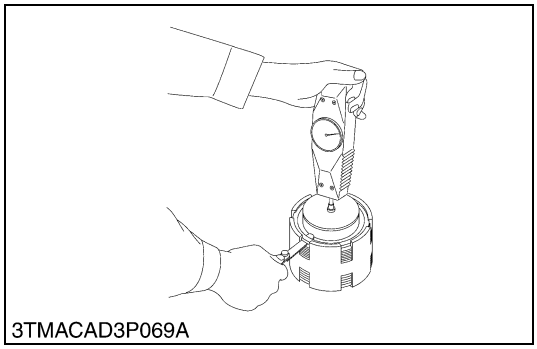
Clearance between internal snap ring and pressure plate	Factory specification	1.8 to 2.1 mm 0.071 to 0.083 in.
	Allowable limit	3.5 mm 0.138 in.

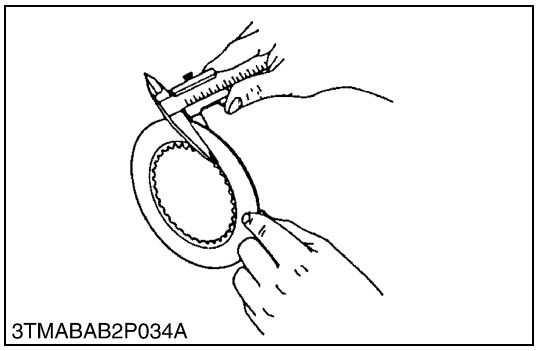
Item	Thickness	Number
Drive plate	1.6 mm (0.063 in.)	5
Clutch disc	2.2 mm (0.087 in.)	5
Pressure plate	4.0 mm (0.157 in.)	1
Piston	10 mm (0.394 in.)	1

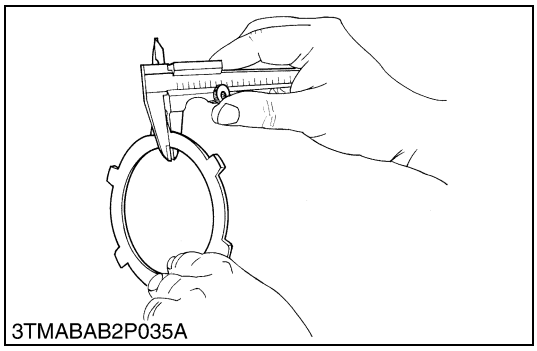
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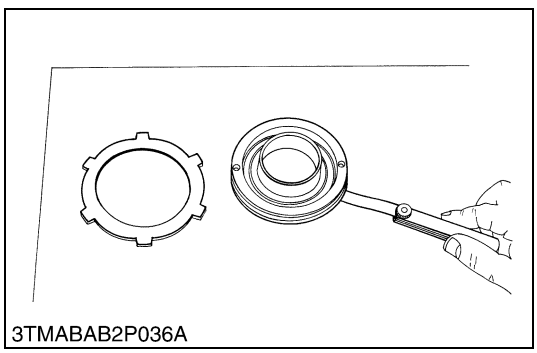
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(3) 4WD/Bi-speed Clutch


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Clearance between Internal Snap Ring and Pressure Plate

1. Measure the clearance between internal snap ring and pressure plate with a feeler gauge while applying the specified force. Specified force: 176 to 296 N (18 to 30 kgf, 39.6 to 66.1 lbf)
2. Three points are measured, and the smallest value is assumed to be clearance.
3. If the clearance exceeds the allowable limit, measure the thickness of clutch disc and steel plate with vernier calipers.
4. If the thickness is less than the allowable limit, replace them.
5. Remeasure to confirm the correct clearance.

■ **NOTE**

- **Clearance between internal snap ring and pressure plate is adjusted by two kinds of clutch discs with different thickness. Therefore, use the one of the same thickness when you change clutch disc.**

■ **4WD/Bi-speed Clutch**

Clearance between internal snap ring and pressure plate	Factory specification	1.5 to 2.0 mm 0.059 to 0.079 in.
	Allowable limit	3.5 mm 0.138 in.

Item	Thickness	Number	
		4WD	Bi-speed
Drive plate	1.2 mm (0.047 in.)	7	6
Clutch disc	2.2 mm (0.087 in.)	7	6
Pressure plate (4WD)	4.5 mm (0.177 in.)	1	–
Pressure plate (Bi-speed)	3.85 mm (0.152 in.)	–	1
Piston	12.0 mm (0.472 in.)	1	1

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Flatness of Piston, Pressure Plate and Drive Plate

1. Place the piston, pressure plate and drive plate on flat surface.
2. Measure the clearance with feeler gauge.
3. Check this at four points on a diagonal line.
4. If measurement exceeds the allowable limit, replace it.

Flatness of piston	Allowable limit	0.15 mm 0.0059 in.
Flatness of pressure plate	Allowable limit	0.3 mm 0.012 in.
Flatness of drive plate	Allowable limit	0.4 mm 0.0157 in.

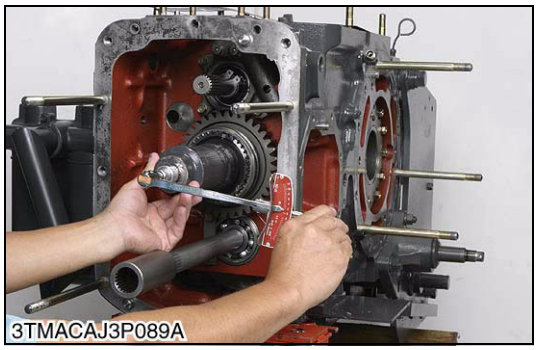
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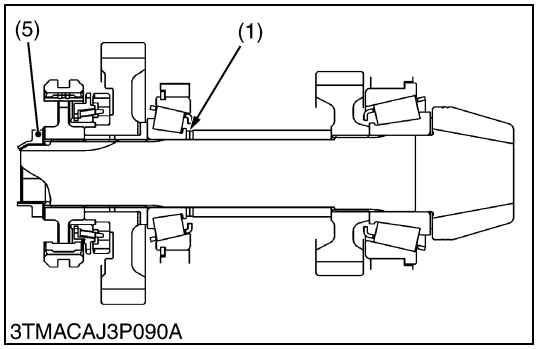
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(4) Differential Gear

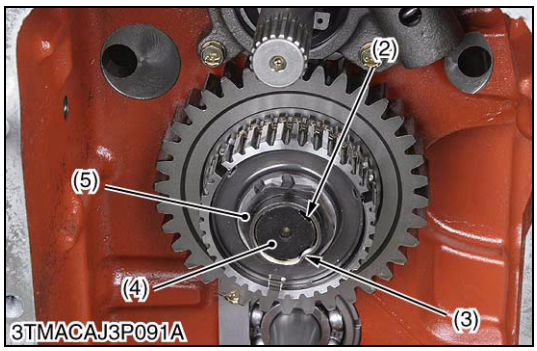
■ **IMPORTANT**

- **When reassembling spiral bevel pinion shaft and differential assembly, be sure to adjust the following.**
- **Turning torque of spiral bevel pinion only.**
- **Turning torque of spiral bevel pinion shaft and differential assembly combined.**
- **Backlash and tooth contact between spiral bevel pinion shaft and spiral bevel gear.**


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Turning Torque of Spiral Bevel Pinion Shaft Only

1. Reassemble the spiral bevel pinion shaft and tighten the staking nut with the bevel pinion shaft nut socket 35 and the pinion locking tool.
2. After striking the bevel pinion shaft to the front and rear, retighten and staking nut so specified torque.
3. Measure the turning torque of spiral bevel pinion shaft.
4. If the measurement is not with in the factory specifications, adjust with the adjusting collar 1 (1).

Turning torque of spiral bevel pinion shaft only	Factory specification	1.47 to 1.96 N·m 0.15 to 0.20 kgf·m 1.10 to 1.45 lbf·ft

(When reassembling)

Tightening torque	Staking nut	274.6 to 343.2 N·m 28 to 35 kgf·m 202.5 to 253.0 lbf·ft

(Reference)

- Thickness of adjusting collar (1)
  1.0 mm (0.0394 in.) [Code No. 33251-32450]
  1.5 mm (0.0591 in.) [Code No. 33251-32460]
  1.7 mm (0.0669 in.) [Code No. 33251-32470]
  1.75 mm (0.0689 in.) [Code No. 33251-32480]
  1.8 mm (0.0709 in.) [Code No. 33251-32490]
  1.9 mm (0.0748 in.) [Code No. 33251-32510]
  2.0 mm (0.0787 in.) [Code No. 33251-32520]
  2.1 mm (0.0827 in.) [Code No. 33251-32530]
  2.2 mm (0.0866 in.) [Code No. 33251-32540]
  2.25 mm (0.0886 in.) [Code No. 33251-32550]
  2.3 mm (0.0906 in.) [Code No. 33251-32560]

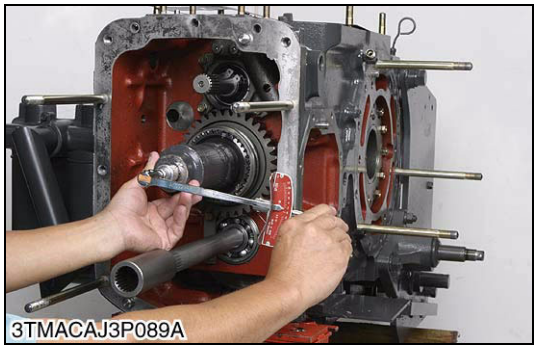
■ **NOTE**

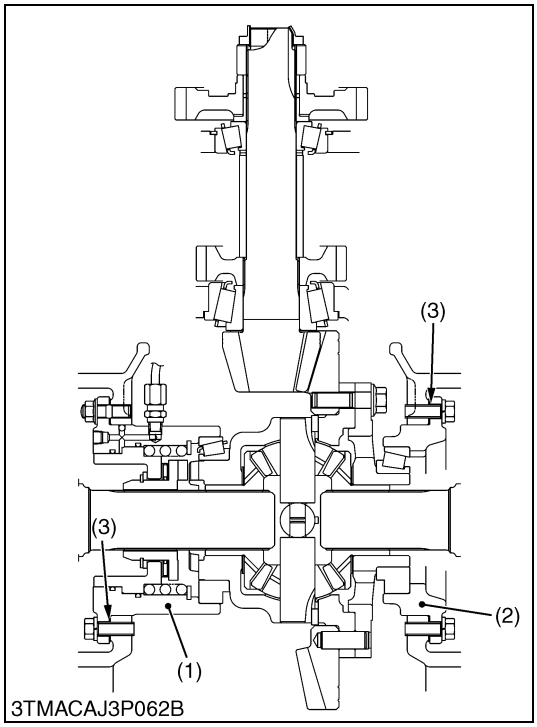
- **Stake the staking nut after performing adjustment described in the following pages.**

(1) Collar 1
(2) For Lubrication
(3) For Staking
(4) Bevel Pinion Shaft
(5) Staking Nut

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Turning Torque of Spiral Bevel Pinion Shaft and Differential Assembly Combined

1. Reassembling the differential assembly with left and right shims (3) same as before disassembling.
2. Check that there is a backlash. If there is no backlash, move a left shim to the right.

(Reference)

- If the thickness of shims is not known, refer to the following. Reassemble the differential assembly with no shim at bearing support **L** (1) aside and with an adequate number of shims at bearing support **R** (2) side. And proceed to the next step.

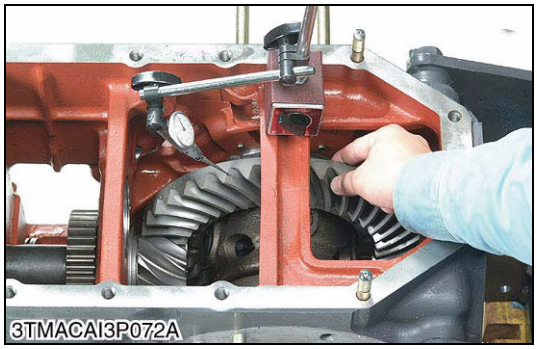
3. Measure the turning torque by turning the spiral bevel pinion shaft, and then add a shim to the bearing support **R** (2) if the turning torque exceeds the factory specifications, or remove a shim from there if the turning torque is less than the factory specifications.
   And repeat the above procedure until the turning torque becomes the factory specifications.

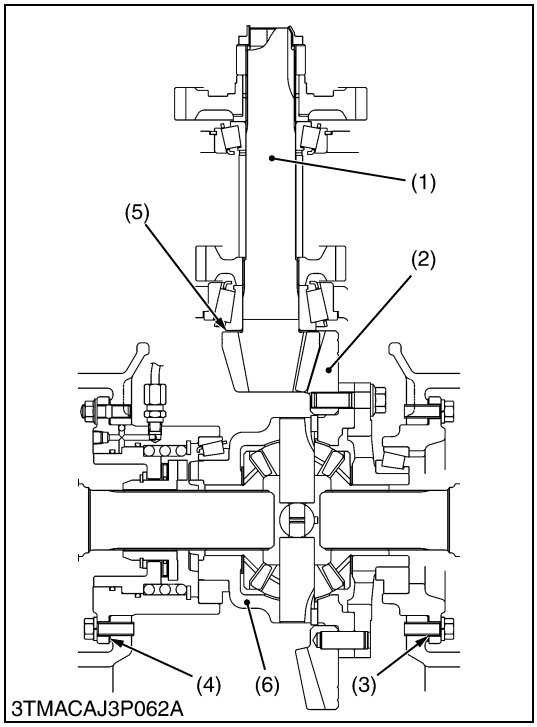
Turning torque	Factory specification	1.96 to 4.41 N·m 0.20 to 0.45 kgf·m 1.45 to 3.25 lbf·ft

(1) Bearing Support **L**
(2) Bearing Support **R**
(3) Shim

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Backlash and Tooth Contact between Spiral Bevel Gear and Spiral Bevel Pinion Shaft

1. Set the dial indicator (lever type) with its finger on the tooth surface.
2. Measure the backlash by fixing the spiral bevel pinion shaft (1) and moving the spiral bevel gear (2) by hand.
3. When the backlash is too large, decrease the number of shims (3) in the side of spiral bevel gear, and insert the removed shims in the opposite side.
   When the backlash is too small, decrease the number of shims (4) in the side of the differential case (6), and insert the removed shims in the opposite side.
4. Adjust the backlash properly by repeating the above procedure.
5. Apply red lead lightly over several teeth at three positions equally spaced on the spiral bevel gear.
6. Turn the spiral bevel pinion shaft (1).
7. Check the tooth contact. If not proper, adjust according to the instructions next page.

Backlash between spiral bevel gear and spiral bevel pinion shaft	Factory specification	0.15 to 0.25 mm 0.0060 to 0.0100 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

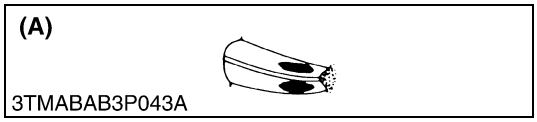
- Thickness of adjusting shim (3), (4)
  0.1 mm (0.004 in.) [Code No. 33740-32130]
  0.3 mm (0.012 in.) [Code No. 33740-32140]
  0.5 mm (0.020 in.) [Code No. 33740-32150]
- Thickness of adjusting collar (5)
  1.2 mm (0.047 in.) Collar is built in standard
  0.8 mm (0.031 in.) [Code No. 3E251-32610]
  1.0 mm (0.039 in.) [Code No. 3E251-32620]
  1.2 mm (0.047 in.) [Code No. 3E251-32630]
  1.4 mm (0.055 in.) [Code No. 3E251-32640]
  1.6 mm (0.063 in.) [Code No. 3E251-32650]

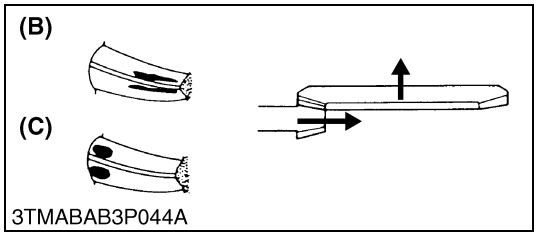
(1) Spiral Bevel Pinion Shaft
(2) Spiral Bevel Gear
(3) Shim
(4) Shim
(5) Adjusting Collar
(6) Differential Case

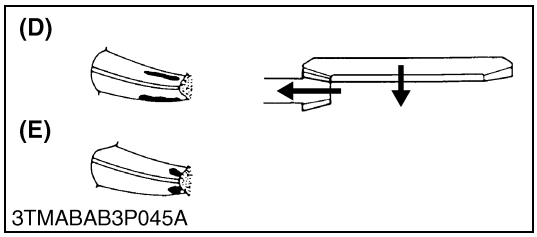
(To be continued)

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(Continued)







- **Proper Contact**

  More than 35 % red lead contact area on the gear tooth surface.

  The center of tooth contact at 1/3 of the entire width from the small end.

(A) Proper Contact

- **Shallow or Heel Contact**

  Replace the adjusting collar (5) with thicker one to move the spiral bevel pinion shaft backward.

  And reduce the shim (4) and shim (3) to move the spiral bevel gear rightward.

  Repeat above until the proper tooth contact and backlash are achieved.

(B) Shallow Contact **(C) Heel Contact**

- **Deep or Toe Contact**

  Replace the adjusting collar (5) with a thinner one to move the spiral bevel pinion shaft forward.

  And increase the shim (4) and shim (3) to move the spiral bevel gear leftward.

  Repeat above until the proper tooth contact and backlash are achieved.

(D) Deep Contact **(E) Toe Contact**

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Clearance between Differential Case Bore (Differential Case Cover Bore) and Differential Side Gear Boss

1. Measure the bore I.D. of the differential case and differential case cover.
2. Measure the differential side gear boss O.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace them.

Clearance between differential case bore and differential side gear boss	Factory specification	0.070 to 0.169 mm 0.00276 to 0.00665 in.
	Allowable limit	0.35 mm 0.014 in.

Differential case bore I.D.	Factory specification	53.070 to 53.150 mm 2.08937 to 2.09252 in.
Differential side gear boss O.D.	Factory specification	52.954 to 53.000 mm 2.08480 to 2.08661 in.

Clearance between differential case cover bore and differential side gear boss	Factory specification	0.070 to 0.169 mm 0.00276 to 0.00665 in.
	Allowable limit	0.35 mm 0.014 in.

Differential case cover bore I.D.	Factory specification	53.070 to 53.150 mm 2.08937 to 2.09252 in.
Differential side gear boss O.D.	Factory specification	52.954 to 53.000 mm 2.08480 to 2.08661 in.

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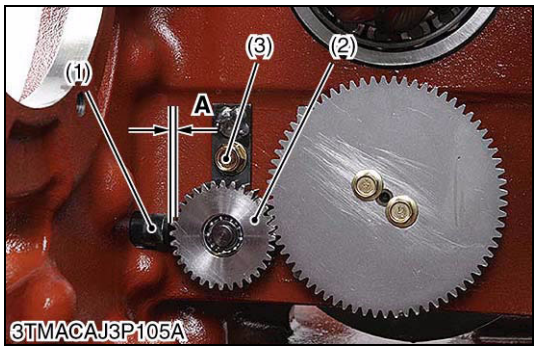
Clearance between Differential Pinion Shaft and Differential Pinion

1. Measure the differential pinion shaft O.D.
2. Measure the differential pinion I.D. and calculate the clearance.
3. If the clearance exceed the allowable limit, replace them.

Clearance between differential pinion shaft and differential pinion	Factory specification	0.080 to 0.122 mm 0.00315 to 0.00480 in.
	Allowable limit	0.25 mm 0.010 in.

Differential pinion shaft O.D.	Factory specification	25.939 to 25.960 mm 1.02122 to 1.02205 in.
Differential pinion I.D.	Factory specification	26.040 to 26.061 mm 1.02520 to 1.02602 in.

9Y1210269TRS0053US0



Clearance between Traveling Speed Sensor and Detection Gear

1. Measure the clearance **"A"** between traveling speed sensor and detection gear with feeler gauge.
2. If clearance is not factory specification, loosen the screw (3) and adjust the clearance then retighten the screw (3).

Clearance **"A"**	Factory specification	0.5 to 0.9 mm 0.0197 to 0.0354 in.

(1) Traveling Speed Sensor
(2) Detection Gear
(3) Screw

A: Clearance

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4 REAR AXLE

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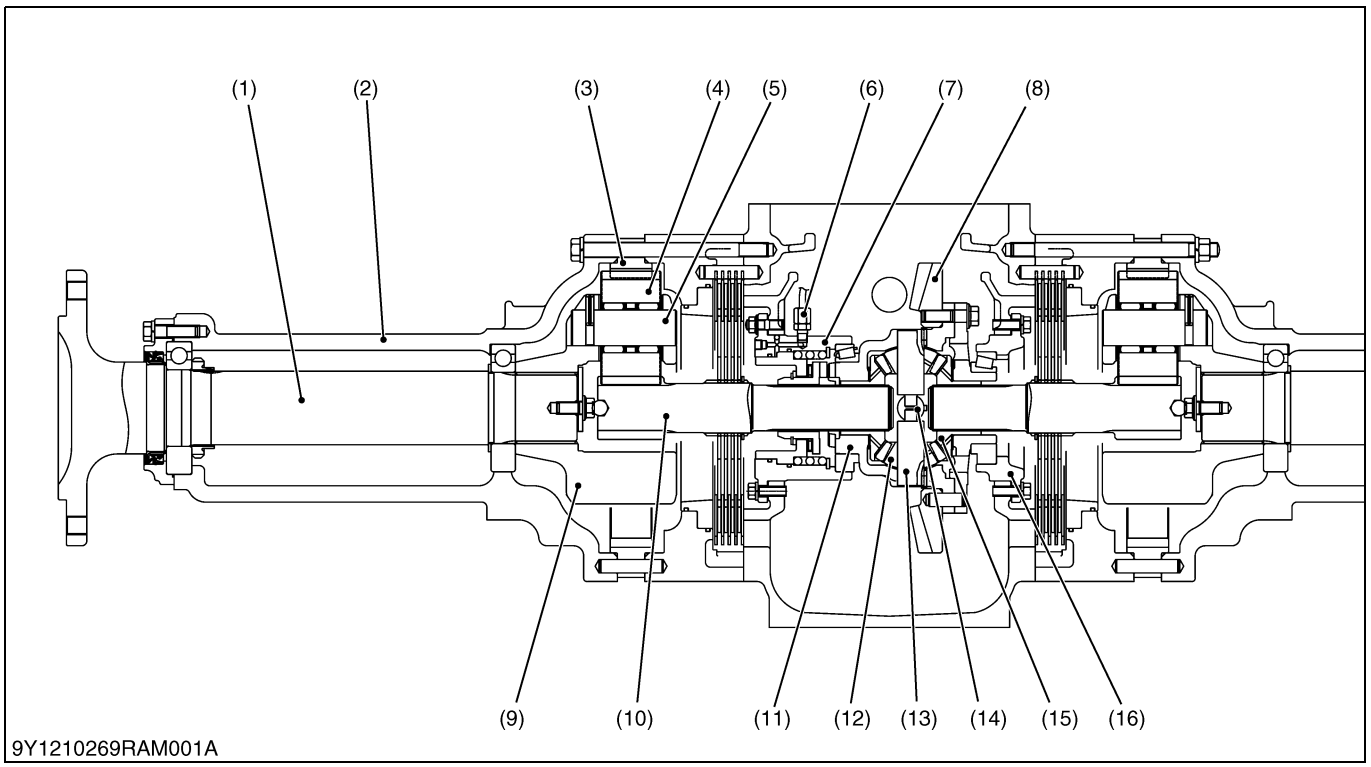
MECHANISM

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1. STRUCTURE



(1) Rear Axle
(2) Rear Axle Case
(3) Internal Gear
(4) Planetary Gear
(5) Planetary Gear Pin
(6) Differential Lock Pipe
(7) Differential Bearing Support L.H. (Differential Lock Clutch)
(8) Spiral Bevel Gear
(9) Planetary Gear Support
(10) Brake Shaft
(11) Differential Case
(12) Differential Pinion
(13) Differential Pinion Shaft 2
(14) Differential Pinion Shaft 1
(15) Differential Side Gear
(16) Differential Bearing Support R.H.

The rear axles are the final mechanisms which transmit power from the transmission to the rear wheels. Direction of power transmitted is changed at a right angle by the differential gear, and at the same time, speed is reduced. It is further reduced by the planetary gear to drive the rear axles.

The rear axles are semi-floating type with the ball bearing between the rear axle (1) and rear axle case (2), which support the rear wheel load as well as transmitting power to the rear wheel. They withstand all the forces caused by tire rotation and side skidding.

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SERVICING

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1. TROUBLESHOOTING....4-S1
2. SERVICING SPECIFICATIONS....4-S2
3. TIGHTENING TORQUES....4-S3
4. CHECKING, DISASSEMBLING AND SERVICING....4-S4
   [1] PREPARATION....4-S4
      (1) Separating Rear Axle Case from Transmission Case....4-S4
   [2] DISASSEMBLING AND ASSEMBLING....4-S6
      (1) Rear Axle Case....4-S6
   [3] SERVICING....4-S7

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Excessive or Unusual Noise at All Time	Improper backlash between brake shaft's 13T gear and planetary gear	Replace	–
	Improper backlash between planetary gear and internal gear	Replace	4-S7
	Bearings worn	Replace	4-S7
	Insufficient or improper type of transmission fluid used	Replace	G-10
Noise while Turning	Brake shaft gear, planetary gears and internal gear worn or damaged	Replace	4-S7
	Planetary support or bearing worn or broken	Replace	4-S7

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Internal Gear to Planetary Gear	Backlash	0.10 to 0.20 mm 0.0039 to 0.0079 in.	0.5 mm 0.020 in.
Planetary Gear Thrust Collar	Thickness	1.55 to 1.65 mm 0.0610 to 0.0650 in.	1.2 mm 0.047 in.
Planetary Gear to Planetary Gear Shaft	Clearance	0.009 to 0.048 mm 0.00035 to 0.00189 in.	0.30 mm 0.0118 in.
• Planetary Gear Shaft	O.D.	34.989 to 35.000 mm 1.37752 to 1.37795 in.	–
• Planetary Gear	I.D.	49.009 to 49.025 mm 1.92949 to 1.93012 in.	–
• Needle	O.D.	6.994 to 7.000 mm 0.27535 to 0.27559 in.	–

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3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-13.)

Item	N·m	kgf·m	lbf·ft
Rear wheel mounting nut	343 to 401	35.0 to 41.0	254 to 297
Cabin mounting screw and nut	69 to 88	7.0 to 9.0	50.6 to 65.1
Rear axle case mounting screw and nut	166.7 to 196.1	17.0 to 20.0	123.0 to 144.6
Planetary gear support mounting UBS screw	90.0 to 104.0	9.2 to 10.6	66.4 to 76.7
Rear axle cover mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Rear axle nut	392 to 588	40.0 to 60.0	289 to 434

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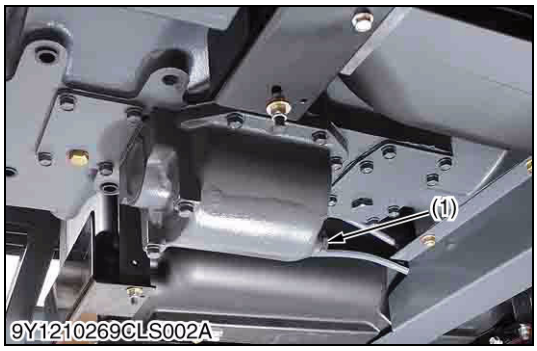
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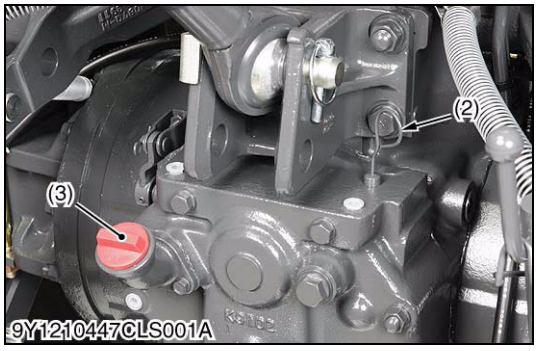
4. CHECKING, DISASSEMBLING AND SERVICING

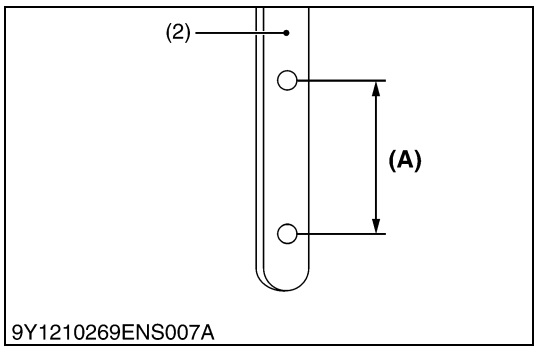
[1] PREPARATION

(1) Separating Rear Axle Case from Transmission Case









Draining Transmission Fluid

1. Place an oil pan underneath the transmission case.
2. Remove the drain plugs (1).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1).

(When reassembling)

- Fill the transmission fluid up to the proper oil level after removing the filling plug (3).
- After running the engine for few minutes, stop it and check the fluid level again, add the fluid to prescribed level if it is not correct level.

■ **IMPORTANT**

- **Use KUBOTA UDT or KUBOTA SUPER UDT fluid. Use of other fluids may damage the transmission or hydraulic system.**
- **Refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.**
- **Do not mix different brands oil together.**

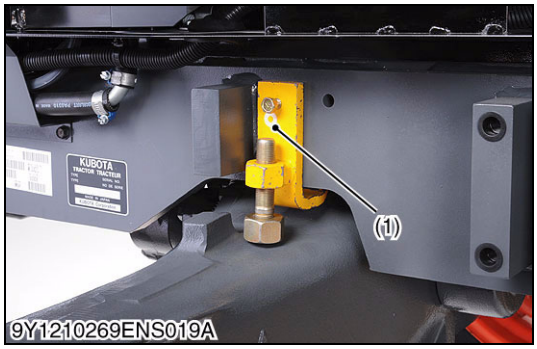
Transmission fluid	Capacity	60.0 L 63.4 U.S.qts 52.8 Imp.qts

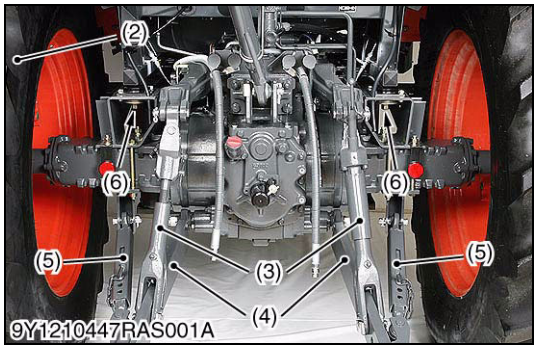
(1) Drain Plug
(2) Dipstick
(3) Filling Plug

(A) Oil level is acceptable within this range.

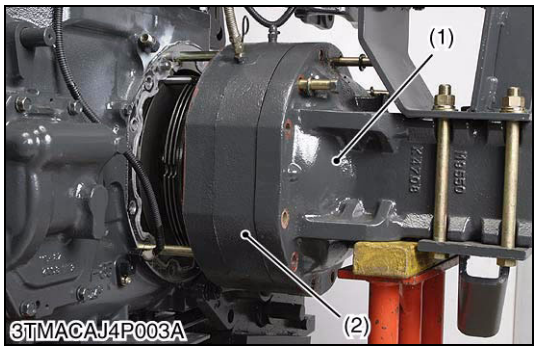
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Rear Wheel and 3-Points Hitch

1. Set the front axle rocking restrictor (see page G-66) (1) to the front axle.
2. Place the disassembling stand under the transmission case.
3. Remove the rear wheel (2).
4. Remove the lifting rod (3) and lower link (4) with stabilizer (5).
5. Remove the cabin mounting screw and nut (6).
6. Hoist the cabin.

(When reassembling)

Tightening torque	Rear wheel mounting nut	343 to 401 N·m 35.0 to 41.0 kgf·m 254 to 297 lbf·ft
	Cabin mounting screw and nut	69 to 88 N·m 7.0 to 9.0 kgf·m 50.6 to 65.1 lbf·ft

(1) Front Axle Rocking Restrictor
(2) Rear Wheel
(3) Lifting Rod
(4) Lower Link
(5) Stabilizer
(6) Cabin Mounting Nut

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Rear Axle Case

1. Set the disassembling stand to the rear axle case.
2. Disconnect the brake hose (3).
3. Remove the rear axle case (1) and brake case (2).

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to the seam of brake case and transmission case.
- Be sure to bleed the brake system completely. (See page 5-S12.)

Tightening torque	Rear axle case mounting screw and nut	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.6 lbf·ft

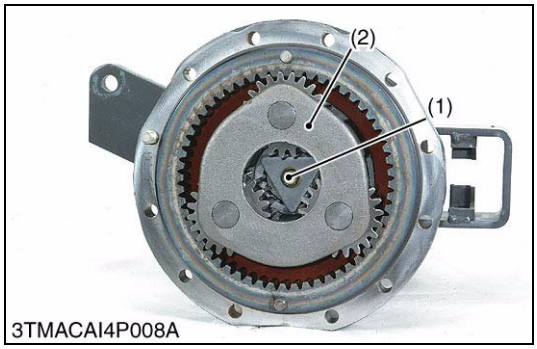
(1) Rear Axle Case
(2) Brake Case
(3) Brake Hose

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[2] DISASSEMBLING AND ASSEMBLING

(1) Rear Axle Case



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Planetary Gear Support

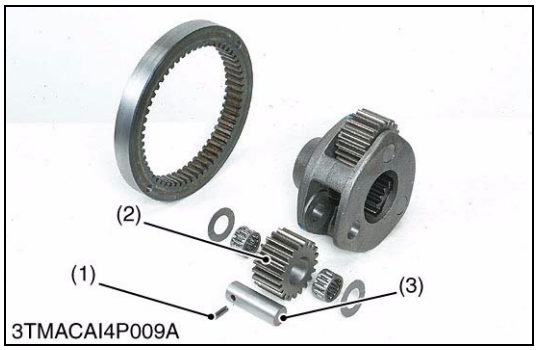
1. Remove the planetary gear support mounting UBS screw (1).
2. Remove the planetary gear support (2).

(When reassembling)

Tightening torque	Planetary gear support mounting UBS screw	90.0 to 104.0 N·m 9.2 to 10.6 kgf·m 66.4 to 76.7 lbf·ft

(1) Planetary Gear Support Mounting UBS Screw
(2) Planetary Gear Support

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Planetary Gear

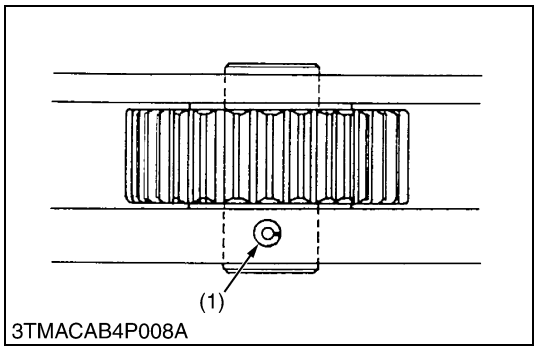
1. Tap the spring pin (1) into the planetary gear shaft (3).
2. Draw out the planetary gear shaft (3), and remove the planetary gear (2).
3. Tap out the spring pin (1) from the planetary gear shaft (3).

(When reassembling)

- Apply transmission fluid to the inner surface of planetary gear (2) and bearing.
- Tap in the spring pin (1) as shown in the figure.

(1) Spring Pin
(2) Planetary Gear
(3) Planetary Gear Shaft

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Rear Axle

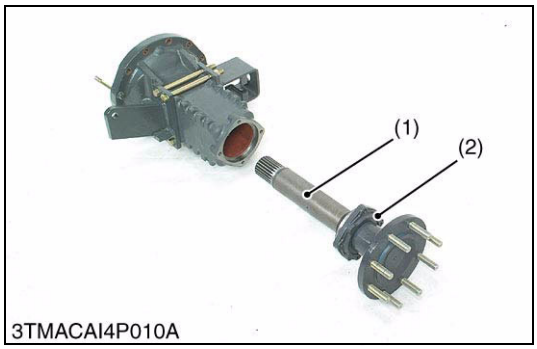
1. Remove the rear axle cover mounting screw.
2. Hammer out the rear axle (1).

(When reassembling)

Tightening torque	Rear axle cover mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

(1) Rear Axle
(2) Rear Axle Cover

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Rear Axle Nut

1. Fix the rear axle on the repair table or set to the rear wheel.
2. Remove the stake on the rear axle nut.
3. Remove the rear axle nut with a rear axle nut wrench 98 (Code No. 07916-52521).

(When reassembling)

Tightening torque	Rear axle nut	392 to 588 N·m 40.0 to 60.0 kgf·m 289 to 434 lbf·ft

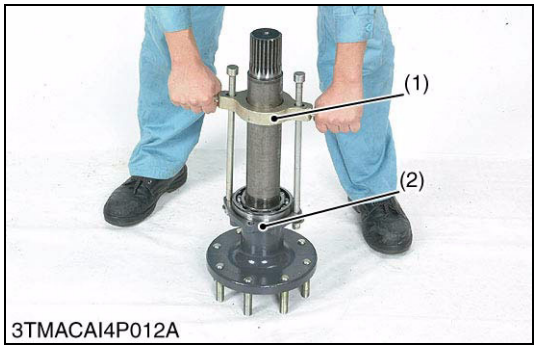
(1) Rear Axle Nut Wrench

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Rear Axle Cover

1. Remove the rear axle cover (2) with a rear axle cover puller (1) (Code No. 07916-51041).

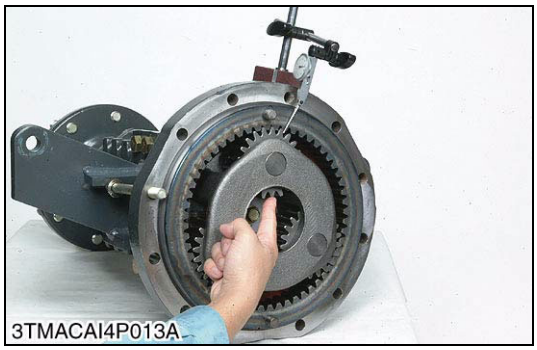
(When reassembling)

- Apply grease to the oil seal lips.

(1) Rear Axle Cover Puller (2) Rear Axle Cover

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[3] SERVICING



Backlash between Internal Gear and Planetary Gear

1. Set a dial indicator (lever type) on the tooth of the planetary gear.
2. Hold the planetary gear support and move only the planetary gear to measure the backlash.
3. If the measurement exceeds the allowable limit, check the planetary gear and planetary shaft.

Backlash between internal gear and planetary gear	Factory specification	0.10 to 0.20 mm 0.0039 to 0.0079 in.
	Allowable limit	0.5 mm 0.020 in.

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Thrust Collar Thickness

1. Measure the thickness of the thrust collar.
2. If the measurement is less than the allowable limit, replace it.

Thrust collar thickness	Factory specification	1.55 to 1.65 mm 0.0610 to 0.0650 in.
	Allowable limit	1.2 mm 0.047 in.

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Clearance between Planetary Gear and Planetary Gear Shaft

1. Measure the planetary gear shaft O.D. (rubbing surface).
2. Measure the planetary gear I.D. (rubbing surface).
3. Measure the O.D. of the two needles installed diagonally in the needle bearing.
4. Calculate the clearance.
5. (Clearance = Planetary gear I.D. - {(2 × Needle O.D.) + Planetary gear shaft O.D.}).
6. If the clearance exceeds the allowable limit, replace them.

Clearance between planetary gear and planetary gear shaft	Factory specification	0.009 to 0.048 mm 0.00035 to 0.00189 in.
	Allowable limit	0.30 mm 0.0118 in.

Planetary gear shaft O.D.	Factory specification	34.989 to 35.000 mm 1.37752 to 1.37795 in.
Planetary gear I.D.	Factory specification	49.009 to 49.025 mm 1.92949 to 1.93012 in.
Needle O.D.	Factory specification	6.994 to 7.000 mm 0.27535 to 0.27559 in.

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5 BRAKES

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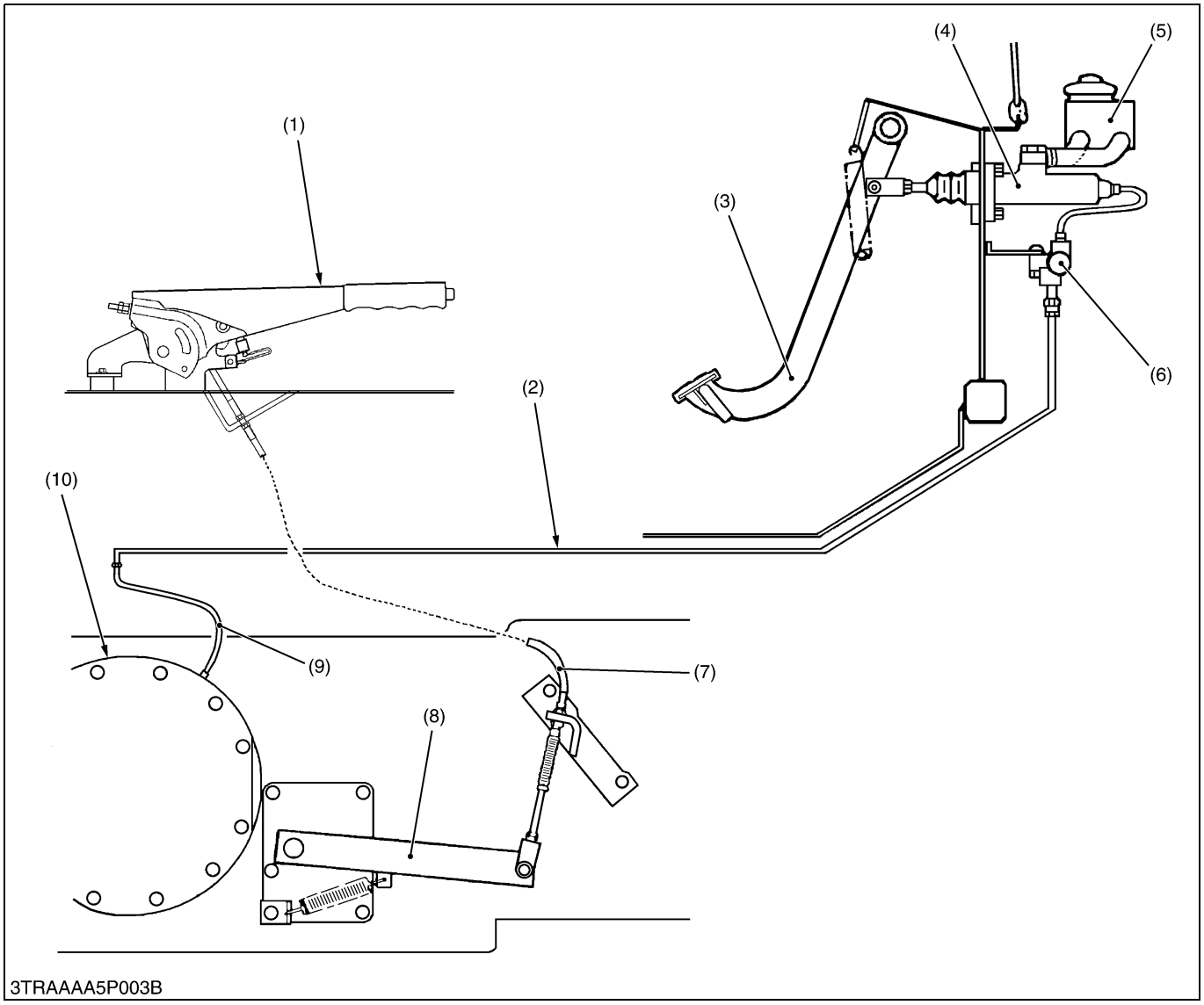
MECHANISM

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1. STRUCTURE..... 5-M1

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1. STRUCTURE



(1) Parking Brake Lever
(2) Brake Pipe
(3) Brake Pedal
(4) Master Cylinder
(5) Brake Oil Reservoir
(6) Equalizer
(7) Parking Brake Wire
(8) Parking Brake Camshaft
(9) Brake Hose
(10) Brake Case

The traveling brake is a hydraulic wet disc type, which consists of the master cylinder (4), equalizer (6), brake pipe (2), brake oil reservoir (5) and others. This type provides high and stable braking effect and requires almost no adjustment.

■ **NOTE**

- **Refer to "5. BRAKES" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).**

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SERVICING

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4. CHECKING, DISASSEMBLING AND SERVICING....5-S4
   [1] CHECKING AND ADJUSTING....5-S4
   [2] DISASSEMBLING AND ASSEMBLING....5-S7
      (1) Master Cylinder and Equalizer....5-S7
      (2) Brake Case....5-S10
      (3) Parking Brake....5-S13
   [3] SERVICING....5-S13

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Poor Braking Force	Brake pedal free travel excessive	Adjust	5-S4
	Brake disc worn	Replace	5-S6 5-S13
	Brake piston warped	Replace	5-S13
	Brake oil insufficient or improper	Fill or change with specified oil	5-S5
	Brake oil leakage from brake pipes, bleeder, master cylinder or equalizer	Repair or replace	5-S5 5-S8
	Master cylinder or equalizer malfunctioning	Repair or replace	5-S8 5-S9
Uneven Braking Force	Brake pedal free travel unevenly adjusted	Adjust	5-S4
	Brake disc worn	Replace	5-S6 5-S13
	Brake piston warped	Replace	5-S13
	Brake oil leakage from brake pipes, bleeder, master cylinder or equalizer	Repair or replace	5-S5 5-S8
	Master cylinder or equalizer malfunctioning	Repair or replace	5-S8 5-S9
Brake Drags	Brake pedal free travel too small	Adjust	5-S4
	Master cylinder return spring weaken or broken	Replace	5-S8
	Master cylinder malfunctioning	Repair or replace	5-S8
	Brake seal failure	Replace	5-S12
	Brake lines clogged	Clean	5-S5
	Brake pedal return spring weaken or broken	Replace	5-S4
	Brake oil improper	Change with specified oil	G-10 5-S5
Spongy Brake Pedal	Brake oil insufficient or improper	Fill or change with specified oil	G-10 5-S5
	Air in brake system	Bleed air	5-S12
Brake Oil Consumed Excessively	Brake seal failure	Replace	5-S12
	Brake oil leakage in brake lines	Repair or replace	5-S5
Poor Parking Brake Force	Parking brake lever free play excessive	Adjust	5-S6
Parking Brake Drags	Parking brake lever free play too small	Adjust	5-S6

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2. SERVICING SPECIFICATIONS

TRAVELING BRAKE

Item		Factory Specification	Allowable Limit
Brake Pedal	Free Travel	7 to 14 mm 0.28 to 0.55 in.	–
	Right and Left (Stroke)	Less than 100 mm 3.9 in.	–
	Difference	0 to 5 mm 0 to 0.20 in.	–
Brake Piston	Flatness	–	0.3 mm 0.012 in.
Brake Disc	Thickness	4.15 to 4.35 mm 0.1634 to 0.1713 in.	3.3 mm 0.130 in.
Plate	Thickness	2.1 to 2.5 mm 0.083 to 0.098 in.	1.5 mm 0.059 in.
Master Cylinder Return Spring	Free Length	78.4 mm 3.087 in.	–
	Setting Load / Setting Length	29.4 N / 60.6 mm 3.0 kgf / 60.6 mm 6.6 lbf / 2.386 in.	–

PARKING BRAKE

Item		Factory Specification	Allowable Limit
Parking Brake Lever	Lever Play (Number of Notches)	2 notches	–
Brake Pad	Thickness (Pad 1)	2.20 mm 0.0866 in.	1.95 mm 0.0768 in.
	Thickness (Pad 2)	2.80 mm 0.1102 in.	2.30 mm 0.0906 in.

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3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-13.)

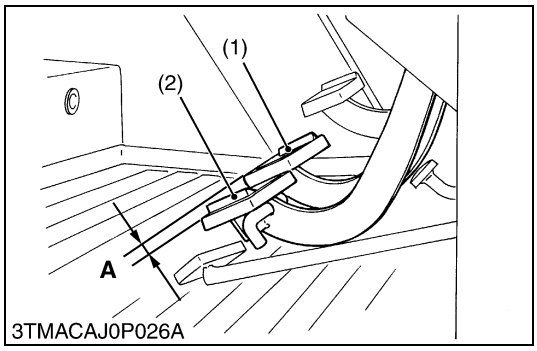
Item	N·m	kgf·m	lbf·ft
Muffler mounting nut	24 to 27	2.4 to 2.8	18 to 20
Brake pipe lock nut	16.0 to 24.0	1.6 to 2.5	11.8 to 17.7
Equalizer plug	78 to 118	8 to 12	58 to 87
Rear wheel mounting nut	343 to 401	35 to 41	254 to 297
Cabin mounting screw and nut	69.0 to 88.0	7.0 to 9.0	50.6 to 65.1
Rear axle case mounting screw	123.6 to 147	12.6 to 15.0	91.2 to 108.4
Stud	61.8 to 73.5	6.3 to 7.5	45.6 to 54.2
Stud lock nut	14.7 to 24.5	1.5 to 2.5	10.9 to 18.0

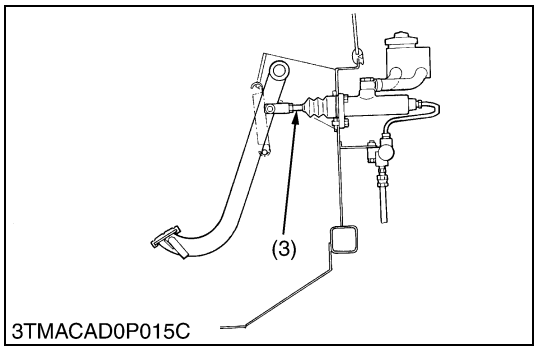
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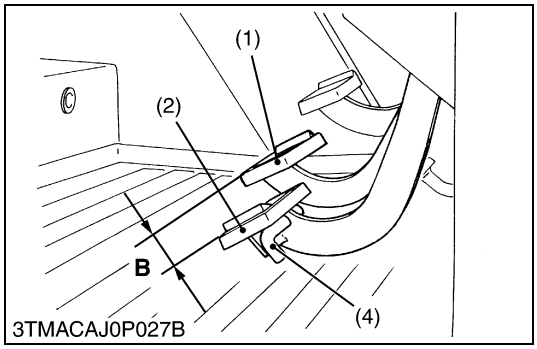
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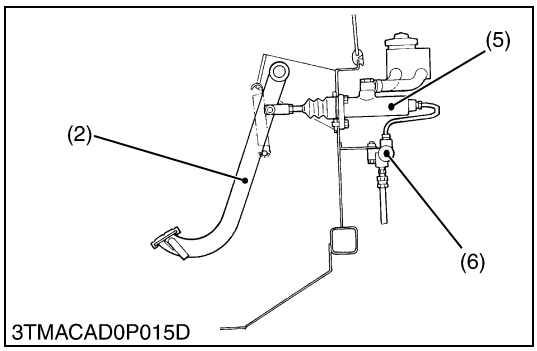
4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING









Adjusting Brake Pedal Free Travel

1) Brake Pedal Free Travel

CAUTION

- **When checking, parking the tractor on flat ground and stop the engine.**

1. Measure the free travel by depressing the brake pedals.
2. Slightly depress the brake pedals and measure free travel at the top of pedal stroke.
3. If the measurement is not within the factory specifications, adjust the free travel by the push rod (3).
4. After adjustment, tighten the lock nut firmly.

IMPORTANT

- **Keep the free travel in the right and left brake pedals equal.**

Brake pedal free travel **"A"**	Factory specification	7 to 14 mm 0.28 to 0.55 in.

2) Brake Pedal Stroke and Difference between Right and Left Pedal Strokes

CAUTION

- **When checking, park the tractor on flat ground and stop the engine.**

1. Disengage the brake pedal lock.
2. Step on either side brake pedal and measure the level difference (pedal stroke) between right and left pedals.
3. Do the same for the other side.
4. If the pedal stroke exceeds the factory specification, check the air bleeding, master cylinder, equalizer brake case.

Brake pedal stroke **"B"**	Factory specification	Less than 100 mm 3.9 in.
Difference between left and right brake pedal stroke	Factory specification	0 to 5 mm 0 to 0.20 in.

3) Equalizer Working Level

1. Gently step on both the right and left pedals at once with our both feet. Step on the right pedal all the way (the left pedal rises). Measure the level difference between the two pedals.
2. Next step on the left pedal all the way and measure the level difference.
3. If the measurement is not within the factory specifications, check the equalizer (6).

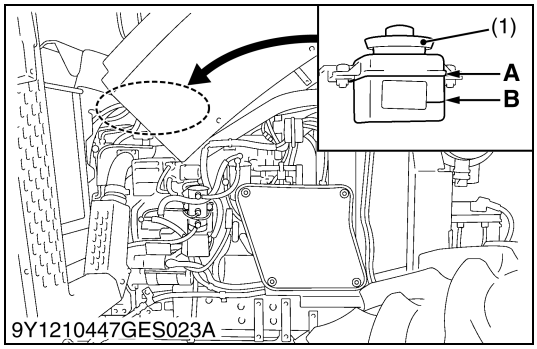
Level difference between two pedals	Factory specification	Less than 10 mm 0.4 in.

(1) Brake Pedal L.H.
(2) Brake Pedal R.H.
(3) Push Rod
(4) Brake Pedal Lock
(5) Master Cylinder
(6) Equalizer

A: Free Travel
B: Pedal Stroke

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Brake Oil

1. Make sure that the brake oil reservoir is filled with the specified amount of brake oil.
2. If the brake oil is insufficient, fill the specified brake oil.

■ **IMPORTANT**

- **Never operate the tractor, if the brake oil is below the "MIN" line.**
- **Wipe the oil reservoir cap (1) and its surrounding before removing it.**
- **When pouring the brake oil, be sure to use the filter and take care not to allow dust or water to enter.**

Brake Oil	Capacity	0.3 L 0.32 U.S.qts 0.26 Imp.qts

(1) Reservoir Cap

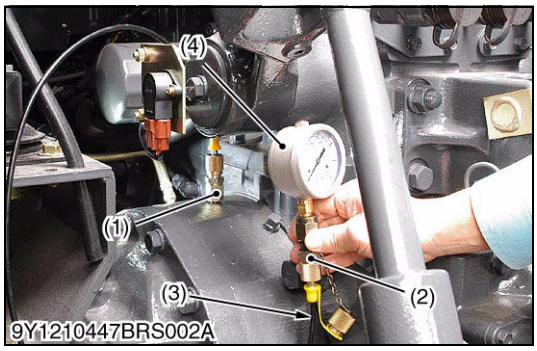
A: MAX Level
B: MIN Level

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Precautions for Brake Oil Handling

- Be sure to use the recommended mineral type brake oil (see "4. LUBRICANTS, FUEL AND COOLANT" in "G. GENERAL" section).
  Never use automotive brake oil. This will cause brake failure.
- When filling brake oil, use the same quality of oil as the one already in the tank. Adding an oil of different make or type can cause damage, and must be avoided.

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Brake Test

1. Remove the bleeder from brake case and set the hydraulic brake adaptor (Code No. 07916-52970) (1), joint (Code No. 07916-50401) (2), cable (Code No. 07916-50331) (3) and pressure gauge (Code No. 07916-52961) (4).
2. Set the pedal fixing plate between the pedal and pedal stopper after depressing the brake pedal to reach the pressure between 2.94 to 3.24 MPa (30 to 33 kgf/cm^2, 426.7 to 469.4 psi).
3. Read the pressure P after one minute.
4. After reading the pressure **P**, wait another five minutes to read the pressure **P** and check the pressure drop. The pressure drop should be within **P** × 0.1 MPa (**P** × 0.1 kgf/cm^2, **P** × 0.1 psi).
5. If the pressure drop is too big, attach the pressure gauge to equalizer (brake pipe rear end) and master cylinder (brake pipe front end) to find out the problem area.

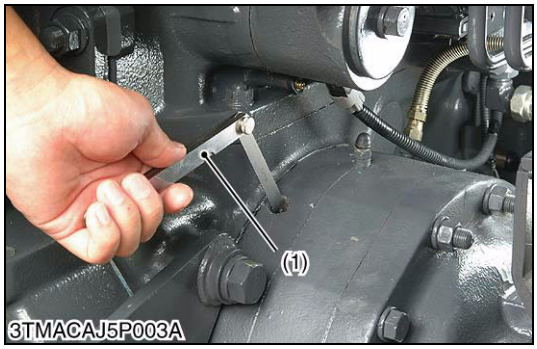
CAUTION

- **If the air is in the master cylinder, brake pipe and case, bleed the air completely.**

(1) Hydraulic Brake Adaptor
(2) Joint
(3) Cable
(4) Pressure Gauge

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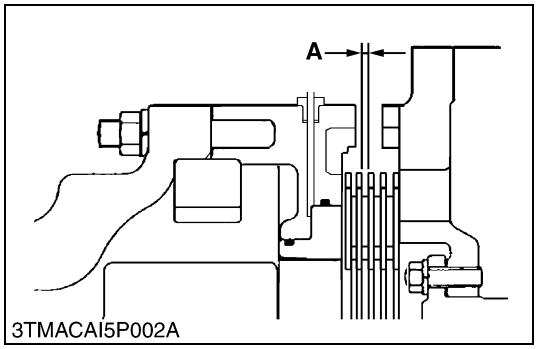
Brake Disc Thickness

1. Remove the checking plug of brake disc thickness at brake case.
2. Press the brake pedal and measure the clearance **"A"** between two brake discs by the feeler gauge.
3. If the measurement is less than the allowable limit, replace the brake disc.

Clearance between two brake discs **A**	Allowable limit	3.3 mm 0.13 in.

(1) Feeler Gauge **A: Clearance**

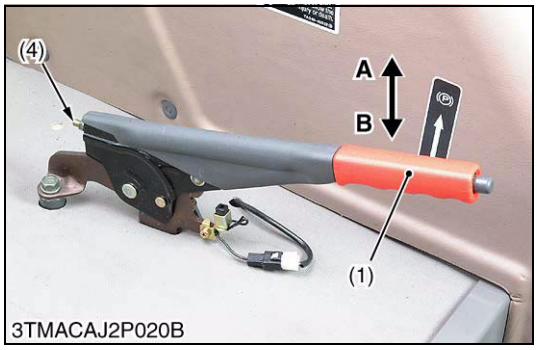
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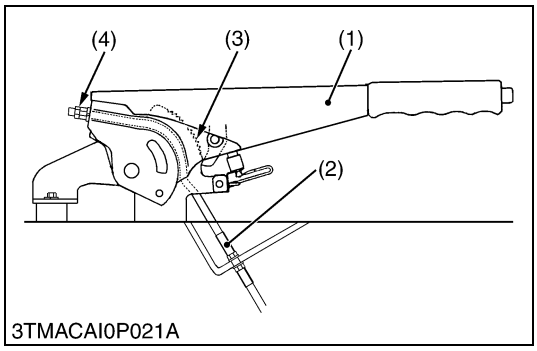


Adjusting Parking Brake Lever Free Play

1. Release the parking brake lever.
2. Pull the parking brake lever with a force of 30 kgf (66.2 lbf) for checking the free play and check the number of notches (3).
3. If the number of notches is not within the factory specifications, loosen the lock nuts (4) and adjust the length of the parking brake wire (2).
4. After adjustment, tighten the lock nuts firmly.

Parking brake lever play (number of notches)	Factory specification	2 notches





■ **IMPORTANT**

- **After adjustment, check the parking brake performance according to steps 1 to 5.**

1. **Set the parking brake lever to below 7th notch.**
2. **Start the engine and set at the idling speed.**
3. **Shift the traveling speed to the maximum speed range.**
4. **Release the clutch pedal slowly, and check that the engine is stopped.**
5. **If the engine is not stopped, check the parking brake pad and brake plate. (See page 5-S13.)**

(1) Parking Brake Lever **A: Pull**
(2) Parking Brake Wire **B: Release**
(3) Notch
(4) Lock Nut

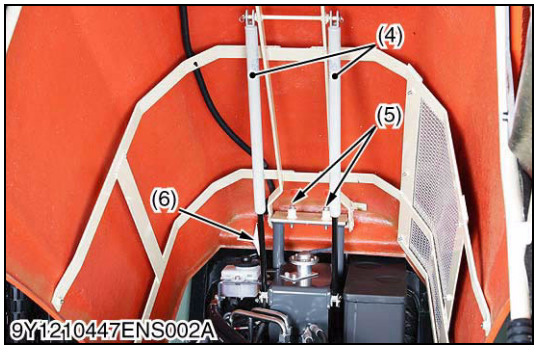
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[2] DISASSEMBLING AND ASSEMBLING

(1) Master Cylinder and Equalizer







Muffler and Bonnet

1. Open the bonnet (1) and disconnect the battery (7) negative cable.
2. Disconnect the **8P** connector (6) for head light.
3. Remove the damper (4) and bonnet bracket mounting screws (5).
4. Remove the bonnet (1).
5. Remove the side cover (3).
6. Remove the muffler (2).

(When reassembling)

■ **NOTE**

- **Be sure to insert the muffler by 42 mm (1.7 in.).**

Tightening torque	Muffler mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

■ **IMPORTANT**

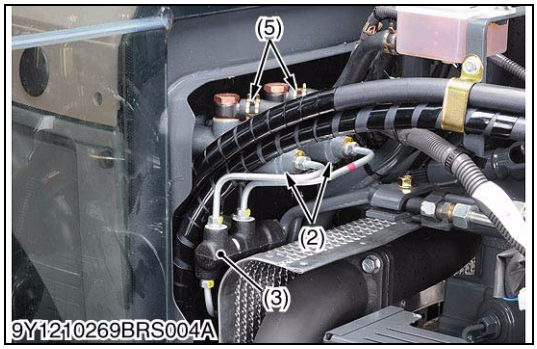
- **When disconnecting the battery cables, disconnect the negative cable first. When connecting, positive cable first.**

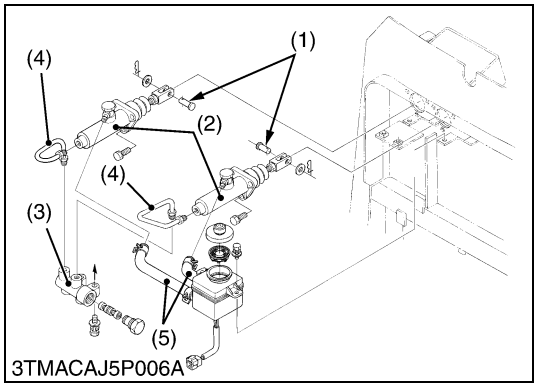
(1) Bonnet
(2) Muffler
(3) Side Cover
(4) Damper
(5) Screw
(6) **8P** Connector
(7) Battery

L: Insertion Length of the Muffler

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Master Cylinder and Equalizer

1. Disconnect the hoses (5).
2. Remove the clevis pin (1) from push rod end.
3. Remove the brake pipe (4).
4. Remove the master cylinder (2) and equalizer (3).

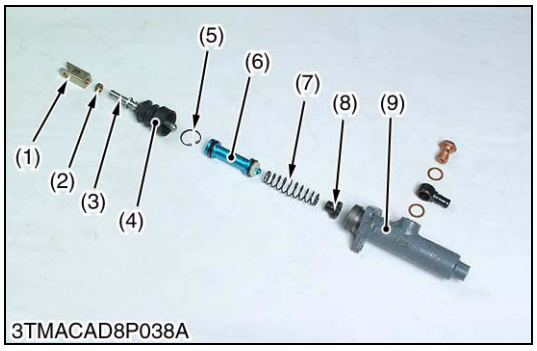
(When reassembling)

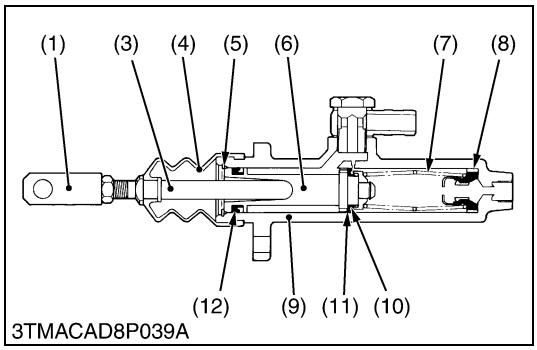
- Wash all parts with clean brake oil. (Refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.)
- Before assembling the cylinder cups and O-rings, immerse them in clean brake oil or apply silicon grease to them.
  Use only the brake oil or silicon grease, otherwise the cylinder cups may be deteriorated.
- It is recommended to replace the cylinder cups and gasket with new ones.
- Check the cylinder port for clogging, the inner surface of cylinder and piston sliding part for damage, wear and rust the spacer for breakage and deformation, the return spring for fatigue and rust.
  If any defect is found, replace it.

Tightening torque	Brake pipe nut	16.0 to 24.0 N·m 1.6 to 2.5 kgf·m 11.8 to 17.7 lbf·ft

(1) Clevis Pin
(2) Master Cylinder
(3) Equalizer
(4) Brake Pipe
(5) Hose

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Master Cylinder

1. Drain the brake oil from the master cylinder.
2. Secure the master cylinder in a vise.
   Remove the push rod (3) and boot (4) as a unit from the master cylinder.
3. Remove the internal snap ring (5), and pull out the piston (6), return spring (7) and outlet valve (8).

(Reference)

- When taking out the piston, supply compressed air slowly to the brake pipe mounting portion.

(When reassembling)

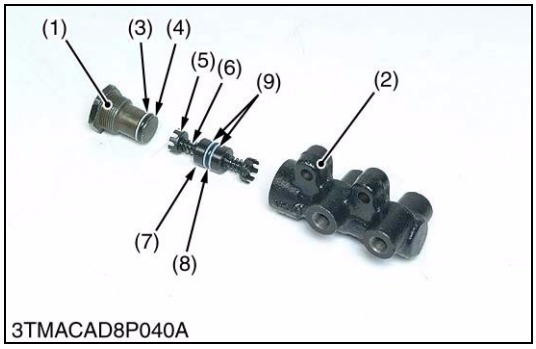
- Install the outlet valve, noting its direction.
- Install the piston, taking care not to damage the cylinder cup lip.
- Bleed the air completely. (See page 5-S12.)

Master cylinder return spring	Free length	78.4 mm 3.087 in.
	Setting load / Setting length	29.4 N / 60.6 mm 3.0 kgf / 60.6 mm 6.6 lbf / 2.386 in.

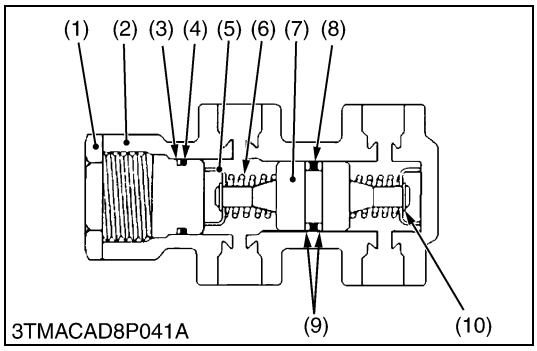
(1) Turnbuckle
(2) Nut
(3) Push Rod
(4) Boot
(5) Internal Snap Ring
(6) Piston
(7) Return Spring
(8) Outlet Valve
(9) Master Cylinder Body
(10) Secondary Cylinder cup
(11) Spacer (Shim)
(12) Primary Cylinder Cup

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Equalizer

1. Drain the brake oil from the equalizer.
2. Secure the equalizer in a vise, remove the plug (1) to pull out the piston sub-assembly.

(When reassembling)

- Install the piston sub-assembly and plug, noting the O-ring.

Tightening torque	Plug	78 to 118 N·m 8 to 12 kgf·m 58 to 87 lbf·ft

(Reference)

Spring	Free length	22.2 mm 0.874 in.
	Setting load / Setting length	12.7 N / 13.5 mm 1.3 kgf / 13.5 mm 2.9 lbf / 0.531 in.

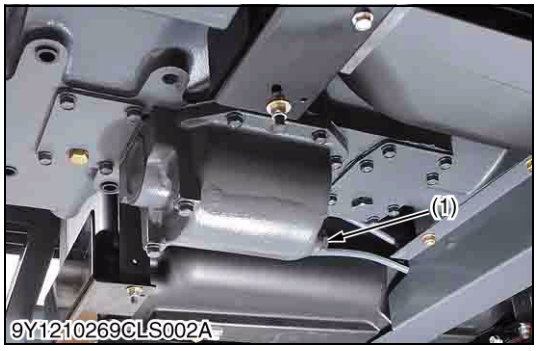
(1) Plug
(2) Equalizer Body
(3) Backup Ring
(4) O-ring
(5) Retainer
(6) Spring
(7) Piston
(8) O-ring
(9) Backup Ring
(10) E Snap Ring

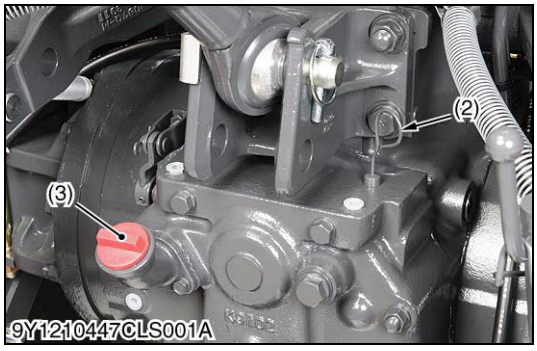
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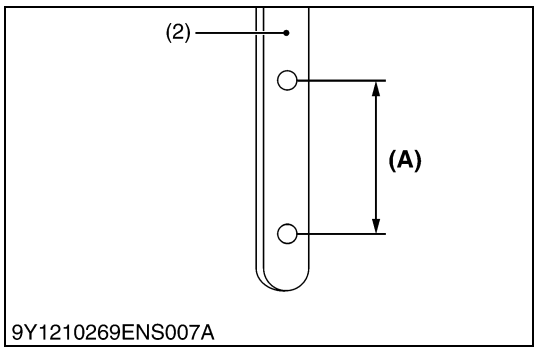
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(2) Brake Case









Draining Transmission Fluid

1. Place an oil pan underneath the transmission case.
2. Remove the drain plugs (1).
3. Drain the transmission fluid.
4. Reinstall the drain plugs (1).

(When reassembling)

- Fill the transmission fluid up to the proper oil level after removing the filling plug (3).
- After running the engine for few minutes, stop it and check the fluid level again, add the fluid to prescribed level if it is not correct level.

■ **IMPORTANT**

- **Use KUBOTA UDT or KUBOTA SUPER UDT fluid. Use of other fluids may damage the transmission or hydraulic system.**
- **Refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.**
- **Do not mix different brands oil together.**

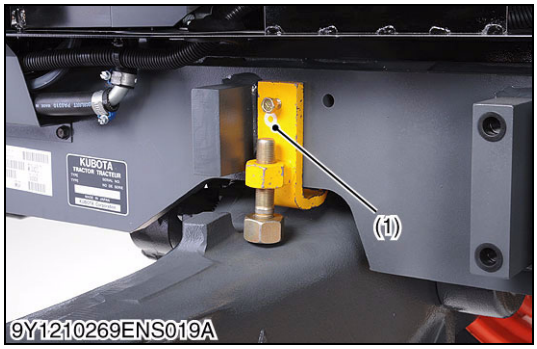
Transmission fluid	Capacity	60.0 L 63.4 U.S.qts 52.8 Imp.qts

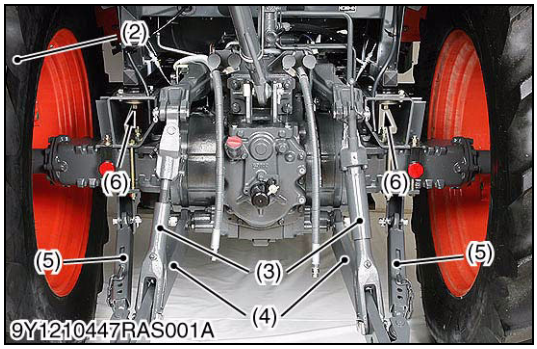
(1) Drain Plug
(2) Dipstick
(3) Filling Plug

(A) Oil level is acceptable within this range.

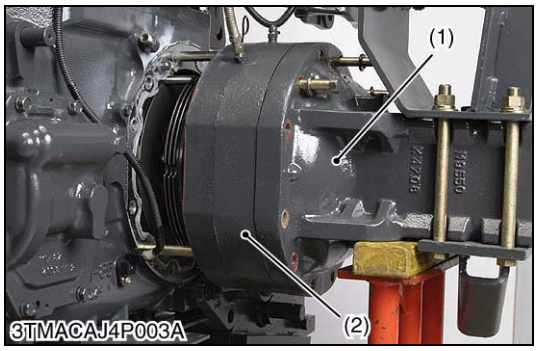
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Rear Wheel and 3-Points Hitch

1. Set the front axle rocking restrictor (see page G-66) (1) to the front axle.
2. Place the disassembling stand under the transmission case.
3. Remove the rear wheel (2).
4. Remove the lifting rod (3) and lower link (4) with stabilizer (5).
5. Remove the cabin mounting screw and nut (6).
6. Hoist the cabin.

(When reassembling)

Tightening torque	Rear wheel mounting nut	343 to 401 N·m 35.0 to 41.0 kgf·m 254 to 297 lbf·ft
	Cabin mounting screw and nut	69 to 88 N·m 7.0 to 9.0 kgf·m 50.6 to 65.1 lbf·ft

(1) Front Axle Rocking Restrictor
(2) Rear Wheel
(3) Lifting Rod
(4) Lower Link
(5) Stabilizer
(6) Cabin Mounting Nut

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Rear Axle Case

1. Set the disassembling stand to the rear axle case.
2. Disconnect the brake hose (3).
3. Remove the rear axle case (1) and brake case (2).

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to the seam of brake case and transmission case.
- Be sure to bleed the brake system completely. (See page 5-S12.)

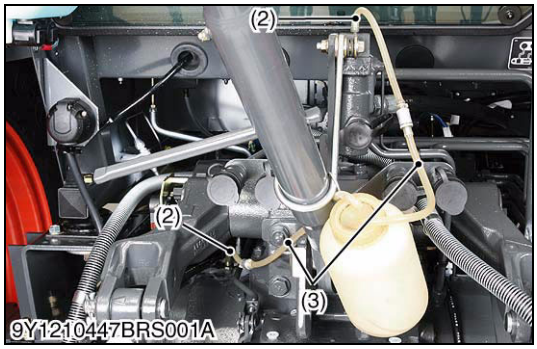
Tightening torque	Rear axle case mounting screw and nut	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.6 lbf·ft

(1) Rear Axle Case
(2) Brake Case
(3) Brake Hose

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Air Bleeding

■ **NOTE**

- **While bleeding, make sure to keep enough brake oil in the brake oil reservoir**

1. Disconnect the brake pipes (1) from the master cylinder.
2. Move the brake pedal up and down by hand. At this time, when raising the pedal, close the master cylinder outlet by a finger, and when lowering, release the finger.
   Repeat this operation several times.
3. After bleeding the master cylinder, install the front brake pipes.
4. After installing the vinyl pipe (3) to the bleeder (2) loosen the bleeder two turns.
5. Move the brake pedal up and down.
   Repeat this motion until air bubble in brake oil disappears.
   After bleeding, tighten the bleeders firmly.

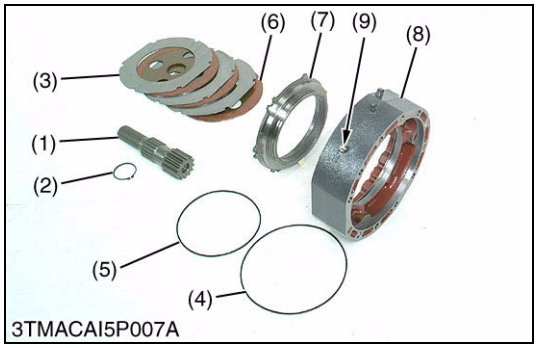
Tightening torque	Brake pipe nut	16.0 to 24.0 N·m 1.6 to 2.5 kgf·m 11.8 to 17.7 lbf·ft

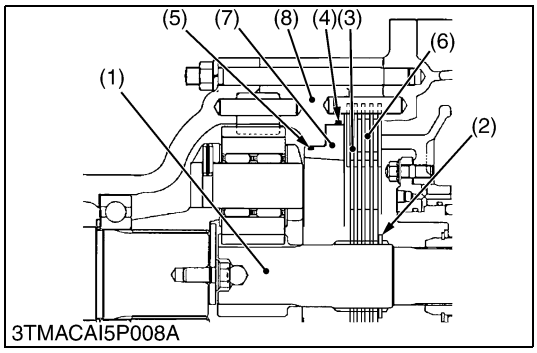
(Reference: Importance of Bleeding)

- If the air mixes in the brake hydraulic circuit, poor or no braking force is obtained due to compress the air even when the brake pedal is pressed.
  Accordingly whenever the hydraulic brake system is disassembled, be sure to bleed after reassembling.

(1) Brake Pipe
(2) Bleeder
(3) Vinyl Pipe

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Brake Case

1. Draw out the brake shaft (1) with brake discs (6) and plates (3).
2. Remove the external snap ring (2) and remove the brake discs and plates.
3. Remove the brake piston (7) from the brake case (8) with compressed air. (Slowly inject an air from brake hose joint (9).)

(When reassembling)

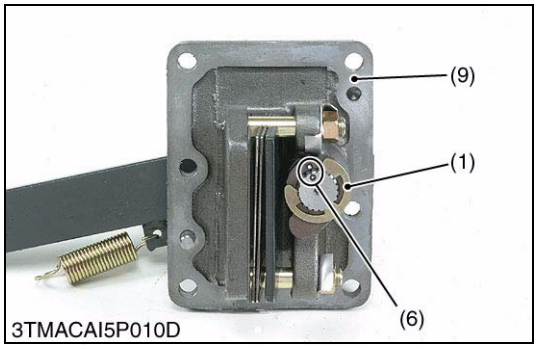
- Install the brake seals (4), (5), noting its direction and distortion.
- Take care not to enter the foreign matter into the seal groove inside brake case.
- Install the plates, noting its direction (flat edge down).
- install the brake discs with their hoses aligned to the next holes.
- When installing the brake piston, apply silicon grease to the brake seals, and tap it in evenly and lightly using a soft hammer.
- Be sure to bleed the brake system completely. (See page 5-S12.)

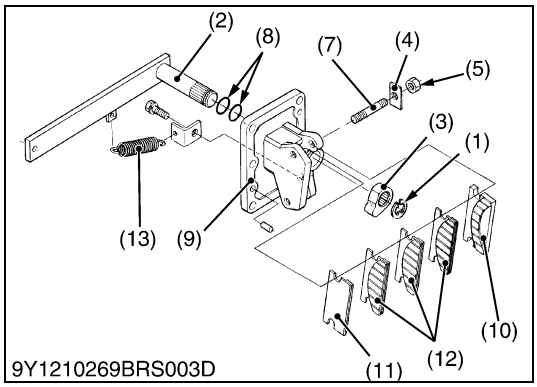
(1) Brake Shaft
(2) External Snap Ring
(3) Plate
(4) Brake Seal 2
(5) Brake Seal 1
(6) Brake Disc
(7) Brake Piston
(8) Brake Case
(9) Brake Hose Joint

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(3) Parking Brake





Parking Brake Pad

1. Remove the E snap ring (1), and put out the parking brake camshaft (2) and parking brake cam (3).
2. Straighten the lock plate (4) and loosen the nut (5).
3. Remove the parking brake pads.

(When reassembling)

- Align the alignment marks (6) of the parking brake camshaft (2) and parking brake cam (3).
- Install the parking brake pad, noting its direction.
- After tightening the nut (5), bend the lock plate (4) firmly.
- Apply grease to the O-rings.

Tightening torque	Stud (7)	61.8 to 73.5 N·m 6.3 to 7.5 kgf·m 45.6 to 54.2 lbf·ft
	Stud lock nut	14.7 to 24.5 N·m 1.5 to 2.5 kgf·m 10.9 to 18.0 lbf·ft

■ **NOTE**

- **Excessively tightened the stud lock nut (5) causes damage to the parking brake case.**
  Tighten it to the specified torque.

(1) E Snap Ring
(2) Parking Brake Camshaft
(3) Parking Brake Cam
(4) Lock Plate
(5) Nut
(6) Alignment Mark
(7) Stud
(8) O-ring
(9) Parking Brake Case
(10) Brake Plate
(11) Brake Pad 1
(12) Brake Pad 2
(13) Spring

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[3] SERVICING



Brake Piston Flatness

1. Place the brake piston on flat surface (surface plate) and determine if a 0.3 mm (0.012 in.) feeler gauge will fit underneath.
2. Check this at four points on a diagonal line.
3. If it will fit, grind in a circular motion with sandpaper or replace it.
4. Inspect the sliding portion of the brake piston and brake case interior. If damage or wear is found, replace it.

Brake piston flatness	Allowable limit	0.3 mm 0.012 in.

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Brake Disc Wear

1. Measure the brake disc thickness with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

Brake disc thickness	Factory specification	4.15 to 4.35 mm 0.1634 to 0.1713 in.
	Allowable limit	3.3 mm 0.130 in.

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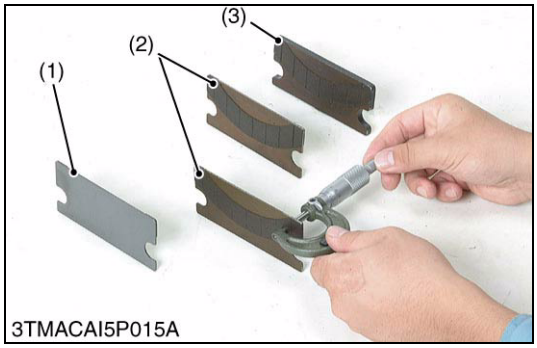


Brake Plate Wear

1. Measure the brake plate thickness with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.

Plate thickness	Factory specification	2.1 to 2.5 mm 0.083 to 0.098 in.
	Allowable limit	1.5 mm 0.059 in.

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Parking Brake Pad and Friction Plate Wear

1. Measure the brake pad thickness with vernier calipers.
2. Measure the friction plate thickness with vernier calipers.
3. If the thickness is less than the allowable limit, replace it.

Brake pad thickness	Factory specifica-tion	Pad 1	2.20 mm 0.0866 in.
		Pad 2	2.80 mm 0.1102 in.
	Allowable limit	Pad 1	1.95 mm 0.0768 in.
		Pad 2	2.30 mm 0.0906 in.

(1) Brake Pad 1
(2) Brake Pad 2
(3) Brake Plate

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6 FRONT AXLE

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MECHANISM

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1. STRUCTURE..... 6-M1

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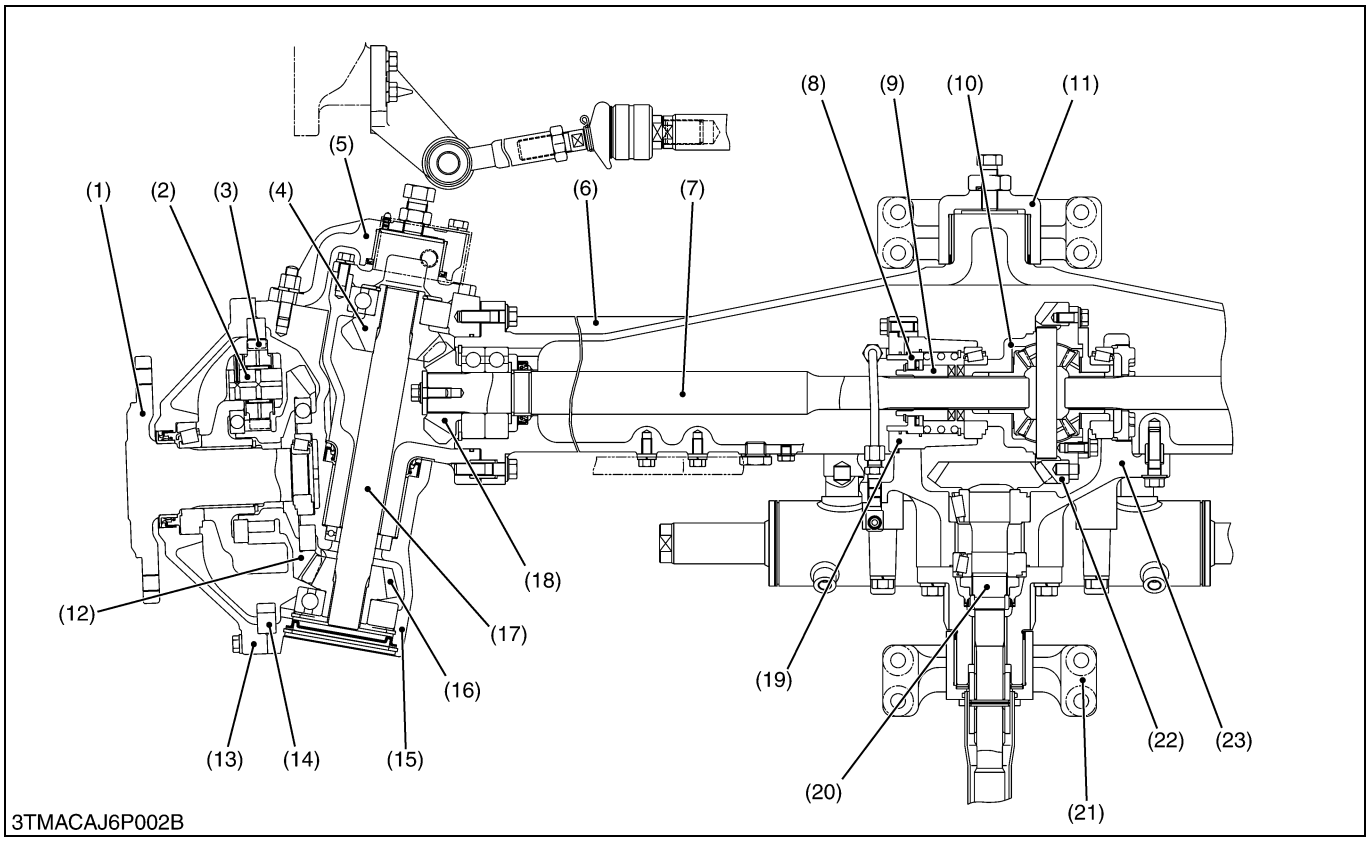
1. STRUCTURE

The front axle supports the front of tractor and facilitates steering. The four wheel drive axle has powered front wheels.

■ **NOTE**

- **Refer to "6. FRONT AXLE" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).**

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(1) Front Axle
(2) Planetary Gear Pin
(3) 17T Planetary Gear
(4) 16T Bevel Gear
(5) Front Axle Case Support
(6) Front Differential Case
(7) Differential Yoke Shaft
(8) Piston
(9) Clutch
(10) Differential Case
(11) Bracket (Front)
(12) 35T Bevel Gear
(13) Front Axle Case Cover
(14) 56T Internal Gear
(15) Front Axle Case
(16) 14T Bevel Gear
(17) Bevel Gear Shaft
(18) 15T Bevel Gear
(19) Differential Bearing Support
(20) 18T Bevel Pinion Shaft
(21) Bracket (Rear)
(22) 33T Bevel Gear
(23) Pinion Bearing Case

The front axle of the 4WD is constructed as shown above. Power is transmitted from the transmission through the propeller shaft and to the bevel pinion shaft (20), then to the bevel gear (22) after that to the differential gear.

The power through the differential is transmitted to the differential yoke shaft (7), and to the bevel gear shaft (17) in the front axle case (15).

The revolution is greatly reduced by the bevel gears (16), (12), then the power is transmitted to the axle (1).

The differential system allows each wheel to rotate at a different speed to make turning easier.

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SERVICING

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Front Wheels Wander to Right or Left	Tire pressure uneven	Adjust	G-72
	Improper toe-in adjustment (improper alignment)	Adjust	G-30
	Clearance between front axle case boss and front axle bracket (front, rear) bushing excessive	Replace	6-S24
	Front wheel sway excessive	Replace	6-S5
	Tie-rod end loose	Tighten	6-S9
	Air sucked in power steering circuit	Bleed	–
	Poor tightening torque of king pin pivot adjusting screw	Adjust	6-S6
Front Wheels Can Not Be Driven	Propeller shaft broken	Replace	6-S8
	Front wheel drive gears in transmission broken	Replace	3-S29
	Front differential gear broken	Replace	6-S16
	Coupling displaced	Reassemble	6-S8
Noise	Gear backlash excessive	Adjust or replace	6-S19 6-S20
	Oil insufficient	Fill	G-10
	Bearings damaged or broken	Replace	6-S19 6-S20
	Gears damaged or broken	Replace	6-S19 6-S20

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
Front Wheel Alignment	Toe-in	2.0 to 15.0 mm 0.08 to 0.59 in.	–
Front Wheel	Steering Angle	0.840 to 0.873 rad 48 to 50 °	–
	Axial Sway	5.0 mm 0.197 in.	–
Spiral Bevel Pinion Shaft	Turning Torque	1.47 to 1.96 N·m 0.15 to 0.20 kgf·m 1.08 to 1.45 lbf·ft	–
Differential Case to Differential Side Gear	Clearance	0.050 to 0.151 mm 0.00197 to 0.00594 in.	0.35 mm 0.0138 in.
• Differential Case	I.D.	40.500 to 40.562 mm 1.59449 to 1.59693 in.	–
• Differential Side Gear	O.D.	40.411 to 40.450 mm 1.59098 to 1.59252 in.	–
Differential Pinion Shaft to Differential Pinion Gear	Clearance	0.080 to 0.122 mm 0.00315 to 0.00480 in.	0.25 mm 0.0098 in.
• Differential Pinion Shaft	I.D.	19.959 to 19.980 mm 0.78579 to 0.78661 in.	–
• Differential Pinion Gear	O.D.	20.060 to 20.081 mm 0.78976 to 0.79059 in.	–
Differential Pinion Gear to Differential Side Gear	Backlash	0.1 to 0.3 mm 0.004 to 0.012 in.	0.4 mm 0.0157 in.
Spiral Bevel Pinion Shaft to Bevel Gear	Backlash	0.20 to 0.30 mm 0.008 to 0.012 in.	0.4 mm 0.0157 in.
Differential Assembly	Turning Torque	2.45 to 4.41 N·m 0.25 to 0.45 kgf·m 1.81 to 3.25 lbf·ft	–
Bearing Retainer	O.D.	64.970 to 65.000 mm 2.55787 to 2.55906 in.	–
Bevel Gear Case Boss	O.D.	69.970 to 70.000 mm 2.75472 to 2.75591 in.	–
Bevel Gear in Bevel Gear Case	Backlash	0.20 to 0.30 mm 0.0079 to 0.0118 in.	0.4 mm 0.016 in.
Planetary Gear, Needle Bearing and Shaft	Clearance	0.009 to 0.046 mm 0.00035 to 0.00181 in.	0.3 mm 0.012 in.
• Shaft	O.D.	29.991 to 30.000 mm 1.18075 to 1.18110 in.	–
• Planetary Gear	I.D.	37.009 to 37.025 mm 1.45705 to 1.45768 in.	–
• Needle	O.D.	3.494 to 3.500 mm 0.13756 to 0.13780 in.	–
Thrust Collar (Planetary Gear)	Thickness	1.55 to 1.65 mm 0.0610 to 0.0650 in.	1.0 mm 0.039 in.

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Item		Factory Specification	Allowable Limit
Internal Gear to Planetary Gear	Backlash	0.08 to 0.30 mm 0.0031 to 0.0118 in.	0.5 mm 0.020 in.
Bevel Gear to Front Wheel Case	Backlash	0.20 to 0.30 mm 0.0079 to 0.0118 in.	0.4 mm 0.016 in.
Front Axle	Turning Force	19.6 to 29.4 N 2.0 to 3.0 kgf 4.4 to 4.6 lbf	–
	Turning Torque	1.96 to 2.94 N 0.2 to 0.3 kgf 1.45 to 2.17 lbf	–
Pinion Bearing Case Boss	O.D.	64.970 to 65.000 mm 2.55788 to 2.55906 in.	–
Front Differential Case Boss	O.D.	69.970 to 70.000 mm 2.75472 to 2.75591 in.	–

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3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-13.)

Item	N·m	kgf·m	lbf·ft
Tie-rod joint lock nut	166.8 to 196.1	17.0 to 20.0	123.0 to 144.6
King pin pivot adjusting screw	4.9 to 9.8	0.5 to 1.0	3.62 to 7.24
King pin pivot adjusting screw lock nut	98.1 to 147.1	10.0 to 15.0	72.3 to 108.5
Knuckle arm mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Tie-rod end slotted nut	156.9 to 196.1	16.0 to 20.0	115.7 to 144.6
Front tire mounting nut	166.8 to 196.1	17.0 to 20.0	123.0 to 144.6
Power steering hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.2
Front differential lock hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.6 to 20.2
Bevel gear case mounting screw (M14-7T)	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Bevel gear case mounting screw (M12 UBS screw)	127.5 to 142.2	13.0 to 14.5	94.0 to 104.9
Bevel gear case mounting screw (M14 UBS screw)	166.8 to 196.1	17.0 to 20.0	123.0 to 144.6
Bevel gear case mounting screw (M10 UBS screw)	70.7 to 90.2	7.2 to 9.2	52.1 to 66.5
Front axle bracket mounting nut	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Front axle bracket mounting screw	166.8 to 196.1	17.0 to 20.0	123.0 to 144.6
Power steering cylinder mounting screw and nut	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Pinion bearing case mounting screw (M12 UBS screw)	127.5 to 142.2	13.0 to 14.5	94.0 to 104.9
Differential bearing support 1 mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Spiral bevel gear mounting screw (M8 UBS screw)	29.4 to 34.3	3.0 to 3.5	21.7 to 25.3
Spiral bevel gear mounting screw (M10 UBS screw)	70.7 to 90.2	7.2 to 9.2	52.1 to 66.5
Differential case cover mounting screw (M10-7T)	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Pinion bearing case cover mounting screw (M14-7T)	166.8 to 196.1	17.0 to 20.0	123.0 to 144.6
Bearing support cover mounting screw (M6-7T)	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31

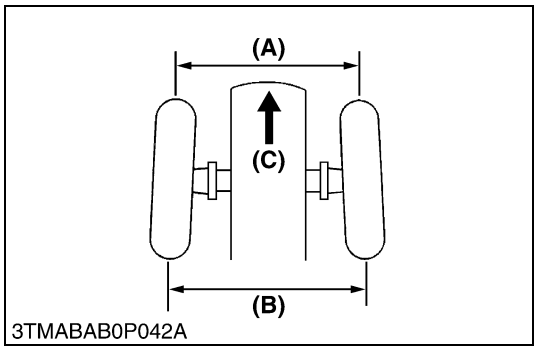
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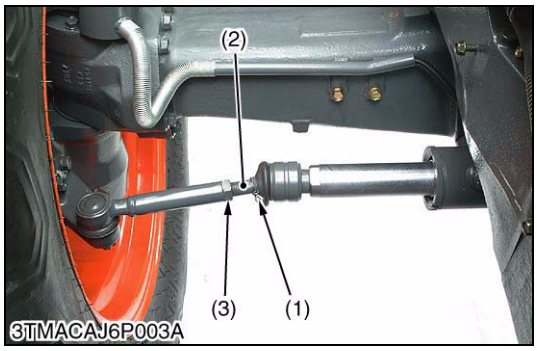
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4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING



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Adjusting Toe-in

1. Park tractor on a flat place.
2. Turn steering wheel so that front wheels are in the straight ahead position.
3. Lower the implement, lock the park brake and stop the engine.
4. Measure distance between tire beads at front of tire, hub height.
5. Measure distance between tire beads at rear of tire, hub height.
6. Front distance should be shorter than rear distance.
7. If not, adjust tie-rod length.

Toe-in **(B)** - **(A)**	Factory specification	2.0 to 15.0 mm 0.08 to 0.59 in.

■ **Toe-in Adjustment**

1. Detach the snap ring (1).
2. Loosen the tie-rod joint lock nut (3).
3. Turn the tie-rod joint (2) to adjust the rod length until the proper toe-in measurement is obtained.
4. Retighten the tie-rod joint lock nut (3).
5. Attach the snap ring (1) of the tie-rod joint.

Tightening torque	Tie-rod joint lock nut	166.8 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.6 lbf·ft

(1) Snap Ring
(2) Tie-rod Joint
(3) Tie-rod Joint Lock Nut
(A) Wheel to Wheel Distance at Front
(B) Wheel to Wheel Distance at Rear
(C) Front

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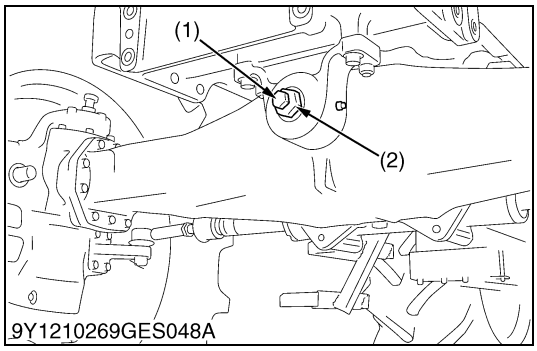

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Axial Sway of Front Wheel

1. Jack up the front side of tractor.
2. Set a dial gauge on the outside of rim.
3. Turn the wheel slowly and rear the runout of rim.
4. If the measurement exceeds the factory specifications, check the bearing, rim and front wheel hub.

Axial sway of front wheel	Factory specification	Less than 5.0 mm 0.197 in.

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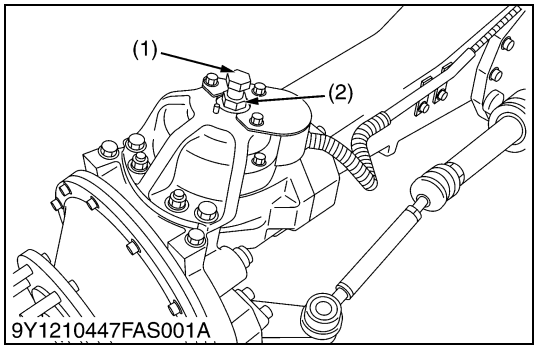
Adjusting Front Axle Pivot

1. Loosen the lock nut, tighten the adjusting screw all the way, and then tighten the screw by 1/6 turn.
2. Retighten the lock nut.

(1) Adjusting Screw
(2) Lock Nut

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Adjusting King-pin Pivot

1. Jack up the tractor, then loosen the lock nut (2).
2. Measure the adjusting screw tightening torque.
3. If tightening torque is not within the factory specifications, adjust the adjusting screw (1).
4. After adjustment, tighten the lock nut (2) firmly.

Tightening torque	Adjusting screw	4.9 to 9.8 N·m 0.5 to 1.0 kgf·m 3.62 to 7.24 lbf·ft
	Lock nut	98.1 to 147.1 N·m 10.0 to 15.0 kgf·m 72.3 to 108.5 lbf·ft

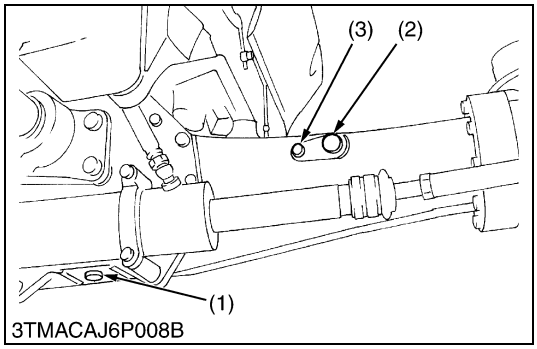
(1) Adjusting Screw (2) Lock Nut

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[2] PREPARATION

(1) Separating Front Axle



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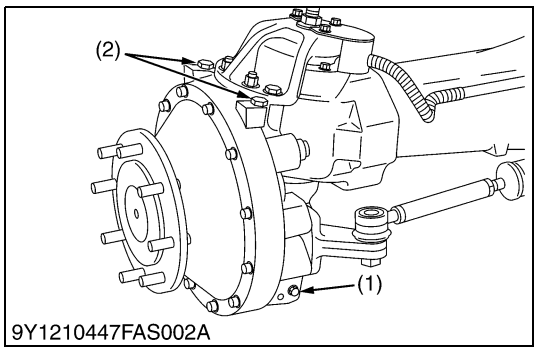
Draining Front Differential Case Oil

1. To drain the used oil, remove the drain and filling plug (1), (2) at the front differential case and drain the oil completely into the oil pan.
2. After draining, reinstall the drain plug (1).
3. Remove the oil level check plug (3).
4. Fill with the new oil up to the lower rim of check plug port. Refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.
5. After filling, reinstall the filling plug (2) and check plugs (3).

Front differential case oil	Capacity	13.0 L 13.7 U.S.qts 11.4 Imp.qts

(1) Drain Plug
(2) Filling Plug
(3) Check Plug

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Draining Front Axle Gear Case Oil

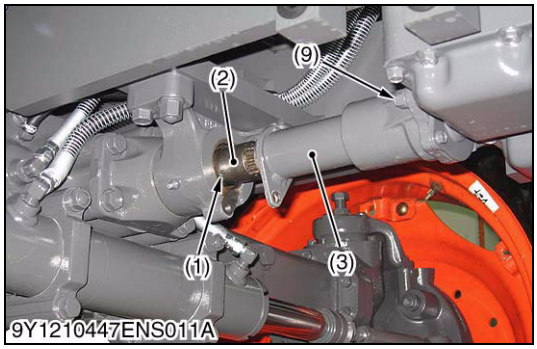
1. To drain the used oil, remove the right and left drain plugs (1) and filling plug (2) at the front axle gear case and drain the oil completely into the oil pan.
2. After draining reinstall the drain plugs (1).
3. Fill with the new oil up to the filling plug port. Refer to "4. LUBRICANTS, FUEL AND COOLANT" at "G. GENERAL" section.
4. After filling, reinstall the filling plugs (2).

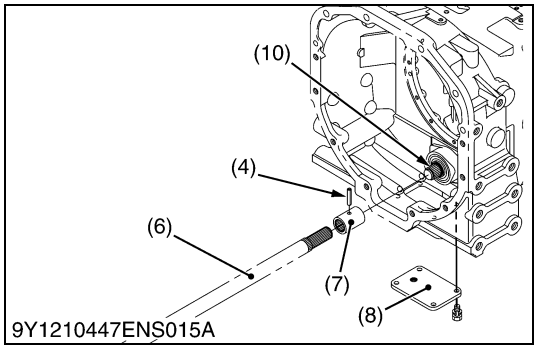
Front axle gear case oil	Capacity	4.5 L 4.8 U.S.qts 4.0 Imp.qts

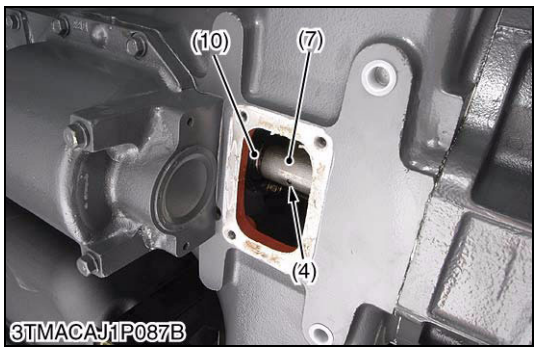
(1) Drain Plug
(2) Filling Plug

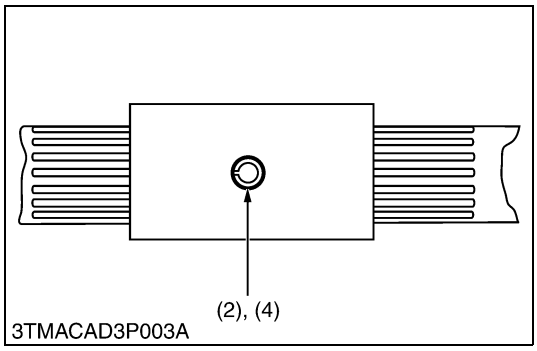
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Propeller Shaft

1. Slide the propeller shaft cover (3) after removing the screw (5).
2. Tap out the spring pins (2) and then slide the coupling (1) to the rear.
3. Remove the cover (8).
4. Tap out the spring pins (4) and then slide the coupling (7) forward.

(When reassembling)

- Please assemble the propeller shaft by following procedure.

1. Loosen the nuts (9).
2. Slide the coupling (7) and match the splines of the coupling (7) and front transmitting shaft (10) only by 10 mm (0.39 in.)
3. Match the spline of the coupling (1), propeller shaft (6) and pinion shaft (11). And then, tap in the spring pin (2) as shown in figure.

■ **NOTE**

- **Apply grease to the coupling (1) splines.**

4. Slide the coupling (7) and tap in the spring pin (4) as shown in figure.

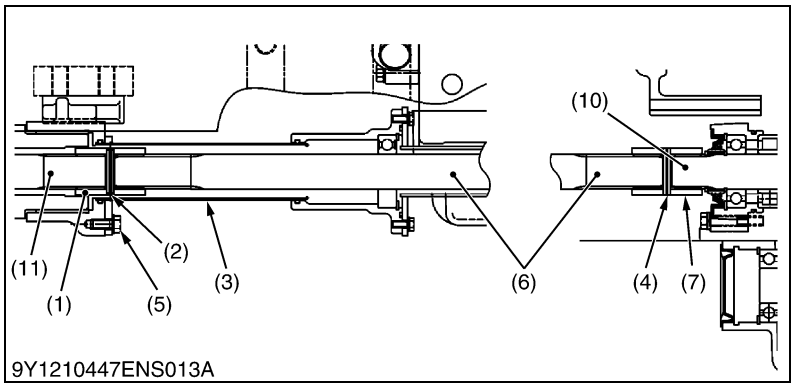
■ **NOTE**

- **Apply grease to the coupling (7) splines.**

5. Tighten the nuts (9).
6. Attach the cover (8).

■ **NOTE**

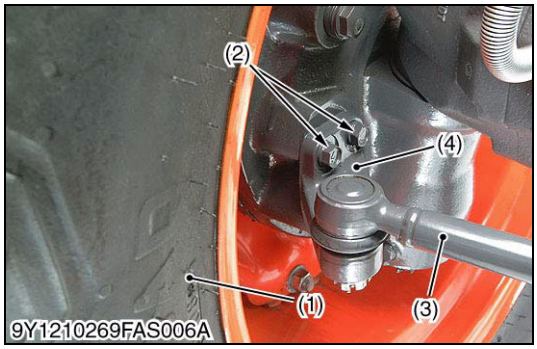
- **Apply liquid gasket (Three Bond 1206D or equivalent) to cover face and cover (8).**



(1) Coupling
(2) Spring Pin
(3) Propeller Shaft Cover
(4) Spring Pin
(5) Screw
(6) Propeller Shaft
(7) Coupling
(8) Cover
(9) Nut
(10) Front Transmitting Shaft
(11) Pinion Shaft

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Front Tire and Knuckle Arm

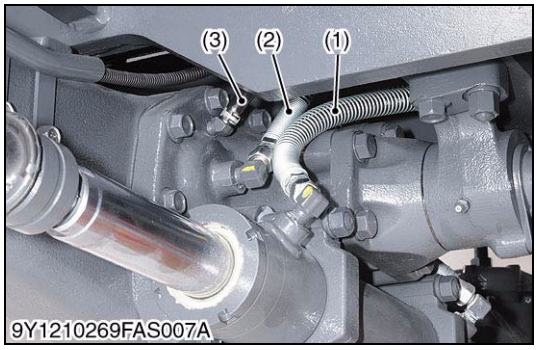
1. Place the disassembly stand under the engine and support it with a jack.
2. Remove the front tire (1).
3. Remove the knuckle arm mounting screws (2) and then remove the knuckle arm (4).

(When reassembling)

Tightening torque	Knuckle arm mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft
	Tie-rod end slotted nut	156.9 to 196.1 N·m 16.0 to 20.0 kgf·m 115.7 to 144.6 lbf·ft
	Front tire mounting nut	166.8 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.6 lbf·ft

(1) Front Tire
(2) Screw
(3) Tie-rod
(4) Knuckle Arm

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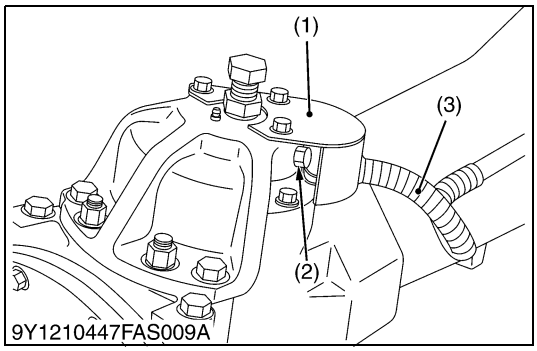
Power Steering Hoses and Front Differential Lock Hose

1. Remove the power steering hoses (1) and front differential lock hose (2).
2. Remove the breather hose (3).

Tightening torque	Power steering hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.2 lbf·ft
	Front differential lock hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.2 lbf·ft

(1) Power Steering Hose
(2) Front Differential Lock Hose
(3) Breather Hose

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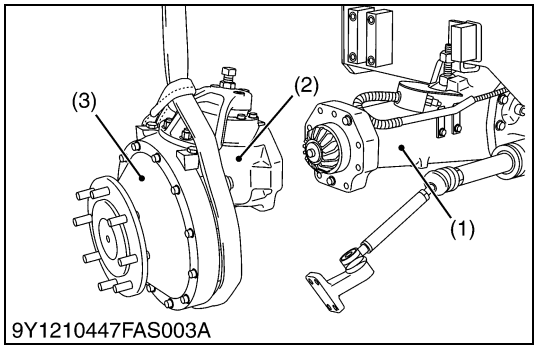
Turning Angle Inspection Switch

1. Remove the switch cover (1).
2. Remove the turning angle inspection switch (2) and wire harness (3).

(1) Cover
(2) Turning Angle Switch
(3) Wire Harness

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Separation of Front Differential Case and Bevel Gear Case

1. Remove the bevel gear case (2) and the front wheel case (3) as a unit from the front differential case (1).

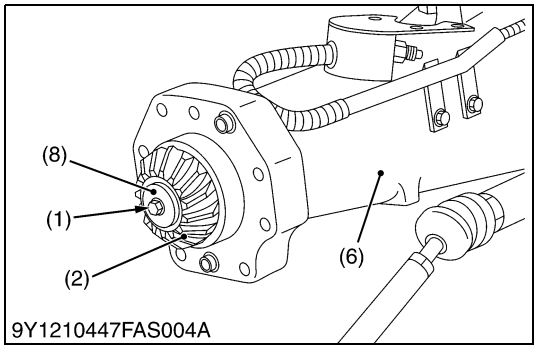
(When reassembling)

- Apply grease to the O-ring.
- Install the bevel gear case to the front differential case, noting the O-ring.

Tightening torque	Bevel gear case mounting screw (M14-7T)	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 lbf·ft
	Bevel gear case mounting screw (M12 UBS screw)	127.5 to 142.2 N·m 13.0 to 14.5 kgf·m 94.0 to 104.9 lbf·ft
	Bevel gear case mounting screw (M14 UBS screw)	166.8 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.6 lbf·ft

(1) Front Differential Case
(2) Bevel Gear Case
(3) Front Wheel Case

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Bevel Gear and Differential Yoke Shaft

1. Loosen the bevel gear mounting screw (1), and remove the bevel gear (2).
2. Remove the internal snap ring (5), and draw out the bearing (4) and differential yoke shaft (3) as a unit from the front differential case (6).

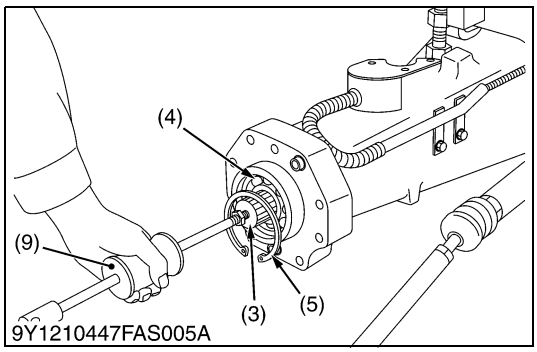
(When reassembling)

- Install the adjusting shims (7) correctly noting their location.
- Install the oil seal to the front differential case so that its lip faces the outward.
- Apply grease to the oil seal.
- Check the identification marks on the bevel gears, the right side has single line and for left side has two lines on the gear teeth.

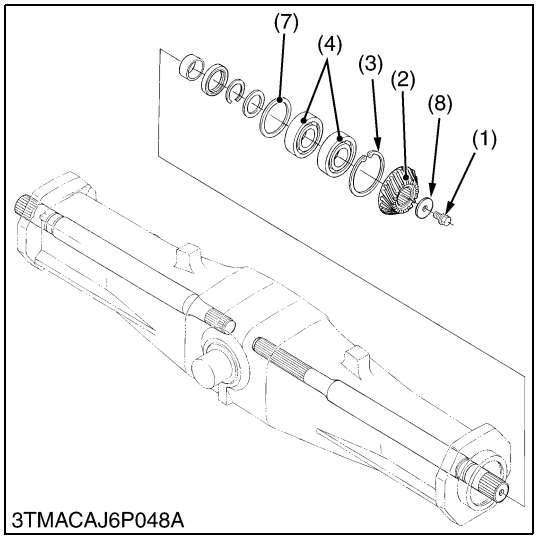
Tightening torque	Bevel gear mounting screw (M10 UBS screw)	70.7 to 90.2 N·m 7.2 to 9.2 kgf·m 52.1 to 66.5 lbf·ft

(1) Screw
(2) Bevel Gear
(3) Differential Yoke Shaft
(4) Bearing
(5) Internal Snap Ring
(6) Front Differential Case
(7) Shim
(8) Collar
(9) Sliding Hammer

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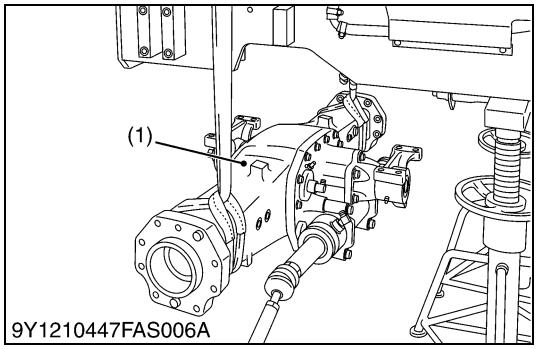


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Front Axle

1. Hoist and hold the front axle with nylon slings.
2. Remove the bracket (front and rear) mounting screws and nuts.
3. Separate the front axle (1) from front axle bracket.

(When reassembling)

- Be sure to adjust the front axle pivot (see page 6-S6).

Tightening torque	Front axle bracket mounting nut	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 lbf·ft
	Front axle bracket mounting screw	166.8 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.6 lbf·ft

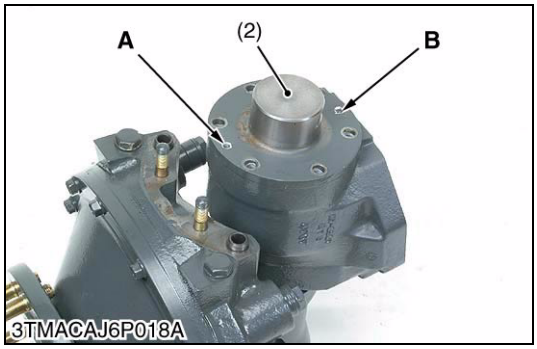
(1) Front Axle

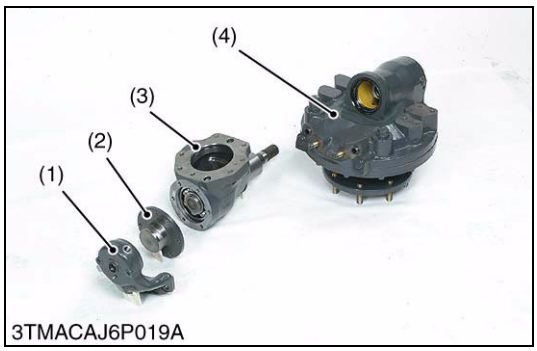
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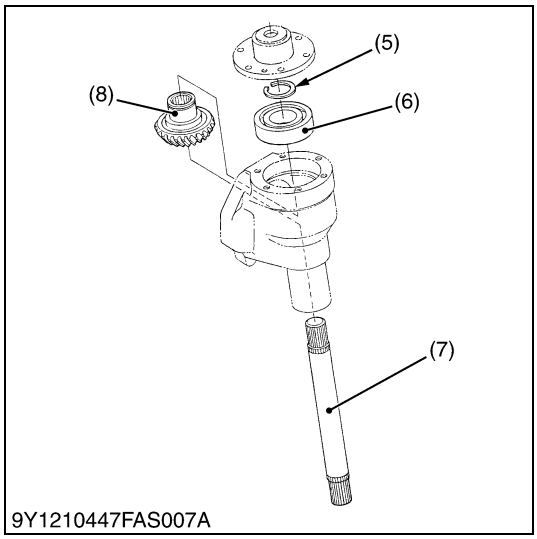
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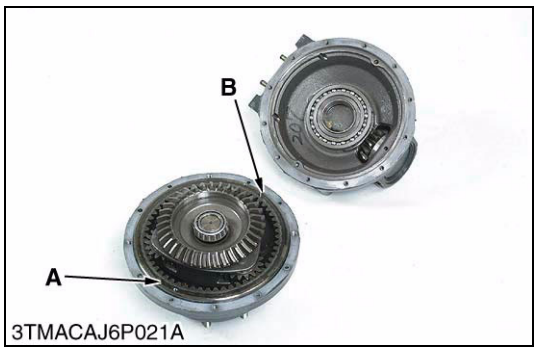
[3] DISASSEMBLING AND ASSEMBLING

(1) Bevel Gear Case Assembly









Bevel Gear Case

1. Remove the front wheel case support (1).
2. Separate the bevel gear case (3) from front wheel case (4).
3. Loosen the bearing retainer (2) mounting screws.
4. Remove the bearing retainer (2) by screwing M8 screw into holes **"A"** and **"B"**.
5. Remove the external snap ring (5).
6. Draw out the bevel gear (8) and bevel gear shaft (7).

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to the bevel gear case.
- Apply grease to the front wheel case support DX bushing and front wheel case DX bushing.
- Install the oil seal to the front wheel case support so that its lip faces the outward.
- Apply gear oil to the bearing.

Tightening torque	Front wheel case support mounting screw (M14, UBS)	166.8 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.6 lbf·ft
	Front wheel case support mounting nut (M14-7T)	166.8 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.6 lbf·ft
	Front wheel case support mounting screw (M12, UBS)	127.5 to 142.2 N·m 13.0 to 14.5 kgf·m 94.0 to 104.9 lbf·ft
	Front wheel case support mounting screw (M12-7T)	103.0 to 117.7 N·m 10.5 to 12.0 kgf·m 75.9 to 86.8 lbf·ft
	Bearing retainer mounting screw (M8-7T)	23.5 to 27.5 N·m 2.4 to 2.8 kgf·m 17.4 to 20.3 lbf·ft
	Bearing retainer mounting screw (M10-7T)	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 lbf·ft

(1) Front Wheel Case Support
(2) Bearing Retainer
(3) Bevel Gear Case
(4) Front Wheel Case
(5) External Snap Ring
(6) Bearing
(7) Bevel Gear Shaft
(8) Bevel Gear

A: Hole for Jack Bolt
B: Hole for Jack Bolt

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Front Wheel Case Cover

1. Remove the front wheel case cover from the front wheel case by screwing M8 screws into hole **"A"** and **"B"**.

(When reassembling)

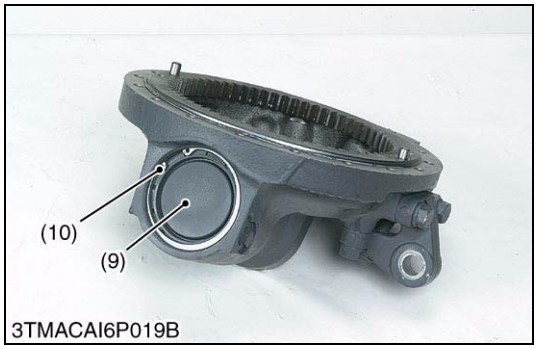
- Apply liquid gasket (Three Bond 1206D or equivalent) to the front wheel case cover.

Tightening torque	Front wheel case cover mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 lbf·ft

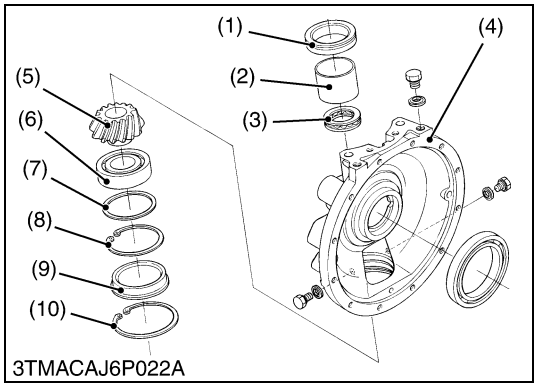
A: Hole for Jack Bolt **B: Hole for Jack Bolt**

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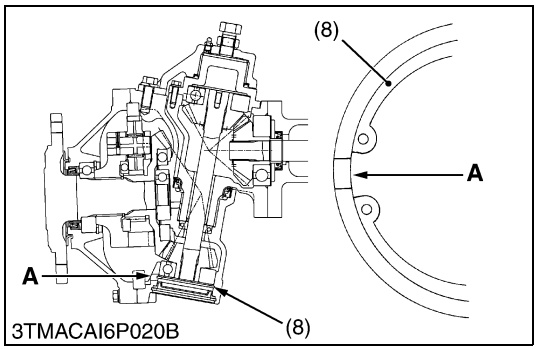
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Front Wheel Case

1. Remove the internal snap ring (10).
2. Remove the cap (9) which is installed in the bottom of front wheel case.
3. Remove the internal snap ring (8) and take out the adjusting shims (7).
4. Tap out bevel gear to downward, and take out the bevel gear (5) and bearing (6) as a unit.

(When reassembling)

- Apply grease to the front wheel case DX bushing (2).
- Apply grease to the oil seal.
- Install the oil seal (1) to the front wheel case so that its lips faces the inward.
- Install the internal snap ring (8) as shown in the figure left side so that align the gap of internal snap ring (8) and by-pass hole **"A"**.
- Apply gear oil to the cap.

(1) Oil Seal
(2) DX Bushing
(3) Thrust Ball Bearing
(4) Front Wheel Case
(5) Bevel Gear
(6) Ball Bearing
(7) Shim
(8) Internal Snap Ring
(9) Cap
(10) Internal Snap Ring

A: By-pass Hole

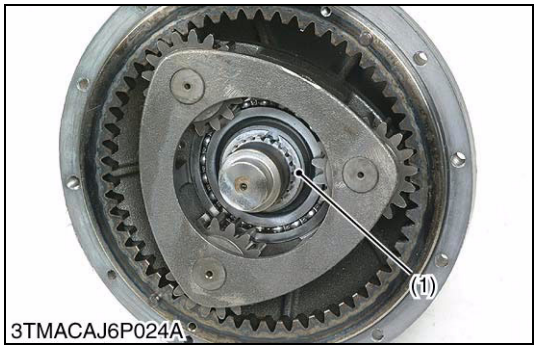
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Bevel Gear

1. Remove the bevel gear and bearing with a puller.

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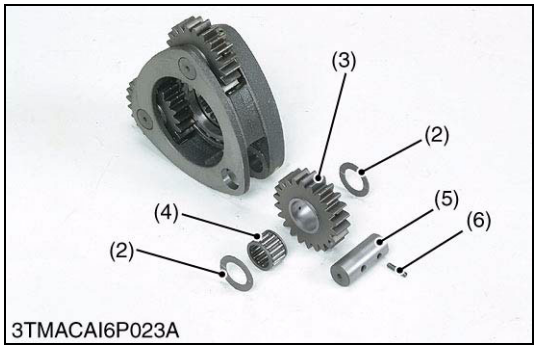


Planetary Gear

1. Remove the external snap ring (1).
2. Remove the planetary gear support assembly.
3. Tap the spring pin (6) into the planetary gear shaft (5).
4. Draw out the planetary gear shaft (5), and remove the planetary gear (3).
5. Tap out the spring pin (6) from the planetary gear shaft (5).

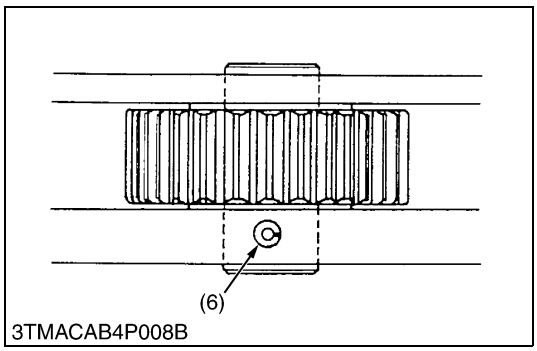
(When reassembling)

- Apply gear oil to the needle bearing (4).
- Tap in the spring pin (6) as shown in the figure left.



(1) External Snap Ring
(2) Thrust Collar
(3) Planetary Gear
(4) Needle Bearing
(5) Planetary Gear Shaft
(6) Spring Pin

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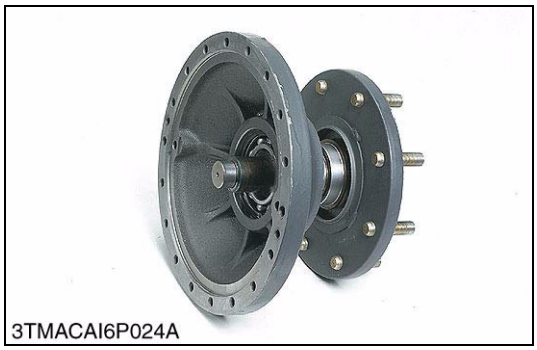


Front Axle

1. Tap out the front axle (8) from front wheel case cover (6).

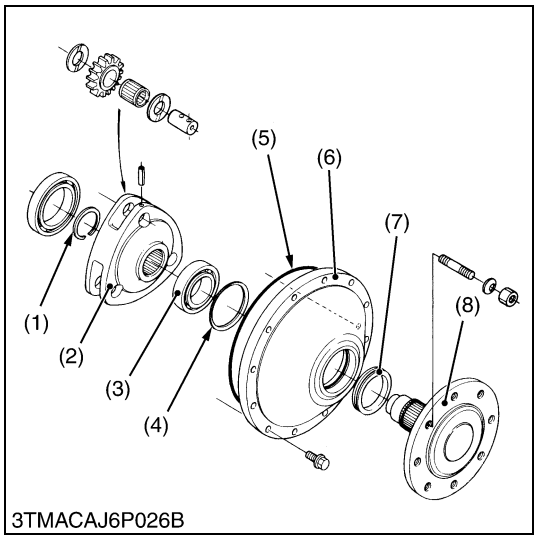
(When reassembling)

- Apply grease to the front axle oil seal (7).
- Install the oil seal to the front wheel case cover so that its lip faces the inward.



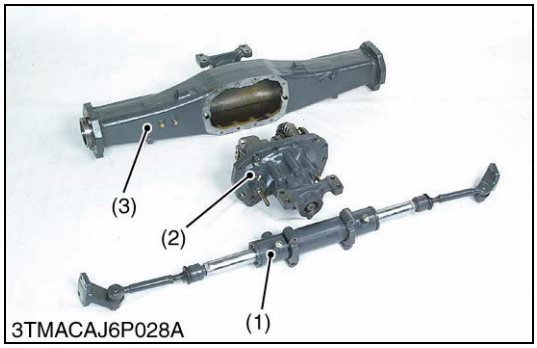
(1) External Snap Ring
(2) Planetary Gear Support
(3) Bearing
(4) Belleville Spring
(5) O-ring
(6) Front Wheel Case Cover
(7) Oil Seal
(8) Front Axle

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(2) Front Differential Assembly



Pinion Bearing Case

1. Remove the power steering cylinder mounting screws and power steering cylinder (1).
2. Remove the pinion bearing case mounting screws.
3. Remove the pinion bearing case (2) from the front differential case (3).

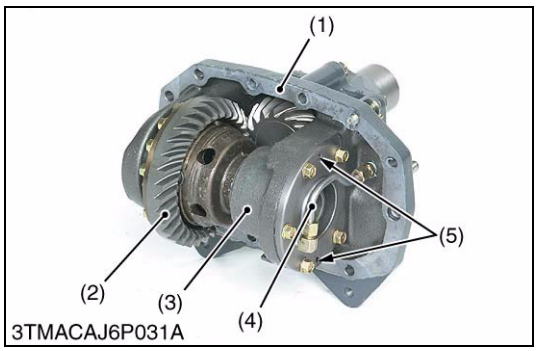
(When reassembling)

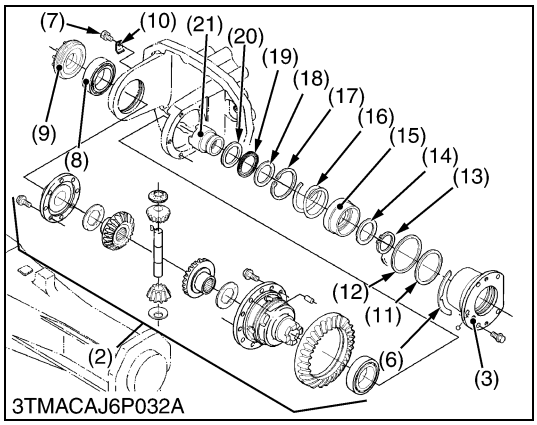
- Apply liquid gasket (Three Bond 1206D or equivalent) to the pinion bearing case (2).
- Apply grease to the O-ring.

Tightening torque	Power steering cylinder mounting screw and nut	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 lbf·ft
	Pinion bearing case mounting screw (M12, UBS screw)	127.5 to 142.2 N·m 13.0 to 14.5 kgf·m 94.0 to 104.9 lbf·ft

(1) Power Steering Cylinder
(2) Pinion Bearing Case
(3) Front Differential Case

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Differential Assembly and Differential Lock Piston

1. Remove the differential lock pipe (4).
2. Remove the differential bearing support 1 (3) mounting screws.
3. Remove the differential bearing support 1 (3) by screwing M8 screws into threaded holes (5), noting the shims (6).
4. Remove the retainer (10) and adjusting screw (9).
5. Remove the differential assembly (2) from the pinion bearing case (1).
6. Remove the internal snap ring (17).
7. Tap out the differential lock piston (15) with differential lock clutch (21).
8. Remove the external snap ring (13).
9. Remove the differential lock clutch (21).

(When reassembling)

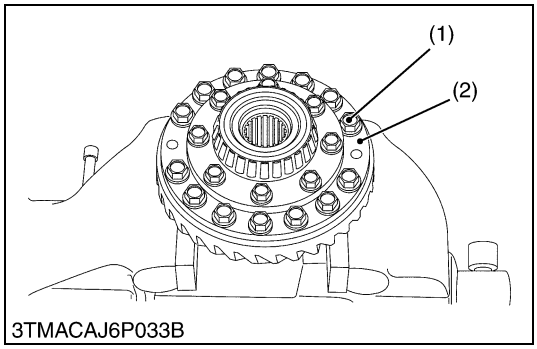
- Be sure to adjust the backlash and tooth contact between spiral bevel gear and spiral bevel pinion shaft. (See page 6-S20.)
- Apply oil to the thrust needle bearing (19).
- Apply grease to the D-ring 1 (11) and D-ring 2 (12).
- Be sure to direct the groove side of the collar (14) to the differential lock piston (15).

Tightening torque	Differential bearing support 1 mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 lbf·ft

(1) Pinion Bearing Case
(2) Differential Assembly
(3) Differential Bearing Support 1
(4) Differential Lock Pipe
(5) Threaded Hole
(6) Shim
(7) Bolt
(8) Bearing
(9) Adjusting Screw
(10) Retainer
(11) D-ring
(12) D-ring
(13) External Snap Ring
(14) Collar
(15) Differential Lock Piston
(16) Spring
(17) Internal Snap Ring
(18) Bearing Retainer
(19) Thrust Bearing
(20) Bearing Retainer
(21) Differential Lock Clutch

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Spiral Bevel Gear

1. Remove the spiral bevel gear mounting screws (1).
2. Tap out the spiral bevel gear (2) from the differential gear case.

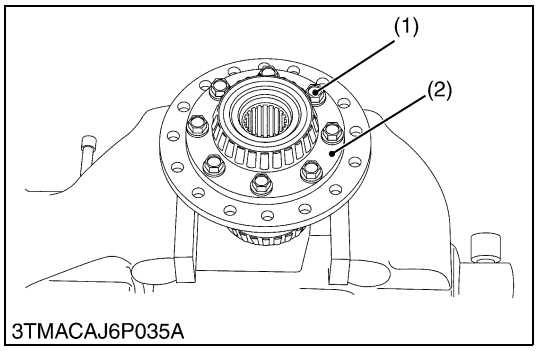
(When reassembling)

- Apply lock tight (Three Bond 1324B or equivalent) to the spiral bevel gear mounting screws.

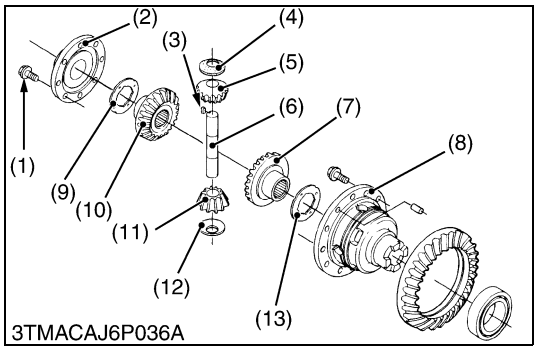
Tightening torque	Spiral bevel gear mounting screw (M8 UBS screw)	29.4 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft
	Spiral bevel gear mounting screw (M10 UBS screw)	70.7 to 90.2 N·m 7.2 to 9.2 kgf·m 52.1 to 66.5 lbf·ft

(1) Screw (2) Spiral Bevel Gear

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Differential Gear

1. Remove the differential case cover mounting screws (1).
2. Remove the differential pinion shaft (6), and tap out the differential case cover (2) from the differential gear case (8) side.
3. Take out the differential side gear (10) and differential side gear washer (9).
4. Take out the differential pinions (5), (11) and differential pinion washer (4), (12).
5. Take out the differential side gear (7) and differential side gear washer (13).

■ **NOTE**

- **Arrange the parts to know their original position.**

(When reassembling)

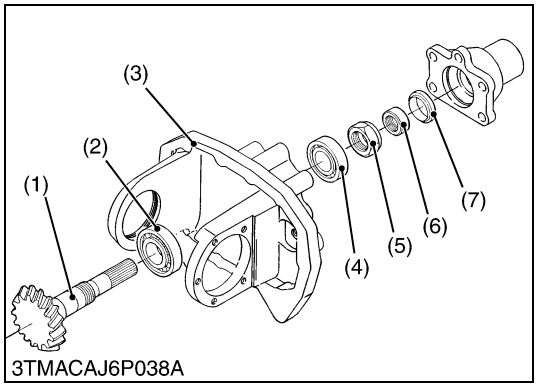
- Install the parts to their original position.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) to the inner circumferential surface of the differential pinions and differential side gears.
- Lock the differential pinion shaft (6) by setting the key (3).
- Apply lock tight (Three Bond 1324B or equivalent) to the differential case cover mounting screws.

Tightening torque	Differential case cover mounting screw (M10-7T)	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 lbf·ft

(1) Screw
(2) Differential Case Cover
(3) Key
(4) Differential Pinion Washer
(5) Differential Pinion
(6) Differential Pinion Shaft
(7) Differential Side Gear
(8) Differential Gear Case
(9) Differential Side Gear Washer
(10) Differential Side Gear
(11) Differential Pinion
(12) Differential Pinion Washer
(13) Differential Side Gear Washer

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Spiral Bevel Pinion

1. Secure the spiral bevel pinion shaft (1) in the vise, and remove the staking nut (5) with the socket wrench 50 (Code No. 07916-31821).
2. Remove the spiral bevel pinion shaft (1) from the pinion bearing case (3).

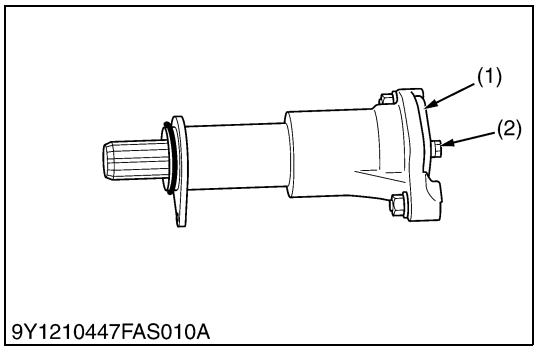
(When reassembling)

- Apply grease to the oil seal (7).
- Apply gear oil to the bearing.
- Stake the staking nut (5) after adjusting the turning torque of spiral bevel pinion shaft (1). (See page 6-S18.)

Tightening torque	Pinion bearing case cover mounting screw (M14-7T)	166.7 to 196.1 N·m 17.0 to 20.0 kgf·m 123.0 to 144.6 lbf·ft

(1) Spiral Bevel Pinion Shaft
(2) Taper Roller Bearing
(3) Pinion Bearing Case
(4) Taper Roller Bearing
(5) Staking Nut
(6) Sleeve
(7) Oil Seal

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Bearing Support

1. Remove the screw (2) and the cover (1).
2. Remove the circlip (6) and bearing (5).

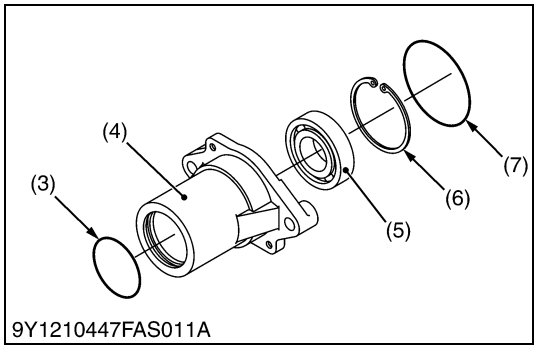
(When reassembling)

- Apply grease to the O-ring (3), (7).

Tightening torque	Bearing support cover mounting screw (M6, 7T)	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft

(1) Cover
(2) Screw
(3) O-ring
(4) Bearing Support
(5) Bearing
(6) Circlip
(7) O-ring

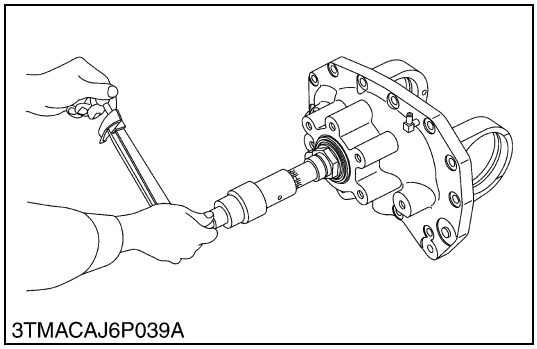
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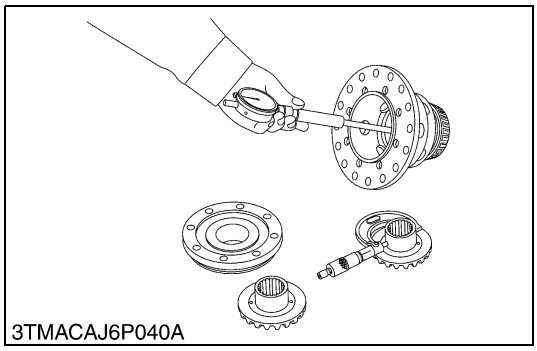

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Turning Torque of Spiral Bevel Pinion Shaft

1. Apply the oil to spiral bevel pinion shaft and bearings, and measure the turning torque.
2. If the measurement is not within factory specification, adjust with the staking nut.

Turning torque	Factory specification	1.47 to 1.96 N·m 0.15 to 0.20 kgf·m 1.08 to 1.45 lbf·ft

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Clearance between Differential Case and Differential Side Gear

1. Measure the differential side gear boss O.D..
2. Measure the differential case bore I.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace it.

Clearance between differential case and differential side gear	Factory specification	0.050 to 0.151 mm 0.00197 to 0.00594 in.
	Allowable limit	0.35 mm 0.0138 in.

Differential case bore I.D.	Factory specification	40.500 to 40.562 mm 1.59449 to 1.59693 in.
Bevel gear bore I.D.	Factory specification	40.500 to 40.562 mm 1.59449 to 1.59693 in.
Differential side gear boss O.D.	Factory specification	40.411 to 40.450 mm 1.59098 to 1.59252 in.

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Clearance between Differential Pinion Shaft and Pinion

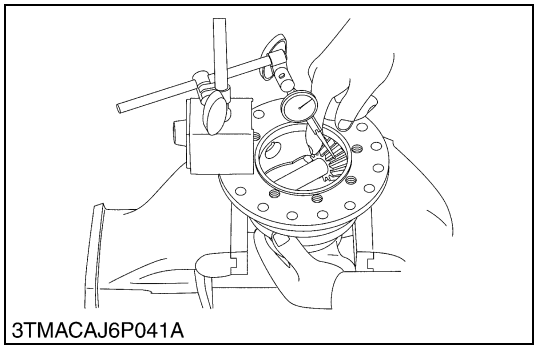
1. Measure the differential pinion shaft O.D..
2. Measure the differential pinion I.D. and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace.

Clearance between differential pinion shaft and pinion	Factory specification	0.080 to 0.122 mm 0.00315 to 0.00480 in.
	Allowable limit	0.25 mm 0.0098 in.

Differential pinion shaft O.D.	Factory specification	19.959 to 19.980 mm 0.78579 to 0.78661 in.
Differential pinion I.D.	Factory specification	20.060 to 20.081 mm 0.78976 to 0.79059 in.

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Backlash between Differential Pinion and Differential Side Gear

1. Set a dial indicator (lever type) on the tooth of the differential pinion.
2. Hold the differential side gear and move the pinion to measure the backlash.
3. If the backlash exceeds the allowable limit, adjust with the differential side gear washer.

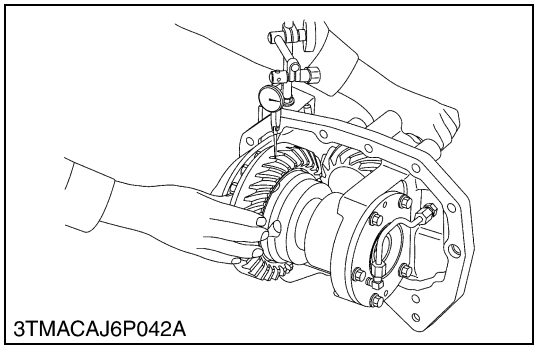
Backlash between differential pinion and differential side gear	Factory specification	0.1 to 0.3 mm 0.004 to 0.012 in.
	Allowable limit	0.4 mm 0.0157 in.

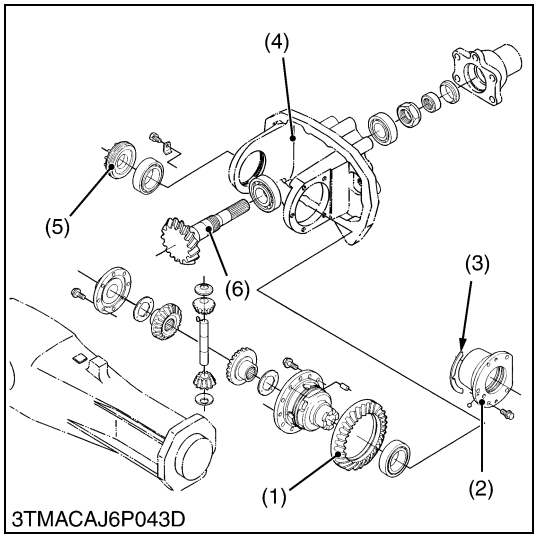
(Reference)

- Thickness of differential side gear washer.
  1.5 mm (0.059 in.)
  1.6 mm (0.063 in.)
  1.7 mm (0.067 in.)

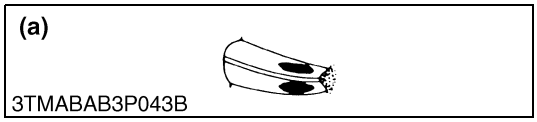
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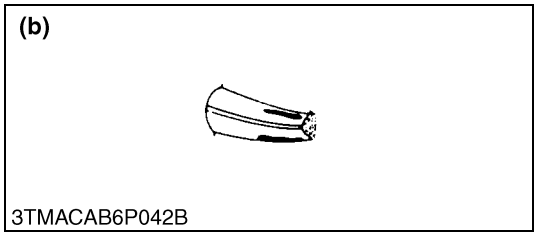

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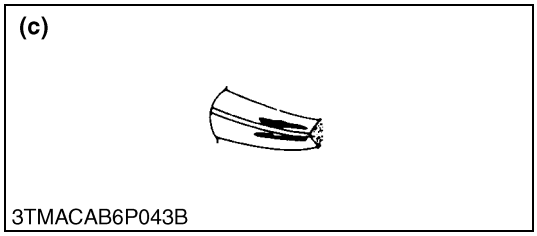
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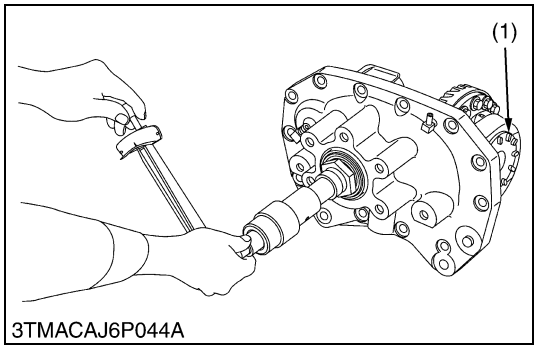
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3TMACAJ6P044A

Backlash and Tooth Contact between Spiral Bevel Pinion Shaft and Bevel Gear

1. Set a dial indicator (lever type) with its finger on the tooth surface.
2. Measure the backlash by fixing the spiral bevel pinion shaft (6) and moving the bevel gear (1) by hand.
3. If the backlash exceeds the allowable limit, adjust with the shim (3) and the adjusting screw (5) on the pinion bearing case (4).
4. Adjust the backlash properly by repeating the above procedures.

Backlash between bevel gear and spiral bevel pinion shaft	Factory specification	0.2 to 0.3 mm 0.008 to 0.012 in.
	Allowable limit	0.4 mm 0.016 in.

5. Apply red lead lightly over several teeth at three positions equally spaced on the bevel gear (1).
6. Turn the spiral bevel pinion shaft (6), while pressing a wooden piece against the periphery of the bevel gear.
7. Check the tooth contact. If not proper, adjust according to the instructions shown in the figure.

(Reference)

- Thickness of adjusting shim (3):

0.1 mm (0.004 in.)	0.3 mm (0.012 in.)

- Backlash change per 0.1 mm (0.004 in.) shim: Approx. 0.05 mm (0.002 in.)

■ **IMPORTANT**

- **Adjust the tooth contact with shims (3) so that the spiral bevel pinion shaft may not contact with the differential case.**

(1) Bevel Gear
(2) Differential Bearing Support
(3) Shim
(4) Pinion Bearing Case
(5) Adjusting Screw
(6) Spiral Bevel Pinion Shaft

(a) Proper Contact:
More than 35 % red lead contact area on the gear tooth surface.
The center of tooth contact at 1/3 of the entire width from the small end.
(b) Deep Contact:
Decrease the shims
(c) Shallow Contact:
Increase the shims

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Turning Torque of Differential Assembly

1. Measure the turning torque, after properly adjusted the backlash between spiral bevel pinion shaft and bevel gear.
2. If the measurement is not within the factory specification, adjust with the adjusting screw (1).

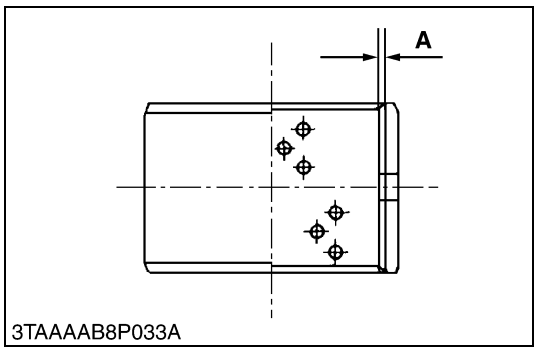
Turning torque	Factory specification	2.45 to 4.41 N·m 0.25 to 0.45 kgf·m 1.81 to 3.25 lbf·ft

(1) Adjusting Screw

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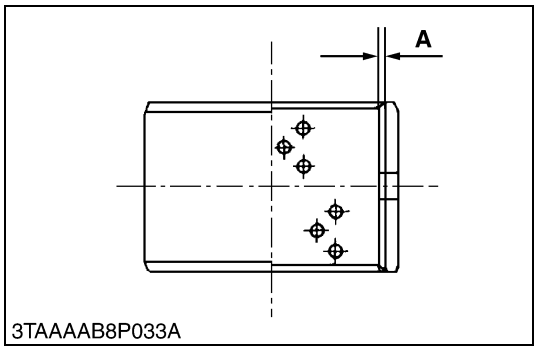
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Bearing Retainer and Front Wheel Case Support Bushing

1. Visually inspect the DX bushings for signs of wear or damage. (The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion **"A"**, replace it.

Front wheel case support bushing	Alloy thickness **"A"**	0.57 mm 0.0224 in.

Bearing retainer O.D.	Factory specification	64.970 to 65.000 mm 2.55787 to 2.55906 in.

A: Thickness

9Y1210269FAS0039US0

Bevel Gear Case and Front Wheel Case Bushing

1. Visually inspect the DX bushings for signs of wear or damage. (The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion **"A"**, replace it.

Front wheel case bushing	Alloy thickness **"A"**	0.57 mm 0.0224 in.

Bevel gear case O.D.	Factory specification	69.970 to 70.000 mm 2.75472 to 2.75591 in.

A: Thickness

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3TMACAI6P041A

Backlash of Bevel Gear in Bevel Gear Case

1. Set a dial indicator (lever type) on the shaft (king-pin).
2. Move the shaft (king-pin) by hand and measure the circumferential play of the shaft.
3. Calculate the backlash from the ratio of the shaft diameter to the gear diameter.

Backlash=Play × 2

4. If the backlash exceeds the allowable limit, adjust with the shims (1).

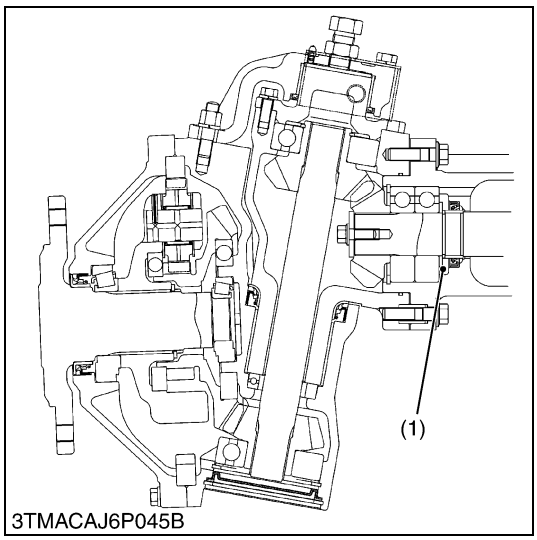
Backlash of bevel gear in bevel gear case	Factory specification	0.20 to 0.30 mm 0.0079 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

- Thickness of adjusting shim (1):
  The 1.0 mm (0.039 in.) shim is built in the standard.

0.1 mm (0.004 in.)	0.8 mm (0.031 in.)
0.2 mm (0.008 in.)	1.0 mm (0.039 in.)
0.4 mm (0.016 in.)	1.2 mm (0.047 in.)

- Backlash changes per 0.1 mm (0.004 in.) shim:
  Approx. 0.04 mm (0.015 in.)



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(1) Shim

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3TMACAI6P043A

Clearance between Planetary Gear Shaft

1. Measure the planetary gear I.D. and the planetary gear shaft O.D. (rubbing surface).
2. Measure the O.D. of two needles installed diagonally in the needle bearing.
3. Calculate the clearance.
4. If the clearance exceeds the allowable limit, replace them.

Clearance between planetary gear and shaft	Factory specification	0.009 to 0.046 mm 0.00035 to 0.00181 in.
	Allowable limit	0.3 mm 0.01 in.

Planetary gear I.D.	Factory specification	37.009 to 37.025 mm 1.45705 to 1.45768 in.
Shaft O.D.	Factory specification	29.991 to 30.000 mm 1.18075 to 1.18110 in.
Needle O.D.	Factory specification	3.494 to 3.500 mm 0.13756 to 0.13780 in.

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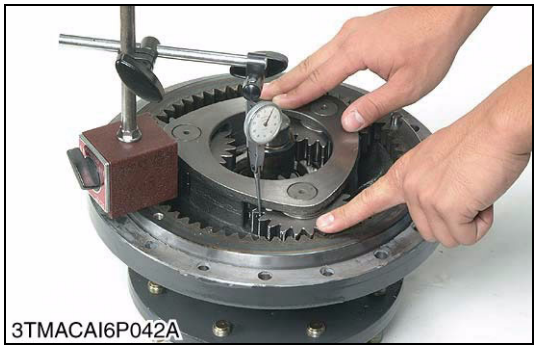
Thrust Collar Thickness

1. Measure the thickness of the thrust collar.
2. If the measurement is less than the allowable limit, replace it.

Thrust collar thickness	Factory specification	1.55 to 1.65 mm 0.0610 to 0.0650 in.
	Allowable limit	1.0 mm 0.039 in.

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Backlash between Internal Gear and Planetary Gear

1. Set a dial indicator (lever type) on the tooth of the planetary gear.
2. Hold the planetary gear support and move only the planetary gear.
3. If the measurement exceeds the allowable limit, check the planetary gear and planetary shaft.

Backlash between internal gar and planetary gear	Factory specification	0.08 to 0.30 mm 0.0031 to 0.0118 in.
	Allowable limit	0.5 mm 0.020 in.

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3TMACAI6P045A

Backlash of Bevel Gear in Front Wheel Case

1. Set a dial indicator (lever type) on the shaft (king-pin).
2. Move the shaft (king-pin) by hand and measure the circumferential play of the shaft.
3. Calculate the backlash from the ratio of the shaft diameter to the gear diameter.

Backlash=Play × 2

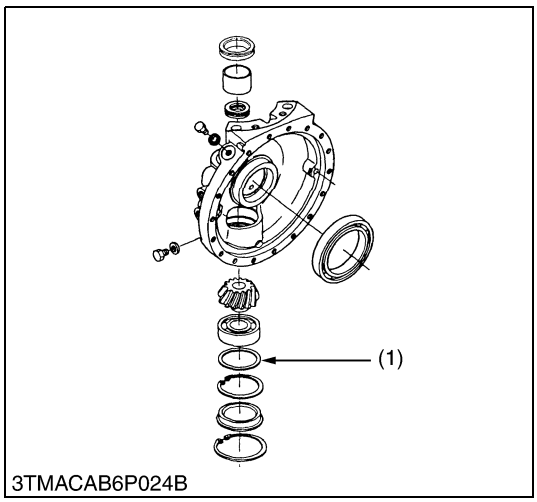
4. If the backlash exceeds the allowable limit, adjust with the shims (1).

Backlash of bevel gear in front wheel case	Factory specification	0.20 to 0.30 mm 0.0079 to 0.0118 in.
	Allowable limit	0.4 mm 0.016 in.

(Reference)

- Thickness of adjusting shims (1):
  The 2.0 mm (0.078 in.) shim is built in the standard.

0.1 mm (0.004 in.)	1.0 mm (0.039 in.)
0.3 mm (0.012 in.)	

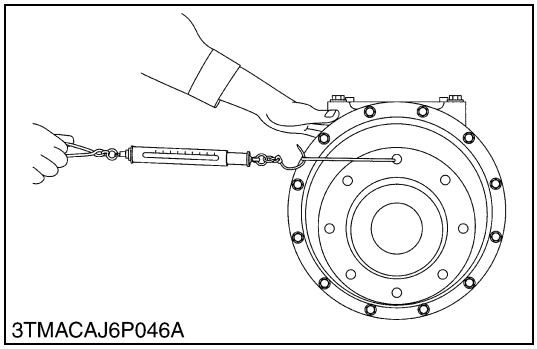


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(1) Shim

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Turning Torque of Front Axle

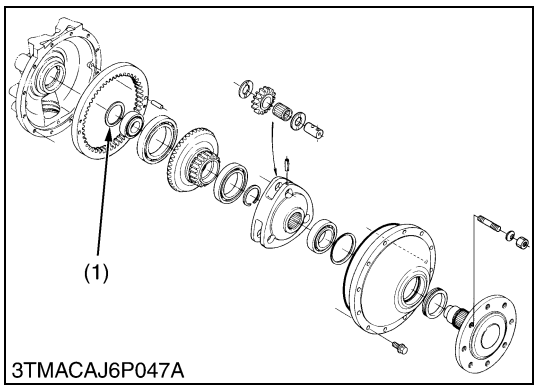
1. Measure the turning force of front axle by spring balance.
2. If the measurement is not within the factory specification, adjust with shim (1).

Turning force	Factory specification	19.6 to 29.4 N 2.0 to 3.0 kgf 4.4 to 6.6 lbf
Turning torque	Factory specification	1.96 to 2.94 N·m 0.2 to 0.3 kgf·m 1.45 to 2.17 lbf·ft

(Reference)

- Thickness of adjusting shims (1):

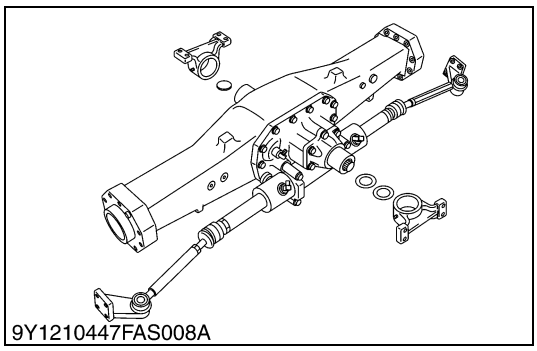
0.1 mm (0.004 in.)	1.0 mm (0.039 in.)
0.3 mm (0.012 in.)	



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(1) Shim

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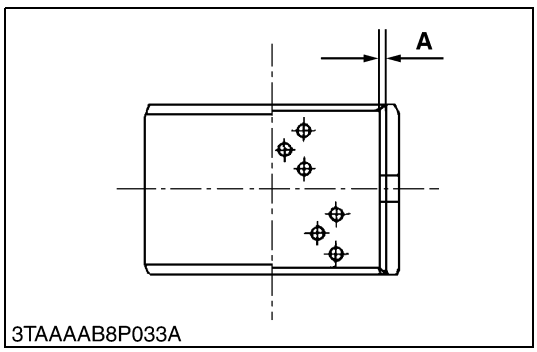

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Front Bracket and Rear Bracket Bushing

1. Visually inspect the DX bushings for signs of wear or damage. (The DX bushing tends to show concentrated wear.)
2. If the DX bushing is worn beyond the alloy portion **"A"**, replace it.

Front bracket and rear bracket bushing	Alloy thickness	0.57 mm 0.0224 in.

Pinion bearing case O.D.	Factory specification	64.970 to 65.000 mm 2.55787 to 2.55906 in.
Front differential case boss O.D.	Factory specification	69.970 to 70.000 mm 2.75472 to 2.75591 in.



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A: Thickness

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7 STEERING

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MECHANISM

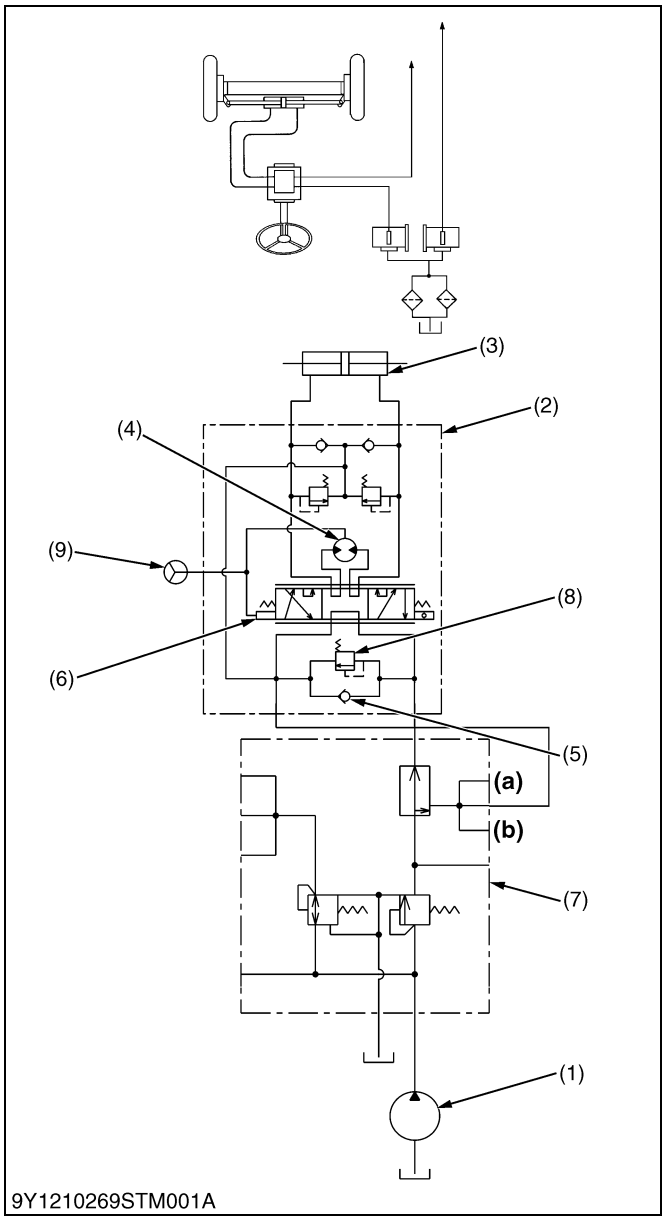
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[1] STEERING MECHANISM 7-M1

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1. STRUCTURE

[1] STEERING MECHANISM



This model is provided with a full hydrostatic power steering. Generally power steerings are divided into 4 types: booster type, integral type, semi-integral type and full hydrostatic type.

In the full hydrostatic power steering, the steering controls through the hydraulic pipe. This steering is actuated by oil pressure. Accordingly, it does not have mechanical transmitting parts such as steering gear, pitman arm, drag link, etc.. Therefore, it is simple in construction.

This steering system consists of the hydraulic pump (1), steering controller (2), steering cylinder (3), etc..

The full hydrostatic power steering systems are divided into two types: non-load reaction type and load reaction type.

They are distinguished by whether the cylinder port is blocked or not with the controller in neutral. In this models, load reaction type is used.

With the load reaction type power steering, the steering wheel returns almost to the straight forward position as with an automobile when the operator releases his hands from the steering wheel.

(Reference)

With the non-load reaction type power steering, the steering wheel maintain their position when the operator releases his hands from the steering wheel.

Vibration at the wheels is not transmitted to the steering wheel.

(1) Hydraulic Pump
(2) Steering Controller
(3) Steering Cylinder
(4) Gerotor
(5) Check Valve
(6) Control Valve
(7) Regulator Valve
(8) Relief Valve
(9) Steering Wheel

(a) To Shuttle Clutch Pack for Lubrication
(b) To PTO Clutch Pack for Lubrication

■ **NOTE**

- **Refer to "7. STEERING" section in the workshop manual of tractor mechanism (Code No. 9Y021-18200).**

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SERVICING

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Tractor Cannot Be Steered	Shaft in the steering controller improperly assembled	Reassemble	8-S25
	Turning delivery hose damaged	Replace	–
Hard Steering	Oil improper	Change with specified oil	G-10
	Hydraulic pump malfunctioning	Replace	8-S6 8-S17 8-S18
	Relief valve malfunctioning	Replace	8-S14 8-S24
	Steering controller (spool and sleeve) malfunctioning	Repair or replace	8-S26
	Oil leak due to seal damaged	Replace	8-S26
Steering Force Fluctuates	Steering controller malfunctioning	Replace	7-S5
	Air sucked in pump due to leaking or missing of oil	Fill	G-10
	Air sucked in pump from suction circuit	Repair	–
Heavy Steering Especially in the Beginning of Steering	Steering controller malfunctioning	Repair or replace	7-S5
Steering Wheel Turns Spontaneously When Released	Steering controller malfunctioning	Repair or replace	7-S5
Front Wheels Wander to Right and Left	Steering controller malfunctioning	Repair or replace	7-S5
	Air sucked in pump due to lack of oil	Fill	G-10
	Air sucked in pump from suction circuit	Repair	–
	Insufficient bleeding	Bleed	8-S14
	Steering cylinder malfunctioning	Repair or replace	8-S27 8-S35
Wheels Are Turned to a Direction Opposite to Steering Direction	Cylinder piping connected in reverse	Repair	–
Steering Wheel Turns Idle in Manual Steering	Insufficient bleeding	Bleed	8-S14
	Air sucked in pump due to lack of oil	Fill	G-10
Noise	Air sucked in pump due to lack of oil	Fill	G-10
	Air sucked in pump from suction circuit	Repair	–
	Pipe deformed	Replace	–
Oil Temperature Increases Rapidly	Relief valve malfunctioning	Replace	8-S14 8-S24
Front Wheels Vibrate	Mechanical connections or wheel bearings worn	Replace defective parts	–

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2. SERVICING SPECIFICATIONS

- Refer to servicing "Power Steering Controller and Cylinder" in "8. HYDRAULIC SYSTEM" section.

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3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-13.)

Item	N·m	kgf·m	lbf·ft
Muffler mounting screw	24 to 27	2.4 to 2.8	18 to 20
Main delivery pipe and return pipe retaining nut	49.0 to 68.0	5.0 to 7.0	36.2 to 50.5
Turning delivery hose retaining nut	22.6 to 27.5	2.3 to 2.8	16.7 to 20.2
Steering controller mounting screw	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
Steering joint shaft mounting screw	17.0 to 24.0	1.8 to 2.4	12.6 to 17.7
Knuckle arm mounting screw	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Cylinder bracket mounting screw and nut	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5

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4. CHECKING AND ADJUSTING

[1] CHECKING AND ADJUSTING

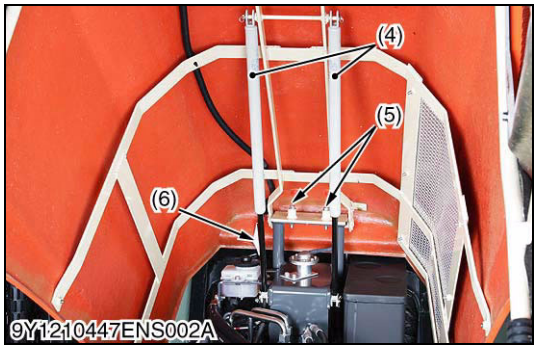
- Refer to checking "Steering Controller" in "8. HYDRAULIC SYSTEM" section.

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[2] PREPARATION

(1) Removing Steering Controller







Muffler and Bonnet

1. Open the bonnet (1) and disconnect the battery (7) negative cable.
2. Disconnect the **8P** connector (6) for head light.
3. Remove the damper (4) and bonnet bracket mounting screws (5).
4. Remove the bonnet (1).
5. Remove the side cover (3).
6. Remove the muffler (2).

(When reassembling)

■ **NOTE**

- **Be sure to insert the muffler by 42 mm (1.7 in.).**

Tightening torque	Muffler mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

■ **IMPORTANT**

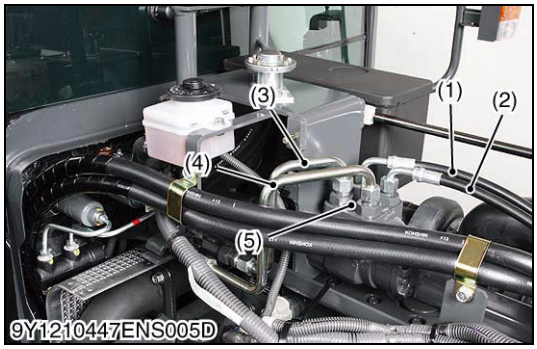
- **When disconnecting the battery cables, disconnect the negative cable first. When connecting, positive cable first.**

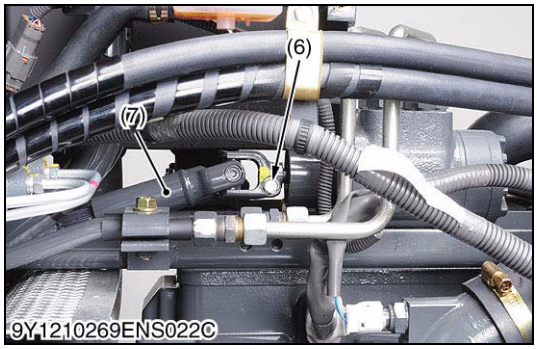
(1) Bonnet
(2) Muffler
(3) Side Cover
(4) Damper
(5) Screw
(6) **8P** Connector
(7) Battery

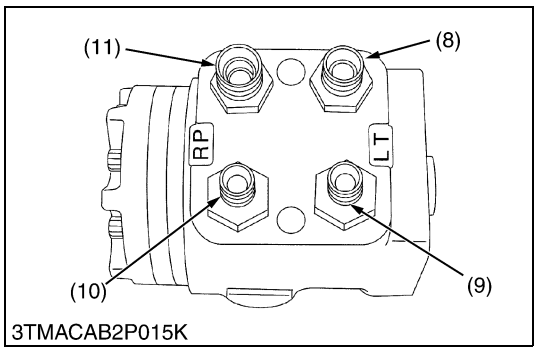
L: Insertion Length of the Muffler

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Piping and Power Steering Controller

1. Remove the steering joint shaft mounting screw (6).
2. Disconnect the joint shaft (7) from steering controller (5).
3. Remove the turning delivery hoses (1), (2).
4. Remove the main delivery pipe (4) and return pipe (3).
5. Remove the steering controller mounting screws.
6. Remove the steering controller (5).

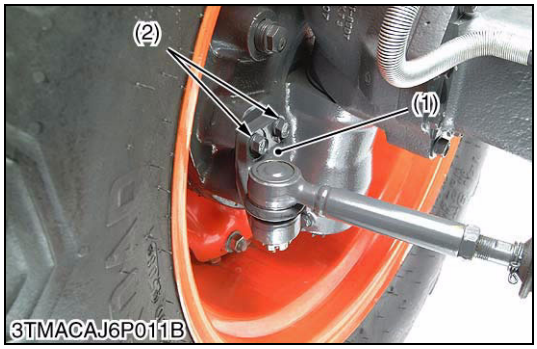
Tightening torque	Main delivery pipe and return pipe retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.5 lbf·ft
	Turning delivery hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.7 to 20.2 lbf·ft
	Steering controller mounting screw	48.1 to 55.9 N·m 4.9 to 5.7 kgf·m 35.4 to 41.2 lbf·ft
	Steering joint shaft mounting nut	17.0 to 24.0 N·m 1.8 to 2.4 kgf·m 12.6 to 17.7 lbf·ft

(1) Turning Delivery Hose (L)
(2) Turning Delivery Hose (R)
(3) Return Pipe
(4) Main Delivery Pipe
(5) Steering Controller
(6) Screw
(7) Steering Joint Shaft
(8) Return Port
(9) Left Turning Port
(10) Right Turning Port
(11) Pump Port

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(2) Removing Steering Cylinder



Knuckle Arm

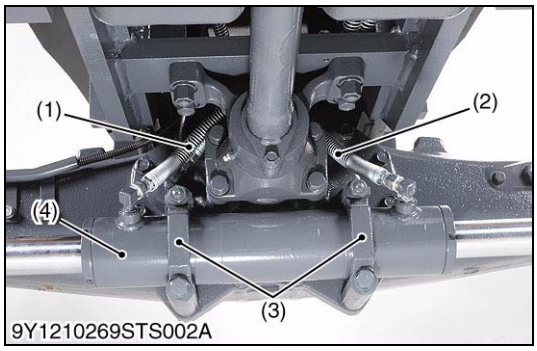
1. Place the disassembly stand under the clutch housing case and support it with a jack.
2. Remove the knuckle arm mounting screws (2).
3. Remove the knuckle arms (1) (R.H.) (L.H.).

(When reassembling)

Tightening torque	Knuckle arm mounting screw	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

(1) Knuckle Arm (2) Screw

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Power Steering Cylinder Assembly

1. Disconnect the turning delivery hose (1), (2).
2. Remove the steering cylinder mounting screw and nut.
3. Remove the power steering bracket (3) and power steering cylinder assembly.

(When reassembling)

Tightening torque	Turning delivery hose retaining nut	22.6 to 27.5 N·m 2.3 to 2.8 kgf·m 16.6 to 20.2 lbf·ft
	Cylinder bracket mounting screw and nut	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 lbf·ft

(1) Turning Delivery Hose (3) Power Steering Bracket
(2) Turning Delivery Hose (4) Power Steering Cylinder Assembly

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[3] DISASSEMBLING AND ASSEMBLING

(1) Power Steering Controller

- Refer to disassembling "Power Steering Controller" in "8. HYDRAULIC SYSTEM" section.

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(2) Power Steering Cylinder

- Refer to disassembling "Power Steering Controller" in "8. HYDRAULIC SYSTEM" section.

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[4] SERVICING

(1) Power Steering Controller

- Refer to servicing "Power Steering Controller" in "8. HYDRAULIC SYSTEM" section.

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(2) Power Steering Cylinder

- Refer to servicing "Power Steering Controller" in "8. HYDRAULIC SYSTEM" section.

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8 HYDRAULIC SYSTEM

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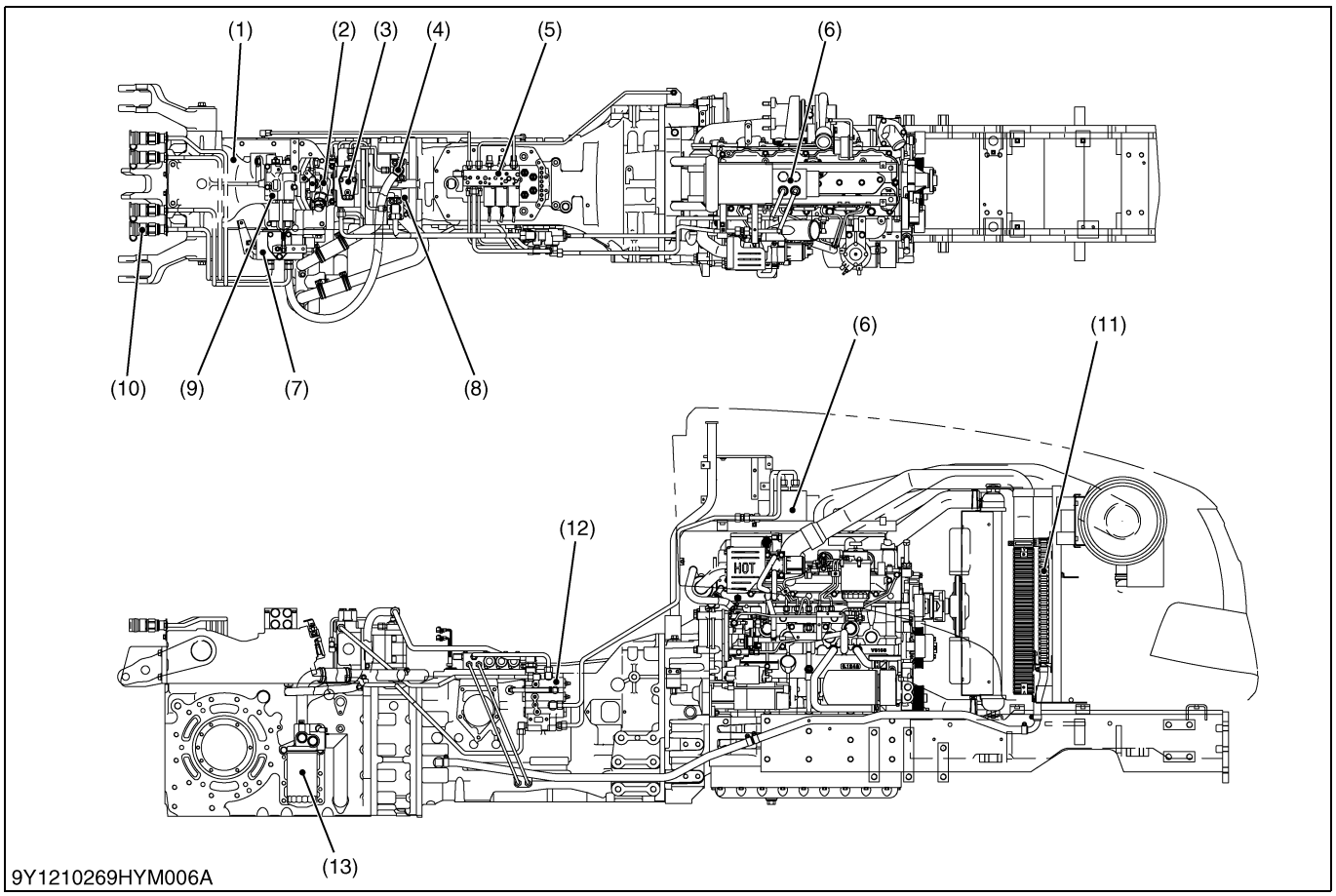
MECHANISM

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4. REGULATOR VALVE 8-M5
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1. STRUCTURE



(1) Hydraulic Cylinder Body
(2) Safety Valve for 3P
(3) PTO Valve
(4) Hydraulic Pump for 3-point Hitch
(5) Power Shift Valve
(6) Power Steering Controller
(7) Auxiliary Control Valve
(8) Hydraulic Pump for Power Steering / Power Shift / 4WD/Bi-speed / PTO Clutch
(9) Control Valve
(10) Quick Coupler
(11) Oil Cooler
(12) Regulator Valve
(13) Oil Filter

(To be continued)

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(Continued)

The hydraulic system of M130X Tractors are composed of three point hitch is controlled by a microcomputer, remote hydraulic control for implements, power steering, PTO clutch, power shift clutches and 4WD/bi-speed turn clutch hydraulic systems shown above.

This system has the following functions.

1) To raise and lower implements connected to the 3-point hitch

The hydraulic lift is subject to position control and draft (New Mix) control. The hydraulic control lever and draft ratio dial, both on the hydraulic control panel on the right of the operator's seat, are used to make settings. According to the settings, the control valve (solenoid proportional type) (9) located on the hydraulic cylinder is regulate the oil flow.

2) To draw hydraulic power from auxiliary control valve (7) to operate implement hydraulic actuators

1. For implements with double acting actuators, hydraulic power can be easily drawn from the quick couplers (10).
2. The auxiliary control permits the simultaneous operation of implements powered by hydraulic pressure along with those attached to the 3-point hitch.
3. Oil flowed from 3-point hitch pump can be connected with oil flowed from auxiliary control valve.
4. Two remote valves are standard. Maximum installation is four valves (3 valves with a flow control valve).

3) To operate power steering through the steering controller

This system is shown in "7. STEERING" section.

4) To operate hydraulic PTO clutch

This system is shown in "2. CLUTCH" section.

5) To operate hydraulic clutch for power shift transmission

This system is shown in "3. TRANSMISSION" section.

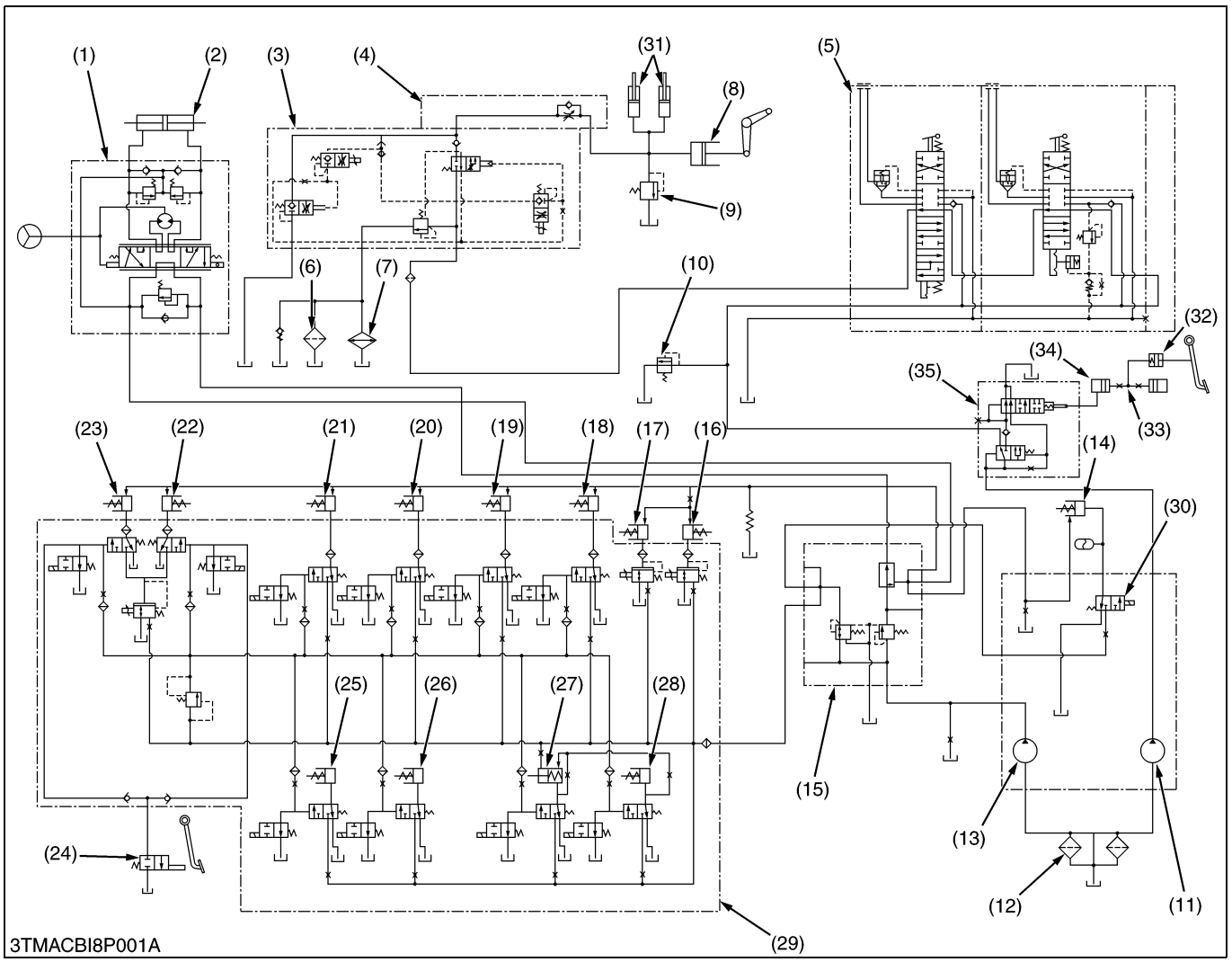
6) To operate hydraulic clutch for 4WD/Bi-speed turn

The bi-speed turn clutch is controlled by the combination of the solenoid valve and hydraulic flow. Three ways of power train are available: 2 wheel drive, 4 wheel drive and bi-speed turn drive. See "3. TRANSMISSION" section regarding each power train.

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2. HYDRAULIC CIRCUIT

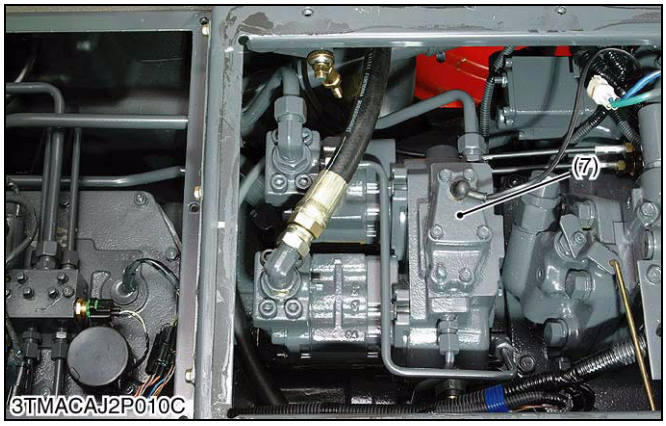


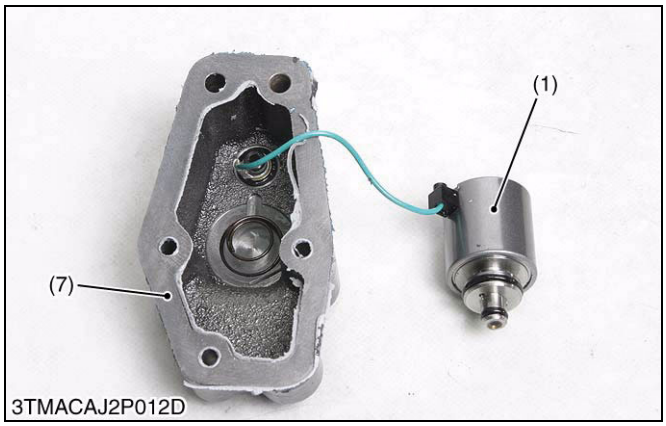
(1) Power Steering Controller
(2) Power Steering Cylinder
(3) Control Valve
(4) 3-Point Hitch Lowering Lock Valve
(5) Auxiliary Control Valve
(6) Return Filter
(7) Oil Cooler
(8) Hydraulic Cylinder
(9) Cylinder Safety Valve
(10) Relief Valve for 3-Point Hitch
(11) Hydraulic Pump (for 3-Point Hitch)
(12) Oil Filter
(13) Hydraulic Pump (for Power Steering / PTO / Power Shift / 4WD/Bi-speed)
(14) PTO Clutch
(15) Regulator Valve
(16) Main Shift Clutch H
(17) Main Shift Clutch L
(18) Main Shift Clutch 4
(19) Main Shift Clutch 3
(20) Main Shift Clutch 2
(21) Main Shift Clutch 1
(22) Master Clutch R
(23) Master Clutch F
(24) Clutch Safety Valve
(25) Differential Lock Clutch F
(26) Differential Lock Clutch R
(27) 4WD Clutch
(28) Bi-speed Clutch
(29) Power Shift Valve Assembly
(30) PTO Valve
(31) Assist Cylinder
(32) Master Cylinder
(33) Equalizer
(34) Brake Cylinder
(35) Trailer Brake Valve

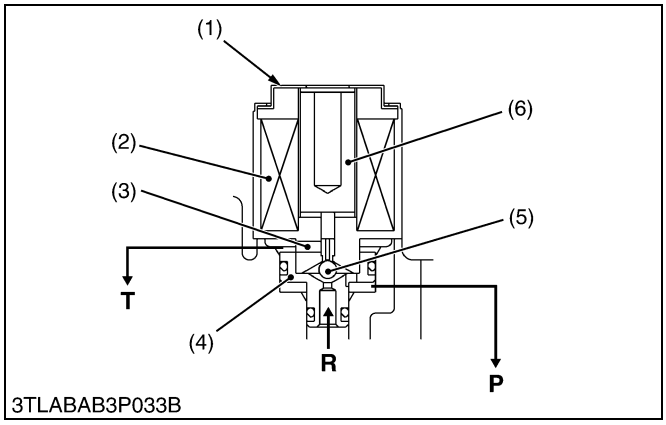
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3. PTO CLUTCH VALVE







Solenoid ON/OFF Valve

When the PTO switch is operated, the solenoid valve controls the flow of oil to the PTO clutch.

When the solenoid is not excited, oil from regulating valve flows to the PTO clutch through the surrounding of the ball (5) in the valve. When the solenoid is excited, plunger (6) presses the ball against the valve seat (4) to open the unload passage (3), and drain the oil.

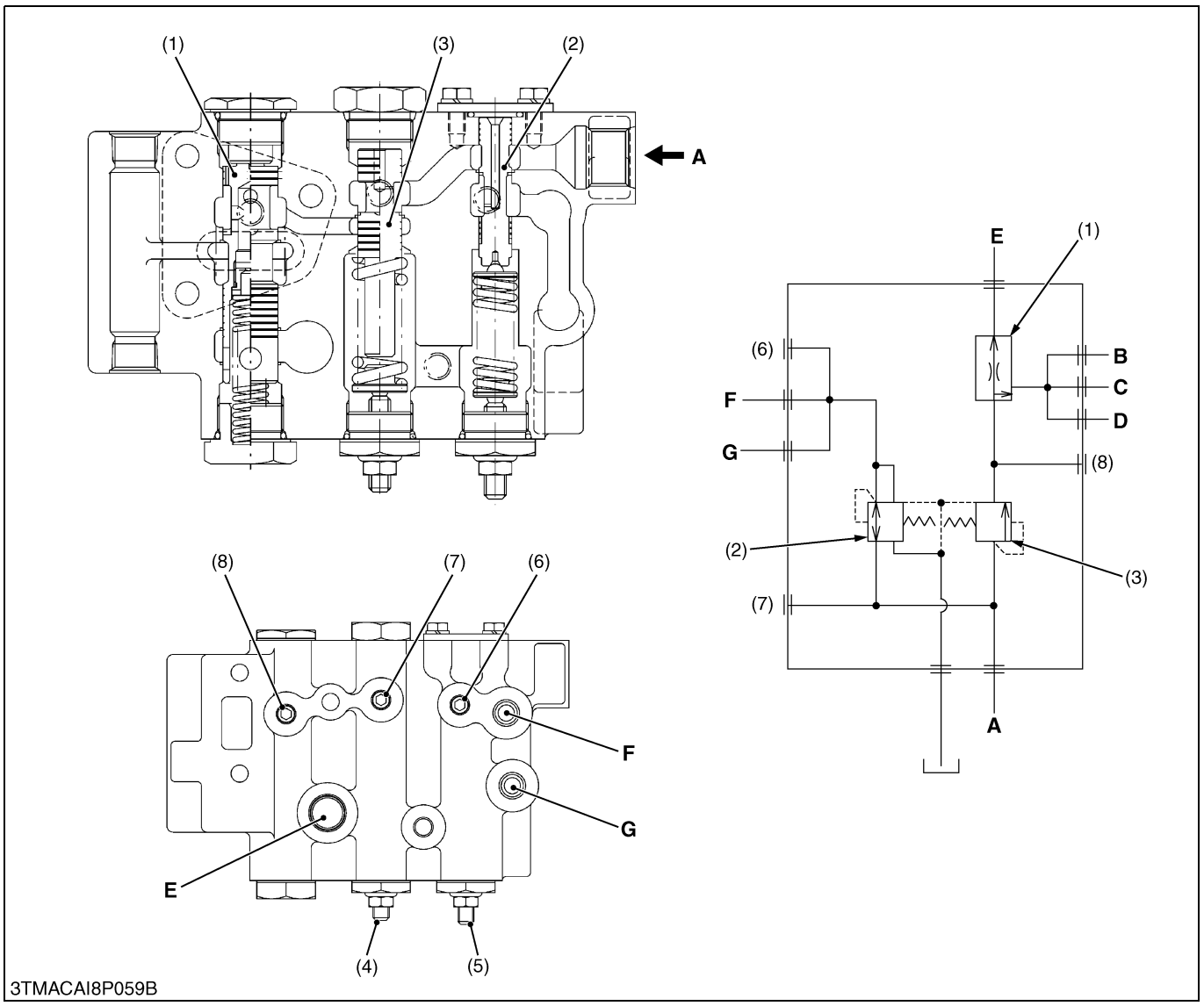
(1) Solenoid Valve
(2) Solenoid
(3) Valve Passage
(4) Valve Seat
(5) Ball
(6) Plunger
(7) PTO Clutch Valve Cover

T: Drain Port
R: IN Port
P: To PTO Clutch

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4. REGULATOR VALVE



(1) Flow Priority Valve
(2) Pressure Reducing Valve
(3) Regulating Valve
(4) Adjusting Screw
(5) Adjusting Screw
(6) Check Port 1
(7) Check Port 2
(8) Check Port 3

A: From Hydraulic Pump
B: To Main Shift Clutch Pack for Lubrication
C: From Power Steering Controller
D: To PTO Clutch Pack for Lubrication
E: To Power Steering Controller
F: To PTO Clutch Valve
G: To Power Shift Valve

Section view of the regulator valve and its hydraulic circuit are shown in the figure above.

The regulator valve is composed of the flow priority valve, regulating valve and pressure reducing valve. Oil from the hydraulic pump for the power steering system flows through the pressure reducing valve (2) to the power shift circuit / PTO circuit / 4WD, bi-speed circuit and differential lock circuit. When oil filled into the circuit the pressure reducing valve (2) is closed to maintain the pressure in power shift system circuit to 2.16 MPa (22 kgf/cm^2, 313 psi). The oil from the power steering pump passes through the regulator valve (2) and flow priority valve (1) and then it flow to the power steering circuit.

The regulator valve (3) is provided to maintain 2.94 MPa (30 kgf/cm^2, 427 psi) at inlet pressure of the pressure reducing valve (2) except when the power steering is operated.

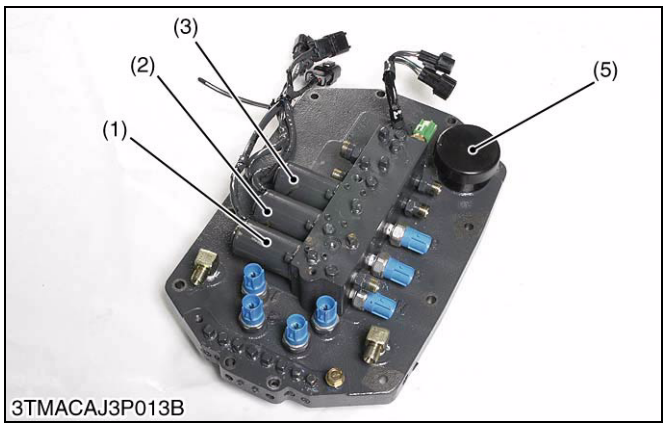
Thereby getting 2.16MPa (22 kgf/cm^2, 313 psi) of the power shift circuit / PTO circuit / 4WD, bi-speed circuit and differential lock circuit.

The flow priority valve is a flow divider that divides the flow from single hydraulic source (hydraulic pump). This valve feeds fixedly controlled flow to the E port side with priority and remainder to the **"B"** and **"D"** port side.

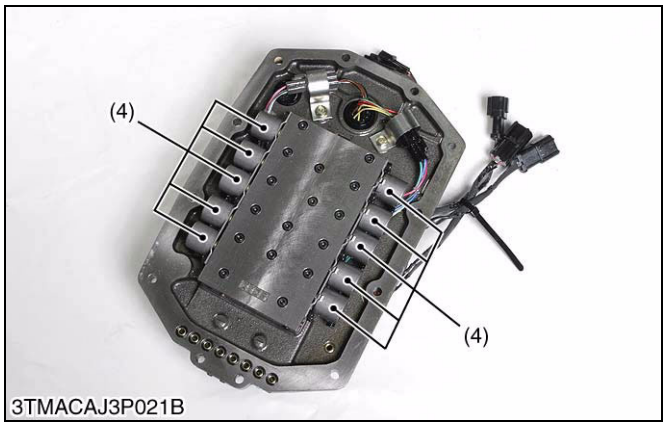
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5. POWER SHIFT VALVE



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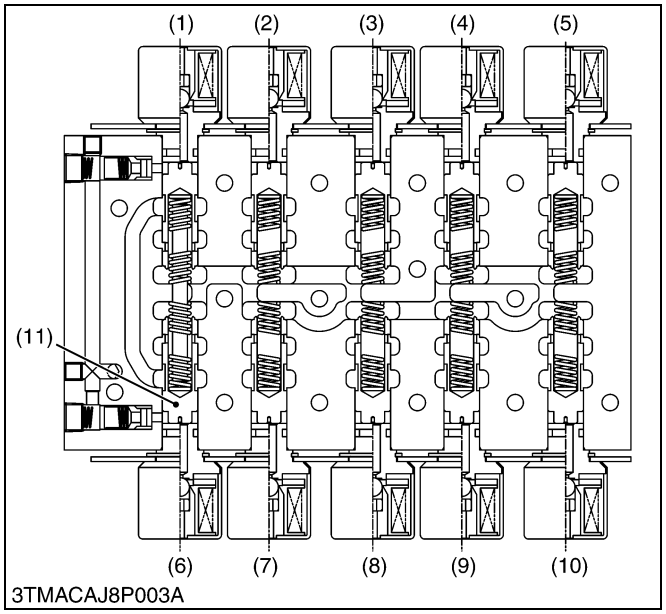
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The power shift valve comprises 10 sets of solenoid ON/OFF valve (4) for main speed change (in 1-4 steps), forward/reverse operation switching, 4WD/bi-speed switching and ON/OFF switching of front and rear wheel hydraulic differential lock, a main spool, 3 sets of solenoid (1), (2), (3) which control the pressure of the clutches for master clutch (**F**-**R**) and main shift (**L**-**H**).

(1) Solenoid Proportional Reducing Valve (Master)
(2) Solenoid Proportional Reducing Valve (**L**)
(3) Solenoid Proportional Reducing Valve (**H**)
(4) Solenoid ON/OFF Valve
(5) Breather

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(1) Master (F-R)

The valves relating to the master clutch (**F**-**R**) includes the solenoid proportional reducing valve, 2 sets of solenoid valve and the main spool.

The hydraulic clutch for Forward/Reverse operation is switched by the solenoid valve (1), (6), and the pressure of oil to be supplied to the hydraulic clutch is controlled by the solenoid proportional reducing valve. The combination of these valves realizes clutch operation having quasi-mechanical feeling and non-clutch shuttle speed change.

(2) Main Shift (1-4)

The valves to operate the main shift (**1**-**4**) clutch are 4 sets of solenoid valve (2), (3), (7), (8) and the main spool. Electricity is supplied to solenoid valves to switch over to the hydraulic clutch to be operated, in accordance with the signal sent from the power shift control unit.

(3) Main Shift (L-H)

The valves to operate the main shift (**L**-**H**) clutch are 2 sets of solenoid proportional reducing valve.

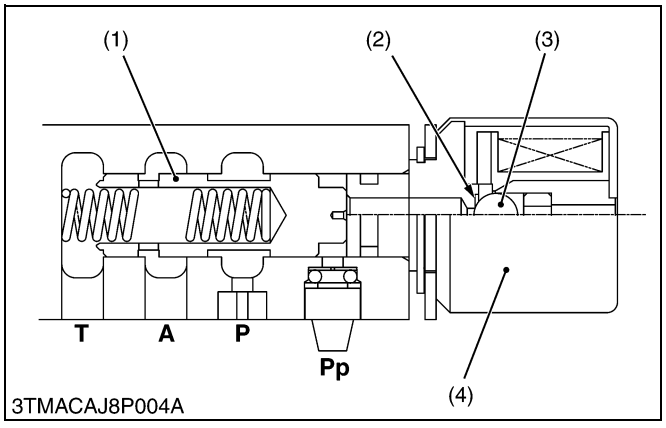
This solenoid proportional reducing valve controls the pressure of oil to be supplied to the hydraulic clutch and reduced shock at the time of speed change.

(4) 4WD/Bi-speed Turn and Differential Lock

4 sets of solenoid proportional reducing valve and main spool are provided for 4WD/Bi-speed switching and hydraulic differential locking of front and rear wheels.

Electricity is supplied to solenoid valves and they are switched according to the state of switches and sensors.

(1)	Master Reverse Solenoid Valve	(6)	Master Forward Solenoid Valve
(2)	Main Shift 1 Solenoid Valve	(7)	Main Shift 4 Solenoid Valve
(3)	Main Shift 2 Solenoid Valve	(8)	Main Shift 3 Solenoid Valve
(4)	Bi-speed Turn Solenoid Valve	(9)	Rear Differential Lock
		(10)	Front Differential Lock
(5)	4WD Solenoid Valve	(11)	Main Spool



(5) Solenoid ON/OFF Valve

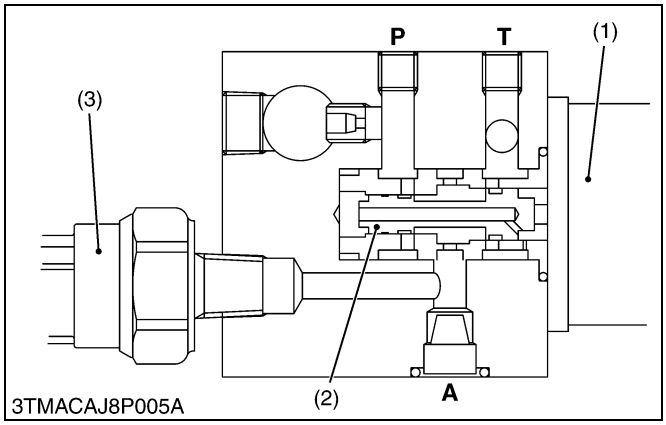
The figure shows the construction of this solenoid ON/OFF valve. When electricity is not supplied, hydraulic oil passes around the ball and the pilot pressure is unloaded. Thus the main spool is closed by spring force.

When electricity is supplied to the solenoid valve, the ball is pressed to the seat by which the unloading oil channel closes and the pilot pressure is applied to the main spool.

Thus, the main spool is pressed to make communication between **"P"** port and **"A"** port.

(1)	Main Spool	**P:**	**System Pressure**
(2)	Valve Seat	**Pp:**	**Pilot Pressure**
(3)	Steel Ball	**A:**	**To Hydraulic Clutch**
(4)	Solenoid ON/OFF Valve	**T:**	**To Transmission Case**

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(6) Solenoid Proportional Reducing Valve

The figure shows the construction of this solenoid proportional reducing valve.

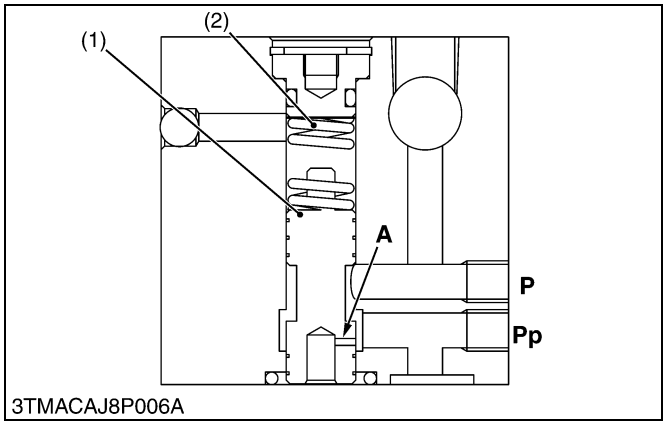
Since the spool remains pressed when no electricity is supplied to the solenoid valve, the oil channel between the **"P"** port and the **"A"** port is closed.

When electricity is supplied to the solenoid valve, the spool is pressed by a force generated by current, and the oil channel between the **"P"** port and **"A"** port opens and oil runs through this channel. On the other hand, since the sectional area of **"P"** port side of the spool is different from that of **"A"** port side, the spool is thrust back in closing direction by a force proportional to the pressure applied to the **"A"** port, and it stops at a position where both the forces are balanced.

Thus, a pressure proportional to the current running through the solenoid valve is generated.

(1) Solenoid
(2) Spool
(3) Pressure Switch

P: System Pressure (from Regulator Valve)
A: To Hydraulic Clutch
T: To Transmission Case



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(7) Pressure Reducing Valve

The figure shows the construction of the pilot pressure reducing valve.

Since the spool remains pressed by spring force when no pressure is supplied to the **"P"** port, communication is established between the P port and the **"Pp"** port.

When the **"P"** port is pressurized, the pressure is transmitted to the spool backside through the path **"A"** and the spool is thrusted back to the spring side. As the result, the oil channel formed between the **P** port and the **"Pp"** port narrows to lower the **"Pp"** port pressure, and the spool stops at the position where the spool thrusting force equalizes with the spring force.

Thus, the pilot pressure lower than the system pressure is obtained.

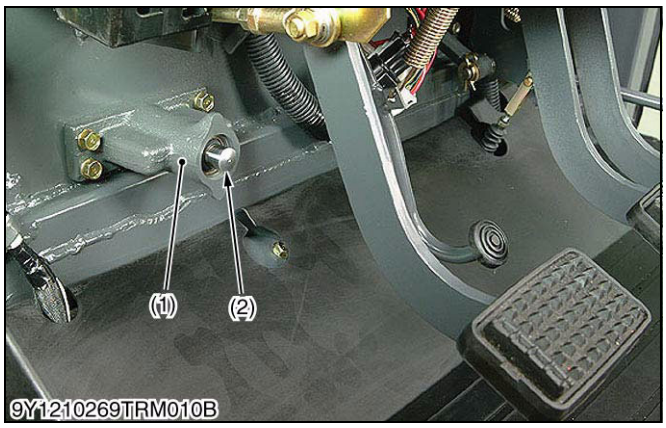
(1) Spool
(2) Spring

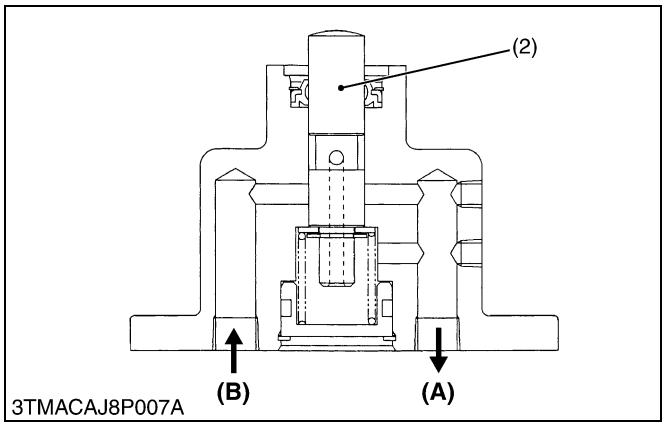
P: System Pressure (from Regulator Valve)
Pp: Pilot Pressure
A: Path

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6. CLUTCH SAFETY VALVE





This valve works to lower the master clutch (**F**-**R**) pressure surely when the clutch pedal is depressed.

The figure shows the construction of the clutch safety valve. The master clutch (**F**-**R**) pressure is lowered mechanically by thrusting the spool end by the clutch pedal to relieve the pilot pressure directly into the transmission case.

(1) Clutch Safety Valve
(2) Spool

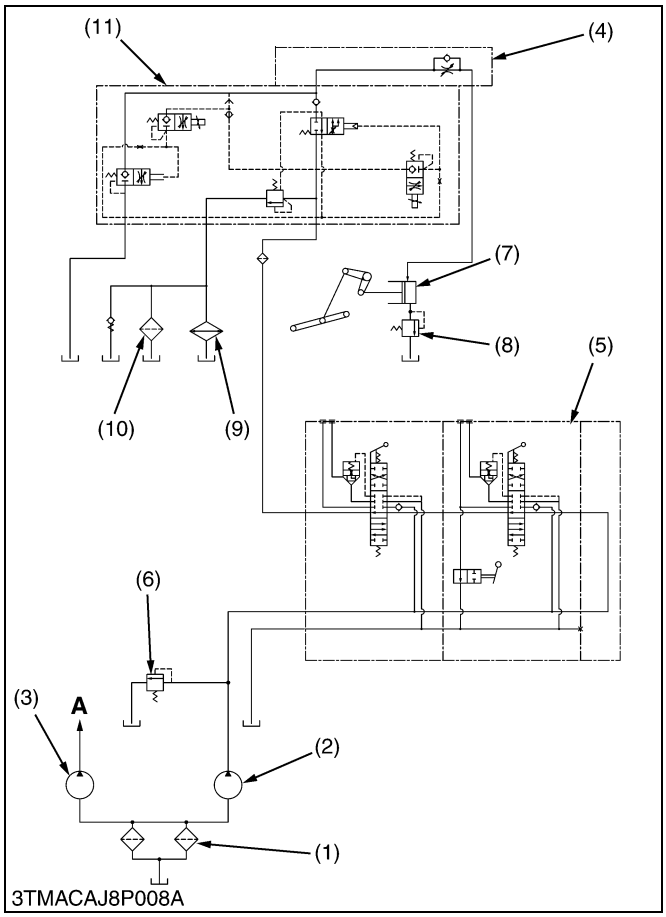
(A) To Transmission Case
(B) From Power Shift Valve

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7. THREE POINT HITCH SYSTEM

[1] HYDRAULIC CIRCUIT



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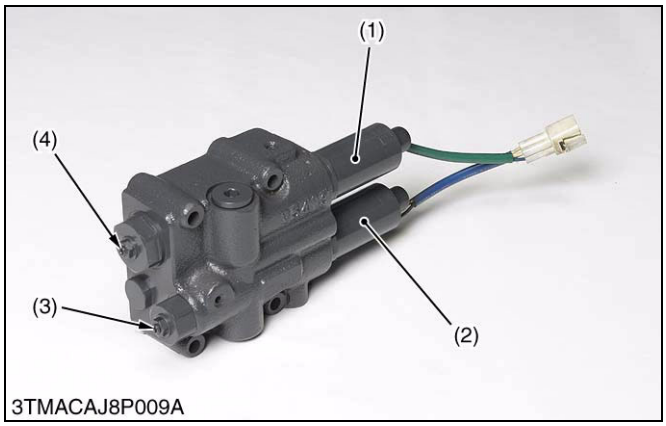
1. The hydraulic pump works to feed oil from the transmission case through the oil filter into the auxiliary control valve first and then into the lift control valve.
2. The solenoid valve in the lift control circuit in a proportional valve controls the oil flow rate in proportion to the electric current. The pilot spool regulate the flow rate to the hydraulic cylinder.
3. To protect the hydraulic system against excessive pressure, the relief valve and the safety valve are provided. To keep it free of dust and dirt, the suction oil filter and the return oil filter are added.

(1) Hydraulic Oil Filter (Suction)
(2) Hydraulic Pump (for 3-point Hitch)
(3) Hydraulic Pump (for Power Shift, Power Steering, etc.)
(4) Lowering Speed Adjusting Valve
(5) Double Acting Remote Control Valve
(6) Relief Valve
(7) Hydraulic Cylinder
(8) Cylinder Safety Valve
(9) Oil Cooler
(10) Return Filter
(11) Control Valve

A: To Regulator Valve

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[2] CONTROL VALVE



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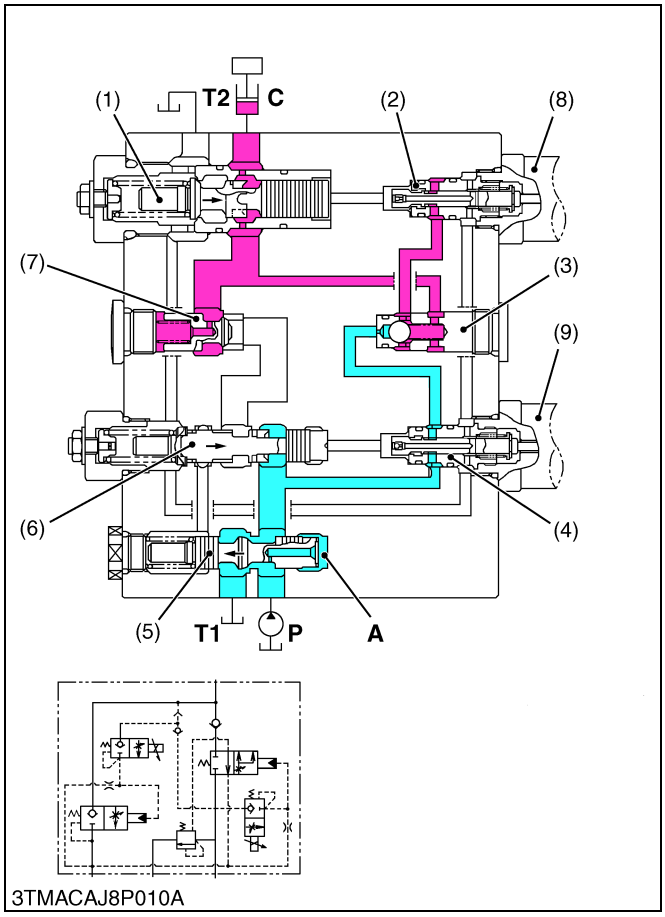
Solenoid Proportional Control Valve for Lifting

The solenoid proportional control valve is used to regulate the oil flow rate in proportion to the electric current. When the solenoid is energized, its current activates the main spool proportionally, which controls the oil flowing into the hydraulic cylinder.

(1) Solenoid Valve for Lowering
(2) Solenoid Valve for Lifting
(3) Adjusting Screw
(4) Adjusting Screw

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Neutral

While the both solenoid are not energized, the pilot spools (2), (4), main spools (1), (6) and check valve (7) are closed by the springs.

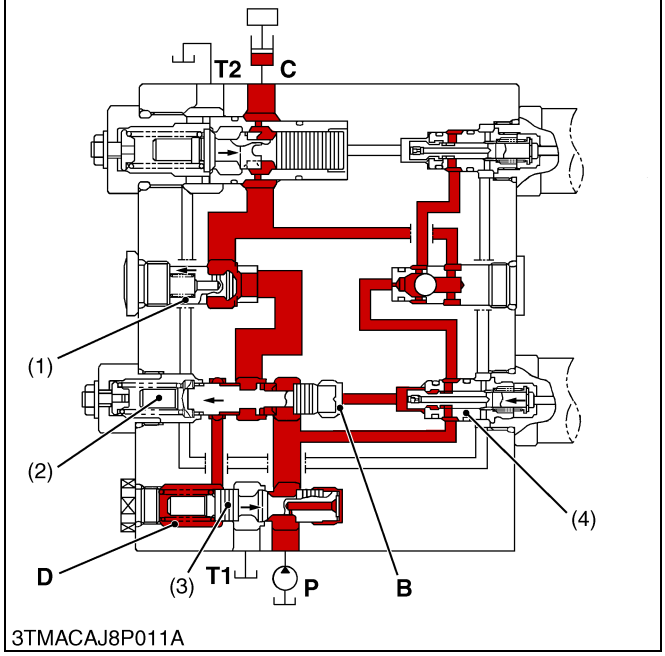
The oil from hydraulic pump flows into chamber **"A"** to move the compensation spool (5) to the left.

As a result, the oil from hydraulic pump returns to transmission case through **"T1"** port.

(1) Main Spool for Lowering
(2) Pilot Spool for Lowering
(3) High Pressure Selecting Valve
(4) Pilot Spool for Lifting
(5) Compensation Spool
(6) Main Spool for Lifting
(7) Check Valve
(8) Solenoid Valve for Lowering
(9) Solenoid Valve for Lifting

A: Chamber A
C: Cylinder Port
P: Pump Port
T1: Tank Port 1
T2: Tank Port 2

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Lifting

When the lifting solenoid valve is energized, the lifting pilot spool (4) moves to the left. By the pilot spool (4) moving to the left, the oil from the pump enters the chamber **"B"**, moving the main spool (2) to the left, and opens a path to the cylinder port.

At the same time, the oil enters the chamber **"D"** of the unload valve (3), moves through the unload valve (3) to the right, and closes the path to the tank.

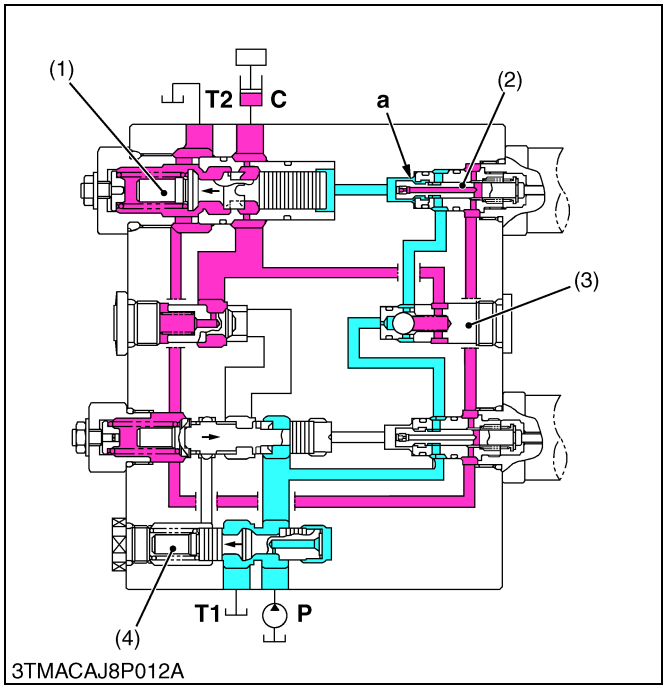
Therefore, pump pressure increases, and the oil from the **"P"** port opens the check valve (1) to flow into the cylinder from **"C"** port.

(1) Check Valve
(2) Main Spool for Lifting
(3) Compensation Spool
(4) Pilot Spool for Lifting

B: Chamber B
D: Chamber D
C: Cylinder Port
P: Pump Port
T1: Tank Port 1
T2: Tank Port 2

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Lowering

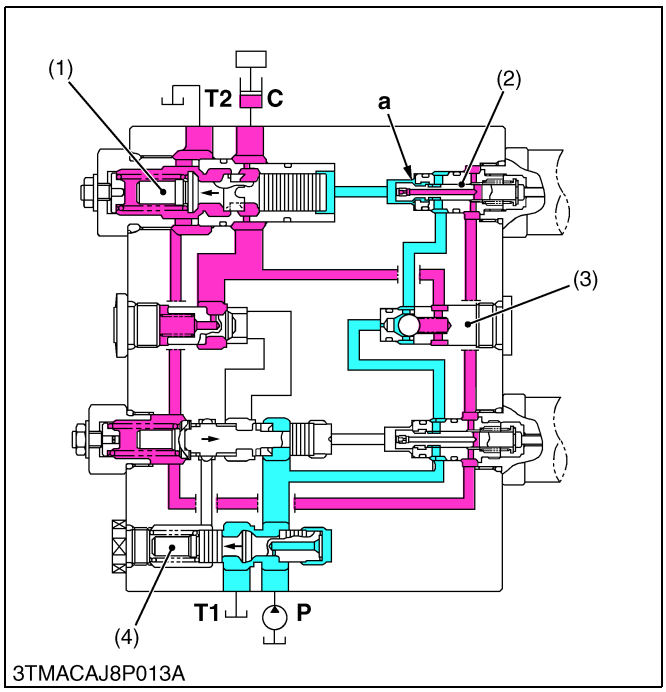
[When the C port pressure is higher than the unload pressure]

When the lowering solenoid is energized, the lowering pilot spool (2) moves to the left and the path **"a"** opens.

The pressure oil from the **"C"** port opens the shuttle valve, goes through the lowering pilot spool path **"a"**, and moves the lowering main spool (1) to the left.

By moving the lowering main spool to the left, the path from the cylinder port to the tank port **"T2"** opens, and the oil in cylinder port **"C"** returns to the tank.

(1)	Main Spool for Lowering	**C:**	**Cylinder Port**
(2)	Pilot Spool for Lowering	**P:**	**Pump Port**
(3)	High Pressure Selecting Valve	**T1:**	**Tank Port 1**
		T2:	**Tank Port 2**
(4)	Compensation Spool	**a:**	**Path**



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[When the C port pressure is lower than the unload pressure]

When the lowering solenoid is energized, the lowering pilot spool (2) moves to the left and the path **"a"** opens.

The oil from goes through the shuttle valve and the path of the lowering pilot spool (2), and moves the lowering main spool (1) to the left.

By moving the lowering main spool to the left, the path from the cylinder port to the tank port **"T2"** opens, and the oil in cylinder port **"C"** returns to the tank.

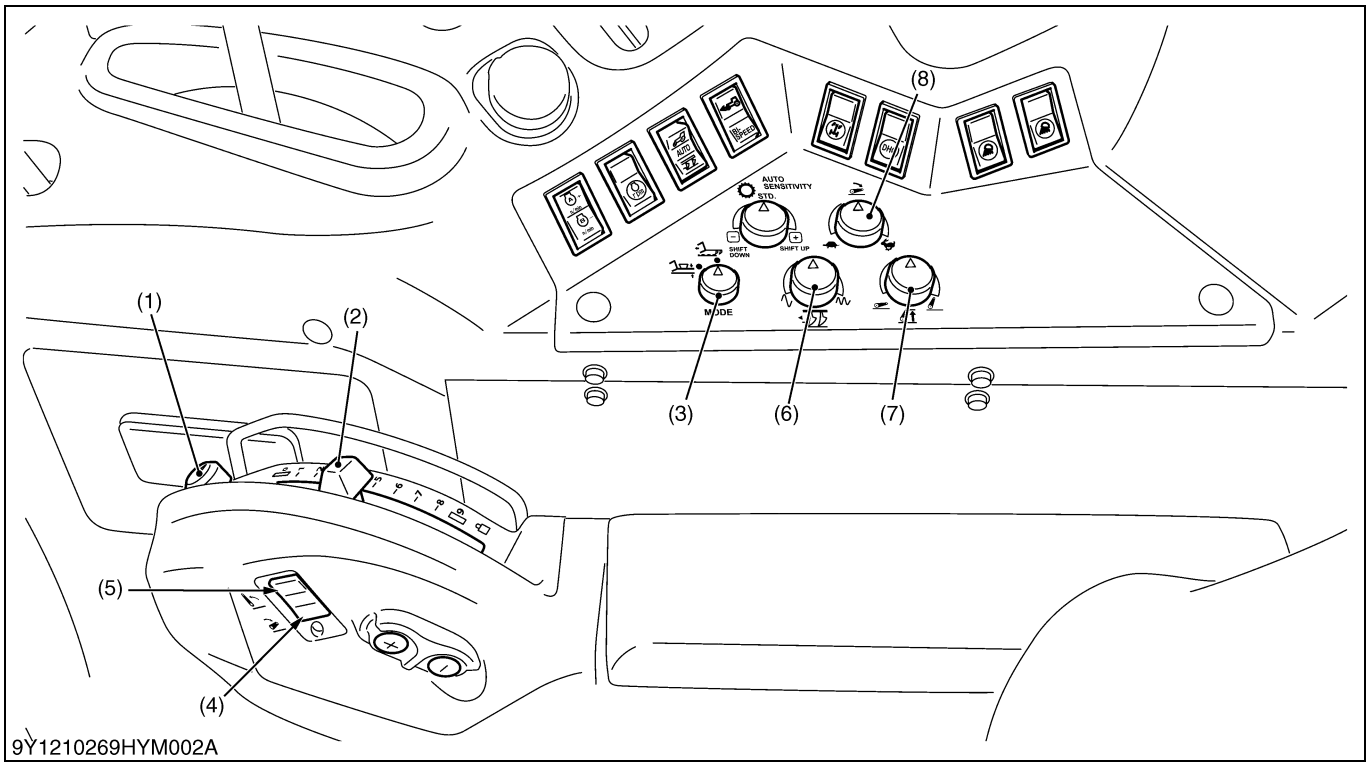
(1)	Main Spool for Lowering	**C:**	**Cylinder Port**
(2)	Pilot Spool for Lowering	**P:**	**Pump Port**
(3)	High Pressure Selecting Valve	**T1:**	**Tank Port 1**
		T2:	**Tank Port 2**
(4)	Compensation Spool	**a:**	**Path**

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8. 3-POINT HITCH CONTROL SYSTEM

[1] SYSTEM OUTLINE



(1) Bottom Limit Control Dial
(2) Hydraulic Control Lever
(3) Mode Selector Switch
(4) 3-Point Hitch Quick Lower Switch
(5) 3-Point Hitch Quick Raise Switch
(6) Draft Ratio Adjustment Dial
(7) Lift Arm Top Limit Adjustment Dial
(8) 3-Point Hitch Lowering Speed Adjusting Dial

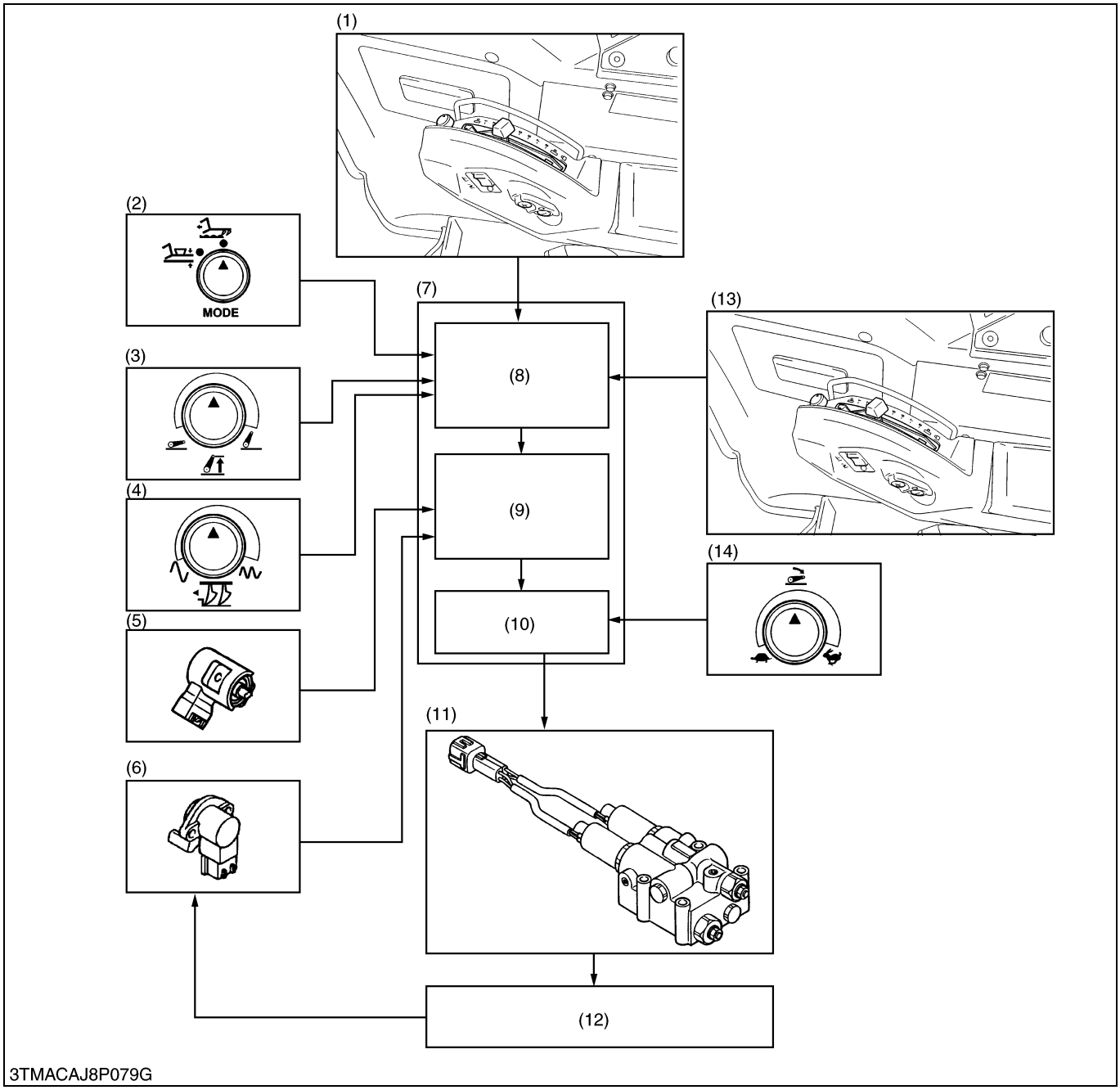
The hydraulic lift is microcomputer-controlled. The electronic draft control, in particular, is best suited to works on uneven farm grounds and slopes as well as plowing work. The well thought-out microcomputer-controlled design boosts work efficiency and stable handling.

The related switches and levers include these: mode selector switch to choose between position and draft control; 3-point hitch quick raise / lower control switch to move up and down an attachment just at the finger touch; draft ratio adjustment dial to set the draft sensitivity; hydraulic control lever to set the attachment's vertical position, to name a few. The 3-point hitch remote control switch is also provided in order for you, when getting out of the machine, to control the lower link hitch height. This switch is used when connecting or disconnecting an attachment.

If any of the sensors and solenoid valves gets in trouble, the fail-safe function is activated to prevent malfunction and to protect the system.

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(1) Hydraulic Control Lever
(2) Mode Switch
(3) Lift Arm Top Limit Adjustment Dial
(4) Draft Ratio Dial
(5) Draft Sensor
(6) Lift Arm Sensor
(7) ECU
(8) Condition Setting
(9) State Detection
(10) Control Amount Decision
(11) Control Valve
(12) Hydraulic Cylinder
(13) 3-point Quick Raise/Lower Switch
(14) 3-point Hitch Lowering Speed Adjustment Dial

(To be continued)

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(Continued)

■ **Position Control**

The attachment can be adjusted to any level by moving the hydraulic control lever. At this time, the top limit of the three-point link is determined by the lift arm top limit dial.

The lowering speed dial is used to adjust the lowering speed of the three-point link.

■ **Draft Control**

1) Hydraulic Control Lever

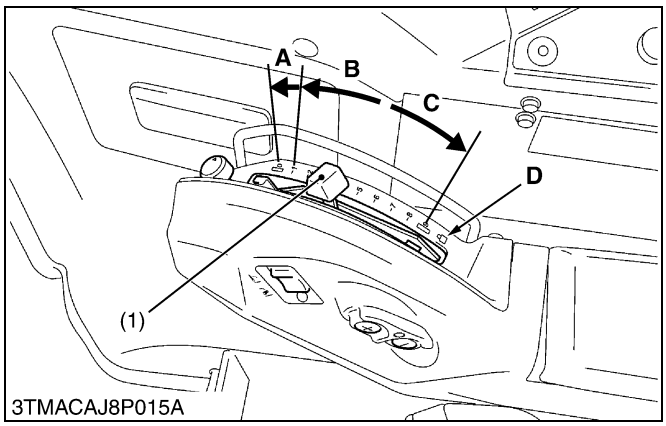
This will control the pull of the 3-point implement. As the load on the 3-point hitch changes due to various soil conditions, the draft control system automatically responds to these changes by either raising or lowering the implement slightly to maintain a constant pull.

Set the implement pull with the hydraulic control lever.

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(1) Position Control



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Position Control

This will control the working depth of 3-point hitch mounted implement regardless of amount of pull required.

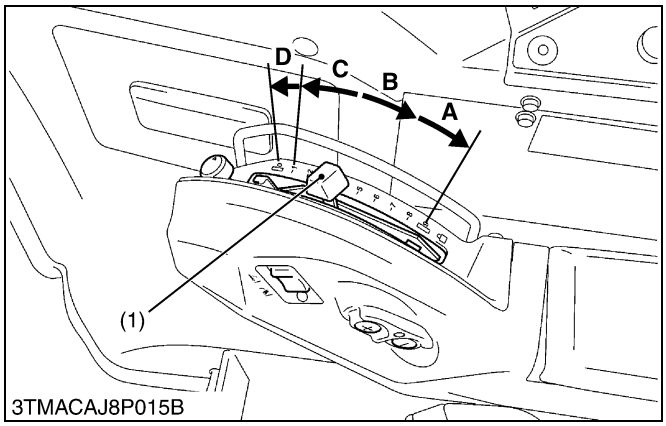
The hydraulic control lever is used to hold the implement in any level.

(1) Hydraulic Control Lever

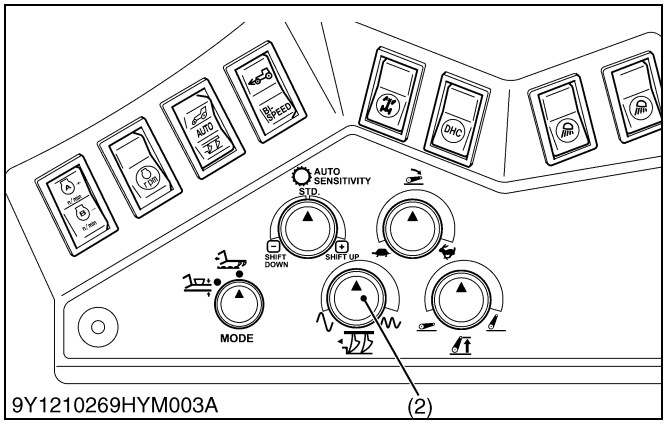
A: Float
B: Down
C: Up
D: Travel Lock Position

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(2) Mixed Draft Control



3TMACAJ8P015B



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Mixed Draft Control

This will control the pull of the 3-point implement. As the load on the 3-point hitch changes due to various soil conditions, the draft control system automatically responds to these changes by either raising or lowering the implement slightly to maintain a constant pull.

Set the implement pull with the hydraulic control lever.

[Draft ratio adjustment dial]

Set the mode selector switch to the **DRAFT** position. Turn the draft ratio adjustment dial to adjust to specific application requirement. Make settings according to the guidelines below.

Draft ratio adjustment dial

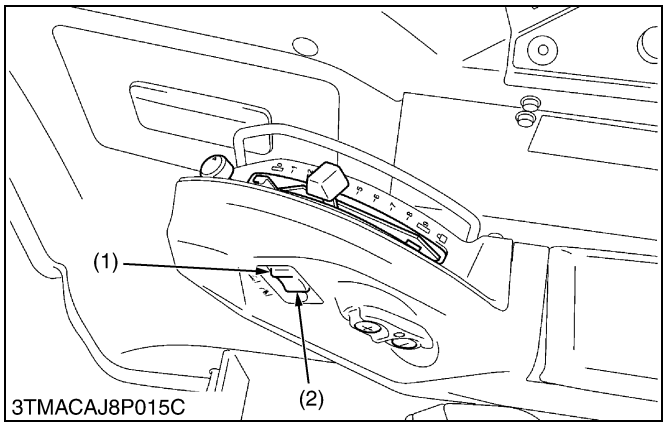
	Counterclockwise	Clockwise
Plowing depth	Shallow	Deep
Type of soil	Light	Heavy
Field (ruggedness)	Little	Much
(Sensitivity)	(Low)	(High)

(1) Hydraulic Control Lever
(2) Draft Ratio Adjustment Dial

A: Up
B: Shallow
C: Deep
D: Float

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(3) 3-Point Hitch Quick Raise / Lower Control



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3-Point Hitch Quick Raise / Lower Switch

These switches are used to raise and lower the implement.

Press the **RAISE** switch, the 3-point Lifting / Lowering indicator turns on and the implement goes up. Press the **LOWER** switch, the indicator goes off and the implement comes down.

When the **RAISE** switch has been pressed to raise the implement, the hydraulic control lever can not work.

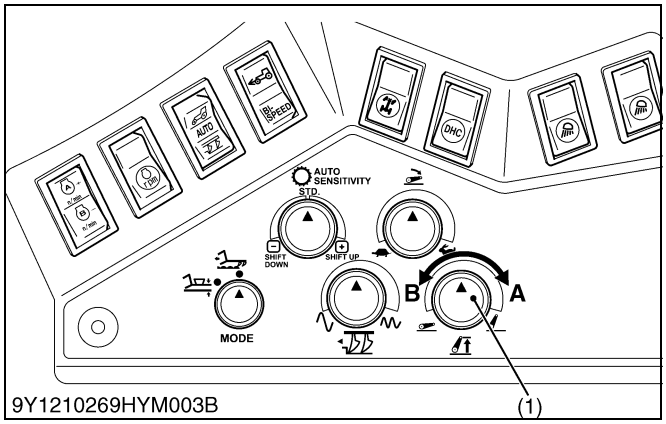
To use the hydraulic control lever, first pull it up to the top position.

(1) 3-Point Hitch Quick Raise Switch
(2) 3-Point Hitch Quick Lower Switch

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(4) Lift Arm Top Limit Adjustment Control



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Lift Arm Top Limit Adjustment Dial

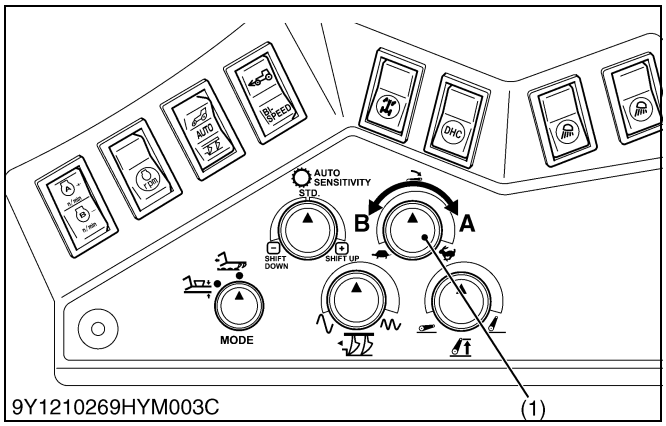
This dial is used to change the top limit of the 3-point hitch.

1. Turn the dial in the **HIGH** direction, and the top limit of the 3-point hitch will raise.
2. Turn the dial in the **LOW** direction, and the top limit of the 3-point hitch will lower.

(1) Lift Arm Top Limit Adjustment Dial — **A: HIGH** **B: LOW**

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(5) 3-Point Hitch Lowering Speed Control



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3-Point Hitch Lowering Speed Adjustment Dial

The dial (1) is used to adjust the 3-point links lowering speed. This dial cannot be completely hydro-locked, however. (When the remote hitch Up / Down switch is used, the lowering speed will be nearly the same as that with the dial at **SLOW**.)

(1) 3-Point Hitch Lowering Speed Adjustment Dial — **A: FAST** **B: SLOW**

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[2] ELECTRIC COMPONENTS

(1) Control Panel and Arm Rest



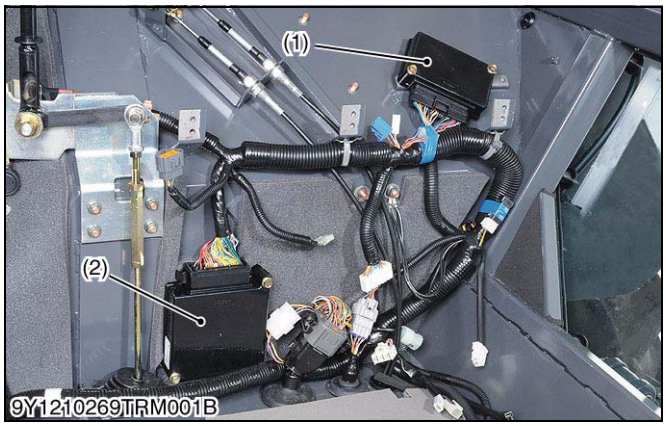
Lever / Switches / Dials

The control panel is provided with switches and dials for automatic control.

(1) Arm Rest
(2) Hydraulic Control Lever
(3) Mode Selector Switch
(4) Draft Ratio Adjustment Dial
(5) 3-Point Hitch Lowering Speed Adjustment Dial
(6) Lift Arm Top Limit Adjustment Dial
(7) Control Panel
(8) 3-Point Hitch Quick Raise / Lower Switch

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(2) 3-Point Hitch Control Unit (ECU)



3-Point Hitch Control Unit (ECU)

The built-in 16-bit microcomputer, ECU (MAIN) (2) processes the data coming from the draft ratio dial, draft sensor, lift arm sensor, etc., via ECU (SUB) (1) and helps actuate the lift and its cylinder, etc. as required.

ECU (MAIN): Control 3-point Hitch

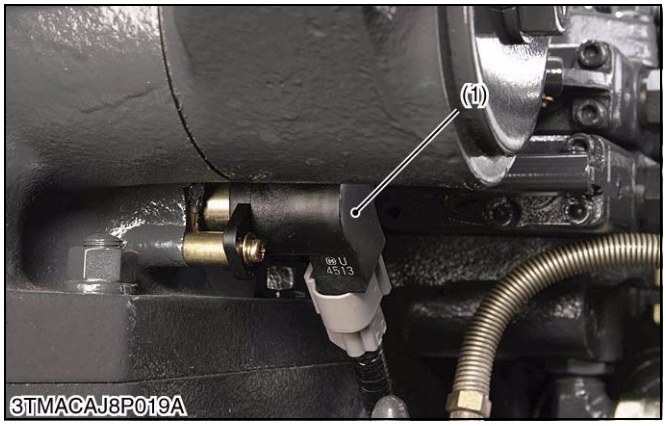
ECU (SUB): Receive the date from sensors and dials, and send it to ECU (MAIN) by CANbus.

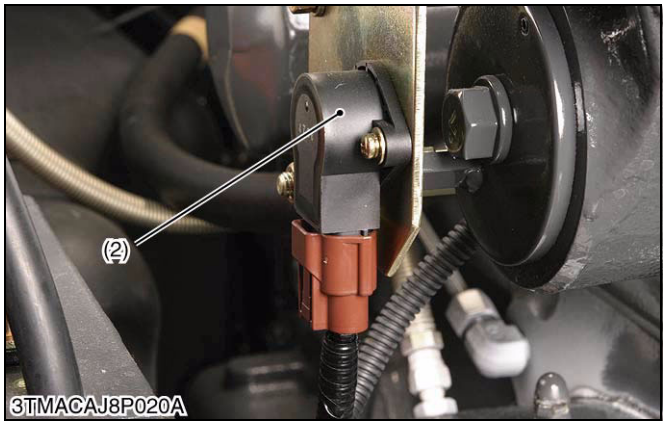
(1) ECU (SUB)
(1) ECU (MAIN)

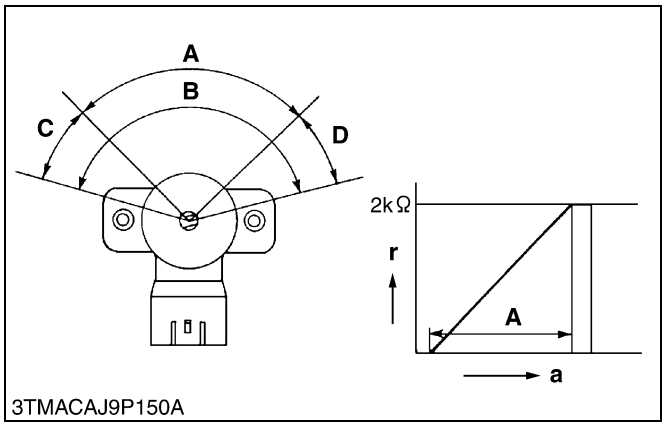
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(3) Lift Arm Sensor and Draft Sensor







Sensors

These sensors are rotary-displacement variable resistors.

The lift arm sensor detects the lift arm's angle and draft sensor detect's the traction load of the implement through the sensing bar.

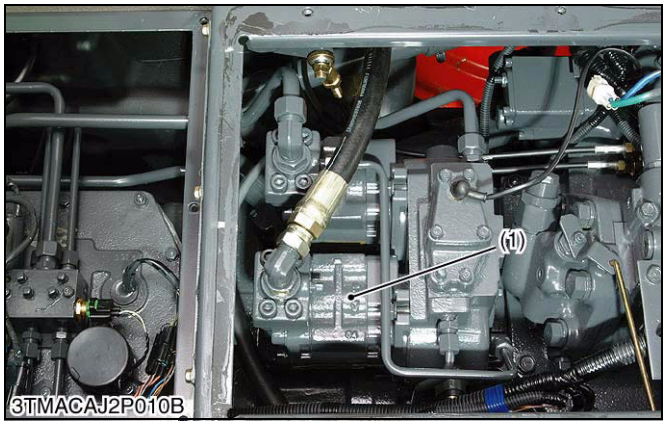
(1) Draft Sensor
(2) Lift Arm Sensor

A: Electrical Effective Angle
B: Movable Angle
C: Free Angle
D: Free Angle
a: Angle
r: Resistance

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[3] HYDRAULIC COMPONENTS



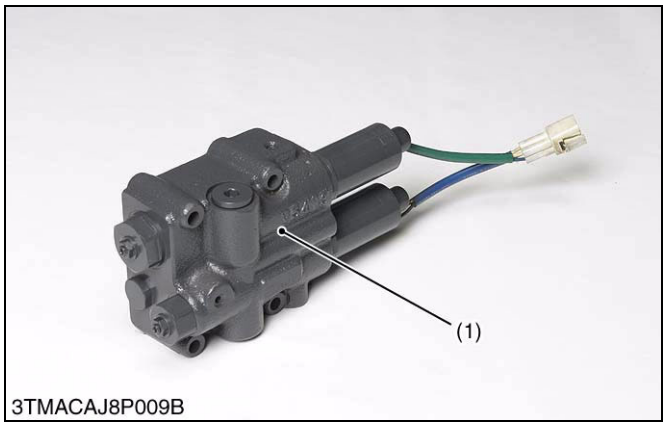
Hydraulic Pump

Hydraulic pump (1) is used for the 3-point hitch hydraulic system and auxiliary hydraulic control system.

They are pressure loading type gear pumps with high volumetric efficiency. Pump is driven by the transmission gear

(1) Hydraulic Pump (for 3P)

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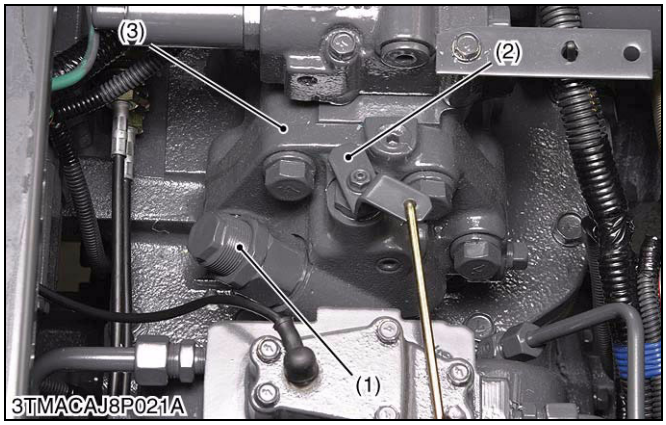


Control Valve

The solenoid proportional control valve is used to regulate the oil flow rate in proportion to the electric current. When the solenoid is energized, its current activates the main spool proportionally, which controls the oil flowing into the hydraulic cylinder.

(1) Control Valve

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Cylinder Safety Valve and 3-Point Hitch Lowering Lock Valve

The cylinder safety valve is located on the cylinder cover of the three point hydraulic system. These tractors use a direct acting relief valve, which is suitable for low volume and less frequent operations.

This valve has a fast response, makes it ideal for relieving shock pressure caused by heavy implement bounce and thereby reducing the possibility of damage to three point hydraulic system components.

The lowering lock valve switchable between **LOCK** (**STOP**) and **RELEASE** (**SLOW** ↔ **FAST)** for the 3-point link. The lowering speed of an attachment can be adjusted with the lowering speed adjustment dial on the hydraulic control panel

(1) Cylinder Safety Valve
(2) 3-Point Hitch Lowering Valve
(3) Hydraulic Cylinder Body

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SERVICING

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1. TROUBLESHOOTING

Symptom	Probable Cause	Solution	Reference Page
Implement Does Not Raise	Transmission fluid improper or insufficient	Change or fill	G-10, G-34
	Oil filter clogged	Replace	G-19
	Hydraulic pump malfunctioning	Replace	8-S17 8-S18
	Control valve malfunctioning	Replace	8-S32
	Cylinder safety valve damaged	Replace or adjust	8-S34
	Relief valve malfunctioning	Replace	8-S34
	Hydraulic piston O-ring, cylinder damaged	Replace	8-S31
	Lift arm sensor defective	Replace	9-S81
	Position lever sensor defective	Replace	9-S81
	Control unit malfunctioning	Replace	–
Implement Does Not Reach Maximum Height	Lift arm sensor defective	Replace	9-S81
	Position lever sensor defective	Replace	9-S81
	Lift arm top limit adjustment dial defective	Replace	9-S83
	Calibration of 3-point hitch fault	Calibrate	9-S68
Implement Does Not Lower	Control valve malfunctioning	Replace	8-S32
	Hydraulic lock valve closed	Open	–
	Lift arm sensor defective	Replace	9-S81
	Position lever sensor defective	Replace	9-S81
	Control unit malfunctioning	Replace	–
	Lowering speed adjustment dial defective	Replace	9-S82
Implement Drops by Weight	Hydraulic cylinder worn or damaged	Replace	8-S29
	Hydraulic piston O-ring, worn or damaged	Replace	8-S31
	Cylinder safety valve damaged	Replace	8-S34
	Hydraulic lock valve damaged	Replace	8-S31
	Control valve malfunctioning	Replace	8-S32
Implement Hunts (Moves Up and Down)	Control valve malfunctioning	Replace	8-S32
	Oil filter clogged	Replace	G-19
	Hydraulic piston, O-ring, cylinder, worn or damaged	Replace	8-S31
	Cylinder safety valve damaged	Replace	8-S34

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2. SERVICING SPECIFICATIONS

HYDRAULIC PUMP FOR POWER STEERING

Item		Factory Specification	Allowable Limit
Hydraulic Pump **Condition** • Engine speed: Approx. 2200 min^{-1} (rpm) • Rated pressure 14.2 MPa (145 kgf/cm^2, 2059 psi) • Oil temperature: 45 to 55 °C (113 to 131 °F)	Delivery	58.9 L/min. 15.5 U.S.gals/min. 12.9 Imp.gals/min.	49.4 L/min. 13.0 U.S.gals/min. 10.8 Imp.gals/min.
Housing Bore	Depth of Scratch	–	0.09 mm 0.0035 in.
Bushing to Gear Shaft	Clearance	–	0.15 mm 0.0059 in.

HYDRAULIC PUMP FOR 3-POINT HYDRAULIC SYSTEM

Item		Factory Specification	Allowable Limit
Hydraulic Pump **Condition** • Engine speed: Approx. 2200 min^{-1} (rpm) • Rated pressure 19.1 MPa (195 kgf/cm^2, 2773 psi) • Oil temperature: 45 to 55 °C (113 to 131 °F)	Delivery	75.6 L/min. 20.0 U.S.gals/min. 16.6 Imp.gals/min.	63.4 L/min. 16.7 U.S.gals/min. 13.9 Imp.gals/min.
Housing Bore	Depth of Scratch	–	0.09 mm 0.0035 in.
Bushing to Gear Shaft	Clearance	–	0.15 mm 0.0059 in.

REGULATOR VALVE

Item		Factory Specification	Allowable Limit
System Pressure	At Maximum Engine Speed	2.06 to 2.25 MPa 21.0 to 23.0 kgf/cm^2 298.7 to 327.1 psi	–
Regulator Valve Setting Pressure	At Maximum Engine Speed	2.75 to 2.94 MPa 28.0 to 30.0 kgf/cm^2 398.3 to 426.7 psi	–

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PTO CLUTCH VALVE

Item		Factory Specification	Allowable Limit
PTO Clutch Operating Pressure	At Maximum Engine Speed	2.06 to 2.25 MPa 21.0 to 23.0 kgf/cm^2 298.7 to 327.1 psi	–

POWER SHIFT SYSTEM

Item		Factory Specification	Allowable Limit
System Pressure	At Idling Engine Speed	2.06 to 2.25 MPa 21.0 to 23.0 kgf/cm^2 298.7 to 327.1 psi	–
Master Clutch Operating Pressure	At Idling Engine Speed	2.06 to 2.25 MPa 21.0 to 23.0 kgf/cm^2 298.7 to 327.1 psi	–
Pilot Pressure	At Idling Engine Speed	0.79 MPa 8.0 kgf/cm^2 113.8 psi	–
Main Shift Hydraulic Clutch Operating Pressure	At Idling Engine Speed	2.06 to 2.25 MPa 21.0 to 23.0 kgf/cm^2 298.7 to 327.1 psi	–

STEERING CONTROLLER

Item		Factory Specification	Allowable Limit
Relief Valve **Condition** • Engine speed: Maximum engine speed • Oil temperature: 45 to 55 °C (113 to 131 °F)	Setting Pressure	14.2 to 14.9 MPa 145 to 152 kgf/cm^2 2063 to 2161 psi	–

STEERING CYLINDER

Item		Factory Specification	Allowable Limit
Steering Cylinder	I.D.	70.000 to 70.074 mm 2.75591 to 2.75882 in.	70.100 mm 2.75984 in.

RELIEF VALVE FOR 3-POINT HYDRAULIC SYSTEM

Item		Factory Specification	Allowable Limit
Relief Valve	Setting Pressure	19.1 to 19.6 MPa 195 to 200 kgf/cm^2 2773 to 2845 psi	–

CYLINDER SAFETY VALVE

Item		Factory Specification	Allowable Limit
Cylinder Safety Valve	Operating Pressure	23.1 to 24.5 MPa 235 to 250 kgf/cm^2 3342 to 3356 psi	–

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HYDRAULIC CYLINDER

Item		Factory Specification	Allowable Limit
Cylinder Bore	I.D.	100.036 to 100.071 mm 3.93843 to 3.93980 in.	100.15 mm 3.94291 in.
Hydraulic Arm Shaft to Bushing	Clearance (Right)	0.140 to 0.250 mm 0.00551 to 0.00984 in.	0.50 mm 0.0197 in.
	Clearance (Left)	0.140 to 0.250 mm 0.00551 to 0.00984 in.	0.50 mm 0.0197 in.
• Hydraulic Arm Shaft (Right)	O.D.	59.970 to 60.000 mm 2.36102 to 2.36220 in.	–
• Hydraulic Arm Shaft (Left)	O.D.	64.970 to 65.000 mm 2.55787 to 2.55906 in.	–
• Bushing (Right)	I.D.	60.140 to 60.220 mm 2.36772 to 2.37087 in.	–
• Bushing (Left)	I.D.	65.140 to 65.220 mm 2.56457 to 2.56772 in.	–

DRAFT SENSOR BAR

Item		Factory Specification	Allowable Limit
Draft Sensor Bar	Alignment	–	0.15 mm 0.0059 in.
Restricted Bolt and Inner Wall of Transmission Case	Clearance	11.5 to 12.5 mm 0.45 to 0.49 in.	–

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3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-13.)

Item	N·m	kgf·m	lbf·ft
3P delivery hose retaining nut	45.1 to 53.0	4.6 to 5.4	33.3 to 39.1
Power steering pump delivery pipe retaining nut	107.9 to 117.7	11.0 to 12.0	79.6 to 86.8
PTO delivery pipe retaining nut	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
PTO pipe retaining nut	39.2 to 49.0	4.0 to 4.9	29.0 to 36.1
Hydraulic pump base mounting nut	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Hydraulic pump housing cover mounting screw	88.2 to 93.1	9.0 to 9.5	65.1 to 68.7
Clutch safety valve hose retaining nut	23.0 to 27.0	2.4 to 2.7	17.0 to 19.9
Gerotor assembly mounting screw (5/16')	25.5 to 28.4	2.6 to 2.9	18.9 to 21.0
Steering cylinder guide assembly	294 to 470	30.0 to 48.0	217 to 347
Hydraulic cylinder mounting screw and nut	77.5 to 90.2	7.9 to 9.2	57.2 to 66.5
Hydraulic arm setting screw	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3
Lift lever mounting screw	123.6 to 147.1	12.6 to 15.0	91.1 to 108.5
Hydraulic cylinder cover mounting screw	197 to 225	20.0 to 23.0	145 to 166
Cylinder safety valve	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Cylinder safety valve lock nut	58.8 to 78.5	6.0 to 8.0	43.4 to 57.9
Control valve mounting screw	12.7 to 16.7	1.3 to 1.7	9.4 to 12.3
Solenoid mounting screw (control valve)	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Lowering main spool mounting plug (control valve)	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Lifting main spool mounting plug (control valve)	39.2 to 49.0	4.0 to 5.0	28.9 to 36.2
Plug for unload valve (control valve)	34.3 to 39.2	3.4 to 4.0	24.6 to 28.9
Plug for check valve (control valve)	68.6 to 78.4	7.0 to 8.0	50.6 to 57.9
Plug for shuttle valve (control valve)	68.6 to 78.4	7.0 to 8.0	50.6 to 57.9
Relief valve	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9

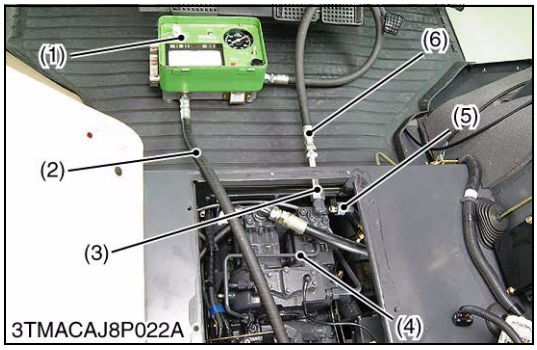
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4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Hydraulic Pump for Power Steering



Hydraulic Flow Test

■ **IMPORTANT**
- **When using flowmeter other than KUBOTA specified flowmeter, be sure to use the instructions with the flowmeter.**
- **Do not close the flowmeter loading valve completely, before testing, because it has no relief valve.**

1. Remove the floor mat and inspection plate under the mat.
2. Remove the delivery pipe (5).
3. Install the adaptor **64** (3) (see page G-56) to the pump discharge port.
4. Connect the hydraulic test hose (6) to the hydraulic pump (4) and flowmeter inlet port.
5. Connect the other hydraulic test hose (2) to the flowmeter outlet port and put the end of the hose into the transmission case oil port.
6. Open the flowmeter loading valve completely. (Turn counterclockwise.)
7. Start the engine and set the engine speed at 2000 to 2200 min^{-1} (rpm).
8. Slowly close the loading valve to generate pressure approx. 9.8 MPa (100 kgf/cm^2, 1422 psi). Hold in this condition until oil temperature reaches approx. 50 °C (122 °F).
9. Open the loading valve completely.
10. Set the engine speed. (Refer to **Condition**.)
11. Read and note the pump delivery at no pressure.
12. Slowly close the loading valve to increase rated pressure. (Refer to **Condition**.) As the load is increased, engine speed drops, therefore, reset the engine speed.
13. Read and note the pump delivery at rated pressure.
14. Open the loading valve completely and stop the engine.
15. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

Condition
- Engine speed: Approx. 2200 min^{-1} (rpm)
- Rated pressure:
  14.2 MPa (145 kgf/cm^2, 2059 psi)
- Oil temperature:
  45 to 55 °C (113 to 131 °F)

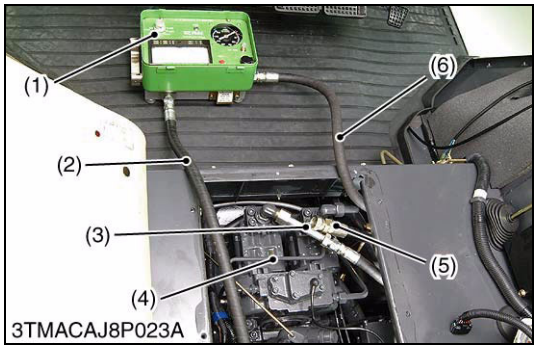
Hydraulic pump delivery at rated pressure	Factory specification	58.9 L/min. 15.5 U.S.gals/min. 12.9 Imp.gals/min.
	Allowable limit	49.4 L/min. 13.0 U.S.gals/min. 10.8 Imp.gals/min.

(1) Flowmeter
(2) Hydraulic Test Hose
(3) Adaptor **64**
(4) Hydraulic Pump (for Power Steering)
(5) Delivery Pipe
(6) Hydraulic Test Hose

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(2) Hydraulic Pump for 3-Point Hitch



Hydraulic Flow Test

■ **IMPORTANT**
- **When using flowmeter other than KUBOTA specified flowmeter, be sure to use the instructions with the flowmeter.**
- **Do not close the flowmeter loading valve completely, before testing, because it has no relief valve.**

1. Remove the floor mat and inspection plate under the mat.
2. Remove the delivery hose (5).
3. Install the adaptor **64** (3) (see page G-56) to the pump discharge port.
4. Connect the hydraulic test hose (6) to the hydraulic pump (4) and flowmeter inlet port.
5. Connect the other hydraulic test hose (2) to the flowmeter outlet port and put the end of the hose into the transmission case oil port.
6. Open the flowmeter loading valve completely. (Turn counterclockwise.)
7. Start the engine and set the engine speed at 2000 to 2200 min^{-1} (rpm).
8. Slowly close the loading valve to generate pressure approx. 9.8 MPa (100 kgf/cm^2, 1422 psi). Hold in this condition until oil temperature reaches approx. 50 °C (122 °F).
9. Open the loading valve completely.
10. Set the engine speed. (Refer to **Condition**.)
11. Read and note the pump delivery at no pressure.
12. Slowly close the loading valve to increase rated pressure. (Refer to **Condition**.) As the load is increased, engine speed drops, therefore, reset the engine speed.
13. Read and note the pump delivery at rated pressure.
14. Open the loading valve completely and stop the engine.
15. If the pump delivery does not reach the allowable limit, check the pump suction line, oil filter or hydraulic pump.

Condition
- Engine speed: Approx. 2200 min^{-1} (rpm)
- Rated pressure:
  19.1 MPa (195 kgf/cm^2, 2773 psi)
- Oil temperature:
  45 to 55 °C (113 to 131 °F)

Hydraulic pump delivery at rated pressure	Factory specification	75.6 L/min. 20.0 U.S.gals/min. 16.6 Imp.gals/min.
	Allowable limit	63.4 L/min. 16.7 U.S.gals/min. 13.9 Imp.gals/min.

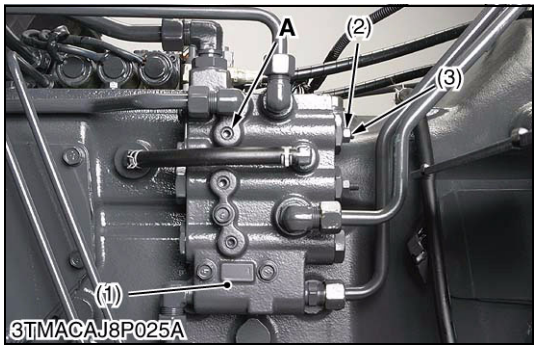
(1) Flowmeter
(2) Hydraulic Test Hose
(3) Adaptor **64**
(4) Hydraulic Pump (for 3-Point Hitch)
(5) Delivery Hose
(6) Hydraulic Test Hose

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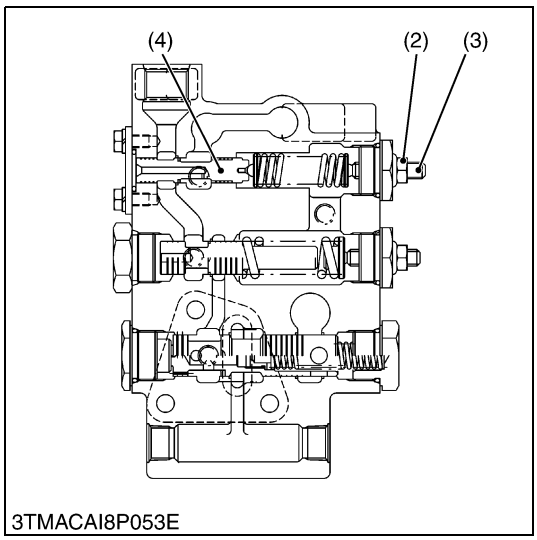
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(3) Regulator Valve


3TMACAJ8P024A



3TMACAJ8P025A



3TMACAI8P053E

System Pressure (for Power Shift / PTO Clutch / 4WD/Bi-speed / Differential Lock)

1. Remove the floor mat and inspection plate under the mat.
2. Remove the plug **"A"** and set the adaptor **D** (PT1/8) (Code No.: 07916-50381), threaded joint (Code No.: 07916-50341), cable (Code No.: 07916-50331) and pressure gauge (Code No.: 07916-52961).
3. Start the engine and measure the pressure.
4. If the system pressure is not within the factory specification, loosen the lock nut (2) and turn the screw (3) on the regulator valve (1) to adjust.

Condition

- Engine speed:
  Maximum
- Oil temperature:
  45 to 55 °C (113 to 131 °F)

System pressure	Factory specification	2.06 to 2.25 MPa 21.0 to 23.0 kgf/cm^2 298.7 to 327.1 psi

■ **NOTE**

- **Apply liquid gasket (Three Bond 1324N or equivalent) to the plug when install it.**

(Reference)

- Turn the screw (3) to clockwise direction → pressure increase
- Turn the screw (3) to counterclockwise direction → pressure decrease

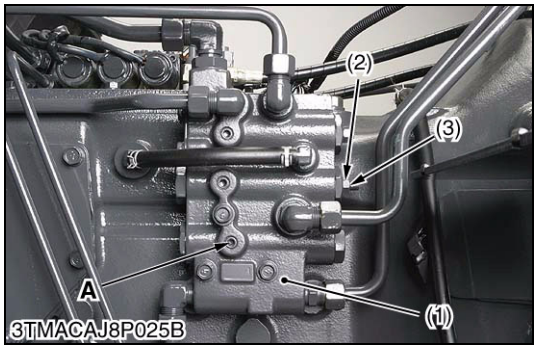
(1) Regulator Valve Assembly
(2) Lock Nut
(3) Adjusting Screw
(4) Pressure Reducing Spool

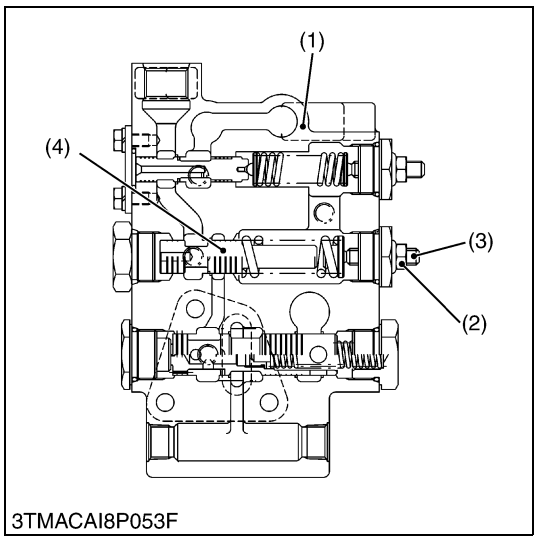
A: Check Plug

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Regulator Valve Setting Pressure

1. Remove the floor mat and inspection plate under the mat.
2. Remove the plug **"A"** and set the adaptor **D** (PT1/8) (Code No.: 07916-50381), threaded joint (Code No.: 07916-50341), cable (Code No.: 07916-50331) and pressure gauge (Code No.: 07916-52961).
3. Start the engine and measure the pressure.
4. If the system pressure is not within the factory specification, loosen the lock nut (2) and turn the screw (3) on the regulator valve (1) to adjust.

Condition

- Engine speed:
  Maximum
- Oil temperature:
  45 to 55 °C (113 to 131 °F)

Regulating pressure	Factory specification	2.75 to 2.94 MPa 28.0 to 30.0 kgf/cm^2 398.3 to 426.7 psi

■ **NOTE**

- **Apply liquid gasket (Three Bond 1324N or equivalent) to the plug when install it.**

(Reference)

- Turn the screw (3) to clockwise direction → pressure increase
- Turn the screw (3) to counterclockwise direction → pressure decrease

(1) Regulator Valve Assembly
(2) Lock Nut
(3) Adjusting Screw
(4) Pressure Reducing Spool

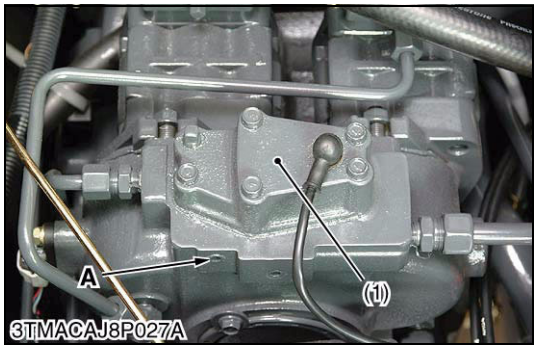
A: Check Plug

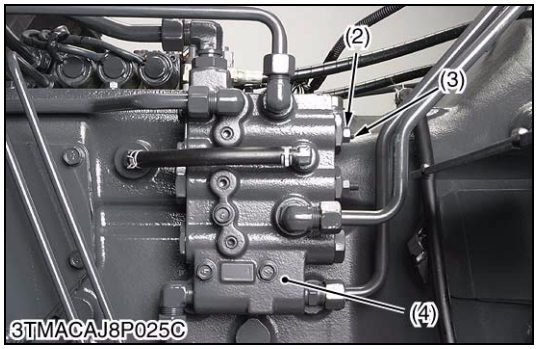
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(4) PTO Clutch







PTO Clutch Operating Pressure

1. Remove the floor mat and inspection plate under the mat.
2. Remove the plug **"A"** and set the adaptor **D** (PT1/8) (Code No.: 07916-50381), threaded joint (Code No.: 07916-50341), cable (Code No.: 07916-50331) and pressure gauge (Code No.: 07916-52961).
3. Start the engine and set the engine speed maximum.
4. Turn on the PTO switch and measure the pressure.
5. If only the pressure in the PTO clutch engaged position is low, check the hydraulic PTO clutch system.
6. If the measurement is not within the factory specifications, loosen the lock nut (2) and turn the screw (3) on the regulator valve (4) to adjust.

■ **IMPORTANT**

- **Do not connect the universal joint of the implement to the tractor PTO shaft while testing.**

Condition

- Engine speed:
  Maximum
- Oil temperature:
  45 to 55 °C (113 to 131 °F)

PTO clutch operating pressure (PTO switch "ON" position)	Factory specification	2.06 to 2.25 MPa 21.0 to 23.0 kgf/cm^2 298.7 to 327.1 psi

■ **NOTE**

- **Apply liquid gasket (Three Bond 1324N or equivalent) to the plug when install it.**

(Reference)

- Turn the screw (3) to clockwise direction → pressure increase
- Turn the screw (3) to counterclockwise direction → pressure decrease

(1) PTO Valve
(2) Lock Nut
(3) Adjusting Screw
(4) Regulator Valve Assembly

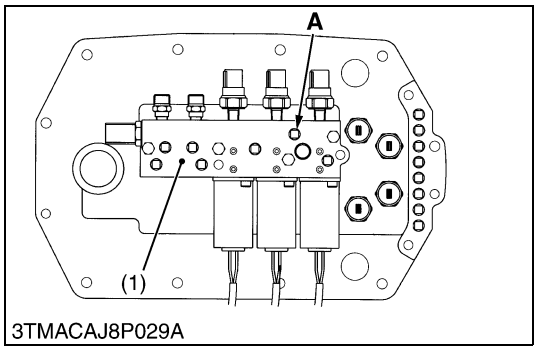
A: Check Plug

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(5) Power Shift Clutch





System Pressure

1. Remove the floor mat and inspection plate under the mat.
2. Remove the plug **"A"** from the power shift valve (1).
3. Set the adaptor **D** (PT1/8) (Code No.: 07916-50381), threaded joint (Code No.: 07916-50341), cable (Code No.: 07916-50331) and pressure gauge (Code No.: 07916-52961).
4. Start the engine and measure the system pressure. (The shuttle lever and power shift lever being set at the **Neutral** position).
5. If system pressure is too low, check the system pressure of regulator valve. (See page 8-S8.)
6. If system pressure of regulator valve is too low, adjust the system pressure of regulator valve. (See page 8-S8.)

Condition

- Engine speed:
  Idling speed
- Oil temperature:
  45 to 55 °C (113 to 131 °F)

System pressure	Factory specification	2.06 to 2.25 MPa 21.0 to 23.0 kgf/cm^2 298.7 to 327.1 psi

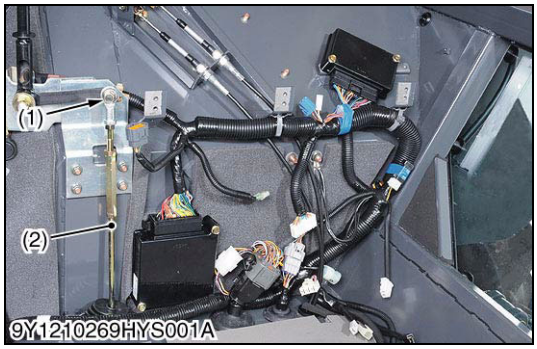
■ **NOTE**

- **Apply liquid gasket (Three Bond 1324N or equivalent) to the plug when install it.**

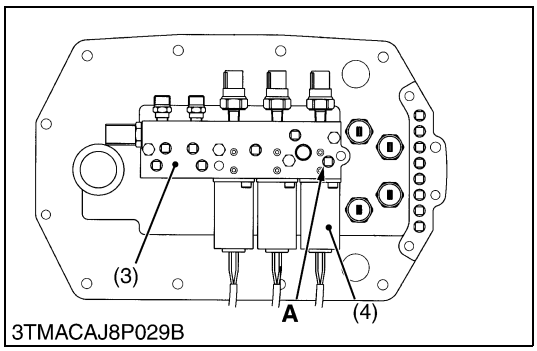
(1) Power Shift Valve **A: System Pressure Checking Port**

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Master Clutch Pressure

1. Remove the panel side cover.
2. Set the power shift / range shift lever to the **Neutral** position.
3. Remove the nut (1) and disconnect the range gear shift rod (2) in neutral position to prevent the tractor from moving while testing.
4. Remove the floor mat and inspection plate under the mat.
5. Remove the plug **"A"** and set the adaptor **D** (PT1/8) (Code No.: 07916-50381), threaded joint (Code No.: 07916-50341), cable (Code No.: 07916-50331) and pressure gauge (Code No.: 07916-52961).
6. Start the engine and shift the power shift lever to **L** or **H** position. Then shift the shuttle lever to **Forward** or **Reverse** position.
7. Check the master clutch pressure.
8. It is OK if pressure is 0 when clutch pedal is depressed and if pressure is same as system pressure when clutch pedal is released. If master clutch pressure is too low, check the solenoid proportional reducing valve (4).

Condition

- Engine speed:
  Idling speed
- Oil temperature:
  45 to 55 °C (113 to 131 °F)

Master clutch pressure	Factory specification	2.06 to 2.25 MPa 21.0 to 23.0 kgf/cm^2 298.7 to 327.1 psi

■ **NOTE**

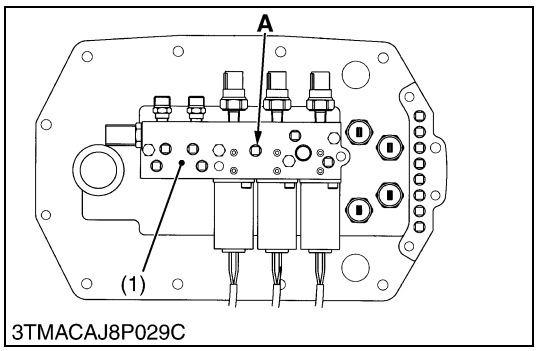
- **Apply liquid gasket (Three Bond 1324N or equivalent) to the plug when install it.**

(1) Nut
(2) Range Gear Shift Rod
(3) Power Shift Valve
(4) Solenoid Proportional Reducing Valve (Master Clutch)

A: Check Plug (Master Clutch)

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Pilot Pressure

1. Remove the floor mat and inspection plate under the mat.
2. Remove the plug **"A"** from the power shift valve (1).
3. Set the adaptor **D** (PT1/8) (Code No.: 07916-50381), threaded joint (Code No.: 07916-50341), cable (Code No.: 07916-50331) and pressure gauge (Code No.: 07916-52961).
4. Start the engine and measure the pilot pressure. (The shuttle lever and power shift lever being set at the **Neutral** position.)
5. If pilot pressure is too low, check the system pressure of power shift valve. (See page 8-S11.)

Condition

- Engine speed:
  Idling speed
- Oil temperature:
  45 to 55 °C (113 to 131 °F)

Pilot pressure	Factory specification	0.79 MPa 8.0 kgf/cm^2 113.8 psi

■ **NOTE**

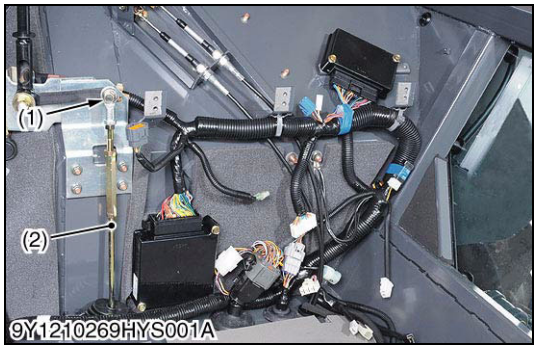
- **Apply liquid gasket (Three Bond 1324N or equivalent) to the plug when install it.**

(1) Power Shift Valve

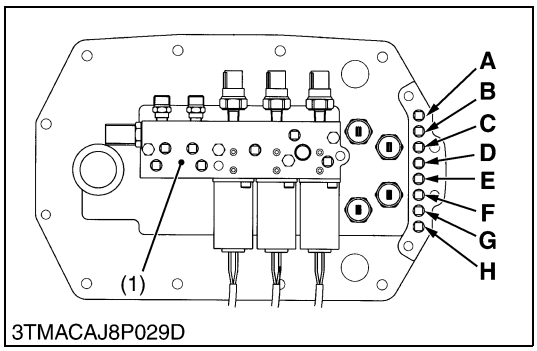
A: Check Plug (Pilot Pressure)

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Hydraulic Clutch Operating Pressure

1. Remove the panel side cover.
2. Set the power shift/range gear shift lever to the **Neutral** position.
3. Remove the nut (1) and disconnect the range gear shift rod (2) in **Neutral** position. (To prevent the tractor from moving while testing.)
4. Remove the floor mat and inspection plate under the mat.
5. Set the adaptor **D** (PT1/8) (Code No.: 07916-50381), threaded joint (Code No.: 07916-50341), cable (Code No.: 07916-50331) and pressure gauge (Code No.: 07916-52961) for checking of hydraulic clutch working pressure
6. Start the engine and check the clutch operating pressure as shown in the table below

Condition

- Engine speed:
  Idling speed
- Oil temperature:
  45 to 55 °C (113 to 131 °F)

Clutch operating pressure	Factory specification	2.06 to 2.25 MPa 21.0 to 23.0 kgf/cm^2 298.7 to 327.1 psi

Hydraulic clutch	Check port	Power shift lever position	Power shift button	Shuttle lever position
Main shift 1	**G**	L or H	1 or 5	F or R
Main shift 2	**F**		2 or 6	
Main shift 3	**C**		3 or 7	
Main shift 4	**B**		4 or 8	
Main shift L	**E**		1 thru 4	
Main shift H	**D**		5 thru 8	
Main shift F	**A**		1 thru 8	F
Main shift R	**H**		1 thru 8	R

NOTE

- **Apply liquid gasket (Three Bond 1324N or equivalent) to the plug when install it.**

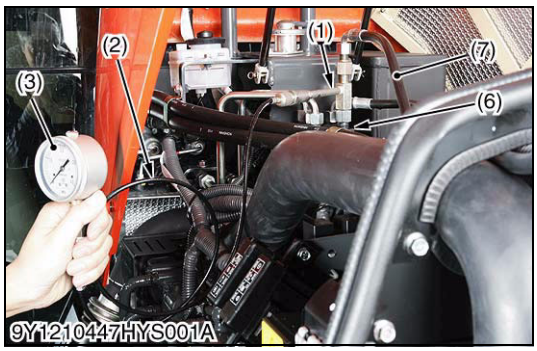
(1) Nut
(2) Range Gear Shift Rod
(3) Power Shift Valve

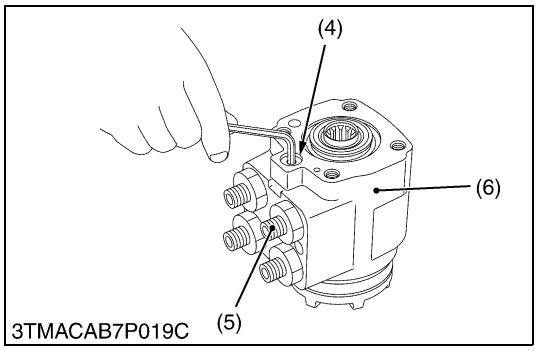
A: Check Port (Master F)
B: Check Port (Main Shift 4)
C: Check Port (Main Shift 3)
D: Check Port (Main Shift H)
E: Check Port (Main Shift L)
F: Check Port (Main Shift 2)
G: Check Port (Main Shift 1)
H: Check Port (Master R)

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(6) Power Steering





Power Steering Relief Valve Setting Pressure

1. Disconnect the power steering hose (7) from the steering controller (6).
2. Install the power steering adaptor (Code No.:07916-54021) between cylinder port **L** (5) and power steering hose (7).
3. Set the joint (Code No.: 07916-50341), cable (Code No.: 07916-50331) and pressure gauge (3) (Code No.: 07916-50321).
4. Start the engine and fully turn the steering wheel to the left and read the pressure when the relief valve operates both idling and maximum engine speeds.
5. If the measurement is not within the factory specifications, adjust the relief pressure by the adjusting screw (4).

■ **IMPORTANT**

- **(Air Bleeding) Start the engine, then turn the steering wheel slowly in both directions all the way alternately a few times, and stop the engine.**

(Reference)

- One full turn of the adjusting screw changes the relief setting pressure by approx. 2.9 MPa (30 kgf/cm^2, 427 psi).

Relief valve setting pressure	Factory specification	14.2 to 14.9 MPa 145 to 152 kgf/cm^2 2063 to 2161 psi

Condition

- Engine speed:
  Idling speed
- Oil temperature:
  50 to 60 °C (122 to 140 °F)

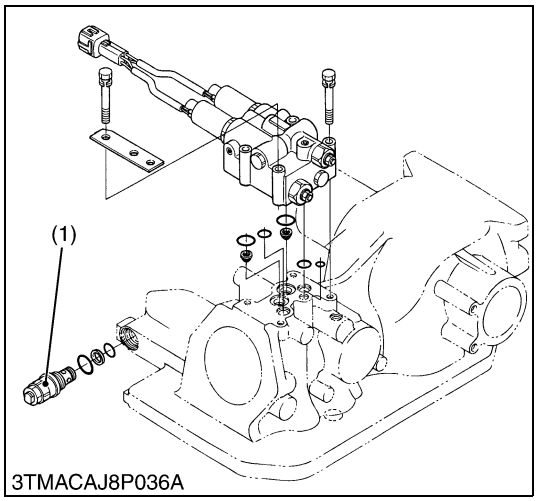
(1) Power Steering Adaptor
(2) Cable
(3) Pressure Gauge
(4) Adjusting Screw
(5) Cylinder Port **L**
(6) Steering Controller
(7) Power Steering Hose

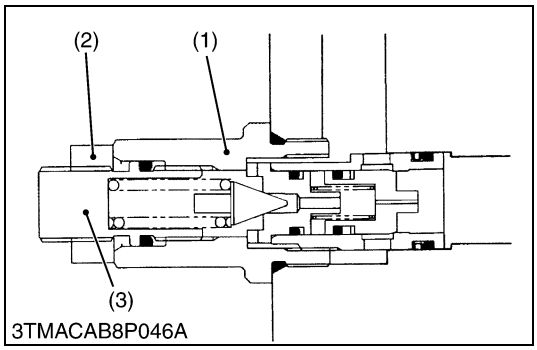
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(7) 3-Point Hitch System







Relief Valve Setting Pressure

1. Set the relief valve set pressure adaptor **G** (Code No.: 07916-52751) to the half male of the quick coupler and then set a pressure gauge (Code No.: 07916-50321), cable (Code No.: 07916-50331).
2. Start the engine, set a maximum speed.
3. Set the auxiliary control valve operation lever to the **DN** position and read the pressure gauge when the relief valve is actuated.
4. If the pressure is not within the factory specification, adjust the relief valve adjustor (3).

Condition

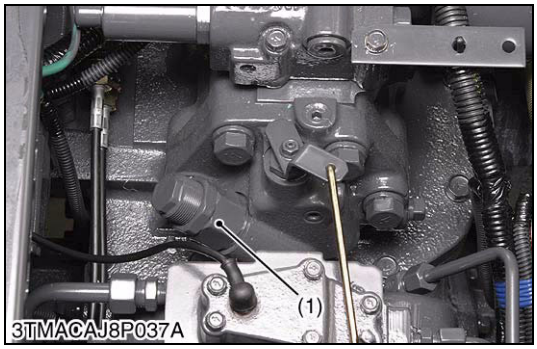
- Engine speed:
  Idling speed
- Oil temperature:
  45 to 55 °C (113 to 131 °F)

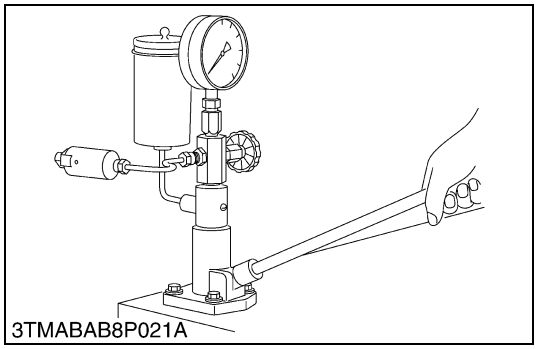
Relief valve setting pressure	Factory specification	19.1 to 19.6 MPa 195 to 200 kgf/cm^2 2773 to 2845 psi

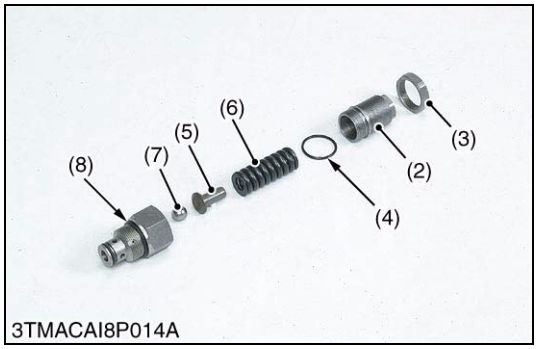
(1) Relief Valve
(2) Lock Nut
(3) Adjustor

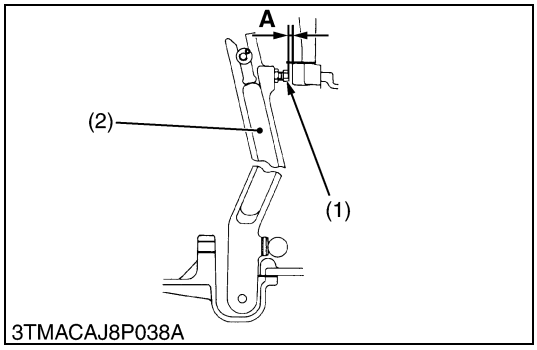
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Safety Valve Setting Pressure Test Using Injection Nozzle Tester

1. Remove the cylinder safety valve assembly (1).
2. Attach the cylinder safety valve to a safety valve tester with a safety valve setting adaptor. (See page G-59.)
3. Measure the operating pressure of the cylinder safety valve.
4. If the operating pressure is not within the factory specifications, adjust by turning the adjusting screw (2).
5. After adjustment, tighten the lock nut (3) firmly.

Cylinder safety valve operating pressure	Factory specification	23.1 to 24.5 MPa 235 to 250 kgf/cm^2 3342 to 3556 psi

■ **NOTE**

- **Use specified transmission fluid (see page G-10) to test the operating pressure of the cylinder safety valve.**

(1) Safety Valve Assembly
(2) Adjusting Screw
(3) Lock Nut
(4) O-ring
(5) Seat
(6) Spring
(7) Ball
(8) Housing

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Adjusting Restricted Bolt of Link 1

1. Measure the clearance **"A"** between the restricted bolt head (1) and the inner wall of transmission case.
2. If the clearance is not equal to the factory specification, adjust the restricted bolt (1).
3. After adjusting the restricted bolt (1), secure it with the lock nut.

Clearance **"A"** between restricted bolt head and inner wall of transmission case	Factory specification	11.5 to 12.5 mm 0.45 to 0.49 in.

(1) Restricted Bolt
(2) Link 1

A: Clearance

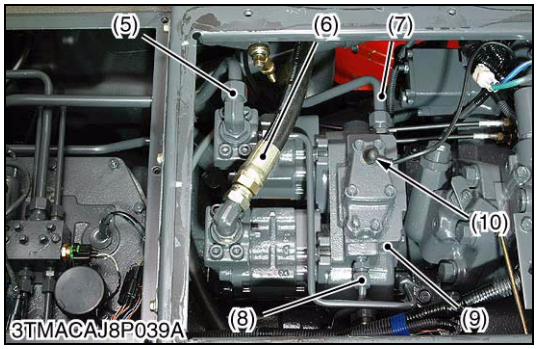
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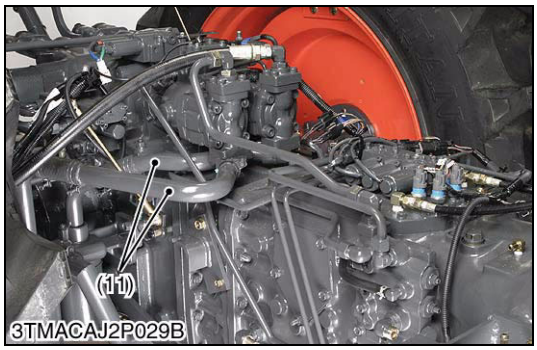
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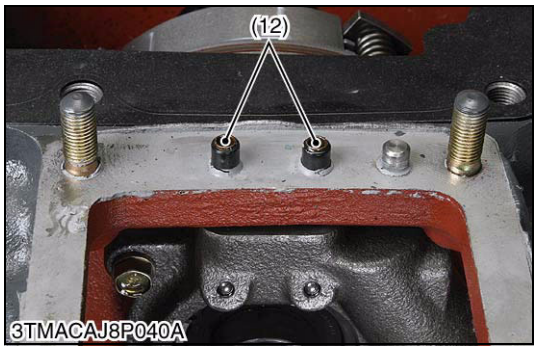
[2] DISASSEMBLING AND ASSEMBLING

(1) Hydraulic Pump (for Power Steering and 3-Point Hitch)









Removing Hydraulic Pump

1. Remove the side cover (4) and disconnect the **2P** connectors and **10P** connector.
2. Remove the seat (1) and 3-point hitch lowering lock lever (13).
3. Remove the cover (3), mat (2) and plate under the mat (2).
4. Disconnect the delivery hose (6) and delivery pipe (5).
5. Disconnect the PTO delivery pipe (7) and PTO pipe (8).
6. Disconnect the terminal (10) from the PTO valve.
7. Remove the suction pipes (11).
8. Remove the pump base mounting nuts.
9. Remove the pump base (9) with pump assembly.

(When reassembling)

- Apply liquid gasket (Three Bond 1206D or equivalent) to joint face of transmission case and valve assembly, and valve assembly and hydraulic pump.
- Replace the oil pipes (12) with new ones.
- Apply oil to oil pipes (12).

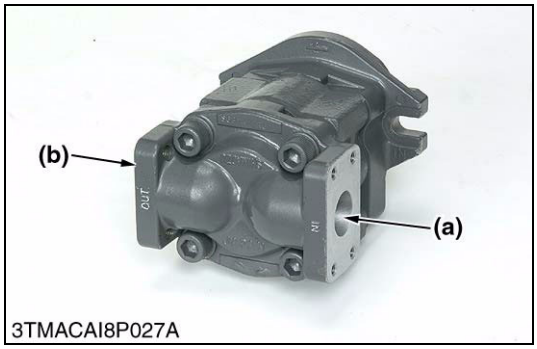
Tightening torque	3P delivery hose (6) retaining nut	45.1 to 53.0 N·m 4.6 to 5.4 kgf·m 33.3 to 39.1 lbf·ft
	Power steering pump delivery pipe (5) retaining nut	107.9 to 117.7 N·m 11.0 to 12.0 kgf·m 79.6 to 86.8 lbf·ft
	PTO delivery pipe (7) retaining nut	49.0 to 68.6 N·m 5.0 to 7.0 kgf·m 36.2 to 50.6 lbf·ft
	PTO pipe (8) retaining nut	39.2 to 49.0 N·m 4.0 to 4.9 kgf·m 29.0 to 36.1 lbf·ft
	Hydraulic pump base mounting nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

(1) Seat
(2) Mat
(3) Cover
(4) Side Cover
(5) Delivery Pipe (for Power Steering)
(6) Delivery Hose (for 3-point Hitch)
(7) PTO Delivery Pipe
(8) PTO Pipe
(9) Pump Base
(10) Terminal
(11) Suction Pipe
(12) Oil Pipe
(13) 3-Point Hitch Lowering Lock Lever

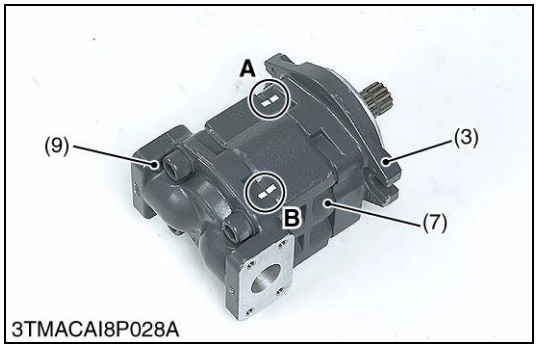
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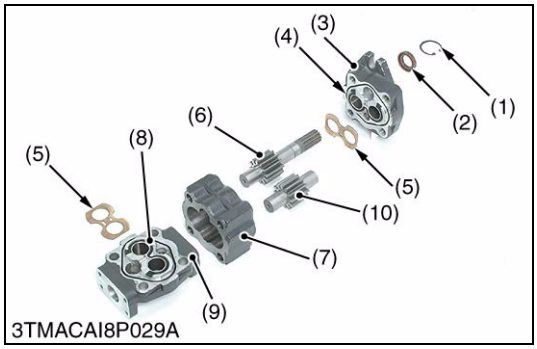

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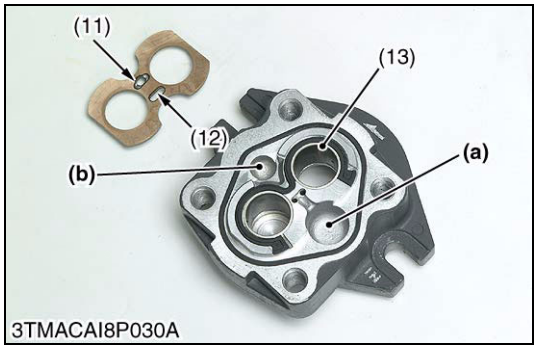
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3TMACAI8P028A



3TMACAI8P029A



3TMACAI8P030A

Disassembling Hydraulic Pump

1. Put parting mark **"A"**, **"B"** on the front cover (3), body (7) and housing rear cover (9).
2. Remove the housing rear cover (9) and body (7).
3. Remove the side plate (5).
4. Take out the gears (6), (10).

(When reassembling)

- Take care not to damage the seal elements and O-rings.
- Fit the ellipse hole (12) of side plate (5) to the inlet side.
- When installing the drive gear (6) and driven gear (10) into front cover and rear cover, apply clean transmission fluid to the assemble.
- When installing the driven gear (10), be sure to reassembling it to the original position.
- After reassembly, check the smooth rotation of the hydraulic pump (for example, mount arm an approx. 100 mm (3.94 in.) long to the drive gear and rotate its arm slowly for smooth rotation).

Tightening torque	Hydraulic pump housing cover mounting screw	88.2 to 93.1 N·m 9.0 to 9.5 kgf·m 65.1 to 68.7 lbf·ft

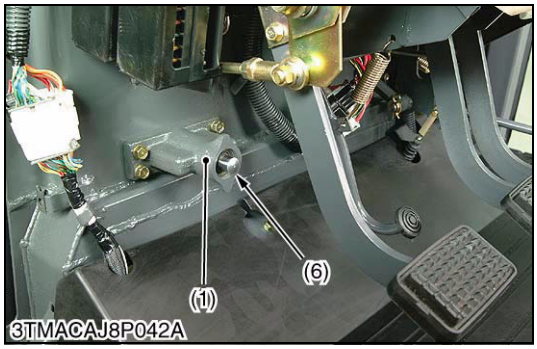
(1) Internal Snap Ring
(2) Oil Seal
(3) Front Cover
(4) O-ring
(5) Side Plate
(6) Drive Gear
(7) Body
(8) O-ring
(9) Rear Cover
(10) Driven Gear
(11) Notching Circle Hole
(12) Ellipse Hole
(13) Seal Element

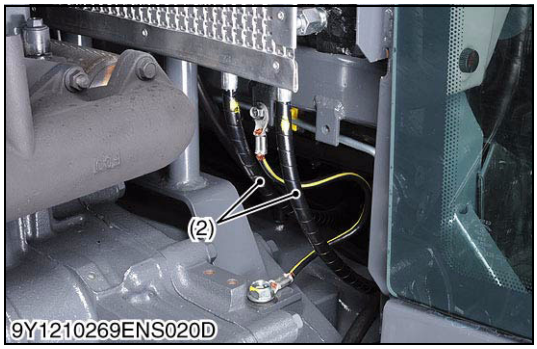
A: Parting Mark
B: Parting Mark
(a) Inlet
(b) Outlet

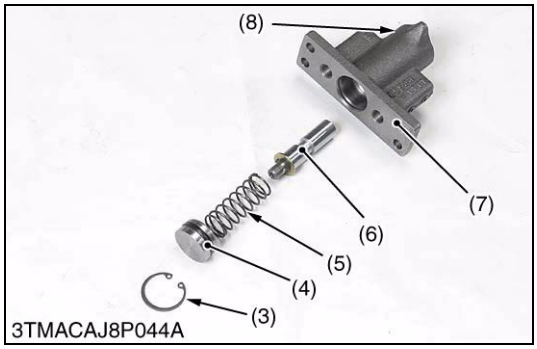
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(2) Clutch Safety Valve







Clutch Safety Valve

1. Remove the safety valve hoses (2).
2. Dismount a clutch safety valve assembly (1).
3. Remove a internal circlip (3) and then plug (4), spring (5) and spool (6).

(When reassembling)

- Mount it so that the hexagonal socket head plug side should come to the right side.
- Take care not to damage the O-ring.

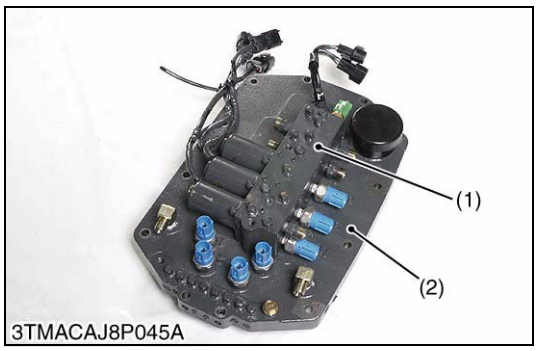
Tightening torque	Clutch safety valve hose retaining nut	23.0 to 27.0 N·m 2.4 to 2.7 kgf·m 17.0 to 19.9 lbf·ft

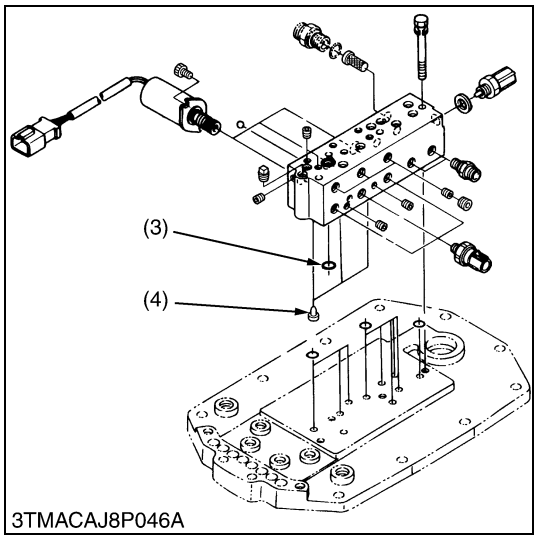
(1) Clutch Safety Valve
(2) Safety Valve Hose
(3) Internal Circlip
(4) Plug
(5) Spring
(6) Spool
(7) Valve Body
(8) Hexagonal Socket Head Plug

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(3) Power Shift Valve





Separating Power Shift Valve Assembly 1 (Upper)

1. Remove the power shift valve 1 mounting screws and dismount the valve assembly 1 (upper) (1) from the housing cover (2).

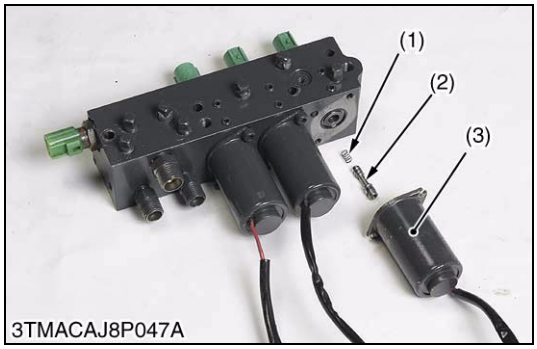
(When reassembling)

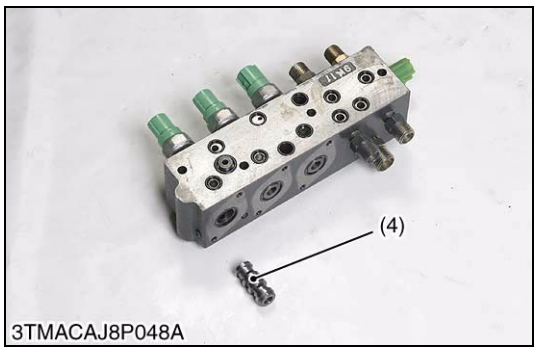
- Mount O-rings and the line filter without fail.

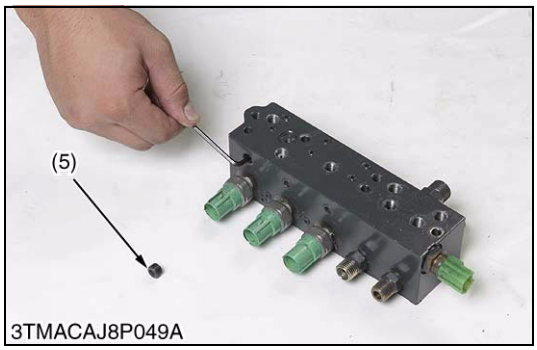
(1) Power Shift Valve Assembly 1 (Upper)
(2) Housing Cover
(3) O-ring
(4) Line Filter

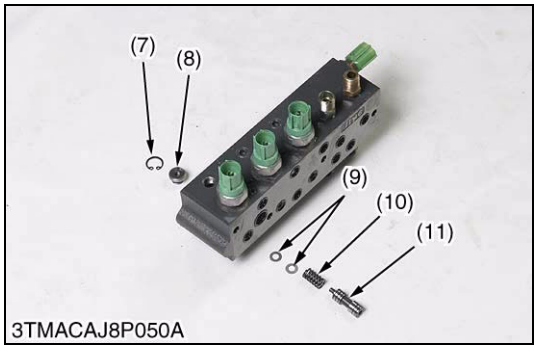
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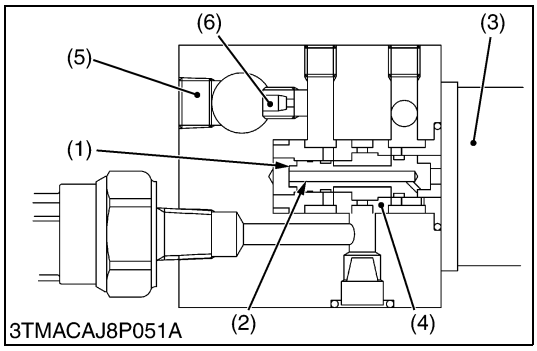


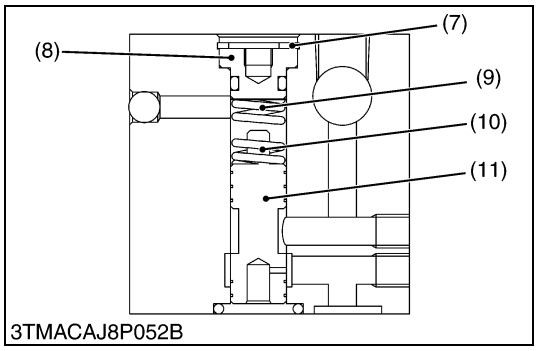
Disassembling Power Shift Valve (Upper)

1. Remove the solenoid valve (3).
2. Remove a spool (2) and a spring (1).
3. Remove a sleeve (4).
4. Remove a plug (5) and then an orifice (6).
5. Remove the internal cir-clip (7) and plug (8).
6. Remove the pressure reducing valve spool (11), spring (10) and shim (9).

(When reassembling)

- Take care not to damage the O-rings.

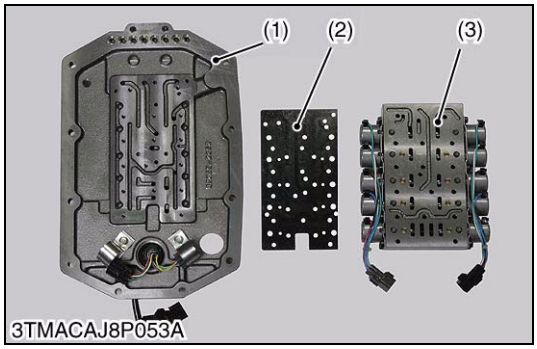


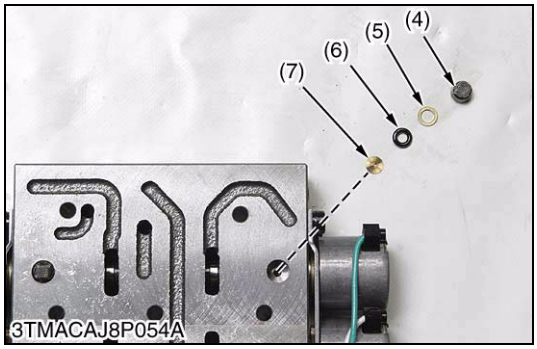


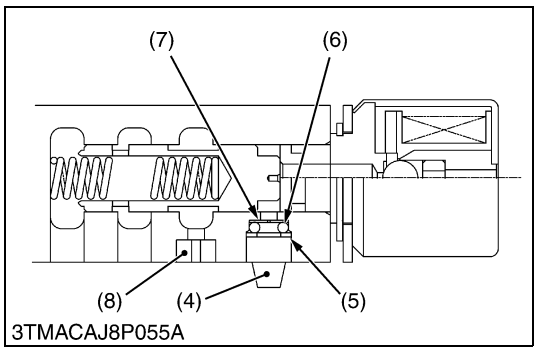
(1) Spring
(2) Spool
(3) Solenoid Valve
(4) Sleeve
(5) Plug
(6) Orifice
(7) Internal Cir-clip
(8) Plug
(9) Shim
(10) Spring
(11) Pressure Reducing Valve Spool

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Separating Power Shift Valve Assembly 2 (Lower)

1. Disconnect the connector of the solenoid ON/OFF valve.
2. Remove hexagonal socket head bolts and dismount a valve assembly (lower) (3) and a partition plate (2) from a housing cover (1).

(When reassembling)

- Take care not to drop line filter (4), plain washer (5), O-ring (6) and orifice (7).
- Do not mount the partition plate in wrong direction.
- Tighten hexagonal socket head bolts with a uniform tightening torque.
- Connect the connectors securely.

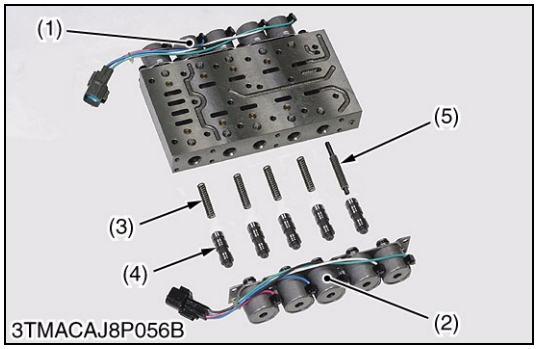
(Reference)

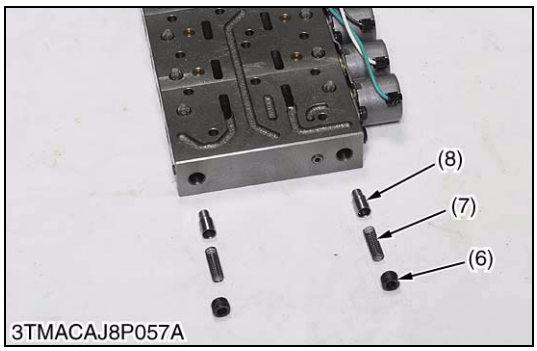
- The orifice (7) is for pilot pressure and the orifice (8) is for clutch working pressure.

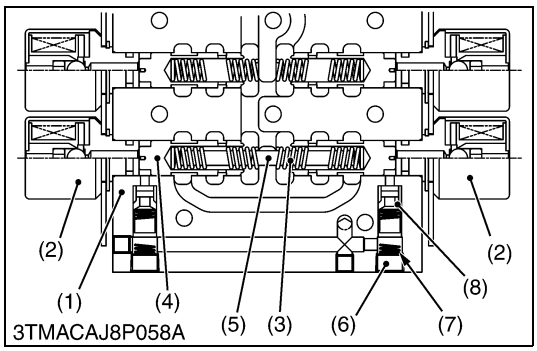
(1) Housing Cover
(2) Partition Plate
(3) Valve Assembly (Lower)
(4) Line Filter
(5) Plain Washer
(6) O-ring
(7) Orifice
(8) Orifice

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Disassembling Power Shift Assembly 2 (Lower)

1. Remove the hexagonal socket head bolts and dismount a solenoid valve assembly right part (2).
2. Remove the main spool (4) and spring (3).
3. Remove the push rod (5).
4. Disassemble parts at left side also in the same manner.

(When reassembling)

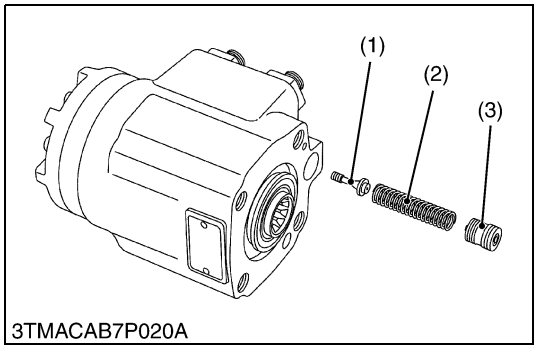
- Mount the main spool duly to the original position.
- Mount the push rod to the main **F**/**R** port.
- Do not mistake mounting direction of the solenoid valve assembly.
- Remove the plug (6), spring (7) and poppet (8).
- Apply an anaerobic adhesive (screw lock bond etc.) to the plug (6) when mounting.

(1) Solenoid Valve Assembly (Left Part)
(2) Solenoid Valve Assembly (Right Part)
(3) Spring
(4) Main Spool
(5) Push Rod
(6) Plug
(7) Spring
(8) Poppet

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(4) Steering Controller



Relief Valve Assembly

1. Remove the adjust plug (3) and draw out the spring (2) and poppet (1).

(When reassembling)

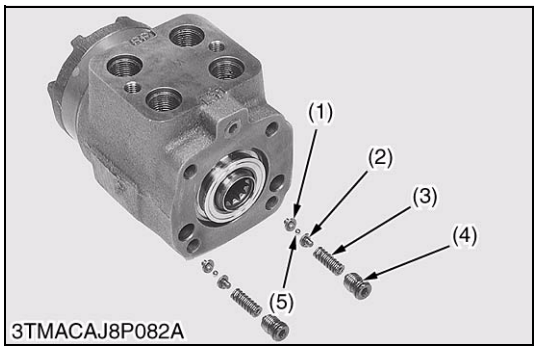
- Take care not to damage the O-ring.

■ **IMPORTANT**

- **After disassembling and assembling the relief valve, be sure to adjust the relief valve setting pressure. (See page 8-S14.)**

(1) Poppet
(2) Spring
(3) Adjusting Plug

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Overload Relief Valve

1. Remove the plug (4) and draw out the spring (3), holder (2), ball (5) and seat (1).

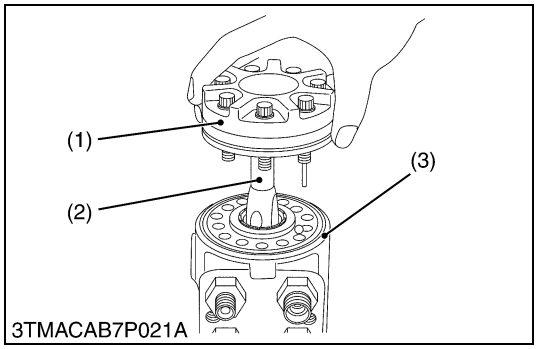
(When reassembling)

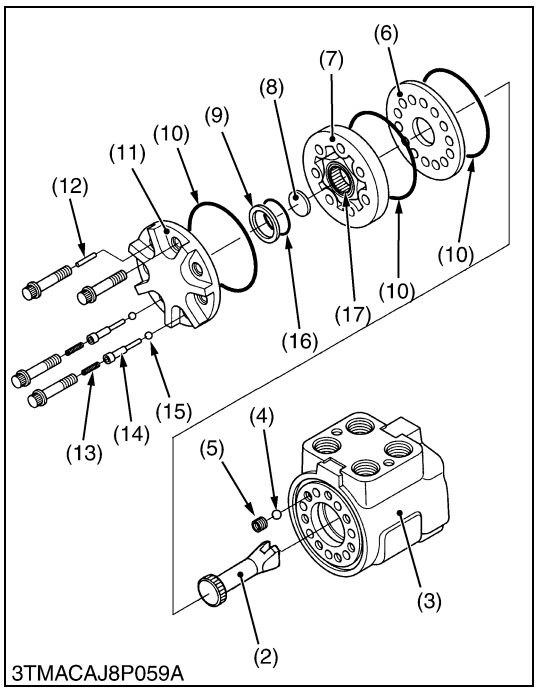
- Take care not to damage the O-ring.

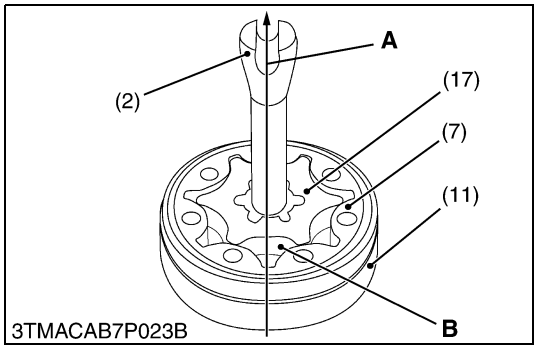
(1) Seat
(2) Holder
(3) Spring
(4) Plug
(5) Ball

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Removing Gerotor

1. Secure the housing (3) in a vise and remove seven gerotor mounting screws and gerotor assembly (1).
2. Remove the distributor plate (6) and drive shaft (2).
3. Remove the stator (7) and rotor (17).
4. Take out the spacer ring (9) and spacer (8).
5. Remove the O-ring (16) from the rotor (17).

(When reassembling)

- Fit an O-ring into the groove of the end cap (11), insert 2 or 3 bolts.
- Fit an O-ring into the groove of the stator (7), and put it on the end cap, with the O-ring upward.
- Apply clean transmission fluid (specified fluid) to the rotor (17), fit an O-ring (16) into the groove of the rotor and put the spacer on it. Keeping the spacer on the rotor, fit it into the stator (7) with the spline bevelled side upward.
- After putting the spacer into the rotor (7) insert the splines of drive shaft (2) into the rotor (7), aligning the direction of drive shaft pin groove **"A"** with the rotor tooth bottom **"B"**.
- Fit an O-ring into the groove of the housing (3).Fit the pin groove of the drive shaft (2) to the dowel pin inside the housing.

■ **IMPORTANT**

- **Be sure to align the direction of the drive shaft pin groove "A" with the rotor tooth bottom "B".**

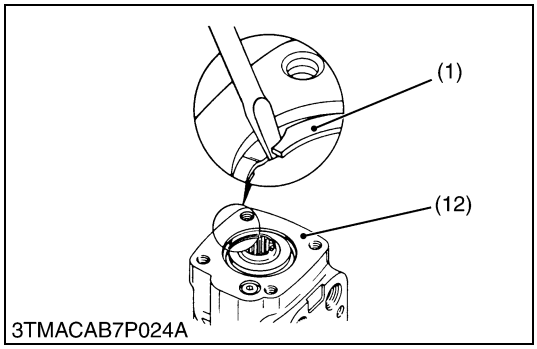
Tightening torque	Gerotor assembly mounting screw (5/16")	25.5 to 28.4 N·m 2.6 to 2.9 kgf·m 18.9 to 21.0 lbf·ft

(1) Gerotor Assembly
(2) Driven Shaft
(3) Housing
(4) Ball
(5) Plug
(6) Distributor Plate
(7) Stator
(8) Spacer
(9) Spacer Ring
(10) O-ring
(11) End Cap
(12) Pin
(13) Spring
(14) Plug Retainer
(15) Ball
(16) O-ring
(17) Rotor

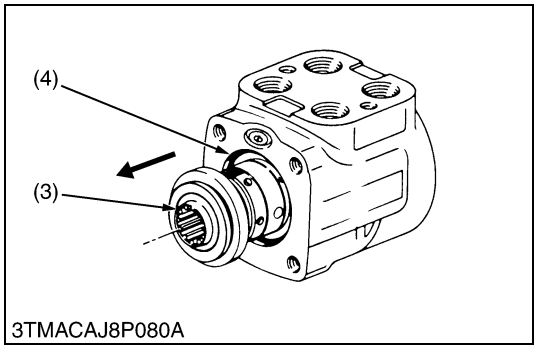
A: Pin Groove
B: Rotor Tooth Bottom

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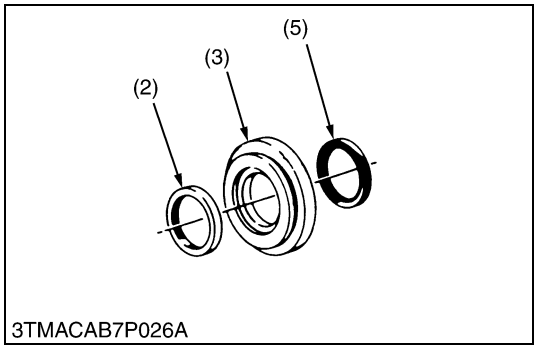
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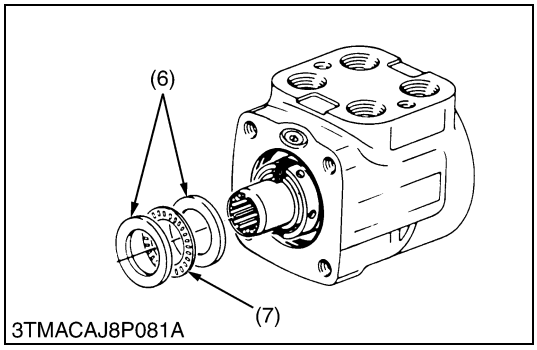
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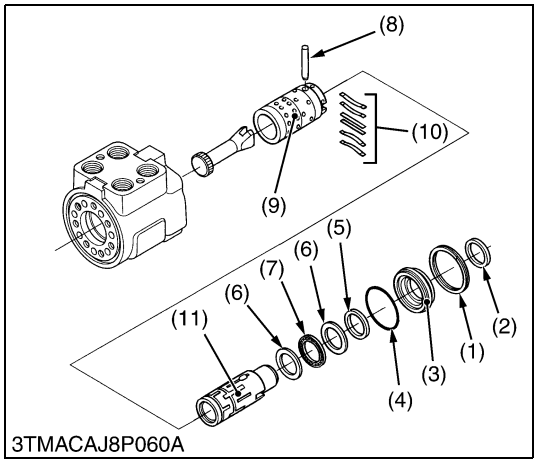
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3TMACAJ8P081A



3TMACAJ8P060A

Grand Seal, Needle Bearing, Sleeve and Spool

1. Remove the retaining ring (1) with a screwdriver.
2. Hold the control valve unit vertically and spool and sleeve align the cross pin parallels to flat side of housing (flow priority valve mounting side), the cross pin is visible through open end of spool.
3. At this time, take care so as not to allow the cross pin to be caught in the groove of the housing. If the cross pin is caught, adjust is position with a fingertip.
4. Push the spool and sleeve to the allow direction and remove the bush (3) with dust seal (2) and oil seal (5).
5. Remove the O-ring (4) from the housing (12).
6. Remove the dust seal from bush (3).
7. Remove the O-ring (4).

(When reassembling)

- Replace the O-ring with new one.
  Apply transmission fluid to the dust seal, oil seal and O-ring.

8. Remove the oil seal (5) from the sleeve (9).
9. Remove the bearing races and needle bearing from valve assembly.

(When reassembling)

- Apply transmission fluid to the bearing races and needle bearing.

10. Draw out the sleeve (9) and spool (11) assembly from the gerotor side, with the port surface of the housing downward. At this time, take care so as not to allow the dowel pin to be caught in the groove of the housing (12). If the dowel pin is caught, adjust its position with a fingertip and draw out the sleeve and spool assembly slowly.

■ **IMPORTANT**

- **As the clearance between the housing and sleeve is very narrow, do not forcibly draw out the sleeve.**

(When reassembling)

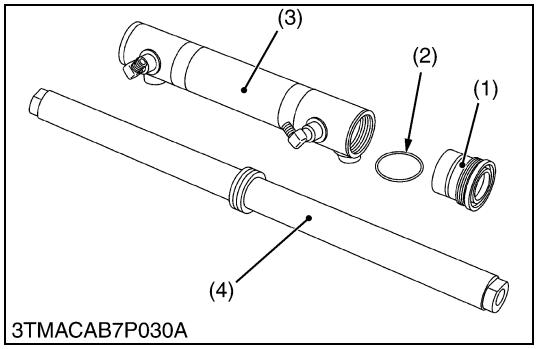
- When fitting the sleeve (9) and spool (11) assembly into the housing (12), apply clean transmission fluid to the assembly and then insert it while turning it slowly, taking care so that the parts are not inclines. Also, pay attention to the dowel pin so that it is not caught in the housing grooves. If the pin is caught, adjust its position with a fingertip.

(1) Retaining Ring
(2) Dust Seal
(3) Bush
(4) O-ring
(5) Oil Seal
(6) Bearing Race
(7) Needle Bearing
(8) Dowel Pin
(9) Sleeve
(10) Centering Spring
(11) Spool
(12) Housing

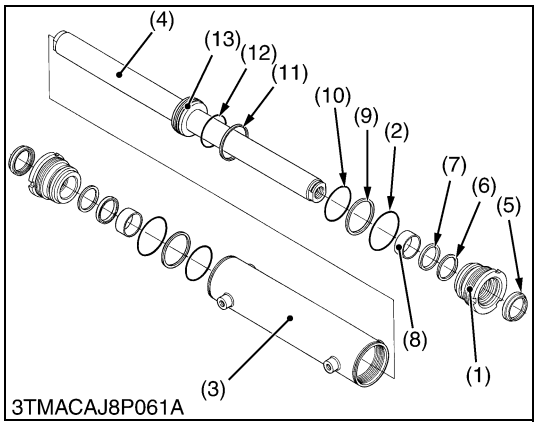
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(5) Power Steering Cylinder



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Disassembling Steering Cylinder

1. Carefully clamp the cylinder in a vise.
2. Remove the guide assembly (1) and draw out the piston rod (4).

(When reassembling)

- Apply transmission fluid to the oil seal and O-ring.
- Apply molybdenum disulfide (Three Bond 1901 or equivalent) on the screw of guide when tighten it.
- After tightening the guide assembly to the specified torque, stake the cylinder firmly.

Tightening torque	Guide assembly	294 to 470 N·m 30.0 to 48.0 kgf·m 217 to 347 lbf·ft

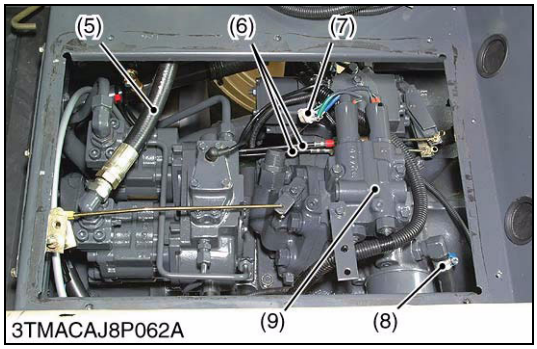
(1) Guide Assembly
(2) O-ring
(3) Cylinder
(4) Piston Rod
(5) Wiper Ring
(6) Backup Ring
(7) U-ring
(8) Bush
(9) Backup Ring
(10) O-ring
(11) Seal
(12) O-ring
(13) Piston

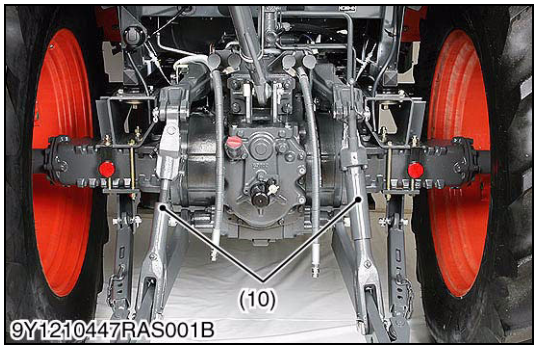
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(6) 3-Point Hitch Cylinder Assembly







Preparation

1. Remove the side cover (4) and disconnect the **2P** connectors and **10P** connector which has come from seat and arm rest.
2. Remove the seat (1) and 3-point hitch lowering lever (11).
3. Remove the cover (3), mat (2) and plate under the mat (2).
4. Remove the delivery hose (5) and return hose (8).
5. Remove the delivery hose (5) and disconnect the connector (7) for 3-point hitch control valve (9).
6. Disconnect the connector for lift arm sensor and draft sensor.
7. Remove the lifting rods (10).

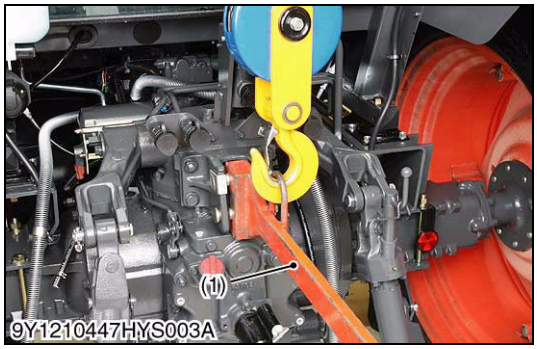
(When reassembling)

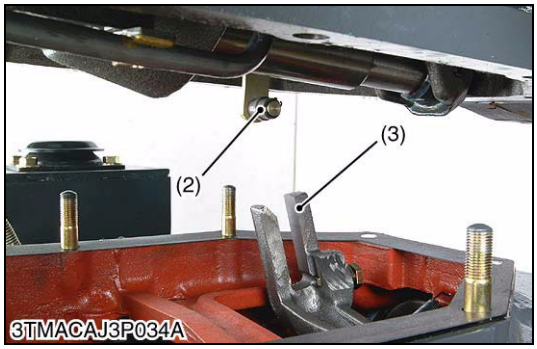
Tightening torque	3-point hitch delivery hose	45.1 to 53.0 N·m 4.6 to 5.4 kgf·m 33.3 to 39.1 lbf·ft

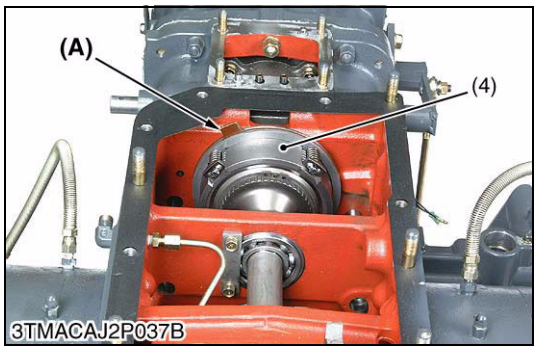
(1) Seat
(2) Mat
(3) Cover
(4) Side Cover
(5) Delivery Hose
(6) Remote Cable
(7) Connector
(8) Return Hose
(9) Control Valve
(10) Lifting Rod
(11) 3-Point Hitch Lowering Lever

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Separating Hydraulic Cylinder Assembly

1. Remove the hydraulic cylinder mounting screws and nuts.
2. Set the lifting bar (1) (see page G-65) to the top link bracket.
3. Hoist the lift bar (1) and separate the hydraulic cylinder assembly.

(When reassembling)

- Be sure to put roller into the groove of draft link 1 (3).
- Change the hydraulic cylinder gasket with new one.
- When reassembling the hydraulic cylinder assembly, direct the projection part of brake plate **(A)** as a photo.

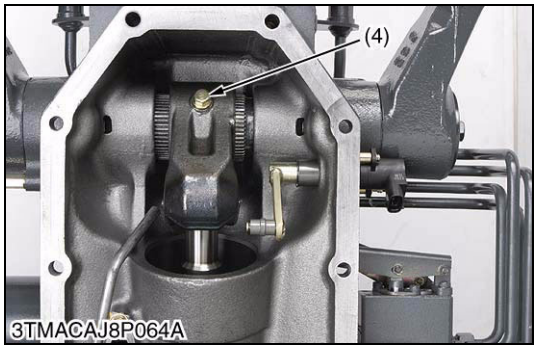
Tightening torque	Hydraulic cylinder mounting screw and nut	77.5 to 90.2 N·m 7.9 to 9.2 kgf·m 57.2 to 66.5 lbf·ft

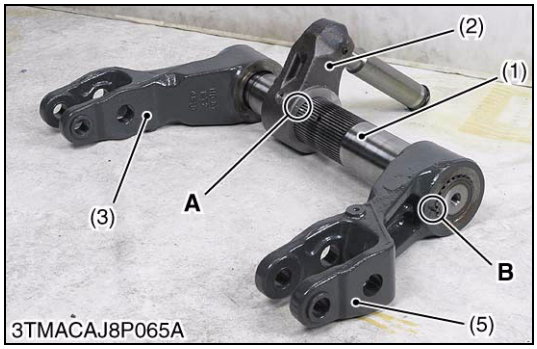
(1) Lifting Bar
(2) Roller
(3) Draft Link 1
(4) PTO Clutch

(A) Projection of Brake Plate

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Hydraulic Arm Shaft

1. Remove the lift arm sensor.
2. Remove the lift arm R.H. (3) and distance collar and O-ring.
3. Remove the hydraulic arm mounting screw (4).
4. Draw out the hydraulic arm shaft (1), and lift arm L.H. (5) as a unit.

(When reassembling)

- Align the alignment marks **"A"** of the hydraulic arm and hydraulic arm shaft.
- Align the alignment marks **"B"** of the lift arm and hydraulic arm shaft.
- Apply grease to the right and left bushings of hydraulic cylinder body and O-ring.
- Take care not to damage the O-ring.
- After tightening the hydraulic arm setting screw to the specified torque, insert a wire through the holes of the screw head and hydraulic arm.

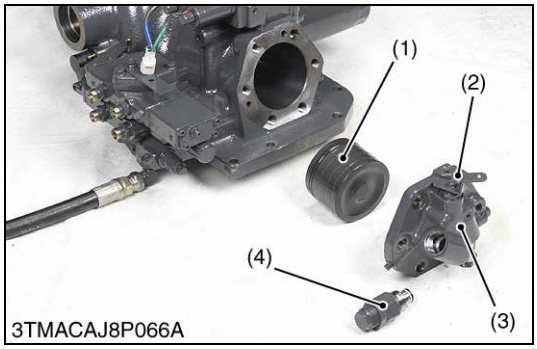
Tightening torque	Hydraulic arm setting screw	39.2 to 45.1 N·m 4.0 to 4.6 kgf·m 28.9 to 33.3 lbf·ft
	Lift lever mounting screw	123.6 to 147.1 N·m 12.6 to 15.0 kgf·m 91.1 to 108.5 lbf·ft

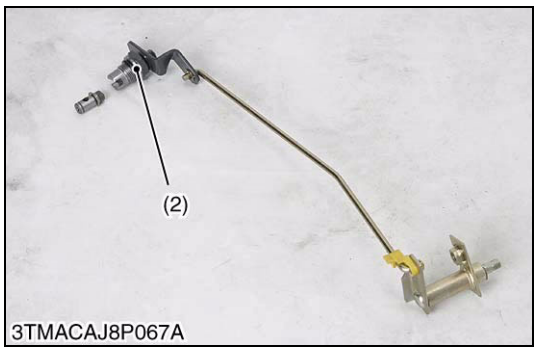
(1) Hydraulic Arm Shaft
(2) Hydraulic Arm
(3) Lift Arm R.H.
(4) Screw
(5) Lift Arm L.H.

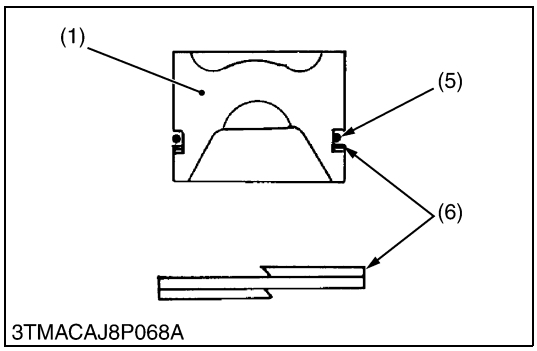
A: Alignment Mark
B: Alignment Mark

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Hydraulic Piston and Cylinder Cover

1. Remove the hydraulic cylinder safety valve (4).
2. Remove the hydraulic cylinder mounting screws.
3. Remove the hydraulic cylinder cover (3).
4. Take out the hydraulic cylinder piston (1).
5. Remove the hydraulic lock valve (2).

(When reassembling)

- Install the hydraulic piston, noting O-ring (5) and backup ring (6).
- Install the hydraulic cylinder cover (3), noting O-ring and backup ring.
- Apply grease to the hydraulic piston bottom contacts with hydraulic rod.

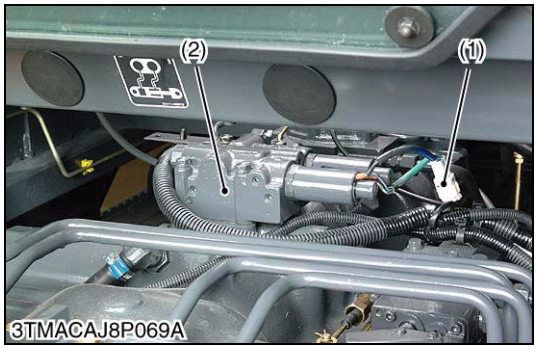
Tightening torque	Cylinder cover mounting screw	197 to 225 N·m 20.0 to 23.0 kgf·m 145 to 166 lbf·ft
	Cylinder safety valve	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 lbf·ft

(1) Hydraulic Piston
(2) Hydraulic Lock Valve
(3) Hydraulic Cylinder Cover
(4) Cylinder Safety Valve
(5) O-ring
(6) Backup Ring

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(7) Control Valve



Control Valve

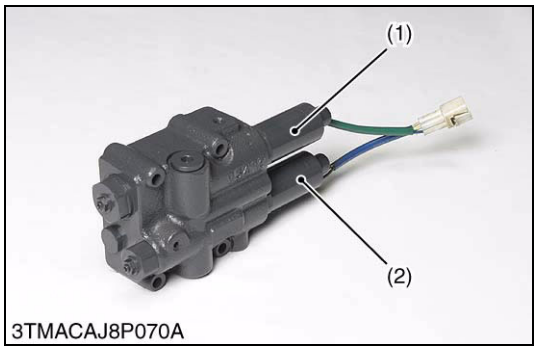
1. Disconnect the connector (1).
2. Remove the control valve mounting screws.
3. Remove the control valve (2).

(When reassembling)

Tightening torque	Control valve mounting screw	12.7 to 16.7 N·m 1.3 to 1.7 kgf·m 9.4 to 12.3 lbf·ft

(1) Connector
(2) Control Valve

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Solenoid

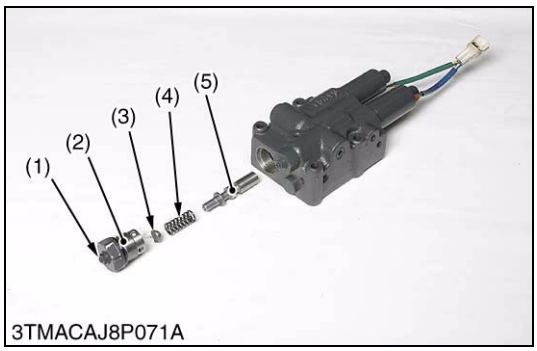
1. Remove the solenoid mounting screws.
2. Remove the solenoid (1), (2).

(When reassembling)

Tightening torque	Solenoid mounting screw	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 lbf·ft

(1) Solenoid (Lowering)
(2) Solenoid (Lifting)

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Lowering Main Spool

■ **IMPORTANT**
- **Do not loosen the adjusting screw (1) of plug (2).**

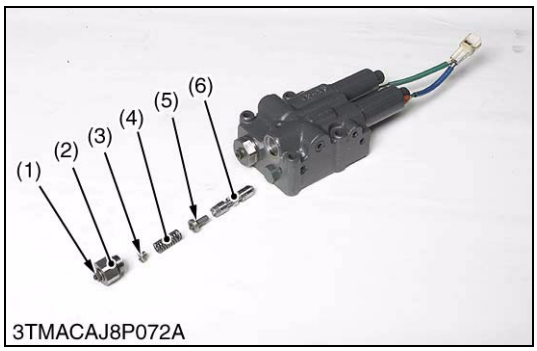
1. Remove the plug (2).
2. Remove the spring sheet (3) and spring (4).
3. Remove the lowering main spool (5).

(When reassembling)

Tightening torque	Lowering main spool mounting plug	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 lbf·ft

(1) Adjusting Screw
(2) Plug
(3) Spring Sheet
(4) Spring
(5) Lowering Main Spool

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Lifting Main Spool

■ **IMPORTANT**
- **Do not loosen the adjusting screw (1) of plug (2).**

1. Remove the plug (2).
2. Remove the spring sheet (3) and spring (4).
3. Draw out the spring sheet 2 (5) and lifting main spool (6).

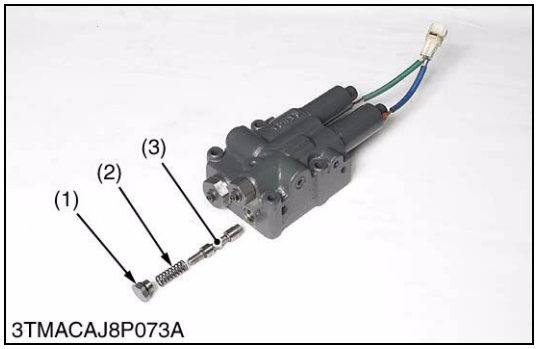
(When reassembling)

Tightening torque	Lifting main spool mounting plug	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 lbf·ft

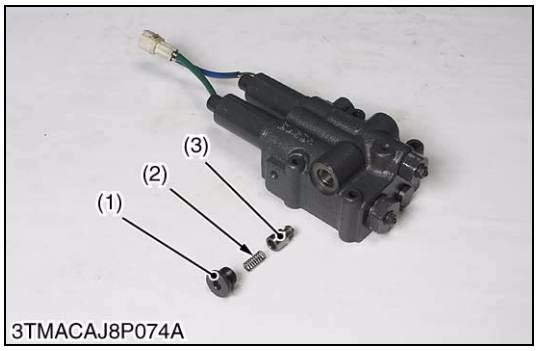
(1) Adjusting Screw
(2) Plug
(3) Spring Sheet
(4) Spring
(5) Spring Sheet 2
(6) Lifting Main Spool

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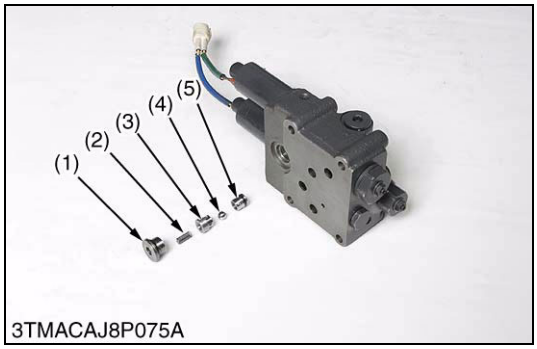
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Compensator (Unload Valve)

1. Remove the plug (1).
2. Remove the spring (2) and adjuster spool (3).

(When reassembling)

Tightening torque	Plug	34.3 to 39.2 N·m 3.4 to 4.0 kgf·m 24.6 to 28.9 lbf·ft

(1) Plug
(2) Spring
(3) Adjuster Spool

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Check Valve

1. Remove the plug (1).
2. Remove the spring (2) and plunger (3).

(When reassembling)

Tightening torque	Plug	68.6 to 78.4 N·m 7.0 to 8.0 kgf·m 50.6 to 57.9 lbf·ft

(1) Plug
(2) Spring
(3) Plunger

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Shuttle Valve

1. Remove the plug (1).
2. Remove the spring (2) and sheet 1 (3).
3. Remove the steel ball (4) and pull out the sheet 2 (5).

(When reassembling)

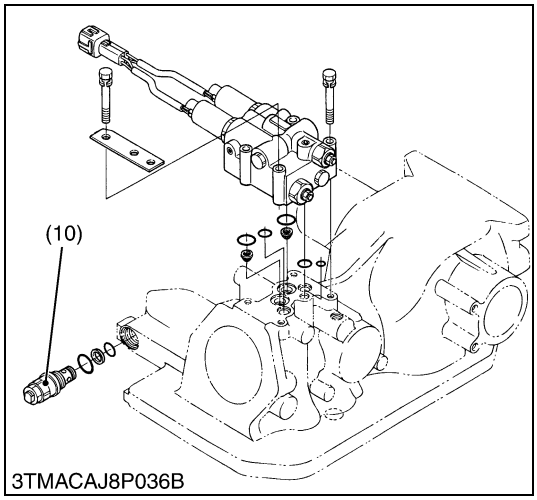
Tightening torque	Plug	68.6 to 78.4 N·m 7.0 to 8.0 kgf·m 50.6 to 57.9 lbf·ft

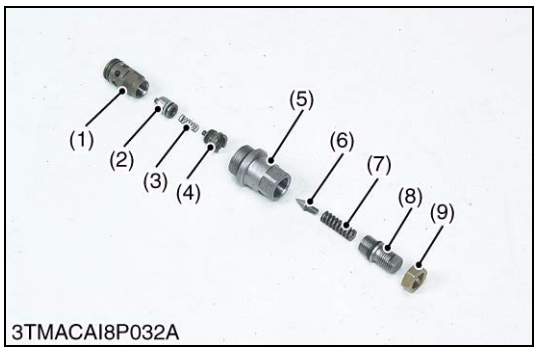
(1) Plug
(2) Spring
(3) Sheet 1
(4) Steel Ball
(5) Sheet 2

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(8) Relief Valve for 3-Point Hitch





Relief Valve

1. Remove the lock nut (9).
2. Remove the adjuster (8), and draw out the spring (7) and then pilot valve (6).
3. Remove the valve seat (1), and draw out the valve seat (4), the spring (3) and main valve (2).

(When reassembling)

- Take care not to damage the O-rings.

Tightening torque	Relief valve	34.3 to 39.2 N·m 3.5 to 4.0 kgf·m 25.3 to 28.9 lbf·ft

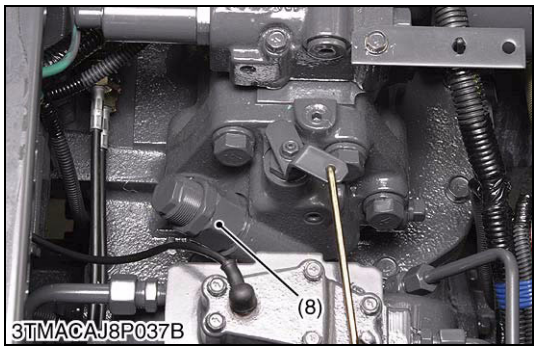
■ **IMPORTANT**

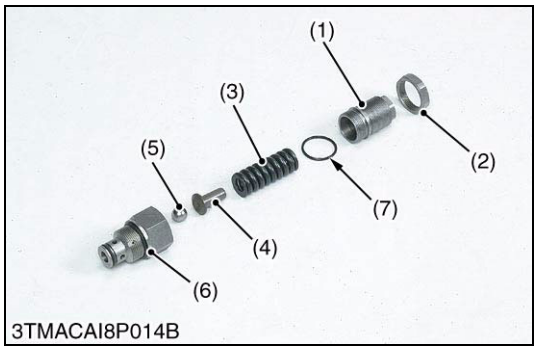
- **After disassembling and assembling the relief valve, be sure to adjust the relief valve setting pressure. (Refer to "Relief Valve for 3-point Hydraulic System" at "2. SERVICING SPECIFICATIONS" section.)**

(1) Valve Seat
(2) Main Valve
(3) Spring
(4) Valve Seat
(5) Valve Body
(6) Pilot Valve
(7) Spring
(8) Adjuster
(9) Lock Nut
(10) Relief Valve

9Y1210269HYS0040US0

(9) Cylinder Safety Valve





Cylinder Safety Valve

1. Remove the cylinder safety valve assembly (8).
2. Secure the cylinder safety valve assembly in a vise.
3. Loosen the lock nut (2), and remove the adjusting screw (1).
4. Draw out the spring (3), seat (4) and ball (5).

(When reassembling)

- install the cylinder safety valve to the hydraulic cylinder block, taking care not to damage the O-ring.
- Be sure to adjust the operating pressure of cylinder safety valve after assembling. ("Cylinder Safety Valve" at "2. SERVICING SPECIFICATIONS" section.)

Tightening torque	Cylinder safety valve assembly	39.2 to 49.0 N·m 4.0 to 5.0 kgf·m 28.9 to 36.2 lbf·ft
	Cylinder safety valve lock nut	58.8 to 78.5 N·m 6.0 to 8.0 kgf·m 43.4 to 57.9 lbf·ft

(1) Adjusting Screw
(2) Lock Nut
(3) Spring
(4) Seat
(5) Ball
(6) Housing
(7) O-ring
(8) Safety Valve Assembly

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[3] SERVICING

(1) Hydraulic Pump


3TMACAI8P049A

Housing Bore

1. Measure the housing I.D. where the interior surface is not scratched, and measure the housing I.D. where the interior surface is scratched.
2. If the values obtained in the two determinations differ by more than the allowable limit, replace the hydraulic pump as a unit.

(Reference)

- Use a cylinder gauge to measure the housing I.D..

Depth of scratch	Allowable limit	0.09 mm 0.0035 in.

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3TMACAI8P050A

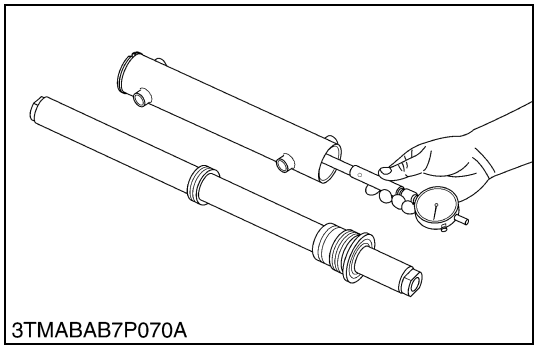
Clearance between Bushing and Gear Shaft

1. Measure the gear shaft O.D. with an outside micrometer.
2. Measure the bushing I.D. with an inside micrometer, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the gear shaft and the bushing as a unit.

Clearance between bushing and gear shaft	Allowable limit	0.15 mm 0.0059 in.

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(2) Power Steering Cylinder


3TMABAB7P070A

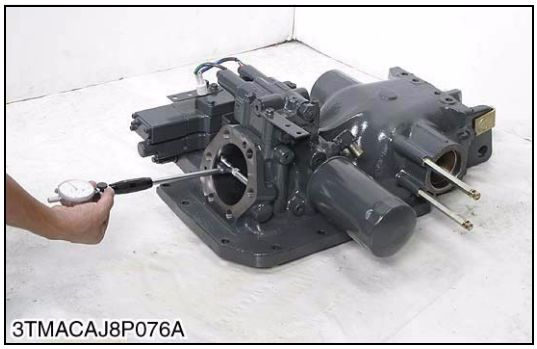
Steering Cylinder I.D.

1. Measure the steering cylinder I.D. with a cylinder gauge.
2. If the cylinder I.D. exceeds the allowable limit, replace the cylinder barrel.

Steering cylinder I.D.	Factory specification	70.000 to 70.074 mm 2.75591 to 2.75882 in.
	Allowable limit	70.100 mm 2.75984 in.

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(3) Hydraulic Cylinder


3TMACAJ8P076A

Hydraulic Cylinder Bore

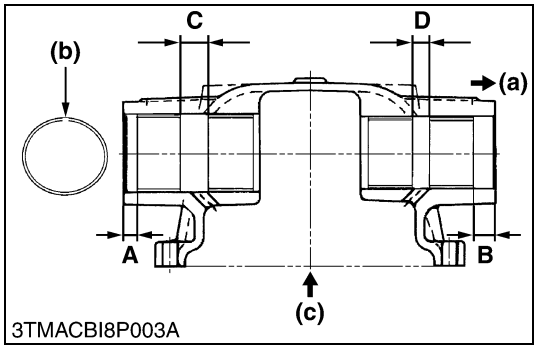
1. Check the cylinder internal surface for scoring or damage.
2. Measure the cylinder I.D. with a cylinder gauge.
3. If the measurement exceeds the allowable limit, replace it.

Cylinder I.D.	Factory specification	100.036 to 100.071 mm 3.93843 to 3.93980 in.
	Allowable limit	100.15 mm 3.94291 in.

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3TMACAJ8P077A



3TMACBI8P003A

Clearance between Hydraulic Arm Shaft and Bushing

1. Measure the hydraulic arm shaft O.D. with an outside micrometer.
2. Measure the bushing I.D. with a cylinder gauge, and calculate the clearance.
3. If the clearance exceeds the allowable limit, replace the bushing.

(When reassembling)

- When press-fitting a new bushing with a press-fitting tool (See "8. SPECIAL TOOLS" in "G. GENERAL" section), observe the dimensions described in the figure.
- When press-fitting a new bushing, apply transmission fluid to the hydraulic cylinder liner boss and bushing.
- When press-fitting a new bushing, press-fit it so that each seam faces up.

Clearance between hydraulic arm shaft and bushing (Right side)	Factory specification	0.140 to 0.250 mm 0.00551 to 0.00984 in.
	Allowable limit	0.50 mm 0.0197 in.

Hydraulic arm shaft O.D. (Right side)	Factory specification	59.970 to 60.000 mm 2.36102 to 2.36220 in.
Bushing I.D. (After press-fitted) (Right side)	Factory specification	60.140 to 60.220 mm 2.36772 to 2.37087 in.

Clearance between hydraulic arm shaft and bushing (Left side)	Factory specification	0.140 to 0.250 mm 0.00551 to 0.00984 in.
	Allowable limit	0.50 mm 0.0197 in.

Hydraulic arm shaft O.D. (Left side)	Factory specification	64.970 to 65.000 mm 2.55787 to 2.55906 in.
Bushing I.D. (After press-fitted) (Left side)	Factory specification	65.140 to 65.220 mm 2.56457 to 2.56772 in.

Press-fit location of bushing **A**	Factory specification	12.0 to 13.0 mm 0.4725 to 0.5118 in.
Press-fit location of bushing **B**	Factory specification	17.0 to 18.0 mm 0.6693 to 0.7086 in.
Press-fit location of bushing **C**	Factory specification	17.5 mm 0.6890 in.
Press-fit location of bushing **D**	Factory specification	7.0 mm 0.276 in.

(1) Bushing (Left)
(2) Bushing (Right)

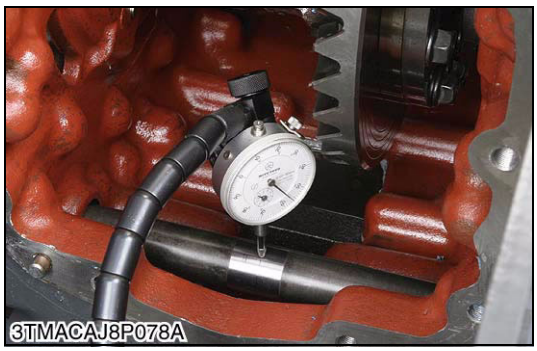
A: Distance
B: Distance
C: Distance
D: Distance

(a) Right Side
(Flush the end of collar with the end of hydraulic cylinder body.)
(b) Seam
(c) Rear View

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(4) Draft Sensor Bar



Draft Sensor Bar Alignment

1. Set the dial indicator as shown in the photo.
2. Turn the draft sensor bar slowly, and rear the deflection of the dial indicators pointer.
3. The actual bend of the draft sensor bar is half the reading.
4. If the measurement exceeds the allowable limit, replace the draft sensor bar.

Draft sensor bar alignment	Allowable limit	0.15 mm 0.0059 in.

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9 ELECTRICAL SYSTEM

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MECHANISM

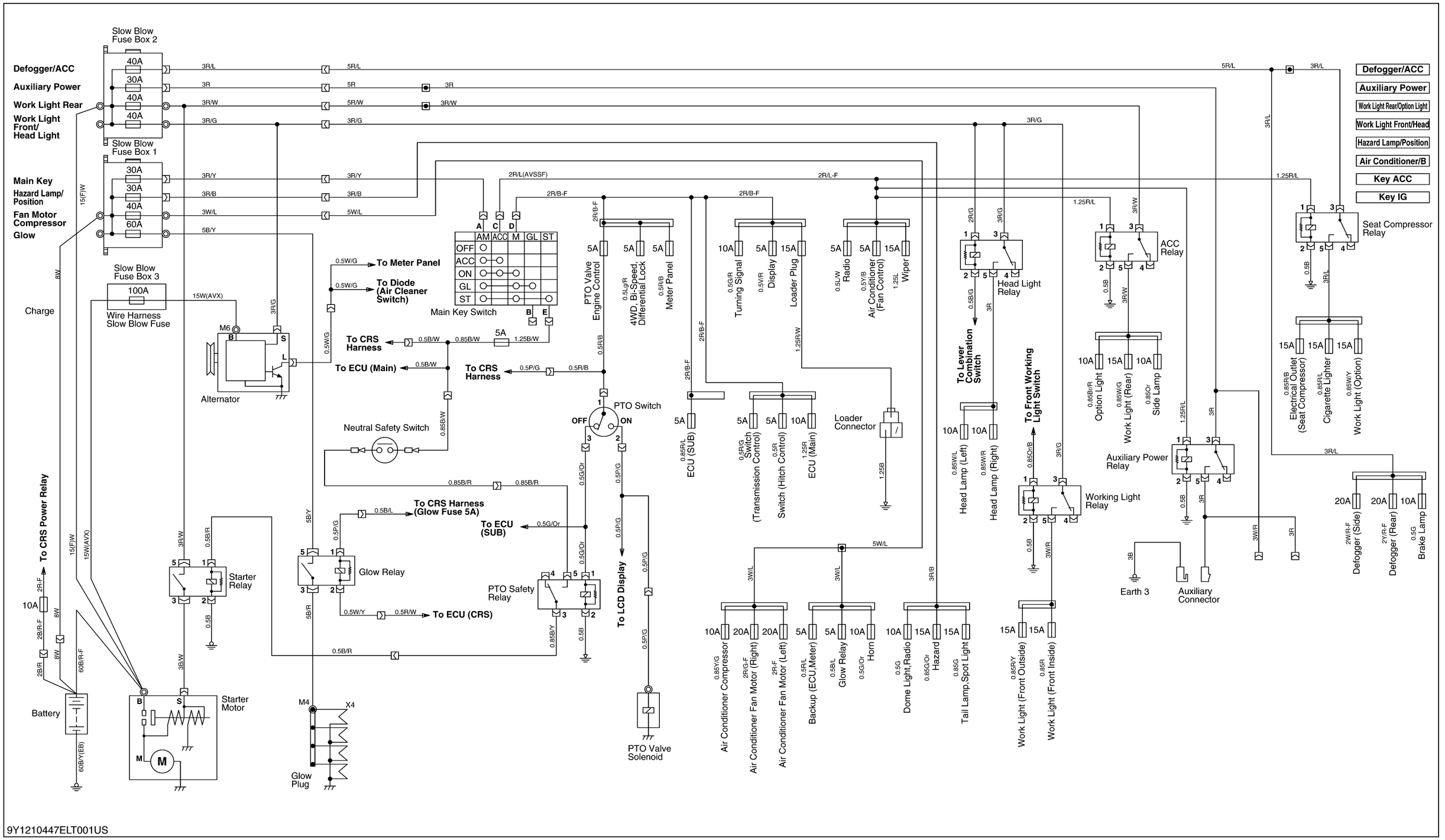
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   [3] COMMON RAIL SYSTEM 9-M3
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1. ELECTRICAL CIRCUIT DETAILED CHART

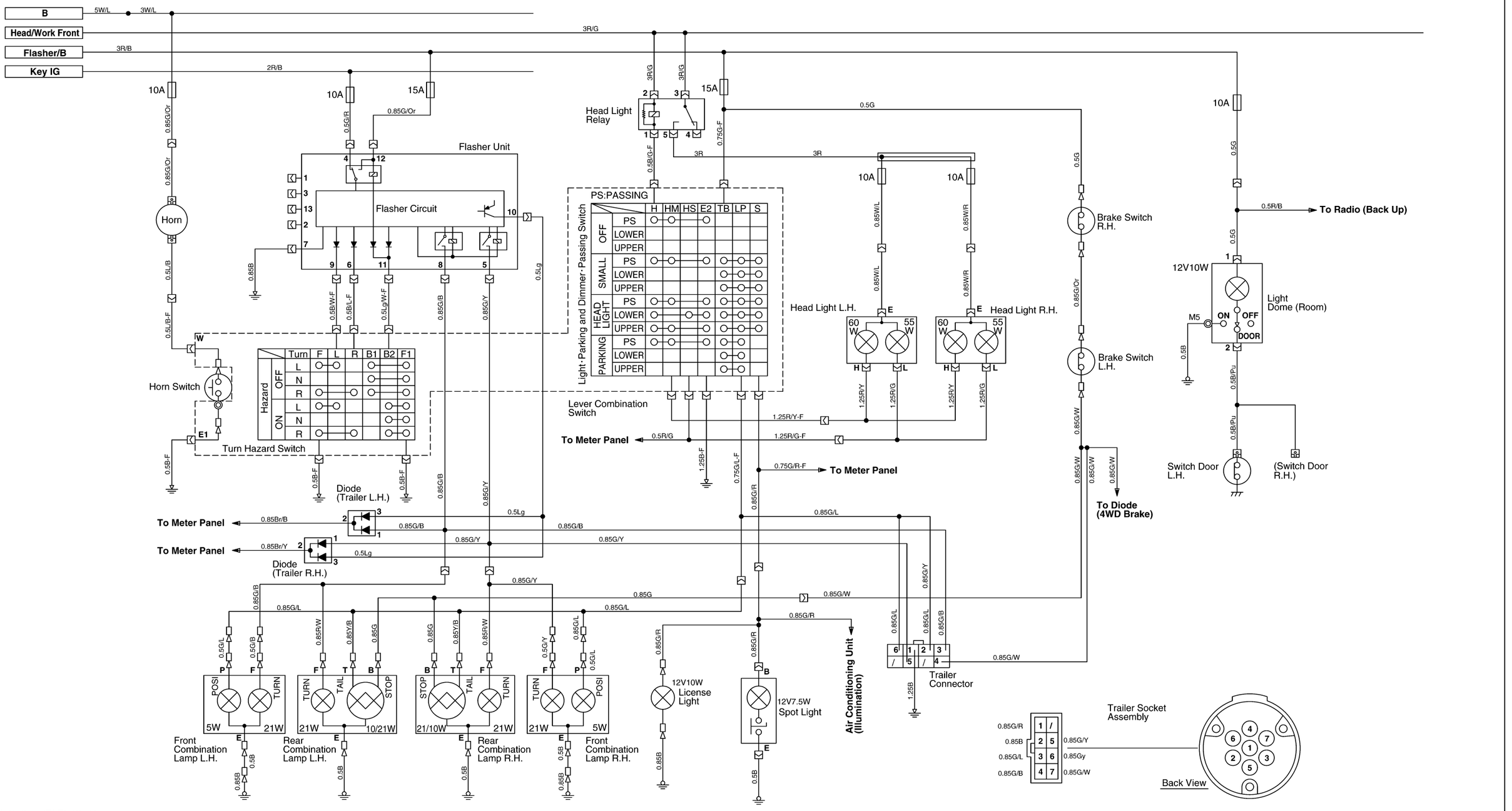
[1] STARTING SYSTEM AND CHARGING SYSTEM



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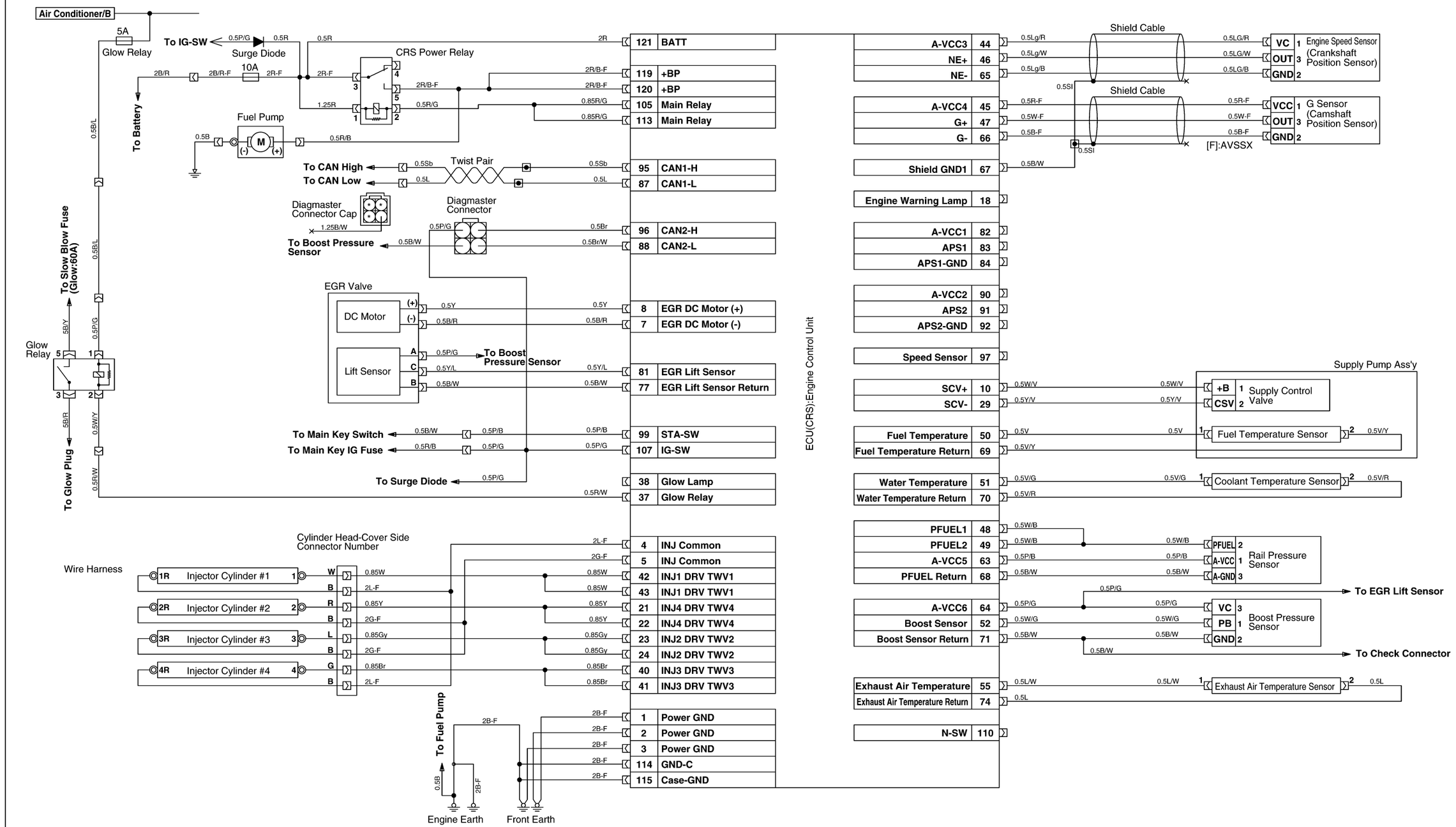
[2] LIGHTING SYSTEM



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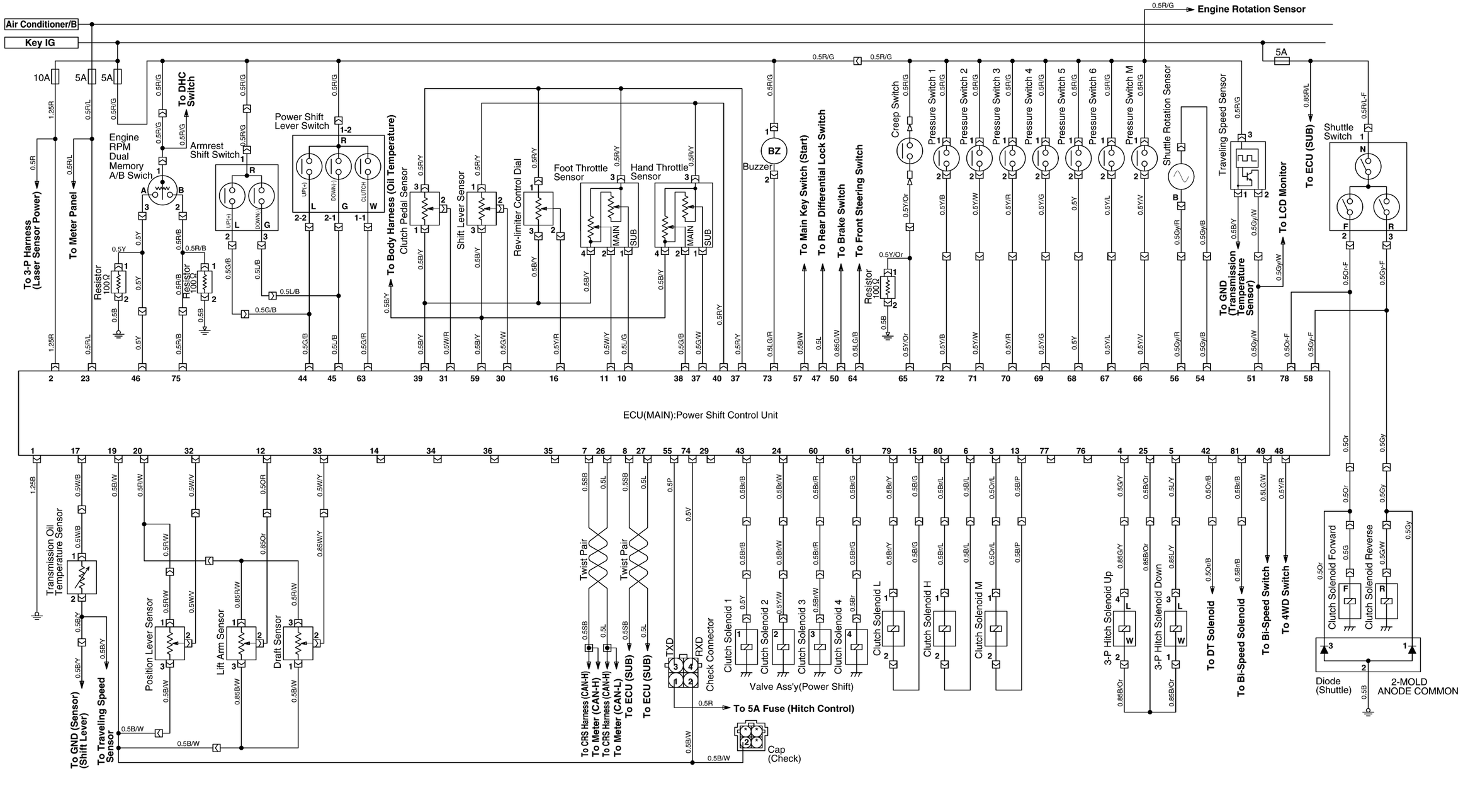
[3] COMMON RAIL SYSTEM



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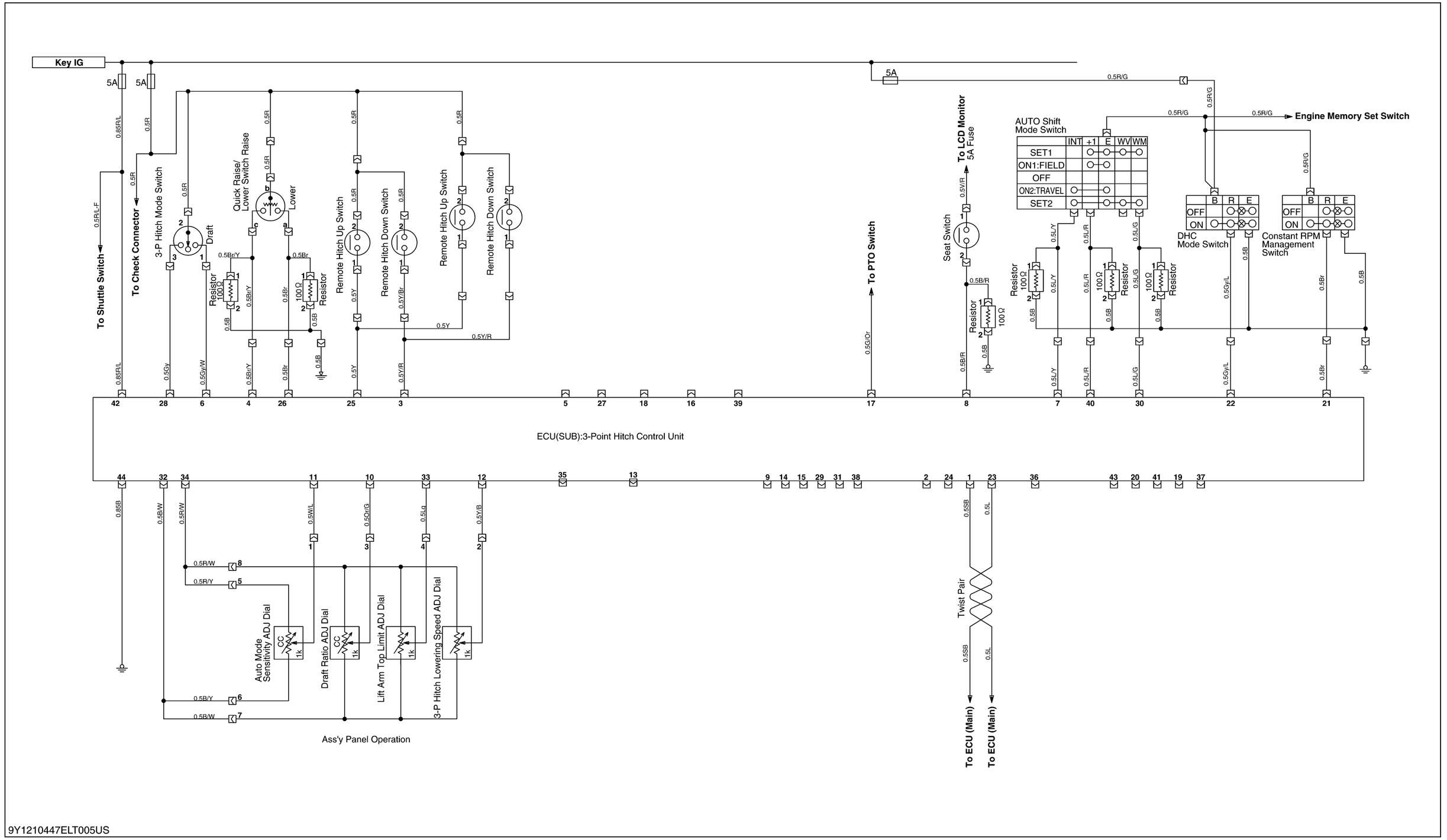
[4] POWER SHIFT SYSTEM



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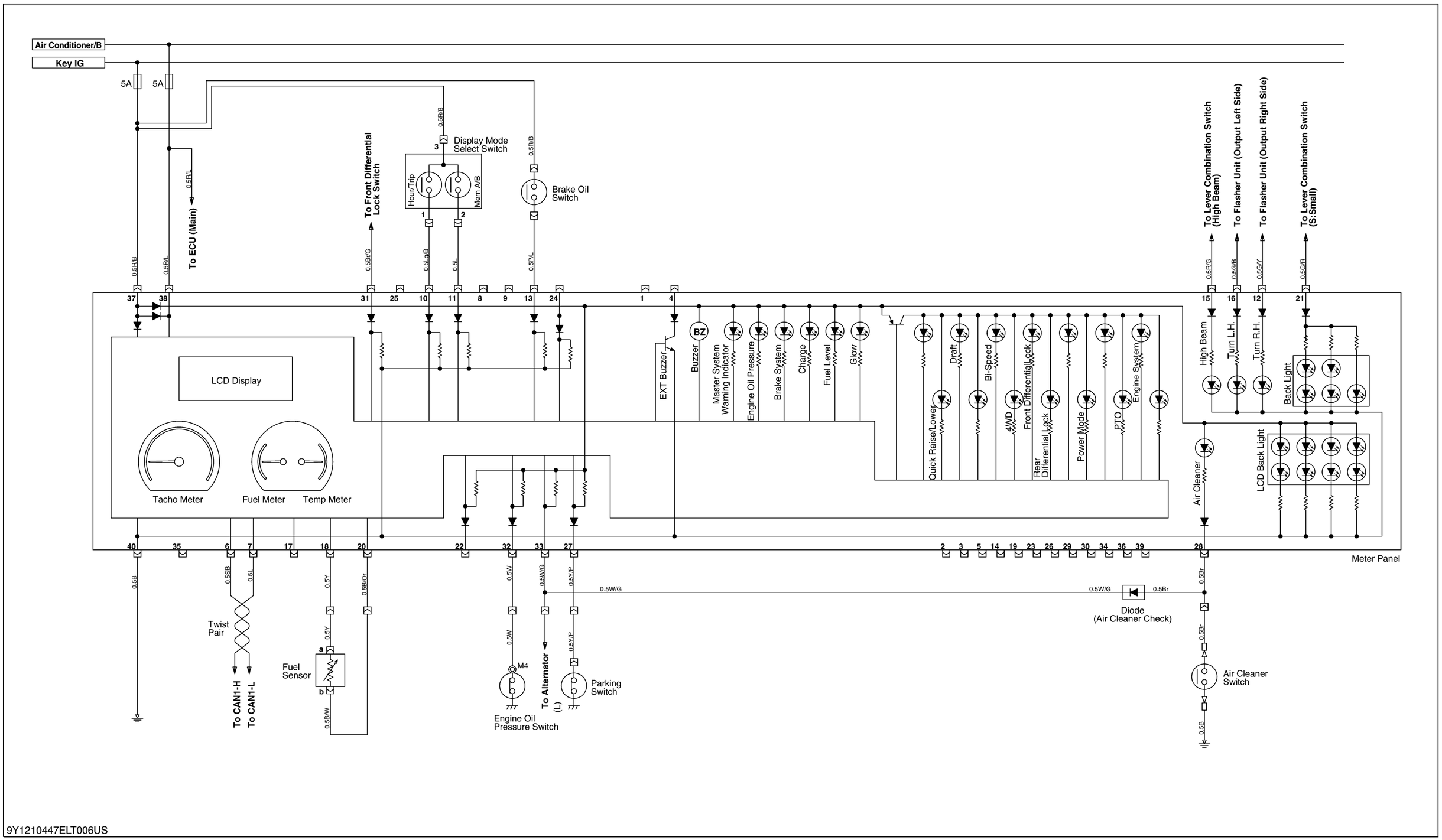
[5] 3-POINT HITCH SYSTEM



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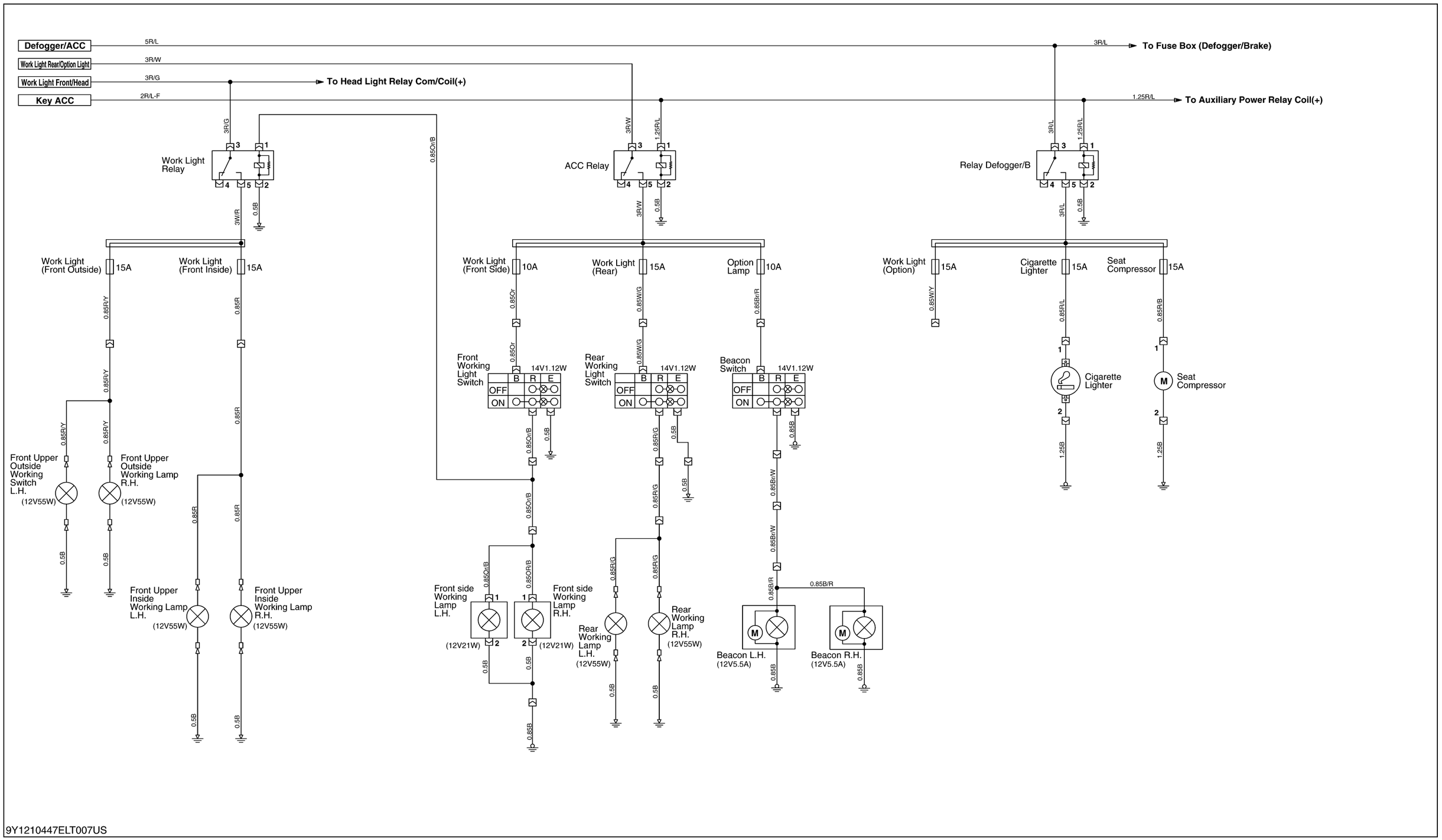
[6] INSTRUMENT PANEL SYSTEM



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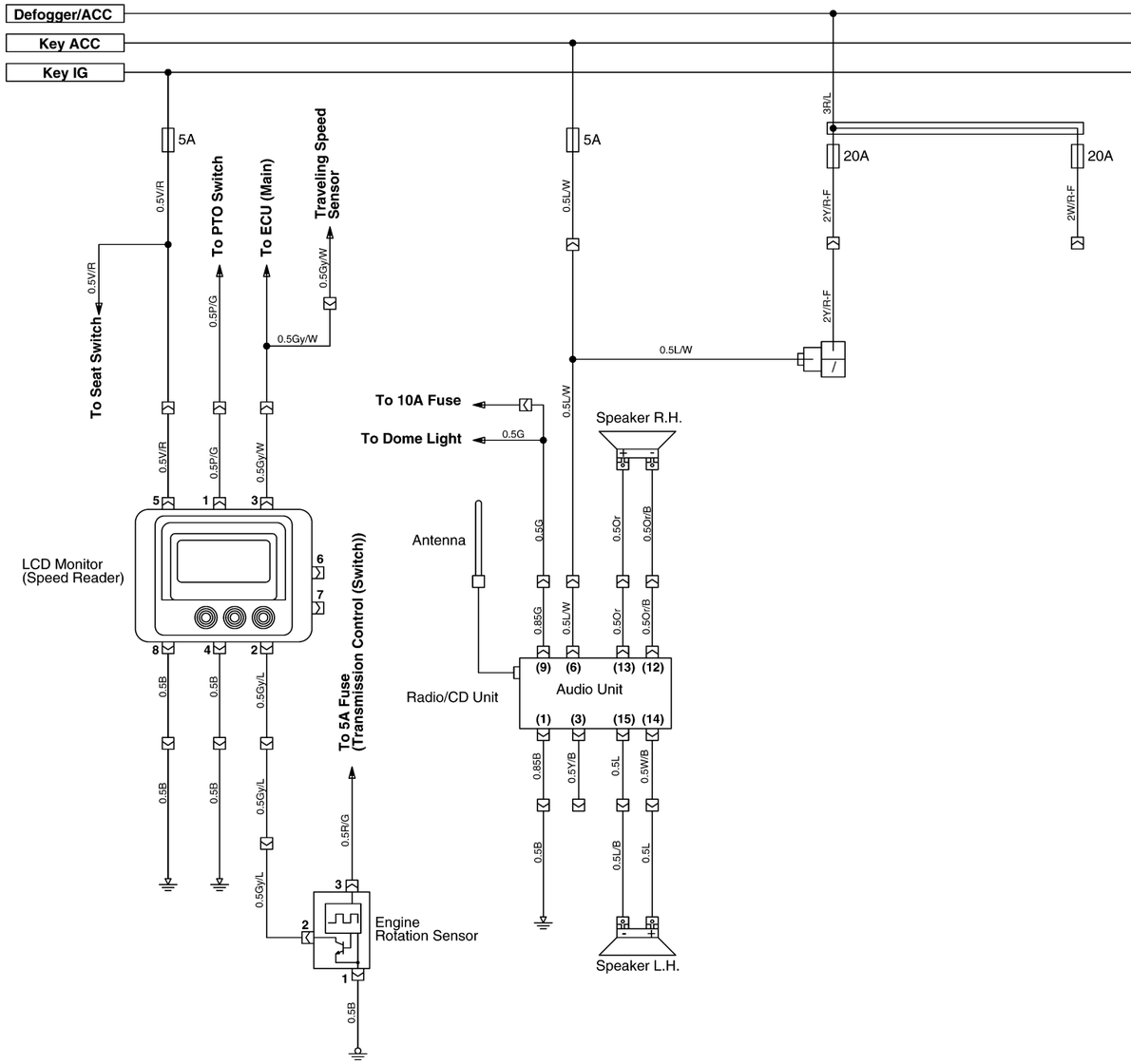
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[7] WORKING LIGHT



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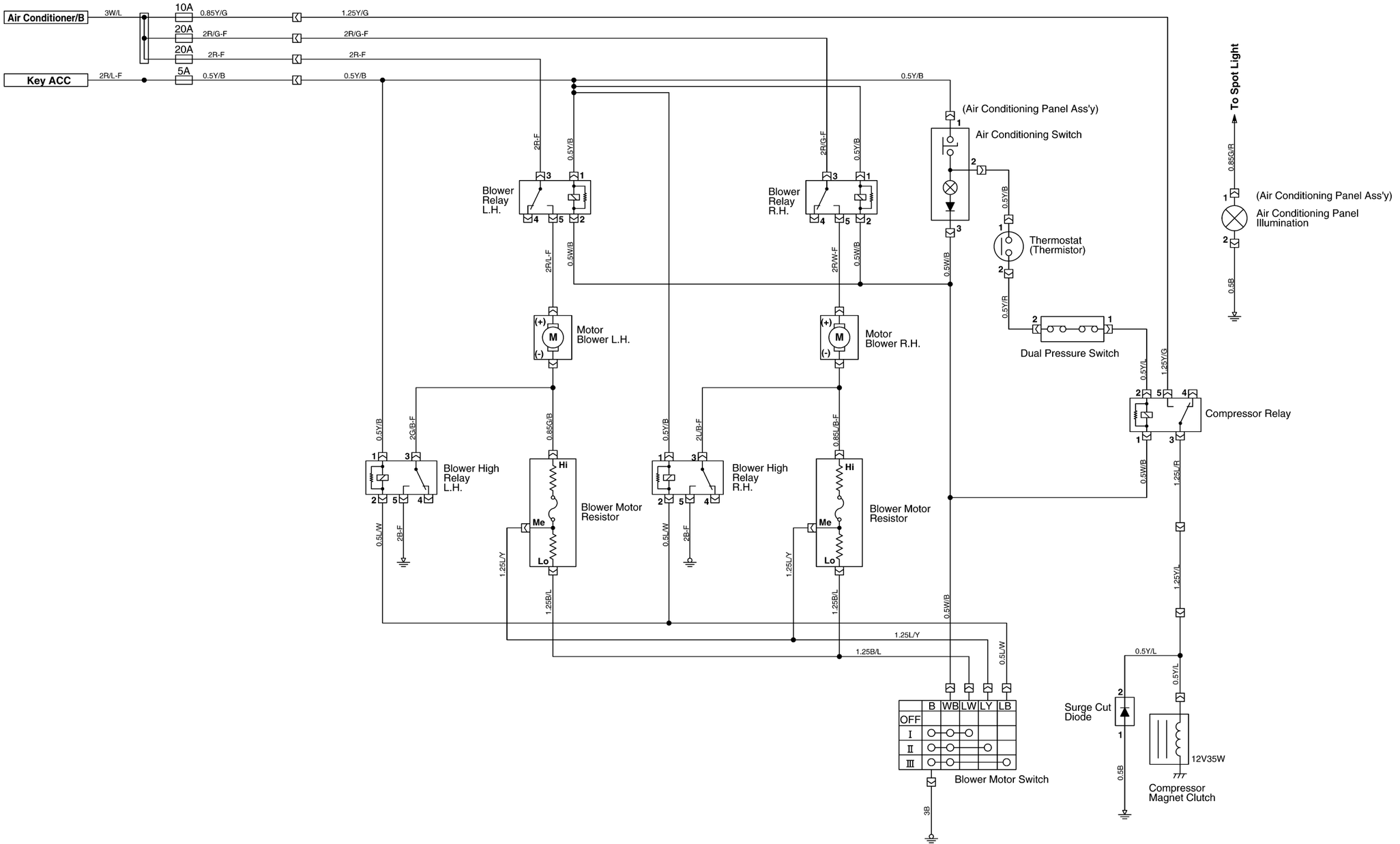
[8] RADIO AND LCD MONITOR



9Y1210447ELT008US

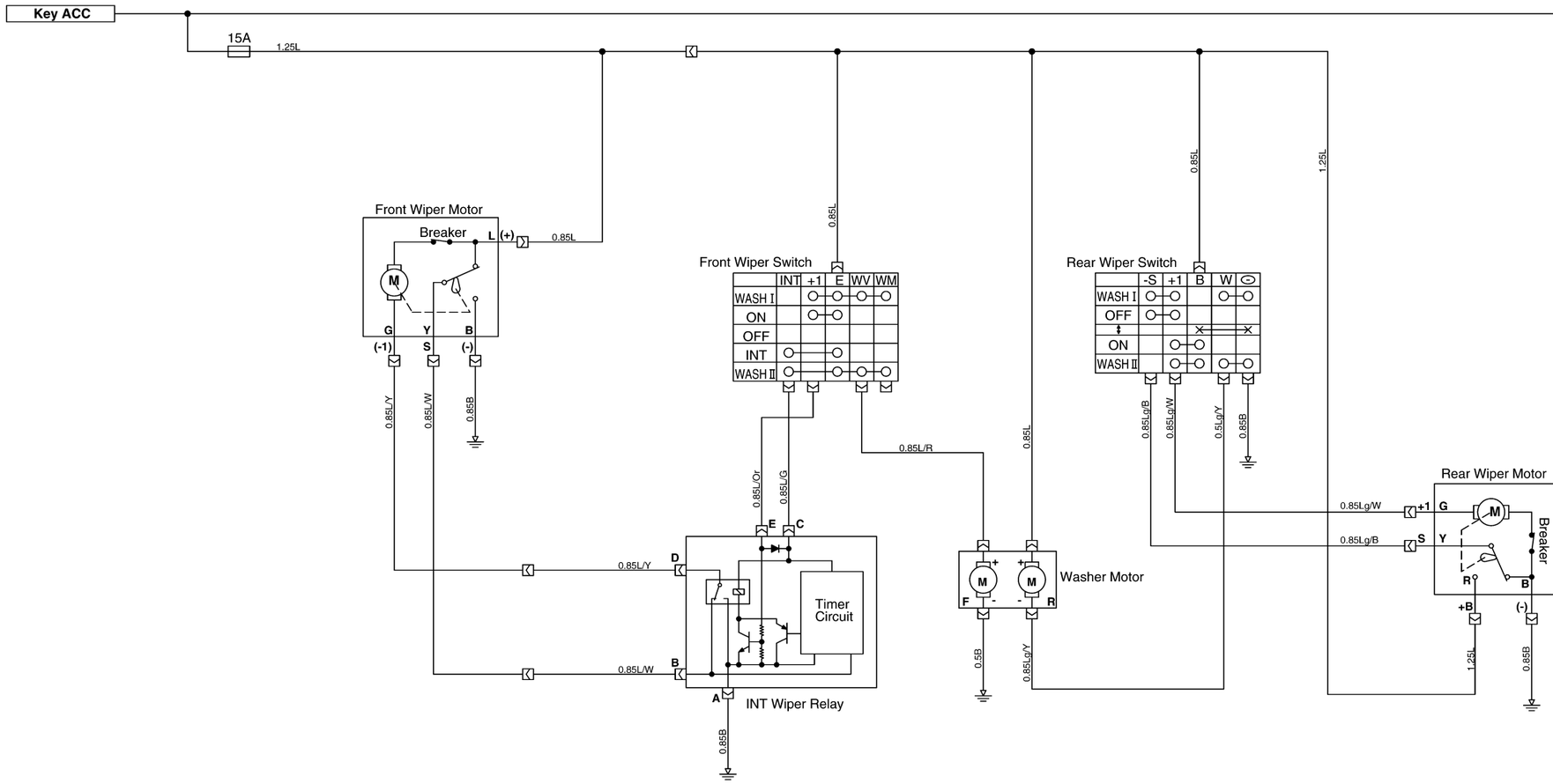
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[9] AIR CONDITIONER



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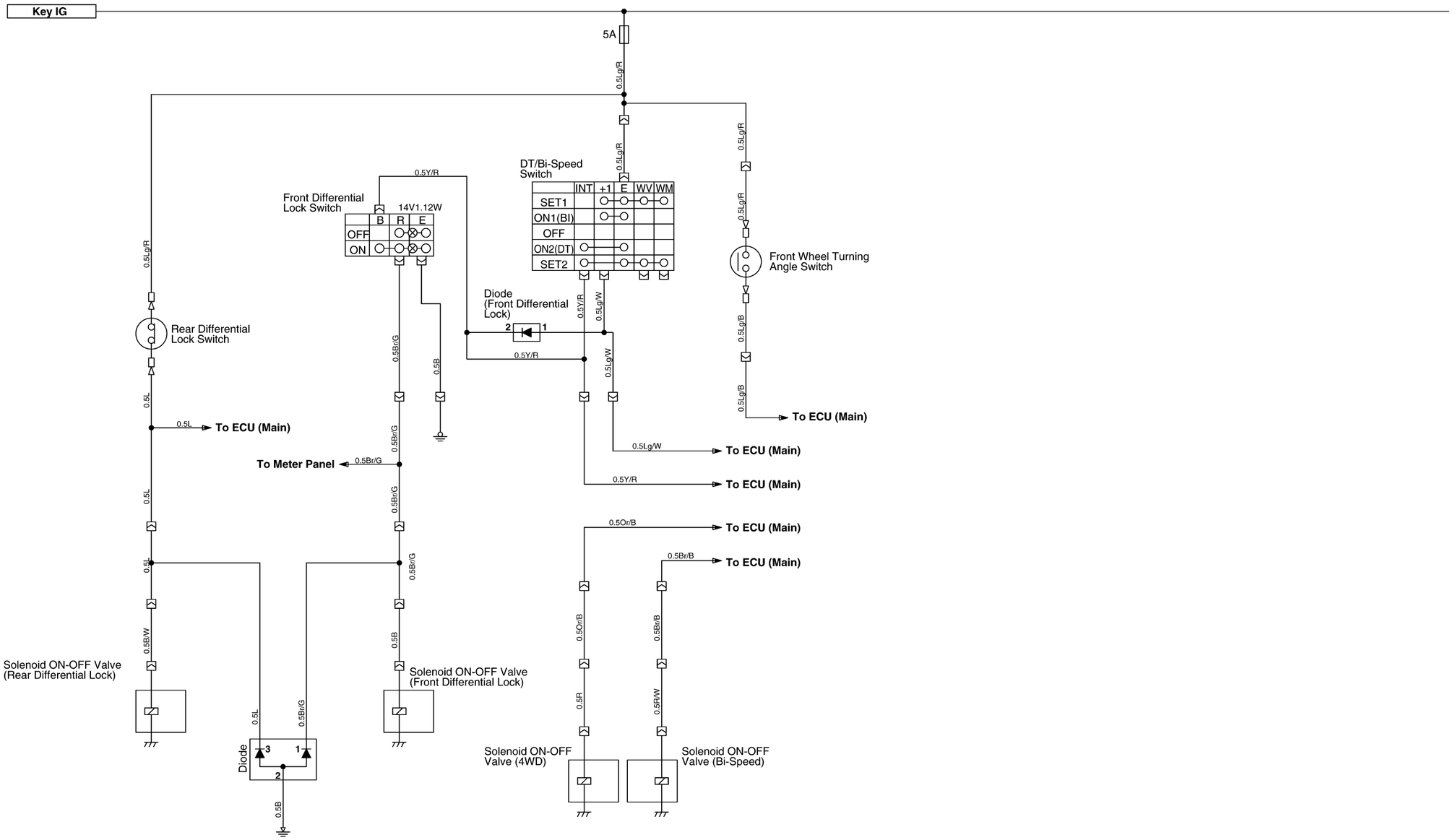
[10] WIPER



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[11] DIFFERENTIAL LOCK AND 4WD/BI-SPEED



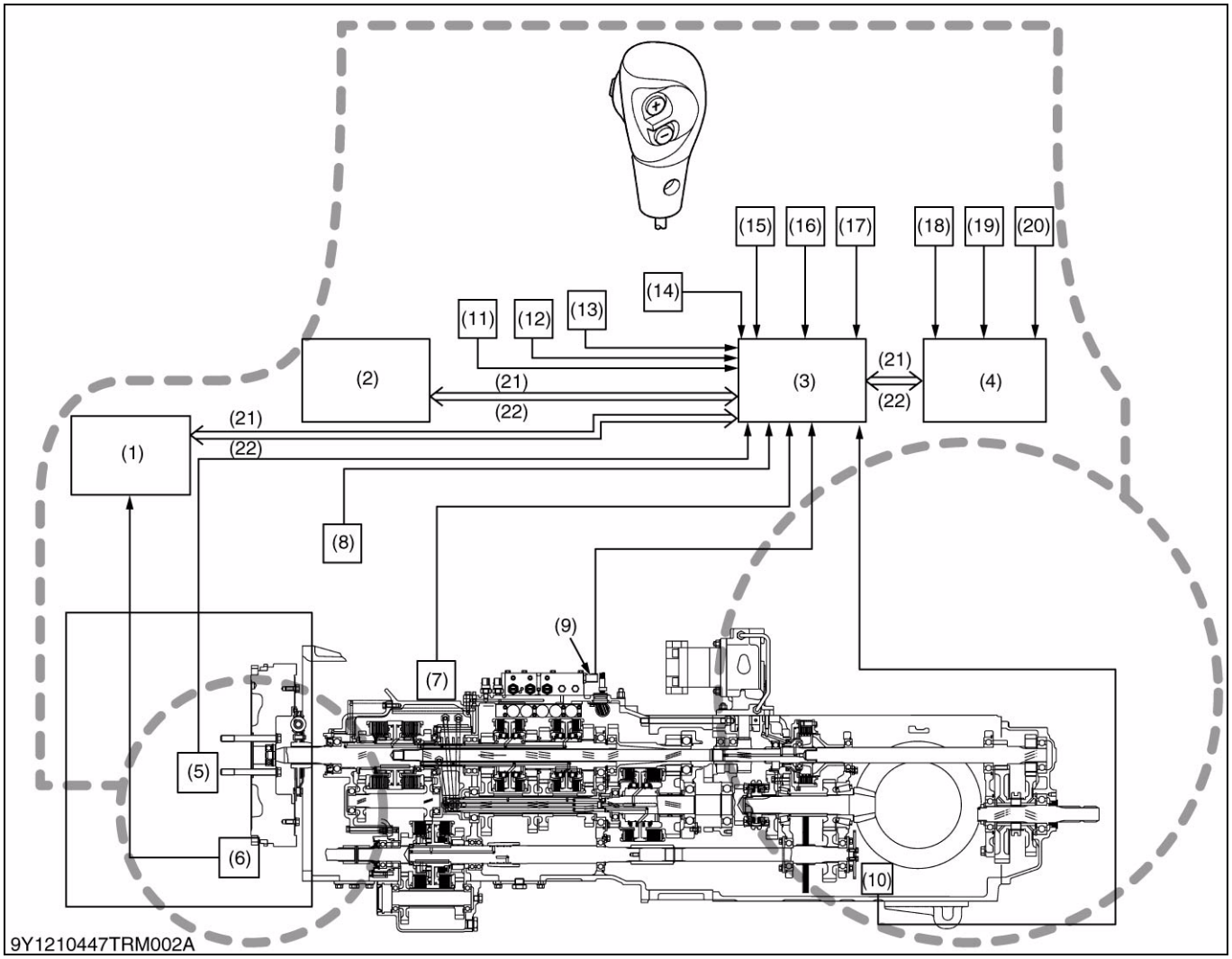
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2. POWER SHIFT CONTROL

[1] SYSTEM OUTLINE

(1) Control System



(1) ECU (CRS)
(2) INSTRUMENT PANEL ECU
(3) ECU (MAIN)
(4) ECU (SUB)
(5) Turning Angle Switch
(6) Crankshaft Position Sensor
(7) Shuttle Rotation Sensor
(8) Clutch Pedal Sensor
(9) Oil Temperature Sensor
(10) Traveling Speed Sensor
(11) Shuttle Switch
(12) Foot Throttle Sensor
(13) Hand Throttle Sensor
(14) Power Shift / Range Shift Lever Sensor
(15) Rev-limiter Control Dial
(16) RPM Dual Memory Switch
(17) Constant RPM Management Switch
(18) Auto Mode Switch
(19) Auto Mode Sensitivity Adjustment Dial
(20) Down Hill Control Switch
(21) CAN (Hi Side)
(22) CAN (Lo Side)

(To be continued)

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(Continued)

(General Information for ECU)

- ECU (MAIN) processes and judges the input signals from the switches and sensors, and sends the signals to solenoid valves concerned with the power shift control system.
- Therefore, ECU (MAIN) controls the engagement of the hydraulic clutches.
- ECU (SUB) processes and judges the input signals from the switches and sensors, and sends the signals to solenoid valves concerned with the 3-point hitch control system.
- Instrument panel ECU processes and judges the input signals from the switches and sensors, and sends the signals to the indicators and the display.
- ECU (CRS) processes and judges the input signals from the switches and sensors, and sends the signals to the injectors.
- All ECU shares information from switches and sensors connected with each ECU.
- For example, ECU (CRS) receives the input signals from switches and sensors. It converts them to ECU (MAIN) with CAN.
  In the same way, ECU (SUB) receives the input signals from switches and dials. It converts them to ECU (MAIN) with CAN.
  Therefore, ECU (MAIN) has all information about sensors, dials and switches which connect to ECU.
  The others have all information about sensors, dials and switches which connect to ECU, too.

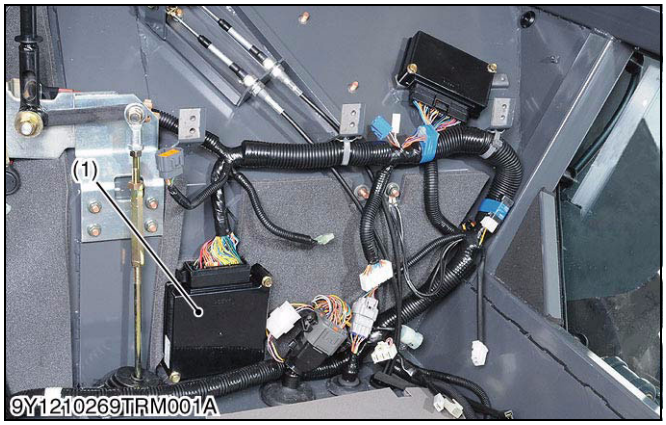
(CAN: Controller Area Network)

CAN is the abbreviation for Controller Area Network. CAN forms the area network connected with all ECU.
All information from sensors and switches are shared with all ECU by using CAN.

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(2) Electric Components



Power Shift Control Unit (MAIN ECU)

The power shift control unit includes the electronic circuits for power shift, 4WD and Bi-speed control functions.

The control unit processes and judges the input signals from the switches and sensors, and sends the signals to solenoid valves.

(1) ECU (Main)

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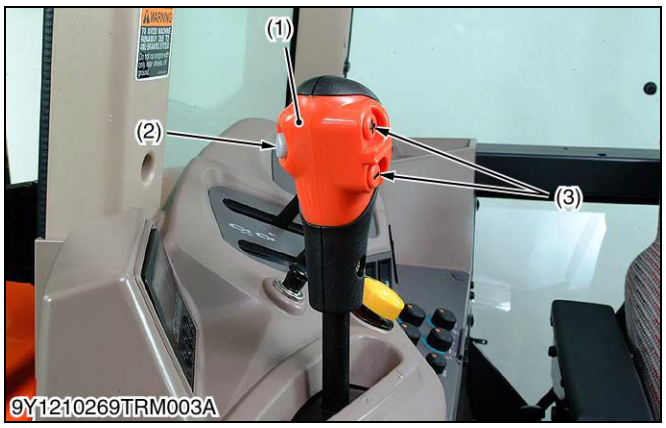
Auto Mode Switch

This switch is equipped with the automatic shifting mode between the field mode and travel mode and performs automatic shifting within an automatic shifting range.

- **Field Mode**
  For plowing, subsoiling and other tilling operations.
- **Travel Mode**
  For trailing and other hauling operations.

(1) Auto Mode Switch

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Power Shift / Range Shift Lever

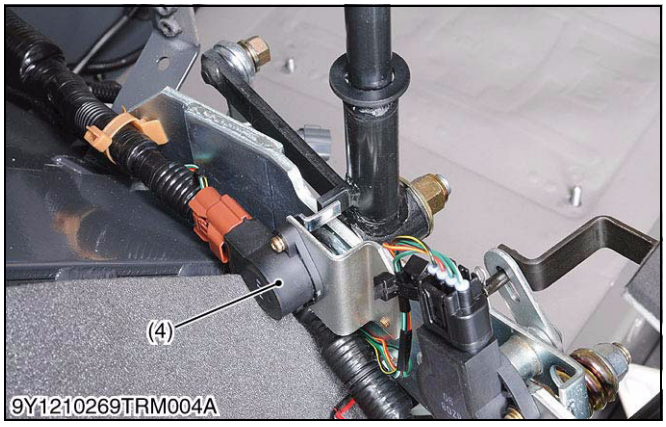
The power shift lever is equipped with shift (**UP / DOWN**) switches, clutch button and range shift lever sensor which detect **L/H** speed in range shift lever operation.

The construction of the lever, and the switches are mounted at the positions as shown in the picture. The speed change mode can be switched mechanically to the **Hi-Lo** speed change mode by moving this lever to the front or rear side.

- **Shift Up / Down Switch**
  Shifting up and down the travel speeds.
- **Clutch Button**
  Pressing the clutch button disengage the master clutch.
- **Range Shift Lever Sensor**
  The shift lever sensor detects position of range shift **(H-L)**.

(1) Power Shift / Range Shift Lever
(2) Clutch Button
(3) Shift Up / Down Switch
(4) Range Shift Lever Sensor

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Rev-limiter Control Dial

Rev-limiter control dial restricts the maximum engine speed.

When setting this dial, the engine speed will not exceed the set speed even if the hand throttle lever or foot throttle pedal is operated.

(1) Rev-limiter Control Dial

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RPM Dual Memory Switch

RPM dual memory switch can be set two different engine speeds, **A** and **B**.

(1) RPM Dual Memory Switch **A: Switch A**
B: Switch B

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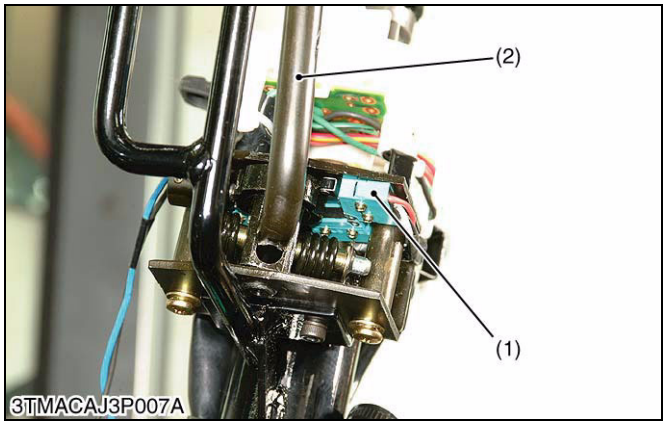
Constant RPM Management Switch

When turning on this switch, the engine speed is kept nearly constant in response to a certain level of load fluctuations.

There is a limit to the range within which a constant speed can be maintained.

(1) Constant RPM Management Switch **A: ON**

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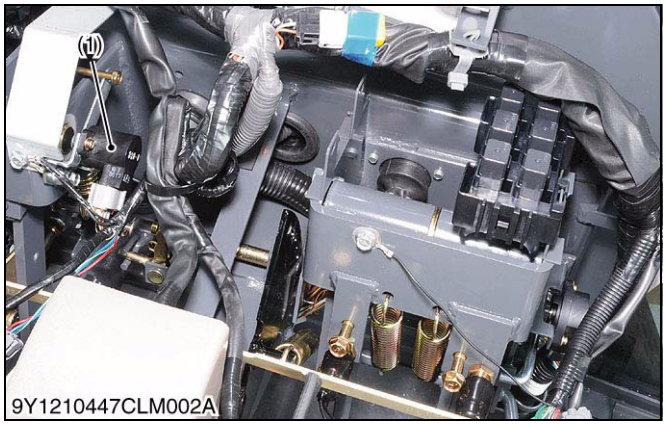
Shuttle Switch

In the power shift, switching of **Forward / Reverse** operation is effected electrically. Therefore, three micro-switches are provided on the shuttle lever shaft so that the position (**Forward-N-Reverse**) of the shuttle lever should be detected.

(1) Shuttle Switch (2) Shuttle Lever

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Clutch Pedal Sensor

The clutch pedal sensor detects the amount of depressing of the clutch pedal to control pressures of the master clutch.

This system allows clutch operation similar to a mechanical clutch.

(1) Clutch Pedal Sensor

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Foot Throttle Sensor

The foot throttle sensor detects the amount of depressing of foot throttle pedal.

(1) Foot Throttle Sensor

9Y1210447ELM0022US0



Hand Throttle Sensor

The hand throttle sensor detects amount of hand throttle lever operation.

(1) Hand Throttle Sensor

9Y1210447ELM0023US0



Shuttle Rotation Sensor

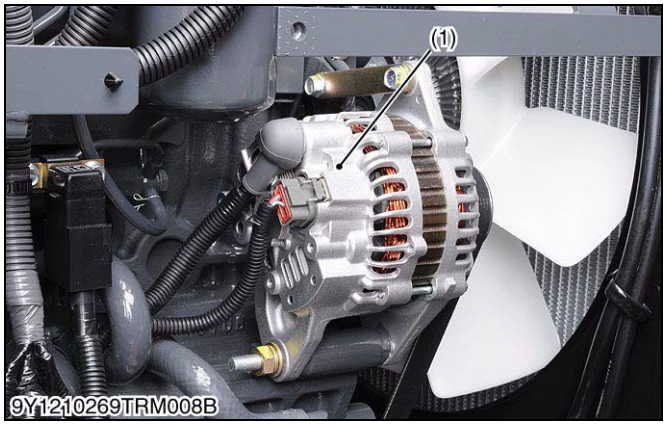
The shuttle rotation sensor detects the rotating speed of the master clutch output shaft and it is provided to detect the connection of master clutch.

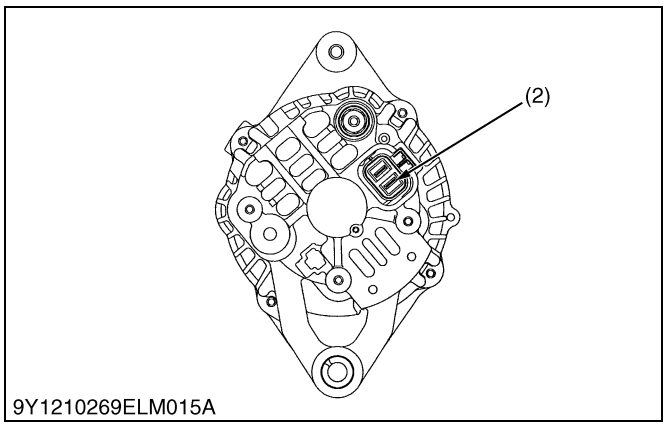
This sensor has a function to generate AC voltage in accordance with changes in the distance from the gear teeth. The ruggedness of the shuttle gear generate an AC voltage having frequency proportional to the rotating speed of the gear, and the rotating speed of the master clutch output is detected by the frequency.

(1) Shuttle Rotation Sensor

9Y1210447ELM0024US0

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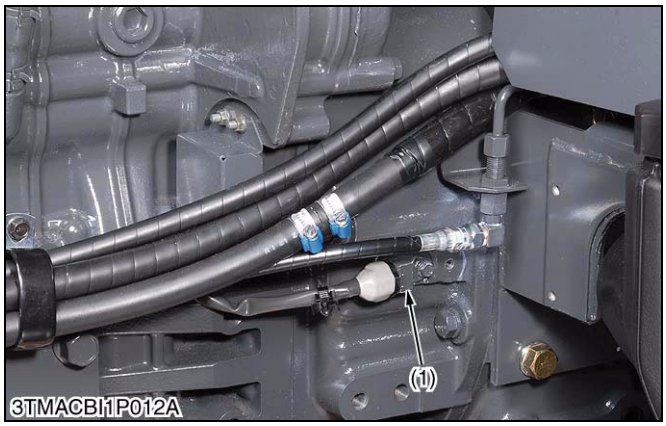
Alternator (L Terminal)

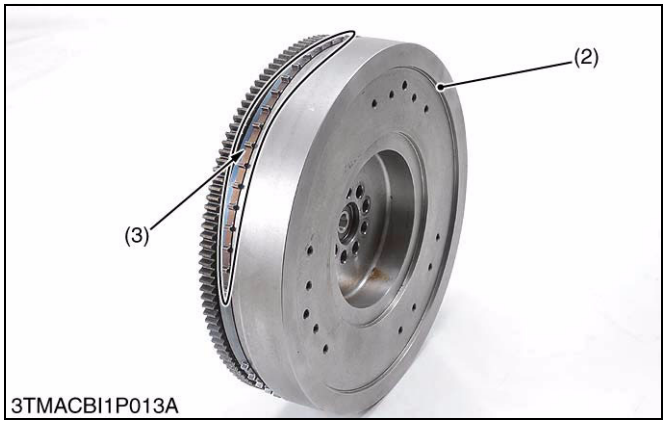
The power shift system detects the rotation of an engine by both engine speed sensor and alternator **L** terminal current which power generation of alternator after engine starts.

Even if the engine speed sensor is faulty, the **L** terminal voltage of the alternator allows detecting rotations on the engine and making operation of power shift possible.

(1) Alternator (2) Alternator **L** Terminal

9Y1210447TRM0003US0





Crankshaft Position Sensor (Engine Speed Sensor)

The crankshaft position sensor (3) is installed near the flywheel pulsar gear (2) on the flywheel (1) and detects the crankshaft angle and outputs the engine speed signal.

The sensor unit is a MRE (magnetic resistance element) type. For the MRE type, when the pulsar passes the sensor, the magnetic resistance changes and the voltage passing through the sensor changes. This change in voltage is amplified by the internal IC circuit and output to the engine ECU.

The output signal is sent to main ECU through CAN communication.

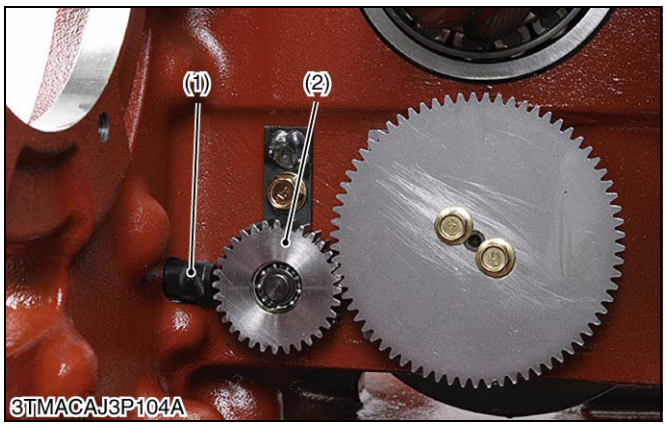
The number of pulses for the pulsar gear is 56.

(1) Crankshaft Position Sensor (3) Flywheel Pulsar Gear
(2) Flywheel

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Traveling Speed Sensor

This sensor detects the traveling speed and it is equipped on the left bottom side of differential case.

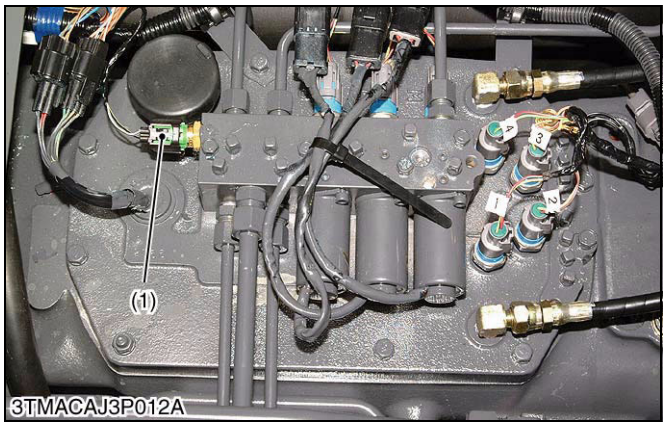
This sensor perceives tooth of the detection gear which is driven by drive gear on the 4WD shaft and emits pulse.

This pulse is sent to the electronic instrument panel and the traveling speed is calculated by the coefficient which is set according to the tire size.

The date of traveling speed is always sent to the MAIN ECU.

(1) Traveling Speed Sensor (2) Detection Gear

9Y1210447ELM0025US0



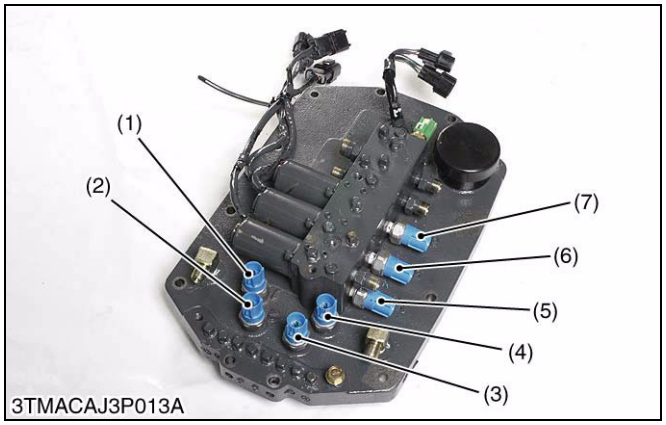
Hydraulic Oil Temperature Sensor

The oil temperature sensor detects a temperature of transmission fluid, and corrects operating time and current of the solenoid valve according to the temperature of transmission fluid.

This system makes master clutch to engage smoothly even if oil viscosity changes.

(1) Hydraulic Oil Temperature Sensor

9Y1210447ELM0026US0



Pressure Switch

The pressure switch detects the operation of hydraulic clutches and is provided at the power shift valve. (7 pressure switch are provided.)

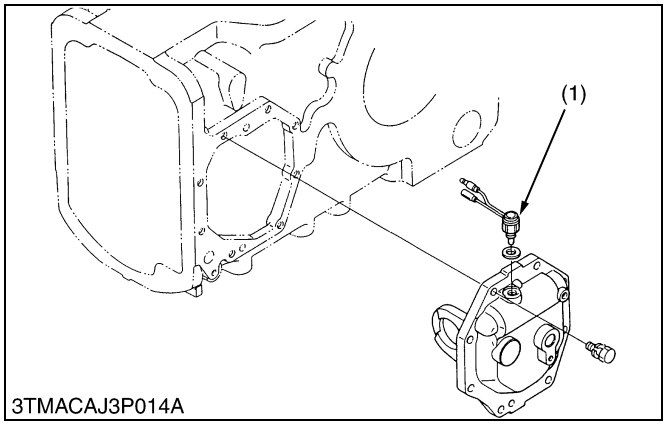
This switch is a Normal Open type switch which contact closes when the pressure is raised.

The contacts is closed at a pressure higher than 1.18 MPa (12 kgf/cm^2) and is opened at a pressure lower than 0.74 MPa (7.5 kgf/cm^2).

(1) For Main Shift **1**
(2) For Main Shift **2**
(3) For Main Shift **3**
(4) For Main Shift **4**
(5) For Master (**F-R**)
(6) For Main Shift **L**
(7) For Main Shift **H**

9Y1210447ELM0027US0

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Creep Speed Change Switch (Option)

The creep speed change switch detects the **ON / OFF** status of the creep speed change operation and it is provided inside the creep speed change gear case.When the creep speed change switch is turned **ON**, the operation changes to the creep speed change control mode which is different from the normal speed change control mode.When this switch is turned **OFF**, the tractor is operated in the normal speed change control mode.

When this switch is **OFF**, the tractor is operated in the normal speed change control mode.

(1) Creep Speed Change Switch

9Y1210447ELM0028US0



Auto Mode Sensitivity Adjustment Dial

This changes the shift conditions and timing of gear shift (up and down) for power shift auto control.

Turn the dial to the negative side	Higher sensitivity for shift-down and lower sensitivity for shift-up
Turn the dial to the positive side	Higher sensitivity for shift-up but the same sensitivity for shift-down

(1) Auto Mode Sensitivity Adjustment Dial

9Y1210447ELM0029US0



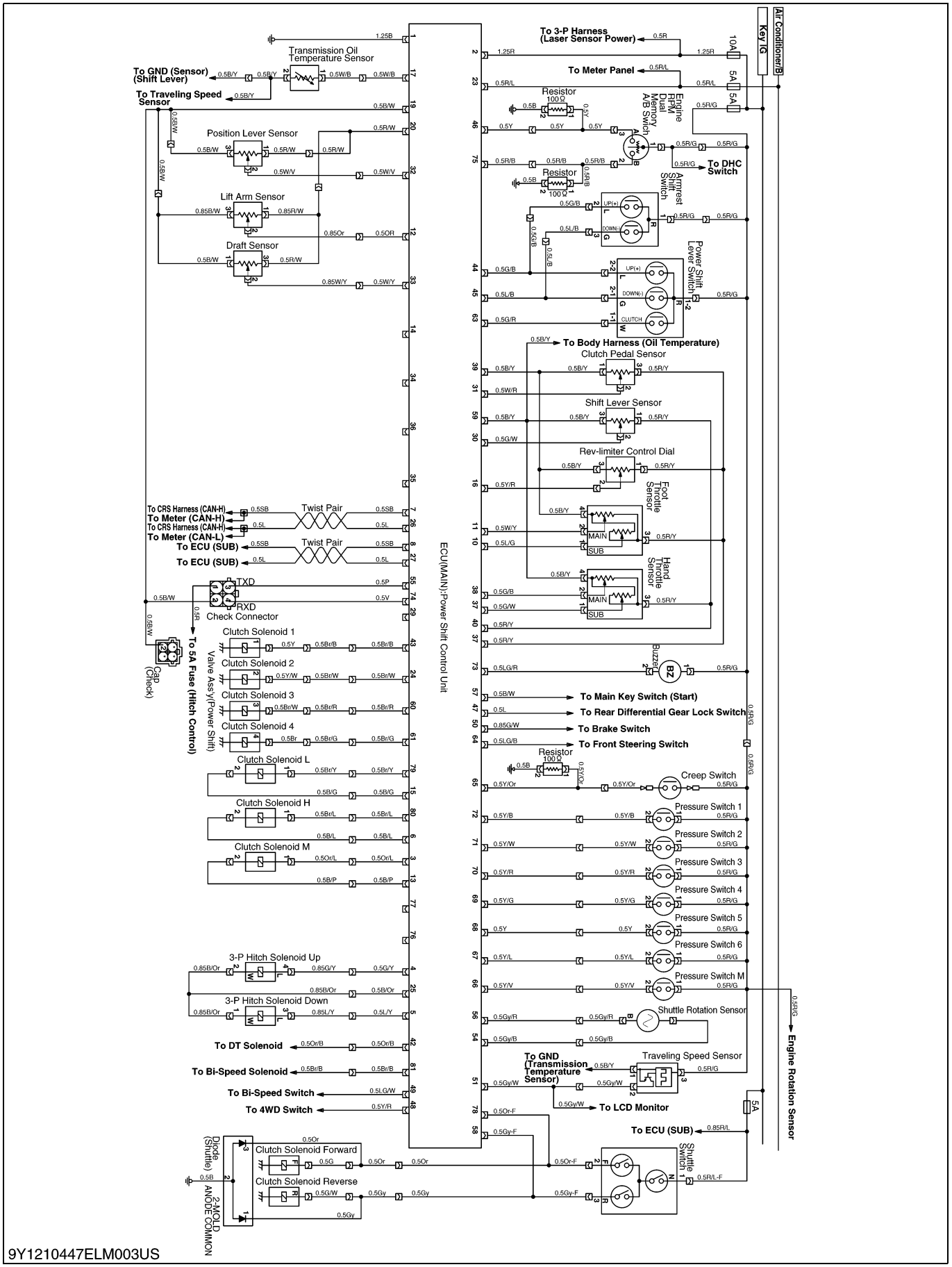
Instrument Panel

On the instrumental meter panel, the lamps are provided to indicate the power shift system such as the step of main speed change, **Forward / Reverse** position of shuttle lever and the **Neutral** position of range shift lever.

9Y1210447TRM0005US0

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[2] ELECTRICAL CIRCUIT (POWER SHIFT)



9Y1210447ELM003US

9Y1210447ELM0030US0

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3. DIGITAL LCD MONITOR



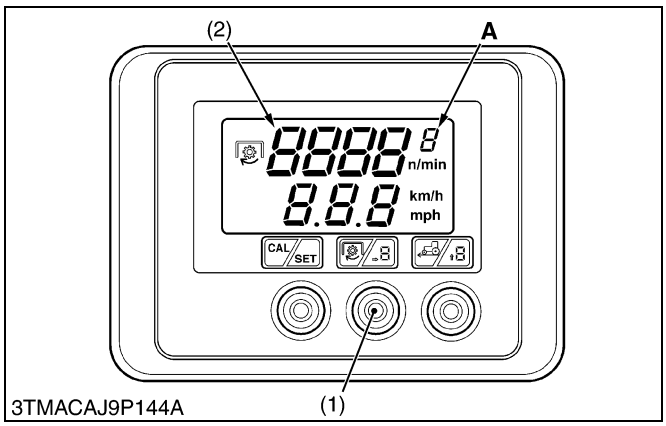
The Monitor Display Travel Speed and PTO Speed

Engine rotation sensor detects the engine speed with number of pulses. The engine speed is converted into PTO speed.

Display of travel speed is switched between "km/h" and "mph".

A travel speed is calculated and displayed by the number of rotation DT shaft, axle ratio and tire size.

9Y1210269ELM0014US0



PTO Tachometer

The PTO speed appears in the LCD display.

Before use, check to see if the reading (**"1"**-**"2"**) in the LCD display and the PTO speed (540/1000 min^{-1} (rpm)) are correct. If not, the correct rpm is not displayed.

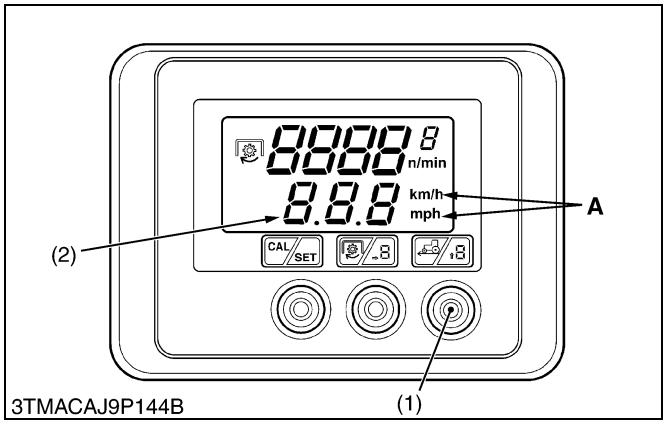
- PTO at 540 min^{-1} (rpm): LCD display **"1"**
- PTO at 1000 min^{-1} (rpm): LCD display **"2"**

Each time the PTO display selector switch is pressed with the key switch at **ON**, the LCD display shows **"1"** and **"2"** alternately. Once selected, the setting is put in memory. (New setting is required when the PTO speed has been changed.)

(1) PTO Display Selector Switch
(2) PTO Speed Display

A: "1" and "2" Alternately Displayed

9Y1210269ELM0015US0



Speed Meter

The travel speed appears in the LCD display while the machine is running.

The speed can be displayed in km/h and mph.

Each time the travel speed display selector switch is pressed with the key switch at **ON**, the LCD display shows km/h and mph alternately. It is able to select a desired unit. (Once selected, the setting is put in memory.)

(1) Travel Speed Display Selector Switch
(2) Speed Display

A: "km/h" and "mph" Alternately Displayed

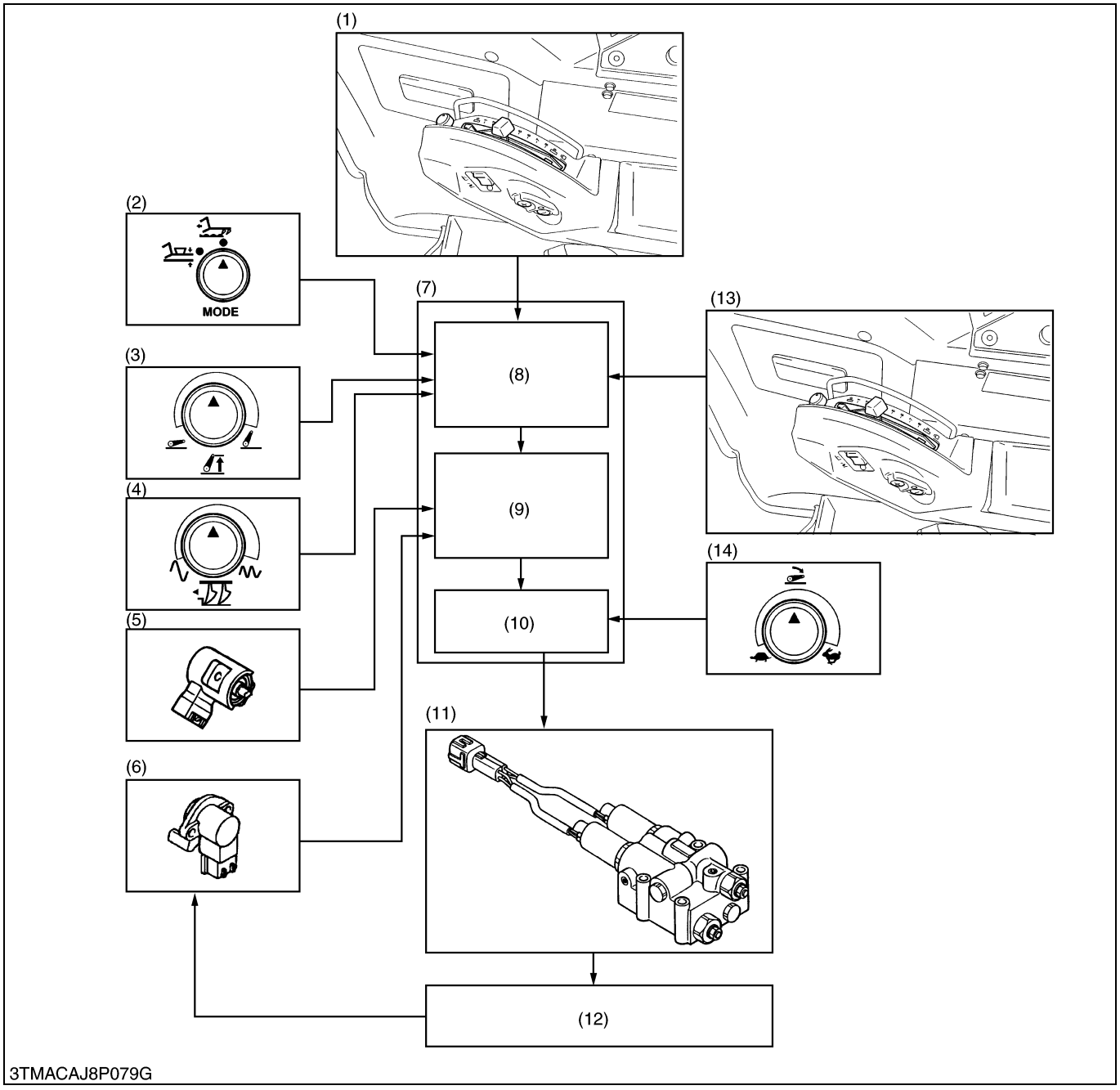
9Y1210269ELM0016US0

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4. 3-POINT HITCH CONTROL

[1] SYSTEM OUTLINE

(1) Control



(1) Hydraulic Control Lever
(2) Mode Switch
(3) Lift Arm Top Limit Adjustment Dial
(4) Draft Ratio Dial
(5) Draft Sensor
(6) Lift Arm Sensor
(7) ECU
(8) Condition Setting
(9) State Detection
(10) Control Amount Decision
(11) Control Valve
(12) Hydraulic Cylinder
(13) 3-point Quick Raise/Lower Switch
(14) 3-point Hitch Lowering Speed Adjustment Dial

(To be continued)

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(Continued)

■ **Position Control**

The attachment can be adjusted to any level by moving the hydraulic control lever. At this time, the top limit of the three-point link is determined by the lift arm top limit dial.

The lowering speed dial is used to adjust the lowering speed of the three-point link.

■ **Draft Control**

1) Hydraulic Control Lever

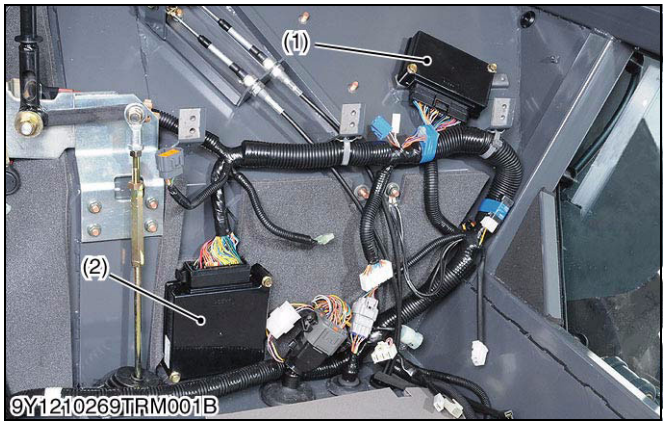
This will control the pull of the 3-point implement. As the load on the 3-point hitch changes due to various soil conditions, the draft control system automatically responds to these changes by either raising or lowering the implement slightly to maintain a constant pull.

Set the implement pull with the hydraulic control lever.

9Y1210447ELM0031US0

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(2) Electrical Components



3-Point Hitch Control Unit (ECU)

The built-in 16-bit microcomputer, ECU (MAIN) (2) processes the data coming from the draft ratio dial, draft sensor, lift arm sensor, etc., via ECU (SUB) (1) and helps actuate the lift and its cylinder, etc. as required.

ECU (MAIN): Control 3-point Hitch

ECU (SUB): Receive the date from sensors and dials, and send it to ECU (MAIN) by CANbus.

(1) ECU (SUB) (1) ECU (MAIN)

9Y1210447HYM0006US0



Hydraulic Control Lever

This will control the working depth of 3-point hitch mounted implement regardless of the amount of pull required.

(1) Hydraulic Control Lever

9Y1210269ELM0019US0



3-Point Quick Raise/Lower Switch

These switches are used to raise and lower the implement. This facilitates turning in the field.

When pressing the **RAISE** switch, the 3-point lifting/lowering indicator turns on and the implement goes up. When pressing the **LOWER** switch, the indicator goes off and the implement comes down.

When the **RAISE** switch has been pressed to raise the implement, the hydraulic control lever can not work.

When using the hydraulic control lever, first pull it up to the top position.

(1) 3-point Quick Raise/Lower Switch

9Y1210269ELM0020US0



Remote Hitch Up/Down Switch

These switches are used to raise and lower the 3-point hitch for aligning the arm with the implement only. When pressing the **UP** switch and 3-point hitch goes up. When pressing the **DOWN** switch and the 3-point hitch comes down. Movement of the 3-point hitch stops when the switch is released.

(1) Remote Hitch Up/Down Switch

9Y1210447ELM0001US0

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Control Dial and Switch

1) Mode Selector Switch

It is able to select the position control or the draft control depending on the types of work. The draft control is suitable for jobs requiring traction such as plowing and sub-soiling.

- Draft control selected: The draft indicator lights up.
- Position control selected: The draft indicator goes off.

2) Lift Arm Top Limit Adjustment Dial

This dial is used to change the top limit of the 3-point hitch.

1. Turn the dial in the **HIGH** direction, and the top limit of the 3-point hitch will raise.
2. Turn the dial in the **LOW** direction, and the top limit of the 3-point hitch will lower.

3) 3-point Hitch Lowering Speed Adjustment Dial

This dial is used to change the 3-point hitch's lowering speed.

1. Turn the dial in the **FAST** direction, and the 3-point hitch's lowering speed will increase.
2. Turn the dial in the **SLOW** direction, and the 3-point hitch's lowering speed will decrease.

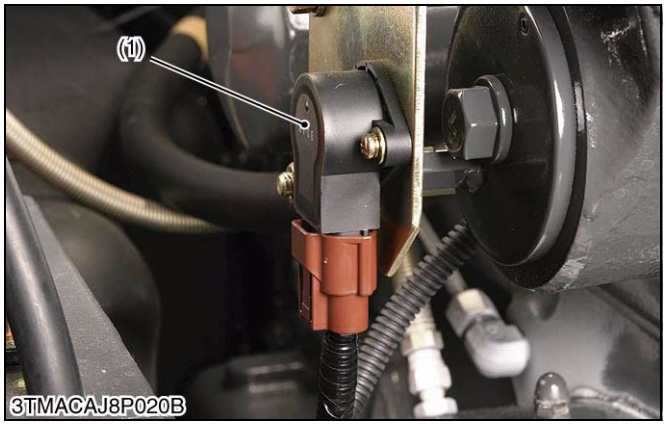
4) Draft Ratio Adjustment Dial

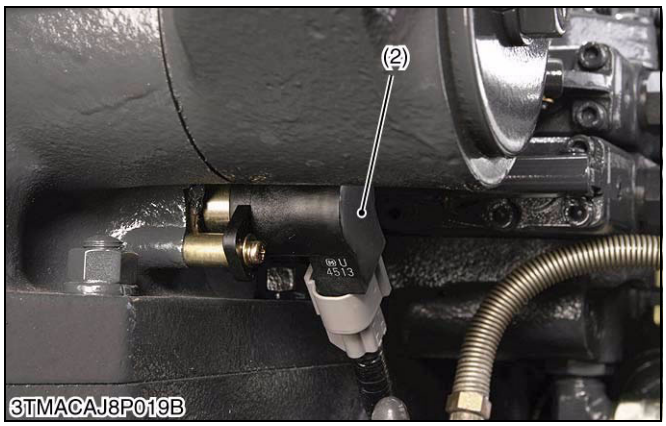
Set the mode selector switch to the **DRAFT** position. Turn the draft ratio adjustment dial to adjust to specific application requirement. Make settings according to the guidelines below.

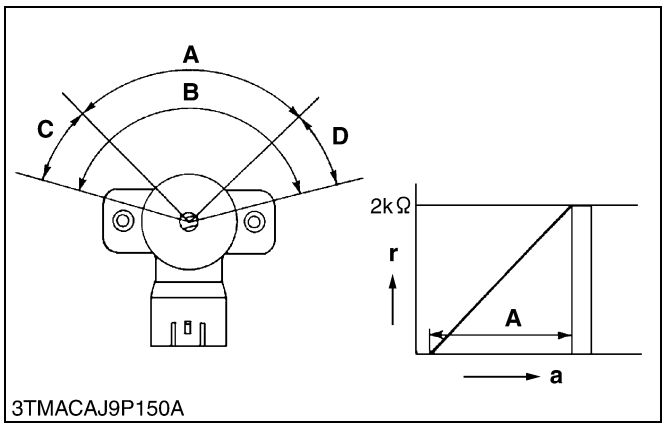
(1) Mode Switch
(2) 3-point Hitch Lowering Speed Adjustment Dial
(3) Lift Arm Top Limit Adjustment Dial
(4) Draft Ratio Adjustment Dial

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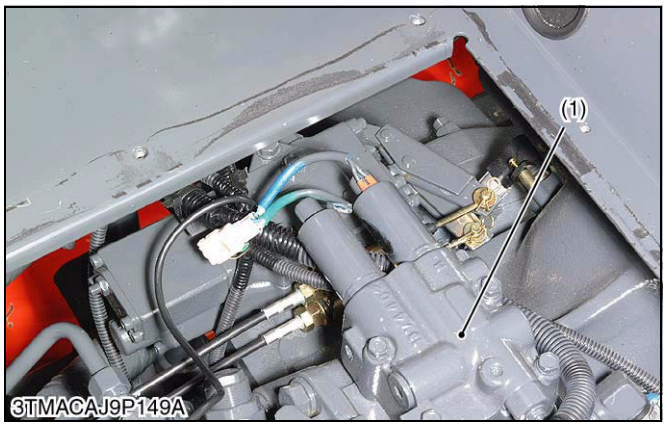
Lift Arm Sensor and Draft Sensor

These sensors are rotary-displacement variable resistors. The hydraulic control lever sensor detects the hydraulic control lever's position, where as the lift arm sensor detects the lift arm's angle and the draft sensor.

(1) Lift Arm Sensor
(2) Draft Sensor

A: Electrical Effective Angle
B: Movable Angle
C: Free Angle
D: Free Angle
a: Angle
r: Resistance

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Control Valve

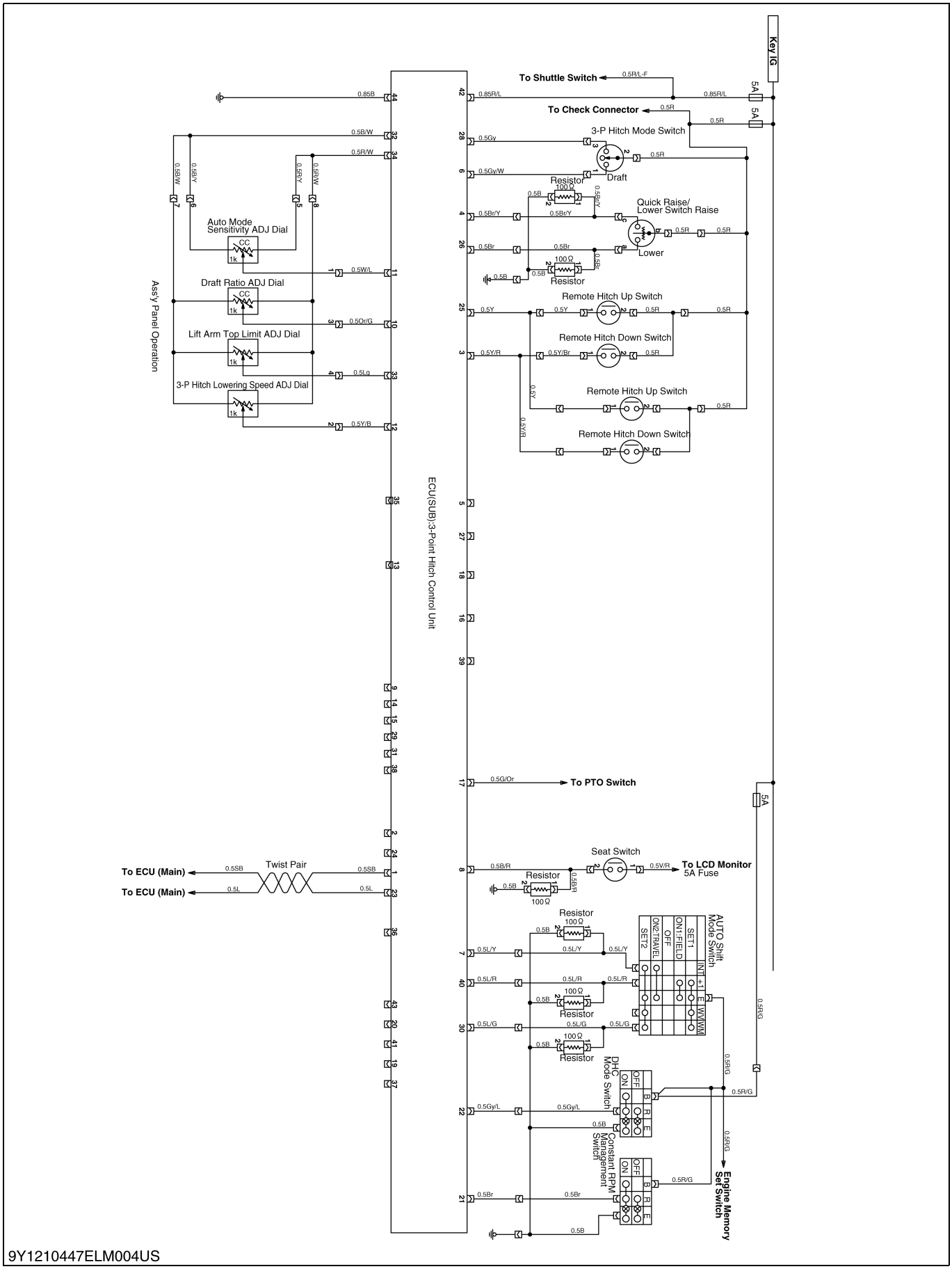
The solenoid proportional control valve is used to regulate the oil flow rate in proportion to the electric current. When the solenoid is energized, its current activates the main spool proportionally, which controls the oil flowing into the hydraulic cylinder.

(1) Control Valve

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[2] ELECTRICAL CIRCUIT (3-POINT HITCH)

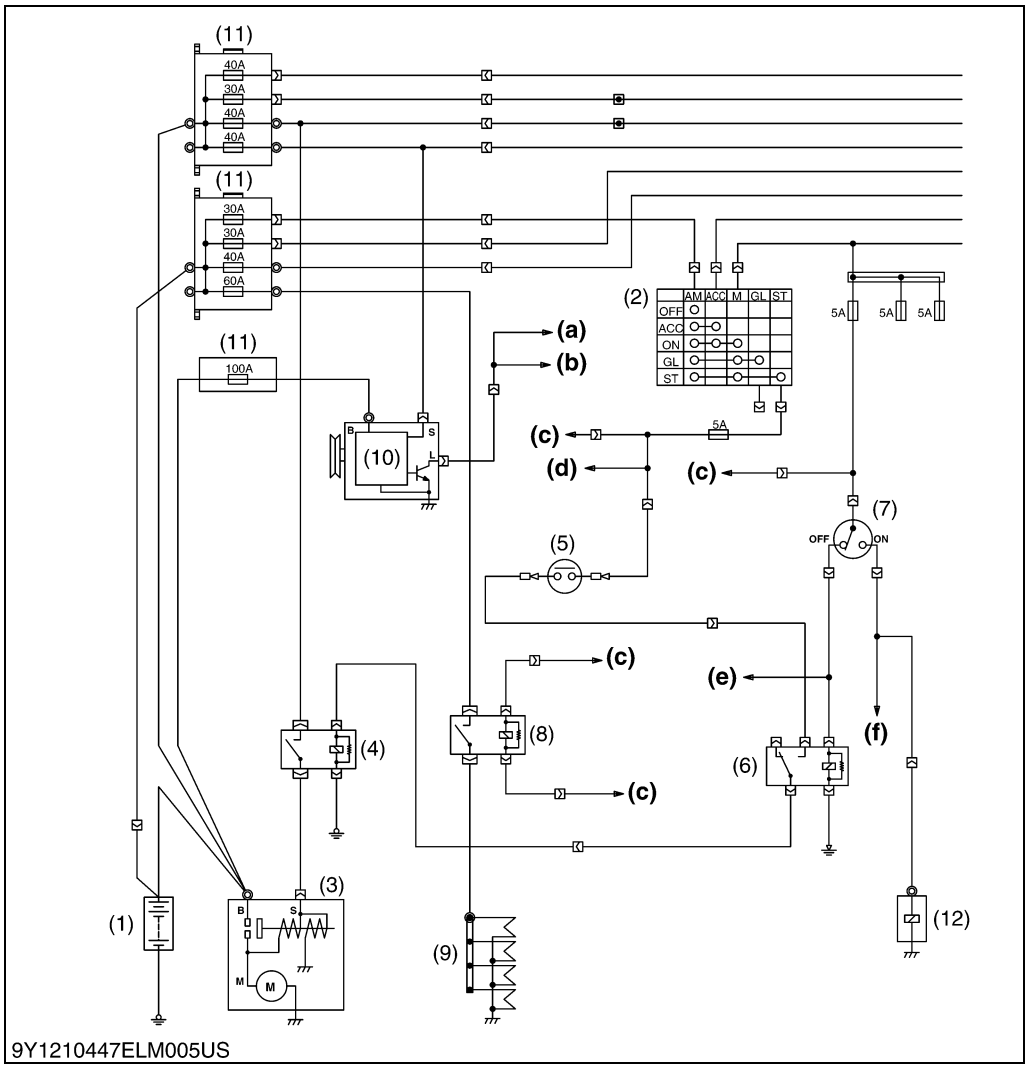


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5. STARTING SYSTEM

[1] SYSTEM OUTLINE AND ELECTRICAL CIRCUIT



9Y1210447ELM005US

(1) Battery
(2) Main Switch
(3) Starter Motor
(4) Starter Relay
(5) Neutral Safety Switch
(6) PTO Relay
(7) PTO Switch
(8) Glow Relay
(9) Glow Plug
(10) Alternator
(11) Slow Blow Fuse
(12) PTO Valve Solenoid

(a) To Meter Panel
(b) To Diode
(c) To CRS Harness
(d) To ECU (Main)
(e) To ECU (Sub)
(f) To LCD Display

There are four key positions, **OFF, ACC, ON** and **START** on the main switch as shown above.

When the main switch is set to **ACC** (Accessory), the radio, windshields wipers (front and rear), work lights (front and rear), cigar lighter and blower fan can be used.

When the main switch is set **ON**, terminal **AM** of the main switch is connected to terminal **ACC** and terminal **M**.

When the main switch is set to **START** under the condition that the power shift/range shift lever is neutral position and the safety switch (5) is turned on and PTO switch is **OFF** position. Terminal **AM** of the main switch is connected to terminal **M** and terminal **ST**. Consequently, battery current flows to neutral safety switch (5), coil of starter relay (4), PTO safety relay (6). (When the PTO switch is set to **OFF**, battery current flows PTO switch (7) and coil of PTO safety relay (6).)

This actuates starter (3).

When the main switch is released after starting the engine, the main switch returns to **ON** automatically. This stops the starter.

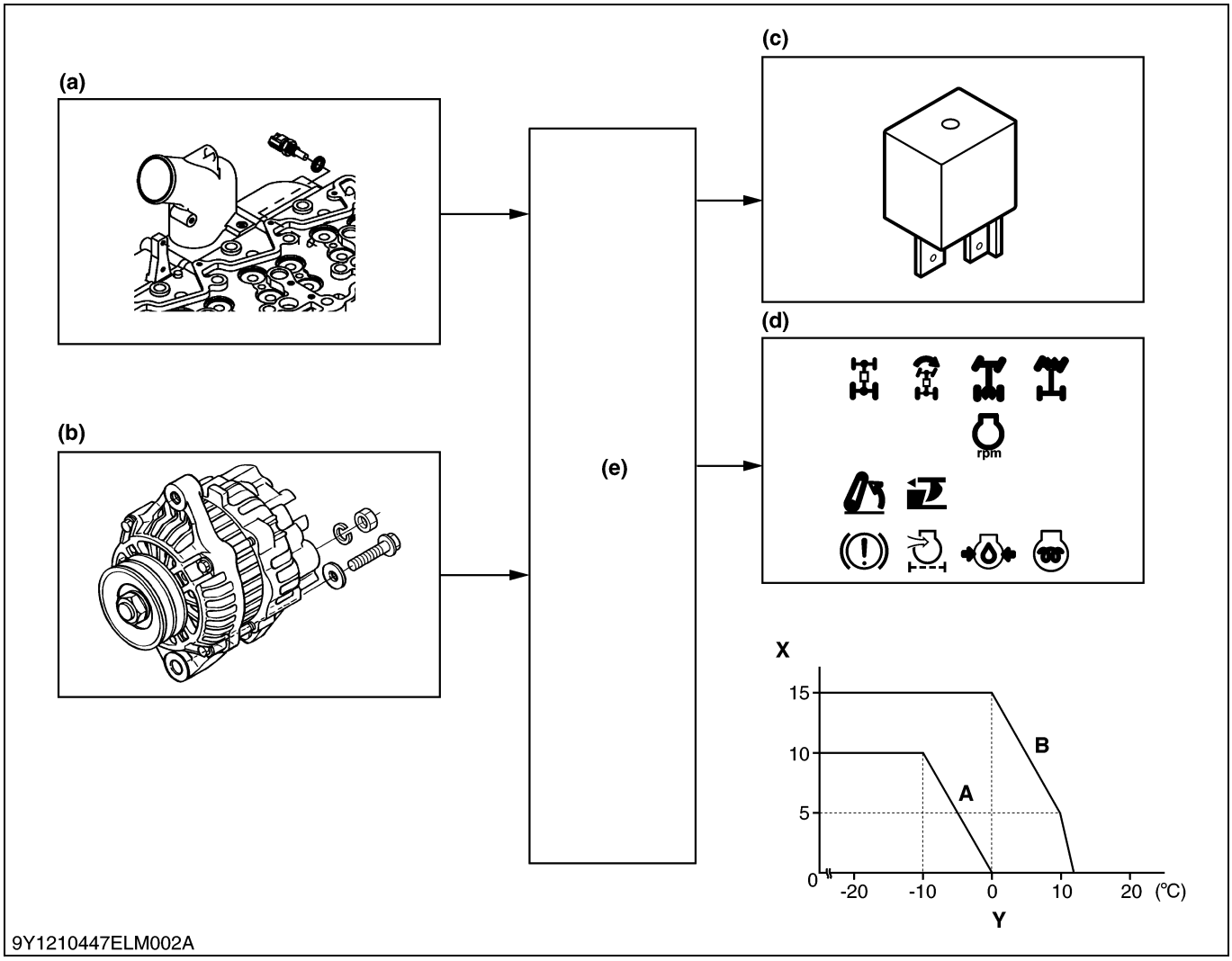
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[2] PTC HEATER (POSITIVE TEMPERATURE COEFFICIENT)

(1) System Outline

[A] Before Glow



(a) Coolant Temperature Sensor
(b) Alternator (L Terminal)
(c) Glow Relay
(d) Glow Lamp
(e) ECU (CRS)

A: Glow Lamp Lighting Time
B: Glow Plug Operating Time
X: Energizing Time (Sec)
Y: Water Temperature (When Starting Engine)

(To be continued)

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(Continued)

On engine start-up, the air intake heater heats up the intake air to increase startability and combustion efficiency.

1. Drive Conditions for Glow Plug
   - Engine water temperature is 12 °C (54 °F) or lower.
   - One second after turning the key switch **ON**.
2. Energizing Time
   - Above 12 °C (54 °F): 0 seconds.
   - 10 to 12 °C (50 to 54 °F): (12 - Engine water temperature) × 3 seconds
   - 0 to 10 °C (32 to 50 °F): 15 - (0.9 × Engine water temperature) seconds
   - Below 0 °C (32 °F): 15 seconds.
3. Limitation on Energizing Time
   - When turning the main switch on without starting the engine, the energizing time is limited to 20 seconds in order to prevent damage to the heater.
4. Lighting Conditions for Glow Lamp
   - Engine water temperature is below 0 °C (32 °F)
5. Glow Lamp Lighting Time
   - −10 to 0 °C (14 to 32 °F): (0 - Engine water temperature) × 1 seconds
   - Below −10 °C (14 °F): 10 seconds
6. Glow Plug Operation and Lamp Indication on Failure Detection

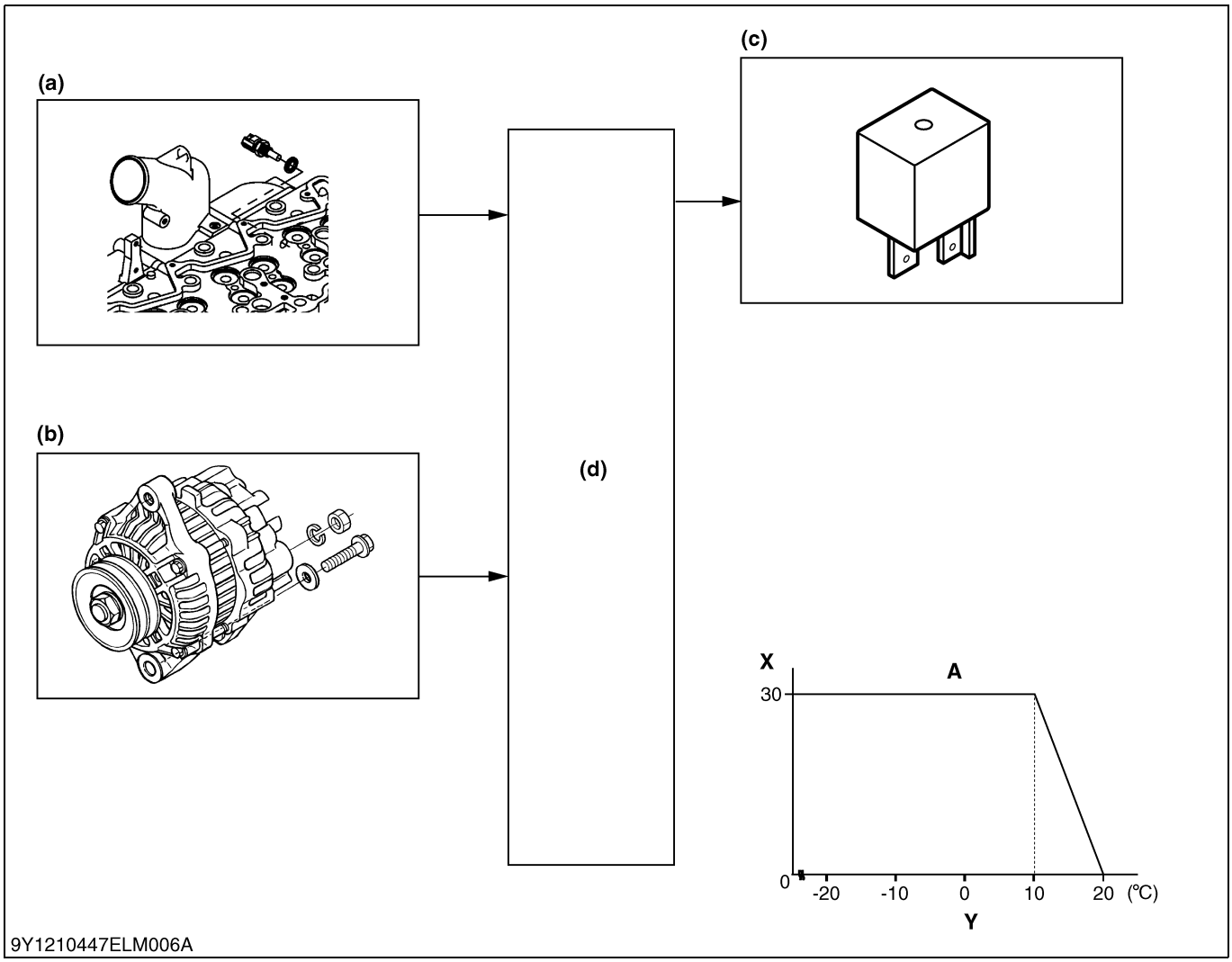
   When the engine water sensor fails.
   - Glow plug operating time: 20 seconds at the maximum
   - Glow lamp lighting: Slow blinking for 15 seconds (Twice per second)

   When the ECU (CRS) fails
   - Output to glow relay is disabled.
   - Heater lamp lighting: Fast blinking for 15 seconds (Five times per second)

9Y1210447ELM0004US0

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[B] After Glow



(a) Coolant Temperature Sensor
(b) Alternator (L Terminal)
(c) Glow Relay
(d) ECU (CRS)
A: Glow Plug Operating Time
X: Energizing Time (Sec)
Y: Water Temperature (When Starting Engine)

On engine start-up, the air intake heater heats up the intake air to increase startability and combustion efficiency.

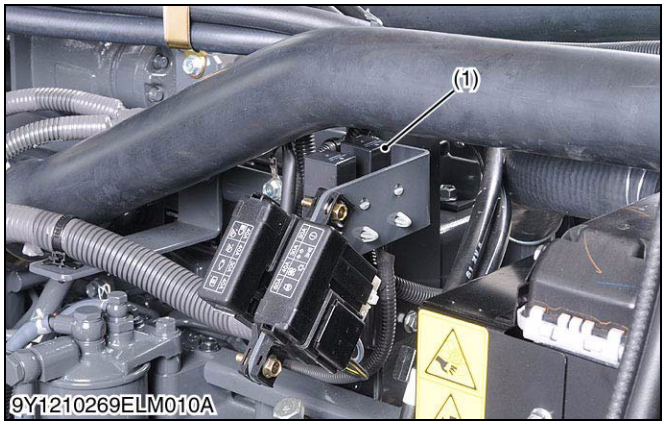
1. Drive Conditions for Glow Plug
   - Engine water temperature is 20 °C (68 °F) or lower.
2. Energizing Time
   - Above 20 °C (68 °F): 0 seconds.
   - 10 to 20 °C (50 to 68 °F): (20 - Engine water temperature) × 3 seconds
   - Below 10 °C (50 °F): 30 seconds.

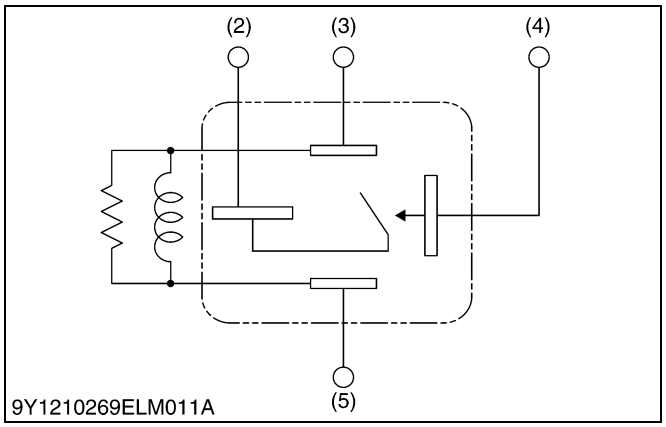
9Y1210447ELM0032US0

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[3] COMPONENTS

(1) Glow Relay





In some cases, the glow relay is mounting on air heating system to prevent the contact of the main switch burning out when the main switch is switched.

Current from battery flows only the ECU (CRS).

The ECU (CRS) controls the time that current flows to the earth through the ECU (CRS).

Current from the battery through slow blow fuse (60 A) flows to the glow plug while the ECU (CRS) connecting the earth line.

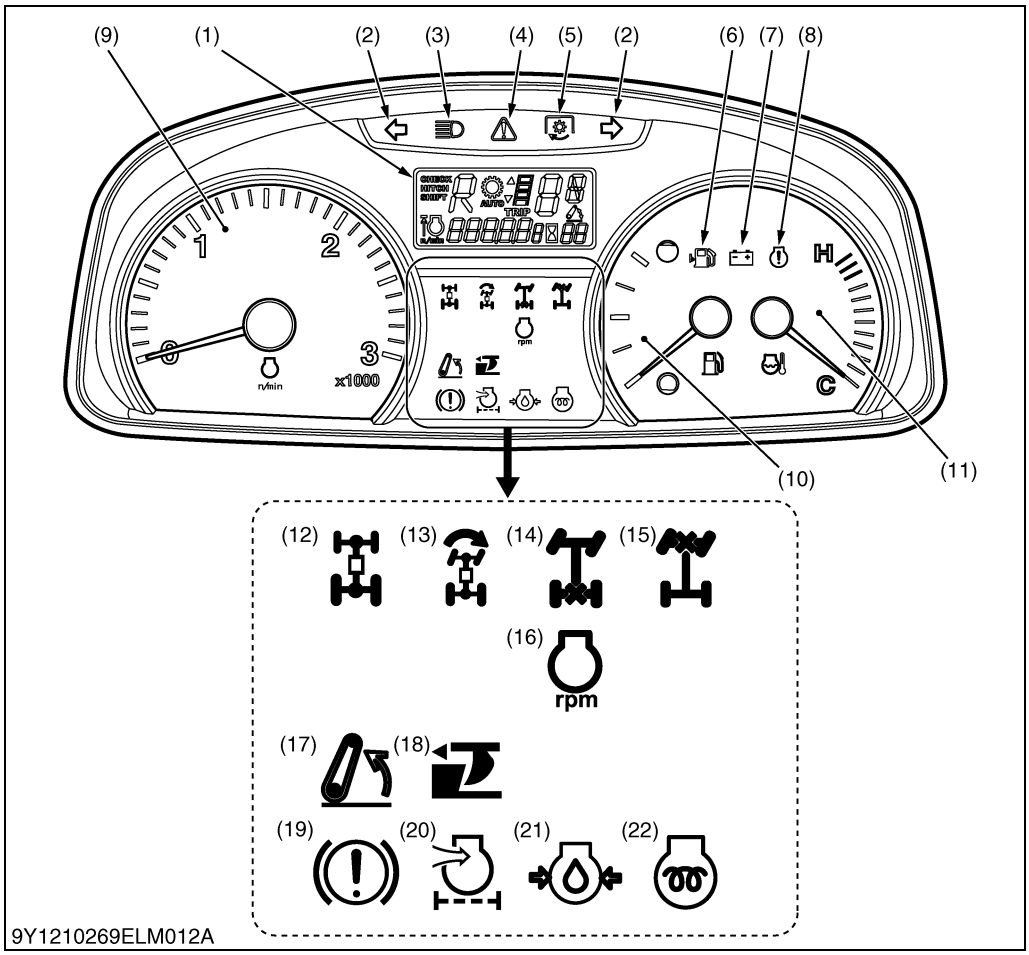
(1) Glow Relay
(2) To Glow Plug
(3) From Battery
(4) From Slow Blow Fuse (Glow: 60A)
(5) To ECU (CRS)

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6. METER PANEL

[1] EASY CHECKER™



(1) Liquid Crystal Display
(2) Turn Signal / Hazard Indicator
(3) Hi-beam Indicator
(4) Master System Warming Indicator
(5) PTO Clutch Indicator
(6) Fuel Level Indicator
(7) Electrical Charge Indicator
(8) Engine Warming Indicator
(9) Tachometer
(10) Fuel Gauge
(11) Coolant Temperature Gauge
(12) 4WD Indicator
(13) Bi-speed Turn Indicator
(14) Rear Wheel Differential Lock Indicator
(15) Front Wheel Differential Lock Indicator
(16) Constant RPM Management Indicator
(17) 3-points Lifting / Lowering Indicator
(18) Draft Indicator
(19) Parking Brake / Brake Oil Indicator
(20) Air Cleaner Indicator
(21) Engine Oil Pressure Indicator
(22) Heater Indicator

If the warning lamps in the Easy Checker™ come on during operation, immediately stop the engine, and find the cause as shown below.

Never operate the tractor while Easy Checker™ lamp is on.

■ **Coolant Temperature**

The indicator lights up if the water temperature gauge points to **"H"** (red zone) to indicated an overheat.

■ **Alarm Against Low Brake Oil Level or Parking Brake Operation**

The warning lamp in the Easy Checker™ comes on if the parking brake is applied.

If the lamp is on during operation, release the parking brake lever immediately.

If the brake oil goes below the prescribed level, the warning lamp in the Easy Checker™ will come on.

If this should happen during operation, check to see that there is no oil leak in the brake system, and then add oil.

■ **Air Cleaner**

If the air cleaner is clogged, the warning lamp in the Easy Checker™ will come on.

If this should happen during operation, clean the air cleaner element.

■ **Engine Oil Pressure**

If the oil pressure in the engine goes below the prescribed level, the warning lamp in the Easy Checker™ will come on. If this should happen during operation, and it does not go off when the engine is accelerated to more than 1000 min^{-1} (rpm), check level of engine oil.

■ **Fuel Level**

If the fuel in the tank goes below the prescribed level, the warning lamp in the Easy Checker™ will come on (less than 14 L (3.7 U.S.gals, 3.1 Imp.gals)).

If this should happen during operation, refuel as soon as possible.

■ **Electrical Charge**

If the alternator is not charging battery, the Easy Checker™ will come on.

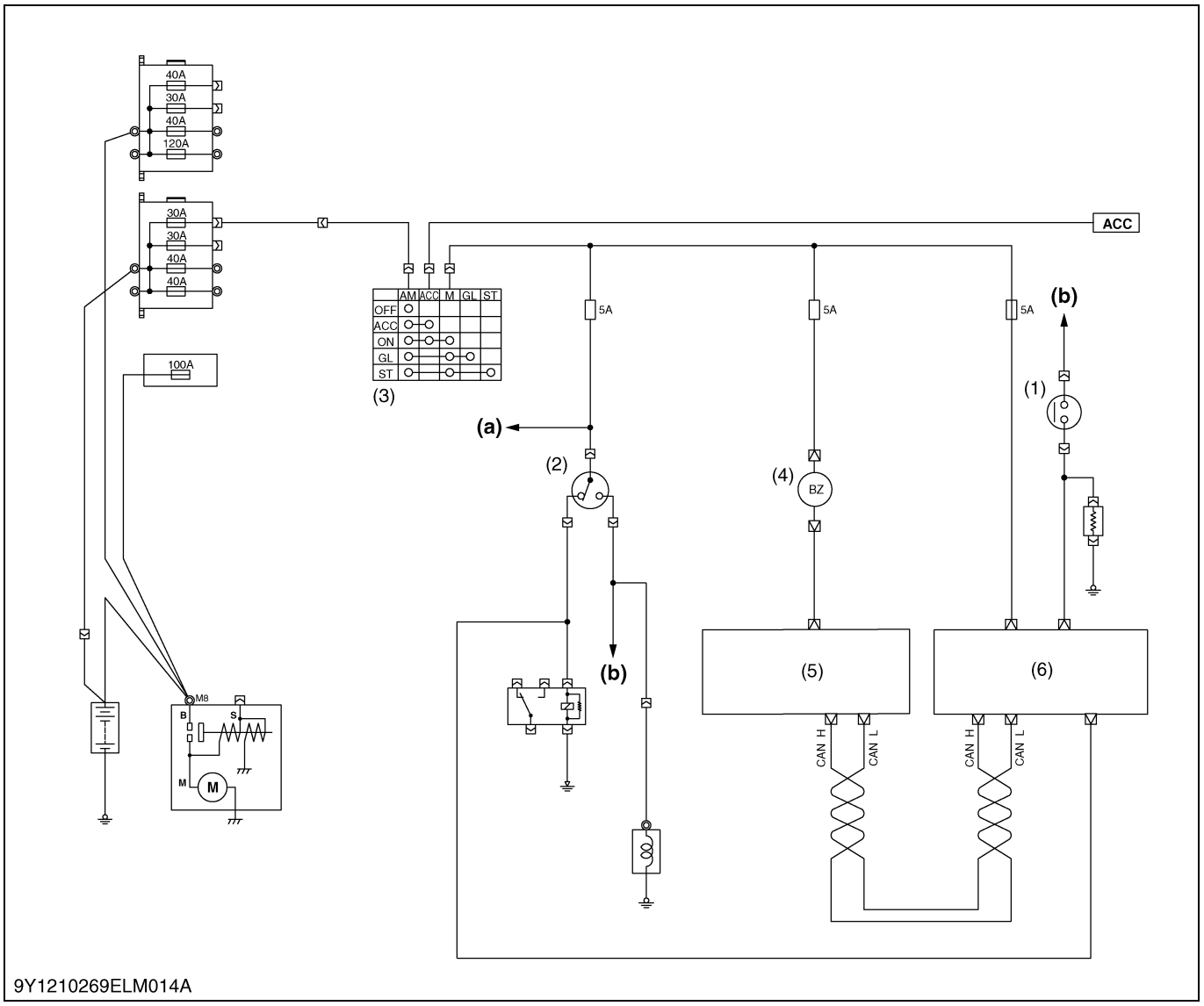
If this should happen during operation, check the electrical charging system.

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7. OPC (OPERATOR PRESENCE CONTROL)

[1] SYSTEM OUTLINE AND ELECTRICAL CIRCUIT



(1) Seat Switch
(2) PTO Switch
(3) Main Switch
(4) Alarm (Buzzer)
(5) ECU (Main)
(6) ECU (Sub)
(a) To CRS
(b) To LCD Display

The tractors equip operator presence control (OPC) system which automatically whistling when operator stands from seat while engaging PTO clutch.

This system is controlled by the seat switch (1), PTO switch (2) and alarm (4).

■ **Electric Circuit**

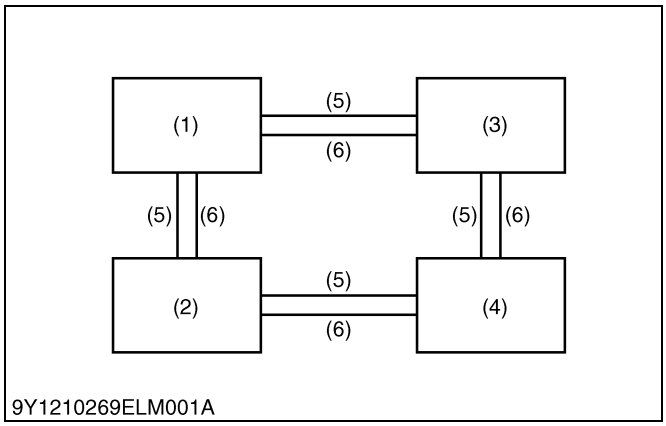
When sitting on the seat in the state of main switch **ON,** the battery voltage passes the seat switch (1).

When standing from the operators seat while the PTO switch at **ON** position, the warning buzzer whistle about one second after standing up. It whistles for 10 seconds.

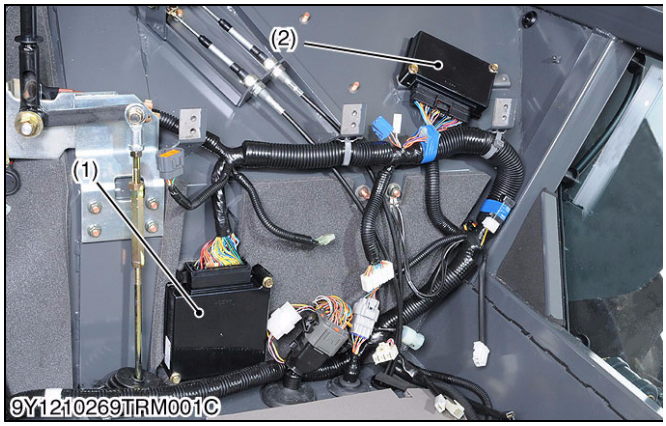
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8. CAN (CONTROLLER AREA NETWORK) COMMUNICATION



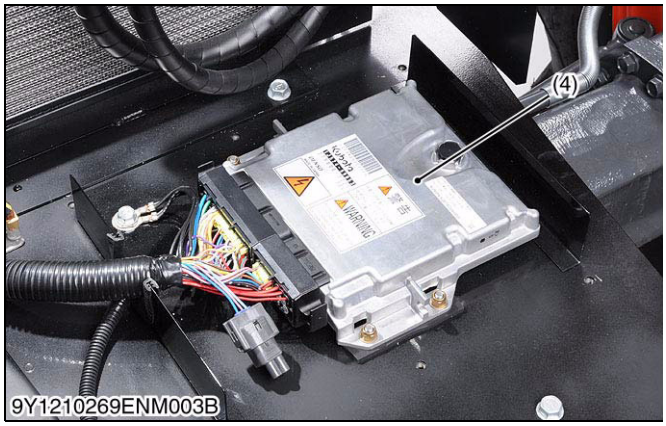
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The Controller Area Network (CAN) specification defines the Data Link Layer, ISO 11898 defines the Physical Layer.

The CAN bus [CANbus] is a Balanced (differential) 2-wire interface running over a Shielded Twisted Pair (STP), WIRING HARNESS (5) and (6). The Bit Encoding used is Non Return to Zero (NRZ) encoding (with bit-stuffing) for data communication on a differential two wire bus. The use of NRZ encoding ensures compact messages with a minimum number of transitions and high resilience to external disturbance.

A number of data rates is 500 kbps (kilo bits per second).

The CAN Bus interface uses an asynchronous transmission scheme controlled by start and stop bits at the beginning and end of each character. This interface is used, employing serial binary interchange. Information is passed from transmitters to receivers in a data frame.

The first merit of the CANbus is that the wiring harness becomes simplified.

The second merit of the CANbus is that the output signal data of sensors and switches connected with ECU can be shared by each ECU.

(1) ECU (MAIN)
(2) ECU (SUB)
(3) ECU (INSTRUMENT PANEL)
(4) ECU (CRS)
(5) WIRING HARNESS (CAN BUS High)
(6) WIRING HARNESS (CAN BUS Low)

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SERVICING

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1. TROUBLESHOOTING

ALL

Symptom	Probable Cause	Solution	Reference Page
All Electrical Equipments Do Not Operate	Battery discharged or defective	Recharge or replace	G-23, G-24
	Battery positive cable disconnected or improperly connected	Repair or replace	–
	Battery negative cable disconnected or improperly connected	Repair or replace	–
	Slow blow fuse blown	Replace	G-41
Fuse Blown Frequently	Short-circuit	Repair or replace	G-42

BATTERY

Symptom	Probable Cause	Solution	Reference Page
Battery Discharges Too Quickly	Battery defective	Recharge or replace	G-23, G-24
	Alternator defective	Repair or replace	9-S97
	Wiring harness disconnected or improperly connected (between battery positive terminal and alternator terminal **B**)	Repair or replace	9-S97
	Cooling fan belt slipping	Adjust tension	G-32

STARTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Starter Motor Does Not Operate	Battery discharged or defective	Recharge or replace	G-23, G-24
	Slow blow fuse blown	Replace	G-41
	Starter relay defective	Replace	9-S91
	Safety switch defective	Replace	9-S96
	Wiring harness disconnected or improperly connected (between main switch terminal **ST** and neutral switch, between neutral switch and starter relay, between starter relay and PTO relay, between PTO relay and ground, between main switch terminal **AM** and slow blow fuse, between slow blow fuse and starter motor terminal **B**, between starter motor terminal **B** and battery positive terminal, between starter motor terminal **B** and starter relay, between starter relay and starter motor terminal **S**)	Repair or replace	–
	Starter motor defective	Repair or replace	9-S92
	Main key switch defective	Replace	9-S87

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OPC

Symptom	Probable Cause	Solution	Reference Page
Buzzer Does Not Buzz	Fuse blown	Replace	G-42
	Buzzer defective	Replace	–
	Seat switch defective	Replace	9-S94

CHARGING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Charging Lamp Does Not Light When Main Switch is Turned ON	Fuse blown	Replace	G-42
	Wiring harness disconnected or improperly connected (between main switch terminal **AC** and panel board, between panel board and alternator terminal **L**)	Repair or replace	9-S97
Charging Lamp Does Not Go Off When Engine is Running	Short circuit between alternator terminal **L** lead and chassis	Repair or replace	9-S97
	Alternator defective	Repair or replace	9-S97

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LIGHTING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Headlight Does Not Light	Fuse blown (10 A)	Replace	G-42
	Bulb blown	Replace	G-44
	Wiring harness disconnected or improperly and slow blow fuse, between slow blow fuse and light relay, between light relay and combination switch terminal **H**, between combination switch terminal **E2** and ground, between light relay and fuse (10 A), between fuse and headlight, between headlight and combination switch terminal **HM** and terminal **HS**)	Repair or replace	9-S99
Illumination Light Does Not Light	Fuse blown (10 A)	Replace	G-42
	Bulb blown	Replace	G-44
	Wiring harness disconnected or improperly connected (between combination switch terminal **S** and panel board)	Repair or replace	9-S99
Tail Light Does Not Light	Fuse blown	Replace	G-42
	Wiring harness disconnected or improperly connected (between combination switch terminal **LP** and rear combination light)	Repair or replace	9-S99
Hazard Light Does Not Light	Fuse blown	Replace	G-42
	Bulb blown	Replace	G-44
	Flasher unit defective	Replace	9-S101
	Hazard switch defective	Replace	9-S100
Hazard and Turn Signal Indicator Lamp Does Not Light	Bulb blown	Replace	G-44
	Wiring harness disconnected or improperly connected	Repair or replace	–
Hazard and Turn Signal Light Does Not Go ON and OFF	Flasher unit defective	Replace	9-S101
Work Light Does Not Light	Fuse blown	Replace	G-42
	Bulb blown	Replace	G-44
	Wiring harness disconnected or improperly connected (between starter motor terminal **B** and work light)	Repair or replace	9-S102

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EASY CHECKER™

Symptom	Probable Cause	Solution	Reference Page
Brake Oil Level / Parking Brake Indicator Lamp Does Not Light When Main Switch is Turned ON and Pull Parking Brake Lever	Bulb blown	Replace	–
	Brake oil level too low	Supply oil	5-S5
	Brake oil level switch defective	Replace	9-S104
	Parking brake switch defective	Replace	9-S103
Engine Oil Pressure Lamp Lights Up When Engine is Running	Engine oil pressure too low	Repair engine	–
	Engine oil insufficient	Fill	G-10
	Engine oil pressure switch defective	Replace	9-S103
	Short circuit between engine oil pressure switch lead and chassis	Repair	9-S103
	Circuit in panel board defective	Replace	–
Engine Oil Pressure Lamp Does Not Light When Main Switch is Turned ON and Engine Is Not Running	Bulb blown	Replace	–
	Engine oil pressure switch defective	Replace	9-S103
	Wiring harness disconnected or improperly connected (between panel board and engine oil pressure switch)	Repair or replace	–
	Circuit in panel board defective	Replace	–
Charge Lamps Do Not Go OFF When Engine Is Running	Alternator defective	Repair or replace	9-S97
	Short circuit between alternator terminal **L** and chassis	Repair	9-S97
	Circuit in panel board defective	Replace	–
Charge Lamps Do Not Light When Main Switch Is Turned ON	IC regulator defective	Repair or replace	9-S113
	Wiring harness disconnected or improperly connected (between panel board and alternator)	Repair or replace	–
	Circuit in panel board defective	Replace	–
PTO Lamp Lights Up When PTO Switch Is OFF Position	PTO switch is defective	Replace	9-S95
PTO Lamp Does Not Light Up When PTO Switch Is ON Position	PTO switch is defective	Replace	9-S95
	PTO lamp defective	Replace	–
Fuel Level Indicator Lamp Lights Up	Fuel insufficient	Fill	G-10
	Fuel limit sensor defective	Replace	9-S104
	Short circuit between fuel limit sensor lead and chassis	Repair	9-S104
	Circuit in panel board defective	Replace	–
Fuel Level Indicator Lamp Does Not Light When Fuel Tank Is Empty	Bulb blown	Replace	–
	Fuel limit sensor defective	Replace	9-S104
	Wiring harness disconnected or improperly connected (between panel board and fuel limit sensor)	Repair or replace	–
	Circuit in panel board defective	Replace	–

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Symptom	Probable Cause	Solution	Reference Page
Coolant Temperature Indicator Does Not Light When Water Temperature Gauge Points to H (Red Zone)	Bulb blown	Replace	–
	Fuse blown	Replace	G-42
	Coolant temperature sensor defective	Replace	9-S105
	Wiring harness disconnected or improperly connected (between panel and coolant temperature sensor)	Repair or replace	–
	Circuit in panel board defective	Replace	–
4WD Indicator Lamp Lights Up When 4WD Is Not Engaged	4WD/Bi-speed switch defective	Replace	9-S105
4WD Indicator Lamp Does Not Light When 4WD Is Engaged	4WD/Bi-speed switch is defective	Replace	9-S105
	4WD indicator lamp defective	Replace	–
Bi-speed Indicator Lamp Lights Up When Bi-speed Is Not Engaged	4WD/Bi-speed switch defective	Replace	9-S105
Bi-speed Indicator Lamp Does Not Light When Bi-speed Is Engaged	4WD/Bi-speed switch defective	Replace	9-S105
	Bi-speed indicator lamp defective	Replace	–
Front Differential Lock Indicator Lamp Lights Up When Differential Lock Is Not Engaged	Front differential lock switch defective	Replace	9-S106
Front Differential Lock Indicator Lamp Does Not Light When Differential Lock Is Engaged	Front differential lock switch defective	Replace	9-S106

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MAIN KEY SWITCH SHUT-OFF SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Engine Does Not Stop When Main Key Switch Is Turned OFF	Fuse blown (5 A)	Replace	G-42
	Wiring harness disconnected or improperly connected	Repair or replace	–
Engine Does Not Start	Fuse blown (5 A)	Replace	G-42
	Wiring harness disconnected or improperly connected	Repair or replace	–

4WD/BI-SPEED TURN

Symptom	Probable Cause	Solution	Reference Page
Front Wheel Can Not Drive Bi-speed Turn Does Not Operate	4WD/Bi-speed switch or wiring harness is defective	Replace	9-S105
	Turning angle switch or wiring harness is defective	Repair or replace	6-S9
	4WD/Bi-speed relay defective	Replace	9-S93
	4WD/Bi-speed solenoid ON/OFF valve defective	Replace	3-M10
Front Wheel Drive Can Not Be Cancelled Bi-speed Turn Can Not Cancelled	4WD/Bi-speed switch or wiring harness is defective	Repair or replace	9-S105
	Turning angle switch or wiring harness is defective	Repair or replace	6-S9
	4WD/Bi-speed relay defective	Replace	9-S93
	4WD/Bi-speed solenoid ON/OFF valve defective	Replace	3-M10

GAUGES

Symptom	Probable Cause	Solution	Reference Page
Fuel Gauge Does Not Function	Fuel gauge defective	Replace	–
	Fuel level sensor (tank unit) defective	Replace	9-S104
	Wiring harness disconnected or improperly connected (between panel board and fuel level sensor)	Repair or replace	–
	Circuit in panel board defective	Replace	–
Coolant Temperature Gauge Does Not Function	Coolant temperature gauge defective	Replace	–
	Coolant temperature sensor defective	Replace	9-S105
	Wiring harness disconnected or improperly connected (between panel board and coolant temperature sensor)	Repair or replace	–
	Circuit in panel board defective	Replace	–

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2. SERVICING SPECIFICATIONS

STARTER MOTOR

Item		Factory Specification	Allowable Limit
Commutator	O.D.	43.0 mm 1.693 in.	42.0 mm 1.654 in.
Mica	Undercut	0.50 to 0.80 mm 0.0197 to 0.0315 in.	0.2 mm 0.0079 in.
Brush	Length	18.0 mm 0.7086 in.	11.0 mm 0.4331 in.

ALTERNATOR

Item		Factory Specification	Allowable Limit
Brush	Length	18.5 mm 0.728 in.	5.0 mm 0.197 in.
Slip Ring	O.D.	22.7 mm 0.894 in.	22.1 mm 0.870 in.
Stator	Resistance	Less than 1.0 Ω	–
Rotor	Resistance	2.8 to 3.3 Ω	–

FUEL LEVEL SENSOR

Item		Factory Specification	Allowable Limit
Float at Uppermost Position	Resistance	1.0 to 5.0 Ω	–
Float at Lowermost Position	Resistance	108 to 112 Ω	–

COOLANT TEMPERATURE SENSOR (FOR COOLANT TEMPERATURE GAUGE)

Item		Factory Specification	Allowable Limit
Coolant Temperature at 120 °C (248 °F)	Resistance	Approx. 14.9 to 17.3 Ω	–
Coolant Temperature at 100 °C (212 °F)	Resistance	Approx. 26.2 to 29.3 Ω	–
Coolant Temperature at 80 °C (176 °F)	Resistance	Approx. 47.7 to 56.8 Ω	–
Coolant Temperature at 50 °C (122 °F)	Resistance	Approx. 133.9 to 178.9 Ω	–

GLOW PLUG

Item		Factory Specification	Allowable Limit
Glow Plug	Resistance	Approx. 0.95 Ω	–

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3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-13.)

Item	N·m	kgf·m	lbf·ft
Pulley nut (alternator)	58.3 to 78.9	5.95 to 8.05	43.0 to 58.2

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4. CHECKING, DISASSEMBLING AND SERVICING

[1] OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE ADJUSTING AND EASY CHECKING

(1) Information for Menu and Model

This tractor is equipped with the three menus, **"SHI"**, **"HIT"** and **"CHK"**. (See the table below.)
The menu **"SHI"** relates to "Power Shift System". The menu **"SHI"** consists of 11 mode items.
The menu **"HIT"** relates to "3-Point Hitch System". The menu **"HIT"** consists of 3 mode items.
The menu **"CHK"** relates to "Power Shift System" and "3-Point Hitch System". The menu **"CHK"** consists of 4 mode items.

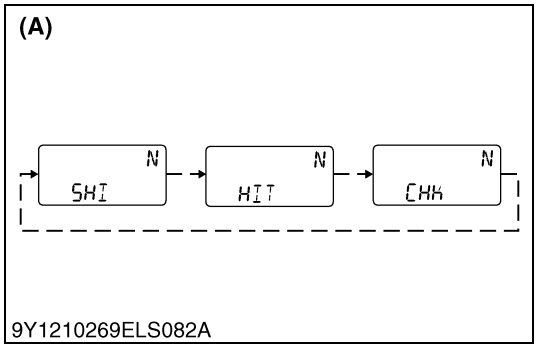
Menu	Menu's main purpose	Mode	Mode Items	Remarks
SHI	POWER SHIFT SYSTEM • Self Diagnosis • Calibrating	SHI-1	C	Power shift system diagnosis
			A	Calibration of all items for power shift system
			1	Calibration of clutch pedal sensor
			2	Calibration of main shift clutch (1 thru 4, L and H)
			3	Calibration of master clutch (F and R)
			4	Calibration of throttle sensor
			5	Calibration of solenoid proportional pressure reducing valve (Master)
			6	Calibration of solenoid proportional pressure reducing valve (Main shift L)
			7	Calibration of solenoid proportional pressure reducing valve (Main shift H)
			N	Setting tractor model
			P	Power shift/range shift lever (Neutral setting)
HIT	3 POINT HITCH SYSTEM • Self Diagnosis • Calibrating	HIT-1		3-point hitch system (Sensors) diagnosis
		HIT-2		Calibration of 3-point hitch system and assist cylinder number
		HIT-3		Calibration of assist cylinder number
CHK	EASY CHECKING	CHK-1		Checking sensors and dials output voltage
		CHK-2		Checking the diagnostic trouble code history
		CHK-3		Checking the master clutch protected times
		CHK-4		Clearing the diagnostic trouble code history

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(2) Information for Setting Menu and Mode





Procedure 1: Setting Menu

1. Turn the main key switch **ON** while pushing both the display switch (1) and the engine RPM dual memory A/B indicator switch (2).
2. Release the switches (1), (2), and **"SHI"** is blinked on the display.
3. Push the display switch (1), and menu item **"SHI"**, **"HIT"** and **"CHK"** are changed in order.
4. Push and hold the engine RPM dual memory A/B indicator switch (2) more than 3 seconds. And then, the target menu is selected.
5. Release the engine RPM dual memory A/B indicator switch (2).

■ **NOTE**

- **If the set menu item is wrong, turn the main key switch OFF and restart the procedure 1.**

(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(A) Flow Chart (Menu)

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Procedure 2: Setting Mode

1. After selecting the menu, make sure that the mode item **"SHI-1"** or **"HIT-1"** or **"CHK-1"** blinks on the display.

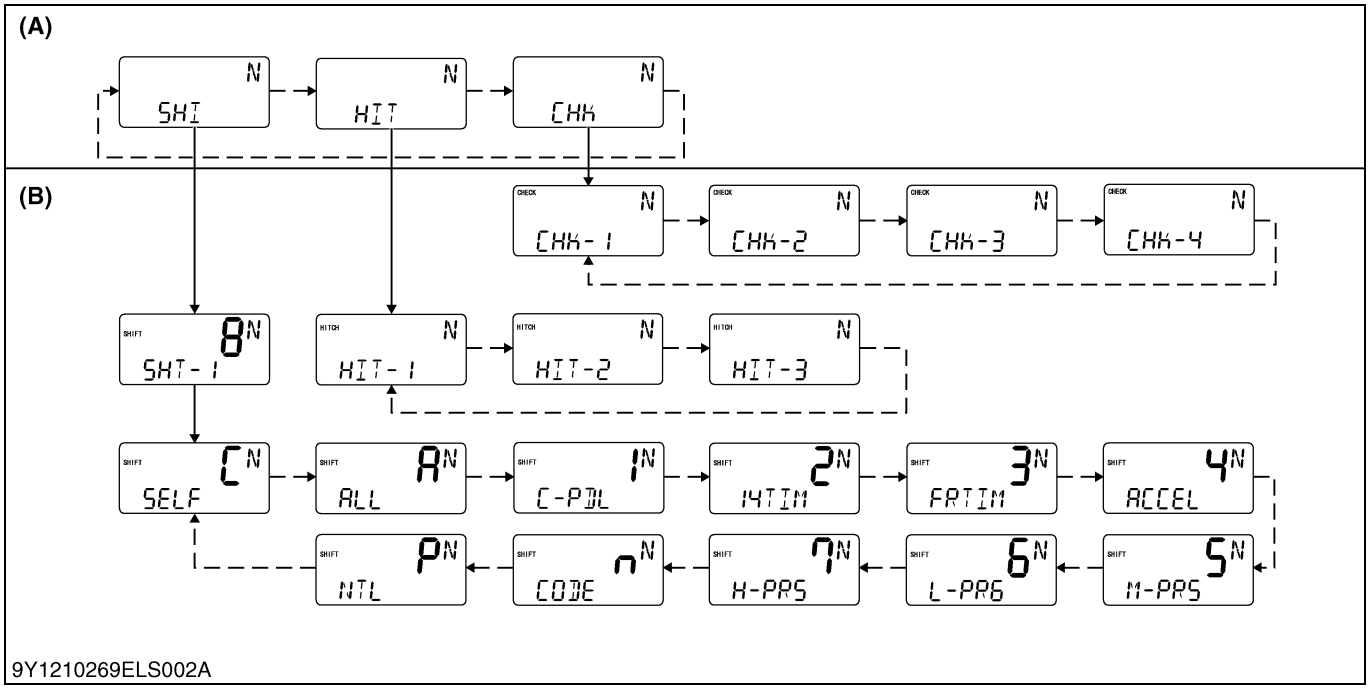
■ **NOTE**
- **Every time depressing the display switch, the mode item changes (see the chart below).**

2. Push and hold the engine RPM dual memory A/B indicator switch (2) more than 3 seconds. And then, the target mode is selected.
3. Release the engine RPM dual memory A/B indicator switch (2).

■ **NOTE**
- **If the set mode item is wrong, turn the main key switch OFF and restart the procedure 1.**

(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch

(A) Flow Chart (Menu)
(B) Flow Chart (Mode)



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[2] CHECKING AND ADJUSTING (CHECKING MODE)

(1) Checking Mode

This tractor is equipped with the checking mode for easy sensor and dial checking.

■ **IMPORTANT**

- **The output voltage of easy sensor and dial is compared with the specified value for the checking purpose. It should be noted, therefore, that even if no problem with the diagnostic results, the sensor itself may be defective.**
- **After changing the sensor, switch, control units on be sure to calibration them. (See page 9-S30.)**

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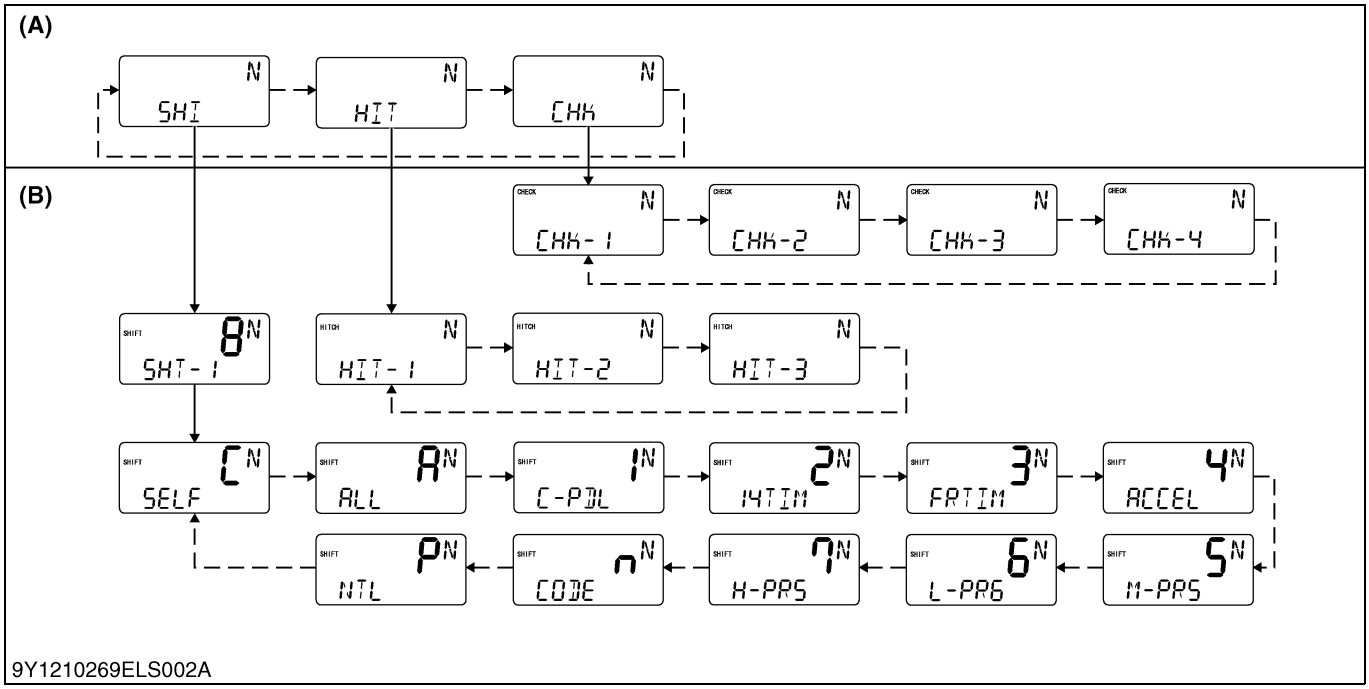


Procedure 1: Setting Menu

1. Set the menu item **"CHK"**.
   Refer to "(2) In formation for Setting Menu and Mode at [1] OUTLINE FOR METHOD OF SELF DIAGONOSIS, FINE-ADJUSTING AND EASY CHECKING".

(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch

(A) Flow Chart (Menu)
(B) Flow Chart (Mode)

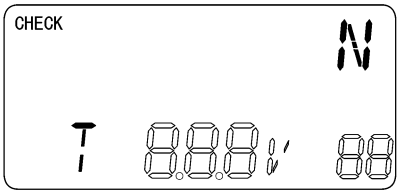


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(A)



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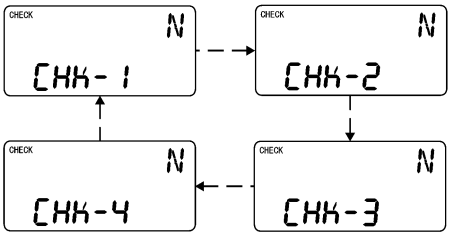
Procedure 2: Setting Mode

1. Make sure that the menu item **"CHK"** blinks on the display with depressing the display switch (1) once.
2. Make sure that the mode item **"CHK-1"** blinks on the display.

■ **NOTE**

- **Every time depressing the display switch, the mode item changes (See the chart below).**

(B)



9Y1210269ELS004A

3. Depress and hold the engine RPM dual memory A/B indicator switch (2) more than 3 seconds. And then, the mode item **"CHK-1"** is selected.
4. Release the engine RPM dual memory A/B indicator switch (2).
5. Push and hold the display switch (1) more than 3 seconds until **"T 0"** appears on the display.
6. Make sure that **"T 0"** appears on the display, and then release the display switch (1).

(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(A) Display
(B) Flow Chart (CHK)

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Procedure 3: Checking Display

1. Check the display.

■ **NOTE**
- **The mode "CHK-1" consists of 17 checking items.**
- **Every time depressing the display switch (1), the mode item changes. (See the chart below).**

2. Turn the main key switch **OFF**.

(1) Display Switch

Display Lower Right Item No.	Item	Display Center Output voltage and so on	Remarks
12	Engine rpm	800 rpm	Idling
73	Battery Voltage	More than 12 V	
11	Foot Throttle Sensor	from 0.7 to 4.5 V	Engine rpm is from idling to the maximum.
13	Hand Throttle Sensor	from 0.5 to 4.5 V	Engine rpm is from idling to the maximum.
16	Rev-limiter Control Dial	from 0.25 to 4.75 V	Engine rpm is from the minimum to the maximum.
17	Auto-mode Sensitivity Adjustment Dial	from 2.3 to 2.7 V	This dial's arrow is on the center.
19	Power Shift Lever Sensor	from 2.0 to 3.0 V	Power shift lever is neutral.
20	Clutch Pedal Sensor	from 0.73 to 1.46 V	Press the Clutch pedal until the end of stroke. *2
23	T/M Oil Temperature Sensor	from 2.8 to 0.8 V	T/M oil temperature is from 20 to 80 degree.
75	Shuttle Rotational Sensor	from 0 to 3000 min^{-1} (rpm) *1	The tractor is traveling.
76	Traveling Sensor	rom 0 to 3000 min^{-1} (rpm) *1	The tractor is traveling.
2	Lift Arm Sensor	from 0.35 to 1.15 V	Lift arm is the top position.
4	Position Lever Sensor	from 3.4 to 4.0 V	The position lever is on the scale 9.
7	Lift Arm Top Limit Adjustment Dial	from 4.2 to 4.8 V	The dial's arrow is on the end of clockwise.
8	Draft Sensor	from 2.0 to 4.0 V	No load
14	Draft Ratio Adjustment Dial	from 2.1 to 2.9 V	This dial's arrow is on the center.
15	3-Point Hitch Lowering Speed Adjustment Dial	from 4.2 to 4.8 V	The dial's arrow is on the end of clockwise.

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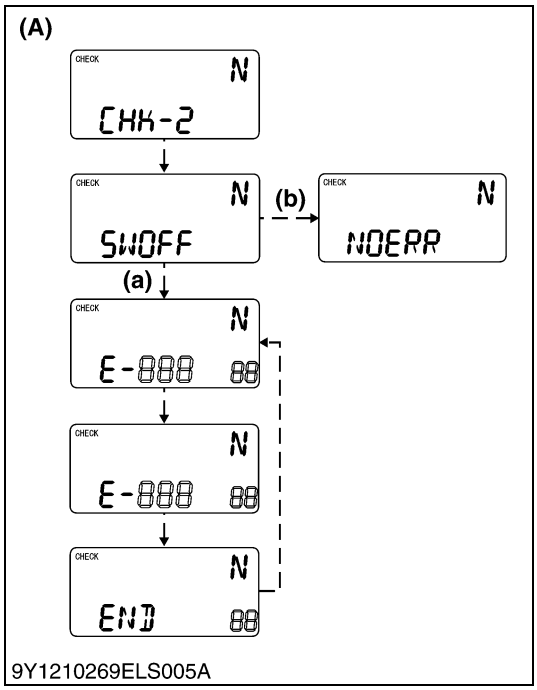
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(2) Checking the Diagnostic Trouble Code (DTC) History

Procedure 1: Setting Menu and Mode

1. Set the menu item **"CHK"**.
   Refer to the "(2) Information for Setting Menu and Mode at [1] OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE-ADJUSTING AND EASY CHECKING ".
2. Set the mode item **"CHK-2"**.
   Refer to the "(2) Information for Setting Menu and Mode at [1] OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE-ADJUSTING AND EASY CHECKING ".

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9Y1210269ELS005A



9Y1210269ELS001B

Procedure 2: Checking Display

1. Check the display.

■ **NOTE**

- **Every time depressing the display switch (1), the item changes in order of the diagnostic trouble code history. (See the next page, "Diagnostic Trouble Code" chart.)**
  If any of the diagnostic trouble code history is nothing, "NOERR" appears on the display.

2. Turn the main key switch **OFF**.

(1) Display Switch

(A) Flow Chart (CHK-2)

(a) With DTC (Diagnostic Trouble Code) history
(b) Without DTC (Diagnostic Trouble Code) history

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Diagnostic Trouble Code

Display	Item	Condition	Remark
E-H02	Lift Arm Sensor	Sensor Output Voltage: below 0.2 V or more than 4.9 V	Wiring from sensor is disconnected or is short-circuited. Power source line (5 V) for ECU(MAIN) is disconnected. or Ground Harness from Sensor is disconnected.
E-H04	Position Lever Sensor	Sensor Output Voltage: below 0.2 V or more than 4.9 V	Wiring from sensor is disconnected or is short-circuited. Power source line (5 V) for ECU(MAIN) is disconnected. Ground Harness from Sensor is disconnected.
E-H07	Lift Arm Top Limit Adjustment Dial	Sensor Output Voltage: below 0.2 V or more than 4.9 V	Wiring for sensor line is disconnected or is short-circuited. Power source line (5 V) for switch box is disconnected. Ground wiring from Sensor is disconnected.
E-H08	Draft sensor	Sensor Output Voltage: below 0.2 V or more than 4.9 V	Wiring from sensor is disconnected or is short-circuited. Power source line (5 V) for ECU(MAIN) is disconnected. Ground Harness from Sensor is disconnected.
E-R11	Foot Throttle Sensor	Sensor Output Voltage: below 0.2 V or more than 4.9 V	Wiring from sensor is disconnected or is short-circuited. Power source line (5 V) for ECU(MAIN) is disconnected. Ground Harness from Sensor is disconnected.
E-R13	Hand Throttle Sensor	Sensor Output Voltage: below 0.2 V or more than 4.9 V	Wiring from sensor is disconnected or is short-circuited. Power source line (5 V) for ECU(MAIN) is disconnected. or Ground Harness from Sensor is disconnected.
E-H14	Draft Ratio Adjustment Dial	Sensor Output Voltage: below 0.2 V or more than 4.9 V	Wiring for sensor line is disconnected or is short-circuited. Power source line (5 V) for switch box is disconnected. Ground wiring from Sensor is disconnected.
E-H15	3-Point Hitch Lowering Speed Adjustment Dial	Sensor Output Voltage: below 0.2 V or more than 4.9 V	Wiring from sensor is disconnected or is short-circuited. Power source line (5 V) for ECU(MAIN) is disconnected. Ground Harness from Sensor is disconnected.
E-R16	Rev-Limiter Control Dial	Sensor Output Voltage: below 0.2 V or more than 4.9 V	Wiring from sensor is disconnected or is short-circuited. Power source line (5 V) for ECU(MAIN) is disconnected. Ground Harness from Sensor is disconnected.
E-R20	Clutch Pedal Sensor	Sensor Output Voltage: below 0.2 V or more than 4.9 V	Wiring from sensor is disconnected or is short-circuited. Power source line (5 V) for ECU(MAIN) is disconnected. Ground Harness from Sensor is disconnected.
E-R23	T/M Oil Temperature Sensor	Sensor Output Voltage: below 0.1 V or more than 4.9 V	Wiring for sensor is disconnected or is short-circuited. Power source line (5 V) for ECU(MAIN) is disconnected. Ground Harness from Sensor is disconnected.

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Display	Item	Condition	Remark
E-H24	3-Point Hitch Solenoid	Solenoid Output Voltage or Current is abnormal.	Wiring for solenoid is disconnected or is short-circuited.
E-R28	Bi-Speed Solenoid	Solenoid Output Voltage is abnormal.	Wiring for solenoid is disconnected or is short-circuited.
E-R29	4WD Solenoid	Solenoid Output Voltage is abnormal.	Wiring for solenoid is disconnected or is short-circuited.
E-R31	Solenoid (Main shift 1)	Solenoid Output Voltage is abnormal.	Wiring for solenoid is disconnected or is short-circuited.
E-R32	Solenoid (Main shift 2)	Solenoid Output Voltage is abnormal.	Wiring for solenoid is disconnected or is short-circuited.
E-R33	Solenoid (Main shift 3)	Solenoid Output Voltage is abnormal.	Wiring for solenoid is disconnected or is short-circuited.
E-R34	Solenoid (Main shift 4)	Solenoid Output Voltage is abnormal.	Wiring for solenoid is disconnected or is short-circuited.
E-R35	Solenoid (Main shift L)	Solenoid Output Voltage or Current is abnormal.	Wiring for solenoid is disconnected or is short-circuited.
E-R36	Solenoid (Main shift H)	Solenoid Output Voltage or Current is abnormal.	Wiring for solenoid is disconnected or is short-circuited.
E-R37	Solenoid (Master Clutch)	Solenoid Output Voltage or Current is abnormal.	Wiring for solenoid is disconnected or is short-circuited.
E-R38	Pressure Switch 1 OFF	Pressure Switch can not be turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R39	Pressure Switch 2 OFF	Pressure Switch can not be turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R40	Pressure Switch 3 OFF	Pressure Switch can not be turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R41	Pressure Switch 4 OFF	Pressure Switch can not be turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R42	Pressure Switch L OFF	Pressure Switch can not be turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R43	Pressure Switch H OFF	Pressure Switch can not be turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R44	Pressure Switch M OFF	Pressure Switch can not be turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R45	Pressure Switch 1 ON	Pressure Switch is always turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R46	Pressure Switch 2 ON	Pressure Switch is always turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R47	Pressure Switch 3 ON	Pressure Switch is always turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.

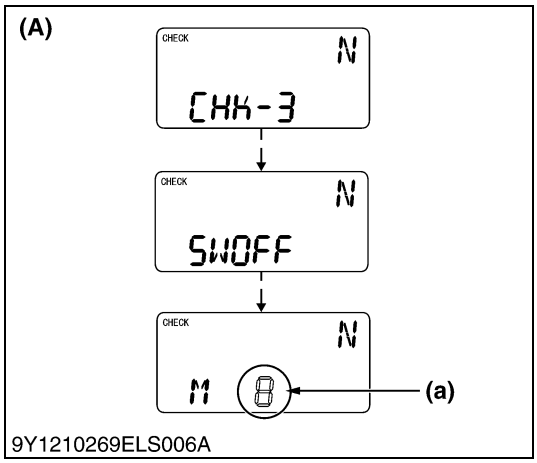
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Display	Item	Condition	Remark
E-R48	Pressure Switch 4 ON	Pressure Switch is always turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R49	Pressure Switch L ON	Pressure Switch is always turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R50	Pressure Switch H ON	Pressure Switch is always turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R51	Pressure Switch M ON	Pressure Switch is always turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R52	Pressure Switch 1 ON	Not Specified Pressure Switch is turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R53	Pressure Switch 2 ON	Not Specified Pressure Switch is turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R54	Pressure Switch 3 ON	Not Specified Pressure Switch is turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-R55	Pressure Switch 4 ON	Not Specified Pressure Switch is turned on.	Switch Failure or the problem occurs in hydraulic circuit. Wiring is disconnected or is short-circuited.
E-C56	ECU(SUB) CANbus	ECU(SUB) CANbus is interrupted.	Sensors and Dials output signal are interrupted.
E-C57	ECU(CRS) CANbus	ECU(CRS) CANbus is interrupted more than 5 seconds.	CANbus Wiring for ECU(CRS) is disconnected or is short-circuited.
E-C58	Instrument Meter Panel ECU CANbus	Instrument Meter Panel ECU CANbus is interrupted more than 5 seconds.	CANbus Wiring for Instrument Panel ECU is disconnected or is short-circuited.
E-C59	ECU(SUB) CANbus	ECU(SUB) CANbus is interrupted more than 5 seconds.	CANbus Wiring for ECU(SUB) is disconnected.
E-C60	ECU(Main) Power Source (5 V) for Sensor Line	ECU(Main) Power Source (5 V) for Sensor Line decreases.	Ground wiring for ECU(Main) Power Source (5 V) is short-circuited.

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(3) Checking the Master Clutch Protected Times



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Procedure 1: Setting Menu and Mode

1. Set the menu item **"CHK"**.
   Refer to the "(2) Information for Setting Menu and Mode at [1] OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE-ADJUSTING AND EASY CHECKING ".
2. Set the mode item **"CHK-3"**.
   Refer to the "(2) Information for Setting Menu and Mode at [1] OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE-ADJUSTING AND EASY CHECKING ".

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Procedure 2: Checking Display

1. Check the display.
2. Turn the main key switch **OFF**.

■ **IMPORTANT**

- **If necessary, the master clutch should be replaced.**
- **After replacing the master clutch, do not forget to clear the diagnostic trouble code history.**
  Refer to the same section, "(4) Clearing the Diagnostic Trouble Code History".

(A) Flow Chart (CHK-3)

(a) The times of protecting the master clutch

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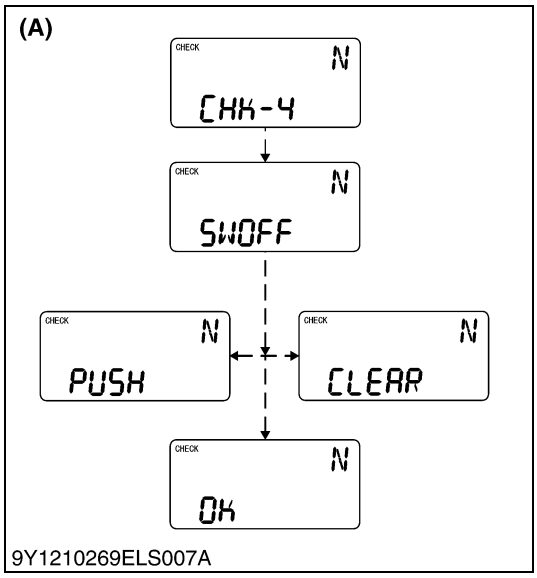
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(4) Clearing the Diagnostic Trouble Code (DTC) History

Procedure 1: Setting Menu and Mode

1. Set the menu item **"CHK"**.
   Refer to the "(2) Information for Setting Menu and Mode at [1] OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE-ADJUSTING AND EASY CHECKING ".
2. Set the mode item **"CHK-4"**.
   Refer to the "(2) Information for Setting Menu and Mode at [1] OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE-ADJUSTING AND EASY CHECKING ".

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Procedure 2: Clearing the DTC History

1. Make sure that **"PUSH"** and **"CLEAR"** blinks alternately.
2. Push and hold the engine RPM dual memory A/B indicator switch (1) more than 3 seconds until **"OK"** appears on the display.
3. After confirming **"OK"**, turn the main key switch **OFF**.



(1) Engine RPM Dual Memory A/B Indicator Switch

(A) Flow Chart (CHK-4)

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[3] CHECKING AND ADJUSTING (POWER SHIFT SYSTEM)

(1) Checking by Self Diagnosis





Self-diagnosis and Calibration (Initial Setting) Menu

■ **IMPORTANT**

- **Be sure to conduct warm-up operation to raise the temperature of transmission fluid up to the specified level (40 to 50 °C (104 to 122 °F)) before performing self-diagnosis and calibration (initial setting).**
  (The self-diagnosis of various switches and the items of clutch pedal sensors and models are excluded).

■ **Self-diagnosis and Calibration (Initial Setting) Item**

Mode	Item	Display	
		Upper Right	Center
C	Self-diagnosis	**C**	**SELF**
A	Calibration of all items	**A**	**ALL**
1	Calibration of clutch pedal sensor	**1**	**C-PDL**
2	Calibration of main shift clutch (**1** thru **4**, **L** and **H**)	**2**	**14TIM**
3	Calibration of master clutch (**F** and **R**)	**3**	**FRTIM**
4	Calibration of hand throttle sensor Foot throttle sensor	**4**	**ACCEL**
5	Calibration of solenoid proportional pressure reducing valve (master)	**5**	**M-PR5**
6	Calibration of solenoid proportional pressure reducing valve (Main shift **L**)	**6**	**L-PR5**
7	Calibration of solenoid proportional pressure reducing valve (Main shift **H**)	**7**	**H-PR5**
N	Setting model	**n**	**CODE**
P	Power shift/range shift lever (Neutral setting)	**P**	**NTL**

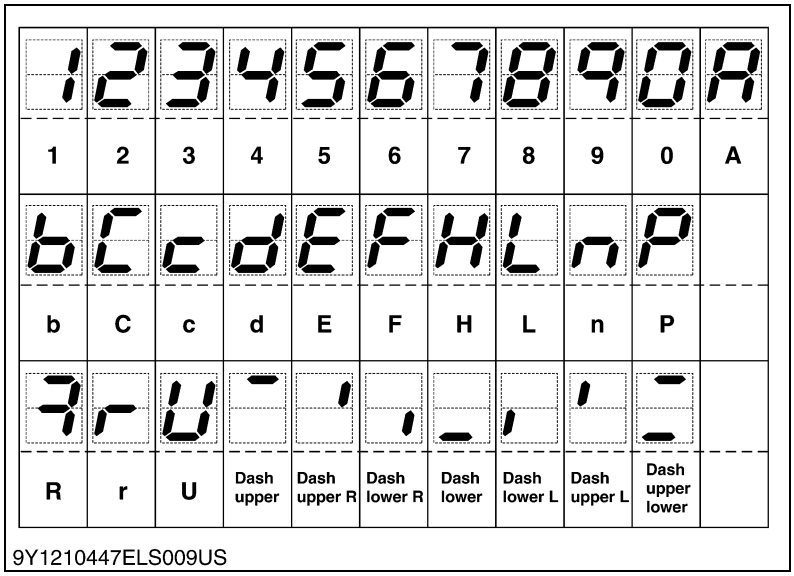
(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch

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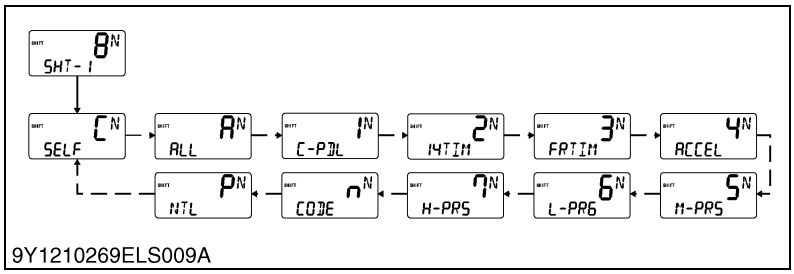
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[Display]



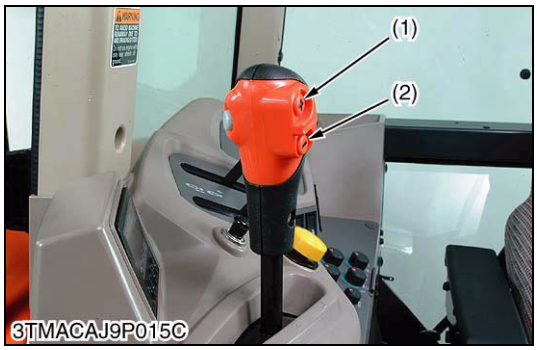
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(1) Shift-up Button (+) (2) Shift-down Button (−)

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Step 1: Setting Menu and Mode

1. Set the menu item **"SHI"**.
   Refer to "OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE ADJUSTING AND EASY CHECKING".
2. Set the mode item **"SHI-1"**.
   Refer to "OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE ADJUSTING AND EASY CHECKING".

■ **NOTE**

- **It is possible to set the mode item "SHI-1" directly.**
- **Press and hold both the shift up (+) and shift down (−) buttons then turn the main key switch to start the engine.**

Step 2: Setting Diagnosis Mode

1. Make sure that **"Self C"** blinks on the display.
2. Then press shift-down button (−) or engine rpm dual memory A/B indicator switch to set Diagnosis Mode.
3. **"UP"** appears on the display, then press (+) button on the power shift lever.
4. **"UP U"** blinks on the display, then press (+) button on the power shift lever to check (+) button.
5. **"DN d"** blinks on the display, then press (−) button on the power shift lever to check (−) button.
6. **"LOCK n"** blinks on the display, then press the clutch button on the power shift lever to check the clutch button.

■ **NOTE**

- **It is possible to skip to necessary item by pushing shift-up button.**

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Step 3: Checking Power Shift/Range Shift Lever Sensor

1. **"LEVER n"** and **"UP n"** blinks alternately on the display.
2. Move the power shift lever into low range and **"L"** shows on the panel display.
3. Move the power shift lever into high range and **"H"** shows on the panel display.
4. Shift the power shift lever back to neutral position. And then, **"n"** should reappear. Then press the clutch button on the shift lever.
5. Then press the shift-up button (+) on the shift lever.

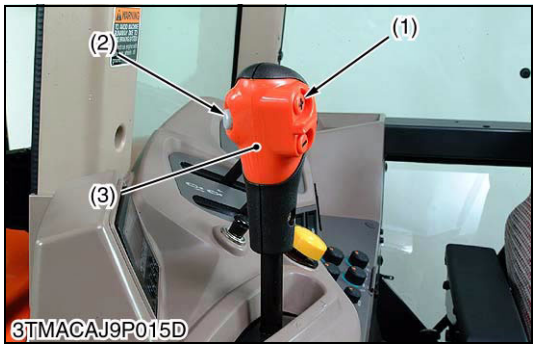
■ **NOTE**

- **If the "d" starts to blinking in any of the three position (H-N-L), there is a short circuit of switch.**

Display	Shift lever	Switch	
		L	H
L (light)	L	ON	OFF
n (light)	N	OFF	OFF
H (light)	H	OFF	ON
d (blink)	–	ON	ON

(1) Power Shift Lever

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Step 4: Checking Power Shift/Range Shift Lever Sensor and Clutch Button

1. **"UP 2"** and **"LEVSW 2"** appears alternately on the display.
2. Press the clutch button (2) and move the power shift lever each position (**H-N-L**) then release the clutch button following the below chart.
3. Shift the power shift lever back to neutral position.
4. Press (+) button on the shift lever to go to next step.

Display	Shift lever	Clutch button	Switch		
			L	H	Clutch button
0	L	Release	ON	OFF	OFF
1	L	Press	ON	OFF	ON
2	N	Release	OFF	OFF	OFF
3	N	Press	OFF	OFF	ON
4	H	Press	OFF	ON	ON
5	H	Release	OFF	ON	OFF
d	–	–	ON	ON	–

■ **NOTE**

- **"d" blinking means part of a short circuit.**

(1) Shift-up Button (+)
(2) Clutch Button
(3) Power Shift Lever

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Step 5: Checking Shuttle Switch

1. **"SHTLE n"** and **"UP n"** appears.
2. Shift the shuttle lever to each position (**F-n-R**). Then refer to the chart below
3. Press (+) button on the shift lever to go to next step.

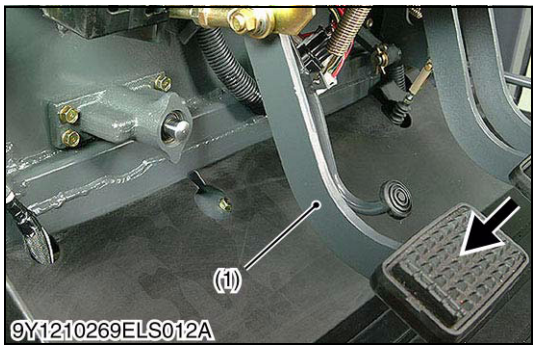
Display	Shuttle lever	Switch	
		F	**R**
F	F	ON	OFF
n	N	OFF	OFF
R	R	OFF	ON
d	–	ON	ON

■ **NOTE**

- **If both switch contacts are ON at the same time, "d" will show in the display.**

(1) Shuttle Lever

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Step 6: Checking Clutch Pedal Sensor

1. **"CLUTC C"** blinks on the display.
2. Press the clutch pedal in until you hear the beep.
3. Release the clutch pedal.
4. Automatically step 7 starts after the clutch pedal checking.

■ **NOTE**

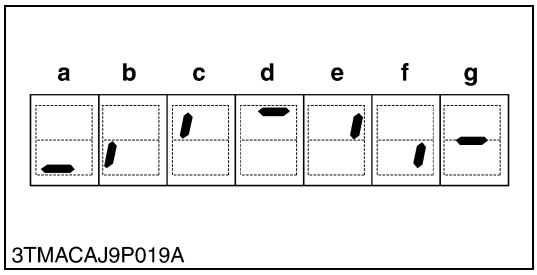
- **If no beep is heard, the clutch pedal sensor calibration is incorrect.**
- **If dash is blinking in the bottom of display, clutch pedal sensor out-put voltage is below 0.2 volts.**
- **If dash is blinking in top of display, clutch pedal sensor out-put voltage is above 4.9 volts.**

(1) Clutch Pedal

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Step 7: Checking Switches and Sensors

1. **"SWOFF O"** blinks on the display, and then step 7 starts.
2. Check switches by referring to the chart below.

■ **NOTE**

- **Make sure to release the parking lever. Otherwise, "P-BRK" appears on the display.**
- **Make sure to sit on the seat. Otherwise, "SEAT" appears on the display.**

Display		Switch	Position
Center	Upper Right		
BI	b	Bi-speed switch	ON
STEER	F	Front wheel angle switch	ON
DHC	n	DHC switch	ON
PTO	P	PTO switch	ON
CREEP	c	Creep switch (Option)	ON
A-RUN	r	Travel mode switch	ON
A-WRK	L	Field mode switch	ON
A-SET	A	Auto-mode switch	Press
A-MEM	0	RPM dual memory switch (A)	ON
B-MEM	0	RPM dual memory switch (B)	ON
DT	0	4WD switch	ON
F-DEF	0	Front wheel differential lock switch	ON
R-DEF	0	Rear wheel differential lock switch	ON
POWER	0	Constant RPM management switch	ON
BRAKE	0	Field mode switch	ON
L-BRK	0	Brake switch	ON
P-BRK	0	Parking brake lever switch	ON
SEAT	5	Seat switch	Press

(1) RPM Dual Memory Switch (A)
(2) RPM Dual Memory Switch (B)
(3) Travel Mode Switch
(4) Field Mode Switch
(5) 4WD Switch
(6) Bi-speed Switch
(7) Front Wheel Differential Lock Switch
(8) DHC Switch
(9) Constant RPM Management Switch

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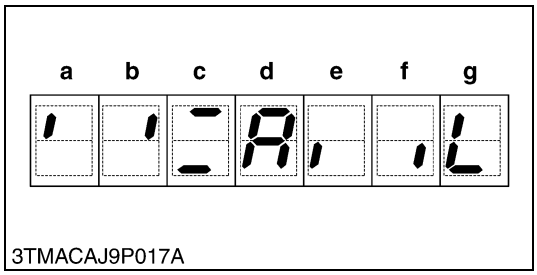
3. Check the auto-mode sensitivity adjustment dial following the below.
   – Rotate the auto-mode sensitivity adjustment dial.
   – Then check the display in the display panel.
   – If dash in bottom **"a"** or dash in center **"g"** is displayed, the auto-mode sensitivity adjustment dial is defective.
   a. dash in bottom: 0 volt side malfunction
   b. dash in lower left: 0 V to 1.0 V
   c. dash in upper left: 1.0 to 2.0 V
   d. dash in top: 2.0 to 3.0 V
   e. dash in upper right: 3.0 to 4.0 V
   f. dash in lower right: 4.0 to 5.0 V
   g. dash in center: 5.0 V side malfunction
4. Press (+) button on the shift lever to go to next step.

■ **NOTE**

- **If there is nothing wrong in the system, there will be no failure code "a" or "g".**

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3TMACAJ9P017A

Step 8: Testing Throttle Sensor, Crankshaft Position Sensor, Oil Temperature Sensor and Alternator

1. Set the engine speed at 1500 min^{-1} (rpm).
   - If you do not set the engine speed at 1500 min^{-1} (rpm), the bar starts continuously in both top and bottom positions of the panel.
2. Set the power shift lever to Neutral position.
   - If the power shift lever is not at Neutral position, then **"F"** display blinks in view.
3. If the shift lever position is **L** or **H**, **"C"** display will stay in view.
4. If sensor is malfunction, following dash is displayed.

- If the bar blinks in the upper left of the display, then the throttle sensor output voltage is below 0.2 volts. **"a"**
- If the bar blinks in the upper right of the display, then throttle sensor output is above 4.9 volts. **"b"**
- If the bar starts continuously in both top and bottom positions of the panel, then there is a failure of the crankshaft position sensor. **"c"**
- If **"A"** starts to flash in the display, the throttle sensor calibration is incorrect and needs to be reset. **"d"**
- If the bar blinks in the lower left of the display, then the oil temperature sensor is below 0.8 volts. **"e"**
- If the bar blinks in the lower right of the display, then the oil temperature sensor voltage is above 4.9 volts. **"f"**
- If **"L"** starts to blink in the display, there is a malfunction in the alternator. **"g"**.

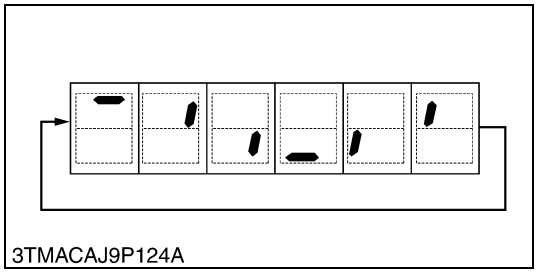
■ **NOTE**

- **If there is nothing wrong in the system, there will be no failure code "a" to "g".**

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3TMACAJ9P124A

Step 9: Testing Solenoid Valve, Pressure Switches and Shuttle Rotation Sensor

1. If **"F"** is blinking in the display, shift the shuttle lever to forward position.
2. Press the shift-up button (+) while **"F UP U"** blinks.
3. Since the self-diagnostic program has been initiated, a series of dashes flash around the outer sides of the panel display as figure left.
4. Press the shift-up button (+) while **"F UP U"** blinks.
5. **"1"** appears on the display for a second, then **"1"** changes **"F UP U"** blinking.
6. Check from **1** to **8** according to the same procedure.

Diagnosis code		Result of diagnosis	
Display	**Solenoid**	**Display**	**Pressure switch**
0	All OFF	**0**	All OFF
1	Main shift **1**	**1**	Main shift **1**
2	Main shift **2**	**2**	Main shift **2**
3	Main shift **3**	**3**	Main shift **3**
4	Main shift **4**	**4**	Main shift **4**
5	Main shift **L**	**5**	Main shift **L**
6	Main shift **H**	**6**	Main shift **H**
7	Master (**F**-**R**)	**7**	Master (**F**-**R**)
8	Short circuit	**0** to **7** (**0**: normal)	
9	Disconnection	**0** to **7** (**0**: normal)	

■ **NOTE**

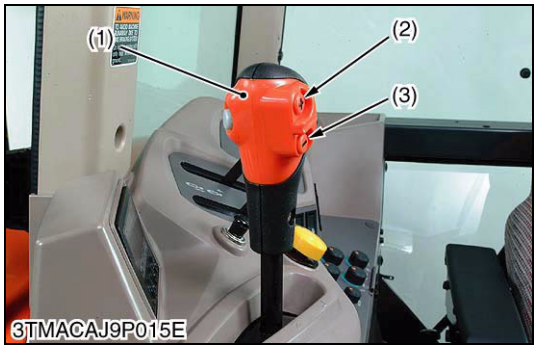
- **If "E" is blinking, there is a malfunction of the shuttle rotation sensor.**

7. Press the shift-up button (+).
8. **"8"** followed by **"0"** and **"C"** will light.
9. To regain normal operation of the unit, turn the main key switch **OFF** and restart the engine.

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(2) Calibration (Power Shift System)





Calibration (Initial Setting) Function

1. To calibrate this system by the calibration (initial setting) function, take the procedure as follows. After starting the calibration program, manipulate the shift button and the lever in the specified procedure and memorize initial setting values in the power shift control unit.
2. The mode selection can be made for either of individual calibration (**1** thru **P**) or all calibration, the calibration of a necessary part alone is also possible. (If the all calibration mode is selected, calibration is to be executed in the order of calibration modes **1** thru **P** as shown in table below.)

■ **IMPORTANT**

- **Be sure to carry out the following calibrations when the related sensors, solenoid valves or hydraulic clutch are disassembled or replaced.**
- **When ECU (power shift) is replaced, Mode N should be carried out before calibration of Mode 4 (throttle sensor).**

■ **Calibration (Initial Setting) Item**

- The items of calibration to be made by calibration (initial setting) function of the micro-computer are the 9 items as shown in table below.

Mode	Item	Display	
		Upper Right	Center
C	Self-diagnosis	**C**	**SELF**
A	Calibration of all items	**A**	**ALL**
1	Calibration of clutch pedal sensor	**1**	**C-PDL**
2	Calibration of main shift clutch (**1** thru **4**, **L** and **H**)	**2**	**14TIM**
3	Calibration of master clutch (**F** and **R**)	**3**	**FRTIM**
4	Calibration of hand throttle sensor Foot throttle sensor	**4**	**ACCEL**
5	Calibration of solenoid proportional pressure reducing valve (master)	**5**	**M-PR5**
6	Calibration of solenoid proportional pressure reducing valve (Main shift **L**)	**6**	**L-PR5**
7	Calibration of solenoid proportional pressure reducing valve (Main shift **H**)	**7**	**H-PR5**
N	Setting model	**n**	**CODE**
P	Power shift/range shift lever (Neutral setting)	**P**	**NTL**

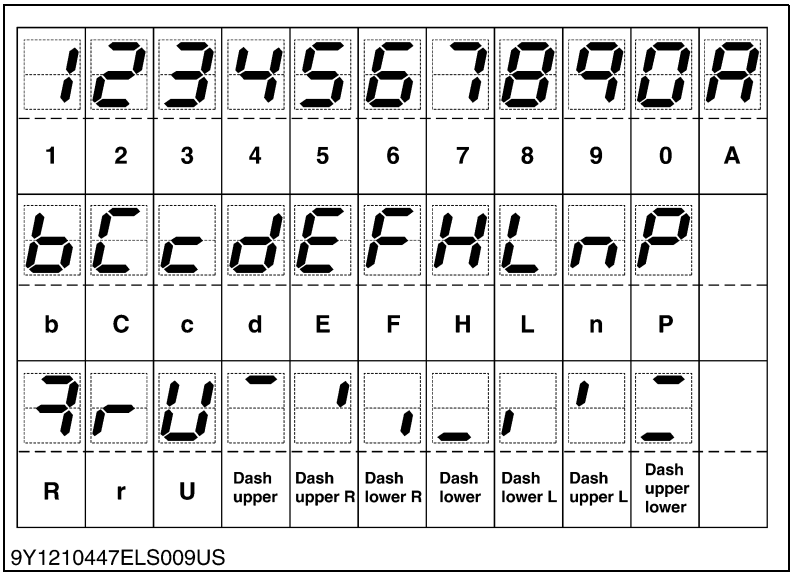
(1) Power Shift/Range Shift Lever
(2) Shift-up Button (+)
(3) Shift-down Button (−)
(4) Liquid Crystal Display

(To be continued)

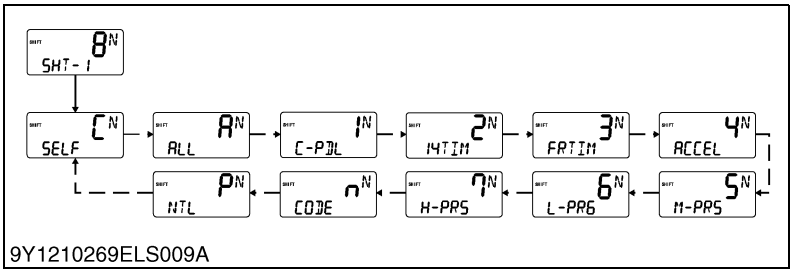
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[Display]



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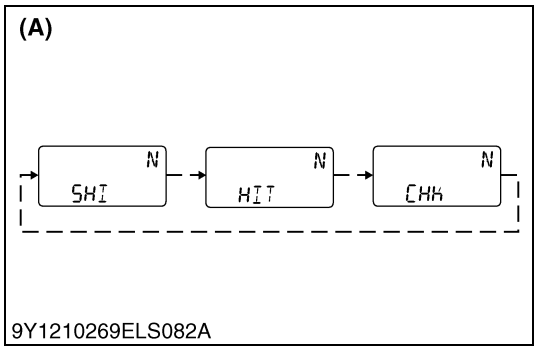


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Preparation

■ Setting Menu and Mode

1. Start the engine while pushing both the display switch (1) and the engine RPM dual memory A/B indicator switch (2).

■ NOTE

- **When the menu item "SHI" blinks on the display, the menu item changes every time the display switch (1) is depressed.**

2. Be sure to confirm the mode **"SHI"**.
3. Push and hold the engine RPM dual memory A/B indicator switch (2) more than 3 seconds. And then, the target mode **"SHI"** is selected.
4. Release the engine RPM dual memory A/B indicator switch (2).
5. Make sure that the mode item **"SHI-1"** blinks on the display.
6. Push and hold the engine RPM dual memory A/B indicator switch (2) more than 3 seconds. And then, the target mode **"SHI-1"** is selected.
7. Release the engine RPM dual memory A/B indicator switch (2).

■ NOTE

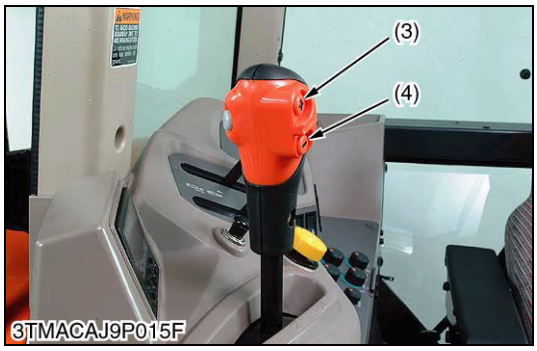
- **If the set menu item is wrong, turn the main key switch OFF and restart the procedure 1.**
- **It is possible to set the mode item "SHI-1" directly. Push and hold both the shift up (+) and shift down (−) buttons then turn the key to start the engine.**
- **After starting the engine, "8" has been displayed while the button is being held. Release both buttons, "C" is displayed. If "8" or "C" does not light, return to start.**

(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(A) Flow Chart (Menu)

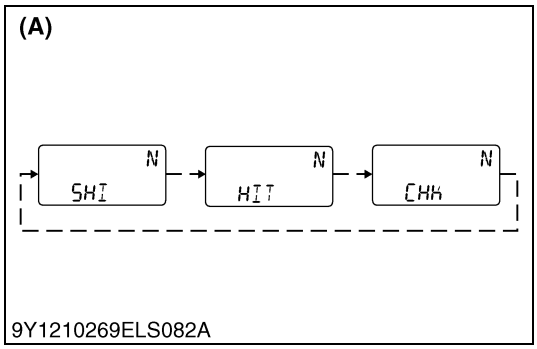
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Mode A (Calibration of All Items)

1. Press the display switch (1) or the shift-up button (+) (3) to select the mode **"A"**.
   The mode changes whenever shift-up button (+) is pushed.
2. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) to lock mode **"A"**.
3. Press the display switch (1) or the shift-up button (+) (3) until the number **"1"** lights in the display.
4. Set up the individual items **"1"** thru **"P"** one by one.

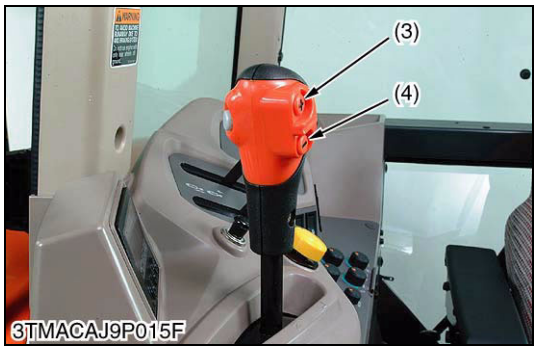
(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(3) Shift-up Button (+)
(4) Shift-down Button (−)

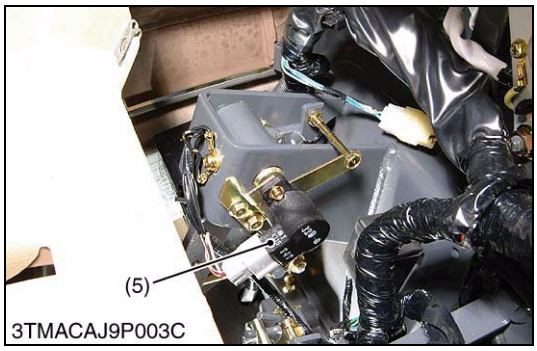
(A) Flow Chart (Menu)

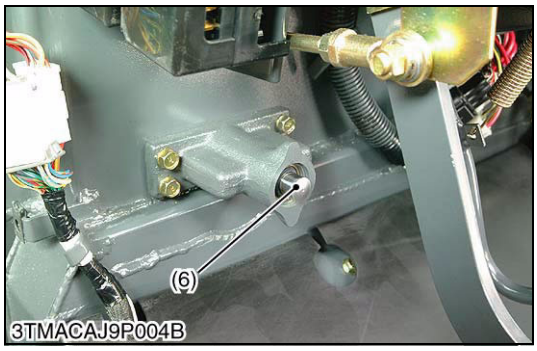
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Mode 1 (Clutch Pedal Sensor) Initial Setting Procedure

1. Press the display switch (1) or the shift-up button (+) (3) to select the mode **"1"** and **"1"** will show in the display.
2. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) to lock into Mode **"1"** calibration (clutch pedal sensor).
3. Press the display switch (1) or the shift-up button (+) (3) and **"C"** will begin blinking in the panel display.
4. Press the clutch pedal in until the clutch pedal edge contacts the top of the spool (6) on the safety valve and the blinking **"C"** stops blinking and light continuously.
5. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) and **"8"** will light.
6. You may now release the clutch pedal by lifting your foot.
7. Display **"8"** changes to **"C"** in 2 seconds.
   Do not turn the tractor ignition off until **"C"** shows in the display or the calibration will not take.
8. Turn the main key switch **OFF**.

■ **NOTE**

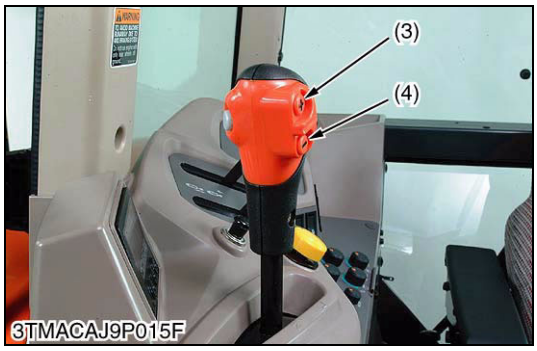
- **Do not push the top of the spool (6).**
- **If "C" continues to blink in the display, check the clutch pedal sensor and readjust it.**
- **If "E" lights in the display, carry out calibration again.**

(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(3) Shift-up Button (+)
(4) Shift-up Button (−)
(5) Clutch Pedal Sensor
(6) Spool

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Mode 2 (Main Shift Clutch 1 thru 4, L-H) Initial Setting Procedure

1. Press the display switch (1) or the shift-up button (+) (3) a few times until **"2"** will show in the display.
2. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) to lock into Mode **"2"** calibration (main shift clutch, **1-4, L-H**).

■ **NOTE**
- **If "P" is blinking in the display instead of "2", set the power shift lever to the Neutral position.**

3. Set the engine speed at 1500 min^{-1} (rpm).

■ **NOTE**
- **If dash "="blinks in the display, this indicates the engine rpm is set at the wrong rpm level. Adjust the rpm until the "2" shows in the display.**

4. Press and release the display switch (1) or the shift-up button (+) (3) on the power shift lever.
5. "**1**-**2**-**3**-**4**-**5**-**6**-**8**"will light in order on the panel display and then a beep will be heard.

■ **NOTE**
- **If "E" lights in the display, you must return to start.**

■ **IMPORTANT**
- **If the sequencing of numbers stops at any points and lights continuously in the display, check the parts related to the appropriate hydraulic clutch, solenoid valve or pressure switch.**

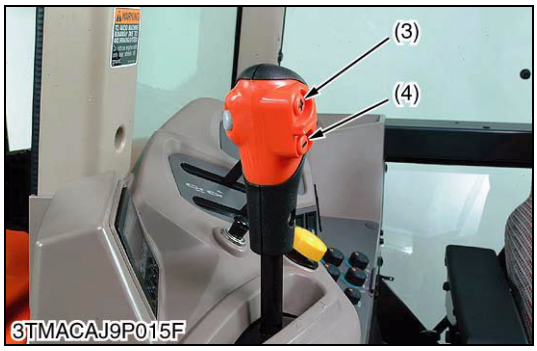
6. All eight numbers are displayed in sequence and the beep is heard, the panel display should change to **"C"** to indicate the procedure is complete. Return engine rpm to idle and turn the main key switch **OFF**.

(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(3) Shift-up Button (+)
(4) Shift-up Button (−)

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Mode 3 (Master Clutch F-R) Initial Setting Procedure

1. Press the display switch (1) or the shift-up button (+) (3) to select the mode **"3"** and **"3"** will show in the display.
2. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) to lock the computer into Mode **"3"** calibration (master clutch **F-R**).
3. Set the engine rpm to 1500. **"F"** will be blinking in the panel display at this time.

■ **NOTE**
- **If dash "="is flashing in the display, the engine rpm is not at 1500; reset it.**

4. Shift the shuttle lever to forward. **"F"** should be light in the display.

■ **NOTE**
- **If "P" starts to blink in the display, be sure that the power shift lever is in the Neutral position. And then return to Step 1 and repeat the process.**

5. Press the display switch (1) or the shift-up button (+) (3) and **"R"** will start to blink in the display.

■ **NOTE**
- **If "F" or "R" will not stop blinking, check the shuttle switches.**

6. Shift the shuttle shift lever into reverse and **"R"** should start to light continuously.

■ **NOTE**
- **If "E" lights up in the display, carry out the entire procedure again from step 1.**
- **If either "F"or "R" starts blinking again, check the solenoid proportional reducing valve and/or pressure switch.**

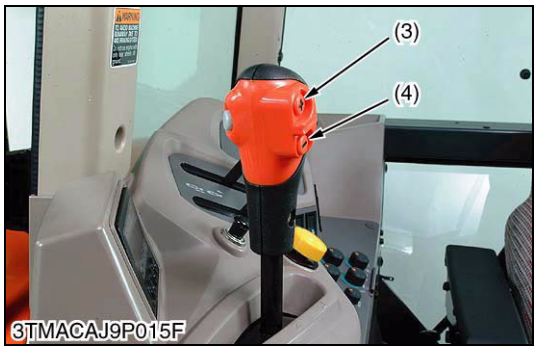
7. Press the display switch (1) or the shift-up button (+) (3) and **"8"** shown briefly in the display and then changes to **"C"**.
   At this point, shift the shuttle lever back to neutral and turn the main key switch **OFF**.

(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(3) Shift-up Button (+)
(4) Shift-up Button (−)
(5) Shuttle Lever

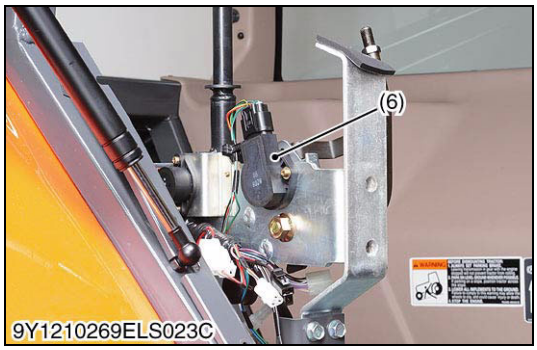
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Mode 4 (Throttle Sensor) Initial Setting Procedure

1. Press the display switch (1) or the shift-up button (+) (3) to select the mode **"4"** and **"4"** will show in the display.
2. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down (−) (4) button to lock the computer into Mode **"4"** calibration (Throttle sensor).
3. Make sure the hand throttle lever, foot throttle pedal and the rev-limiter control dial (7) are on the minimum position.
4. Press the display switch (1) or the shift-up button (+) (3) and **"1"** will light in the panel display.
5. Press the display switch (1) or the shift-up button (+) (3) and **"2"** will light in the panel display.
6. By referring to below chart, press the shift-up button (+) (3) to proceed to next setting.
7. Continue this same procedure until **"STP 11"** blinks in the display.

Display	
Center	**Upper Right**
STP 02	**2**
STP 03	**3**
STP 04	**4**
STP 05	**5**
STP 06	**6**
STP 07	**7**
STP 08	**8**
STP 09	**9**
STP 10	**0**
STP 11	**1**

8. On the position **"STP 11"** before to confirm the calibration, they should move the hand throttle lever, the foot throttle pedal and rev-limit control dial (7) to the maximum position.
9. Press the display switch (1) or the shift-up button (+) (3) again and the display should switch to **"8"** for just a second and then changes to **"C"**.
10. Turn the main key switch **OFF**.

■ **NOTE**

- **If diagnostic trouble code appears in the display, turn off the engine and then check and calibrate each sensor and dial (See the table below).**

Diagnostic Trouble Code (Center Display)	Parts in Trouble
E-R11	**Foot throttle sensor**
E-R13	**Hand throttle sensor**
E-R16	**Rev-limiter control dial**

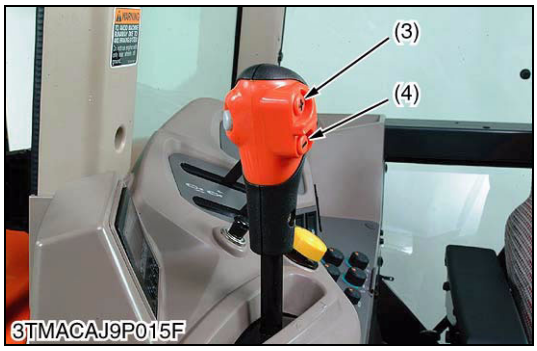
- **When ECU (power shift) is replaced, Mode "N" should be carried out before calibration of Mode "4" (throttle sensor).**

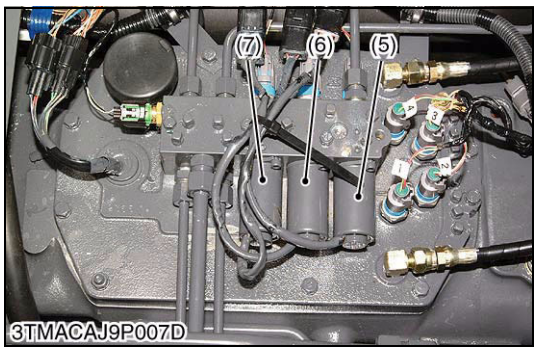
(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(3) Shift-up Button (+)
(4) Shift-up Button (−)
(5) Foot Throttle Sensor
(6) Hand Throttle Sensor
(7) Rev-Limiter Control Dial

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Mode 5, 6 and 7 (Solenoid Proportional Pressure Reducing Valve) Initial Setting Procedure

- Mode **"5"**
  (Solenoid Proportional Pressure Reducing Valve - Master)
- Mode **"6"**
  (Solenoid Proportional Pressure Reducing Valve - Main Shift L)
- Mode **"7"**
  (Solenoid Proportional Pressure Reducing Valve - Main Shift H)

CAUTION

- **Tractor will move during parts of the setting procedure for mode "5", "6" and "7". It is extremely important that all safety caution are followed to avoid injuries to persons or damage to the tractor surrounding equipment.**

NOTE

- **Make sure that the parking brake is released.**

1. Press the display switch (1) or the shift-up button (+) (3) several times until **"5"**, **"6"** and **"7"** shows in the panel display.
   – **"5"** is the setting for the master solenoid proportional reducing valve (5).
   – **"6"** is the setting for the main shift low solenoid proportional reducing valve (6).
   – **"7"** is the setting for the main shift high solenoid proportional reducing valve (7).
2. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) to computer locks into mode **"5"** calibration (master solenoid proportional valve (5)).
   Or mode **"6"** calibration (main shift low solenoid proportional valve (6)). Or mode **"7"** calibration (main shift high solenoid proportional valve (7)).
3. Either **"5"**, **"6"** and **"7"** for modes five, six or seven will be shown in the panel display. And then **"SUB H P"** blinks on the display
4. Maintain the engine rpm at idle. Shift the shuttle lever into forward and shift the power shift lever into **H** position.

(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(3) Shift-up Button (+)
(4) Shift-down Button (−)
(5) Solenoid Proportional Pressure Reducing Valve - Master
(6) Solenoid Proportional Pressure Reducing Valve - Main Shift **L**
(7) Solenoid Proportional Pressure Reducing Valve - Main Shift **H**

(To be continued)

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■ **NOTE**
- **If "P" is blinking in the panel display, the power shift lever is in the wrong position.**
- **If "F" is blinking in the panel display, the shuttle shift lever is in the wrong position.**
- **If dash "=" is blinking in the panel display, engine rpm is over 950.**

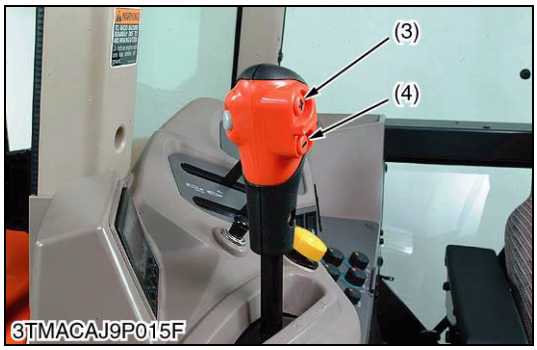
5. Press the display switch (1) or the shift-up button (+) (3) on the power shift lever.
6. **"C"** for mode **"5"**, **"L"** for mode **"6"**, **"H"** for mode **"7"** followed by a series of dashes and beeps will light around the outer edge of the display depending on the mode selected.
7. After a moment tractor will begin to move forward.
   At this time (when tractor starts to move), press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4).
8. When the programming is completed, **"8"** will light in the panel display and the **"8"** should change to **"C"**.
9. Move the power shift lever to **Neutral** position and turn the main key switch **OFF**.

■ **NOTE**
- **If "E" lights in the panel display, carry out procedure again.**

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Mode N (Model Setting Mode) Initial Setting Procedure

1. Press the display switch (1) or the shift-up button (+) (3) several times until **"CODE n"** is shown in the display.
2. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) to locks into mode **"n"** calibration (model setting mode).
3. **"UP n N"** appears on the display, then press the display switch (1) or the shift-up button (+) (3) on the power shift lever.
4. **"SET01 AN"** or **"SET01 1N"** appears on the display.

■ **NOTE**
- **"SET01 AN" means "Oversea Model"**
- **"SET01 1N" means "Japanese Model"**
- **To switch "SET01 AN" and "SET01 1N", press (+) button on the power shift lever.**

5. Make sure that **"SET01 AN"** appears, then press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) on the power shift lever.
6. **"SET02 AN"** appears on the display, then press the display switch (1) or the shift-up button (+) (3) to select the model.

Model	Model	Display
U.S Canada	M100X	**A**
	M110X	**b**
	M126X	**c**
	M135X	**d**
	M126XDTPC	**F**
Europe	**M130X**	**H**
Japanese Model	Japanese Model	**1** **2** **3** **4** **5** **6** **7** **8** **9**

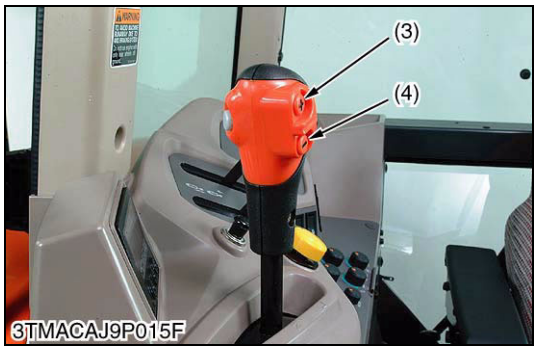
7. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) to confirm this setting.
8. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) one more time to enter the set mode.
9. **"8"** will be shown in the display and **"8"** should change to **"C"**.
10. The model setting procedure is complete and turn the main key switch **OFF**.

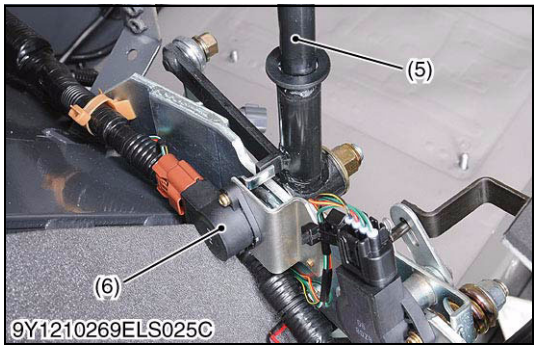
(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(3) Shift-up Button (+)
(4) Shift-down Button (−)
(5) Display

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Mode P (Power Shift/Range Shift Lever Sensor) Initial Setting Procedure

1. Press the display switch (1) or the shift-up button (+) (3) several times until **"P"** is shown in the display.
2. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) to locks into mode **"P"** calibration (power shift/range shift lever sensor).
3. Press the display switch (1) or the shift-up button (+) (3) and **"n"** lights in the display.

■ **NOTE**

- **If "n" is blinking in the display, check the power shift lever position, sensor and adjusting rod.**

4. Set the power shift lever at the **Neutral** position.
5. Press the engine RPM dual memory A/B indicator switch (2) or the shift-down button (−) (4) and **"8"** will be shown in the display and the **"8"** should be changed to **"C"**.
6. Turn the main key switch **OFF**.

(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(3) Shift-up Button (+)
(4) Shift-down Button (−)
(5) Power Shift/Range Shift Lever
(6) Power Shift/Range Shift Lever Sensor

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(3) Checking Fuse and Ground Wire



Fuses

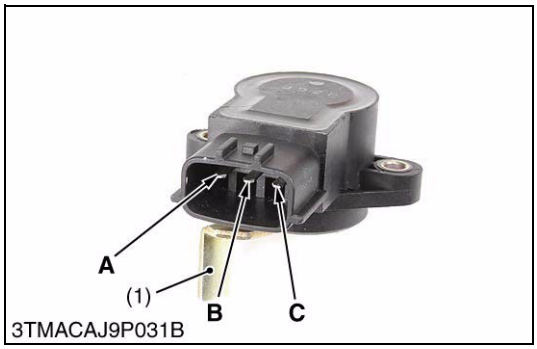
1. Remove the left lower rear bonnet.
2. Check the fuses 5 A for circuit line (1) and 5 A for load line (2) related to power shift inside the fuse box and the fuse 5 A of the meter panel (3).
3. If any of the fuses is blown, replace it with the one having same capacity.

■ **IMPORTANT**

- **If a fuse is blown, check the cause and be sure to replace it with the one having same capacity.**

(1) Fuse (5 A) Power Source for Circuit Line (3) Meter Panel Fuse (5 A)
(2) Fuse (5 A) Power Source for Load Line

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Power Shift/Range Shift Lever Sensor Resistance

1. Measure the resistance between terminal **A** and **C**.
2. Then, check resistance between terminal **A** and **B** while slowly turning the sensor lever (1).
3. It is OK if the resistance value approximates to the value shown in the table below.

(Reference)

- The change of resistance can be checking easily when an analog tester is employed.

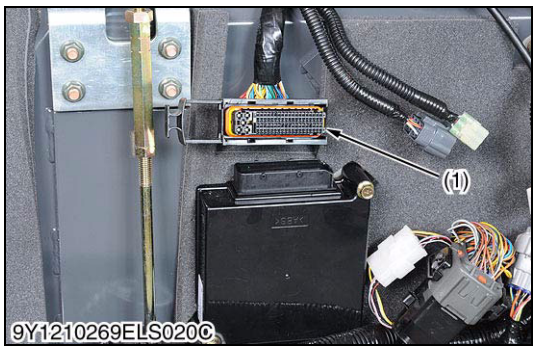
Resistance	Terminal **A** – Terminal **C**	1.6 to 2.4 kΩ
	Terminal **A** – Terminal **B**	Resistance is normal if smoothly changing

(1) Sensor Lever

A: Terminal A
B: Terminal B
C: Terminal C

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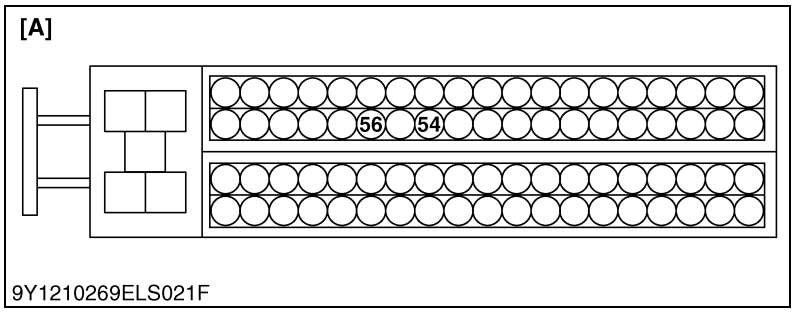




Shuttle Rotation Sensor

1. Remove the **CNT-A** connector (1).
2. Check the resistance between the terminal **A54** (Gy/B) and terminal **A56** (Gy/R) of the wire harness side.
3. Replace those of other than the standard value.

Item	Terminal No.	Wiring color	Resistance
Shuttle Rotation Sensor	**A54** – **A56**	Gy/B - Gy/R	400 to 600 Ω

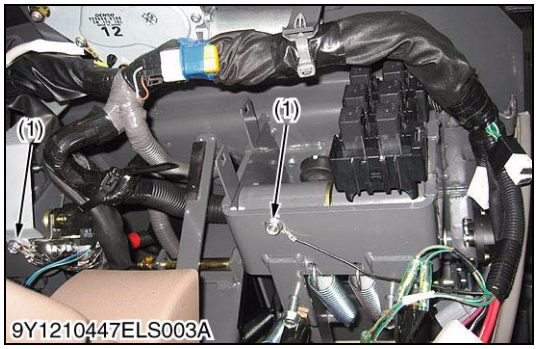


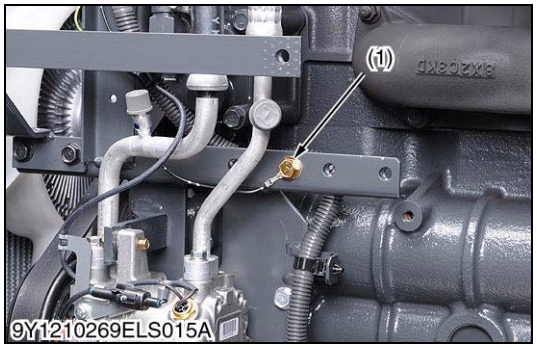
(1) **CNT-A** Connector
(2) Shuttle Rotation Sensor

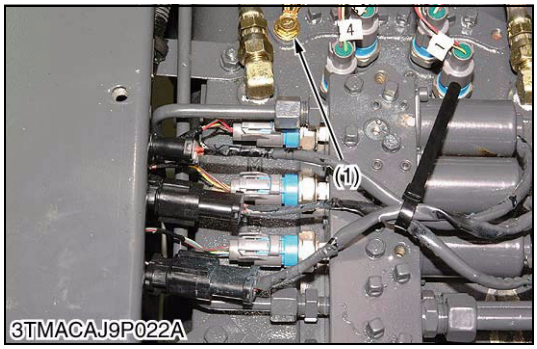
[A] CNT-A

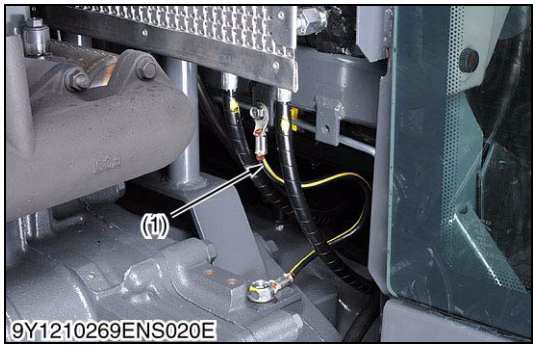
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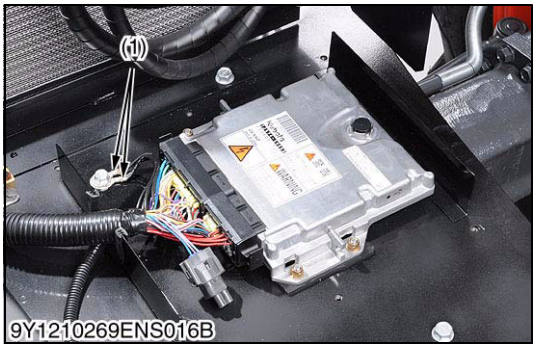


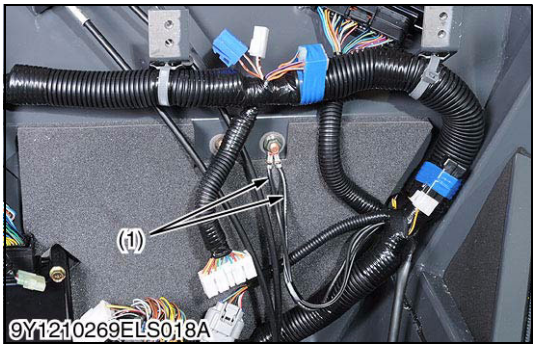


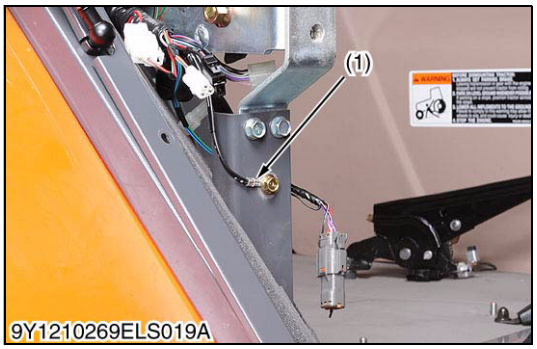


Checking Grounding Wire

1. Check the whether the grounding wire (1) is connected securely to the tractor chassis.
2. If the grounding wire is broken or disconnected, replace it.





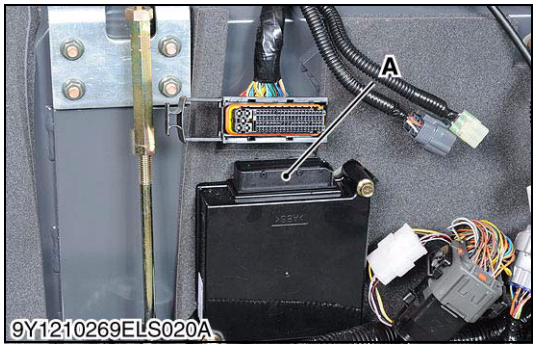


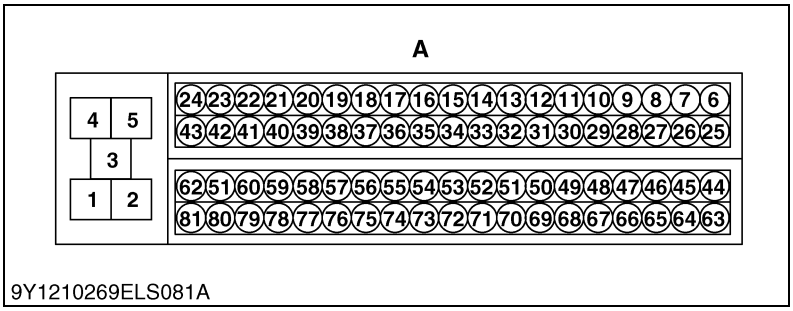
(1) Grounding Wire

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(4) Arrangement of ECU (MAIN) Connector Pin





A: 81P Connector

(To be continued)

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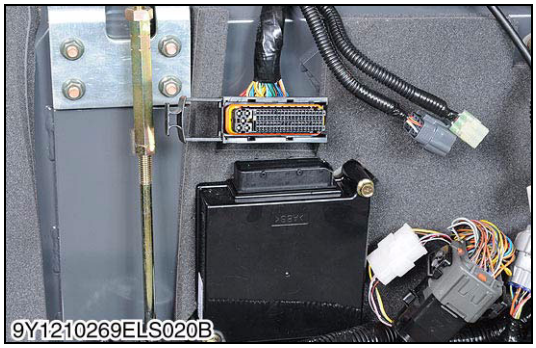
Connector A (ECU (MAIN) Side)

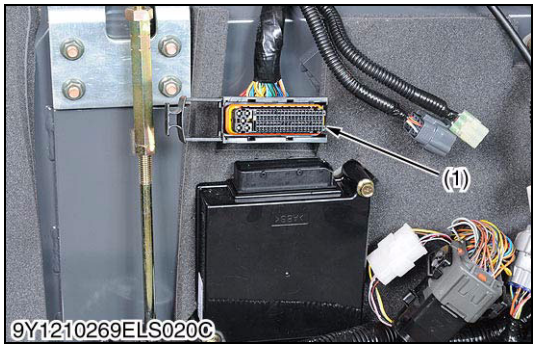
Terminal No.	Item	Color or wiring	Terminal No.	Item	Color or wiring
A1	GND	B	**A42**	Solenoid (4WD)	O/B
A2	+12 V (Power Source from Key Switch)	R	**A43**	Solenoid (Main Shift 1)	Br/B
A3	Solenoid (Master Clutch)	O/L	**A44**	Switch (Shift Up)	G/B
A4	Solenoid (3-point hitch raise)	G/Y	**A45**	Switch (Shift Down)	L/B
A5	Solenoid (4-P hitch lower)	L/Y	**A46**	RPM Dual Memory Switch (A)	Y
A6	Solenoid Valve (Main shift H)	B/L	**A47**	Switch (Rear Differential Lock)	L
A7	CAN(H)-(1)	SB	**A48**	Switch (4WD)	Y/R
A8	CAN(H)-(2)	SB	**A49**	Switch (Bi-Speed)	Lg/W
A9	CAN(H)-(3)	–	**A50**	Brake Switch	G/W
A10	Foot throttle sensor (sub)	L/G	**A51**	Travel Speed Sensor	Gy/W
A11	Foot throttle sensor	W/Y	**A52**	Blank	–
A12	Lift arm sensor	O	**A53**	Blank	–
A13	Solenoid Valve (Master Clutch)	B/P	**A54**	Shuttle Rotation Sensor (A)	Gy/B
A14	Blank	–	**A55**	TXD (For Check)	P
A15	Solenoid Valve (Main Shift L)	B/G	**A56**	Shuttle Rotation Sensor (B)	Gy/R
A16	Rev-limiter Control Dial	Y/R	**A57**	Starter Switch	B/W
A17	Oil Temperature Sensor	W/B	**A58**	Shuttle Switch (R)	Gy
A18	Blank	–	**A59**	GND (Ground For Sensor Line)-(3)	B/Y
A19	GND (Ground For Sensor Line)-(1)	B/W	**A60**	Solenoid (Main Shift 3)	Br/R
A20	+5 V (Power Source For Sensor Line)-(1)	R/W	**A61**	Solenoid (Main Shift 4)	Br/G
A21	+5 V (Power Source For Sensor Line)-(2)	R/Y	**A62**	Blank	–
A22	+5 V (Power Source For Sensor Line)-(3)	–	**A63**	Shift Lock Switch	G/R
A23	+12 V (Power Source From Battery)	R/L	**A64**	Front Wheel Turning Angle Switch	Lg/B
A24	Solenoid (Main Shift 2)	Br/W	**A65**	Creep Switch	Y/G
A25	Solenoid Valve (3-point Hitch Control)	B/O	**A66**	Pressure Switch (Master Clutch)	Y/Y
A26	CAN(L)-(1)	L	**A67**	Pressure Switch (main Shift H)	Y/L
A27	CAN(L)-(2)	L	**A68**	Pressure Switch (main Shift L)	Y
A28	CAN(L)-(3)	–	**A69**	Pressure Switch (main Shift 4)	Y/G
A29	Blank	B	**A70**	Pressure Switch (main Shift 3)	Y/R
A30	Power Shift/Range Shift Lever Sensor	G/W	**A71**	Pressure Switch (main Shift 2)	Y/W
A31	Clutch Pedal Sensor	W/R	**A72**	Pressure Switch (main Shift 1)	Y/B
A32	Position Lever Sensor	W/V	**A73**	Buzzer	Lg/R
A33	Draft Sensor	W/Y	**A74**	TXD (For Check Connector)	Y
A34	Blank	–	**A75**	RPM Dual Memory Switch (B)	R/B
A35	Blank	–	**A76**	Blank	–
A36	Blank	–	**A77**	Blank	–
A37	Hand Throttle Sensor (Sub)	G/W	**A78**	Shuttle Switch (F)	O
A38	Hand Throttle Sensor	G/B	**A79**	Solenoid (Main shift L)	Br/Y
A39	GND (Ground For Sensor Line)-(2)	B/Y	**A80**	Solenoid (Main shift H)	Br/L
A40	+5 V (Power Source For Sensor Line)-(4)	R/Y	**A81**	Solenoid (Bi-speed)	Br/B
A41	+5 V (Power Source For Sensor Line)-(5)	–			

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(5) Checking Switch by Electric Control Unit (ECU)





Connecting of Connector

1. Remove connectors and check their terminals for contamination and deformation.
2. Check the cables for damage and the terminals for disconnection.
3. If any defective parts are found, repair or replace them.

■ **IMPORTANT**

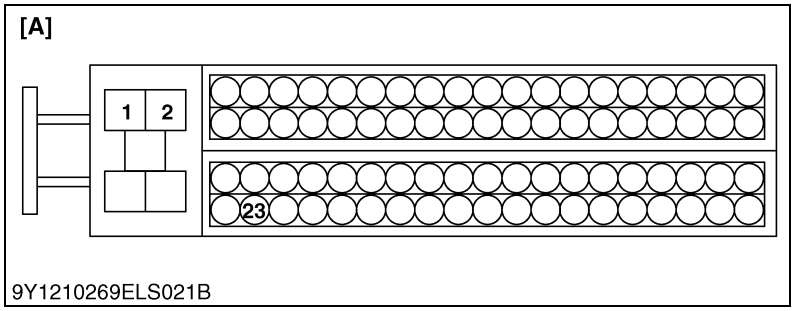
- **Connect connectors surely after checked.**

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Battery Voltage

1. Remove the **CNT-A** connector (1).
2. Check the voltage between connector terminal **A23** (+) (Red / Blue) and terminal **A1** (−) (Black) of the wire harness side.
3. Turn the main key switch **ON**.
4. Check the voltage between terminal **A2** (+) (Red) and terminal **A1** (−) (Black).
5. It is OK if the voltage equals to the battery voltage.

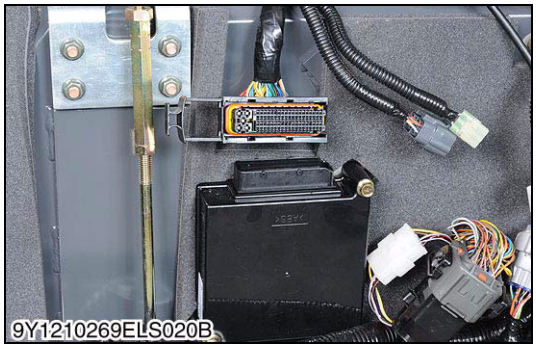
Voltage	Terminal **A23** – **A1**	Approx. battery voltage
	Terminal **A2** – **A1**	Approx. battery voltage



(1) **CNT-A** Connector **[A] CNT-A**

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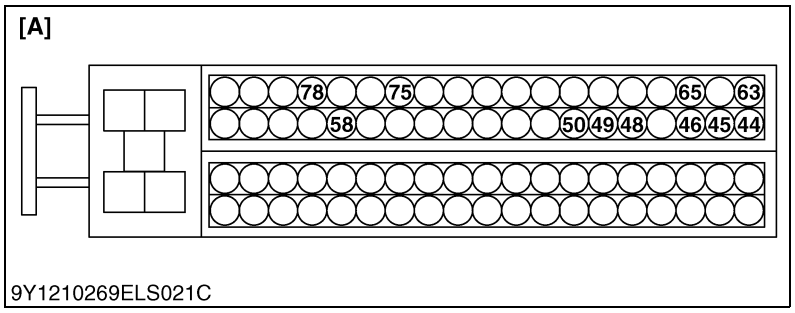


Switch Output Voltage

1. Remove the **CNT-A** connector (1).
2. Turn the main key switch **ON** (do not start the engine).
3. Check the voltage between terminal of the wire harness side which are shown in the table below and the chassis.

Item	Measuring terminal		Position	Voltage (V)
	Terminal No.	Wiring color		
Power Shift Up/Down Shift (UP)	**A44**	G/B	Press	12
			Release	0
Power Shift Up/Down Shift (DOWN)	**A45**	L/B	Press	12
			Release	0
Shuttle Switch (Shuttle Lever) (F)	**A78**	Or	F	12
			N	0
			B	0
Shuttle Switch (Shuttle Lever) (R)	**A58**	Gy	F	0
			N	0
			R	12
RPM Dual Memory Switch (A)	**A46**	Y	OFF	0
			ON	12
RPM Dual Memory Switch (B)	**A75**	R/B	OFF	0
			ON	12
Shift Lock Switch	**A63**	G/R	Press	12
			Release	0
Creep Switch	**A65**	Y/G	Creep ON	12
			Creep OFF	0
Brake Switch	**A50**	Y/R	OFF	0
			ON	12
4WD Switch	**A48**	Y/R	OFF	0
			ON	12
Bi-speed Switch	**A49**	Lg/W	OFF	0
			ON	12

* The voltage 12 V means the battery voltage.

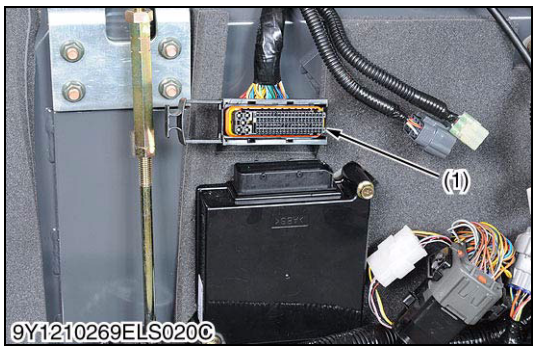


(1) **CNT-A** Connector **[A] CNT-A**

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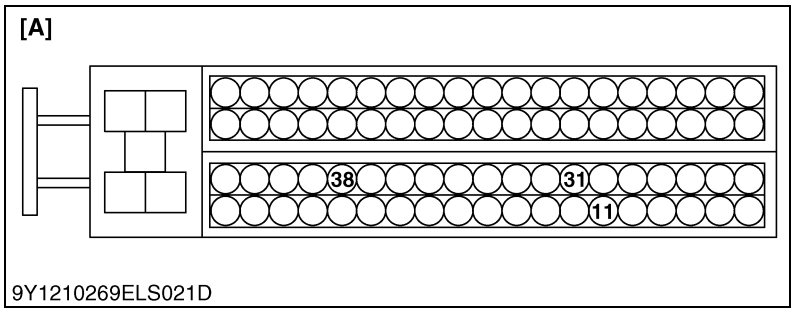
(6) Checking Foot Throttle Sensor, Hand Throttle Sensor and Clutch Pedal Sensor



Sensor Output Voltage

1. Remove the **CNT-A** connector.
2. Turn the main key switch **ON**.
3. Check the voltage between terminal of the wire harness side which are shown in the table below and chassis.

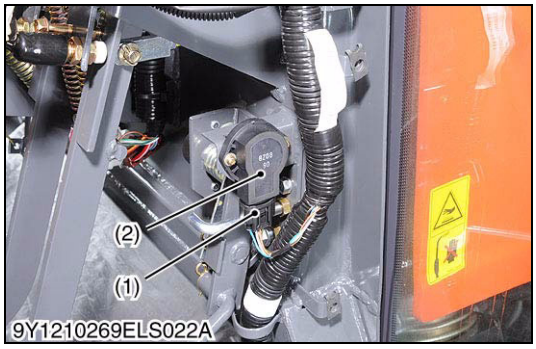
Item	Measuring terminal		Position	Voltage (V)
	Terminal No.	Wiring color		
Foot Throttle Sensor	**A11**	W/Y	When pedal is released	4.50
			When pedal is pressed	0.7
Hand Throttle Sensor	**A38**	G/B	Maximum	4.50
			Idling	0.5
Clutch Pedal Sensor	**A31**	W/R	When pedal is released	2.80
			When pedal is pressed	0.85

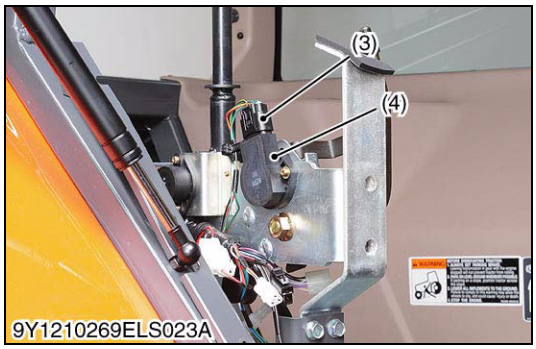


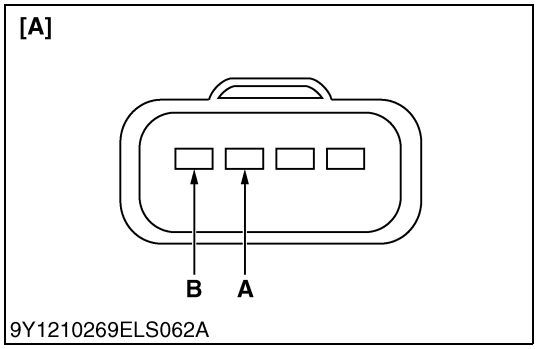
(1) **CNT-A** Connector **[A] CNT-A**

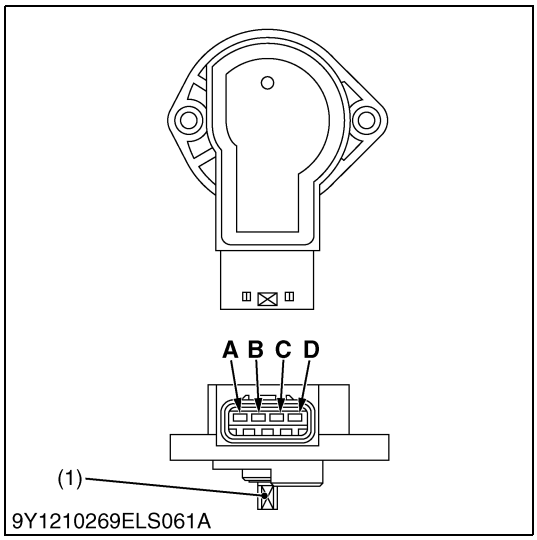
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Throttle Sensor Input Voltage

1. Remove the connector (1) and the connector (3).
2. Turn the main key switch **ON**.
3. Check the voltage between terminal **A** (+) and terminal **B** (−) of the wire harness side.

Item	Terminal	Wiring color	Voltage (V)
Foot Throttle Sensor	Terminal **A** –Terminal **B**	R/Y – B/Y	5
Hand Throttle Sensor			

(1) Foot Throttle Sensor Connector
(2) Foot Throttle Sensor
(3) Hand Throttle Sensor Connector
(4) Hand Throttle Sensor

[A] Connector (Harness)
A: Terminal A
B: Terminal B

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Throttle Sensor Resistance

1. Measure the resistance between terminal **A** and **D** while slowly turning the sensor shaft (1).
2. Then, check resistance between terminal **B** and **D** while slowly turning the sensor shaft (1).
3. It is OK if the resistance value approximates to the value shown in the table below.

(Reference)

- The change of resistance can be checking easily when an analog tester is employed.

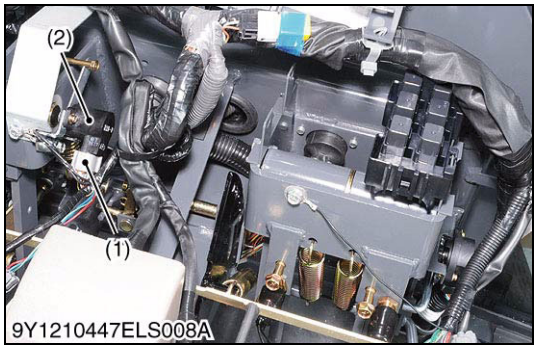
Resistance	Terminal **A** – Terminal **D**	0 to 1 kΩ
	Terminal **B** – Terminal **D**	0 to 1 kΩ

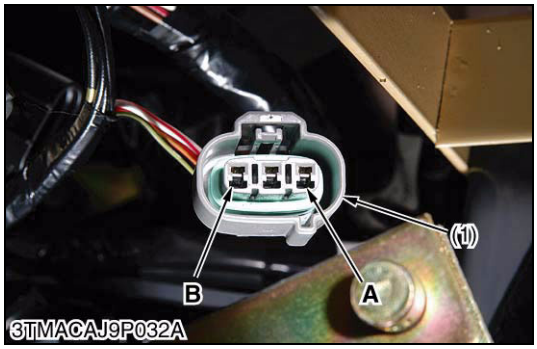
(1) Sensor Shaft

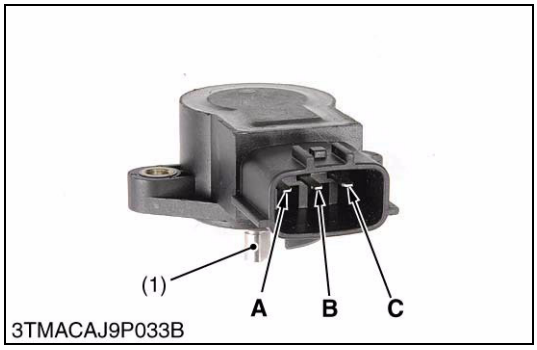
A: Terminal A
B: Terminal B
C: Terminal C
D: Terminal D

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Clutch Pedal Sensor Input Voltage

1. Remove the connector (1) for clutch pedal sensor.
2. Turn the main key switch **ON**.
3. Check the voltage between terminal **A** (+) and terminal **B** (−) of the wire harness side.

Item	Terminal	Wiring color	Voltage (V)
Clutch Pedal Sensor	Terminal **A** –Terminal **B**	R/Y – B/Y	5

(1) Clutch Pedal Sensor Connector
(2) Clutch Pedal Sensor

A: Terminal A
B: Terminal B

9Y1210447ELS0023US0

Clutch Pedal Sensor Resistance

1. Measure the resistance between terminal **A** and **C**.
2. Then, check resistance between terminal **A** and **B** while slowly turning the sensor shaft.
3. It is OK if the resistance value approximates to the value shown in the table below.

(Reference)

- The change of resistance can be checking easily when an analog tester is employed.

Resistance	Terminal **A** – Terminal **C**	1.6 to 2.4 kΩ
	Terminal **A** – Terminal **B**	Resistance is normal if smoothly changing

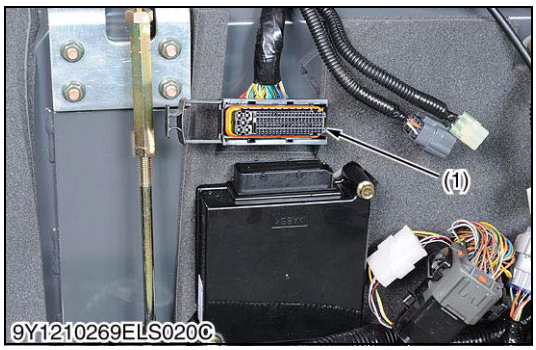
(1) Sensor Shaft

A: Terminal A
B: Terminal B
C: Terminal C

9Y1210269ELS0040US0

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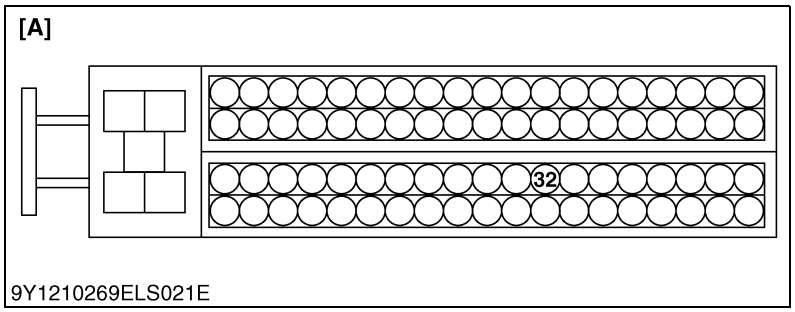
(7) Checking Power Shift/Range Shift Lever Sensor



Sensor Output Voltage

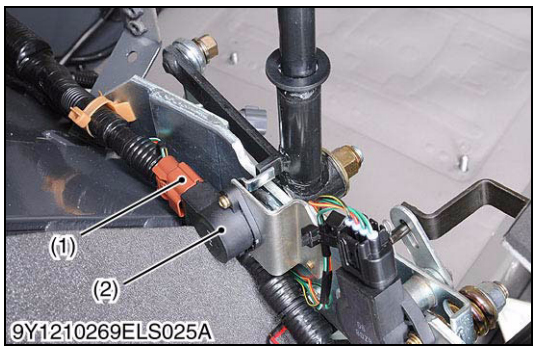
1. Remove the **CNT-A** connector (1).
2. Turn the main key switch **ON**.
3. Check the voltage between terminal of the wire harness side which are shown in the table below and chassis.

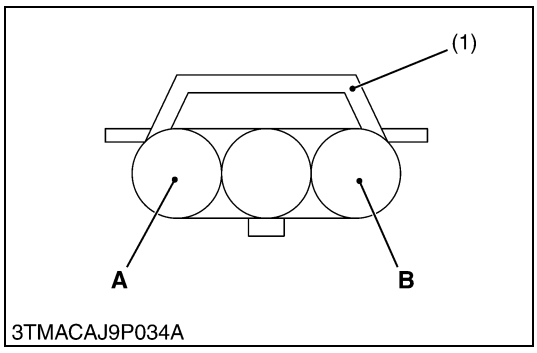
Item	Terminal No.	Wiring color	Position	Approx. Voltage (V)
Power Shift/Range Shift Lever Sensor	**A32**	W/V	L	1.0
			N	2.5
			H	4.0



(1) **CNT-A** Connector **[A] CNT-A**

9Y1210447ELS0054US0





Sensor Input Voltage

1. Remove the connector (1) for power shift/range shift lever sensor.
2. Turn the main key switch **ON**.
3. Check the voltage between terminal **A** (+) and terminal **B** (−) of the wire harness side.

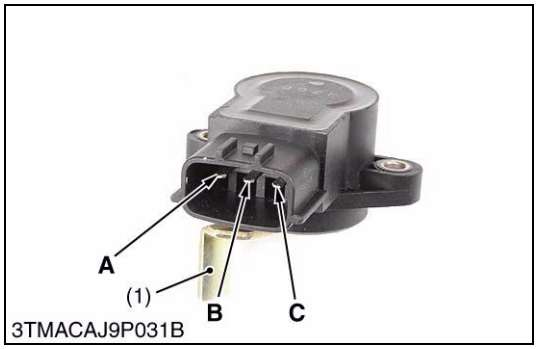
Item	Terminal	Wiring color	Voltage (V)
Power Shift/Range Shift Lever Sensor	Terminal **A** – Terminal **B**	R/Y – B/Y	5

(1) Power Shift/Range Shift Lever Sensor Connector
(2) Power Shift/Range Shift Lever Sensor

A: **Terminal A**
B: **Terminal B**

9Y1210447ELS0055US0

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Power Shift/Range Shift Lever Sensor Resistance

1. Measure the resistance between terminal **A** and **C**.
2. Then, check resistance between terminal **A** and **B** while slowly turning the sensor lever (1).
3. It is OK if the resistance value approximates to the value shown in the table below.

(Reference)

- The change of resistance can be checking easily when an analog tester is employed.

Resistance	Terminal **A** – Terminal **C**	1.6 to 2.4 kΩ
	Terminal **A** – Terminal **B**	Resistance is normal if smoothly changing

(1) Sensor Lever

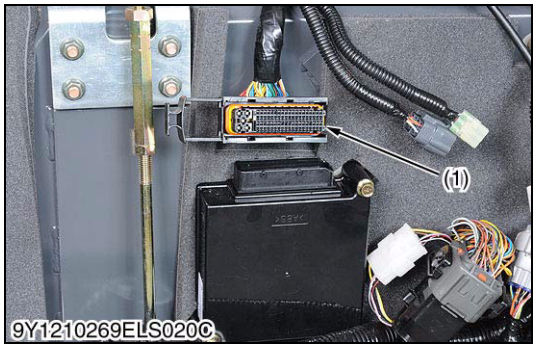
A: Terminal A
B: Terminal B
C: Terminal C

9Y1210269ELS0043US0

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(8) Checking Shuttle Rotation Sensor

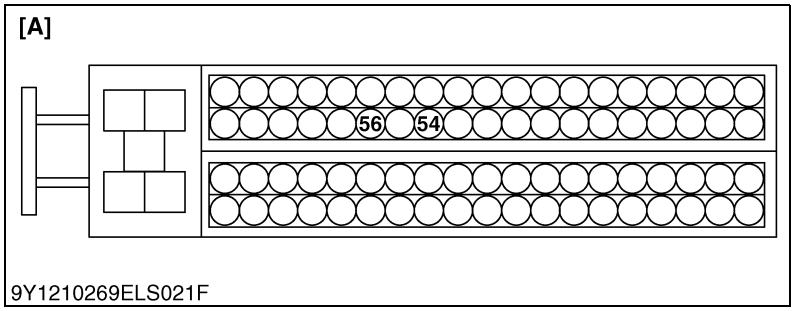




Shuttle Rotation Sensor

1. Remove the **CNT-A** connector (1).
2. Check the resistance between the terminal **A54** (Gy/B) and terminal **A56** (Gy/R) of the wire harness side.
3. Replace those of other than the standard value.

Item	Terminal No.	Wiring color	Resistance
Shuttle Rotation Sensor	**A54** – **A56**	Gy/B - Gy/R	400 to 600 Ω

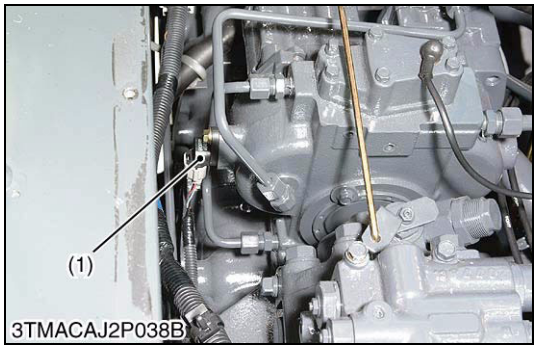


(1) **CNT-A** Connector
(2) Shuttle Rotation Sensor

[A] CNT-A

9Y1210269ELS0044US0

(9) Checking Engine Rotation Sensor and Traveling Speed Sensor





Engine Rotation Sensor and Traveling Speed Sensor

1. Check the engine speed meter and travel speed display.
2. It is OK if engine speed is displayed in the meter panel.
3. It is OK if traveling speed is displayed in the LCD display.

■ **NOTE**

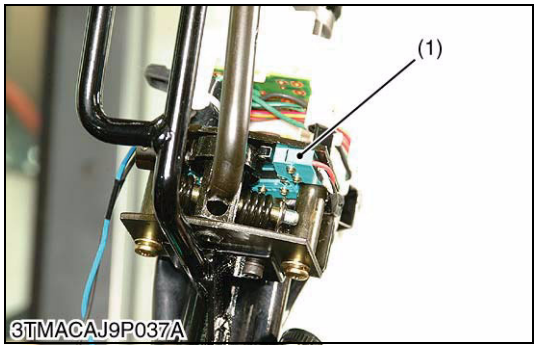
- **Engine rotation sensor and traveling speed sensor are not checked with circuit tester.**

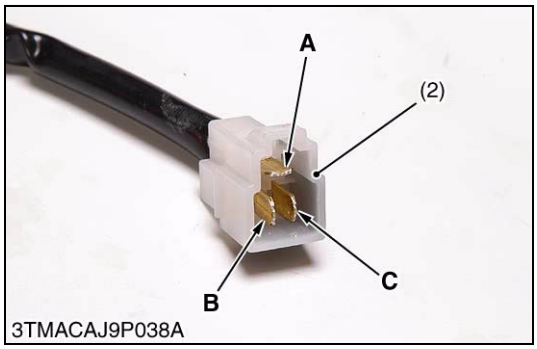
(1) Engine Rotation Sensor (2) Travel Speed Sensor

9Y1210269ELS0045US0

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(10) Checking Shuttle Switch





Shuttle Switch

1. Check the continuity between connector terminal as shown in table below.
2. If the switch is defective, replace it.

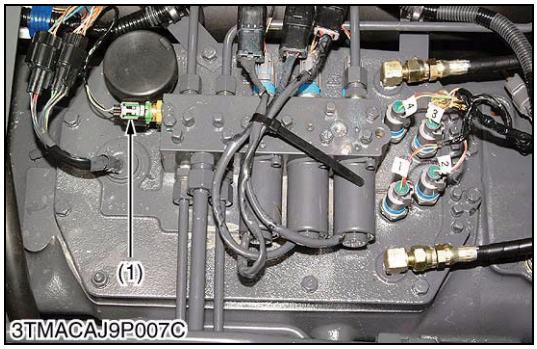
Item	Terminal	Position	Resistance
Shuttle Switch	Terminal **A** – **B**	N	Infinity
	Terminal **A** – **C**		
	Terminal **A** – **C**	F	0 Ω
	Terminal **A** – **B**	R	0 Ω

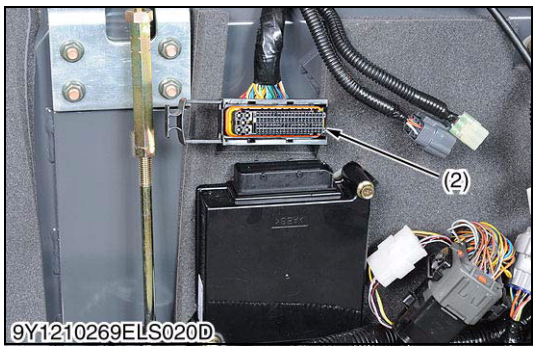
(1) Shuttle Switch
(2) Shuttle Switch Connector

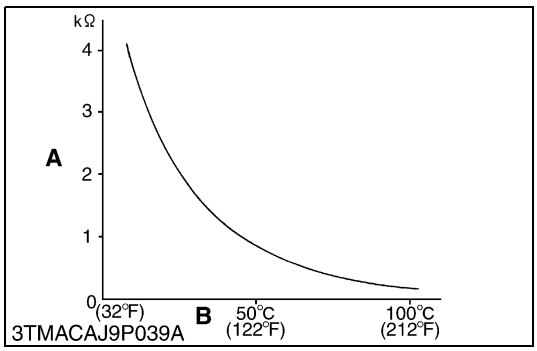
A: Terminal A
B: Terminal B
C: Terminal C

9Y1210269ELS0046US0

(11) Checking Transmission Oil Temperature Sensor



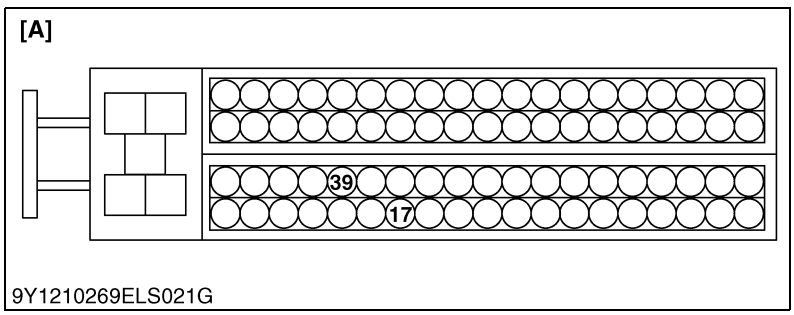




Transmission Oil Temperature Sensor

1. Remove the **CNT-A** connector (2).
2. Check resistance between terminals **A17** (White / Black) and **A39** (Black / Yellow) of the wire harness side.
3. It is OK if the resistance value is approximate to the value shown in the table below.
4. If there exists a large difference in resistance between both the values, replace the oil temperature sensor.

Resistance	Terminal **A17** – **A39**	Refer to figure left.



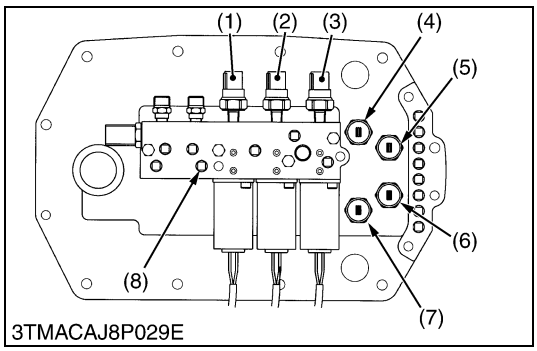
(1) Transmission Oil Temperature Sensor
(2) Connector

[A] CNT-A
A: Resistance
B: Temperature

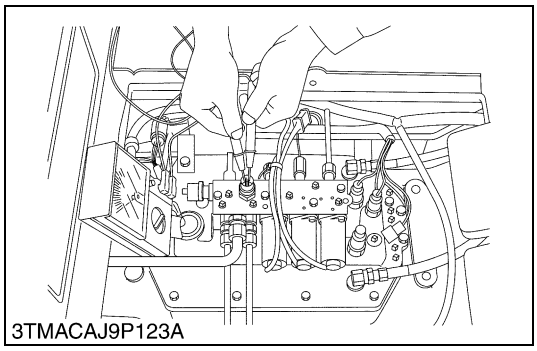
9Y1210269ELS0047US0

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(12) Checking Pressure Switch



3TMACAJ8P029E


3TMACAJ9P123A

Pressure Switch

1. Remove the floor mat and inspection plate center.
2. Remove the defective pressure switches.
3. Remove the plug (8) from the pressure checking port to check the pressure of the front differential lock clutch, and mount the pressure switch to this port. (Mount the plug to the port without fail when the pressure switch is removed.).
4. Start the engine, and idle the engine, set the power shift/range shift lever to the neutral **"N"** position and turn the 4WD switch on.
5. Turn the front differential switch **ON** and measure the resistance between terminals.

(Reference)

- Checking is also possible in the same with each pressure checking port of 4WD clutch, Bi-speed turn clutch and rear differential lock clutch.

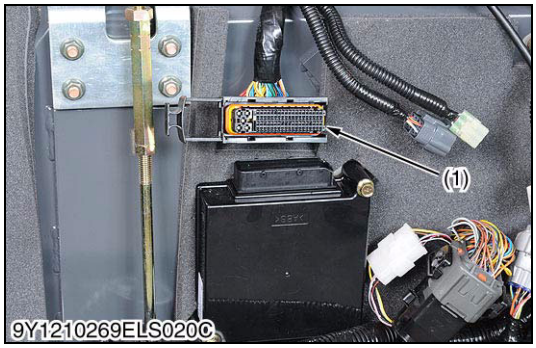
Resistance (Across pressure switch terminals)	When front differential lock switch is **"ON"**	0 Ω
	When front differential lock switch is **"OFF"**	Infinity

(1) Pressure Switch (Main Shift **H**)
(2) Pressure Switch (Main Shift **L**)
(3) Pressure Switch (Master Clutch)
(4) Pressure Switch (Main Shift **4**)
(5) Pressure Switch (Main Shift **3**)
(6) Pressure Switch (Main Shift **2**)
(7) Pressure Switch (Main Shift **1**)
(8) Front Differential Lock System Pressure Check Port

9Y1210447ELS0056US0

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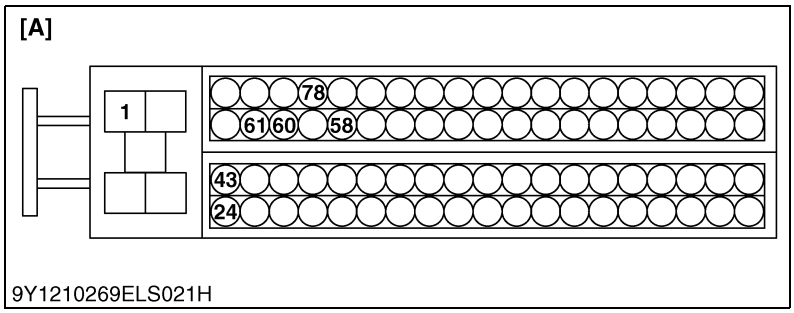
(13) Checking Solenoid Valve



Solenoid ON/OFF Valve

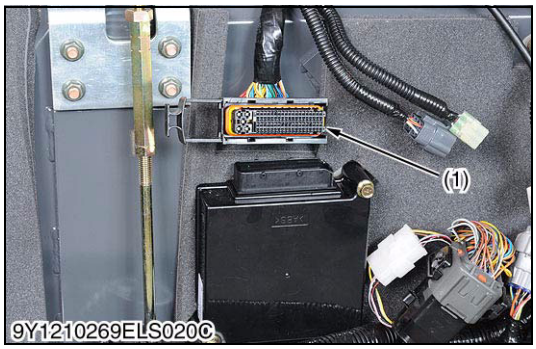
1. Remove the **CNT-A** connector (1).
2. Check resistance between below-shown terminals of the wire harness side and the grounding terminal (or chassis).
3. Replace the solenoid ON/OFF valve unless the resistance is below standard value.

Item	Measuring terminal				Resistance
	Terminal No.	Wiring color	Terminal No.	Wiring color	
Main shift **1**	**A43**	Br/B	**A1**	B	Approx.25 Ω
Main shift **2**	**A24**	Br/W			
Main shift **3**	**A60**	Br/R			
Main shift **4**	**A61**	Br/G			
Master **F**	**B78**	Or			
Master **R**	**B58**	Gy			



(1) **CNT-A** Connector **[A] CNT-A**

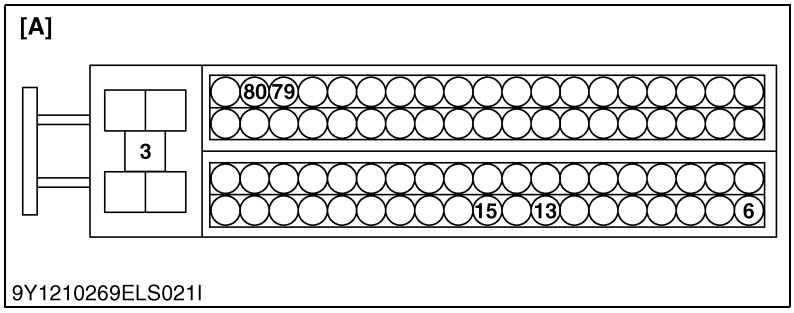
9Y1210269ELS0049US0



Solenoid Proportional Reducing Valve

1. Remove the **CNT-A** connector (1).
2. Check resistance between below-shown terminals of the wire harness side.
3. Replace the solenoid proportional reducing valve if resistance is below the standard value.

Item	Measuring terminal				Resistance
	Terminal No.	Wiring color	Terminal No.	Wiring color	
Main shift **L**	**A79**	Br/Y	**A15**	B/G	Approx.6.5 Ω
Main shift **H**	**A80**	Br/L	**A6**	B/L	
Master **F-R**	**A3**	Or/L	**A13**	B/P	



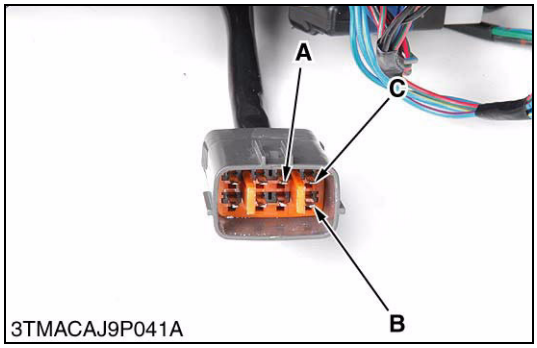
(1) **CNT-A** Connector **[A] CNT-A**

9Y1210269ELS0050US0

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(14) Checking Switch and Dial





Auto-mode Sensitivity Dial

1. Measure the resistance between terminal **A** and **C**.
2. Then, check resistance between terminal **A** and **B** while slowly turning the sensor shaft.
3. It is OK if the resistance value approximates to the value shown in the table below.

(Reference)

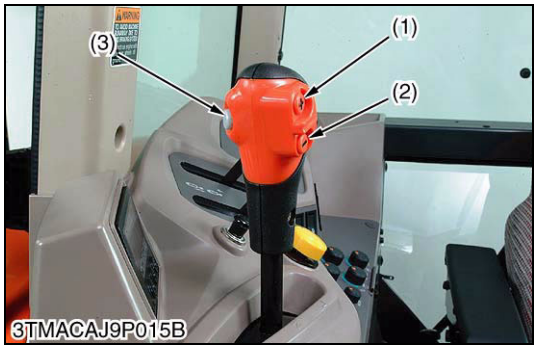
- The change of resistance can be checking easily when an analog tester is employed.

Resistance	Terminal **A** – Terminal **C**	0.8 to 1.2 kΩ
	Terminal **A** – Terminal **B**	Resistance is normal if smoothly changing

(1) Auto-mode Sensitivity Dial

A: Terminal A
B: Terminal B
C: Terminal C

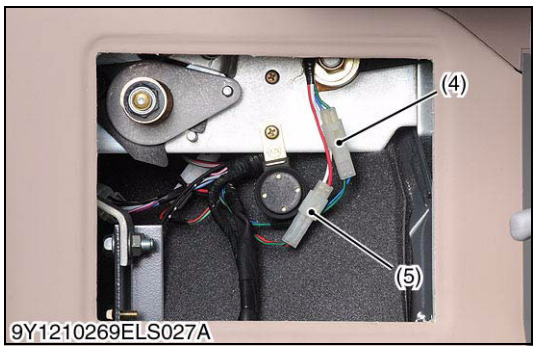
9Y1210269ELS0051US0



Shift-up/Shift-down Switch and Clutch Button

1. Disconnect the **2P** connector (4), (5).
2. Check the continuity between connector terminal as shown in table below.
3. If the switch is defective, replace it.

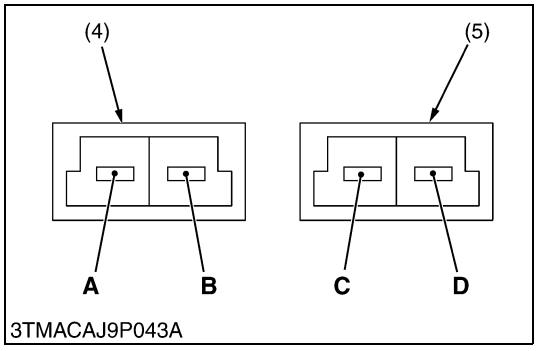
Item	Terminal	Position	Resistance
Power Shift Up/Down Switch (UP)	Terminal **A** – **C**	Press	0 Ω
	Terminal **A** – **C**	Release	Infinity
Power Shift Up/Down Switch (DOWN)	Terminal **B** – **C**	Press	0 Ω
	Terminal **B** – **C**	Release	Infinity
Clutch Button	Terminal **C** – **D**	Press	0 Ω
	Terminal **C** – **D**	Release	Infinity



(1) Shift-up Switch
(2) Shift-down Switch
(3) Clutch Button
(4) Shift Switch Up/Down Connector
(5) Clutch Button Connector

A: Terminal A
B: Terminal B
C: Terminal C
D: Terminal D

9Y1210447ELS0091US0



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Shift-up/Shift-down Switch of Arm Rest

1. Disconnect the **10P** connector (3).
2. Check the continuity between connector terminal as shown in table below.
3. If the switch is defective, replace it.

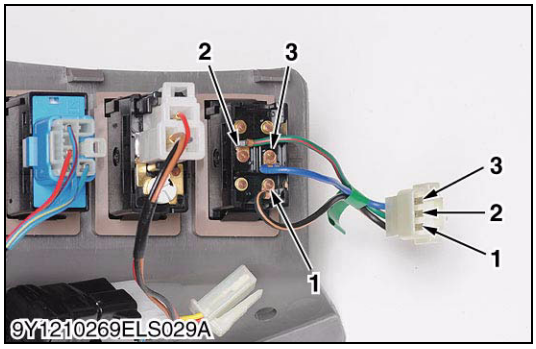
Item	Terminal	Position	Resistance
Power Shift Up/Down Switch (UP)	Terminal **A** – **C**	Press	0 Ω
	Terminal **A** – **C**	Release	Infinity
Power Shift Up/Down Switch (DOWN)	Terminal **B** – **C**	Press	0 Ω
	Terminal **B** – **C**	Release	Infinity

(1) Shift-up Switch
(2) Shift-down Switch
(3) **10P** Connector

A: Terminal A
B: Terminal B
C: Terminal C

9Y1210269ELS0053US0





RPM Dual Memory Switch

1. Check the continuity through the RPM dual memory switch (1) with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position		Terminal		
		1	2	3
RPM dual memory switch	Switch A (press)	●	●	
	OFF			
	Switch B (press)	●		●

9Y1210447ELS010US

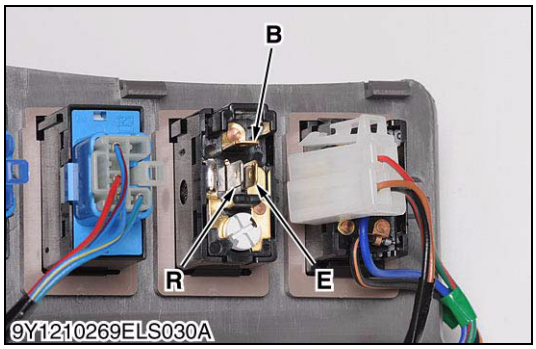
(1) RPM Dual Memory Switch

1: Terminal 1
2: Terminal 2
3: Terminal 3

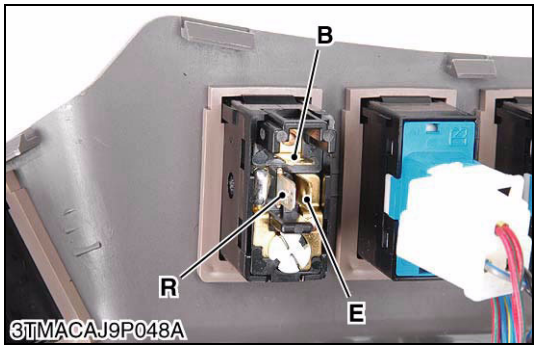
9Y1210447ELS0042US0

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Constant RPM Management Switch

1. Check the continuity through the constant RPM management switch (1) with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position		Terminal		
		B	R	E
Constant RPM dual memory switch	OFF		●	●
	ON	●	●	●

9Y1210447ELS011US

(1) Constant RPM Management Switch **B: Terminal B**
R: Terminal R
E: Terminal E

9Y1210447ELS0043US0

Front Wheel Differential Lock Switch

1. Check the continuity through the front wheel differential lock switch (1) with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position		Terminal		
		B	R	E
Front wheel differential lock switch	OFF			
	ON	●	●	●

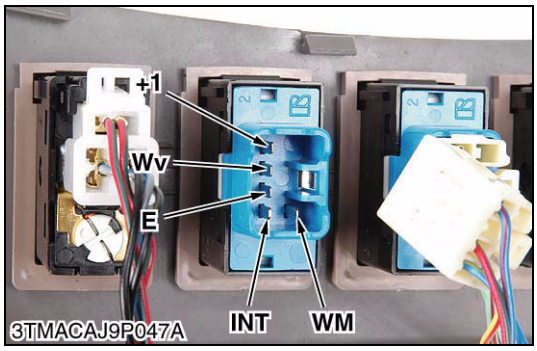
9Y1210447ELS012US

(1) Front Wheel Differential Lock Switch **B: Terminal B**
R: Terminal R
E: Terminal E

9Y1210447ELS0044US0

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Auto-mode Switch

1. Check the continuity through the auto-mode switch (1) with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position		Terminal				
		INT	+1	E	WV	WM
Auto-mode switch	Field mode (Press)		●	●	●	●
	Field mode (ON)		●	●		
	OFF					
	Travel mode (ON)	●		●		
	Travel mode (Press)	●		●	●	●

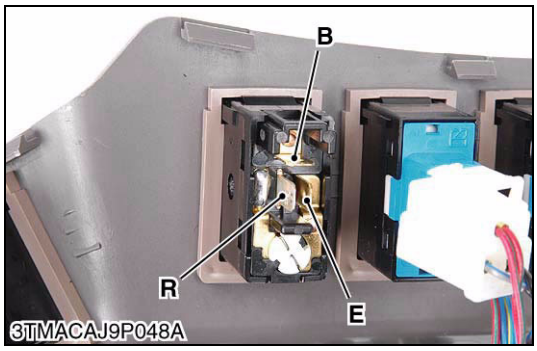
9Y1210447ELS013US

(1) Auto-mode Switch

+1: Terminal +1
WV: Terminal Wv
E: Terminal E
INT: Terminal INT
WM: Terminal WM

9Y1210447ELS0045US0





DHC Switch

1. Check the continuity through the DHC switch (1) with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position		Terminal		
		B	R	E
DHC switch	OFF		●	●
	ON	●	●	●

9Y1210447ELS014US

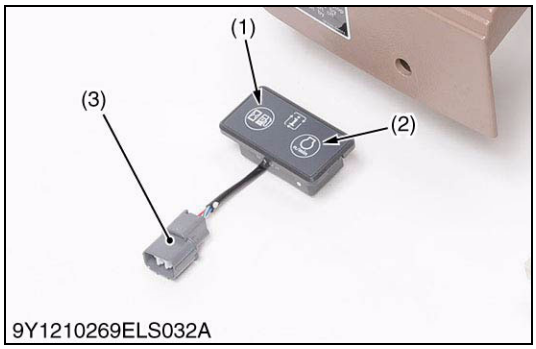
(1) DHC Switch

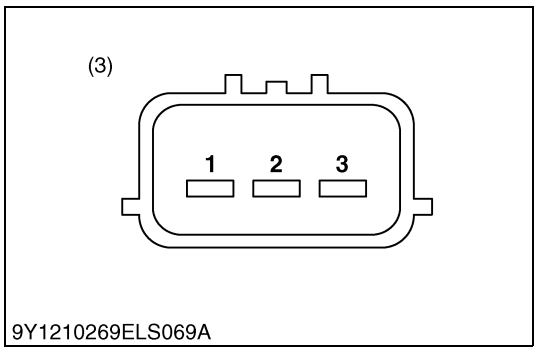
B: Terminal B
R: Terminal R
E: Terminal E

9Y1210447ELS0046US0

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Display Switch and Engine RPM Dual Memory Indicator Switch

1. Check the continuity through the display switch (1) with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position		Terminal		
		1	2	3
Display switch / Engine RPM dual memory indicator switch	Display switch (ON)	●		●
	OFF			
	Engine RPM dual memory indicator switch (ON)		●	●

9Y1210447ELS015US

(1) Display Switch
(2) Engine RPM Dual Memory Indicator Switch
(3) Connector (Switch)

1: Terminal 1
2: Terminal 2
3: Terminal 3

9Y1210447ELS0047US0

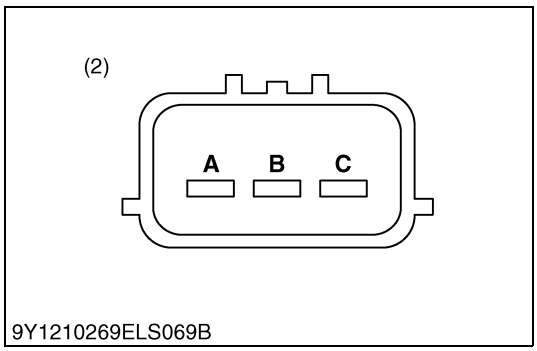
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9Y1210269ELS070A



9Y1210269ELS071A



9Y1210269ELS069B

Rev-limiter Control Dial

1. Measure the resistance between terminal **A** and **C**.
2. Then, check resistance between terminal **B** and **C** while slowly turning the sensor shaft.
3. It is OK if the resistance value approximates to the value shown in the table below.

(Reference)

- The change of resistance can be checked easily when an analog tester is employed.

Resistance	Terminal **A** – Terminal **C**	0.9 to 1.1 kΩ
	Terminal **B** – Terminal **C**	Resistance is normal if smoothly changing

(1) Rev-limiter Control Dial
(2) Connector (Switch)

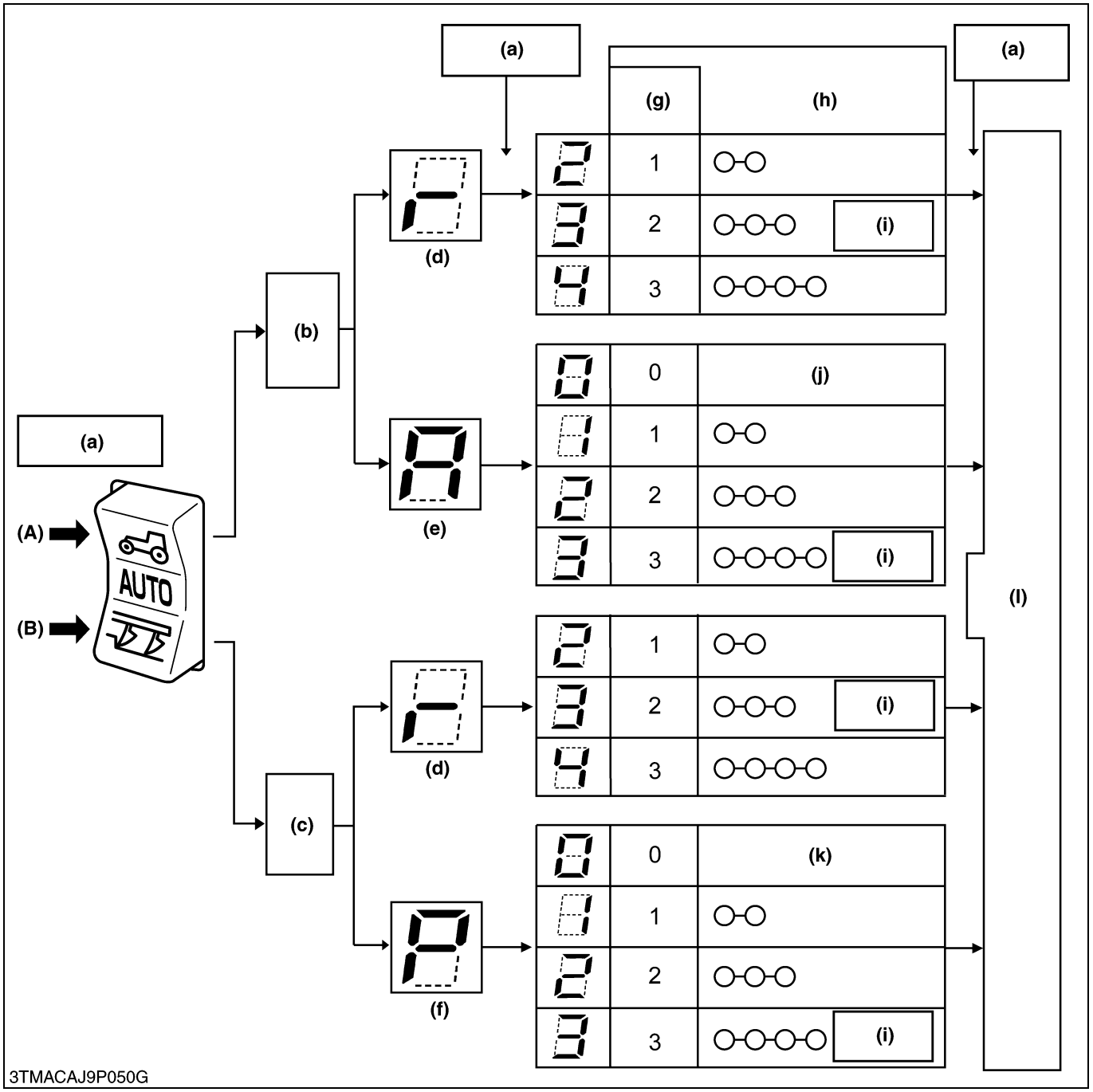
A: Terminal A
B: Terminal B
C: Terminal C

9Y1210269ELS0060US0

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(15) Changing Auto-mode Setting

Auto-mode Setting Chart



(a) Hold Down 3 Seconds.
(b) Travel Mode (A)
(c) Field Mode (B)
(d) Automatic Speed
(e) Shift-Up/Down Using Acceleration Pedal
(f) Shift-Down when Raising 3-point Hitch
(g) Number of Shifts
(h) Amount of Grease Used
(i) Factory Setting
(j) No Auto-Shift
(k) No Auto-Shift Down (Shift-Up to Upper Level Depending on Conditions)
(l) Setting Complete

■ **NOTE**

- **It is impossible to preset a greater number of shift-down speeds than the number of automatic speeds.**
- **If the key switch is moved to "OFF" or the auto-mode switch is turned "OFF" halfway, the setting is cancelled.**

9Y1210447ELS0093US0

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Changing Travel Mode Setting

- The automatic speed range and the shift-down speed at acceleration pedal release can be modified.

1. Place the power shift/range shift lever to **"N"**, and start the engine.
2. Push and hold down the top (travel mode) of the auto-mode switch to the second stage for more than 3 seconds. The buzzer sounds beeping and the setting mode is called.
3. Now each time the top (travel mode) of the auto-mode switch is pressed, **"r"** (automatic speed) and **"A"** (acceleration pedal release shift-down speed) appear flashing alternately.

■ **Changing the speed at engine load detection (RPM)**

4. Using the auto-mode switch, make **"r"** appear in the display. Hold down the top (travel mode) of the auto-mode switch, and the current speed setting starts flashing.
5. Each time the top (travel mode) of the auto-mode switch is pressed, **"2"**, **"3"** and **"4"** appear flashing one after another. When a desired speed setting comes up, hold down the switch again for more than 3 seconds. The flashing number stays on and the setting is complete.
6. This setting refers to how many gears the auto-shift will use up/down, when the engine rpm changes (without using the throttle).
   <Example>
   2 gears = 1 shift
   3 gears = 2 shifts
   4 gears = 3 shifts.

■ **Changing the automatic shift-down speed at acceleration pedal release (throttle operation)**

7. Using the auto-mode switch, make **"A"** appear in the display. Hold down the top (travel mode) of the auto-mode switch, and the current speed setting starts flashing.
8. Each time the top (travel mode) of the auto-mode switch is pressed, **"0"**, **"1"**, **"2"** and **"3"** appear flashing one after another. When a desired speed setting comes up, hold down the switch again for more than 3 seconds. The flashing number stays on and the setting is complete.
9. This setting refers to how many shift the tractor will auto-shift up/down when the operator uses the throttle.
   <Example>
   0 = No shift
   1 = 1 shift
   2 = 2 shifts
   3 = 3 shifts.

(1) Auto-mode Switch

9Y1210269ELS0071US0

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Changing Field Mode Setting

- The automatic speed range and the shift-down speed at attachment lift can be modified.

1. Place the power shift/range shift lever to **"N"**, and start the engine.
2. Hold down the bottom (field mode) of the auto-mode switch to the second stage for more than 3 seconds. The buzzer sounds beeping and the setting mode is called.
3. Each time the bottom (field mode) of the auto-mode switch is pressed, **"r"** (automatic speed) and **"A"** (attachment lift shift-down speed) appear flashing alternately.

■ **Changing the speed at engine load detection (RPM)**

4. Using the auto-mode switch, make **"r"** appear in the display. Hold down the bottom (field mode) of the auto-mode switch, and the current speed setting starts flashing.
5. Each time the bottom (field mode) of the auto-mode switch is pressed, **"2"**, **"3"** and **"4"** appear flashing one after another. When a desired speed setting comes up, hold down the switch again for more than 3 seconds. The flashing number stays on and the setting is complete.
6. This setting refers to how many gears the auto-shift will use up/down, when the engine rpm changes (without using the throttle).
   <Example>
   2 gears = 1 shift
   3 gears = 2 shifts
   4 gears = 3 shifts.

■ **Changing the automatic shift-down speed at 3-point hitch lift**

7. Using the auto-mode switch, make **"P"** appear in the display. Hold down the bottom (plow marking) of the auto-mode switch, and the current speed setting starts flashing.
8. Each time the bottom (plow marking) of the auto-mode switch is pressed, **"0"**, **"1"**, **"2"** and **"3"** appear flashing one after another. When a desired speed setting comes up, hold down the switch again for more than 3 seconds. The flashing number stays on and the setting is complete.
9. This setting refers to how many shift the tractor will auto-shift up/down when the operator raises the 3-point hitch.
   <Example>
   0 = No shift down
   1 = 1 shift
   2 = 2 shifts
   3 = 3 shifts

(1) Auto-mode Switch

9Y1210269ELS0072US0

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[4] CHECKING AND ADJUSTING (3-POINT HITCH SYSTEM)

(1) 3-Point Hitch System (Sensors) Diagnosis





This tractor is equipped with the self-diagnostic function for easy sensor checking.

■ **IMPORTANT**

- **The output voltage of easy sensor in its reference setting is compared with the specified value in the 3-point hitch control unit memory for the checking purpose. It should be noted, therefore, that even if there is no problem with the diagnostic results, the sensor itself may be defective.**
- **After changing the sensor, switch, control units so on, be sure to calibrate them. (See page 9-S68.)**

Procedure 1: Setting Standard States

1. Start the engine and the tractor is standard state setting as shown in the table below.

[Standard States]

Item	Condition	Remarks
Lift Arm	Lift top end	Using the remote hitch up/down switch, raise the lift arm to its relief top end
Draft load	No load	Attach 3-point hitch
Position control lever	Upper most scale 9	–
Lift arm top limit adjustment dial	High position	–
Draft ratio adjustment dial	Center position	–
3-point hitch lowering speed adjustment dial	Fast position	–
Mode selector switch	Position	With no assist cylinder
	Draft	With one assist cylinder
	Draft	With two assist cylinder

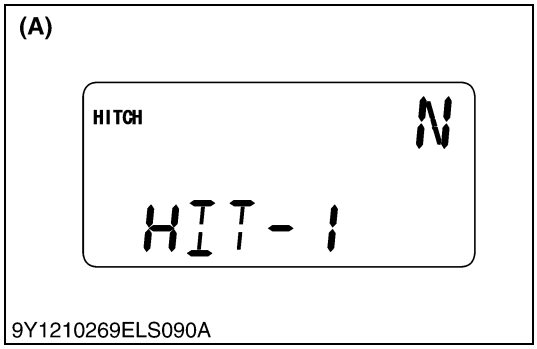
2. Stop the engine.

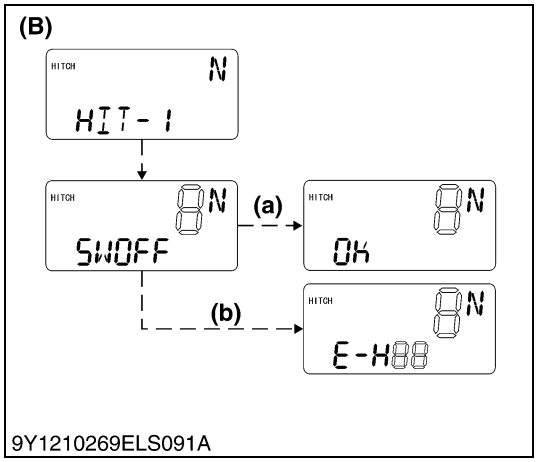
(1) Position Control Lever
(2) Lift Arm Top Limit Adjustment Dial
(3) Draft Ratio Adjustment Dial
(4) Mode Selector Switch
(5) 3-Point Hitch Lowering Speed Adjustment Dial

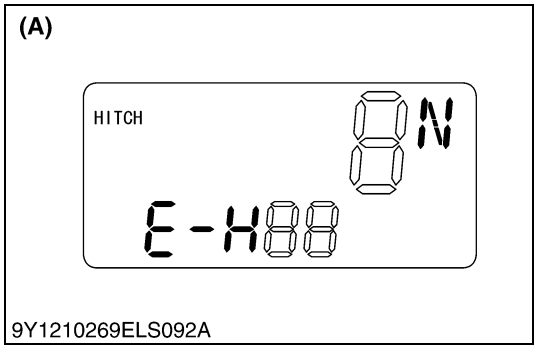
9Y1210447ELS0005US0

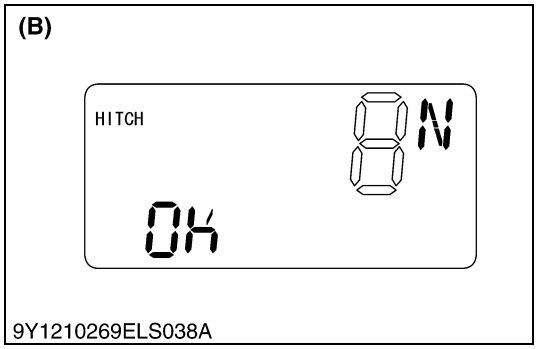
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Procedure 2: Change to the Calibration Mode

1. Set the menu item **"HIT"**.
   Refer to "OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE ADJUSTING AND EASY CHECKING".
2. Set the mode item **"HIT-1"**.
   Refer to "OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE ADJUSTING AND EASY CHECKING".

■ **NOTE**
- **It is possible to set the mode item "HIT-1" directly.**
- **Turn the main key switch ON while pushing the 3-point lower hitch.**

(1) 3-Point Quick Raise/Lower Switch

(A) Display (HIT-1)
(B) Flow Chart (HIT-1)
(a) Without DTC (Diagnostic Trouble Code)
(b) With DTC (Diagnostic Trouble Code)

9Y1210447ELS0057US0

Procedure 3: Checking the Display

1. Check the display.

■ **NOTE**
- **If any of the settings are wrong or any of parts are defective, diagnostic trouble code appears and corresponds to parts in trouble (See the table below).**

Diagnostic Trouble Code (Center Display)	Parts in Trouble
E-H02	Lift arm sensor
E-H04	Position lever sensor
E-H07	Lift arm top limit adjustment dial
E-H08	Draft sensor
E-H14	Draft ratio adjustment dial
E-H15	Lowering speed adjustment dial

2. If nothing is trouble, **"OK"** appears on the display.

■ **NOTE**
- **If the setting is wrong, turn the main key switch OFF and carry out the procedure from step 1.**

3. Turn off the main key switch.

(A) Display (DTC)
(B) Display (OK)

9Y1210447ELS0058US0

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(2) Calibration of 3-Point Hitch System and Assist Cylinder Number





This tractor is equipped with the self-diagnostic function for easy sensor checking.

■ **IMPORTANT**

- **The output voltage of easy sensor in its reference setting is compared with the specified value in the 3-point hitch control unit memory for the checking purpose. It should be noted, therefore, that even if there is no problem with the diagnostic results, the sensor itself may be defective.**
- **After changing the sensor, switch, control units so on, be sure to calibrate them.**

Procedure 1: Setting Standard States

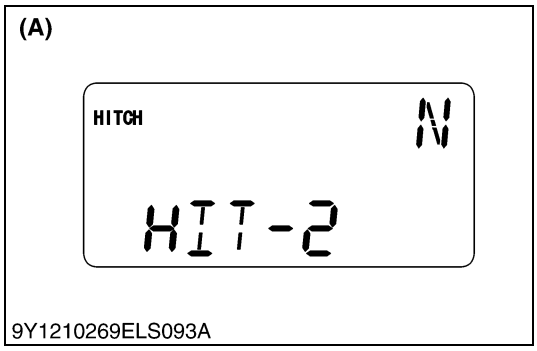
1. Start the engine and the tractor is standard state setting. (See page 9-S66.)

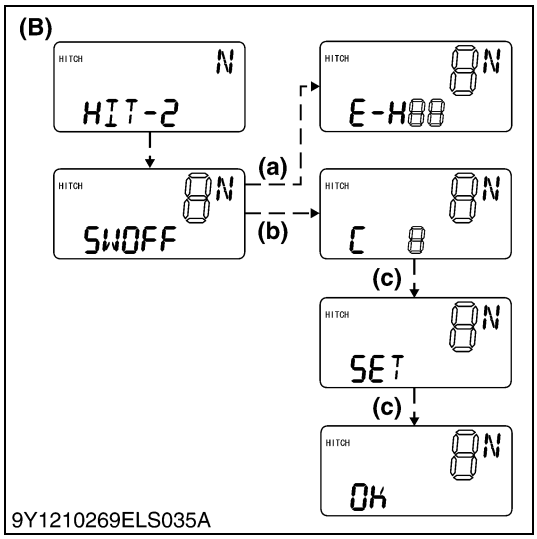
(1) Position Control Lever
(2) Lift Arm Top Limit Adjustment Dial
(3) Draft Ratio Adjustment Dial
(4) Mode Selector Switch
(5) 3-Point Hitch Lowering Speed Adjustment Dial

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Procedure 2: Change to the Calibration Mode

1. Set the menu **"HIT"**.
   Refer to "OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE ADJUSTING AND EASY CHECKING".
2. Set the mode **"HIT-2"**.
   Refer to "OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE ADJUSTING AND EASY CHECKING".

■ **NOTE**

- **If the set menu item is wrong, turn off the main switch key and restart the procedure 1.**

(Reference)

The other Procedure 2: Change the Calibration Mode

■ **NOTE**

- **It is possible to set the mode item "HIT-2" directly.**

1. Turn the main key switch **ON** while pushing the 3-point quick raise switch. And then, **"HIT-2"** appears on the display.
2. Release the 3-point quick raise switch.

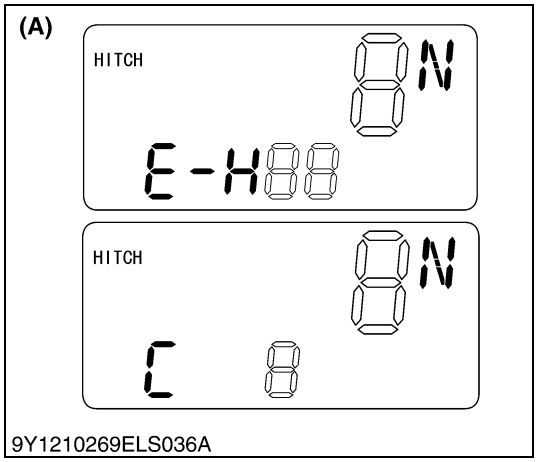
(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch
(3) 3-Point Quick Raise/Lower Switch

(A) Display (HIT-2)
(B) Flow Chart (HIT-2)

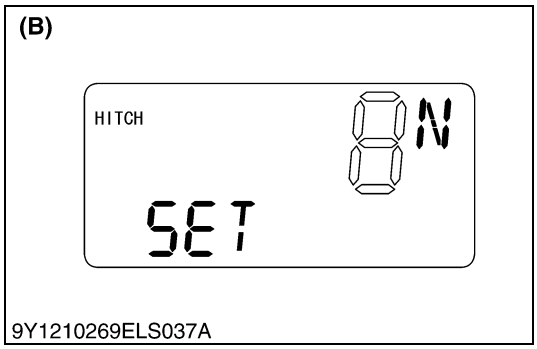
(a) Without DTC (Diagnostic Trouble Code)
(b) With DTC (Diagnostic Trouble Code)
(c) Press the 3-Point Hitch Quick Lower Switch or Engine RPM Dual Memory A/B Indicator Switch for 3 seconds and more.

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9Y1210269ELS037A

Procedure 3: Checking the Display

1. Check the display.

■ **NOTE**
- **If any of the settings are wrong or any of parts are defective, diagnostic trouble code appears and corresponds to a part in trouble (See the table below).**

Diagnostic Trouble Code (Center Display)	Parts in Trouble
E-H02	Lift arm sensor
E-H04	Position lever sensor
E-H07	Lift arm top limit adjustment dial
E-H08	Draft sensor
E-H14	3-point hitch lowering speed
E-H15	Adjustment dial

2. When nothing is trouble, the assist cylinder setting appears on the center of display. See the table below.

Center Display	Number of Assist Cylinder	Model
C3	2	M130X

3. Whenever pressing 3-point quick raise switch or display switch, center display changes from **"C0"** to **"C3"** sequentially
4. When correct number appears on the center display, press and hold 3-point quick lower switch for 3 seconds and more until **"SWOFF"** appears on the center display.
5. When **"SET"** appears on the center display, press and hold 3-point quick lower switch for more than 3 seconds to write calibrated data for 3-point hitch system on ECU (SUB).
   When nothing is trouble, **"OK"** appears on the center display with lighting 3-point indicator.
   When the setting is wrong, **"NG"** appears on the center display with blinking 3-point indicator.

■ **NOTE**
- **If the setting is wrong, turn the main key switch OFF and restart the procedure 1.**

(A) Display (DTC and Assist Cylinder Setting) (B) Display (Set)

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Procedure 4: Ending Self-diagnostic Mode

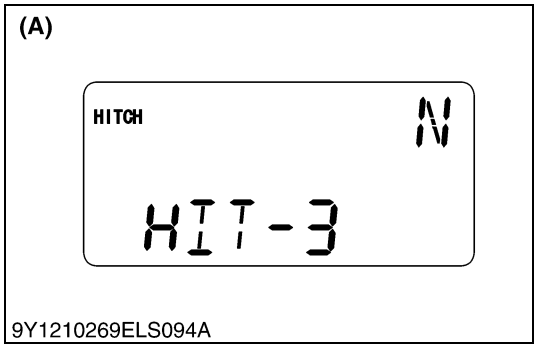
1. After confirming **"OK"** on the center display, turn the main switch key **OFF**.

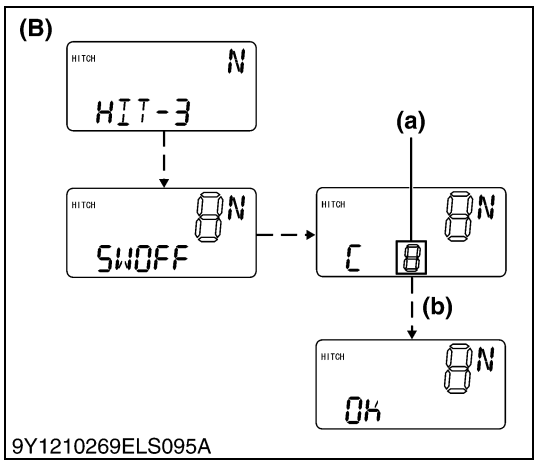
9Y1210447ELS0060US0

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(3) Calibration of Assist Cylinder Number







Procedure 1: Setting Menu and Mode

1. Set the menu **"HIT"**.
   Refer to "OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE ADJUSTING AND EASY CHECKING".
2. Set the mode **"HIT-3"**.
   Refer to "OUTLINE FOR METHOD OF SELF DIAGNOSIS, FINE ADJUSTING AND EASY CHECKING".

■ **NOTE**

- **If the set menu item is wrong, turn the main key switch OFF and restart the procedure 1.**

(1) Display Switch
(2) Engine RPM Dual Memory A/B Indicator Switch

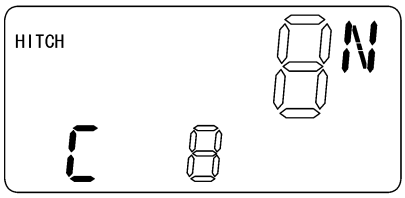
(A) Display (HIT-3)
(B) Flow Chart (HIT-3)

(a) Select Number
(b) Press the 3-Point Lower Switch or Engine RPM Dual Memory A/B Indicator Switch for 3 seconds and more.

9Y1210447ELS0061US0

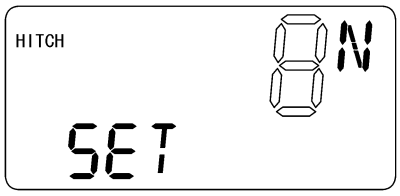
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(A)



9Y1210269ELS096A

(B)



9Y1210269ELS037A

Procedure 2: Setting Number of Assist Cylinder

1. Check the display.
2. The assist cylinder setting appears on the center of display. See the table below.

Center Display	Number of Assist Cylinder	Model
C3	2	M130X

3. Whenever pressing 3-point quick raise switch, center display changes from **"C0"** to **"C3"** sequentially
4. When correct number appears on the center display, press and hold 3-point quick lower switch for 3 seconds and more until **"SWOFF"** appears on the center display.
5. When **"SET"** appears on the center display, press and hold 3-point quick lower switch for more than 3 seconds to write adjusted data on ECU (SUB).
   When nothing is trouble, **"OK"** appears on the center display with lighting 3-point indicator.
   When the setting is wrong, **"NG"** appears on the center display with blinking 3-point indicator.

■ **NOTE**

- **If the setting is wrong, turn the main key switch OFF and carry out the procedure from step 1.**

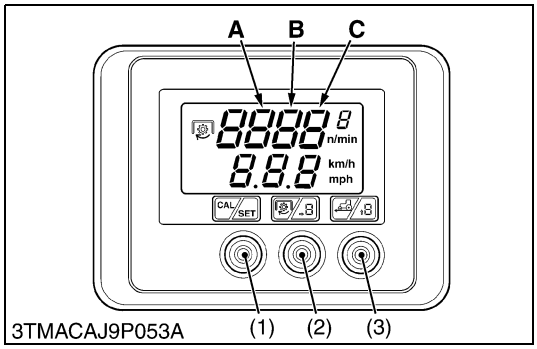
6. After confirming **"OK"** on the center display, turn the main key switch **OFF**.

(A) Display (Assist Cylinder Setting) (B) Display (Set)

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(4) Digital LCD Monitor (Initial Setting)



3TMACAJ9P053A

Entering Travel Speed Coefficient

When different-size tires are optionally put on, the speed is not exactly displayed. Enter a tire perimeter, referring to the chart.

■ **How to enter the tire perimeter (Example: Entering 536 cm)**

1. Turn the main key switch **ON**.
2. Hold down the CAL/SET switch for more than 3 seconds. (The digit of hundreds starts flashing.)
3. Press the travel speed display selector switch to select and display **"5"**.
4. Using the PTO display selector switch, select the digit of tens. (The digit of tens starts flashing.)
5. Press the travel speed display selector switch to select and display **"3"**.
6. Using the PTO display selector switch, select the digit of units. (The digit of units starts flashing.)
7. Press the travel speed display selector switch to select and display **"6"**.
8. Hold down the CAL/SET switch for more than 3 seconds. The digits stop flashing and stay on.

■ **NOTE**

- **If the main key switch is turned "OFF" halfway, the entry will be cancelled.**

[Tire perimeters charts]

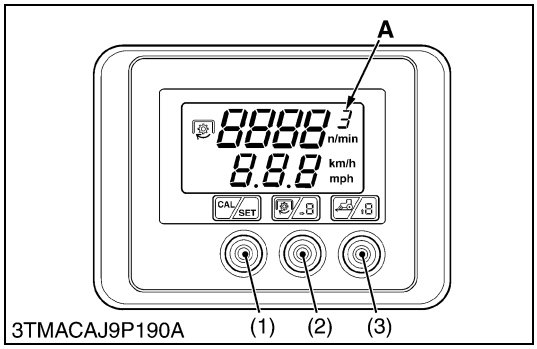
Tractor type	Rear tire size	Entry (cm)
M130X	18.4R38	517
	520/70R38	536

(1) CAL/SET Switch
(2) PTO Display Selector Switch
(3) Travel Speed Display Selector Switch

A: Digit of Hundreds
B: Digit of Tens
C: Digit of Units

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3TMACAJ9P190A

Initial Setting of Tractor Code

Axle ratios are different according to transmission types. For indicating PTO rotation speed correctly, tractor codes are assigned to each tractor model.

■ **How to enter the tractor code**

1. Depress and hold the both CAL/SET switch and PTO display switch and turn the main key switch **ON**.
   Keep holding down the switches until PTO type display appears. The LCD lights up for 0.5 seconds, and PTO type code is displayed.
2. Select the tractor code by press the travel speed display selector switch.
3. Press CAL/SET switch to register the code.
4. Normal display appears and setting is complete.

■ **NOTE**

- **If the main key switch is turned "OFF" halfway, the entry will be cancelled.**
- **When selecting the tractor code, refer to the below table.**
- **Tractor code are "1", "2", "3", "4", "5", "6", "7", "8", "9" "0", "A", "b", "c", "d" and "E".**
- **Choose tractor model and check the PTO specification.**
- **UNIT column "cm" and "inch" means the conversion numerical value of the rear tire perimeter's length.**
  M-X series: "cm" (EU and AUS), "inch" (US and CAN)

(1) CAL/SET Switch
(2) PTO Display Selector Switch
(3) Travel Speed Display Selector Switch

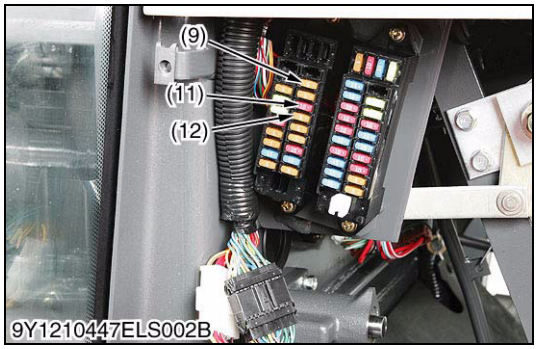
A: Tractor Code

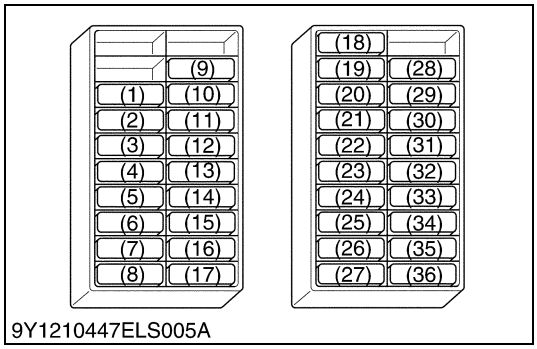
Tractor Code	Model	PTO Speed (min^{-1} (rpm))				Unit	
	M130X	540	540/1000	540/540E	Other	cm	inch
1			❍			❍	
2			❍			❍	
3			❍				❍
4			❍				❍
5		❍		❍		❍	
6				❍		❍	
7			❍				❍
8			❍			❍	
9					❍	❍	
0					❍	❍	
A	❍		❍			❍	
b			❍				❍
c			❍			❍	
d			❍				❍
E	–	–	–	–	–	–	–

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(5) Checking Fuse and Grounding Wire





Fuses

1. Remove the left lower rear bonnet.
2. Check the fuses 5 A for circuit line (9) and 5 A for load line (11) related to power shift inside the fuse box and the fuse 5 A of the meter panel (12).
3. If any of the fuses is blown, replace it with the one having same capacity.

■ **IMPORTANT**

- **If a fuse is blown, check the cause and be sure to replace it with the one having same capacity.**

(9) Fuse (5 A) Power Source for Circuit Line (12) Meter Panel Fuse (5 A)
(11) Fuse (5 A) Power Source for Load Line

(To be continued)

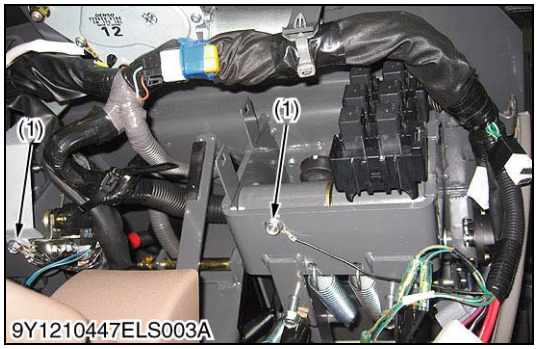
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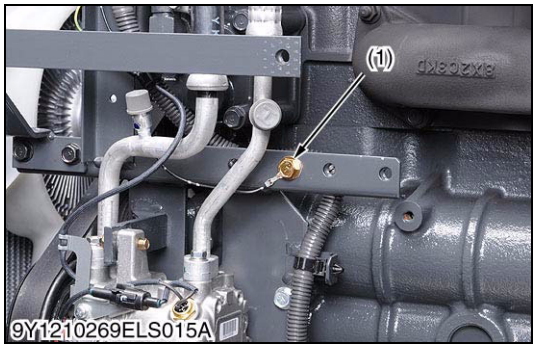
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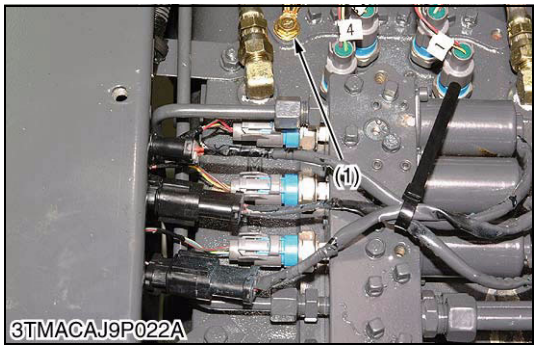
Fuse No.	Capacity (A)	Protected Circuit
(1)	5	ECU (SW)
(2)	20	Defogger (Side)
(3)	20	Defogger (Rear)
(4)	10	Brake Lamp
(5)	5	Radio
(6)	5	Air Conditioner (Fan Control)
(7)	15	Wiper
(8)	5	Starter Relay
(9)	5	Switch (Transmission Control)
(10)	5	Switch (Hitch Control)
(11)	10	ECU (Main)
(12)	5	Panel
(13)	5	4WD, Bi-speed, Differential Lock
(14)	5	Engine Control, PTO Valve
(15)	10	Turn Signal
(16)	15	Loader Power Auxiliary Socket
(17)	5	Display
(18)	15	Work Light (Front Outside)
(19)	15	Work Light (Front Inside)
(20)	10	Head Lamp (Left)
(21)	10	Head Lamp (Right)
(22)	10	Option Lamp
(23)	15	Work Light (Rear)
(24)	10	Work Light (Front Side)
(25)	15	Seat Compressor
(26)	15	Cigarette Lighter
(27)	15	Work Light (Option)
(28)	20	Air Conditioner Fan Motor (Left)
(29)	20	Air Conditioner Fan Motor (Right)
(30)	10	Air Conditioner Compressor
(31)	15	Tail Lamp Spot Light
(32)	15	Hazard
(33)	10	Dome Light Radio
(34)	10	Horn
(35)	5	Glow Relay
(36)	5	Back Up (ECU, Meter)

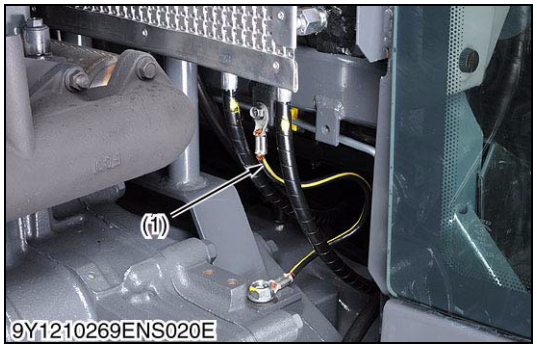
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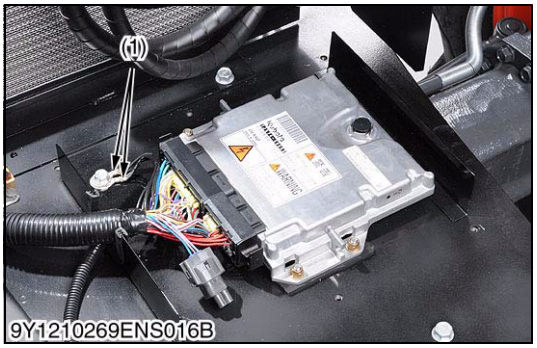


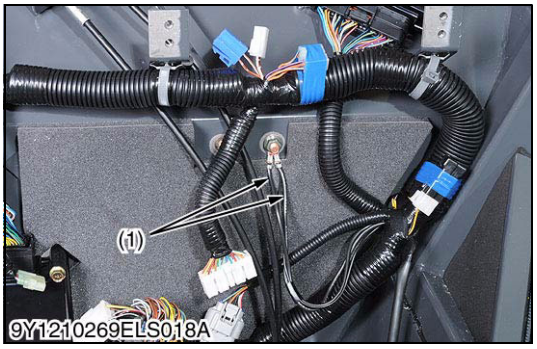


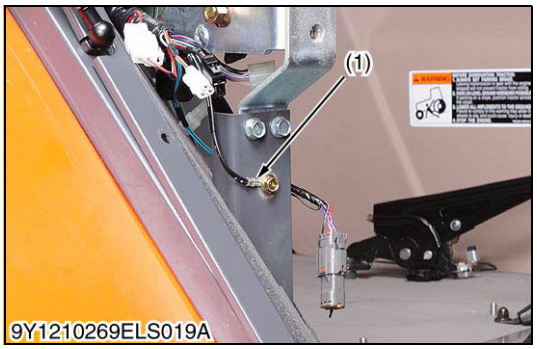


Checking Grounding Wire

1. Check the whether the grounding wire (1) is connected securely to the tractor chassis.
2. If the grounding wire is broken or disconnected, replace it.





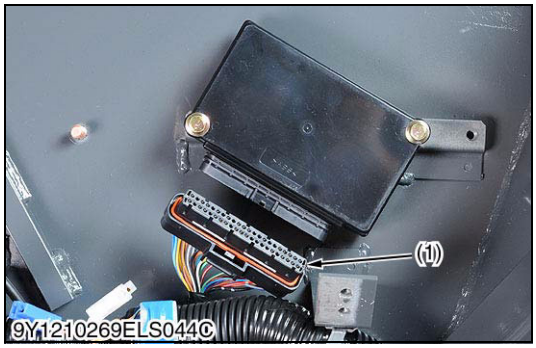


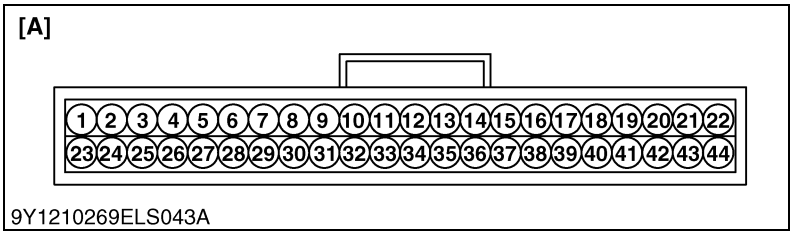
(1) Grounding Wire

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(6) Arrangement of ECU Connector Pin (3-point Hitch)





(1) CNT-B Connector **[A] 44P Connector**

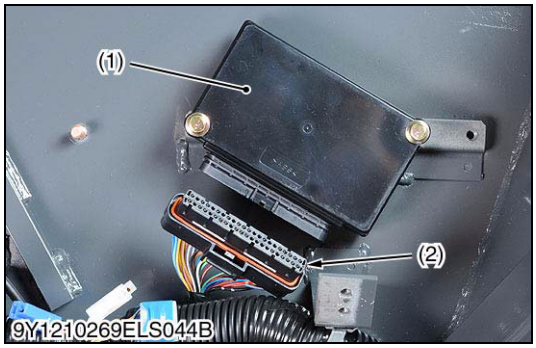
Connector B

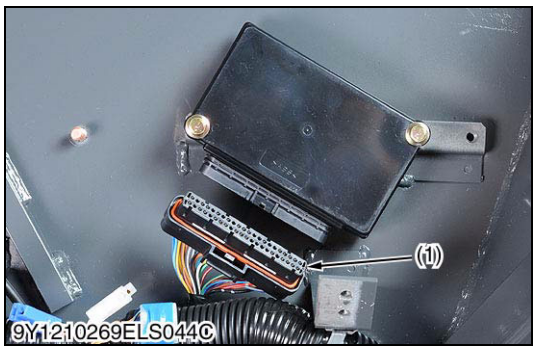
Terminal No.	Terminal Name "A"	Color or wiring	Terminal No.	Terminal Name "A"	Color or wiring
B1	DHC Switch	Gy/L	**B23**	GND	B
B2	Constant RPM Management Control Switch	Br	**B24**	Front Suspension Lock Switch (Option)	Or/L
B3	Front Suspension Auto Switch (Option)	Y/B	**B25**	+12 V (Power Source from Key Switch)	R/L
B4	Front Suspension Attenuation Soft Switch (Option)	Or/B	**B26**	Front Suspension Attenuation Hard Switch (Option)	Or/W
B5	Blank	–	**B27**	Auto-mode Switch (Field)	L/R
B6	PTO Switch	G/Or	**B28**	Blank	–
B7	Blank	–	**B29**	Blank	–
B8	Blank	–	**B30**	Front Suspension Attenuation Normal Switch (Option)	B/L
B9	Blank	–	**B31**	Blank	–
B10	Blank	–	**B32**	Blank	–
B11	3-points Hitch Lowering Speed Adjustment Dial	Y/B	**B33**	+5 V (Power Source from Sensor Line)	R/W
B12	Auto Mode Sensitivity Adjustment Dial	W/L	**B34**	Lift Arm Top Adjustment Dial	Lg
B13	Draft Ratio Adjustment Dial	Or/G	**B35**	GND (Sensor Line)	B/W
B14	Blank	–	**B36**	Blank	–
B15	Seat Switch	B/R	**B37**	Auto-mode Switch	L/G
B16	Auto-mode Switch (Travel)	L/Y	**B38**	Blank	–
B17	Mode Selector Switch	Gy/W	**B39**	Mode Selector Switch	Gy
B18	Blank	–	**B40**	Blank	–
B19	3-point Hitch Quick Raise / Lower Switch (Up)	Br/Y	**B41**	3-point Hitch Quick Raise / Lower Switch (Down)	Br
B20	Remote Hitch Down Switch	Y/R	**B42**	Remote Hitch Up Switch	Y
B21	Blank	–	**B43**	Blank	–
B22	CAN (H)-(1)	B	**B44**	CAN (L)-(1)	L

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(7) Checking Switch and Sensor by Electric Control Unit (ECU)





Checking Connectors

1. Disconnect the connectors and check the terminals for stain and deformation.
2. Check the cables for damage and the terminals for come-off.
3. If there is anything unusual, repair or replace as required.

■ **IMPORTANT**

- **Finally make sure all the connectors are tight in position.**

(1) 3-point Hitch Control Unit (2) **CNT-B** Connector

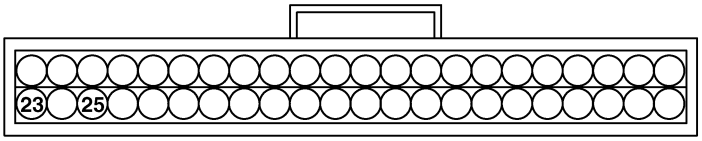
9Y1210269ELS0082US0

Battery Voltage

1. Remove the **CNT-B** connector (1).
2. Turn the main key switch **ON**.
3. Check the voltage between connector terminal **B25** (+) (Red/Blue) and terminal **B23** (−) (Black).
4. It is OK, if the voltage is equal to the battery voltage.

Voltage	Terminal **B25** – **B23**	Approx. battery voltage

[A]

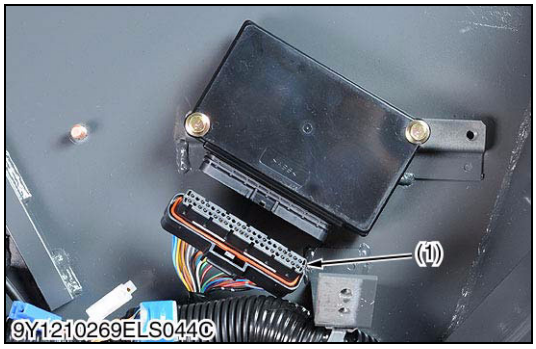


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(1) **CNT-B** Connector **[A] CNT-B**

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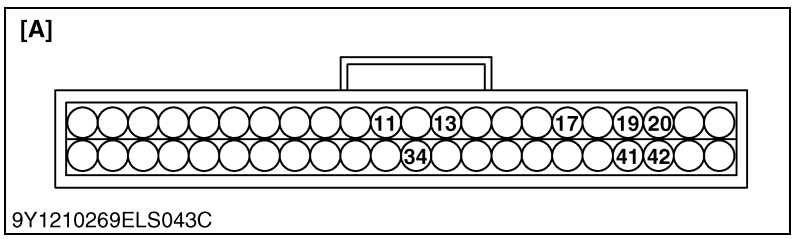


Sensor and Switch Output Voltage

1. Remove the **CNT-B** connector (1). (Do not disconnect the **CNT-A** connector.)
2. Turn the main key switch **ON**. (Do not start the engine.)
3. Check the voltage between terminals of the wire harness side which are shown in the table below and chassis.

Item	Measuring terminal		Position	Voltage (V)
	Terminal No.	Wiring color		
Mode Selector Switch	**B17**	Gy/W	Position	0
			Draft	12
3-Point Hitch Quick Raise/Lower Switch (Up)	**B19**	Br/Y	OFF	0
			ON	12
3-Point Hitch Quick Raise/Lower Switch (Down)	**B41**	Br	OFF	0
			ON	12
Draft Ratio Adjustment Dial	**B13**	Or/G	~ (Left end)	0.5
			· (Center)	2.5
			~~ (Right end)	4.5
Lift Arm Top Limit Adjustment Dial	**B34**	Lg	Low	0.5
			High	2.5
3-point Hitch Lowering Speed Adjustment Dial	**B11**	Y/B	Slow	0.5
			Fast	4.5
Remote Hitch Up/Down Switch (Up)	**B42**	Y	OFF	0
			ON	12
Remote Hitch Up/Down Switch (Down)	**B20**	Y/R	OFF	0
			ON	12

* The reference voltages in the above table may be slightly different from the actual measurement.

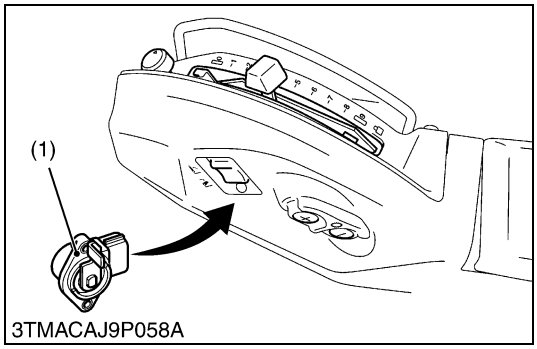


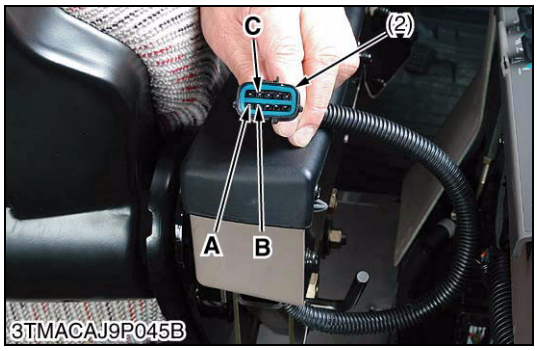
(1) **CNT-B** Connector **[A] CNT-B**

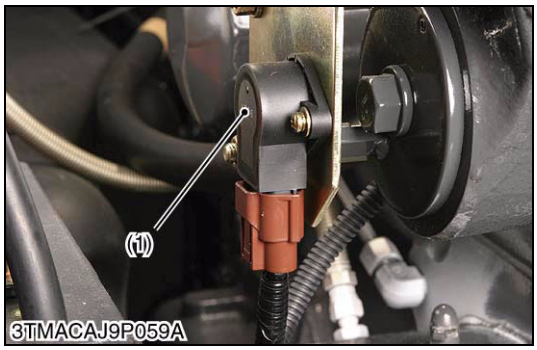
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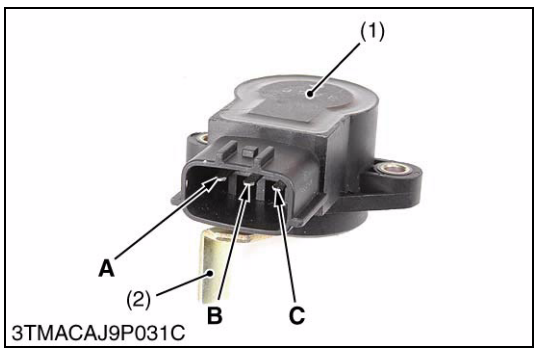
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(8) Checking Sensor









Position Lever Sensor

1. Disconnect the **10P** connector (2).
2. Measure the resistance between terminal **A** and **C**.
3. Then, check resistance between terminal **A** and **B** while slowly turning the sensor shaft.
4. It is OK, if the resistance value is approximate to the value shown in the table below.

(Reference)

- The change of resistance can be checked easily when an analog tester is employed.

Resistance	Terminal **A** – Terminal **C**	1.6 to 2.4 kΩ
	Terminal **A** – Terminal **B**	Resistance is normal if smoothly changing

(1) Position Lever Sensor
(2) **10P** Connector

A: Terminal A
B: Terminal B
C: Terminal C

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Lift Arm Sensor

1. Measure the resistance between terminal **A** and **C**.
2. Then, check resistance between terminal **A** and **B** while slowly turning the sensor lever (2).
3. It is OK, if the resistance value is approximate to the value shown in the table below.

(Reference)

- The change of resistance can be checked easily when an analog tester is employed.

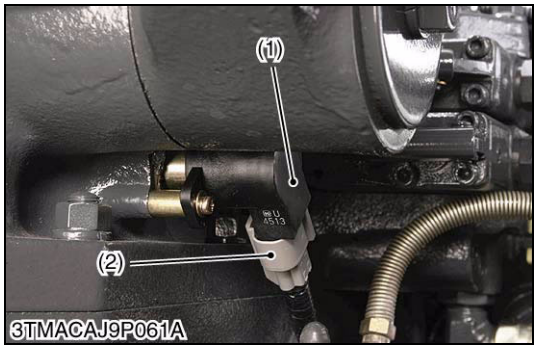
Resistance	Terminal **A** – Terminal **C**	1.6 to 2.4 kΩ
	Terminal **A** – Terminal **B**	Resistance is normal if smoothly changing

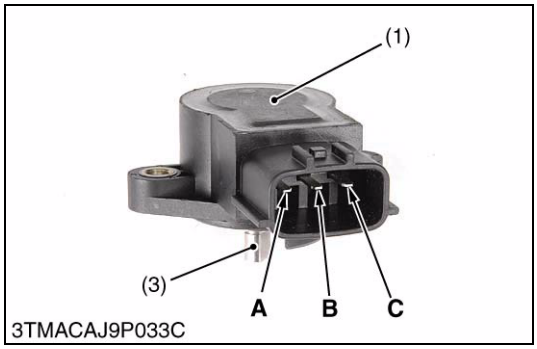
(1) Lift Arm Sensor
(2) Sensor Lever

A: Terminal A
B: Terminal B
C: Terminal C

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Draft Sensor

1. Disconnect the connector (2) and remove the draft sensor (1).
2. Measure the resistance between terminal **A** and **C**.
3. Then, check resistance between terminal **A** and **B** while slowly turning the sensor shaft.
4. It is OK, if the resistance value is approximate to the value shown in the table below.

(Reference)

- The change of resistance can be checked easily when an analog tester is employed.

Resistance	Terminal **A** – Terminal **C**	1.6 to 2.4 kΩ
	Terminal **A** – Terminal **B**	Resistance is normal if smoothly changing

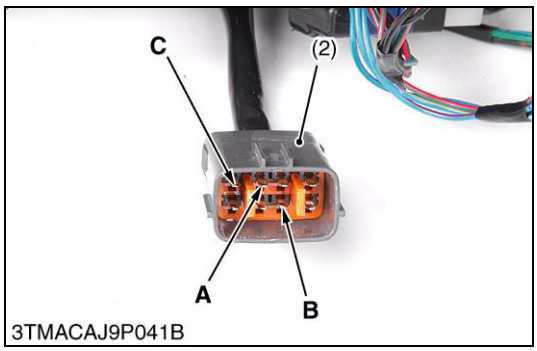
(1) Draft Sensor
(2) Connector
(3) Sensor Shaft

A: Terminal A
B: Terminal B
C: Terminal C

9Y1210269ELS0091US0

(9) Checking Adjustment Dial





3-point Hitch Lowering Speed Adjustment Dial

1. Remove the panel (3) and disconnect the **8P** connector (2).
2. Measure the resistance between terminal **A** and **C**.
3. Then, check resistance between terminal **A** and **B** while slowly turning the sensor shaft.
4. It is OK, if the resistance value is approximate to the value shown in the table below.

(Reference)

- The change of resistance can be checked easily when an analog tester is employed.

Resistance	Terminal **A** – Terminal **C**	1.6 to 2.4 kΩ
	Terminal **A** – Terminal **B**	Resistance is normal if smoothly changing

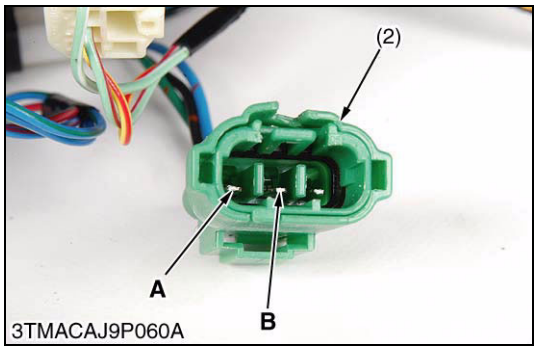
(1) 3-point Hitch Lowering Speed Adjustment Dial
(2) **8P** Connector
(3) Panel

A: Terminal A
B: Terminal B
C: Terminal C

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Mode Switch

1. Remove the panel (3) and disconnect the **3P** connector (2).
2. Check the continuity between connector terminal as shown in table below.
3. If the switch is defective, replace it.

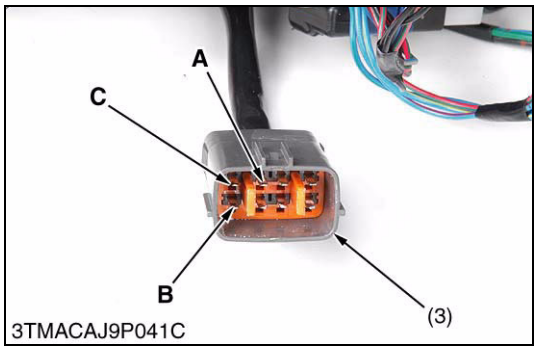
Item	Terminal No.	Position	Resistance
Mode Switch	Terminal **A** – Terminal **B**	Position	Infinity
	Terminal **A** – Terminal **B**	Draft	0 Ω

(1) Mode Switch
(2) Mode Switch Connector
(3) Panel

A: Terminal A
B: Terminal B

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Lift Arm Top Limit Adjustment Dial

1. Remove the panel (2) and disconnect the connector (3).
2. Measure the resistance between terminal **A** and **C**.
3. Then, check resistance between terminal **A** and **B** while slowly turning the sensor shaft.
4. It is OK, if the resistance value is approximate to the value shown in the table below.

(Reference)

- The change of resistance can be checked easily when an analog tester is employed.

Resistance	Terminal **A** – Terminal **C**	1.6 to 2.4 kΩ
	Terminal **A** – Terminal **B**	Resistance is normal if smoothly changing

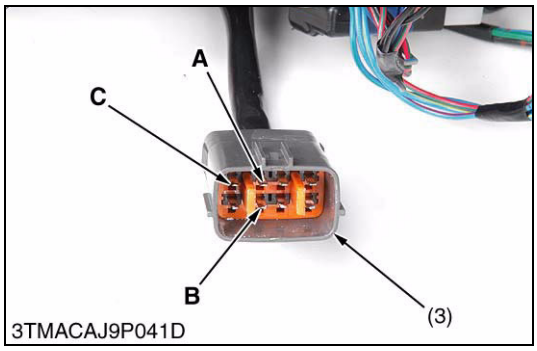
(1) Lift Arm Top Limit Adjustment Dial
(2) Panel
(3) Connector

A: Terminal A
B: Terminal B
C: Terminal C

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Draft Ratio Adjustment Dial

1. Remove the panel (2) and disconnect the connector (3).
2. Measure the resistance between terminal **A** and **C**.
3. Then, check resistance between terminal **A** and **B** while slowly turning the sensor shaft.
4. It is OK, if the resistance value is approximate to the value shown in the table below.

(Reference)

- The change of resistance can be checked easily when an analog tester is employed.

Resistance	Terminal **A** – Terminal **C**	1.6 to 2.4 kΩ
	Terminal **A** – Terminal **B**	Resistance is normal if smoothly changing

(1) Draft Ratio Adjustment Dial
(2) Panel
(3) Connector

A: Terminal A
B: Terminal B
C: Terminal C

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[5] CHECKING AND ADJUSTING (OTHERS)

CAUTION

- **To avoid accidental short circuit, be sure to attach the positive cable to the positive terminal before the negative cable is attached to the negative terminal.**
- **Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash it away completely with water immediately.**
- **Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.**

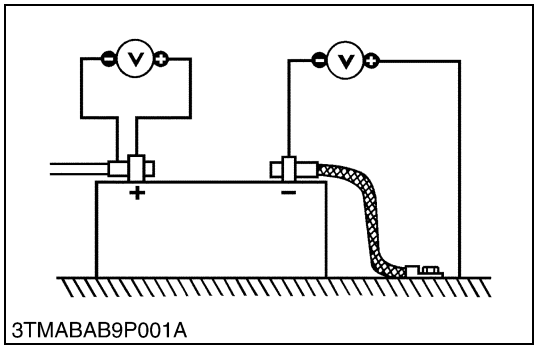
IMPORTANT

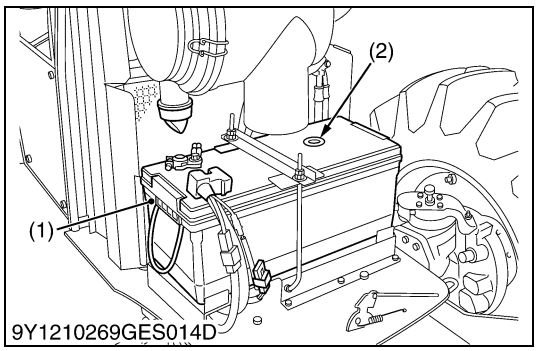
- **If the machine is to be operated for a short time without battery (using a slave battery for starting), use additional current (lights) while engine is running and insulate terminal of battery. If this advice is disregarded, damage to alternator and regulator may result.**
- **Insulate terminal of battery. If this advice is disregarded, damage to alternator and regulator may result.**

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(1) Battery







Battery Voltage

1. Turn the main key switch **OFF**.
2. Connect the COM (−) lead of the voltmeter to the battery's negative terminal post and the (+) lead to the positive terminal post, and measure the battery voltage.
3. If the battery voltage is less than the factory specification, check the battery specific gravity and recharge the battery.

Battery voltage	Factory specification	More than 12 V

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Battery Terminal Connection

1. Turn the main key switch **ON**, and turn the head light **ON**.
2. Measure the voltage with a voltmeter across the battery's positive terminal post and the cable terminal, and the voltage across the battery's negative terminal post and the chassis.
3. If the measurement exceeds the factory specification, clean the battery terminal posts and cable clamps, and tighten them firmly.

Potential difference	Factory specification	Less than 0.1 V

9Y1210447ELS0067US0

Checking Battery Condition

1. Check the battery condition by reading the indicator (2).

Color of Indicator	State of indicator display
Green	Specific gravity of electrolyte and quality of electrolyte are both in good condition.
Black	Needs charging battery.
White	Needs changing battery.

(1) Battery (2) Indicator

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Recharging Battery

CAUTION

- **When the battery is being activated, hydrogen and oxygen gases in the battery are extremely explosive. Keep open sparks and flames away from the battery at all times, especially when charging the battery.**
- **When charging battery, remove battery vent plugs.**
- **When disconnecting the cable from the battery, start with the negative terminal first. When connecting the cable to the battery, start with the positive terminal first.**
- **Never check battery charge by placing a metal object across the posts.**
- **Use a voltmeter or hydrometer.**

1. To slow charge the battery, connect the battery positive terminal to the charger positive terminal and the negative to the negative, then recharge in the standard fashion.
2. A boost charge is only for emergencies. It will partially charge the battery at a high rate and in a short time.
   When using a boost-charged battery, it is necessary to recharge the battery as early as possible.
   Failure to do this will shorten the battery's service life.
3. The battery is charged if the indicator display turns green from black.
4. When exchanging an old battery into new one, use battery of equal specification shown in table below.

Battery type	Volts (V)	Capacity at 20H.R (A.H)	Reserve capacity (min)	Cold Cranking Amps (SAE)	Normal Charging Rate (A)
180G51	12	160	300	1090	8

9Y1210447ELS0068US0

Directions for Storage

1. When shutting down the tractor for long periods of time, remove the battery from the tractor, adjust the electrolyte to the proper level, and after fully charging, store the battery in a well ventilated placed where it is not exposed to direct sunlight.
2. Since the battery self-discharges by approx. 0.5 % per day even in storage, it must be charged once every two months in cold season.
3. When storing the battery mounted on the tractor, disconnect the ground cable from the battery's negative terminal post.

(Reference)

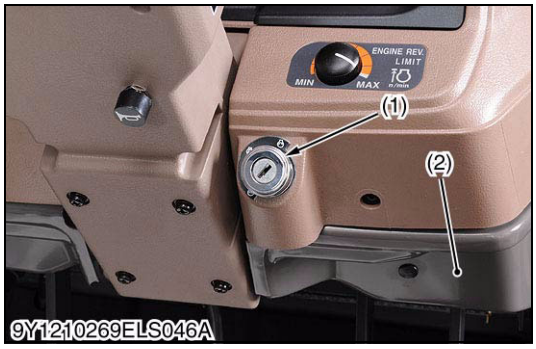
- Self-discharge Rate.

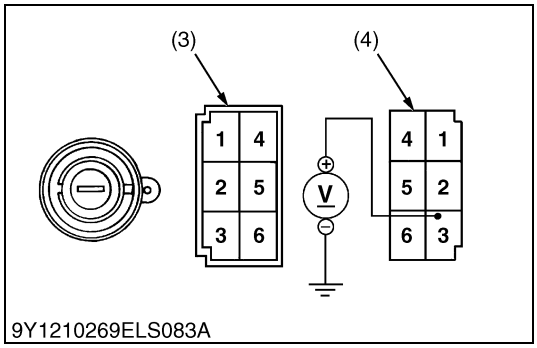
Temperature	Self-discharge rate
30 °C (86 °F)	Approx. 1.0 % per day
20 °C (68 °F)	Approx. 0.5 % per day
10 °C (50 °F)	Approx. 0.25 % per day

9Y1210269ELS0102US0

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(2) Main Key Switch





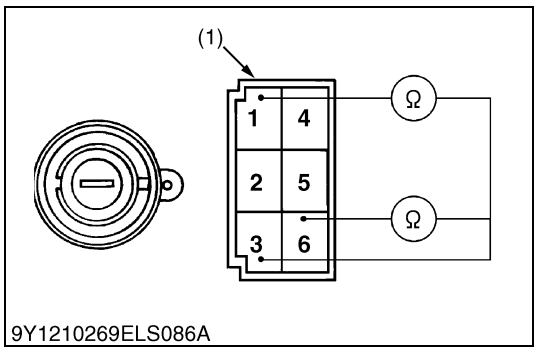
Connector Voltage

1. Remove the rear bonnet R.H. (2).
2. Disconnect the main key switch connector after turning the main key switch **OFF**.
3. Measure the voltage with a voltmeter across the connector terminal **3** and chassis.
4. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness is faulty.

Voltage	Connector terminal **3** – Chassis	Approx. battery voltage

(1) Main Key Switch
(2) Rear Bonnet R.H.
(3) Main Key Switch (Switch Side)
(4) Main Key Switch Connector (Wire Harness Side)

9Y1210447ELS0069US0



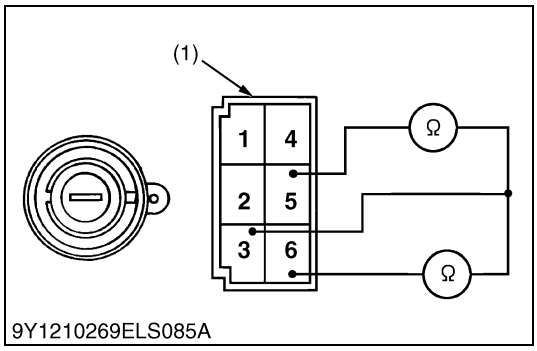
Main Key Switch at ON Position

1. Turn and hold the main key switch at **ON** position.
2. Measure the resistance with an ohmmeter across the terminal **3** and the terminal **1**, and across the terminal **3** and the terminal **6**.
3. If 0 ohm is not indicated, these contacts of the main key switch are faulty.

Resistance	Terminal **3** – Terminal **1**	0 Ω
	Terminal **3** – Terminal **6**	0 Ω

(1) Main Key Switch Connector

9Y1210447ELS0070US0



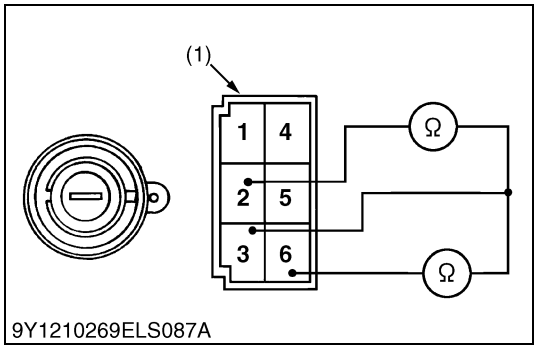
Main Key Switch at START Position

1. Turn and hold the main key switch at the **START** position.
2. Measure the resistance with an ohmmeter across the terminal **3** and the terminal **5**, and across the terminal **3** and the terminal **6**.
3. If 0 ohm is not indicated, these contacts of the main key switch are faulty.

Resistance	Terminal **3** – Terminal **5**	0 Ω
	Terminal **3** – Terminal **6**	0 Ω

(1) Main Key Switch Connector

9Y1210447ELS0071US0



Main Key Switch at PREHEAT Position

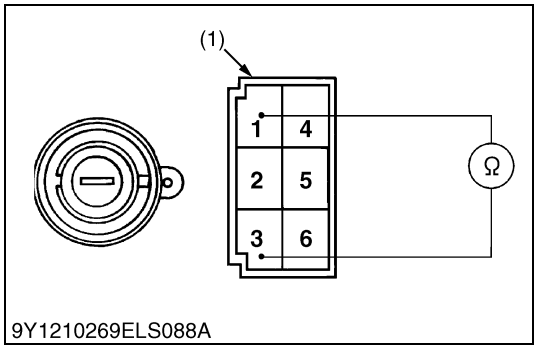
1. Turn and hold the main key switch at the **PREHEAT** position.
2. Measure the resistance with an ohmmeter across the terminal **3** and the terminal **2**, and across the terminal **3** and the terminal **6**.
3. If 0 ohm is not indicated, these contacts of the main key switch are faulty.

Resistance	Terminal **3** – Terminal **2**	0 Ω
	Terminal **3** – Terminal **6**	0 Ω

(1) Main Key Switch Connector

9Y1210447ELS0072US0

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9Y1210269ELS088A

Main Key Switch at ACC Position

1. Turn and hold the main key switch key at the **ACC** position.
2. Measure the resistance with an ohmmeter across the terminal **3** and the terminal **1**.
3. If 0 ohm is not indicated, these contacts of the main key switch are faulty.

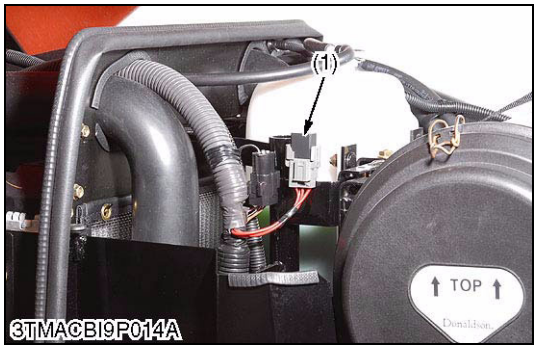
Resistance	Terminal **3** – Terminal **1**	0 Ω

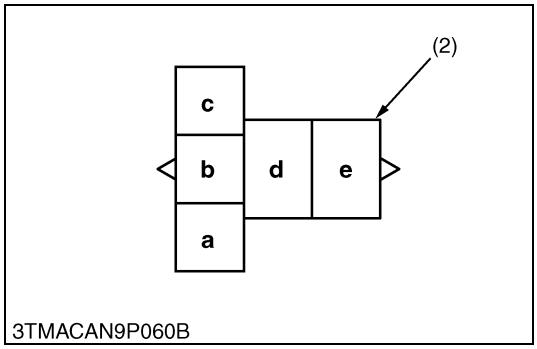
(1) Main Key Switch Connector

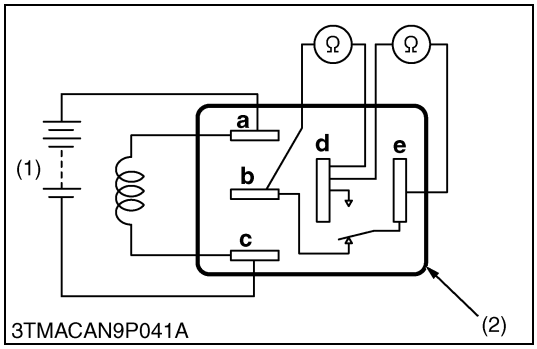
9Y1210447ELS0092US0

https://truckmanualshub.com/

(3) CRS Power Relay







Checking Connector Voltage

1. Measure the voltage with a voltmeter across the battery terminal and chassis as table below.
2. If the voltage differs from the battery voltage, the wiring harness or fuse is faulty.

Voltage	Terminal **e** – Chassis	Approx. battery voltage

(1) CRS Power Relay (2) Connector (Wire Harness)

9Y1210269ELS0162US0

Functional Check

■ **NOTE**

- **The relays described here are the same ones so that these are interchangeable.**

1. Supply battery voltage across the terminals **a** and **c**, and check for continuity across the terminals **d** and **e**.
2. If continuity is not established across terminals **d** and **e**, replace it.

Position	Terminal		
	b	**d**	**e**
At 0 voltage between terminal **a** and **c**	●		●
At battery voltage between terminal **a** and **c**		●	●

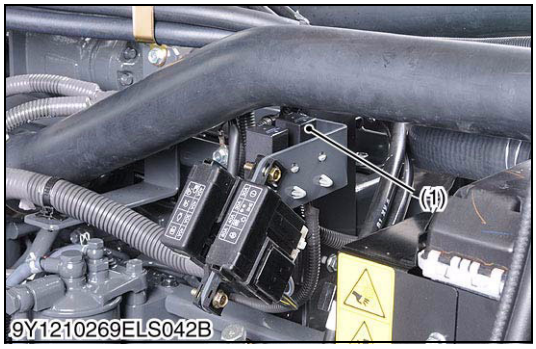
9Y1210447ELS016US

(1) Battery (2) Connector (Relay)

9Y1210447ELS0073US0

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(4) Glow Relay and Glow Plug



Checking Connector Voltage

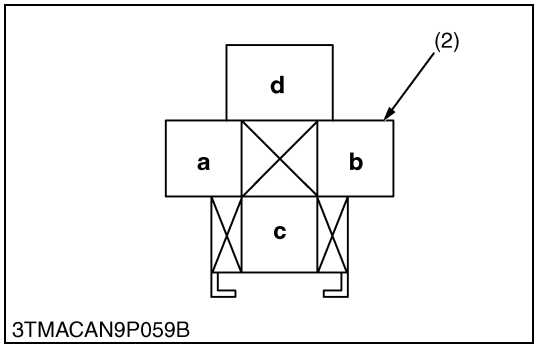
1. Measure the voltage with a voltmeter across the battery terminal and chassis as table below.
2. If the voltage differs from the battery voltage, the wiring harness, or fuse is faulty.

Voltage	Terminal **d** – Chassis	Approx. battery voltage

(1) Glow Relay
(2) Connector (Wire Harness)

a: Terminal a
b: Terminal b
c: Terminal c
d: Terminal d

9Y1210269ELS0190US0

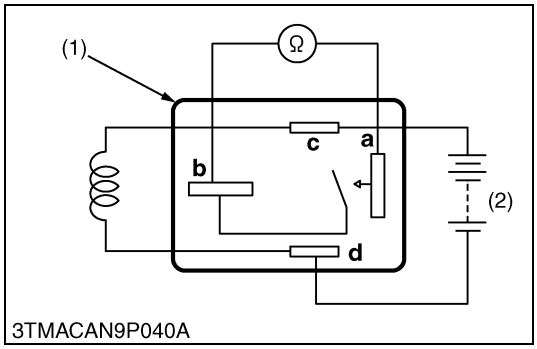


Functional Check

■ **NOTE**

- **The relays described here are the same ones so that these are interchangeable.**

1. Supply battery voltage across the terminal **c** and **d**, and check for continuity across the terminal **a** and terminal **b**.
2. If continuity is not established across the terminal **a** and **b**, replace it.

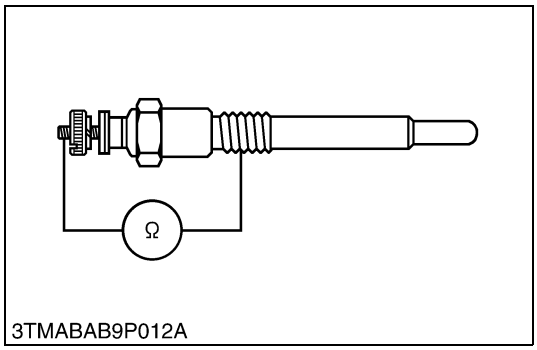


(1) Connector (Relay) (2) Battery

9Y1210447ELS0074US0

Glow Plug

1. Disconnect the leads from the glow plugs.
2. Measure the resistance with an ohmmeter across the glow plug terminal and chassis.
3. If 0 Ω is indicated, the screw at the tip of the glow plug and the housing are short-circuited.
4. Measure the resistance with an ohmmeter across the glow plug terminal and chassis.

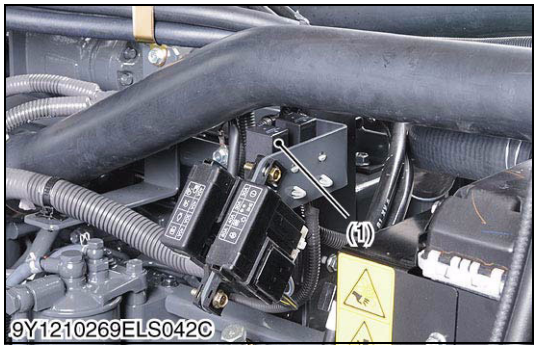


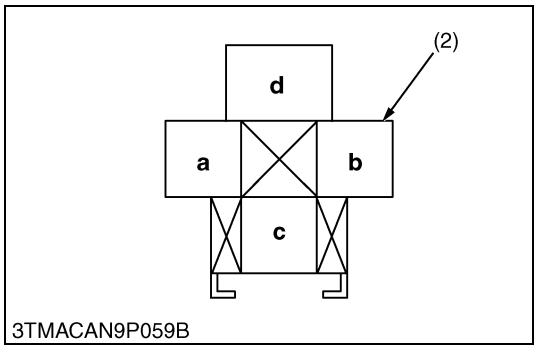
Glow plug resistance	Factory specification	Approx. 0.95 Ω

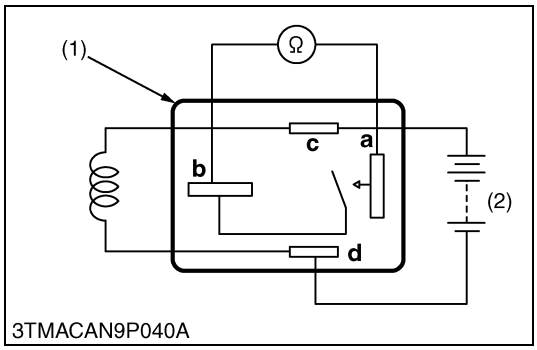
9Y1210269ELS0183US0

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(5) Starter Relay







Checking Connector Voltage

1. Measure the voltage with a voltmeter across the battery terminal and chassis as table below.
2. If the voltage differs from the battery voltage, the wiring harness, or fuse is faulty.

Voltage	Terminal **d** – Chassis	Approx. battery voltage

(1) Starter Relay
(2) Connector (Wire Harness)

a: Terminal a
b: Terminal b
c: Terminal c
d: Terminal d

9Y1210447ELS0012US0

Functional Check

■ **NOTE**

- **The relays described here are the same ones so that these are interchangeable.**

1. Supply battery voltage across the terminal **c** and **d**, and check for continuity across the terminal **a** and terminal **b**.
2. If continuity is not established across the terminal **a** and **b**, replace it.

(1) Connector (Relay)
(2) Battery

9Y1210447ELS0075US0

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(6) Starter Motor



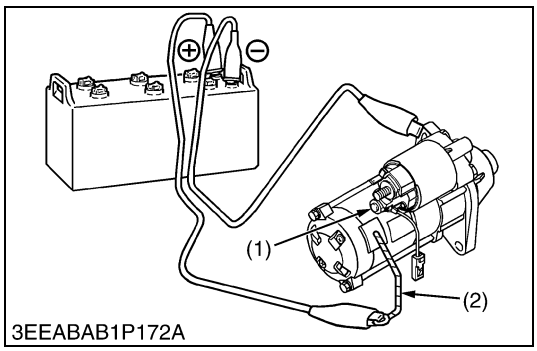
Starter Motor B Terminal Voltage

1. Measure the voltage with a voltmeter across the terminal **B** and chassis.
2. If the voltage differs from the battery voltage, the battery positive cable or the battery negative cable is faulty.

Voltage	Factory specification	Approx. battery voltage

(1) Terminal **B**

9Y1210269ELS0184US0



Motor Test

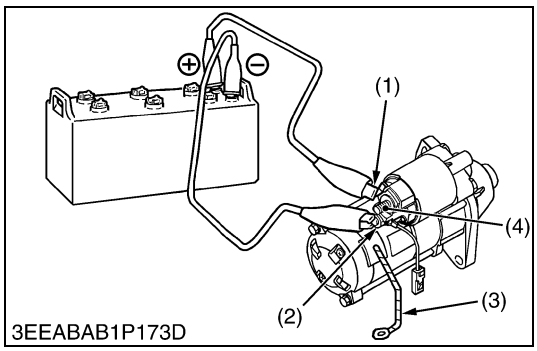
CAUTION

- **Secure the starter to prevent it from jumping up and down while testing the motor.**

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter terminal **C** (1).
3. Remove the starter from the engine.
4. Disconnect the connecting lead (2) from the starter terminal **C** (1).
5. Connect a jumper lead from the connecting lead (2) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter motor housing and the battery negative terminal post.
7. If the motor does not run, check the motor.

(1) Terminal **C** (2) Connecting Lead

9Y1210269ELS0185US0



Magnet Switch Test

1. Disconnect the battery negative cable from the battery.
2. Disconnect the battery positive cable and the leads from the starter terminal **B** (4).
3. Remove the starter from the engine.
4. Disconnect the connecting lead (3) from the starter terminal **C** (2).
5. Connect a jumper lead from the starter terminal **S** (1) to the battery positive terminal post.
6. Connect a jumper lead momentarily between the starter terminal **C** (2) and the battery negative terminal post.
7. If the pinion gear does not pop out, check the magnetic switch.

NOTE

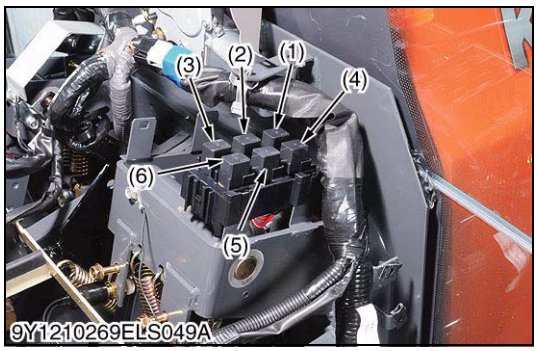
- **This test should be carried out for a short time, about 3 to 5 seconds.**

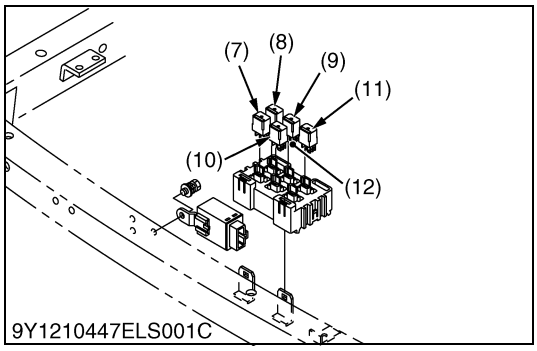
(1) Terminal **S** (3) Connecting Lead
(2) Terminal **C** (4) Terminal **B**

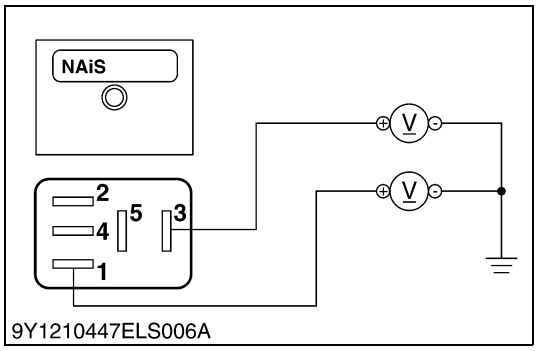
9Y1210269ELS0186US0

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(7) Other Relays







Checking Connector Voltage

1. Remove the relative relays.
2. Turn the main key switch **ON**.
3. Measure the voltage across terminal **4** and chassis, and across terminal **1** and chassis.
4. If the voltage differs from the battery voltage, the wiring harness is faulty.

Voltage	Across terminal **4** – chassis	Approx. battery voltage
	Across terminal **1** – chassis	Approx. battery voltage

(1) Front Work Lamp Relay
(2) Auxiliary Power Relay
(3) Working Light Relay (DEF/B Relay)
(4) PTO Relay
(5) ACC Relay
(6) Head Light Relay
(7) Blower Relay R.H.
(8) Blower Hi Relay R.H.
(9) Compressor Relay
(10) Blower Relay L.H.
(11) Blower Hi Relay L.H.
(12) 4WD / Bi-speed Relay

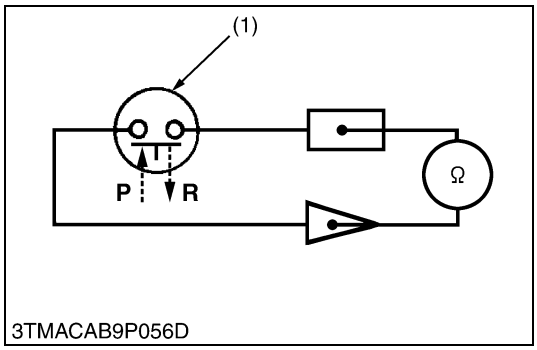
9Y1210447ELS0013US0

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(8) OPC (Operator Presence Control) System



3TMACAJ9P092A



3TMACAB9P056D

Checking OPC System

1. Sit on the seat.
2. Turn the main key switch **ON**.
3. Shift the PTO clutch control switch to **"ON"**. Make sure the warning buzzer does not whistle.
4. Stand up from the seat.
5. The warning buzzer whistles about one second after standing up. It whistles for 10 seconds.

(1) Seat Switch (2) Connector

9Y1210447ELS0076US0

Checking Seat Switch

1. Disconnect the connector from the cabin wire harness.
2. Check the continuity with an ohmmeter across the switch terminals.
3. If it does not conduct or any value is indicated when the switch is pushed (**ON** seat), the switch is faulty.
4. If infinity is not indicated when the switch is released (**OFF** seat), the switch is faulty.

Resistance (Across switch terminals)	Reference value	When switch is pushed (**P**)	0 Ω
		When switch is released (**R**)	Infinity

(1) Seat Switch

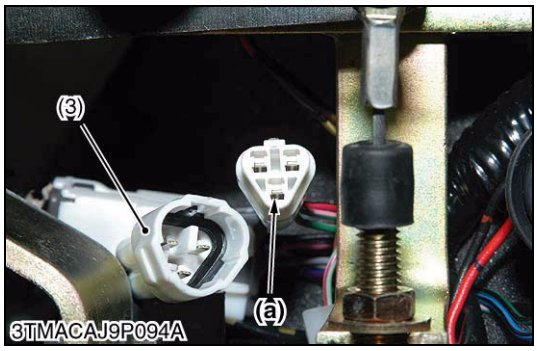
P: Pushed
R: Released

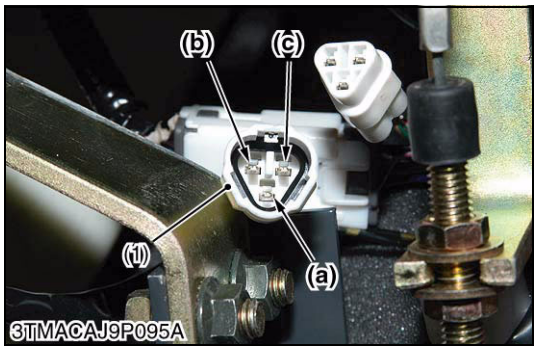
9Y1210269ELS0117US0

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(9) PTO Switch







Checking Connector Voltage

1. Remove the cover (2).
2. Remove PTO switch connector (3).
3. Turn the main key switch **ON**.
4. Measure the voltage across terminal **2** and chassis.
5. If the voltage differs from battery voltage, the wiring harness, fuse, or main key switch is faulty.

Voltage	Terminal **2** – chassis	Approx. battery voltage

(1) PTO Switch
(2) Cover
(3) PTO Switch Connector

(a) Terminal 2

9Y1210447ELS0077US0

Checking PTO Switch

1. Remove the PTO switch connector (1).
2. Check the continuity with an ohmmeter across the terminal **1** and terminal **2**, and terminal **2** and terminal **3**.
3. If it does not conduct or any value is indicated when PTO switch is pushed, PTO switch is faulty.
4. If infinity is not indicated when PTO switch is released, PTO switch is faulty.

Position	Terminal 1 – terminal 2	Terminal 2 – terminal 3
OFF	0 Ω	Infinity
ON	Infinity	0 Ω

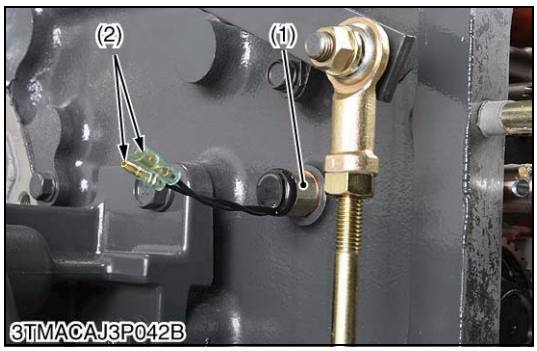
(1) PTO Switch Connector

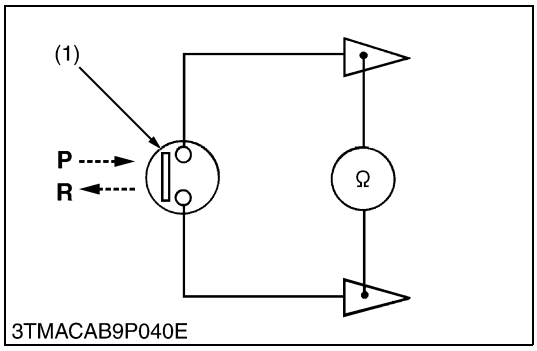
(a) Terminal 2
(b) Terminal 1
(c) Terminal 3

9Y1210447ELS0078US0

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(10) Neutral Safety Switch





Checking Neutral Safety Switch

1. Disconnect the **1P** connectors and remove the neutral safety switch (1).
2. Check the continuity with an ohmmeter across the **1P** connectors (2).
3. If it does not conduct or any value is indicated when the neutral safety switch (1) is pushed, the switch is faulty.
4. If infinity is not indicated when the neutral safety switch (1) is released, the switch is faulty.

Resistance (Across the **1P** connector)	When switch is pushed **"P"**	0 Ω
	When switch is released **"R"**	Infinity

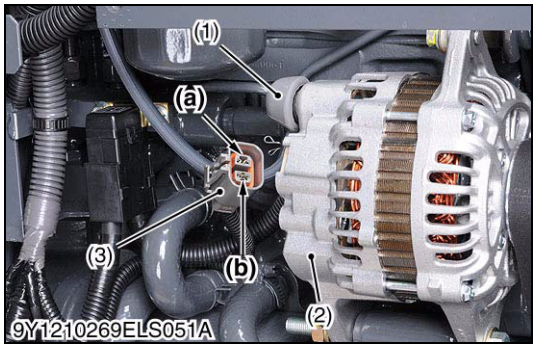
(1) Neutral Safety Switch
(2) **1P** Connector

P: Pushed
R: Released

9Y1210447ELS0079US0

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(11) Alternator



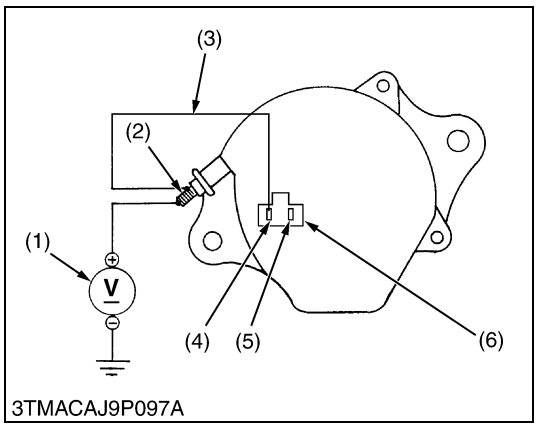
Checking Connector Voltage

1. Disconnect the **2P** connector (3) from alternator after turning the main key switch **OFF**.
2. Turn the main key switch **OFF**. Measure the voltage between the terminal **B** (1) and the chassis.
3. Measure the voltage between the terminal **S (a)** and the chassis.

Voltage	Across terminal **B** – chassis	Approx. battery voltage
	Across terminal **S** – chassis	Approx. battery voltage

(1) Terminal **B**
(2) Alternator
(3) **2P** Connector
(a) Terminal S
(b) Terminal L

9Y1210447ELS0080US0



No-Load Test

1. Connect the **2P** connector (6) to previous positions of the alternator after turning the main key switch **OFF**.
2. Connect the jumper lead (3) between terminal **S** (4) and terminal **B** (2).
3. Start the engine and then set at idling speed.
4. Disconnect the negative cable from the battery.
5. Measure the voltage between the terminal **B** (2) and the chassis.
6. If the measurement is less than the factory specifications, disassemble the alternator and check the IC regulator.

Voltage	Factory specification	More than 14 V

(Reference)

- Once the engine has started, the alternator temperature rises quickly up to an ambient temperature of 70 to 90 °C (158 to 194 °F). As the temperature goes higher than 50 °C (122 °F), the alternator voltage slowly drops; at higher than 100 °C (212 °F), it drops by about 1 V.

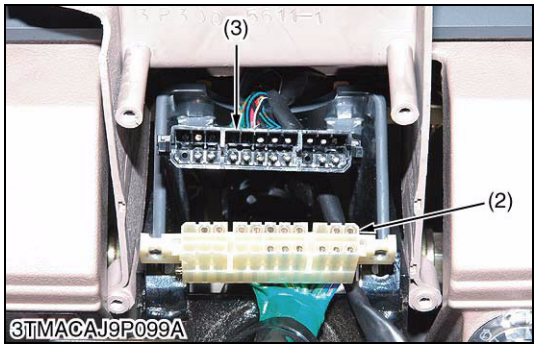
(1) Voltmeter
(2) Terminal **B**
(3) Jumper Lead
(4) Terminal **S**
(5) Terminal **L**
(6) **2P** Connector

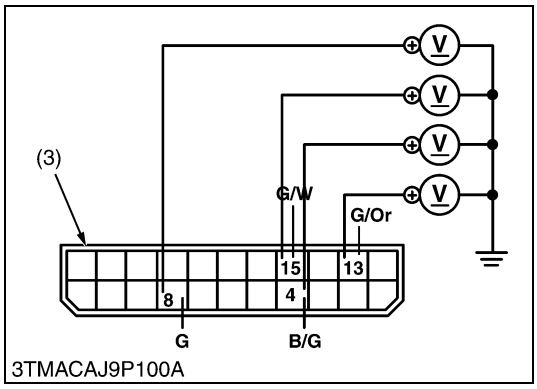
9Y1210447ELS0081US0

https://truckmanualshub.com/

(12) Lighting Combination Switch







Checking Connector Voltage

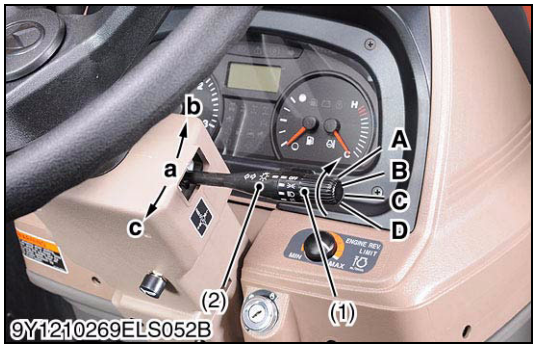
1. Remove the steering wheel.
2. Remove the steering post cover.
3. Disconnect the combination switch connector (3).
4. measure the voltage with voltmeter across the connector terminal **4** and chassis, across the terminal **8** and chassis, terminal **13** and chassis, across the terminal **15** and chassis.
5. If the voltage differs from the battery voltage (11 to 14 volts), the wiring harness, fuses or main key switch is faulty.

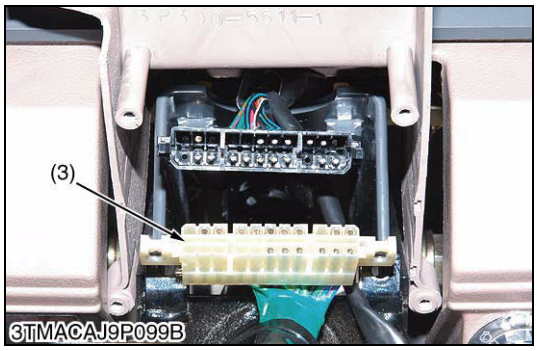
Voltage	Main switch at **"OFF"**	Terminal **4** – Chassis	Approx. battery voltage
		Terminal **18** – Chassis	Approx. battery voltage
		Terminal **13** – Chassis	Approx. battery voltage
	Main switch at **"ON"**	Terminal **15** – Chassis	Approx. battery voltage

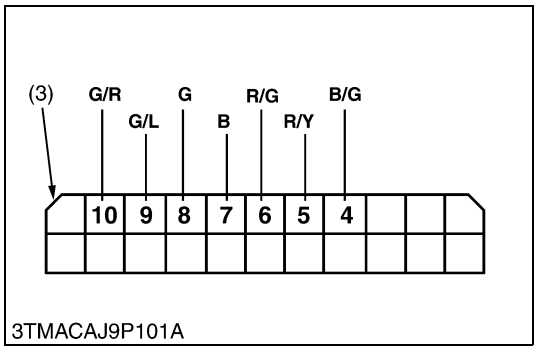
(1) Combination Switch
(2) Combination Switch Connector (Switch Side)
(3) Combination Switch Connector (Wiring Harness Side)

9Y1210447ELS0082US0

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Checking Light Switch and Dimmer Switch

1. Check the continuity through the switches with an ohmmeter.

Light and parking Switch	Dimmer and passing switch	4 (HI)	5 (HM)	6 (HS)	7 (EZ)	8 (TB)	9 (LP)	10 (S)	Resistance
OFF "**A**"	Passing	●	●		●				Continuity exists
	Lower								
	Upper								
Small 1 "**B**"	Passing	●	●		●	●	●	●	
	Lower					●	●	●	
	Upper					●	●	●	
Head light 2 "**C**"	Passing	●	●		●	●	●	●	
	Lower	●		●	●	●	●	●	
	Upper	●	●		●	●	●	●	
Parking light 3 "**D**"	Passing	●	●		●	●	●		
	Lower					●	●		
	Upper					●	●		

9Y1210447ELS017US

(1) Dimmer Switch
(2) Light Switch
(3) Combination Switch Connector (Switch Side)

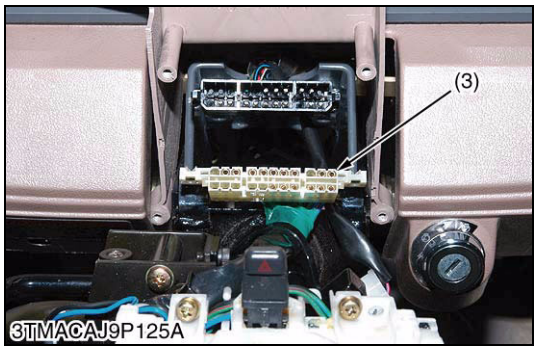
a: Lower (Low Beam)
b: Passing (Flashing)
c: Upper (High Beam)

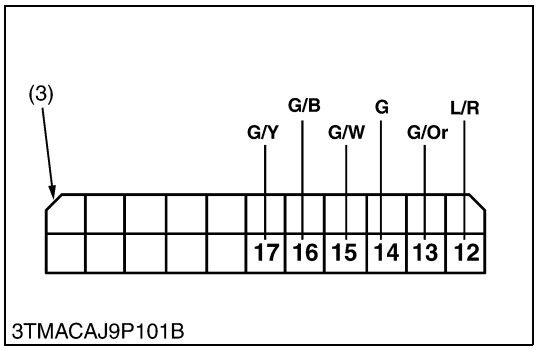
A: OFF
B: Small 1
C: Head Light 2
D: Tail Light

9Y1210447ELS0083US0

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Checking Turn Signal and Hazard Switch

1. Check the continuity through the switches with an ohmmeter.

Hazard light switch (1)	Turn signal switch (2)	15 (F)	16 (L)	17 (R)	12 (B1)	13 (B2)	14 (F1)
OFF	L	●	●		●		●
	N	●			●		●
	R	●		●	●		●
ON	L	●	●				
	L - N - R	●				●	●
	R	●		●			

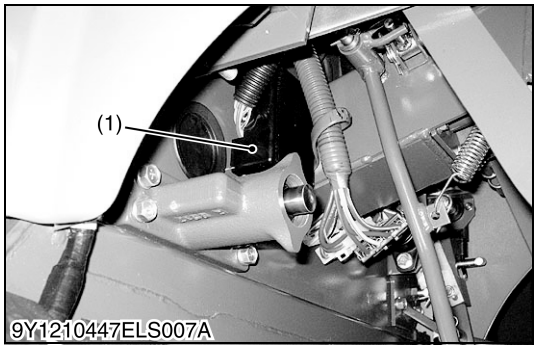
9Y1210447ELS018US

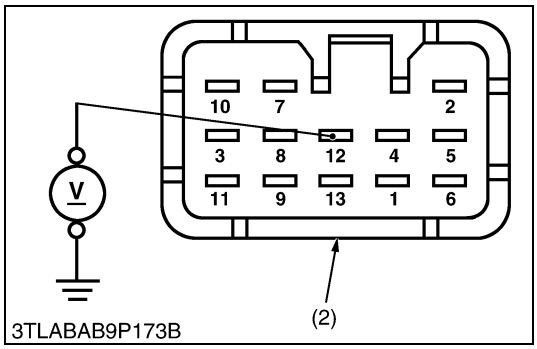
(1) Hazard Light Switch 2
(2) Turn Signal Switch
(3) Combination Switch Connector (Switch Side)

9Y1210447ELS0084US0

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(13) Flasher Unit





Flasher Unit

1. Disconnect the connector (2) from the flasher unit.
2. Turn the main switch at **ON** position.
3. Measure the voltage between the terminal **12**, **13** and chassis.
4. If the voltage differs from the battery voltage (11 to 14 V), the wiring harness or fuse is faulty.

Voltage	Terminal **12** – chassis	Approx. battery voltage
Voltage	Terminal **13** – chassis	Approx. battery voltage

(Reference)

Terminal	Color	Terminal Connector
1	0.85 Y	Lighting switch
2	0.85 Y/R	Position light
3	0.5 W/B	Position light switch
4	0.85 R/Y	Main switch (AC)
5	0.85 R/W	Turn Signal light (R)
6	0.5 G/R	Turn Signal light switch (R)
7	0.5 B/W	Ground
8	0.85 G/W	Turn Signal light (L)
9	0.5 W/G	Turn Signal light switch (L)
10	0.5 G/B	Hazard indicator lamp
11	0.5 W/L	Hazard switch
12	1.25 R/B	Battery Voltage
13	0.85 R/L	Battery Voltage (lighting)

■ **Flasher Unit Actuation Test**

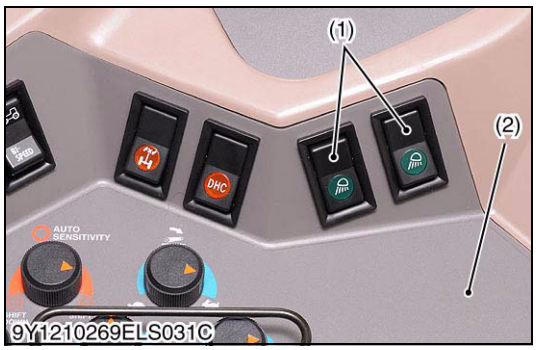
1. Set the hazard switch to the **ON** position, and make sure the hazard light gives 60 to 120 flashers for a minutes.
2. Set the main switch to the **ON** position and move the turn signal switch to the left. Make sure the left-hand light gives flashes. Then move the turn signal switch to the right and make sure the right-hand light gives flashes. Make sure the same actions as above result.
3. If both the hazard switch and the turn signal switch and the turn signal switch function but the above actions do not take place, replace the flasher unit with new one.

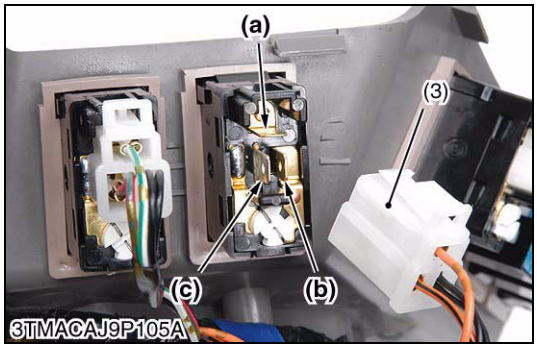
(1) Flasher Unit (2) Wire Harness Connector

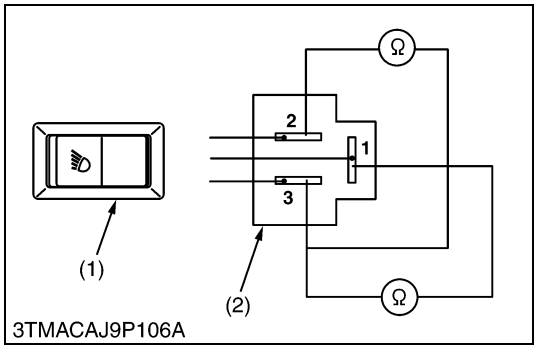
9Y1210447ELS0024US0

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(14) Working Light Switch







Checking Connector Voltage

1. Remove the switch panel (2).
2. Disconnect the **3P** connector (3) from the light switch (1).
3. Turn the main key switch **ON**.
4. Measure the voltage with a voltmeter across the terminal **1** and chassis.
5. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	Terminal **1** – Chassis	Approx. battery voltage

(1) Working Light Switch
(2) Switch Panel
(3) **3P** Connector

(a) Terminal 1
(b) Terminal 2
(c) Terminal 3

9Y1210447ELS0085US0

Checking Working Light Switch

1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, replace it.

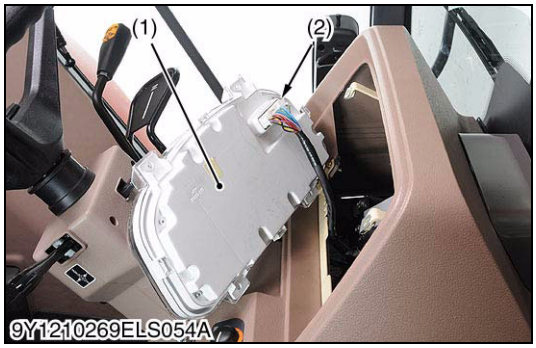
Position		Terminal		
		1	2	3
Working light switch	OFF		●	●
	ON	●	●	●

9Y1210447ELS019US

(1) Working Light Switch
(2) Working Light Switch Connector (Switch Side)

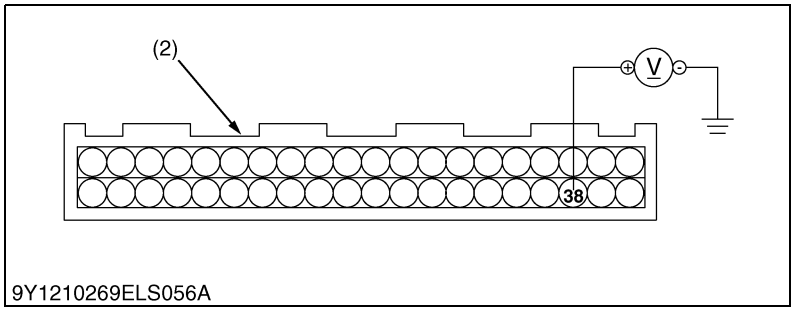
9Y1210269ELS0129US0

(15) Panel Board



Checking Connector Voltage

1. Remove the panel board (1) and disconnect the **40C** connector (2).
2. Turn the main key switch **ON**.
3. Measure the voltage across the following terminal and chassis.
4. If the voltage differs from the battery, the wiring harness is faulty.



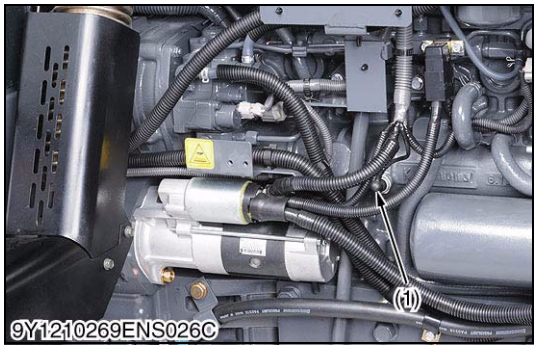
Voltage	Terminal **38** – Chassis	Battery voltage

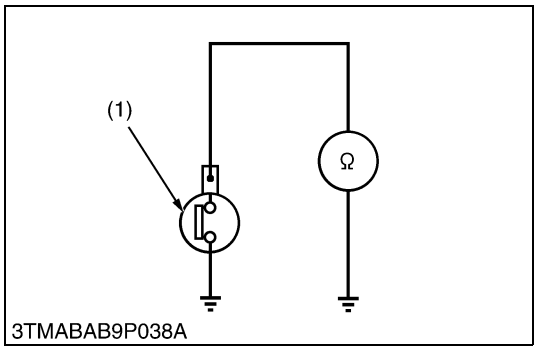
(1) Panel Board
(2) **40C** Connector (Wiring Harness Side)

9Y1210447ELS0086US0

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(16) Engine Oil Pressure Switch





Checking Engine Oil Pressure Switch

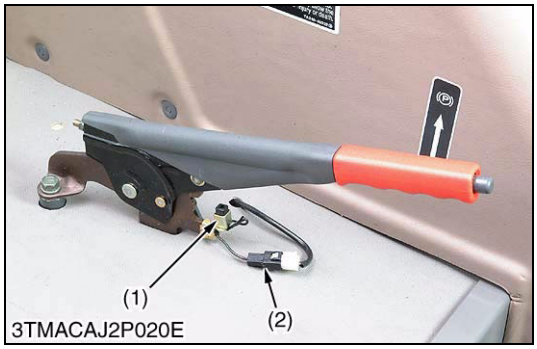
1. Measure the resistance with an ohmmeter across the switch terminal and the chassis.
2. If 0 ohm is not indicated in the normal state, the switch is faulty.
3. If infinity is not indicated at pressure over 50 kPa (0.5 kgf/cm^2, 7 psi), the switch is faulty.

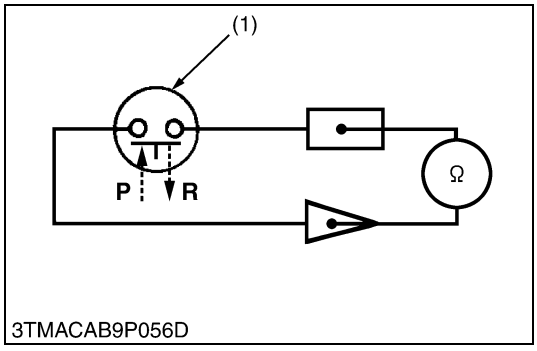
Resistance (Switch terminal – Chassis)	In normal state	0 Ω
	At pressure over approx. 50 kPa (0.5 kgf/cm^2, 7 psi)	Infinity

(1) Engine Oil Pressure Switch

9Y1210447ELS0014US0

(17) Parking Brake Switch





Checking Parking Brake Switch

1. Check the continuity with an ohmmeter across the switch terminals.
2. If it does not conduct or any value is indicated when the switch is pushed, the switch is faulty.
3. If infinity is not indicated when the switch is released, the switch is faulty.

Resistance (Across switch terminals)	Reference value	When switch is pushed **"P"**	0 Ω
		When switch is released **"R"**	Infinity

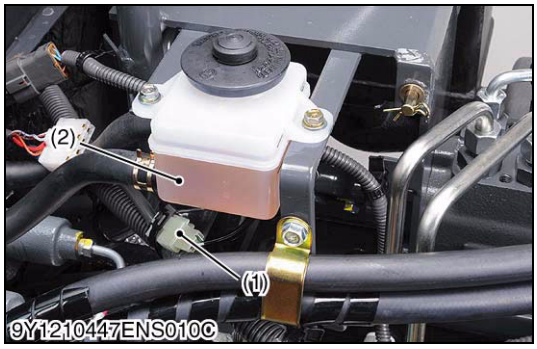
(1) Parking Brake Switch
(2) **1P** connector

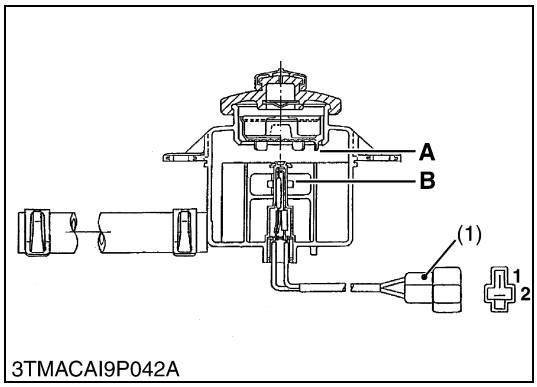
P: Pushed
R: Released

9Y1210269ELS0132US0

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(18) Brake Oil Switch





Checking Brake Oil Switch

1. Check the continuity between terminal **"1"** and terminal **"2"** with an ohmmeter.
2. If the factory specifications is not indicated, replace the brake oil tank assembly.

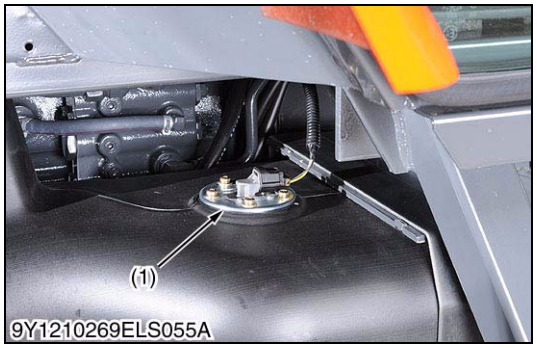
Resistance	Factory specifi-cation	Terminal **1** – Terminal **2**	Brake oil level below **MIN** mark	0 Ω
			Brake oil level above **MIN** mark	Infinity

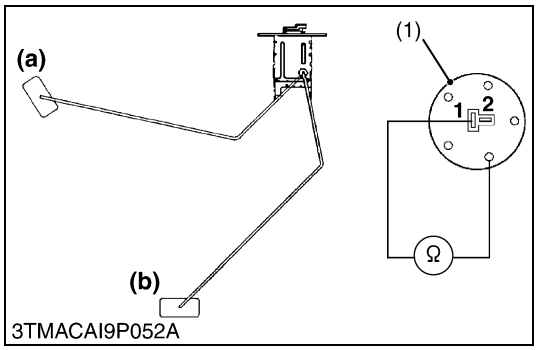
(1) 2P Connector
(2) Brake Oil Tank

A: Max Level
B: Low Level
1: Terminal 1
2: Terminal 2

9Y1210447ELS0015US0

(19) Fuel Level Sensor





Checking Fuel Level Sensor

1. Remove the fuel level sensor from the fuel tank.
2. Measure the resistance with an ohmmeter across the terminal **"1"** and its body.
3. If the measurement is not indicated, the sensor is faulty.

Resistance (Sensor terminal – its body	Factory specification	Float at uppermost position	1.0 to 5.0 Ω
		Float at lowermost position	108 to 112 Ω

(1) Fuel Unit

(a) Float at Uppermost Position
(b) Float at Lowermost Position
1: Terminal 1
2: Terminal 2

9Y1210269ELS0134US0

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(20) Coolant Temperature Sensor



Checking Coolant Temperature Sensor for Temperature Gauge

1. Disconnect the connector from the coolant temperature sensor.
2. Measure the resistance with an ohmmeter across the terminal of coolant temperature sensor (1) and the chassis.
3. If the measurement is not indicated, the sensor is faulty.

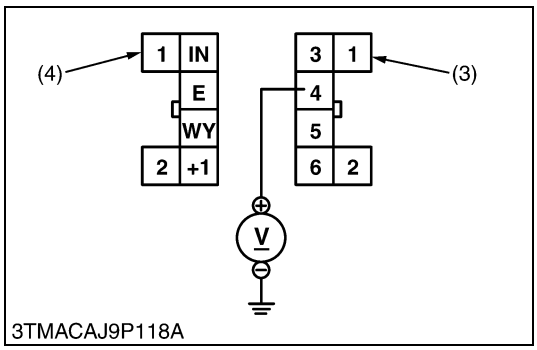
Resistance (Sensor terminal – Chassis)	Reference value	Approx. 14.9 to 17.3 Ω at 120 °C (248 °F) Approx. 26.2 to 29.3 Ω at 100 °C (212 °F) Approx. 47.5 to 56.8 Ω at 80 °C (176 °F) Approx. 133.9 to 178.9 Ω at 50 °C (122 °F)

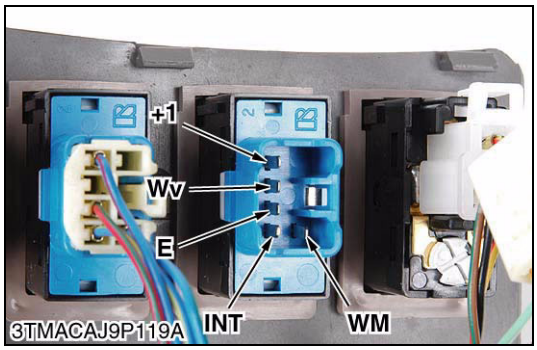
(1) Coolant Temperature Sensor

9Y1210447ELS0016US0

(21) 4WD/Bi-speed Switch







Checking Connector Voltage

1. Remove the switch panel (2) and disconnect the connector from the 4WD/Bi-speed switch (1).
2. Turn the main key switch **ON**.
3. Measure the voltage with a voltmeter across the terminal **4** and chassis.
4. If the voltage differs from the battery voltage, the wiring harness, fuse or main key switch is faulty.

Voltage	Terminal **4** – Chassis	Approx. battery voltage

(1) 4WD/Bi-speed Switch
(2) Switch Panel
(3) 4WD/Bi-speed Switch Connector (Wiring Harness Side)
(4) 4WD/BI-speed Switch Connector (Switch Side)

9Y1210447ELS0087US0

Checking 4WD/Bi-speed Switch

1. Check the continuity through the switch with an ohmmeter.
2. If the continuity specified below are not indicated, the switch is faulty.

Position		Terminal				
		IN	+1	E	WV	WM
4WD/Bi-speed Switch	Bi-speed		●	●	●	●
	ON I		●	●		
	OFF					
	ON II	●		●		
	4WD	●		●	●	●

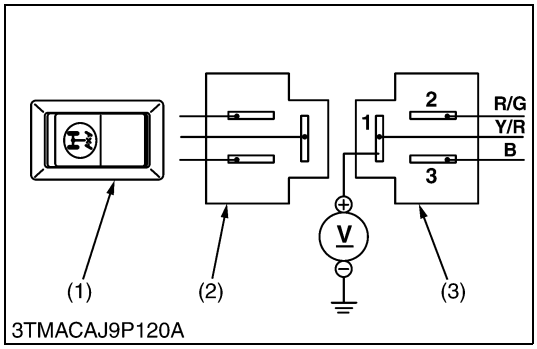
9Y1210447ELS020US

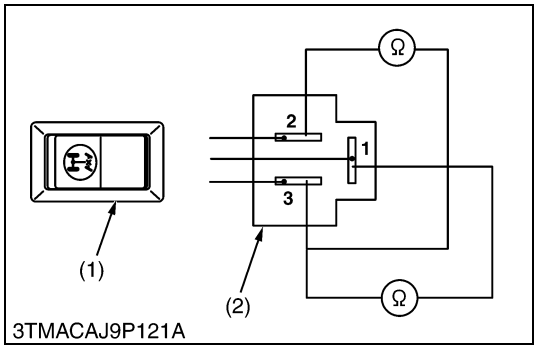
9Y1210269ELS0138US0

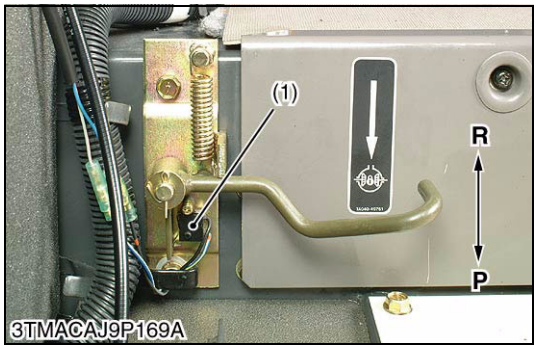
https://truckmanualshub.com/

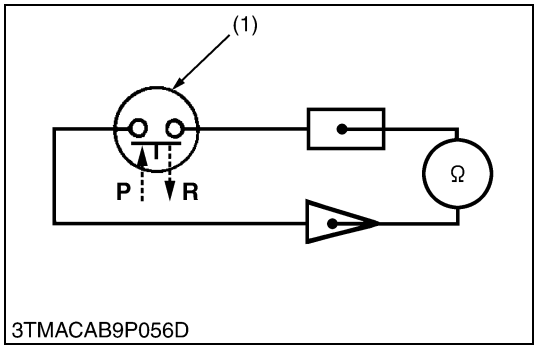
(22) Differential Lock Switch











Checking Connector Voltage

1. Remove the switch panel (4) and disconnect the front differential lock switch connector (3).
2. Turn the main key switch **ON**.
3. Measure the voltage with a voltmeter across the terminal 1 and chassis.
4. If the voltage differs from the battery voltage, the wiring harness, fuse or main key switch is faulty.

Voltage	Terminal **1** – Chassis	Approx. battery voltage

(1) Front Differential Lock Switch
(2) Front Differential Lock Switch Connector (Switch Side)
(3) Front Differential Lock Switch Connector (Wiring Harness Side)
(4) Switch Panel

9Y1210447ELS0088US0

Checking Front Differential Lock Switch

1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, replace it.

Position		Terminal 1	Terminal 2	Terminal 3
Front differential lock switch	OFF		●	●
	ON	●	●	●

9Y1210447ELS021US

(1) Front Differential Lock Switch
(2) Front Differential Lock Switch Connector (Switch Side)

9Y1210269ELS0140US0

Checking Rear Differential Lock Switch

1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, replace it.

Resistance (Across switch terminals)	Reference value	When pedal is depressed (**P**)	0 Ω
		When pedal is released (**R**)	Infinity

(1) Rear Differential Lock Switch

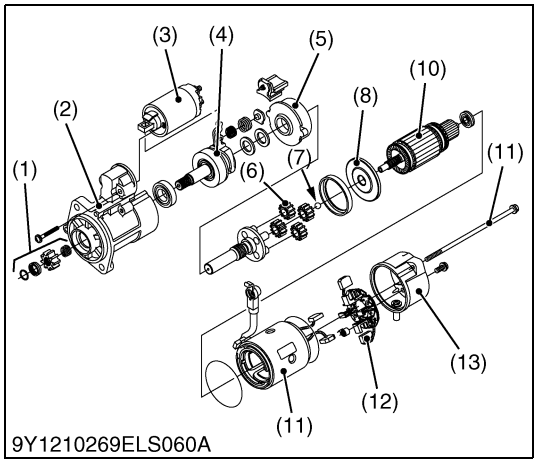
P: Depressed
R: Released

9Y1210269ELS0141US0

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[6] DISASSEMBLING AND ASSEMBLING

(1) Starter Motor



Disassembling Motor

1. Disconnect the solenoid switch (3).
2. Remove the two through screws (9) and the two brush holder lock screws. Take out the rear end frame (13) and the brush holder (12).
3. Disconnect the armature (10) and the yoke (11). Remove also the ball (7) from the tip of the armature.
4. Remove the set of packing (8), the 4 planetary gears and another packing.
5. Take out the shaft assembly. Take note of the position of the lever.

■ **IMPORTANT**

- **Before disconnecting the yoke, put tally marks on the yoke and the front bracket.**
- **Take note of the positions of the set of packing and the setup bolt.**
- **Apply grease to the gears, bearings, shaft's sliding part and ball.**

■ **NOTE**

- **Do not damage to the brush and commutator.**

(When reassembling)

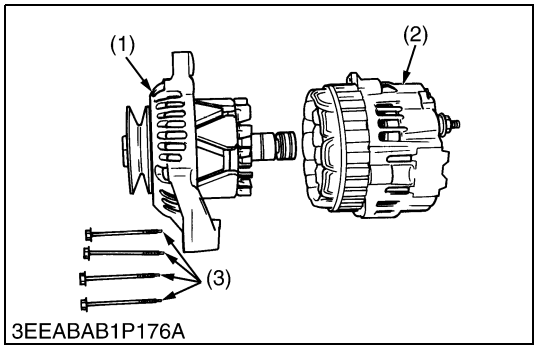
- Apply grease (DENSO CO.No. 50 or equivalent) to the parts indicated in the figure.

(1) Gear
(2) Front Bracket
(3) Solenoid Switch
(4) Overrunning Clutch
(5) Internal Gear
(6) Planetary Gear
(7) Ball
(8) Set of Packing
(9) Through Screw
(10) Armature
(11) Yoke
(12) Brush Holder
(13) Rear End Frame

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(2) Alternator



3EEABAB1P176A

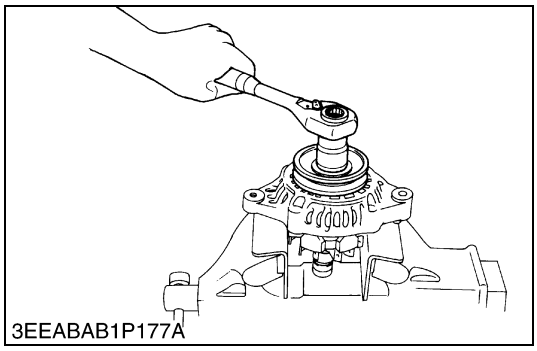
Front Bracket

1. Remove the four screws (3).
2. Separate the front bracket (1) and the rear bracket (2) from each other.

■ **IMPORTANT**
- **Put a tally line on the front bracket and the rear bracket for reassembling them later.**

(1) Front Bracket
(2) Rear Bracket
(3) Screw

9Y1210269ELS0143US0

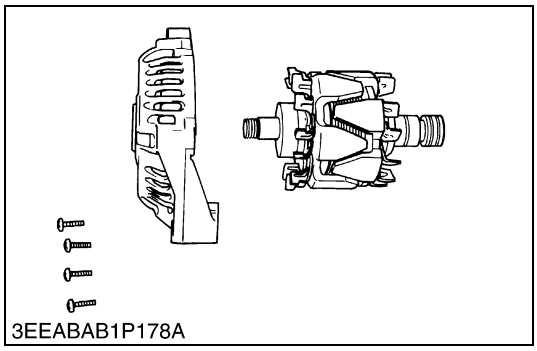

3EEABAB1P177A

Pulley

1. Hold the rotor (base of the claw) in a vise. Loosen the lock nut using a M24 box wrench.

Tightening torque	Pulley nut	58.3 to 78.9 N·m 5.95 to 8.05 kgf·m 43.0 to 58.2 lbf·ft

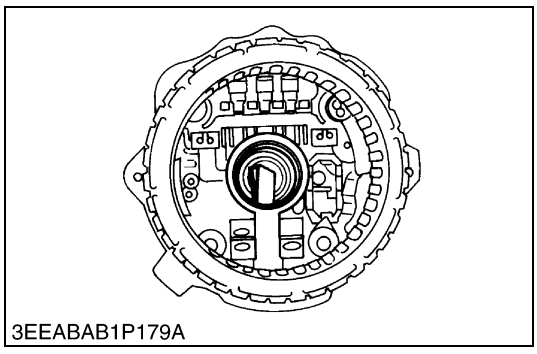
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Rotor

1. Remove the four screws and detach the bearing retainer.
2. Temporarily install the nut on the pulley screw, and detach the rotor.

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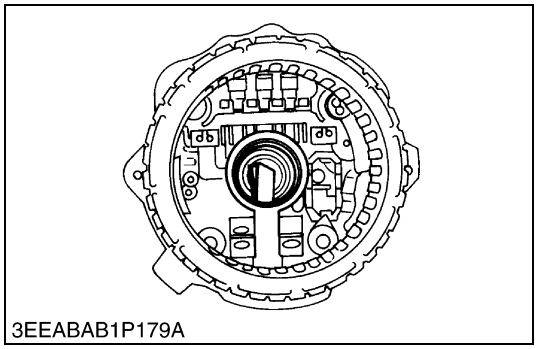

3EEABAB1P179A

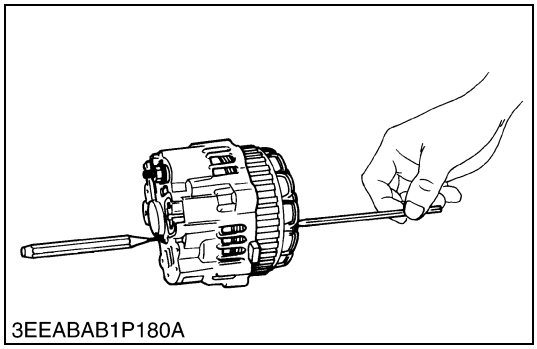
Brush

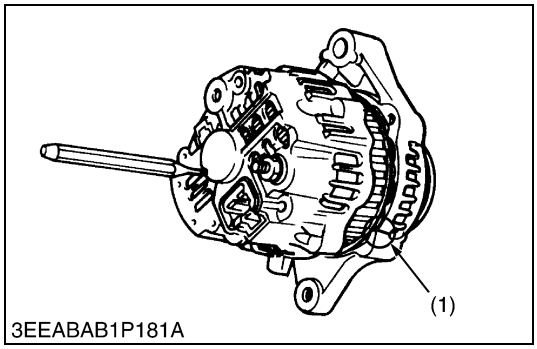
1. When the rotor is detached, the two brushes are found to stretch out of the shaft hole.

9Y1210269ELS0146US0

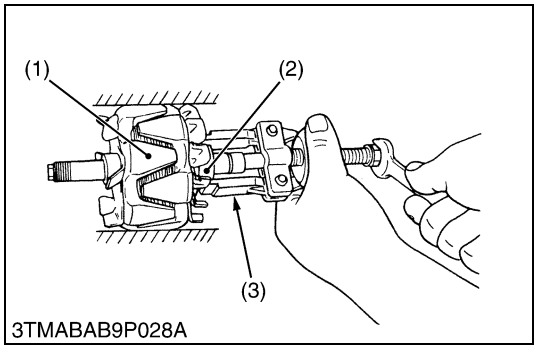
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3EEABAB1P180A



3EEABAB1P181A



3TMABAB9P028A

Reassembling the Brush

1. Fit the brush with its sliding face in the clockwise direction when viewed from front.

■ **IMPORTANT**
- **Be sure to keep the two brushes deep in the brush holder. Otherwise the rotor and the rear section can not be fitted into position.**
- **Use a 4 mm hex. wrench to push the brushes into place.**
- **Using a pin-pointed (2 mm) punch, keep the brushes from popping out.**

2. Match the tally line of the front section with that of the rear section.
3. Tighten the four screws, and draw out the pin-pointed punch out of the brush holder.

(1) Marking

9Y1210269ELS0147US0

Bearing at Slip Ring Side

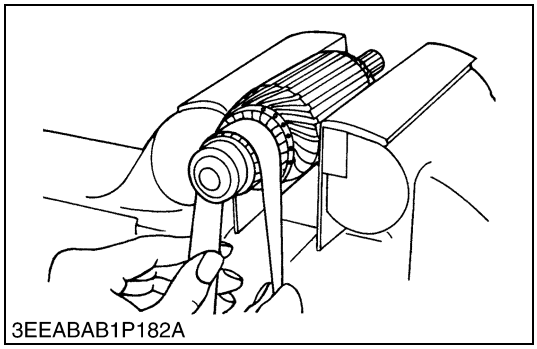
1. Lightly secure the rotor (1) with a vise to prevent damage, and remove the bearing (2) with a puller (3).

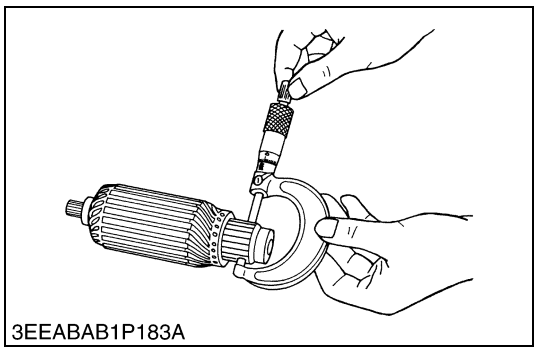
(1) Rotor
(2) Bearing
(3) Puller

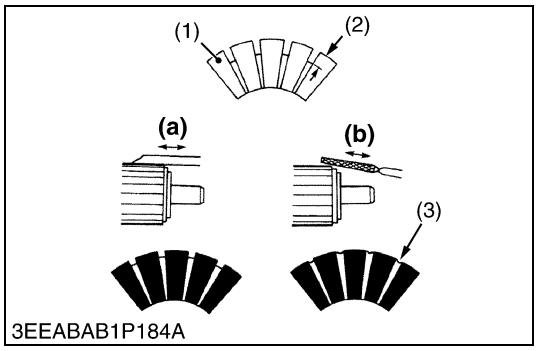
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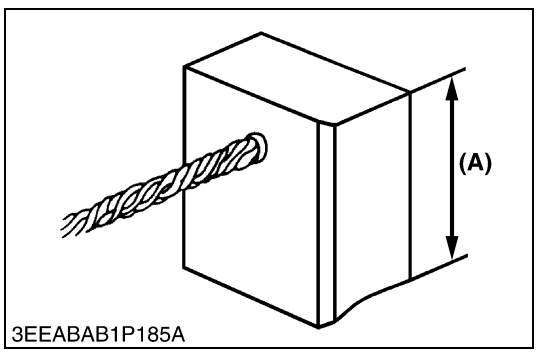
[7] SERVICING
(1) Starter


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3EEABAB1P183A



3EEABAB1P184A



3EEABAB1P185A

Commutator and Mica

1. Check the contact face of the commutator for wear, and grind the commutator with emery paper if it is slightly worn.
2. Measure the commutator O.D. with an outside micrometer at several points.
3. If the minimum O.D. is less than the allowable limit, replace the armature.
4. If the difference of the O.D.'s exceeds the allowable limit, correct the commutator on a lathe to the factory specification.
5. Measure the mica undercut.
6. If the undercut is less than the allowable limit, correct it with a saw blade and chamfer the segment edges.

Commutator O.D	Factory specification	32 mm 1.2598 in.
	Allowable limit	31.4 mm 1.2362 in.

Mica undercut	Factory specification	0.50 to 0.80 mm 0.0197 to 0.0315 in.
	Allowable limit	0.20 mm 0.0079 in.

(1) Segment
(2) Depth of Mica
(3) Mica
(a) Good
(b) Bad

9Y1210269ELS0149US0

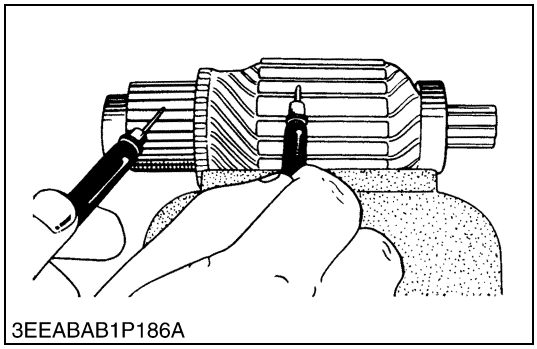
Brush Wear

1. If the contact face of the brush is dirty or dusty, clean it with emery paper.
2. Measure the brush length **(A)** with vernier calipers.
3. If the length is less than the allowable limit, replace the yoke assembly and brush holder.

Brush length **(A)**	Factory specification	21.0 mm 0.827 in.
	Allowable limit	15.0 mm 0.591 in.

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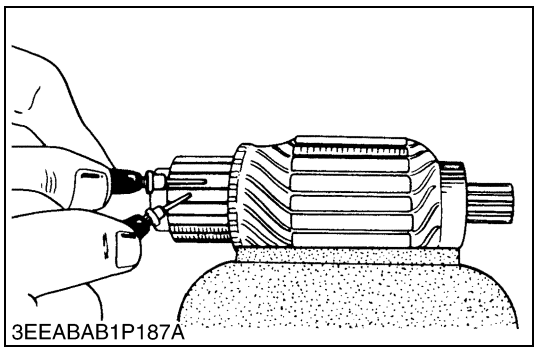

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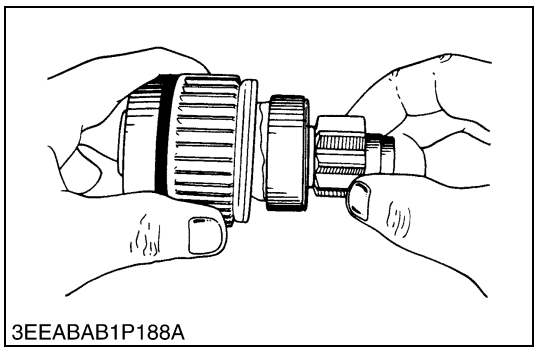
Armature Coil

1. Check the continuity across the commutator and armature coil core with an ohmmeter.
2. If it conducts, replace the armature.
3. Check the continuity across the segments of the commutator with an ohmmeter.
4. If it does not conduct, replace the armature.

Resistance	Commutator – Armature coil core	Infinity
	Commutator segment	0 Ω

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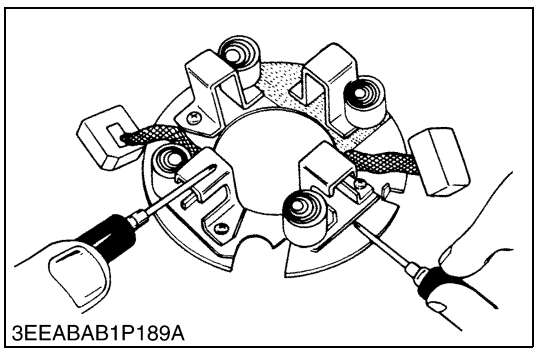

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Overrunning Clutch

1. Inspect the pinion for wear or damage.
2. If there is any defect, replace the overrunning clutch assembly.
3. Check that the pinion turns freely and smoothly in the overrunning direction and does not slip in the cranking direction.
4. If the pinion slips or does not rotate in the both directions, replace the overrunning clutch assembly.

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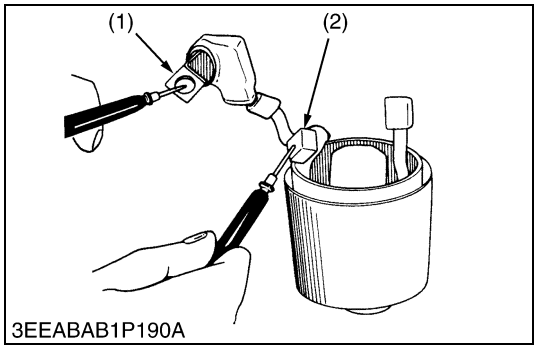
Brush Holder

1. Check the continuity across the brush holder and the holder support with an ohmmeter.
2. If it conducts, replace the brush holder.

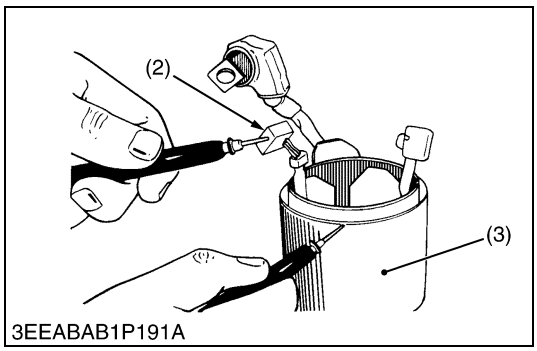
Resistance	Brush holder – Holder support	Infinity

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Field Coil

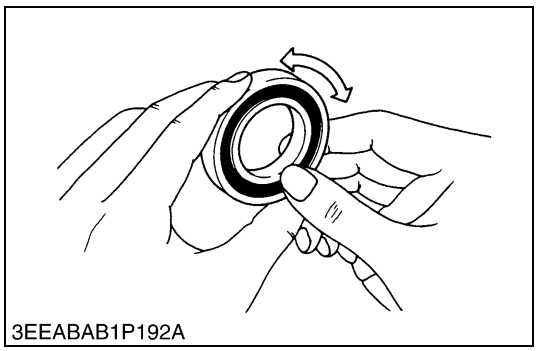
1. Check the continuity across the lead (1) and brush (2) with an ohmmeter.
2. If it does not conduct, replace the yoke assembly.
3. Check the continuity across the brush (2) and yoke (3) with an ohmmeter.
4. If it conducts, replace the yoke assembly.

Resistance	Lead (1) – Brush (2)	0 Ω
	Brush (2) – Yoke (3)	Infinity

(1) Lead
(2) Brush
(3) Yoke

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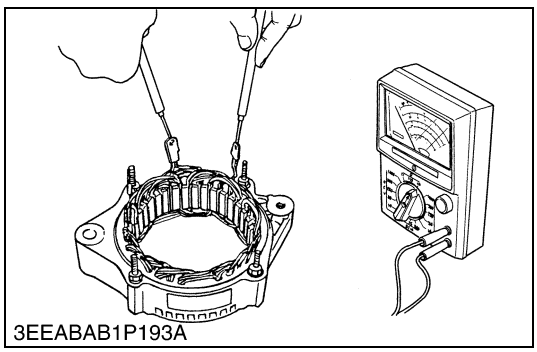
(2) Alternator


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Bearing

1. Check the bearing for smooth rotation.
2. If it does not rotate smoothly, replace it.

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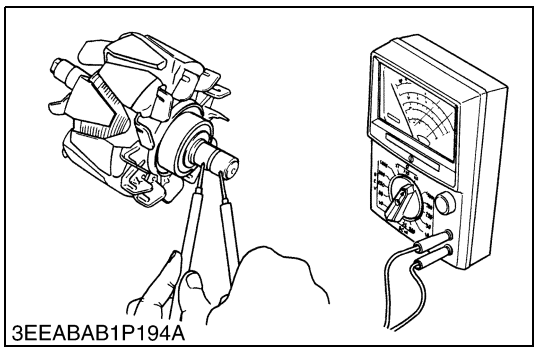

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Stator

1. Measure the resistance across each lead of the stator coil with an ohmmeter.
2. If the measurement is not within factory specification, replace it.
3. Check the continuity across each stator coil lead and core with an ohmmeter.
4. If infinity is not indicated, replace it.

Resistance	Factory specification	Less than 1.0 Ω

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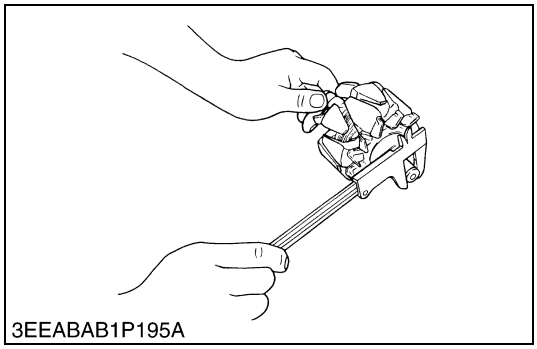
Rotor

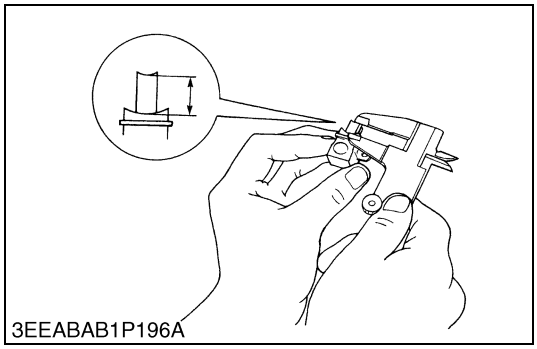
1. Measure the resistance across the slip rings with an ohmmeter.
2. If the resistance is not the factory specification, replace it.
3. Check the continuity across the slip ring and core with an ohmmeter.
4. If infinity is not indicated, replace it.

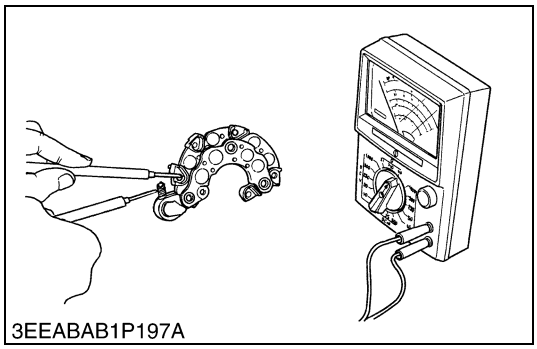
Resistance	Factory specification	2.8 to 3.3 Ω

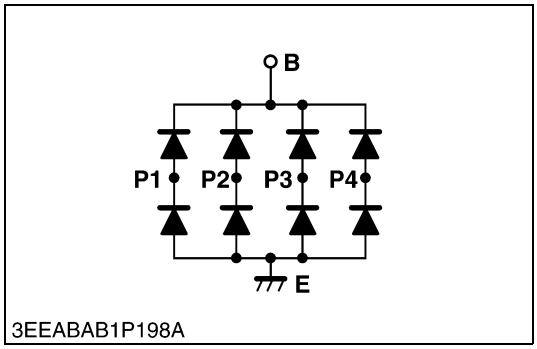
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3EEABAB1P197A



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Slip Ring

1. Check the slip ring for score.
2. If scored, correct with an emery paper or on a lathe.
3. Measure the O.D. of slip ring with vernier calipers.
4. If the measurement is less than the allowable limit, replace it.

Slip ring O.D.	Factory specification	22.7 mm 0.894 in.
	Allowable limit	22.1 mm 0.870 in.

9Y1210269ELS0158US0

Brush Wear

1. Measure the brush length with vernier calipers.
2. If the measurement is less than allowable limit, replace it.
3. Make sure that the brush moves smoothly.
4. If the brush is defective, replace it.

Brush length	Factory specification	18.5 mm 0.728 in.
	Allowable limit	5.0 mm 0.197 in.

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Rectifier

1. Check the continuity across each diode of rectifier with an ohmmeter.
2. The rectifier is normal if the diode in the rectifier conducts in one direction and does not conduct in the reverse direction.

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10 CABIN

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MECHANISM

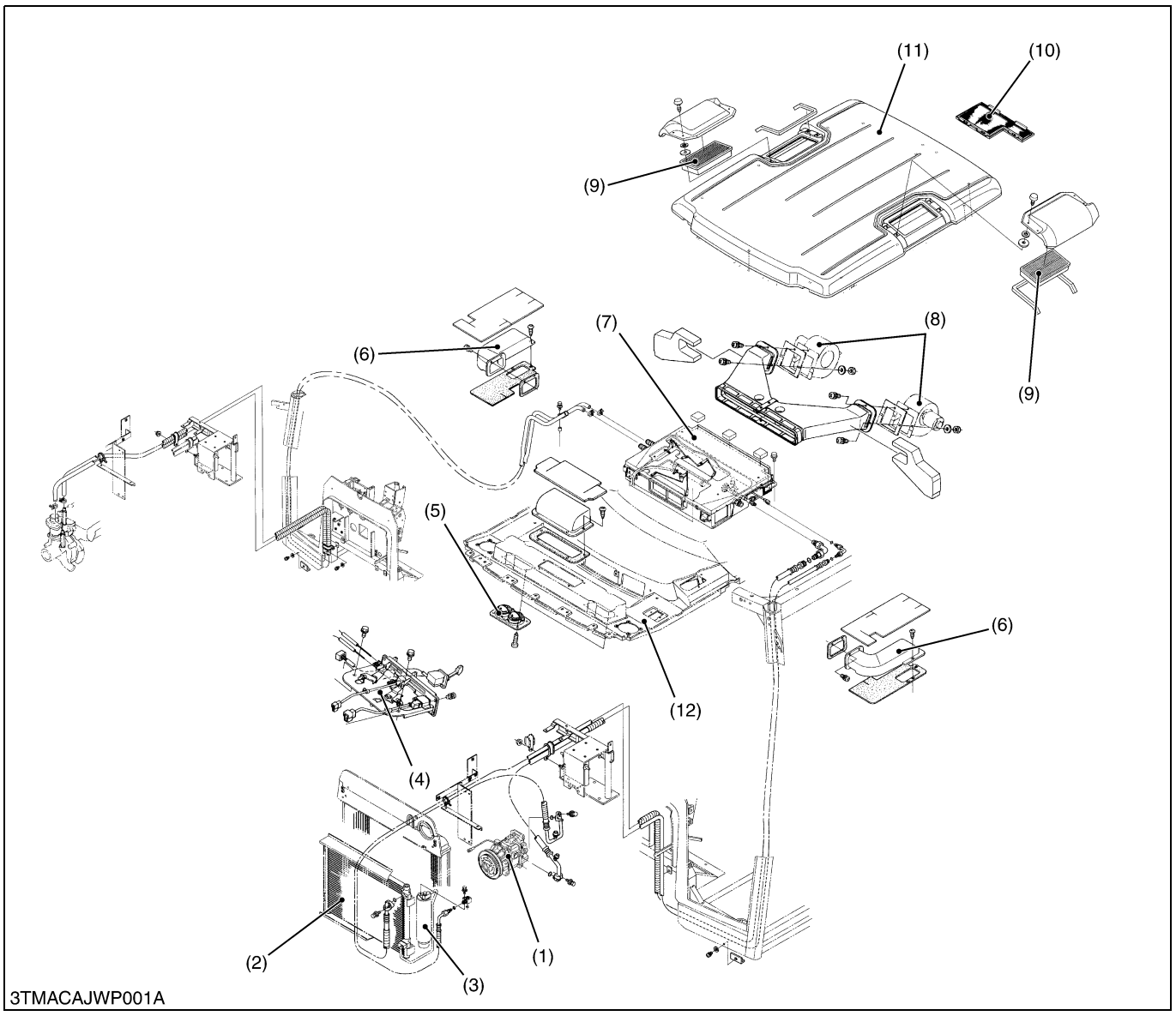
CONTENTS

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1. AIR CONDITIONING SYSTEM

[1] STRUCTURE



(1) Compressor
(2) Condenser
(3) Receiver
(4) Control Unit
(5) Front Blow Port
(6) Side Blow Port
(7) Air Conditioner Unit
(8) Blower
(9) Air Filter
(10) Inner Filter
(11) Outer Roof
(12) Inner Roof

(To be continued)

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(Continued)

The machine is equipped with a thin large-capacity air conditioner with outside air intake. The air through the inside air filter (10) as well as the outside air filter (9) and the inner roof (12) reaches the air conditioner unit (7). The air is then cooled and dehumidified by this unit.

The resulting air is heated to a comfortable level. In this way, the air being blown via the blow port can be kept at comfortable temperature and humidity.

The front air outlet (5) can be opened and closed using the center knob of each port. The side air outlet (6) are opened and closed using the mode lever on the control unit (4). With these ports open or closed, you can feel your head cool and your feet warm.

Capacity (Cooling)	Factory specification	3.38 kW
Capacity (Warming)	Factory specification	4.54 kW
Kinds of refrigerant (Charge amount)	Factory specification	R134a 0.90 to 1.00 kg 1.98 to 2.20 lbs
Pressure sensor (Low)	Factory specification	0.196 MPa 2.0 kgf/cm^2 28.4 psi
Pressure sensor (High)	Factory specification	3.14 MPa 32.0 kgf/cm^2 455 psi

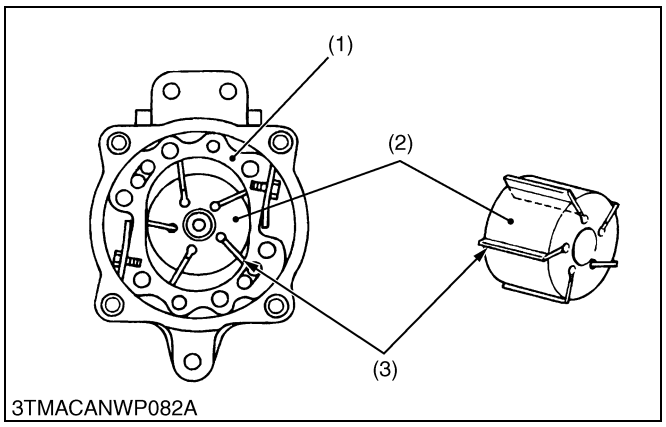
■ **NOTE**

- **As for the mechanism and function of each component part, refer to "10. CABIN" in the workshop manual of tractor mechanism (Code No. 9Y021-18200).**

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[2] COMPRESSOR



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The vane type compressor installed on this cabin is composed of a cylinder (1) with an oval cross section and a rotor (2) with five vanes (3). The vane type compressor is provided with two suction ports and two discharge ports respectively.

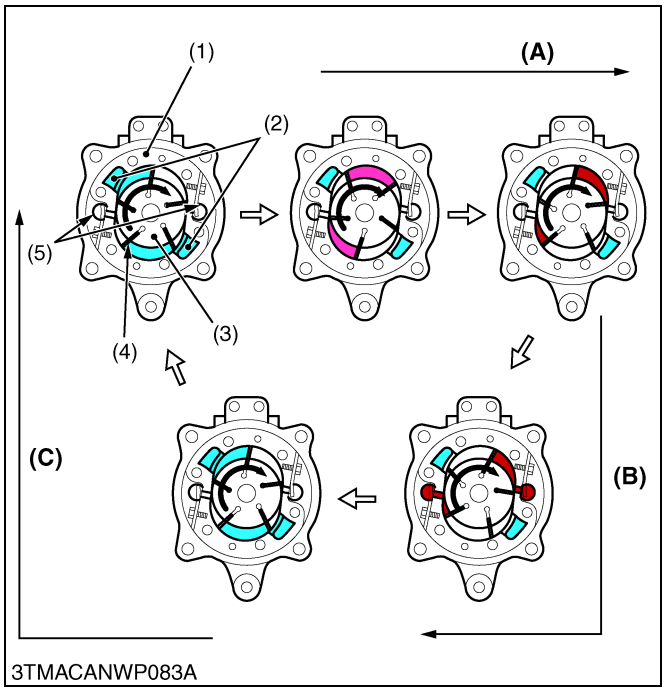
The five vanes (3) mounted on the rotor (2), rotating along the inner wall of the cylinder (1), keeps air-tightness using the centrifugal force of the rotor (2) and the back pressure of the vanes (3) that grow in proportion to the rotating speed of the rotor (2).

As a result, the volumes of the five cylinder chambers separated with the cylinder (1) and the five vanes (3) change.

For each rotation of the rotor (2), each of the cylinder chambers performs two cycles of inhalation, compression, and discharge.

(1) Cylinder
(2) Rotor
(3) Vane

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3TMACANWP083A

Operation

In proportion to the rotation of the rotor (3), a volume of a cylinder chamber separated with the cylinder (1) and the vanes (4) increases. The cylinder chamber inhales refrigerant gas from the suction port (2).

As the rotor (3) rotates further, a volume of the cylinder chamber separated with the cylinder (1) and the vanes (4) decreases, and the refrigerant gas is compressed. As the rotor (3) rotates even further, the refrigerant gas is highly compressed and then presses the discharge valve to open. The refrigerant gas is discharged from the discharge port (5).

(1) Cylinder
(2) Suction Port
(3) Rotor
(4) Vane
(5) Discharge Port
(A) Compression Process
(B) Discharge Process
(C) Suction Process

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■ Compressor Oil

The compressor oil dissolves in the refrigerant, circulates through the air-conditioning cycle, and functions to lubricate the compressor. But the conventional compressor oil for R12 does not dissolve in R134a, so it does not circulate through the cycle, and the lifespan of the compressor is considerably shortened.

It is still essential to ensure that the correct refrigerant oil is used. R12 systems were lubricated with mineral oil, which is totally unsuitable for R134a systems. The latter requires PAG oil, which mixes very well with the refrigerant and provides ideal lubrication throughout the system.

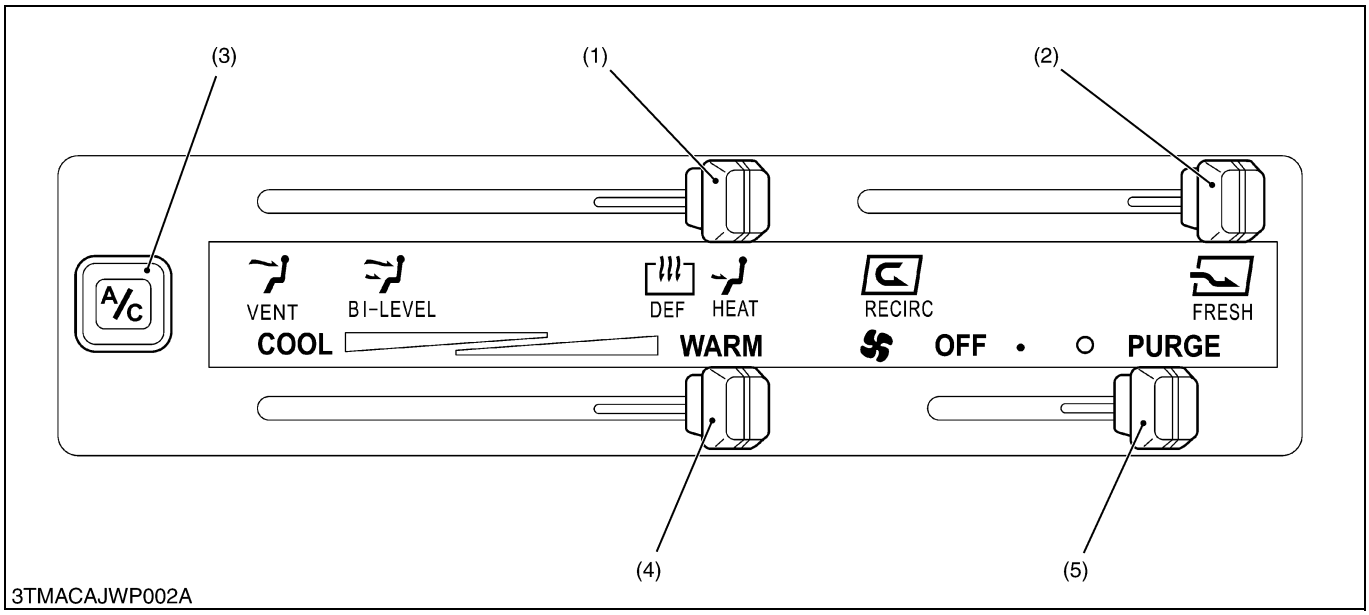
Quantity (Total)	Brand Name
100 to 120 cc 0.106 to 0.127 U.S.qts 0.088 to 0.106 Imp.qts	ND-OIL 8 <PAG* oil>

*PAG: Polyalkyleneglycol (Synthetic oil)

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[3] SYSTEM CONTROL
(1) Control Panel



(1) Mode Lever
(2) Recirculation / Fresh Air Selection Lever
(3) Air Conditioner Switch With Indicator Light
(4) Temperature Control lever
(5) Blower Switch

■ **Mode Lever**

Set the mode lever to the desired position.

- **Vent (Face and chest areas)**
  Air blowing or air conditioning
- **Bi-level (Chest and foot areas)**
  Comfortable air conditioning by keeping the head cool and the feet warm
- **DEF (Windshield)**
  Defrosting the windshield
- **Heat (Foot area)**
  Normal heating

■ **Recirculation / Fresh Air Selection lever**

- **RECIRCULATION**

Set the lever to **"RECIRC"** position, and the in-cabin air will be recirculated. This is useful for cooling or heating the cabin quickly or keeping it extra cool or warm.

- **FRESH AIR**

Set the lever to the **"FRESH"** position, and fresh air will flow into the cabin. This is helpful when you work in a dusty conditions or if the glass windows get foggy.

■ **NOTE**

- **When heating, do not keep the lever at the "RECIRCULATION" position for a long time. The windshield easily gets foggy.**
- **While working in a dusty conditions, keep the lever at the "FRESH AIR" position. This increases the pressure in the cabin, while helps prevent dust from coming into the cabin.**

■ **Temperature Control Lever**

Set this lever at the desired position to obtain the optimum air temperature. Move the lever to the right to obtain warmer air. Move it to the left to obtain cooler air.

■ **Blower Switch**

Air volume can be changed in three steps. At the **"PURGE"** position, the largest air volume is obtained.

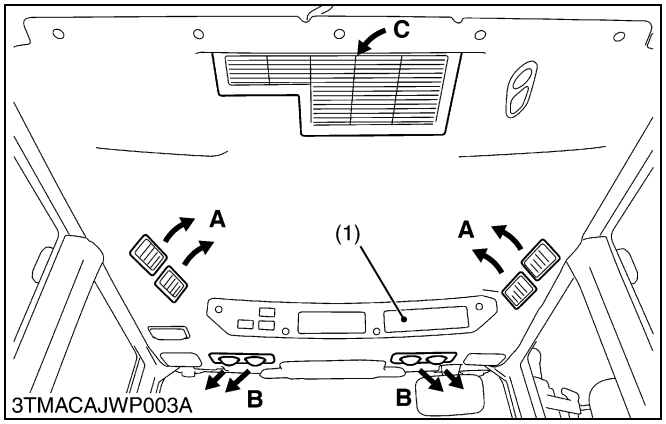
■ **Air Conditioner Switch**

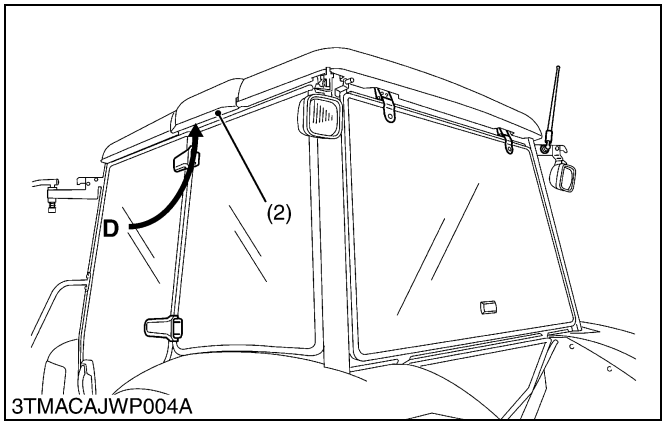
Push this switch to activate the air conditioner. An indicator light will light up when the switch is set to **"ON"**. Push switch again to turn air conditioner off, in which case the indicator light will be off.

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(2) Air Flow





Flow

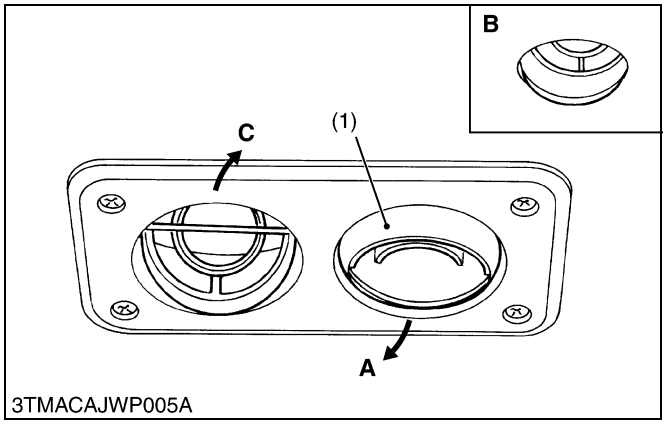
Air in the cabin and fresh air introduced into the cabin flow as shown below. Adjust the 8 air ports to obtain the desired condition

(1) Control Panel
(2) Fresh Air FIlter

A: Face Area
B: Windshield
C: Inner Air Recirculation
D: Fresh Air Inlet

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(3) Air Control Vent



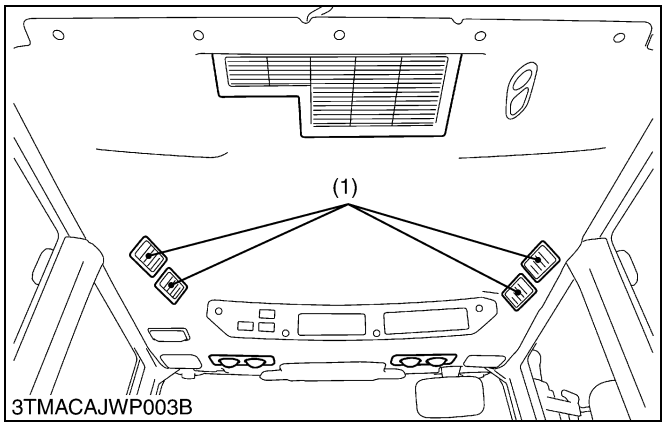
Front Air Outlet

The front air outlets can be independently adjusted as required. To defrost the windshield, rotate the outlets toward the windshield.

(1) Front Air Outlet

A: Windshield
B: Closed
C: Chest Area

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Side Air Outlet

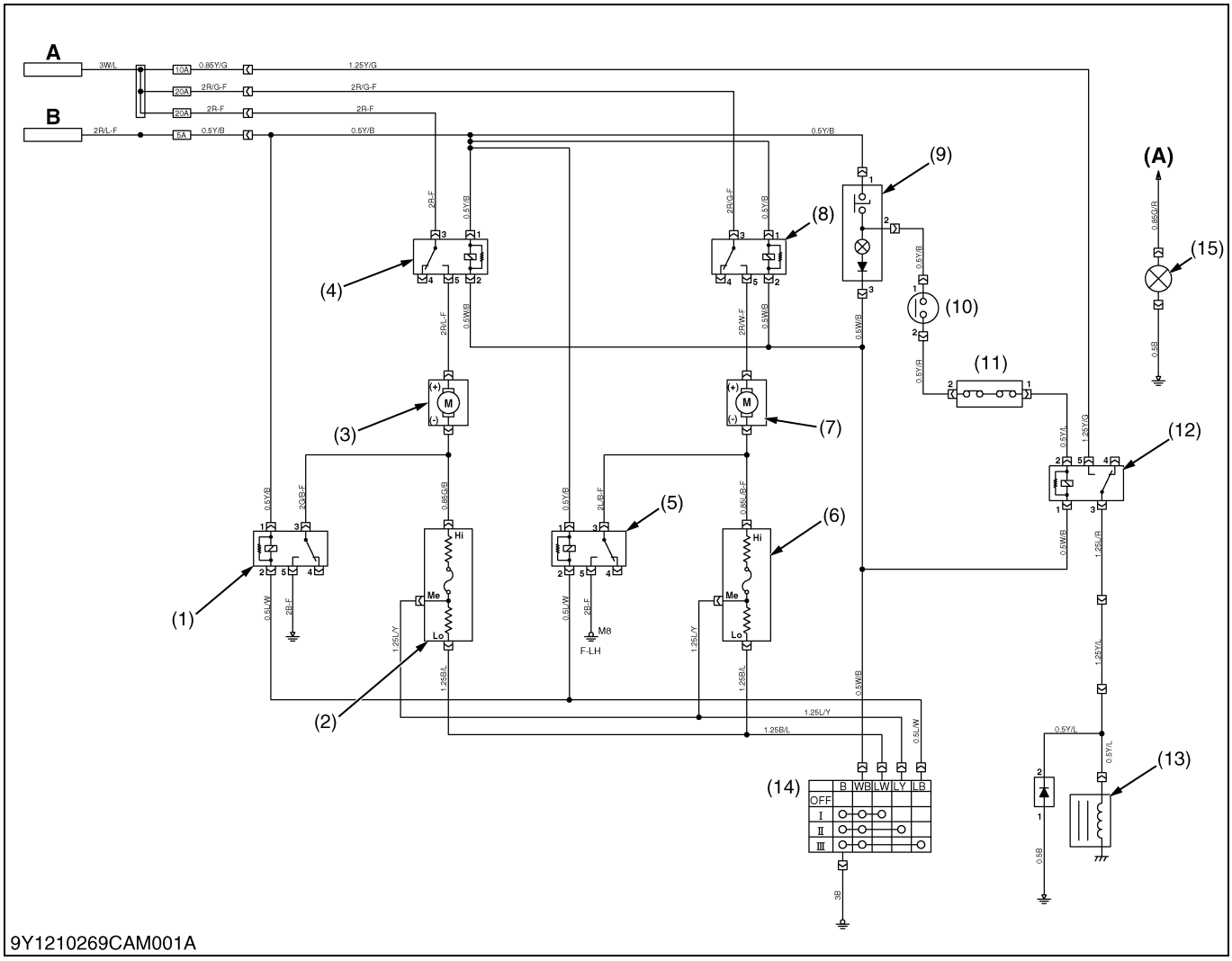
The side air outlets can be adjusted to direct air on to the operator or the rear of the cabin.

(1) Side Air Outlet

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[4] ELECTRICAL SYSTEM



(1) Blower Hi Relay L.H.
(2) Blower Resistance L.H.
(3) Blower Motor L.H.
(4) Blower Relay L.H.
(5) Blower Hi Relay R.H.
(6) Blower Resistance R.H.
(7) Blower Motor R.H.
(8) Blower Relay R.H.
(9) A/C Switch
(10) Thermistor
(11) A/C Pressure Switch
(12) Compressor Relay
(13) Compressor Magnet Clutch
(14) Blower Switch
(15) A/C Unit Illumination

A: Air Conditioner/B
B: Key ACC

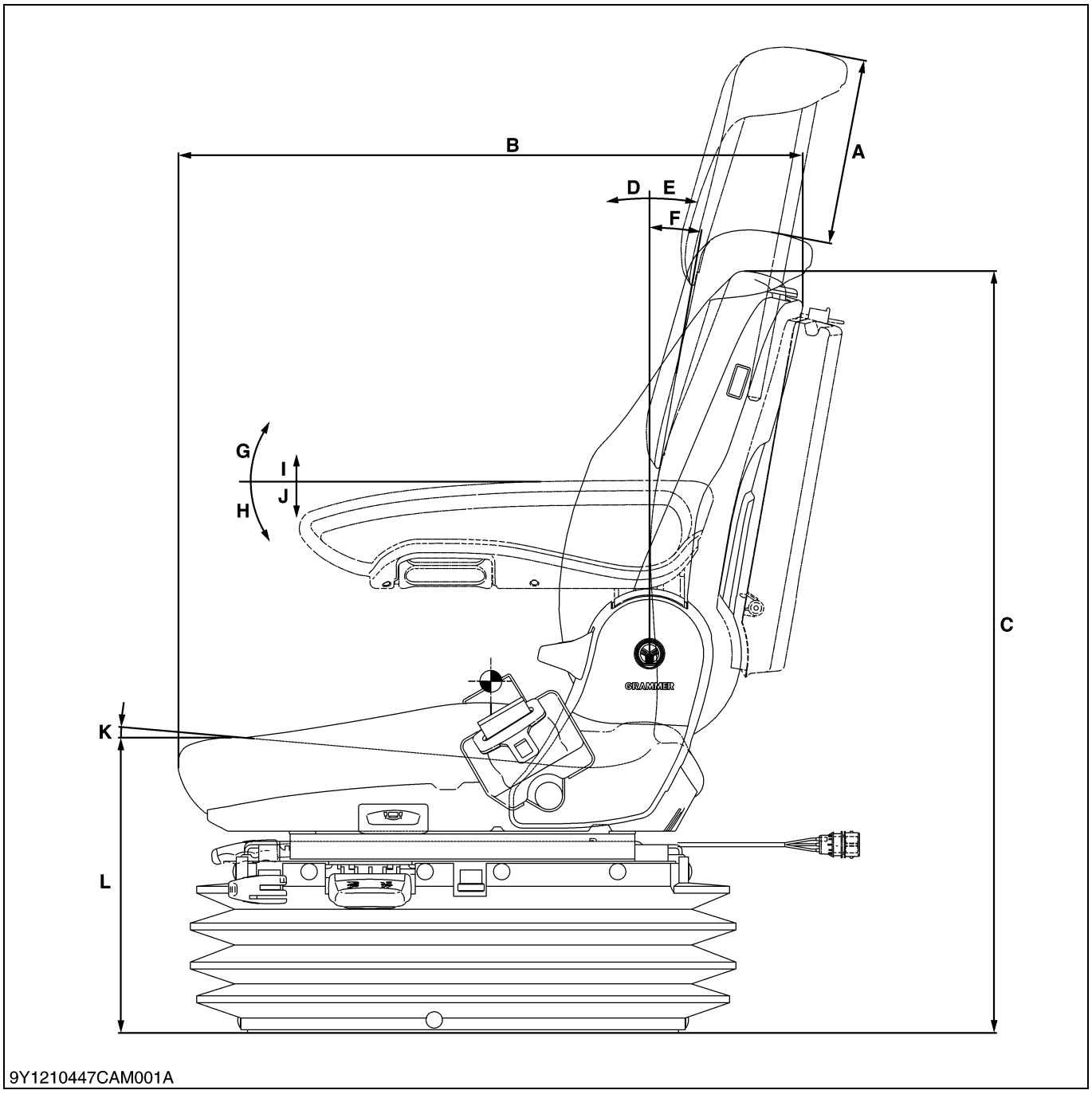
(A) To Light Switch

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2. AIR SUSPENSION SEAT SYSTEM

[1] DIMENSIONS



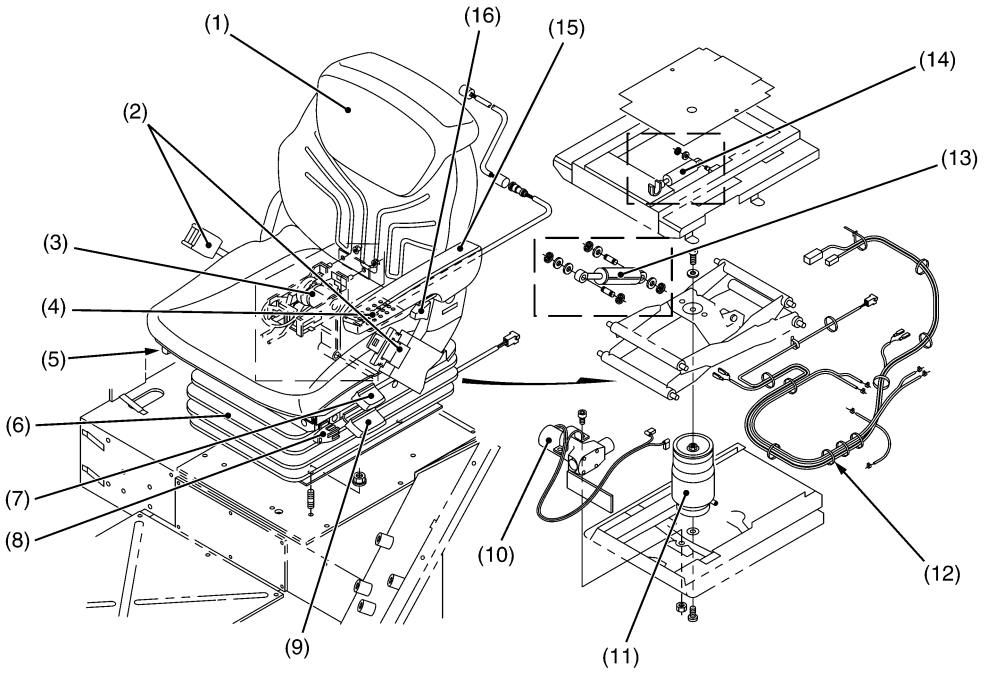
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Dimensions		Remarks	Dimensions		Remarks
A	170 mm (6.69 in.)	Backrest Extension Stroke	**G**	10 ° (0.17 rad)	Armrest Adjustable Angle
B	571 mm (22.5 in.)		**H**	30 ° (0.52 rad)	Armrest Adjustable Angle
C	697 mm (27.4 in.)		**I**	16 mm (0.63 in.)	Armrest Adjustable Angle
D	above 10 ° (0.17 rad)	Backrest Adjustable Angle	**J**	24 mm (0.94 in.)	Armrest Adjustable Angle
E	35 ° (0.61 rad)	Backrest Adjustable Angle	**K**	7 ° (0.1 rad)	Seat Angle
F	10 ° (0.17 rad)	Backrest Angle	**L**	270 mm (10.6 in.)	Seat Height

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[2] STRUCTURE



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(1) Backrest Extension
(2) Seat Belt Assembly
(3) Height Level Control Unit
(4) Seat Switch (OPC Switch)
(5) Travel Adjust Lever
(6) Bellows
(7) Swivel Adjust Lever
(8) Fore / aft Isolator
(9) Weight / Height Adjust Lever
(10) Compressor
(11) Pneumatic Spring
(12) Wiring Harness
(13) Vertical Shock Absorber
(14) Horizontal Shock Absorber
(15) Arm Rest
(16) Backrest Tilt Adjust Lever

The air-suspension seat which is adopted by this tractor has 6 functions below.

1. Weight and height adjustment

The seat weight and height can be adjusted by operating the weight / height adjust lever (9).

2. Travel adjustment

The seat slidely to back and forward can be operated by the travel adjust lever (5).

3. Fore / Aft isolator

The seat shock impacts can be better absorbed by setting the fore / aft isolator in **"ON"** position.

4. Backrest adjustment

The seat backrest extension position can be adjusted.

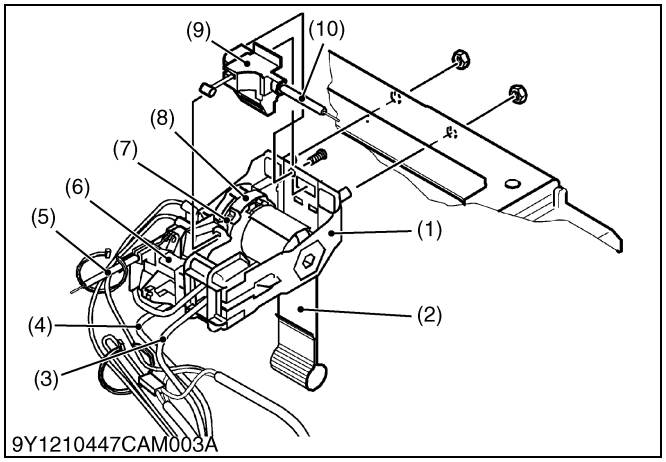
5. Arm rest angle adjustment

6. Swivel adjustment

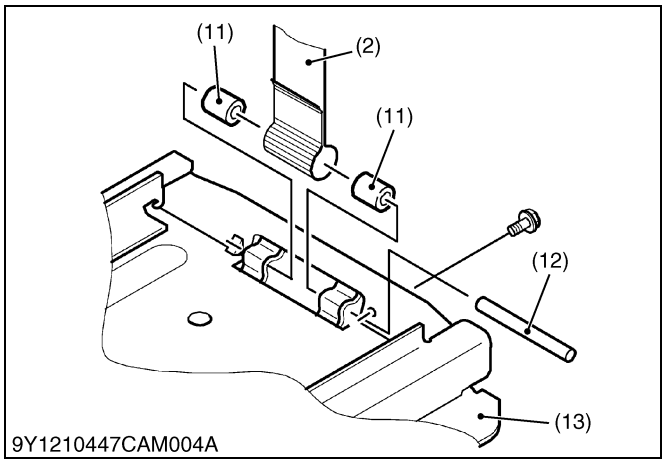
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[3] HEIGHT LEVEL CONTROL



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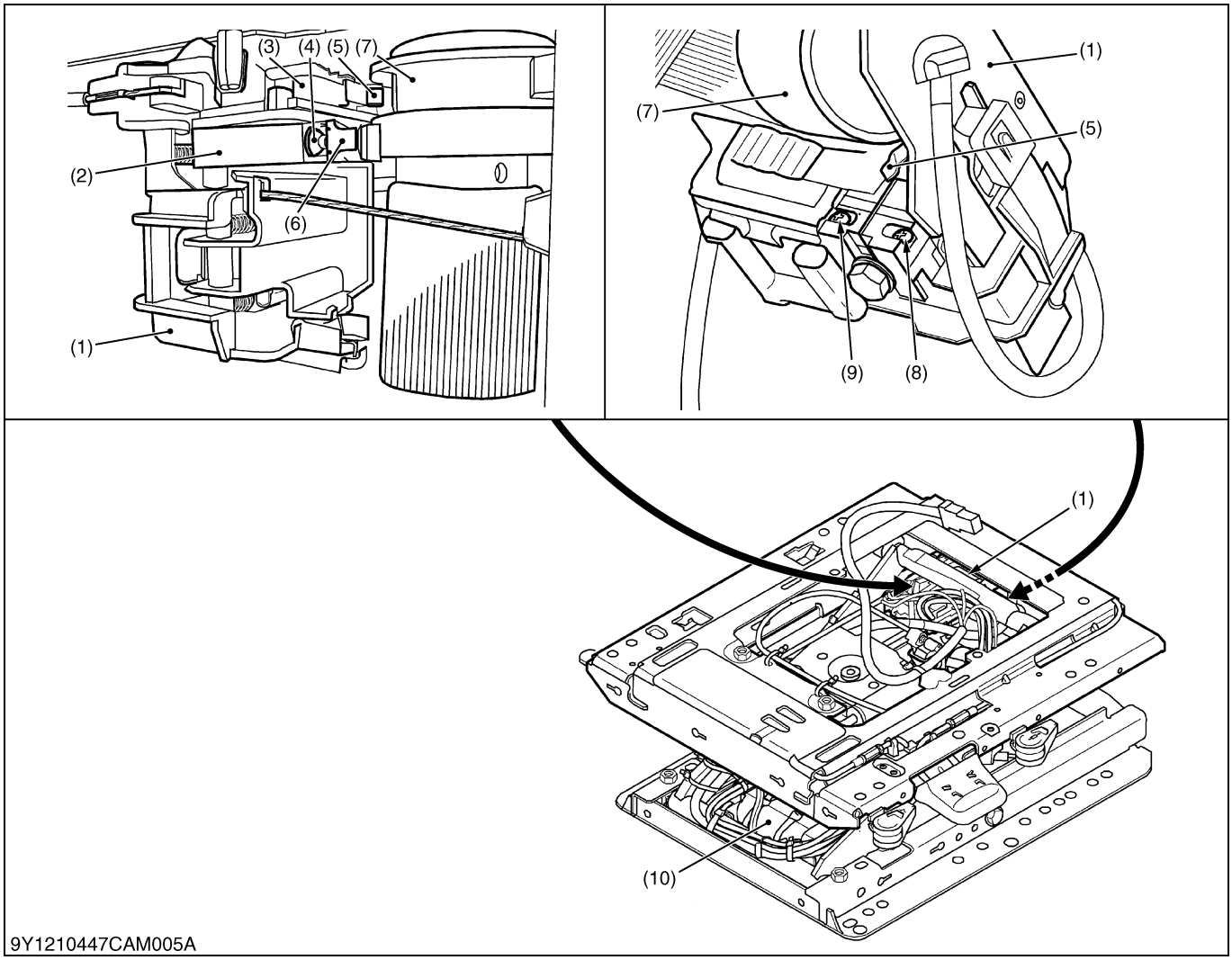
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1. The height level control unit (1) controls the seat height and has the automatic compensation functions.
   It mainly consists of the belt (2), the cam disc (8), the cam switch (7), the bowden pull wire (10), the air hoses (3), (4) and the control unit (6).
2. The belt (2) restricts the seat height and is connected to the cam disc (8) and the seat lower part (13).
3. The cam switch (7) is turned **ON** or **OFF** by the position of the cam disc (8).
4. When the belt (2) is lenghened, the cam disc (8) is rotated and the cam switch is pushed so that the compressor is turned **OFF**.
5. The height level control unit (1) is controlled by the bowden pull wires (5), (10).
6. The bowden pull wires (5), (10) are connected to the weight / height adjust lever.
7. The height level control unit (11) controls the pneumatic spring by using compressed air.

(1) Height Level Control Unit
(2) Belt
(3) Air Hose
(4) Air Hose
(5) Bowden Pull Wire
(6) Control Unit
(7) Cam Switch
(8) Cam Disc
(9) Retainer for Bowden Pull Wire
(10) Bowden Pull Wire
(11) Cushion
(12) Fulcrum Pin
(13) Lower Part of Suspension

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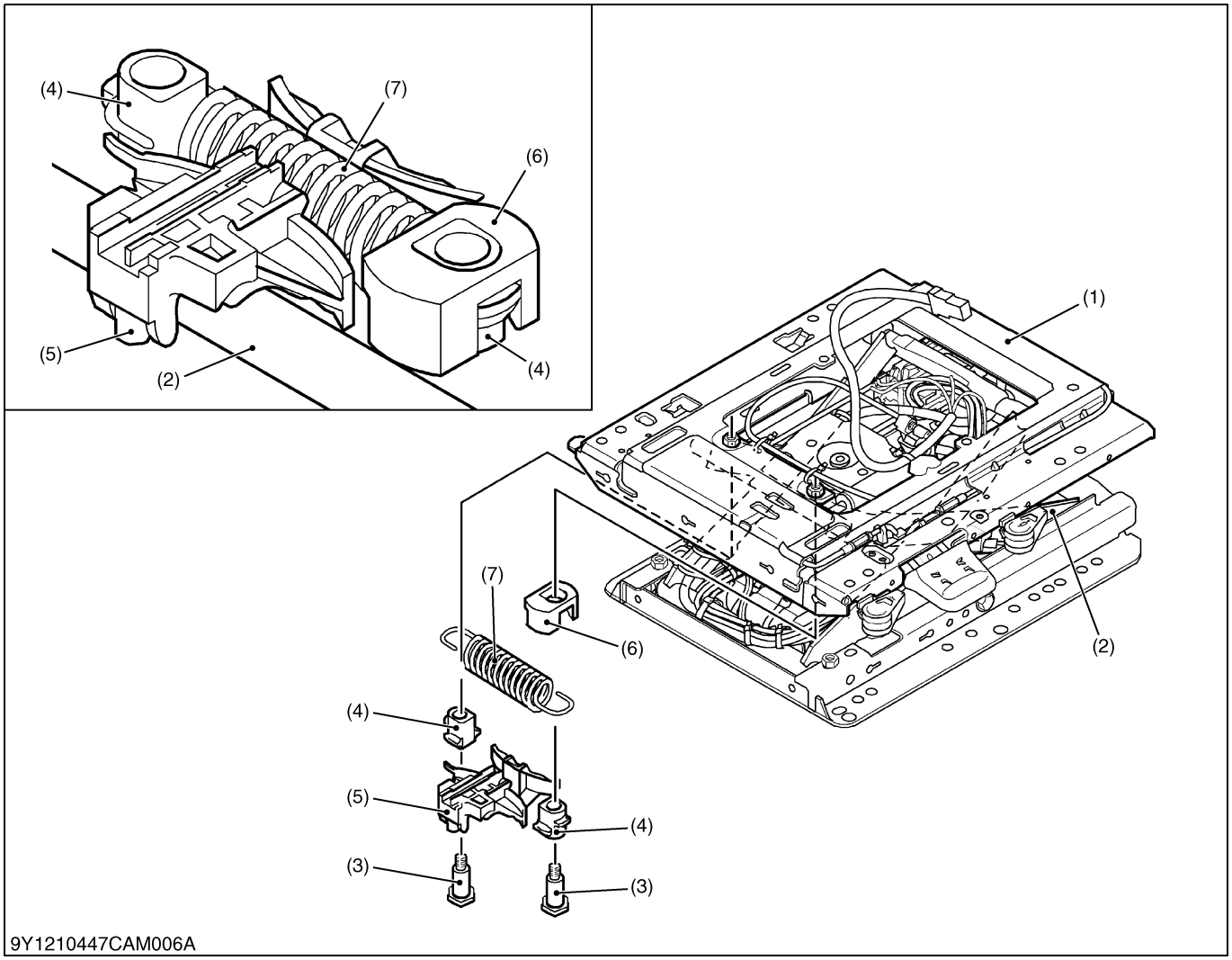


(1) Height Level Control Unit
(2) Outlet Valve
(3) Micro-switch
(4) Valve Tappets
(5) Cam Switch
(6) Valve Lever
(7) Cam Disc
(8) Screw for Micro-switch
(9) Screw for Outlet Valve
(10) Compressor

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[4] HORIZONTAL SPRING UNIT



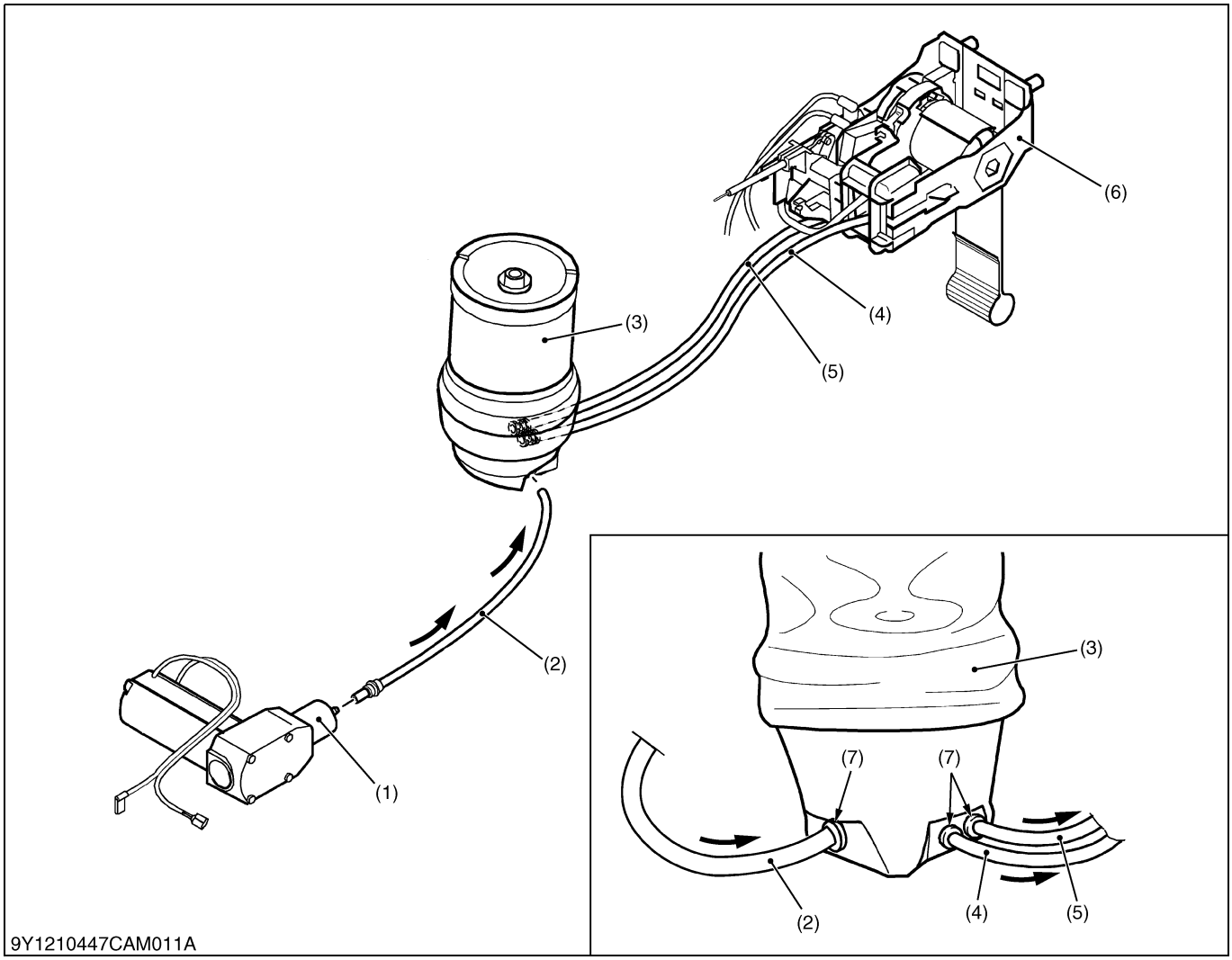
(1) Upper Part of Suspension
(2) Swinging Structure
(3) Collar Screw
(4) Bushing
(5) Clamp
(6) Buffer
(7) Tension Spring

- Horizontal spring unit absorbs the shock of the seat.
- When the upper part of suspension slides forward or backward, the center of tension spring is pulled by the clamp so that tension spring works as the shock absorber.

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[5] COMPRESSOR



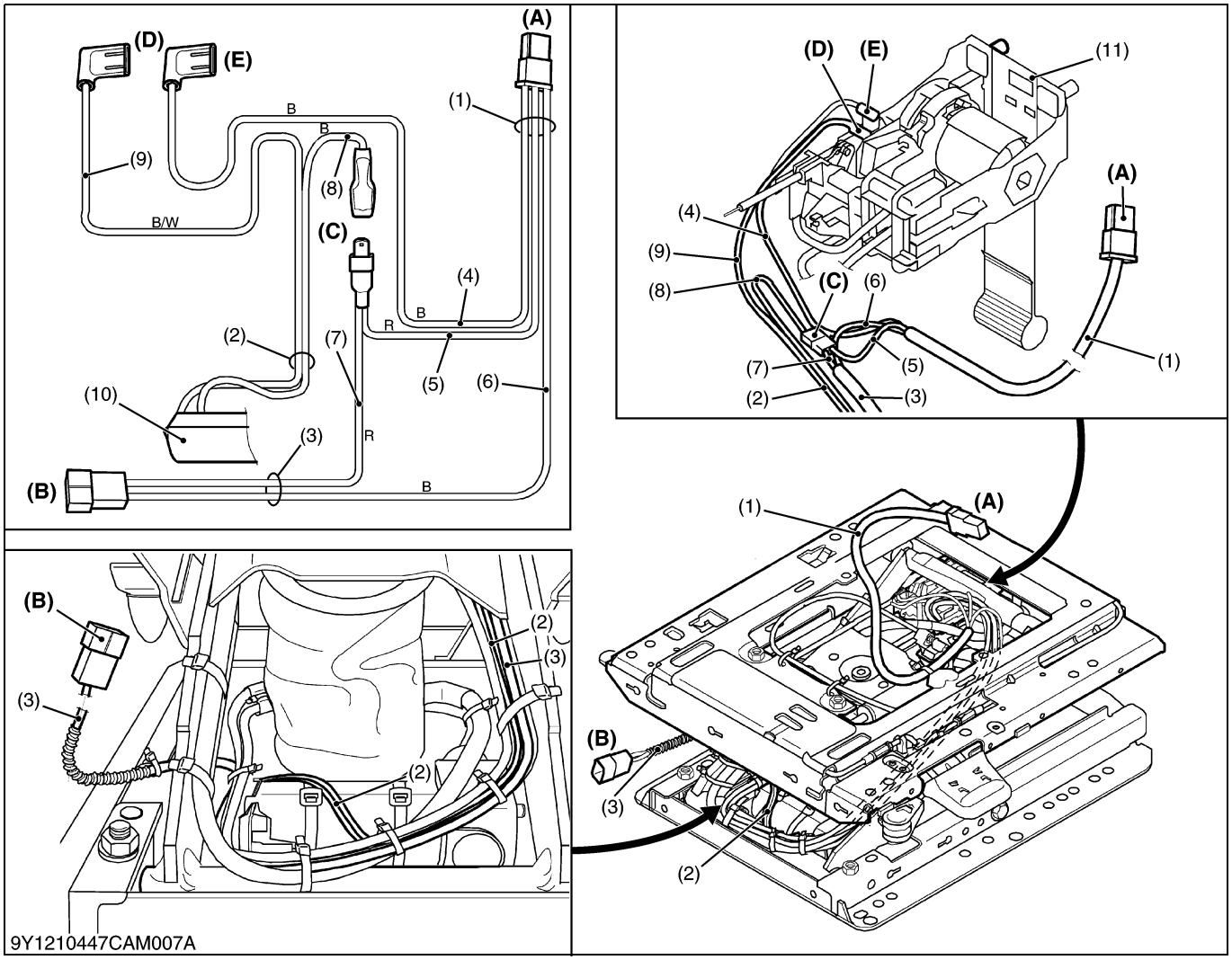
(1) Compressor
(2) Air Hose
(3) Pneumatic Spring
(4) Air Hose
(5) Air Hose
(6) Height Level Control Unit
(7) Coupler

- The compressor (1) provides the compressed air to the pneumatic spring (3).
- The pneumatic spring (3) accumulates the air when extending itself.
- The pneumatic spring (3) discharges the air when retracting itself.
- The height level control unit (6) controls the air flows and the pneumatic spring (3) height.

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[6] ELECTRICAL SYSTEM



(1) Cable Harness with Main Lines
(2) Compressor Cable
(3) Wiring Harness for Power Supply
(4) Power Cable
(5) Power Cable Connector
(6) Cable of the Power Supply Connector
(7) Power Cable of Power Supply Connector
(8) Compressor Power Cable
(9) Cable
(10) Compressor
(11) Height Level Control Unit

(A) Connector Plug
(B) Power Connector (from Tractor Main Air 2-pin)
(C) Plug-in Cable Connection: Power Cable of the Power Connector / Connector Plug-compressor Power Cable
(D) Right-angle Plug (Transparent) (Compressor Connecting Cable for Micro-switch)
(E) Right-angle Plug (Black) (Current-carrying Cable for Micro-switch)

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SERVICING

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1. TROUBLESHOOTING

COMPRESSOR

Symptom	Probable Cause	Solution	Reference Page
Noisy (Compressor ON)	Bearing of compressor worn or damaged	Replace	10-S40
	Valves in compressor damaged	Replace	10-S40
	Belt slipping	Adjust or replace	G-32
	Compressor bracket mounting screws loosen	Tighten	10-S40
	Piping resonant	Tighten or add clamp	10-S44
Noisy (Compressor OFF)	Blower defective	Repair or replace	10-S26
	Bearings of magnetic clutch, idle pulley or crank pulley worn or damaged	Replace	10-S41

AIR CONDITIONING SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Does Not Cool (No Air Flow)	Fuse blown	Replace	–
	A/C main relay defective	Replace	10-S24
	A/C blower motor defective	Replace	10-S26
	A/C blower switch defective	Replace	10-S25
	Wiring harness disconnected or improperly connected	Repair	–
Does Not Cool (Compressor Does Not Rotate)	Fuse blown	Replace	–
	Magnetic clutch defective	Repair or replace	10-S23 10-S41
	A/C switch defective	Replace	10-S27
	Pressure switch defective	Replace	10-S28
	Belt slipping	Adjust or replace	G-32
Does Not Cool (Others)	Insufficient refrigerant	Check with manifold gauge	10-S22
	Expansion valve defective	Replace	–
	Compressor defective	Replace	10-S40
Insufficient Cooling (Insufficient Air Flow)	Air filter clogged	Clean or replace	G-30
	Evaporator frosted	Clean or replace thermo switch	–
	A/C blower motor defective	Replace	10-S26
	A/C blower resistor defective	Replace	10-S26
Insufficient Cooling (Many Bubbles in Sight Glass)	Insufficient refrigerant	Check with manifold gauge	10-S22
	Gas leaking from some place in refrigerating cycle	Repair and charge refrigerant	10-S12 10-S22
	Air mixed in	Check with manifold gauge	10-S22
Insufficient Cooling (No Bubbles in Sight Glass)	Too much refrigerant	Check with manifold gauge	10-S22

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Symptom	Probable Cause	Solution	Reference Page
Insufficient Cooling (Compressor Does Not Rotate Properly)	Belt slipping	Adjust or replace	G-32
	Magnetic clutch defective	Repair or replace	10-S23 10-S41
	Compressor defective	Replace	10-S40
Insufficient Cooling (Others)	Thermostat defective	Replace	–
	Water valve defective	Replace	–
	Condenser fin clogged with dust	Clean	–
	Expansion valve defective	Replace	–
Insufficient Heating	Water valve defective	Replace	–
	Air mix door malfunctioning	Adjust control cable	10-S42
	Insufficient coolant	Fill	G-37
Too Low Air Flow Rate (Blower Motor Does Not Run)	Blower fan switch defective	Check and repair	10-S25
	A/C main relay defective	Replace	10-S24
	Brush in poor contact	Replace	–
	Fuse blown out	Replace	–
	Wrong wiring or loose connections	Check and repair	–
Too Low Air Flow Rate (Flow Rate Does Not Change in 3 Steps)	Blower resistor defective	Replace	10-S26
	Relay defective	Replace	10-S24
	Blower fan switch defective	Replace	10-S25
Too Low Air Flow Rate (Others)	Blower is not tightened enough	Check and repair	10-S26
	Blower deformed	Replace	10-S26
	Blower in contact with casing	Check and repair	–
	Obstacle at or near suction port	Check and repair	–
	Evaporator frosted	Clean or replace	–
	Filter clogged	Clean or replace	–
	Blow duct clogged or missing	Check and repair	10-S43
Insufficient Cooling (Compressor Magnetic Clutch Does Not Work)	Low battery voltage	Charge	G-23 G-24
	Rotor in contact with stator	Replace	–
	Wrong wiring loose connections	Check and repair	–
	Relay defective	Replace	10-S24
	Coil shortage	Replace	10-S23
	Ground malfunction	Check and Repair	–
	Coil burst out	Replace	10-S23
Insufficient Cooling (Hi-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	10-S21 10-S22
	Condenser clogged with dust and dirt	Clean	–
	Air mixed	Check with manifold gauge	–
Insufficient Cooling (Hi-pressure Level is Too Low)	Insufficient refrigerant charge	Check with manifold gauge	10-S22
	Low-pressure pipe in trouble (Cracked or clogged)	Replace	10-S44

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Symptom	Probable Cause	Solution	Reference Page
Insufficient Cooling (Low-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	10-S21 10-S22
	Heat-sensitive tube in poor contact	Check and repair	–
	Expension valve too open	Replace	–
Insufficient Cooling (Low-pressure Level is Too Low)	Refrigerant too short	Check with manifold gauge	–
	Gas leak at heat-sensitive tube	Replace	–
	Evaporator frosted	Clean or replace	10-S43
	Low-pressure pipe in trouble (Cracked or clogged)	Replace	10-S44
	Expension valve clogged	Replace	–
Insufficient Cooling (Both Hi-pressure and Low-pressure Level is Too High)	Refrigerant overcharged	Check with manifold gauge	10-S21 10-S22
Insufficient Cooling (Both Hi-pressure and Low-pressure Level is Too Low)	Insufficient refrigerant charge	Check with manifold gauge	10-S22
Insufficient Cooling (Temperature Control Lever Does Not Work)	Cable poorly fixed	Check and repair	10-S42
	Cable wrongly laid	Check and repair	10-S42
	Cable wrongly set	Check and repair	10-S42
	Cable disconnected	Check and repair	10-S42

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WINDSHIELD WIPER

Symptom	Probable Cause	Solution	Reference Page
Windshield Wiper Does Not Operate	Wiring defective	Check and repair	–
	Fuse blown (Short-circuit, burnt component inside motor or other part for operation)	Correct cause and replace	–
	Wiper motor defective (Broken armature, worn motor brush or seized motor shaft)	Replace	10-S48
	Wiper switch defective	Replace	10-S29 10-S30
	Foreign material interrupts movement of link mechanism	Repair	–
	Wiper arm seized or rusted	Lubricate or replace	–
Windshield Wiper Operating Speed Is Too Low	Wiper motor defective (Short-circuit of motor armature, worn motor brush or seized motor shaft)	Replace	10-S48
	Low battery voltage	Recharge or replace	G-23 G-24
	Humming occurs on motor in arm operating cycle due to seized arm shaft	Lubricate or replace	–
	Wiper switch contact improper	Replace	10-S29 10-S30
Windshield Wiper Does Not Stop Correctly	Wiper motor defective (Contaminated auto-return contacts or improper contact due to foreign matter)	Replace	10-S48

AIR SUSPENSION SEAT SYSTEM

Symptom	Probable Cause	Solution	Reference Page
Seat Does Not Respond After Operating the Seat Height Adjustment in Upward Direction	Compressor defective	Replace	10-S32
	Height level adjustment cannot be operated via the Bowden pull wire	Adjust	10-S34 10-S53
Seat Does Not Respond When Operating the Seat Height Adjustment in Downward Direction	Outlet valve does not respond	Check	10-S33
	Excessive valve clearance	Adjust	10-S33
	Height adjustment is not operated via the Bowden pull wire	Replace or adjust	10-S34 10-S53
	Height level control defective	Replace	10-S53
After the Height Adjustment, the Seat Lowers for at Least 30 mm, But Continues to Vent Automatically After Unloading the Seat (Driver Gets Off the Seat)	Level control does not uncouple	Compress and expand the seat	10-S53

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Symptom	Probable Cause	Solution	Reference Page
Seat Responds After the Height Adjustment Has Been Operated, But Then Returns to Its Original Position	Height level control is defective	Check	10-S53
Seat Changes Its Position While Driving, Vents And Lowers Down	Air connections are untight	Check	10-S52
	Compressed-air hoses leak	Replace	10-S52
	Air leak from pneumatic spring	Check	10-S52
	Level is defective (air escapes from outlet valve)	Adjust	10-S33
	Level control is leaky	Replace	10-S53
	Compressor is untight	Replace	10-S32 10-S52
Seat Can Be Set To the Highest Position And Does Not Vent Anymore	Outlet valve is too far from the cam disc	Adjust	10-S33
	Height level control system defective	Replace	10-S53
Seat Can Be Lowered, But Does Not Pump Up in the Loweat Position Despite of the Handle Pulled Upwards	Excessive cam switch clearance	Adjust	10-S33
	Height level control system is defective	Check	10-S53
Height Adjustment Upwards: Compressor Runs, But Seat Is Not Lifted	Level control defective	Replace	10-S53
Seat Moves Up Automatically (Compressor Does Not Switch Off)	Excessive cam switch clearance	Adjust	10-S33
	Cam switch defective	Replace	10-S33
Compressor Starts Automatically	Cable break or short-circuit	Replace	10-M13
Compressor Is Not Active	Wrong battery or wrong wiring	Check	G-23 G-24 10-M13
	Excessive cam switch clearance	Adjust	10-S33
No Voltage at the Compressor	Cam switch is defective or cam switch is bent	Replace	10-S33
Voltage Present at the Compressor	Compressor defective	Replace	10-S32
Compressor Is Active, Seat Does Not Move Upwards or Sear Lowers After a Short Time	Air hoses leaky	Check	10-S52
	Air spring is untight	Replace	10-S52
	Compressor leaky or defective	Replace	10-S32

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2. SERVICING SPECIFICATIONS

Item		Factory Specification	Allowable Limit
A/C Compressor Magnet Clutch	Air-gap	0.30 to 0.65 mm 0.0118 to 0.0255 in.	–
Magnet Clutch Stator Coil	Resistance	3.0 to 4.0 Ω	–
Refrigerating Cycle (Refrigerating Cycle is Normal Operating)	Pressure (**LO** Pressure Side)	0.15 to 0.20 MPa 1.5 to 2.0 kgf/cm^2 21 to 28 psi	–
	Pressure (**HI** Pressure Side)	1.27 to 1.66 MPa 13 to 17 kgf/cm^2 185 to 242 psi	–
Pressure Switch (Dual Type) (When pressure switch is turned **OFF**)	Setting Pressure (**LO** Pressure Side)	Less than approx. 0.196 MPa 2.0 kgf/cm^2 28.4 psi	–
	Setting Pressure (**HI** Pressure Side)	More than approx. 3.14 MPa 32 kgf/cm^2 455 psi	–
Air Conditioner Drive Belt	Tension	9 to 11 mm (0.36 to 0.43 in.) deflection at 98 N (10 kgf, 22 lbf) of force	–
Front Wiper	Rotating Speed	More than 25 times/min.	–
Rear Wiper	Rotating Speed	More than 40 times/min.	–

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3. TIGHTENING TORQUES

Tightening torques of screws, bolts and nuts on the table below are especially specified.
(For general use screws, bolts and nuts: See page G-13.)

Item	N·m	kgf·m	lbf·ft
Muffler mounting screw	24 to 27	2.4 to 2.8	18 to 20
Clutch safety valve hose retaining nut	22.6 to 26.4	2.3 to 2.7	16.7 to 19.5
Fan belt tension adjusting screw	Below 15	Below 1.53	Below 11.1
Fan belt tension adjusting screw lock nut	123.6 to 147	12.6 to 15.0	91.2 to 108.4
Front differential lock hose retaining nut	19.7 to 29.4	2.0 to 3.0	14.5 to 21.6
Brake hose retaining nut	22.6 to 27.4	2.30 to 2.80	16.7 to 20.2
Cabin mounting screw and nut	69 to 88	7.0 to 9.0	50.6 to 65.1
Outer roof mounting screw	3.5 to 4.0	0.36 to 0.40	2.6 to 2.9
High pressure pipe and low pressure pipe mounting screw	7.85 to 11.7	0.8 to 1.2	5.79 to 8.67
Compressor mounting screw	24.5 to 29.4	2.5 to 3.0	18.1 to 21.6
Magnetic clutch mounting screw	15.0 to 21.0	1.5 to 2.1	11.1 to 15.5
A/C unit mounting screw (M8)	23.6 to 27.4	2.4 to 2.8	17.4 to 20.2
Low pressure pipe retaining nut	29.5 to 34.3	3.0 to 3.5	21.7 to 25.3
High pressure pipe retaining nut	11.8 to 14.7	1.2 to 1.5	8.08 to 10.8
Low pressure pipe mounting screw (compressor side)	7.85 to 11.7	0.8 to 1.2	5.79 to 8.67
High pressure pipe 1 mounting screw (compressor side)	7.85 to 11.7	0.8 to 1.2	5.79 to 8.67
High pressure pipe 1 retaining nut (compressor side)	19.7 to 24.5	2.0 to 2.5	14.5 to 18.0
High pressure pipe 2 retaining nut (receiver side)	11.8 to 14.7	1.2 to 1.5	8.68 to 10.8
High pressure pipe 2 retaining nut	11.8 to 14.7	1.2 to 1.5	8.68 to 10.8
Low pressure pipe retaining nut	29.5 to 34.3	3.0 to 3.5	21.7 to 25.3
Wiper arm mounting nut (front wiper)	6.4 to 9.3	0.65 to 0.95	4.7 to 6.8
Wiper arm mounting nut (rear wiper)	7.8 to 9.3	0.80 to 0.95	5.80 to 6.80
Wiper motor mounting screw	7.8 to 9.3	0.80 to 0.95	5.80 to 6.80
Seat mounting nut	24 to 27	2.4 to 2.8	18 to 20
Arm rest mounting nut	24 to 27	2.4 to 2.8	18 to 20
Counter sunk screw	6	0.6	4

9Y1210447CAS0003US0

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4. PRECAUTIONS AT REPAIRING REFRIGERANT CYCLE

When checking or repairing the air conditioning system, the following precautions and rules must be observed. And it is of first importance that no other personnel than a well-trained serviceman should be allowed to handle the refrigerant.

⚠ CAUTION

- **Since direct contact of the liquid refrigerant with your skin will cause frostbite, always be careful when handling the refrigerant. Always wear goggles to protect your eyes when working around the system.**
- **The refrigerant service container has a safe strength. However, if handled incorrectly, it will explode. Therefore, always follow the instructions on the label. In particular, never heat the refrigerant container above 40 °C (104 °F) or drop it from a high height.**
- **Do not steam clean on the system, especially condenser since excessively high pressure will build up in the system, resulting in explosion of the system.**
- **If you improperly connect the hose between the service valve of compressor and gauge manifold, or incorrectly handle the valves, the refrigerant service container or charging hose will explode. When connecting the hose or handling the valve, be sure to check the high pressure side or low pressure side.**
- **In case the refrigerant is charged while the compressor is operated, do not open the high pressure valve of the gauge manifold.**
- **Beware of the toxicity of the gas. The gas is harmless and nontoxic in its original state, however it produces a toxic substance when it comes in contact with high temperature parts and decomposes.**
- **Do not heat the service can unless necessary. When it has to be heated, use warm water of 40 °C (104 °F) or lower. Do not heat using boiling water.**

■ IMPORTANT

- **If the refrigerant, O-rings, etc. for R12 are used in the R134a air conditioner system, problems such as refrigerant leakage or cloudiness in the sight glass may occur. Therefore, in order to prevent charging of refrigerant or erroneous connections, the shapes of the piping joint as well as the shapes of the service valve and the service tools have been changed.**
- **Always keep the working place clean and dry and free from dirt and dust. Wipe off water from the line fittings with a clean cloth before disconnecting.**
- **Use only for R134a refrigerant service tool.**
- **Use for R134a refrigerant recovery and recycling machine when discharging the refrigerant.**
- **Before attaching the charging hose to the can tap valve of the refrigerant container, check each packing for clogging.**
- **When disconnecting the charging hose from the charging valve of compressor and receiver, remove it as quick as possible so that gas leakage can be minimized.**
- **Be sure to charge the specified amount of refrigerant, but not excessively. Over-charging of the refrigerant in particular may cause insufficient cooling, etc..**
- **Since the charging hose can be connected to can tap valve by hand, do not use a pliers for tightening it.**
- **Keep refrigerant containers in a cool and dark place avoiding such place which are subject to strong sunlight or high temperature.**
- **R134a compressor oil absorbs moisture easily, so be sure to seal after disconnecting the each parts.**
- **Do not use old-type refrigerant R12a or compressor oil for old-type refrigerant.**
- **When replacing the condenser, evaporator and receiver, etc., fill the compressor oil to compressor according to the table next page.**

(To be continued)

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(Continued)
(Refrigerant)

Kinds of refrigerant (Charge amount)	Factory specification	R134a 0.90 to 1.00 kg 1.98 to 2.20 lbs

(Compressor Oil)

Quantity (Total)	Brand Name
50 to 70 cc 0.053 to 0.073 U.S.qts 0.044 to 0.061 Imp.qts	ND-OIL 8 <PAG* oil>

*PAG: Polyalkyleneglycol (Synthetic oil)

(Reference)

Replacing Parts	Fill Quantity	Brand Name
Condenser	20 cc 0.021 U.S.qts 0.018 Imp.qts	ND-OIL 8 <PAG* oil>
Evaporator	20 cc 0.021 U.S.qts 0.018 Imp.qts	
Receiver	10 cc 0.011 U.S.qts 0.009 Imp.qts	
Hose	10 cc 0.011 U.S.qts 0.009 Imp.qts	

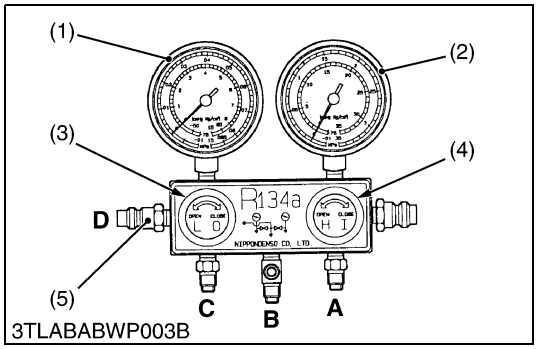
*PAG: Polyalkyleneglycol (Synthetic oil)

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[1] HANDLING OF SERVICE TOOLS

(1) Manifold Gauge Set

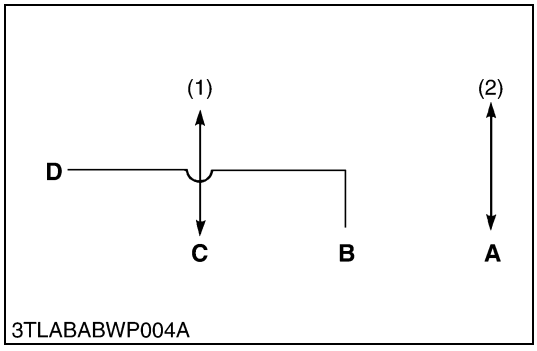


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The hand valves on the manifold gauge set are used to open and close the valve. The hand valve inscribed **LO** is for the low pressure side valve (3) and **HI** is for the high pressure side valve (4). By opening or closing the high and low pressure hand valves, the following circuits are established.

(1) **LO** Pressure Gauge
(2) **HI** Pressure Gauge
(3) **LO** Pressure Side Valve
(4) **HI** Pressure Side Valve
(5) Schrader Valve

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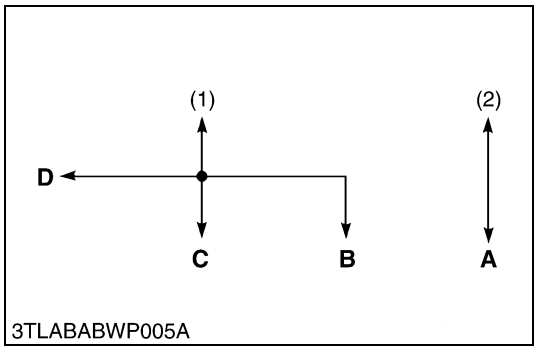
3TLABABWP004A

When LO Pressure Side Valve and HI Pressure Side Valve are Closed

Two circuits are established.
Port (C) → **LO** pressure gauge (1)
Port (A) → **HI** pressure gauge (2)

■ **NOTE**
- **Schrader valve (D) must be opened.**

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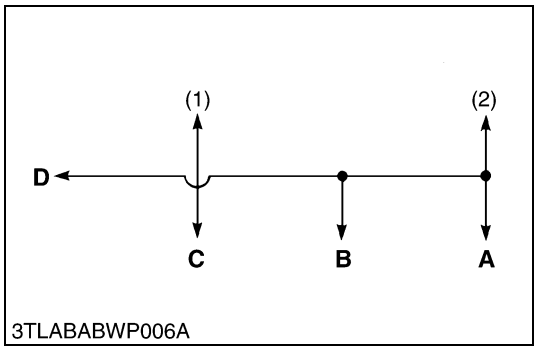
3TLABABWP005A

When LO Valve is Opened and HI Valve is Closed

Two circuits are established.
Port (**C**) → **LO** pressure gauge (1)
→ Port (**B**)
→ Port (**D**)
Port (**A**) → **HI** pressure gauge (2)

■ **NOTE**
- **Schrader valve (D) must be opened.**

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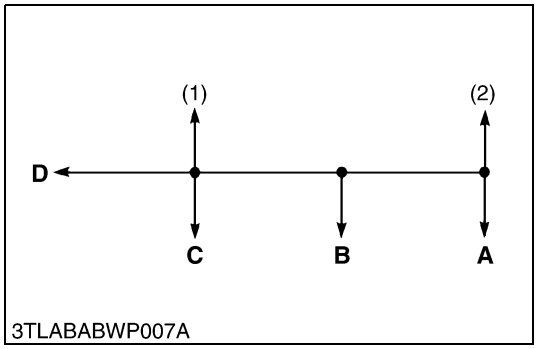
3TLABABWP006A

When LO Valve is Closed and HI Valve is Opened

Two circuits are established.
Port (**C**) → **HI** pressure gauge (2)
→ Port (**B**)
→ Port (**D**) (Schrader valve must be opened)
Port (**A**) → **LO** pressure gauge (1)

■ **NOTE**
- **Schrader valve (D) must be opened.**

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3TLABABWP007A

When LO and HI Valve are Opened

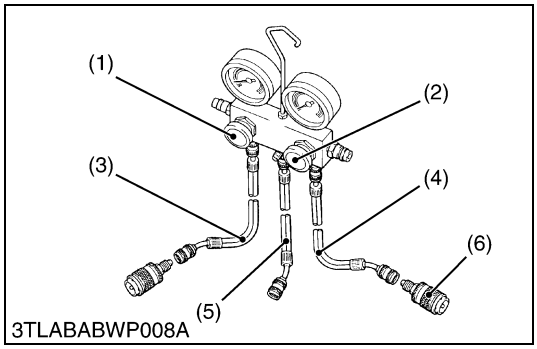
Circuits are established.
Port (**A**) → **HI** pressure gauge (2)
→ **LO** pressure gauge (1)
→ Port (**B**)
→ Port (**C**)
→ Port (**D**) (Schrader valve must be opened)

■ **NOTE**
- **Schrader valve (D) must be opened.**

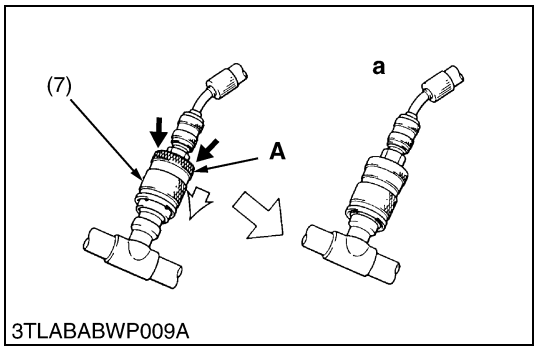
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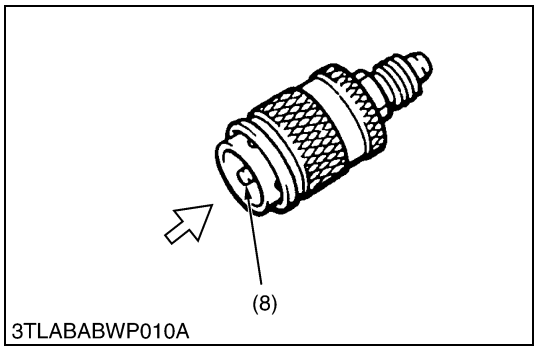
(2) Refrigerant Charging Hose



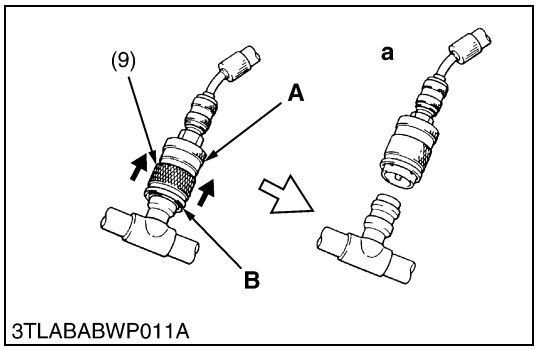
3TLABABWP008A



3TLABABWP009A



3TLABABWP010A



3TLABABWP011A

The charging hoses are classified into three colors. Each charging hose must be handled as follows:

- The air conditioner manufacture recommends that the blue hose (3) is used for the **LO** pressure side (suction side), the green hose (5) for refrigeration side (center connecting port) and the red hose (4) for **HI** pressure side (discharged side).

(When connecting)

- Push the quick disconnect adaptor (6) into the charging valve, and push on part **"A"** until a click is heard.

■ **NOTE**

- **When connecting, push carefully so the pipe doesn't bend.**
- **When connecting the quick disconnect connector, should the sleeve (7) move before the quick link connector can be connected to the charging valve, move the quick sleeve to its original position and try again.**
- **When some refrigerant remains in the charging hose at the time of connections, it may be difficult to connect the quick link connector. In this case, perform the operation after removing any residual pressure in the hose. (Remove the residual pressure by pushing the pusher (8).)**

(When reassembling)

- While holding on to part **"A"** of the quick disconnect adaptor, slide part **"B"** up.

■ **NOTE**

- **After removing the adaptor, ensure to cap the quick disconnect adaptor service valve.**

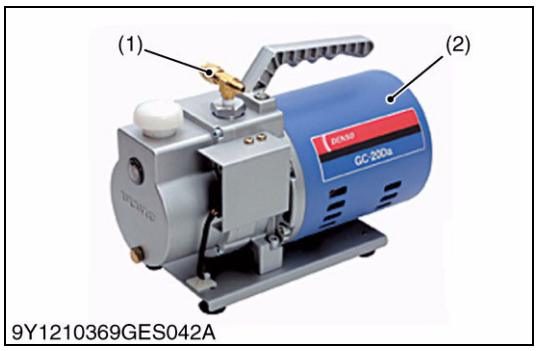
(1) **LO** Pressure Side Valve
(2) **HI** Pressure Side Valve
(3) Blue Hose
(4) Red Hose
(5) Green Hose
(6) Quick Disconnect Adaptor
(7) Sleeve
(8) Pusher
(9) Sleeve

a: CLICK

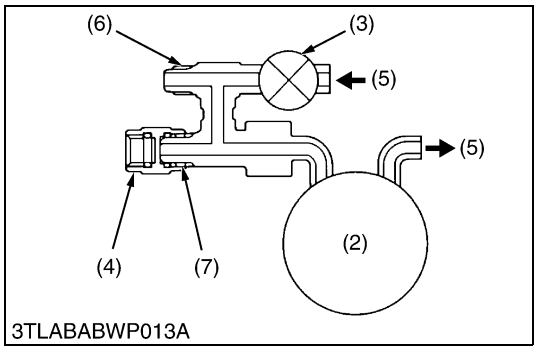
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(3) Vacuum Pump Adaptor



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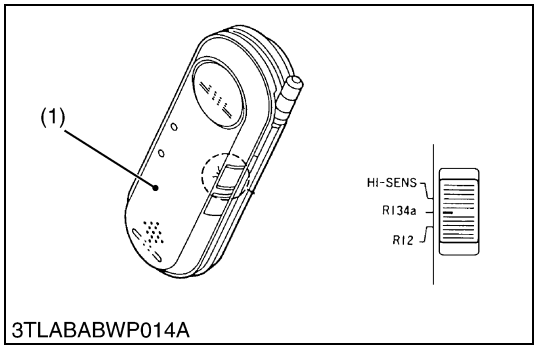
Objective of the Vacuum Pump Adaptor

1. After vacuum has been created in the air conditioning cycle, when the vacuum pump is stopped, since there is vacuum in hoses within the gauge manifold, the vacuum pump oil flows back into the charging hose. If the refrigerant is refilled with the system still in this state, the vacuum pump oil left in the charging hose enters the air conditioner cycle together with the refrigerant. Vacuum pump adaptor with a solenoid valve is used to prevent this back-flow of oil from the vacuum pump. The role of the solenoid valve is that when the current passes through the solenoid valve, the valve closes to keep out the outside air and allow the vacuum to build up, but when the current stops, the valve opens to allow in air and end the vacuum.
2. Attaching this adaptor to the R12 vacuum pump currently being used allows the pump to be used with both R134a and R12.

(1) Vacuum Pump Adaptor
(2) Vacuum Pump
(3) Magnetic Valve
(4) Blind Cap
(5) Air
(6) For R134a
(7) For R12

9Y1210447CAS0031US0

(4) Electric Gas Leak Tester



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The current R12 gas leak tester has poor sensitivity for R134a and cannot be used. Therefore, a new electric gas leak tester with greater sensitivity has been designed and can be used with both R134a and R12.

(Reference)

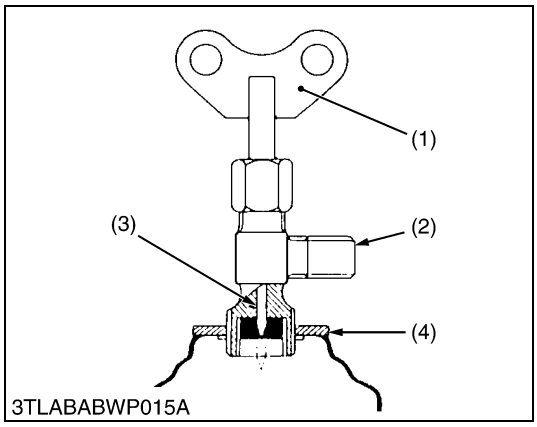
Leak tester with halide torch

- Since the reaction with chlorine within the refrigerant is used to detect gas leaks, R134a, which contains no chlorine, cannot be detected.

(1) Electric Gas Leak Tester

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(5) Can Tap Valve



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The can tap valve that is used to charge the refrigerant into the air conditioning system, should be used as follows:

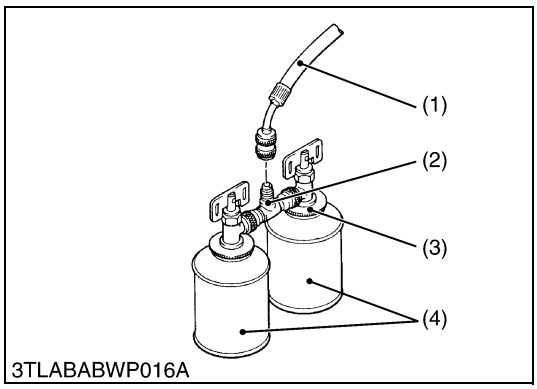
1. Before putting the can tap valve on the refrigerant container, turn the handle (1) counterclockwise till the valve needle is fully retracted.
2. Turn the plate nut (disc) (4) counterclockwise till it reaches its highest position, then screw down the can tap valve into the sealed tap.
3. Turn the place nut clockwise fully, and fix the center charging hose to the valve.
4. Tighten the place nut firmly by hand.
5. Turn the handle (1) clockwise, thus making a hole in the sealed tap.
6. To charge the refrigerant into the system, turn the handle (1) counterclockwise. To stop charging, turn it clockwise.

(1) Butterfly Handle
(2) Connection
(3) Needle
(4) Disc

9Y1210269CAS0013US0

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(6) T-joint



T-joint (2) is used to increase efficiency of gas charging using two refrigerant containers (4) at a time.

1. Install two refrigerant container service valves to T-joint (2) sides and connect the charging hose (1) to it.

(1) Charging Hose (Green)
(2) T-joint
(3) Can Tap Valve
(4) Refrigerant Container

9Y1210269CAS0014US0

(7) R134a Refrigerant Recovery and Recycling Machine

When there is necessity of discharging the refrigerant on repairing the tractor, it should use recovery and recycling machine. (Do not release the refrigerant into the atmosphere.)

■ **IMPORTANT**

- **Use only R134a refrigerant recovery and recycling machine, eliminate mixing R134a equipment, refrigerant and refrigerant oils with R12 systems to prevent compressor damage.**

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5. CHECKING AND CHARGING REFRIGERANT CYCLE

[1] CHECKING WITH MANIFOLD GAUGE

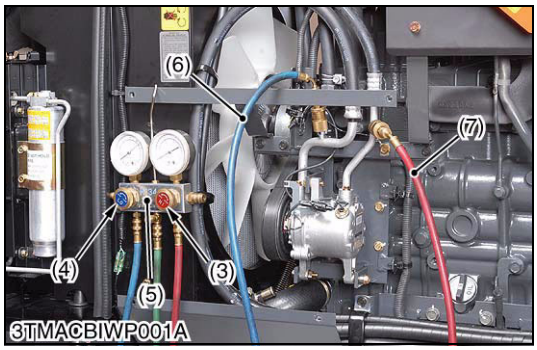
■ **IMPORTANT**

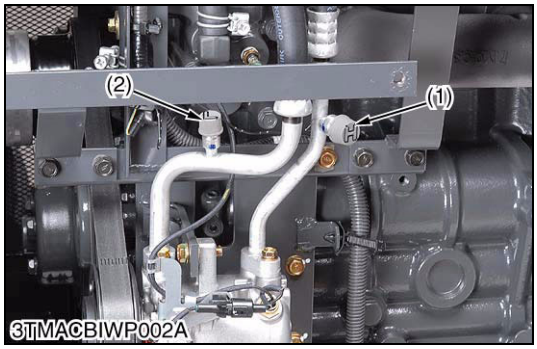
- **The gauge indications described in the following testing are those taken under the same condition, so it should be noted that the gauge readings will differs somewhat with the ambient conditions.**

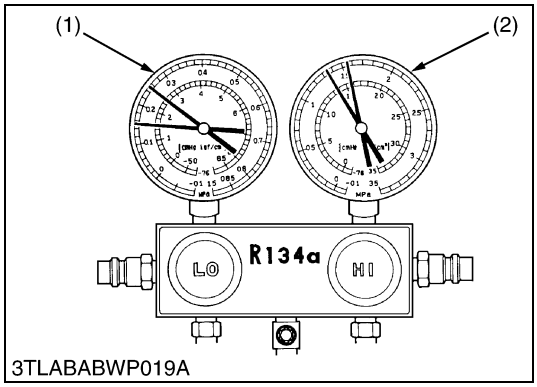
Condition

- Ambient temperature: **30 to 35 °C (86 to 95 °F)**
- Engine speed: Approx. **1500 min^{-1} (rpm)**
- Temperature control lever: **Maximum cooling position**
- Blower switch: **HI** position

9Y1210269CAS0016US0







Manifold Gauge Connecting and Test Preparation

1. Close the manifold gauge **HI** and **LO** pressure side valve (3), (4) tightly.
2. Connect the charging hose (7) (red) to the **HI** pressure side charging valve (1) and connect the charging hose (6) (blue) to the **LO** pressure side charging valve (2).

■ **NOTE**

- **Be sure to drive out the air in the charging hoses at the manifold gauge connection end by utilizing the refrigerant pressure in the refrigerating cycle.**

3. Start the engine and set at approx. **1500 min^{-1} (rpm)**.
4. Turn on the A/C switch and set the temperature control lever to **maximum cooling** position.
5. Set the blower switch to **HI** position.

(1) **HI** Pressure Side Charging Valve
(2) **LO** Pressure Side Charging Valve
(3) **HI** Pressure Side Valve
(4) **LO** Pressure Side Valve
(5) Manifold Gauge
(6) Charging Hose (Blue)
(7) Charging Hose (Red)

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Normal Operating

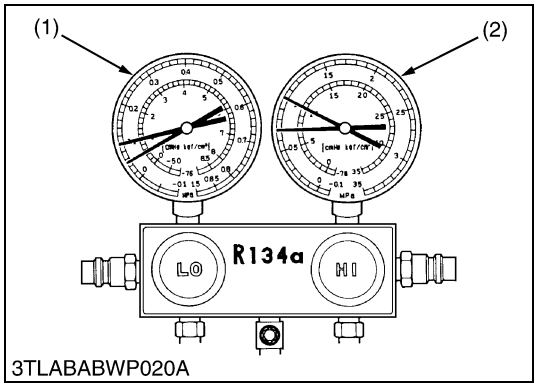
If the refrigerating cycle is operating normally, the reading at the **LO** pressure side (1) should be generally by around 0.15 to 0.2 MPa (1.5 to 2.0 kgf/cm^2, 21 to 28 psi) and that at the **HI** pressure side (2) around 1.27 to 1.66 MPa (13 to 17 kgf/cm^2, 185 to 242 psi).

Gas pressure	Factory spec	Low pressure side	0.15 to 0.20 MPa 1.5 to 2.0 kgf/cm^2 21 to 28 psi
		High pressure side	1.27 to 1.66 MPa 13 to 17 kgf/cm^2 185 to 242 psi

(1) **LO** Pressure Side
(2) **HI** Pressure Side

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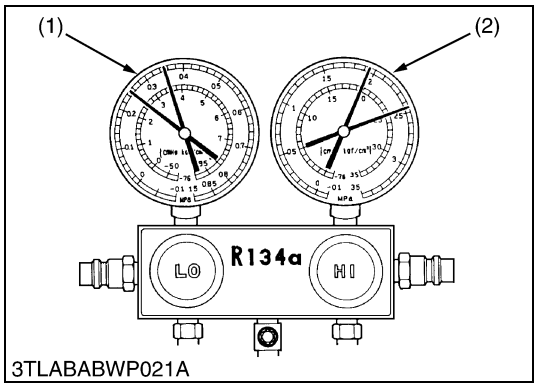
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Insufficient Refrigerant

1. Symptoms seen in refrigerating cycle
   – Both **LO** and **HI** pressure side (1), (2) pressures too low.
   LO pressure side (1):
   0.05 to 0.1 MPa (0.5 to 1.0 kgf/cm^2, 7.1 to 14.2 psi)
   HI pressure side (2):
   0.69 to 0.98 MPa (7 to 10 kgf/cm^2, 99.6 to 142.2 psi)
   – Bubbles seen in sight glass.
   – Air discharged from air conditioner sightly cold.
2. Probable cause
   – Gas leaking from some place in refrigerant cycle.
3. Solution
   – Check for leakage with electric gas leak tester (see "DISCHARGING, EVACUATING AND CHARGING" in this section) and repair.
   – Recharge refrigerant to the proper level. (See "DISCHARGING, EVACUATING AND CHARGING" in this section.)

(1) **LO** Pressure Side (2) **HI** Pressure Side

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Excessive Refrigerant or Insufficient Condenser Cooling

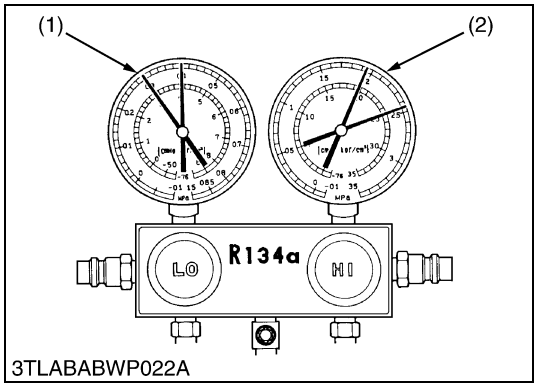
1. Symptoms seen in refrigerating cycle
   – Both **LO** and **HI** pressure side (1), (2) pressures too high.
   LO pressure side (1):
   0.2 to 0.35 MPa (2.0 to 3.5 kgf/cm^2, 28 to 49.8 psi)
   HI pressure side (2):
   1.96 to 2.45 MPa (20 to 25 kgf/cm^2, 284.5 to 355.6 psi)
2. Probable cause
   – Overcharging refrigerant into cycle.
   – Condenser cooling faulty.
3. Solution
   – Clean condenser.
   – Adjust air conditioner belt to proper tension.
   – If the above two items are in normal condition, check refrigerant quantity. (See "DISCHARGING, EVACUATING AND CHARGING" in this section.)

■ **NOTE**
- **If excessive refrigerant is to be discharged, loosen manifold gauge LO pressure side valve and vent out slowly.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

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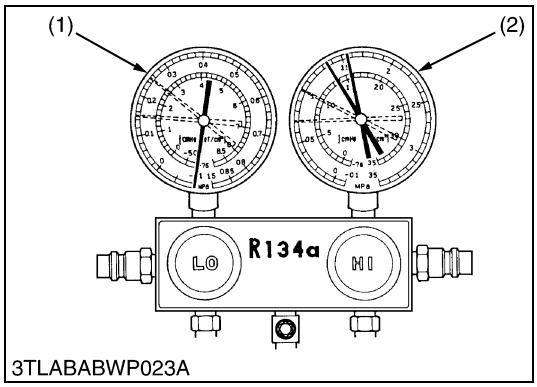
Air Entered in the Cycle

1. Symptoms seen in refrigerating cycle
   – Both **LO** and **HI** pressure side (1), (2) pressures too high.
   LO pressure side (1):
   0.2 to 0.35 MPa (2.0 to 3.5 kgf/cm^2, 28 to 49.8 psi)
   HI pressure side (2):
   1.96 to 2.45 MPa (20 to 25 kgf/cm^2, 284.5 to 355.6 psi)
   – **LO** pressure side (1) piping not cold when touched.
2. Probable cause
   – Air entered in refrigerating cycle.
3. Solution
   – Replace receiver.
   – Check compressor oil contamination and quantity.
   – Evacuate and recharge new refrigerant. (See "DISCHARGING, EVACUATING AND CHARGING" in this section.)

■ **NOTE**
- **The above cycle can be seen when the cycle is charged without evacuation.**

(1) **LO** Pressure Side (2) **HI** Pressure Side

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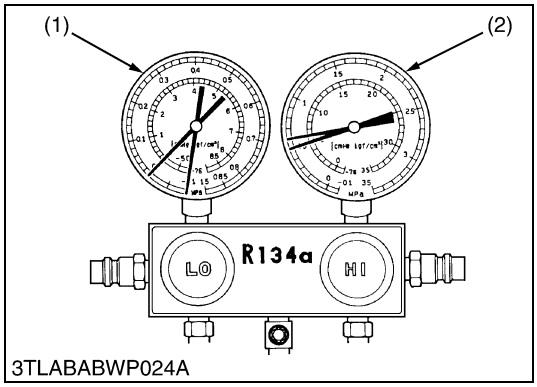
Moisture Entered in the Cycle

1. Symptoms seen in refrigerating cycle
   – The air conditioner operates normally at the beginning, but over time, **LO** pressure side (1) pressure is **vacuum** and **HI** pressure side (2) is low pressure.
   LO pressure side (1): Vacuum
   HI pressure side (2):
   0.69 to 0.98 MPa (7 to 10 kgf/cm^2, 99.6 to 142.2 psi)
2. Probable cause
   – The moisture in the refrigerating cycle freezes in the expansion valve orifice and causes temporary blocking. After a time, the ice melts and condition returns to normal.
3. Solution
   – Replace receiver.
   – Remove moisture in cycle by means of repeated evacuation.
   – Recharge new refrigerant to the proper level. (See "DISCHARGING, EVACUATING AND CHARGING" in this section.)

(1) **LO** Pressure Side (2) **HI** Pressure Side

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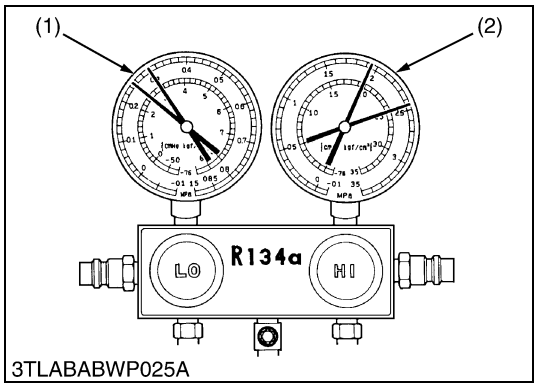
3TLABABWP024A

Refrigerant Fails to Circulate

1. Symptoms seen in refrigerating cycle
   – **LO** pressure side (1) pressure is **vacuum** and, **HI** pressure side (2) is **low** pressure.
   LO pressure side (1): Vacuum
   HI pressure side (2):
   0.49 to 0.59 MPa (5 to 6 kgf/cm^2, 71.2 to 85.3 psi)
   – Frost or dew formed on piping at front and rear sides of expansion valve or receiver.
2. Probable cause
   – Refrigerant flow obstructed by moisture or dirt in the refrigerating cycle freezing or sticking on the expansion valve orifice.
3. Solution
   Allow to stand for same time and then resume operation to decide whether the plugging is due to moisture or dirt.
   – If caused by moisture, correct by referring to instructions in previous.
   – If caused by dirt, remove the expansion valve and blow out the dirt with compressed air.
   – If unable to remove the dirt, replace the expansion valve. Replace the receiver. Evacuate and charge in proper amount of new refrigerant. (See "DISCHARGING, EVACUATING AND CHARGING" in this section.)
   – If caused by gas leakage in heat sensitizing tube, replace the expansion valve.

(1) **LO** Pressure Side (2) **HI** Pressure Side

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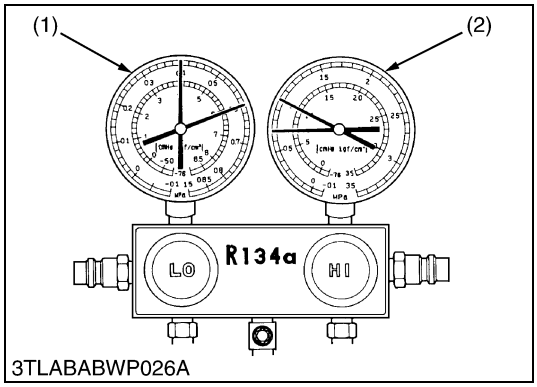
Expansion Valve Opens Too Far or Improper Installation of Heat Sensitizing Tube

1. Symptoms seen in refrigerating cycle
   – Both **LO** and **HI** pressure side (1), (2) pressures too high.
   LO pressure side (1):
   0.29 to 0.39 MPa (3.0 to 4.0 kgf/cm^2, 42.71 to 56.9 psi)
   HI pressure side (2):
   1.96 to 2.45 MPa (20 to 25 kgf/cm^2, 284.5 to 355.6 psi)
   – Frost or heavy dew on low pressure side piping.
2. Probable cause
   – Expansion valve trouble or heat sensitizing tube improperly installed.
   – Flow adjustment not properly done.
3. Solution
   – Check installed condition of heat sensitizing tube.
   – If installation of heat sensitizing tube is correct, replace the expansion valve.

(1) **LO** Pressure Side (2) **HI** Pressure Side

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3TLABABWP026A

Faulty Compression of Compressor

1. Symptoms seen in refrigerating cycle
   – **LO** pressure side (1) pressure too high:
   0.39 to 0.59 MPa (4 to 6 kgf/cm^2, 56.9 to 85.3 psi)
   – **HI** pressure side (2) pressure too low:
   0.69 to 0.98 MPa (7 to 10 kgf/cm^2, 99.6 to 142.2 psi)
2. Probable cause
   – Leak in compressor.
3. Solution
   – Replace compressor. (See "DISCHARGING, EVACUATING AND CHARGING" in this section.)

(1) **LO** Pressure Side
(2) **HI** Pressure Side

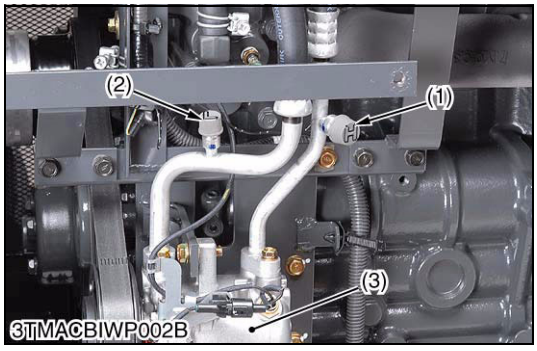
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[2] DISCHARGING, EVACUATING AND CHARGING

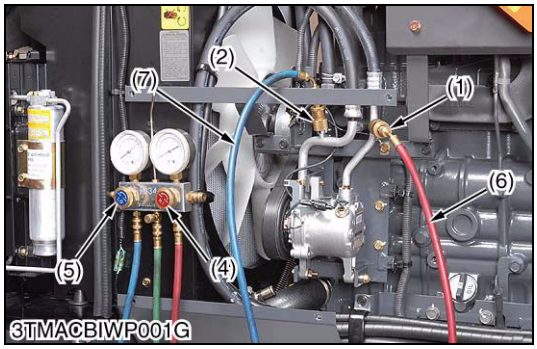
■ **IMPORTANT**
- **When discharging, evacuating or charging the refrigerating system, be sure to observe the "PRECAUTION AT REPAIRING REFRIGERANT CYCLE". (See "4. PRECAUTIONS AT REPAIRING REFRIGERANT CYCLE" in this section.)**

9Y1210269CAS0026US0

(1) Discharging the Refrigerant



3TMACBIWP002B



3TMACBIWP001G



3TMACBIWP003A

Prepare for the R134a refrigerant recovery and recycling machine (8).

1. Connect low pressure side hose (blue) (6) from the recovery and recycling machine to **LO** pressure side charging valve (2). Connect high pressure side hose (red) (7) to **HI** pressure side charging valve (1).
2. Follow the manufacturer's instructions and discharge the system.

■ **IMPORTANT**
- **Use only R134a refrigerant recovery and recycling machine. Eliminate mixing R134a equipment, refrigerant, and refrigerant oils with R12 systems to prevent compressor damage.**

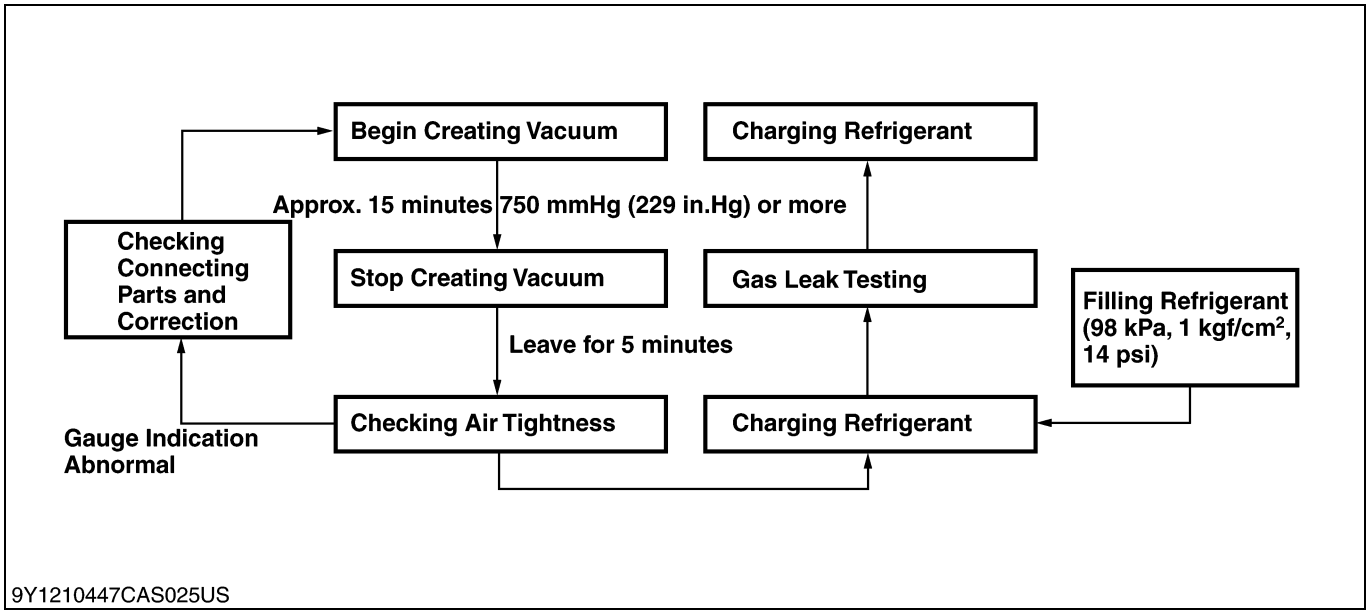
⚠ CAUTION
- **Protect fingers with cloth against frostbite by refrigerant when disconnecting the hose to the charging valve.**

(1) **HI** Pressure Side Charging Valve
(2) **LO** Pressure Side Charging Valve
(3) Compressor
(4) **LO** Pressure Side Valve
(5) **HI** Pressure Side Valve
(6) Red Hose
(7) Blue Hose
(8) Recovery and Recycling Machine

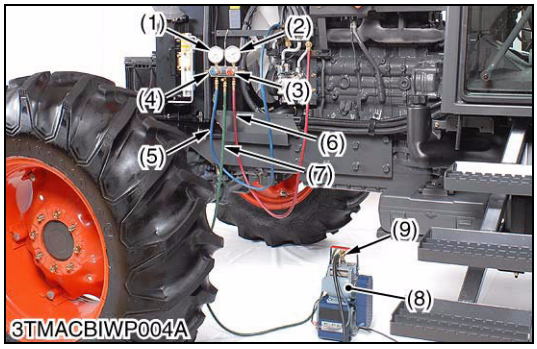
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(2) Evacuating the System



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Evacuating the System

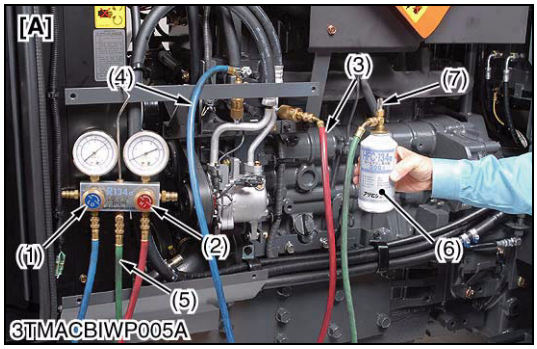
1. Discharge refrigerant from the system by R134a refrigerant recovery and recycling machine. (Refer to "Discharging the Refrigerant" in this section.)
2. Connect the charging hose (6) (red) to the **HI** pressure side charging valve and connect the charging hose (5) (blue) to the **LO** pressure side charging valve.
3. Connect the center charging hose (7) (green) to a vacuum pump inlet.
4. Open both valves (3), (4) of manifold gauge fully. Then run the vacuum pump (8) to evacuate the refrigerant cycle. (For approx. **15 minutes**.).
5. When **LO** pressure gauge (1) reading is more than 750 mmHg (299 in.Hg), stop the vacuum pump (8) and close both valves (3), (4) of manifold gauge fully.
6. Wait for over 5 minutes with the **HI** and **LO** pressure side valves (3), (4) of gauge manifold closed, and then check that gauge indicator does not return to 0.
7. If the gauge indicator is going to approach to 0, check whether there is a leaking point and repair if it is, and then evacuate it again.

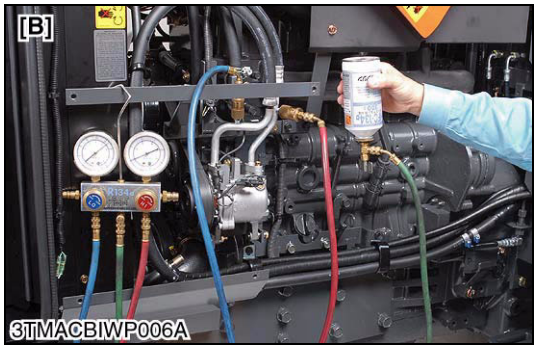
(1) **LO** Pressure Gauge
(2) **HI** Pressure Gauge
(3) **HI** Pressure Side Valve
(4) **LO** Pressure Side Valve
(5) Blue Hose
(6) Red Hose
(7) Green Hose
(8) Vacuum Pump
(9) Vacuum Pump Adaptor

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(3) Charging the Refrigerant





Charging an Empty System (Liquid)

This procedure is for charging an empty system through the **HI** pressure side with the refrigerant in the liquid state.

CAUTION

- **Never run the engine when charging the system through the HI pressure side.**
- **Do not open the LO pressure valve when refrigerant R134a is being charged in the liquid state (refrigerant container is placed upside-down).**

IMPORTANT

- **After charging the refrigerant in the liquid state with approx. 500 g (1.1 lbs) through the HI pressure side, be sure to recharge the refrigerant in the vapor state to specified amount through the LO pressure side.**

1. Close the **HI** and **LO** pressure side valves (1), (2) of manifold gauge after the system is evacuated completely.
2. Connect the center charging hose (5) to the can tap valve (7) fitting, and then loosen the center charging hose at the center fitting of manifold gauge until hiss can be heard.
   Allow the air to escape for few seconds and tighten the nut.
3. Open the **HI** pressure side valve (2) fully, and keep the container upside-down to charge the refrigerant in the liquid state from the **HI** pressure side.
4. Charge the refrigerant in the liquid state with approx. 500 g (1.1 lbs) from the **HI** pressure side.

NOTE

- **If LO pressure gauge does not show a reading, the system is clogged and must be repaired.**

5. Close the **HI** pressure side valve (2) of manifold gauge and can tap valve of refrigerant container.

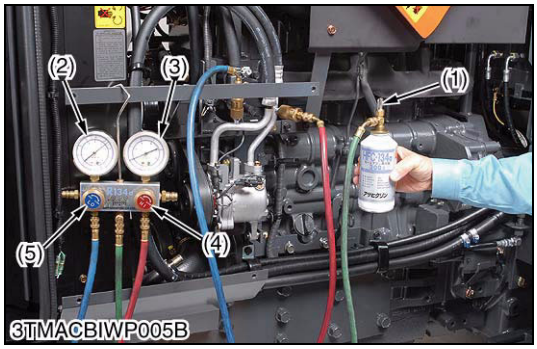
Kinds of refrigerant (Charge amount)	Factory specification	R134a 0.90 to 1.00 kg 1.98 to 2.20 lbs

(1) **LO** Pressure Side Valve (Close)
(2) **HI** Pressure Side Valve (Open)
(3) Red Hose
(4) Blue Hose
(5) Green Hose
(6) Refrigerant Container (R134a)
(7) Can Tap Valve (Open)

[A] Refrigerant Container "Upside"
[B] Refrigerant Container "Down Side"

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Charging an Empty or Partially Charged System (Vapor)

This procedure is to charge the system through the **LO** pressure side with refrigerant in the vapor state. When the refrigerant container is placed right side up, refrigerant will enter the system as a vapor.

CAUTION

- **Never open the HI pressure valve of manifold gauge while the engine is running.**

NOTE

- **Do not turn the refrigerant container upside-down when charging the system by running the engine.**
- **Put refrigerant container into a pan of warm water (maximum temperature 40 °C (104 °F)) to keep the vapor pressure in the container slightly higher than vapor pressure in the system.**

1. Check that the **HI** pressure side valve (4) is closed.
2. Start the engine and set an approx. **1500 min^{-1} (rpm)**.
3. Turn on the A/C switch.
   Set the temperature control lever to **maximum cooling** position and the blower switch to **HI** position.
4. Open the **LO** pressure side valve (5) of manifold gauge and the can tap valve (1) on refrigerant container and charge the refrigerant until air bubbles in the sight glass of the receiver vanish.
5. After charging the specified amount of refrigerant into the system, close the **LO** pressure side valve (5) of manifold gauge and can tap valve (1), then stop the engine.
6. Check for gas leak with an electric gas leak tester. (See "8. PECIAL TOOLS" in "G. GENERAL" section.).

(Reference)

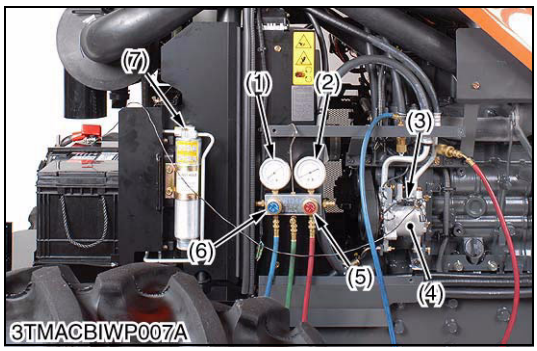
- Specified amount of refrigerant (total):
  0.90 to 1.00 kg (1.98 to 2.20 lbs) [Refrigerant R134a]
- Manifold gauge indication at fully charged system (at ambient temperature: 30 °C (86 °F))
  HI pressure side:
  1.27 to 1.66 MPa (13 to 17 kgf/cm^2, 185 to 242 psi)
  LO pressure side:
  0.15 to 0.20 MPa (1.5 to 2.0 kgf/cm^2, 21 to 28 psi)

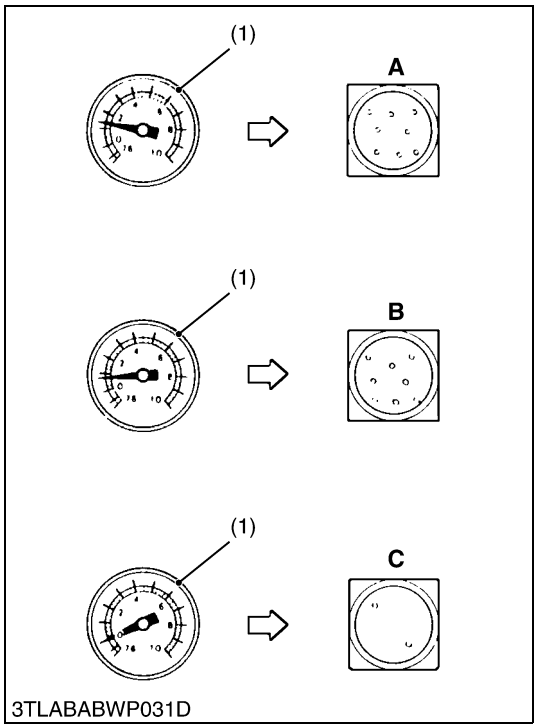
(1) Can Tap Valve
(2) **LO** Pressure Gauge
(3) **HI** Pressure Gauge
(4) **HI** Pressure Side Valve (Close)
(5) **LO** Pressure Side Valve (Open)

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(4) Checking Charge Refrigerant Amount





After charging the refrigerant, check for amount of charging refrigerant as follows.

■ **NOTE**

- **The pressure on the following checking are the gauge indications at ambient temperature 30 °C (86 °F), so it should be noted that the pressure will differ somewhat with the ambient temperature.**

1. Disconnect the **1P** connector (3) of magnetic clutch.
2. Start the engine and set a approx. **1500 min^{-1} (rpm)**.
3. Connect the **1P** connector (3) of magnetic clutch to battery directly, and then set the blower switch to **HI** position.
4. Leave the system for approx. **5 minutes** until the refrigerant cycle becomes stable, keeping pressure on the **HI** pressure side from 1.27 to 1.66 MPa (13 to 17 kgf/cm^2, 185 to 242 psi).
5. When the refrigerant cycle is stabilizer, turn off the blower switch and let the compressor alone to run. Then pressure on the **LO** pressure side gradually drops. At this time, if pressure on the **HI** pressure side is maintained from 1.27 to 1.66 MPa (13 to 17 kgf/cm^2, 185 to 242 psi), air bubbles which pass through the sight glass (7) becomes as stated below depending on refrigerant charged amount.

A: Insufficient refrigerant charge

Air bubbles pass continuously the sight glass when pressure on the **LO** pressure side is over 99.0 kPa (1.01 kgf/cm^2, 14.4 psi). In this case, charge the refrigerant from the **LO** pressure side.

B: Properly refrigerant charge

Air bubbles pass through the sight glass continuously when pressure on the **LO** pressure side is within 59 to 98 kPa (0.6 to 1.0 kgf/cm^2, 9 to 14 psi).

If the charge refrigerant amount is proper, no air bubble is observed on the sight glass at pressure on the **LO** pressure side over 99.0 kPa (1.01 kgf/cm^2, 14.4 psi) when the blower switch is turned on. When the blower switch is turned off, bubbles pass through the sight glass in case pressure on the **LO** pressure side is within 59 to 98 kPa (0.6 to 1.0 kgf/cm^2, 9 to 14 psi).

C: Excessive refrigerant charge

Air bubbles pass through the sight glass time to time or no air bubble is observed when pressure on the **LO** pressure side is under 59 kPa (0.6 kgf/cm^2, 9 psi).

In this case, discharge excessive refrigerant gradually from the **LO** pressure side.

(1) **LO** Pressure Gauge
(2) **HI** Pressure Gauge
(3) **1P** Connector
(4) To Battery
(5) **HI** Pressure Valve (Close)
(6) **LO** Pressure Valve (Close)
(7) Sight Glass

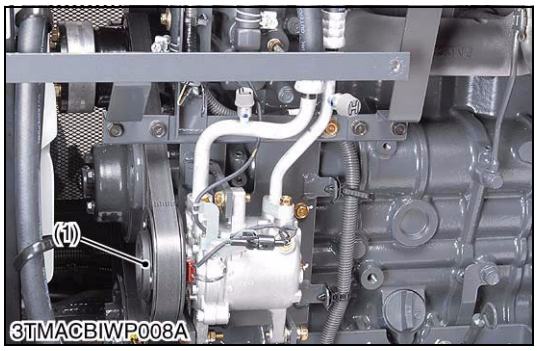
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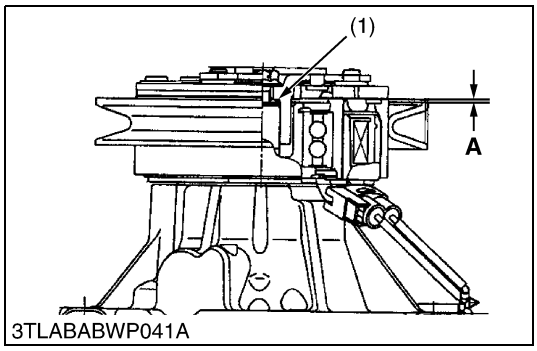
6. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING (AIR CONDITIONING SYSTEM)

(1) Compressor







Operation of Magnetic Clutch

1. Start the engine.
2. Check whether abrasion or abnormal noise is heard when only the magnetic clutch pulley is running while the A/C switch is pushed **OFF**.
3. Check that the magnetic clutch (1) does not slip when the A/C switch and blower switch are turned **ON** (when the air conditioner is in operation).
4. If anything abnormal is found, repair or replace.

(1) Magnetic Clutch

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Stator Coil

1. Measure the resistance of the stator coil with an ohmmeter across the **1P** connector (1) of magnetic clutch and compressor body.
2. If the measurement is not within the factory specifications, replace the stator coil.

Stator coil resistance	Factory specification	3.0 to 4.0 Ω

(1) **1P** Connector

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Air Gap

1. Check the air gap with feeler gauge.
2. If the measurement is not within the factory specifications, adjust it. (See page 10-S54.)

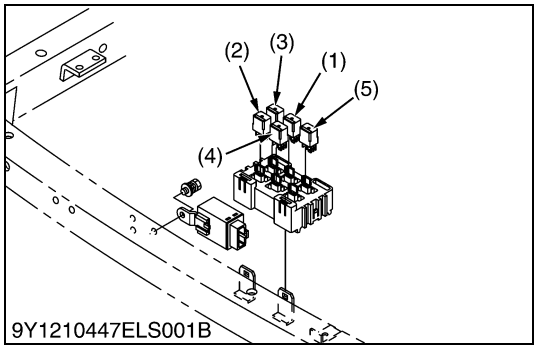
Air gap	Factory specification	0.30 to 0.65 mm 0.0118 to 0.0255 in.

(1) Shim **A: Air Gap**

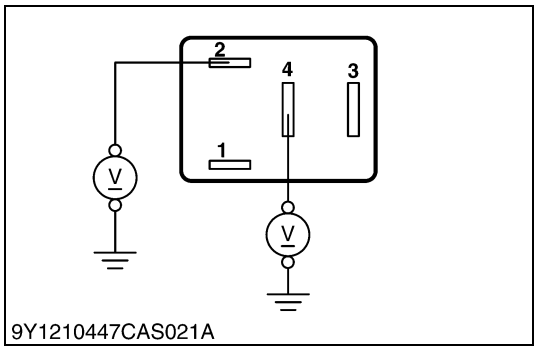
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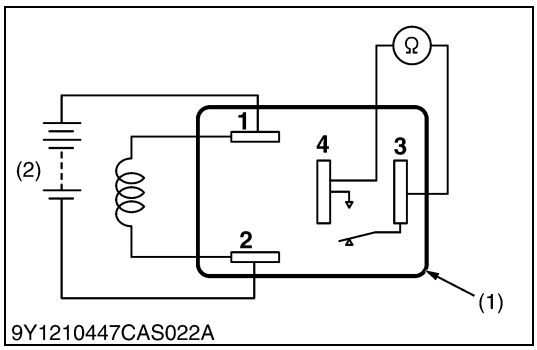
(2) Compressor Relay and Blower Relay



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Connector Voltage

1. Disconnect the relay (1), (2), (3), (4) and (5) from connector after turning the main switch off.
2. Measure the voltage with a voltmeter across the connector terminal **2** and chassis.
3. Turn the main switch on, and measure the voltage across the connector terminal **4** and chassis.
4. If these voltages differ from the battery voltage, the wiring harness or main switch is faulty.

Voltage	Across terminal **2** – chassis	Approx. battery voltage
	Across terminal **4** – chassis	Approx. battery voltage

(1) Compressor Relay
(2) Blower Relay (R.H.)
(3) Blower Hi Relay (R.H.)
(4) Blower Relay (L.H.)
(5) Blower Hi Relay (L.H.)

1: Terminal 1
2: Terminal 2
3: Terminal 3
4: Terminal 4

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Function Check

■ **NOTE**
- **The relays described here are the same ones so that these are interchangeable.**

1. Apply battery voltage across the terminal **1** and **2**, and check for continuity across the terminals **3** and **4**.
2. If continuity is not established across terminals **3** and **4**, rreplace it.

At battery voltage between terminal **1** and **2**	**3**	**4**
	●	●

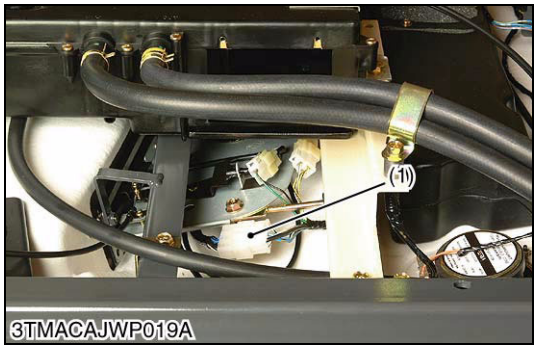
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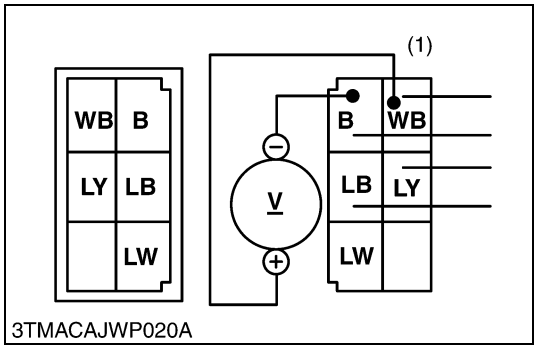
(1) Relay
(2) Battery

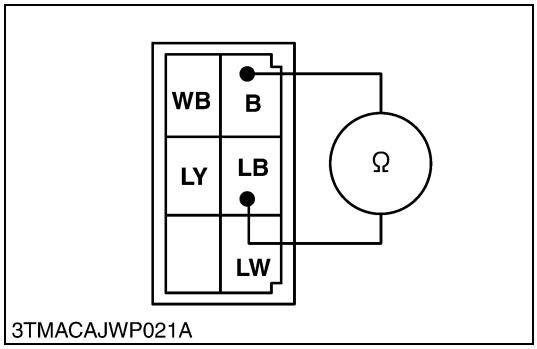
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(3) A/C Blower Switch







Connector Voltage

1. Turn the main switch **ON**.
2. Measure the voltage with a voltmeter across the connector terminal **WB** and terminal **B**.
3. If the voltage differs from the battery voltage, the wiring harness, blower relay, fuse or main switch is faulty.

Voltage	Terminal **WB** – Terminal **B**	Approx. battery voltage

(1) A/C Blower Switch Connector

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A/C Blower Switch

1. Check the continuity through the switch with an ohmmeter.
2. If the continuity specified below are not indicated, the switch is faulty.

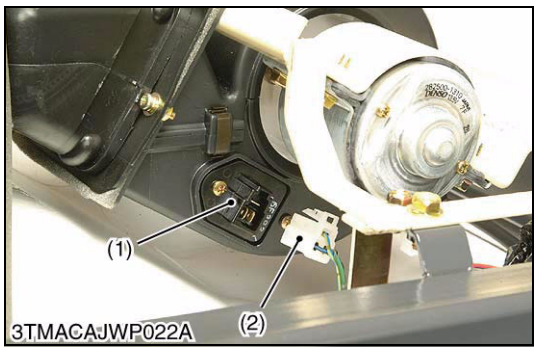
Position		Terminal				
		B	WB	LW	LY	LB
A/C blower switch	OFF	●				
	● (LOW)	●	●	●		
	● (Medium)	●	●		●	
	● (High)	●	●			●

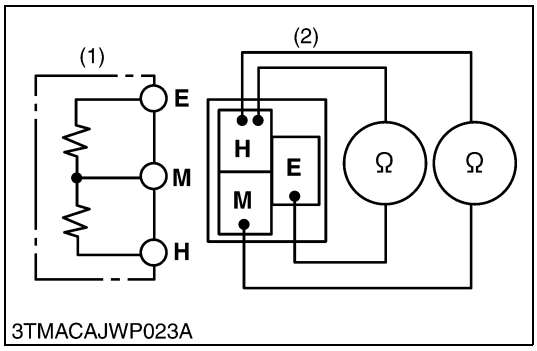
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(4) Blower Resistor





Blower Resistor Checking

1. Remove the outer roof.
2. Disconnect the **3P** connector (2) for A/C blower resistor (1).
3. Measure the resistance with an ohmmeter across the terminal **M** and terminal **H**, and across the terminal **E** and terminal **H**.
4. If the factory specifications are not indicated, A/C blower resistor is faulty.

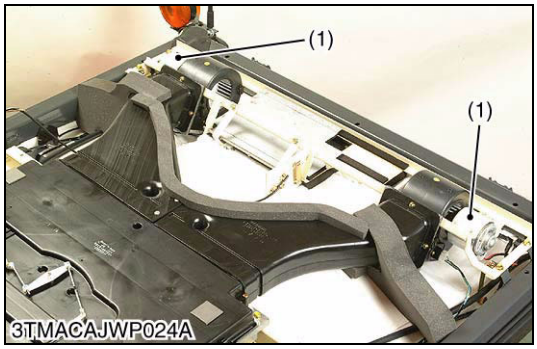
Resistance	Factory specifi-cation	Terminal **M** – Terminal **H**	Approx. 0.4 Ω
		Terminal **E** – Terminal **H**	Approx. 0.8 Ω

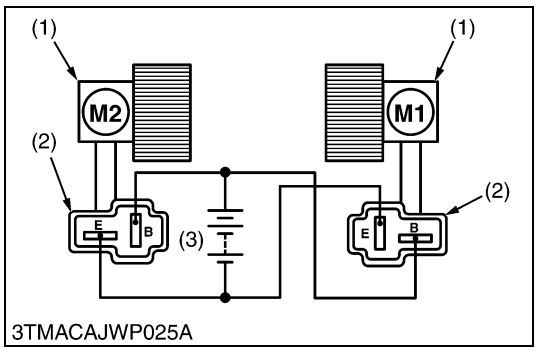
(1) A/C Blower Resistor
(2) A/C Blower Resistor Connector

H: Terminal H
M: Terminal M
E: Terminal E

9Y1210269CAS0040US0

(5) Blower Motor





Blower Motor Test

1. Remove the outer roof.
2. Turn the blower motor (1) by hand and check whether it turns smoothly.
3. Disconnect the connector (2) of blower motor (1).
4. Connect a jumper lead from battery (3) positive terminal to connector terminal **B**.
5. Connect a jumper lead from battery negative terminal to connector terminal **E** momentarily.
6. If the blower motor does not run, check the motor.

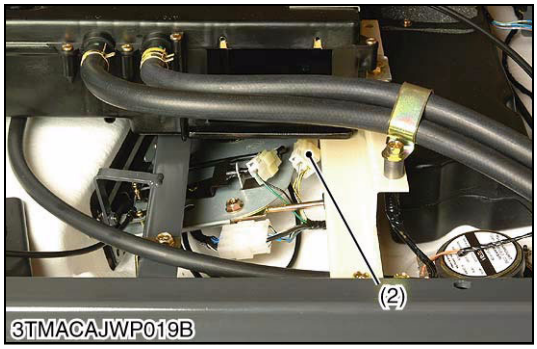
(1) Blower Motor
(2) Blower Motor Connector
(3) Battery (12 V)

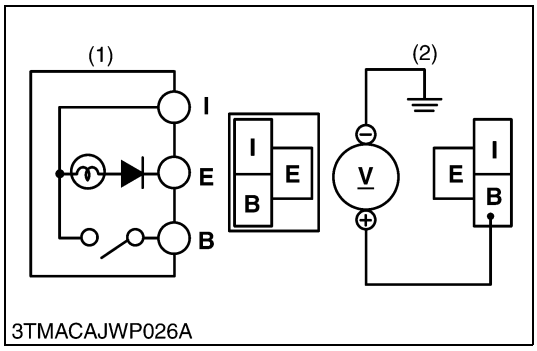
E: Terminal E
B: Terminal B

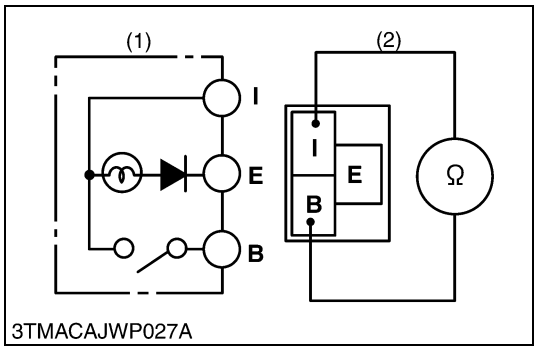
9Y1210269CAS0041US0

https://truckmanualshub.com/

(6) A/C Switch







Connector Voltage

1. Remove the outer roof, and disconnect the A/C switch connector (2).
2. Turn the main switch **ON**.
3. Measure the voltage with a voltmeter across the connector terminal **E** and chassis.
4. If the voltage differs from the battery voltage, the wiring harness, A/C relay or fuse is faulty.

Voltage	Terminal **E** – Chassis	Approx. battery voltage

(1) A/C Switch
(2) A/C Switch Connector

I: **Terminal I**
B: **Terminal B**
E: **Terminal E**

9Y1210269CAS0042US0

A/C Switch Checking

Resistance	Factory specification	Terminal **I** – Terminal **B**	A/C switch at **ON**	0 Ω
			A/C switch at **OFF**	Infinity

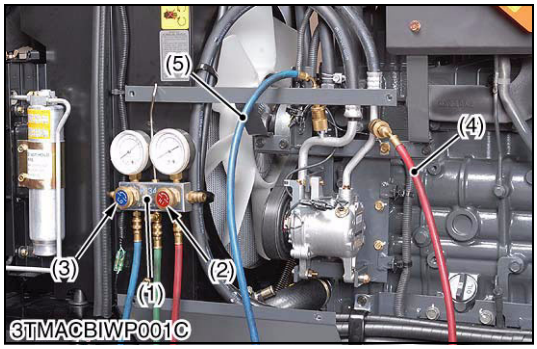
(1) A/C Switch
(2) A/C Switch Connector (Switch Side)

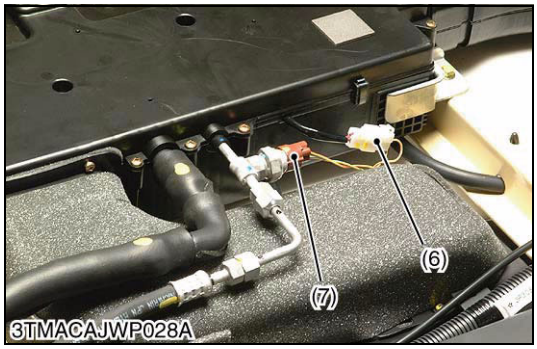
I: **Terminal I**
B: **Terminal B**
E: **Terminal E**

9Y1210269CAS0043US0

https://truckmanualshub.com/

(7) Pressure Switch





Pressure Switch

1) HI Pressure Side

1. Connect the manifold gauge (1) to compressor as following procedure.
   Close the **HI** and **LO** pressure valves (2), (3) of manifold gauge tightly, and connect the charging hoses (red and blue) (4), (5) to the respective compressor service valves. (See "HANDLING OF SERVICE TOOLS" in this section.)

■ **NOTE**

- **Be sure to drive out the air in the charging hoses at the manifold gauge connection end by utilizing the refrigerant pressure in the refrigerant cycle.**

2. Start the engine and set at approx. 1500 min^{-1} (rpm). Turn on the A/C switch, then set the blower switch to **HI** position.
3. Raise pressure on the **HI** pressure side of the refrigerant cycle by covering the condenser front with a corrugated card board, and the pressure switch (7) is activated and the compressor magnetic clutch is turned off. At this time, read the **HI** pressure gauge of the manifold gauge. If this pressure reading differs largely with the setting pressure, replace the pressure switch with a new one.

Setting pressure	Factory specification	Pressure switch **OFF**	More than approx. 3.14 MPa (32 kgf/cm^2, 455 psi)

2) LO Pressure Side

1. Disconnect **2P** connector (6) of pressure switch (7).
2. Measure the resistance with an ohmmeter across the connector terminals.
3. If 0 ohm is not indicated at normal condition, there is no refrigerant in the refrigerating cycle because gas leaks or pressure switch is defective.

(Reference)

Setting pressure	Factory specification	Pressure switch **OFF**	Less than approx. 0.196 MPa (2.0 kgf/cm^2, 28.4 psi)

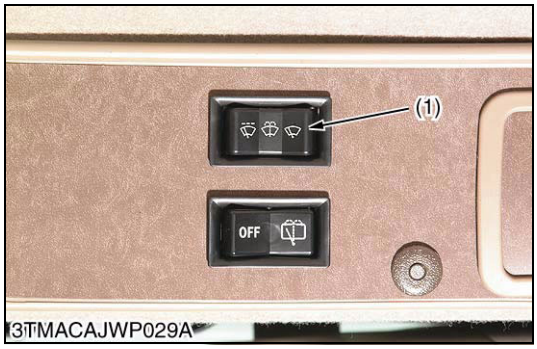
- The resistance of pressure switch is 0 ohm in normal running, but is becomes infinity if the pressure is abnormal (out of factory specification). Because the pressure switch starts to work.

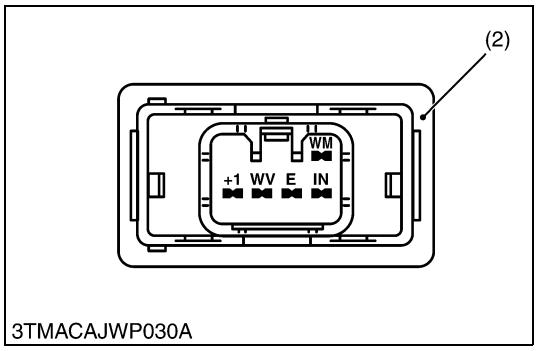
(1) Manifold Gauge
(2) **HI** (High Pressure Side) Charging Valve
(3) **LO** (Low Pressure Side) Charging Valve
(4) Charging Hose (Red)
(5) Charging Hose (Blue)
(6) **2P** Connector
(7) Pressure Switch

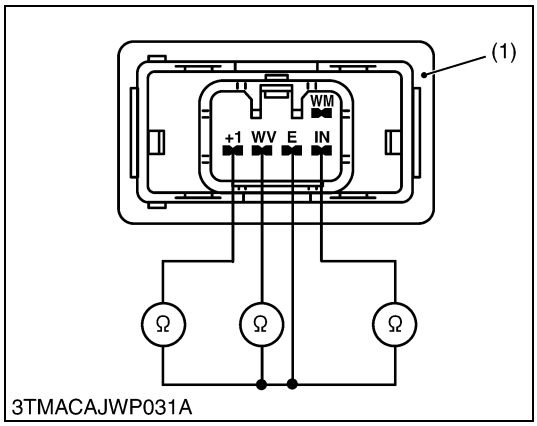
9Y1210447CAS0013US0

https://truckmanualshub.com/

(8) Front Wiper Switch







Connector Voltage

1. Turn the main switch **ON**.
2. Measure the voltage with a voltmeter across the connector terminal **E** of wiring harness side and chassis.
3. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	**E** terminal – Chassis	Approx. battery voltage

(1) Front Wiper Switch
(2) Front Wiper Switch Connector (Switch Side)

+1 : Terminal +1
Wv : Terminal Wv
E : Terminal E
IN : Terminal IN
WM : Terminal WM

9Y1210269CAS0045US0

Front Wiper Switch Checking

1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position		Terminal				
		IN	+1	E	WV	WM
Front wiper switch	WASH I		●	●	●	●
	ON		●	●		
	OFF					
	INT	●		●		
	WASH II	●		●	●	●

9Y1210447CAS030US

(Reference)

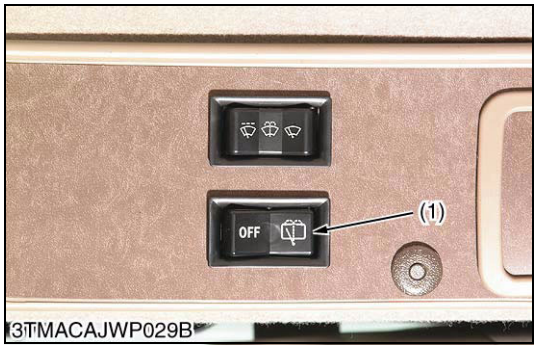
- **WASH** I: **ON** side remains pushed in after the wiper switch is switched **ON** and remains switched **ON**.
- **WASH** II: **INT** side remains pushed in after the wiper switch is switched **ON** and remains switched **ON**.

(1) Front Wiper Switch Connector (Switch Side)

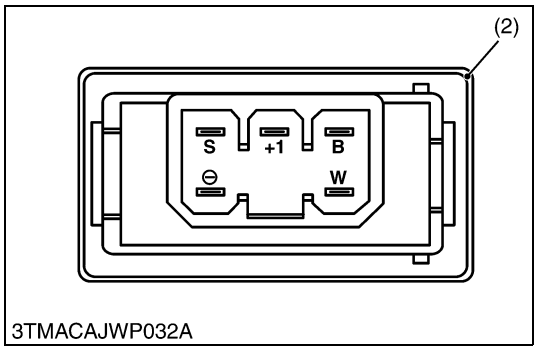
9Y1210269CAS0046US0

https://truckmanualshub.com/

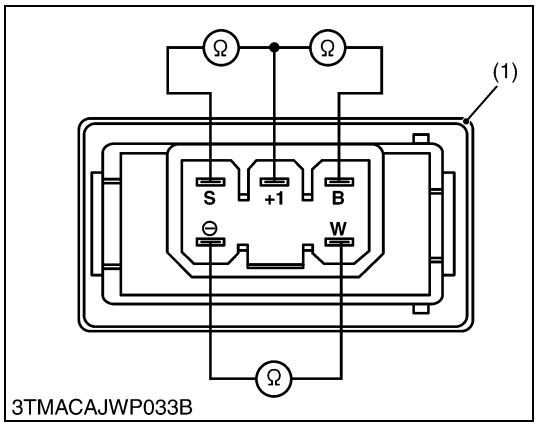
(9) Rear Wiper Switch



3TMACAJWP029B



3TMACAJWP032A



3TMACAJWP033B

Connector Voltage

1. Turn the main switch **ON**.
2. Measure the voltage with a voltmeter across the connector terminal **B** of the wiring harness side and chassis.
3. If the voltage differs from the battery voltage, the wiring harness, fuse or main switch is faulty.

Voltage	**B** terminal – Chassis	Approx. battery voltage

(1) Rear Wiper Switch
(2) Rear Wiper Switch Connector (Switch Side)

9Y1210269CAS0047US0

Rear Wiper Switch Checking

1. Check the continuity through the switch with an ohmmeter.
2. If continuity specified below is not indicated, the switch is faulty.

Position		Terminal				
		S	+1	B	W	–
Rear wiper switch	WASH I	●	●		●	●
	ON	●	●			
	OFF		●	●		
	WASH II		●	●	●	●

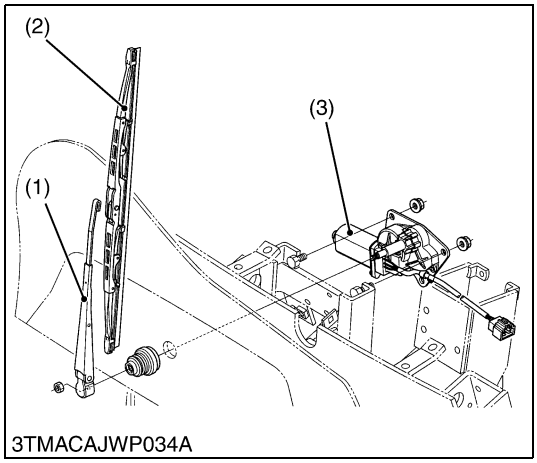
9Y1210447CAS031US

(1) Rear Wiper Switch Connector (Switch Side)

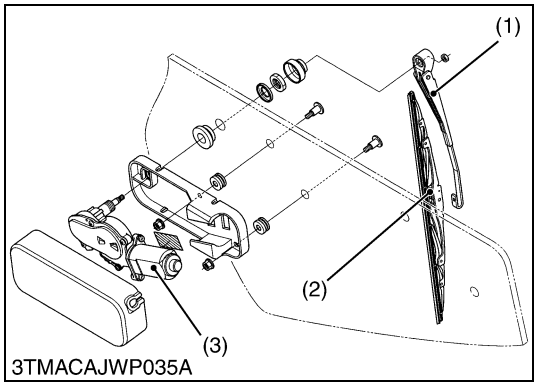
9Y1210269CAS0048US0

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(10) Wiper Motor



3TMACAJWP034A



3TMACAJWP035A

Front Wiper Motor

1. Raise up the front wiper arm (1).
2. Turn the main switch **ON**.
3. Push the front wiper switch to **ON** position.
4. Count the number of wiper arm rocking per minutes.
5. If the number differs from the factory specifications, replace the wiper motor assembly.

No. of wiper arm swing frequency at no load	Factory specification	More than 25 times

(1) Wiper Arm
(2) Wiper Blade
(3) Wiper Motor

9Y1210269CAS0049US0

Rear Wiper Motor

1. Raise up the rear wiper arm (1).
2. Turn the main switch **ON**.
3. Push the front wiper switch to **ON** position.
4. Count the number of wiper arm rocking per minutes.
5. If the number differs from the factory specifications, replace the wiper motor assembly.

No. of wiper arm swing frequency at no load	Factory specification	More than 40 times

(1) Wiper Arm
(2) Wiper Blade
(3) Wiper Motor

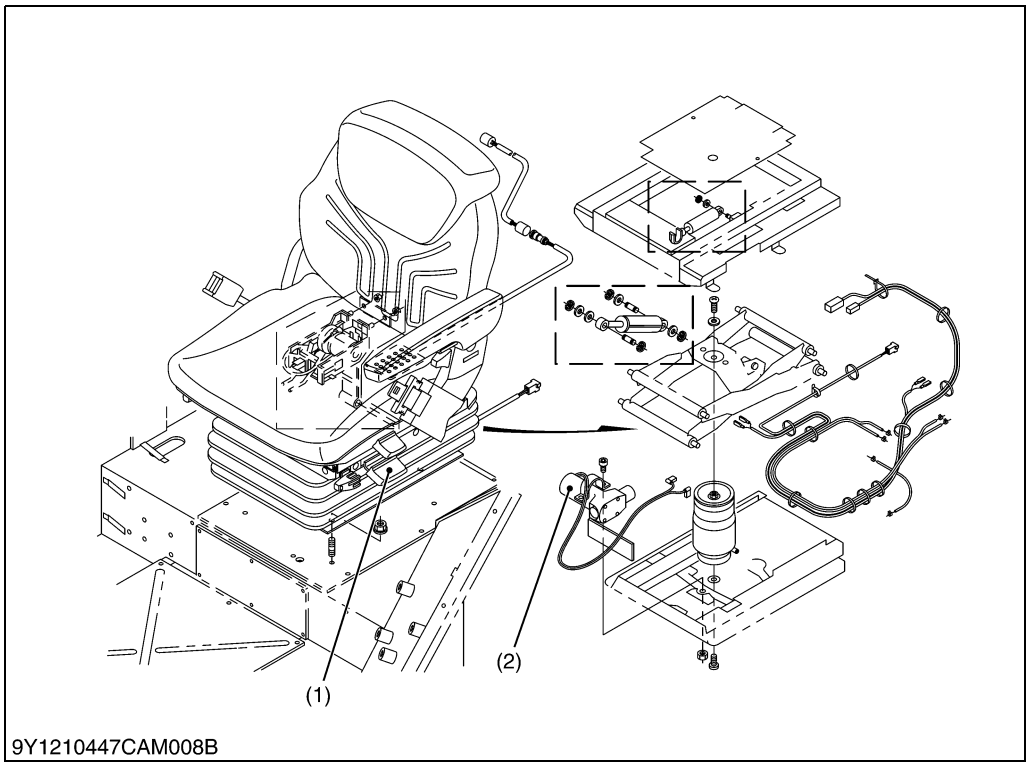
9Y1210269CAS0050US0

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[2] CHECKING AND ADJUSTING (AIR SUSPENSION SEAT)

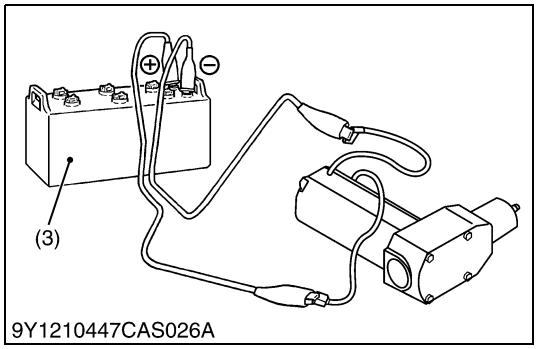
(1) Compressor

Checking Compressor



9Y1210447CAM008B

(1) Weight / Height Adjust Lever
(2) Compressor
(3) Battery



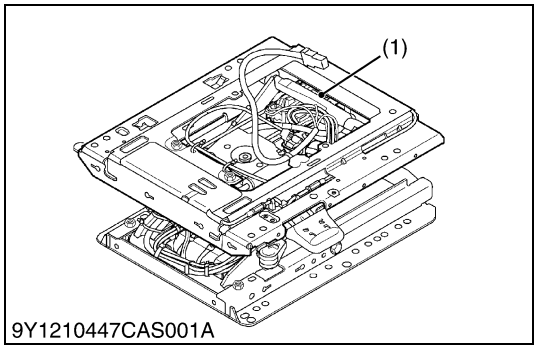
9Y1210447CAS026A

1. Turn on the main key switch.
2. Pull the weight / height adjust lever (1), and then check whether the compressor (2) is activated.
3. If the compressor is not activated, check the wiring harness of compressor.
4. If the wiring harness of compressor is not defective, check the compressor by supplying 12 V voltage to wiring harness of the compressor directly.

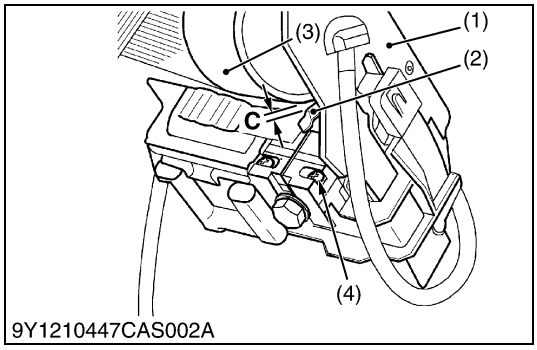
9Y1210447CAS0019US0

https://truckmanualshub.com/

(2) Cam Switch



9Y1210447CAS001A



9Y1210447CAS002A

Adjusting Cam Switch Clearance

1. Check the clearance between the cam switch (2) and the cam disc (3).
2. If the clearance is not within the factory specification, adjust by turning the screw for micro-switch (4).

Clearance **"C"** between cam switch and cam disc	Factory specification	0.8 to 1.2 mm 0.032 to 0.047 in.

■ **NOTE**

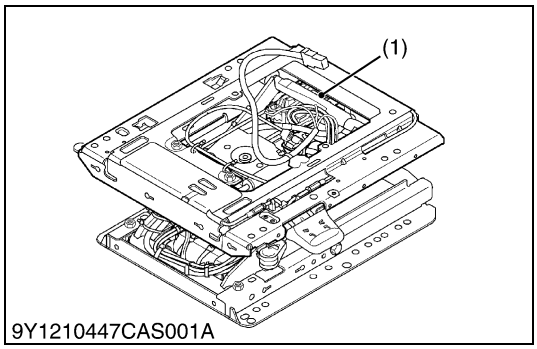
- **When turning the screw (4) counterclockwise, the cam switch (2) is moving toward the cam disc (3).**
- **When turning the screw (4) clockwise, the cam switch (2) is moving away from the cam disc (3).**
- **When the cam switch (2) is placed on the cam disc (3) under pressure, the compressor will react too early and start already during the compression and expansion of the seat suspension.**

(1) Height Level Control Unit
(2) Cam Switch
(3) Cam Disc
(4) Screw for Micro-switch

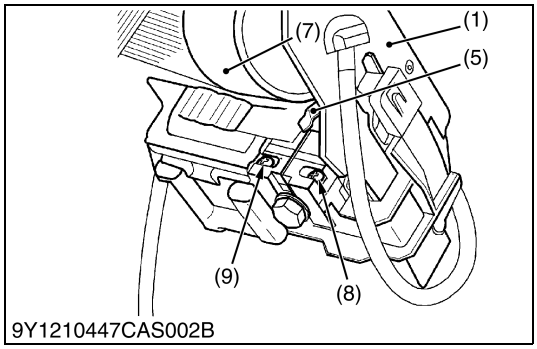
C: Clearance between cam switch and cam disc.

9Y1210447CAS0020US0

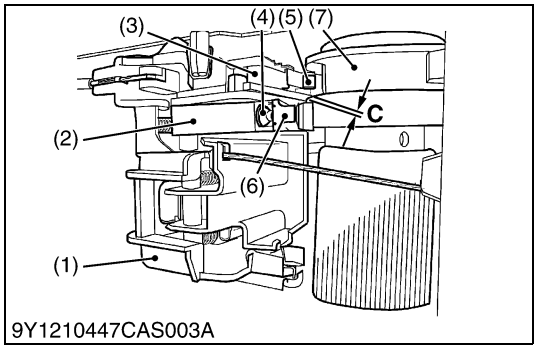
(3) Outlet Valve



9Y1210447CAS001A



9Y1210447CAS002B



9Y1210447CAS003A

Adjusting Outlet Valve Clearance

1. Check the clearance between the valve lever (6) and the cam disc (7).
2. If the clearance is not within the factory specification, adjust by turning the screw for the outlet valve (9).

Clearance **"C"** between valve lever (6) and cam disc (7)	Factory specification	1.0 to 1.5 mm 0.040 to 0.059 in.

■ **NOTE**

- **To adjust the clearance C, turn the screw as shown below chart.**

Turn the screw (9) direction	Valve lever (6)	Pressure on the valve tappets (4)	Air escaping speed
Counterclockwise	Move toward the cam disc (7)	Increase	Up
Clockwise	Move away from the cam disc (7)	Declease	Down

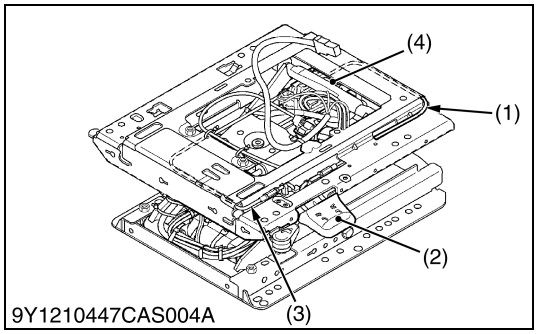
(1) Height Level Control Unit
(2) Outlet Valve
(3) Micro-switch
(4) Valve Tappets
(5) Cam Switch
(6) Valve Lever
(7) Cam Disc
(8) Screw for Micro-switch
(9) Screw for Outlet Valve

C: Clearance between valve lever and cam disc.

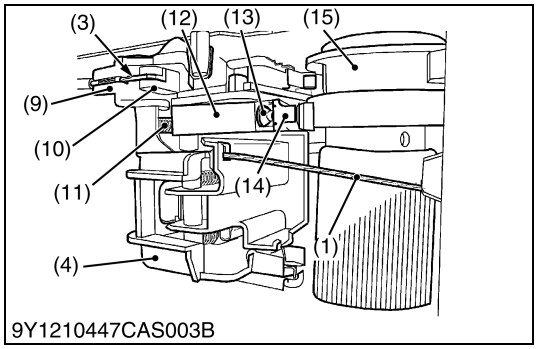
9Y1210447CAS0021US0

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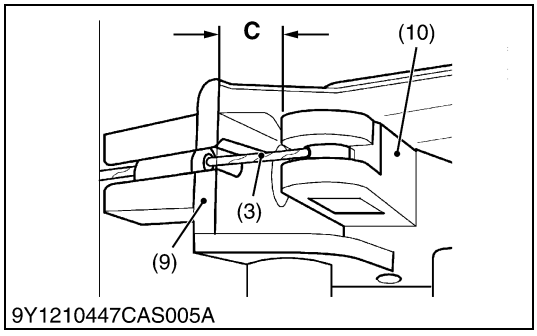
(4) Bowden Pull Wire



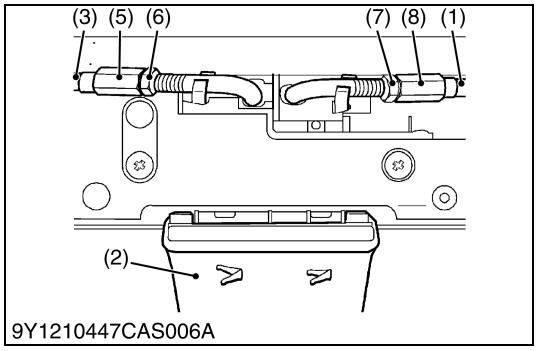
9Y1210447CAS004A



9Y1210447CAS003B



9Y1210447CAS005A



9Y1210447CAS006A

Checking and Adjusting Bowden Pull Wire

1. Turn the main key switch.
2. Operate the weight / height adjust lever (2) several times in both direction as far as possible and simultaneously check the bowden pull wire (1) and (3) for correct functioning and smooth operation.
3. Check the smooth operation of bowden wire lever (10), valve lever (14) and valve tappets (13) at the outlet valve (12).
4. Check the neutral position of the weight / height adjust lever (2) and tensile force of the retracting spring (11) on the height level control unit (4).

■ **NOTE**
- **The retracting spring (11) must fix the weight / height adjust lever (2) in neutral position.**
- **The retracting spring (11) must tightly pull the bowden pull wire (1) and (3), and keep the bowden wire lever (10) in neutral position.**

5. Check the clearance between the bowden wire lever (10) and holder for bowden wire and cap (9).

Distance **"C"** with the handle for height adjustment in top position	Factory specification	20 mm 0.79 in.

(1) Bowden Pull Wire
(2) Weight / Height Adjust Lever
(3) Bowden Pull Wire
(4) Height Level Control Unit
(5) Lock Nut
(6) Counternut
(7) Counternut
(8) Lock Nut
(9) Holder for Bowden Wire End Cap
(10) Bowden Wire Lever
(11) Retracting Spring
(12) Outlet Valve
(13) Valve Tappets
(14) Valve Lever
(15) Cam Disc

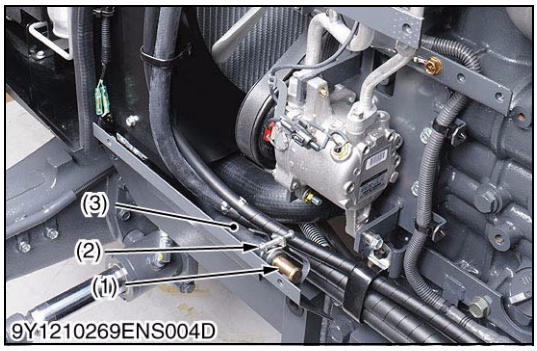
C: Clearance between the holder and bowden wire lever.

9Y1210447CAS0022US0

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[3] DISASSEMBLING AND ASSEMBLING (AIR CONDITIONING SYSTEM)

(1) Separating Cabin from Tractor



Draining Coolant

CAUTION

- **Never remove the radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.**

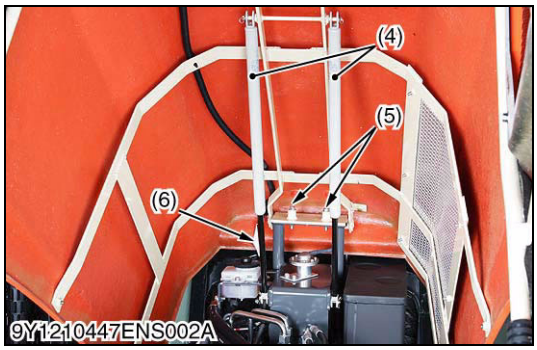
1. Stop the engine and let cool down.
2. Loosen the hose clamp (2) and remove the drain plug (1) to drain the coolant.
3. Remove the radiator cap to completely, drain the coolant.
4. After all coolant is drained, reinstall the drain plug (1) and tighten the hose clamp (2).

Coolant	Capacity	15 L 16 U.S.qts 13 Imp.qts

(1) Drain Plug
(2) Hose Clamp
(3) Radiator Hose

9Y1210447ENS0074US0







Muffler and Bonnet

1. Open the bonnet (1) and disconnect the battery (7) negative cable.
2. Disconnect the **8P** connector (6) for head light.
3. Remove the damper (4) and bonnet bracket mounting screws (5).
4. Remove the bonnet (1).
5. Remove the side cover (3).
6. Remove the muffler (2).

(When reassembling)

■ **NOTE**

- **Be sure to insert the muffler by 42 mm (1.7 in.).**

Tightening torque	Muffler mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

■ **IMPORTANT**

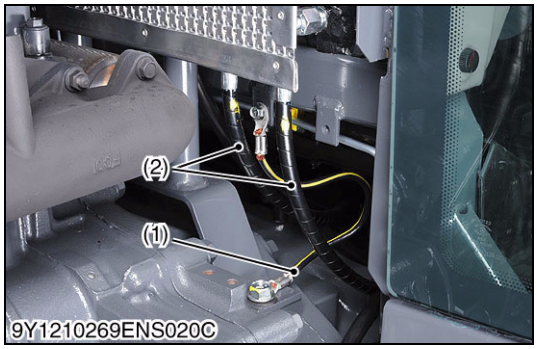
- **When disconnecting the battery cables, disconnect the negative cable first. When connecting, positive cable first.**

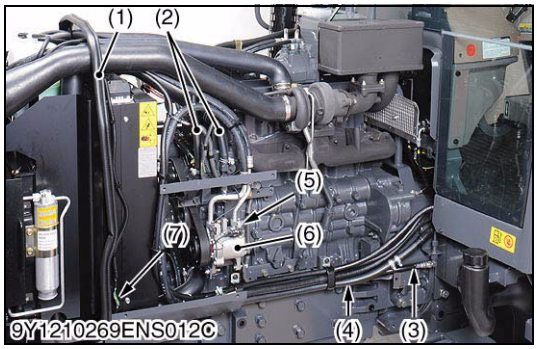
(1) Bonnet
(2) Muffler
(3) Side Cover
(4) Damper
(5) Screw
(6) **8P** Connector
(7) Battery

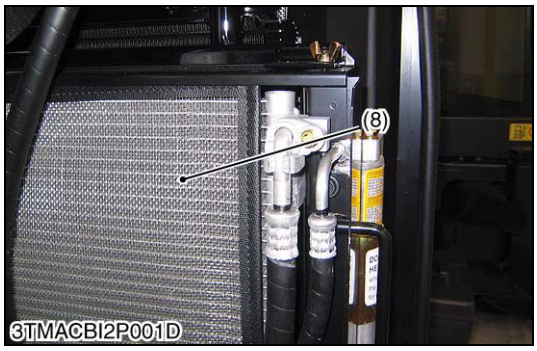
L: Insertion Length of the Muffler

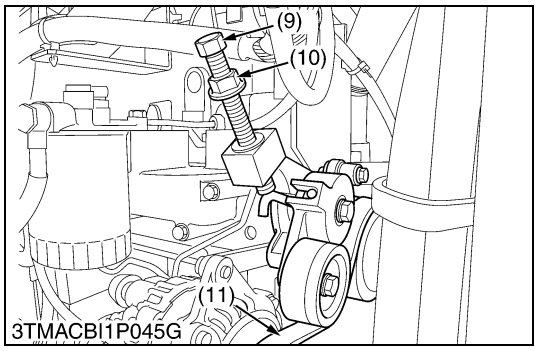
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Clutch Safety Valve Hose and Ground Cable

1. Remove the ground cable (1).
2. Remove the clutch safety valve hoses (2).

(When reassembling)

Tightening torque	Clutch safety valve hose retaining nut	23.0 to 26.5 N·m 2.3 to 2.7 kgf·m 16.6 to 19.6 lbf·ft

(1) Ground Cable
(2) Clutch Safety Valve Hose

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Hoses and Wiring Harness

1. Remove the shield weather strip and plate (1).
2. Disconnect the heater hoses (2).
3. Disconnect the **1P** connector (5) from compressor (6).
4. Disconnect the front differential lock hose (3) and breather hose from front differential case.
5. Disconnect the oil cooler hose (4).
6. Disconnect the **1P** connector (7).
7. Remove the air condenser slide stopper screw and slide out the air condenser (8).
8. Loosen the lock nut (10) and adjusting screw (9) of fan belt, then remove the fan belt (11) from the compressor (6).
9. Remove the compressor bracket mounting screws and compressor (6) with hoses.

(When reassembling)

- Take care not to damage the air condenser fan.
- Be sure to connect the heater hoses to original position.
- After reassembling the compressor, be sure to adjust the fan belt tension. (See page G-32)

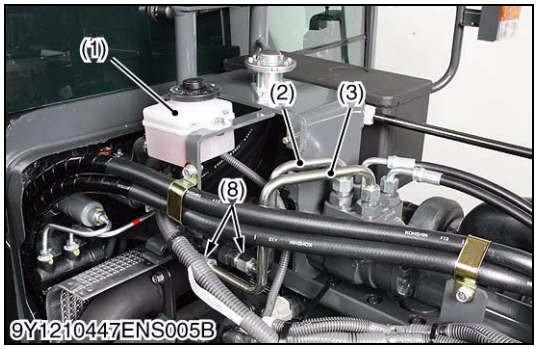
Proper belt tension	A deflection of between 9 to 11 mm (0.35 to 0.47 in.) when the belt is pressed (98 N (10 kgf, 22.1 lbf)) in the middle of the span. (New belt: 7 to 9 mm (0.28 to 0.35 in.))

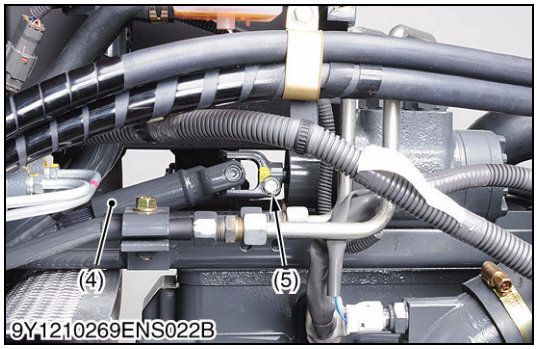
Tightening torque	Adjusting screw	Below 15 N·m 1.53 kgf·m 11.1 lbf·ft
	Lock nut	123.6 to 147 N·m 12.6 to 15.0 kgf·m 91.2 to 108.4 lbf·ft
	Front differential lock hose retaining nut	19.7 to 29.4 N·m 2.0 to 3.0 kgf·m 14.5 to 21.6 lbf·ft

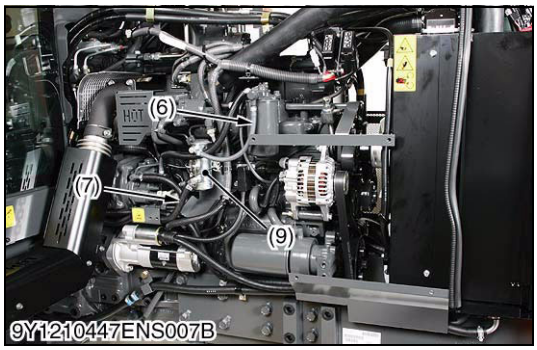
(1) Plate
(2) Heater Hose
(3) Front Differential Lock Hose
(4) Oil Cooler Hose
(5) **1P** Connector
(6) Compressor
(7) **1P** Connector
(8) Air Condenser
(9) Adjusting Screw
(10) Lock Nut
(11) Fan Belt

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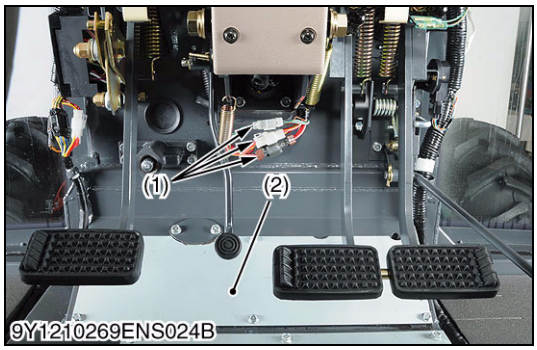


Hoses, Pipes, Steering Joint Shaft and Brake Oil Tank

1. Remove the brake oil tank mounting screws.
2. Remove the steering joint shaft mounting screw (5) and joint shaft (4).
3. Disconnect the pipes (2), (3) from the joint (8).
4. Remove the fuel hoses (6), (7).

(1) Brake Oil Tank
(2) Pipe
(3) Pipe
(4) Joint Shaft
(5) Steering Joint Mounting Screw
(6) Fuel Hose
(7) Fuel Hose
(8) Joint
(9) Fuel Pump

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Wiring Harness Connector and Cover

1. Disconnect the engine wiring harness connectors (1).
2. Remove the floor mat and cover (2).

(1) Connector
(2) Cover

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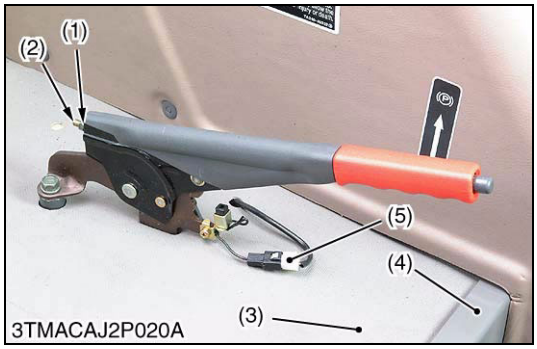
Seat and Hydraulic Lock Lever

1. Remove the side cover (2).
2. Disconnect the **2P** connectors and **10P** connector which come from seat and arm rest.
3. Remove the seat mounting nuts and seat (1).
4. Remove the hydraulic lock lever (3).

(1) Seat
(2) Side Cover
(3) Hydraulic Lock Lever

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Parking Brake Wire and Cover

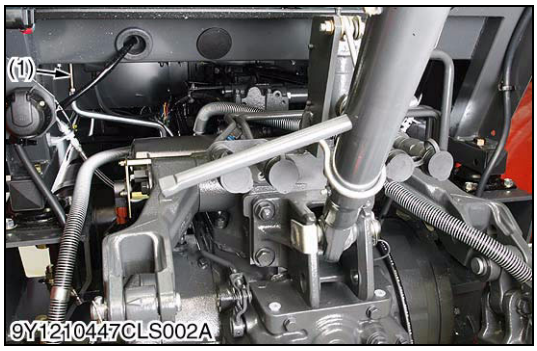
1. Remove the lock nuts (1) and parking brake wire (2) from brake lever.
2. Disconnect the parking brake switch connector (5).
3. Remove the cover (4).
4. Remove the floor mat (3) and floor cover.

(When reassembling)

Parking brake lever play (number of notches)	Factory specification	2 notches

(1) Lock Nut
(2) Parking Brake Wire
(3) Floor Mat
(4) Cover
(5) Connector

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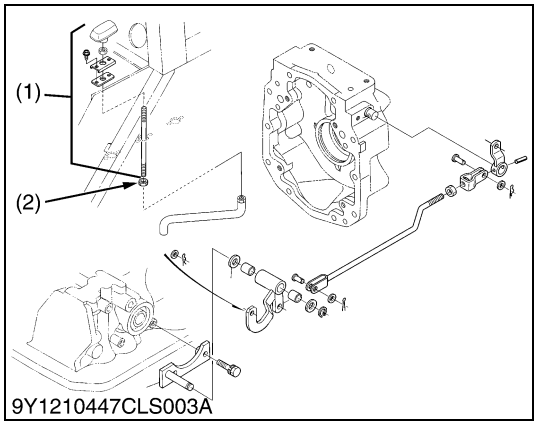


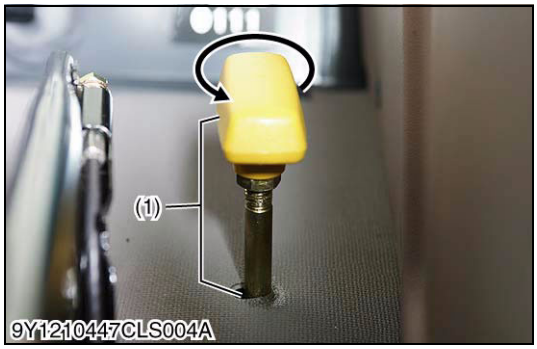
PTO Gear Shift Lever

1. Loosen the lock nut (2).
2. Turn the grip assembling (1) counterclockwise until disengaging.

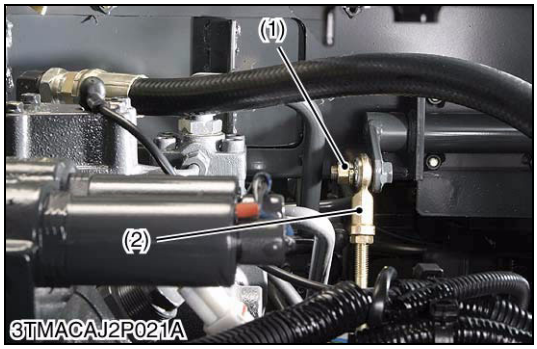
(1) Grip Assembling
(2) Lock Nut

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Auxiliary Shift Rod and Brake Hose

1. Remove the auxiliary shift rod mounting nut (1) and shift rod (2).
2. Disconnect the brake hoses (3) (R.H.)(L.H.).
3. Draw out the parking brake wire (4) from the cabin.

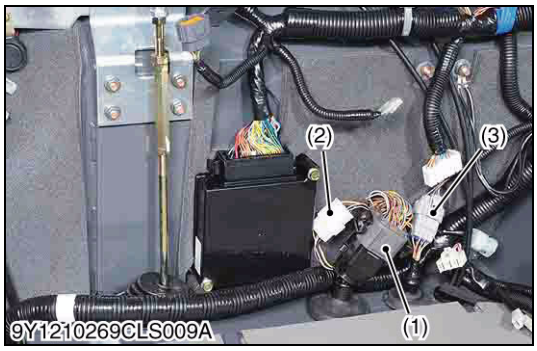
(When reassembling)

Tightening torque	Brake hose retaining nut	22.6 to 27.4 N·m 2.30 to 2.80 kgf·m 16.7 to 20.2 lbf·ft

(1) Nut
(2) Auxiliary Shift Rod
(3) Brake Hose
(4) Parking Brake Wire

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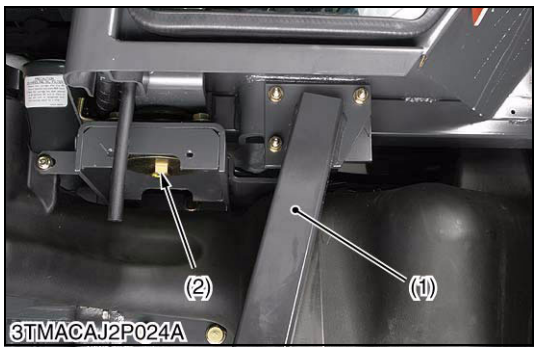


Cabin Harness Connector

1. Disconnect the cabin harness connectors (1), (2), (3).
2. Draw out the harness and connectors from the cabin.

(1) Connector
(2) Connector
(3) Connector

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Dismounting Cabin

1. Remove the step mounting nuts (1) and steps (R.H.) (L.H.).
2. Remove the cabin mounting screws and nuts (2) (front) (rear).
3. Set the cabin dismounting tool (3) to the cabin.
4. Dismounting the cabin from tractor body.

(When reassembling)

Tightening torque	Cabin mounting screw and nut	69 to 88 N·m 7.0 to 9.0 kgf·m 50.6 to 65.1 lbf·ft

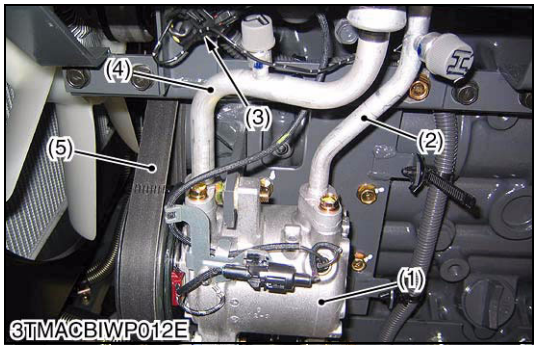
(1) Step
(2) Cabin Mounting Nut
(3) Cabin Dismounting Tool

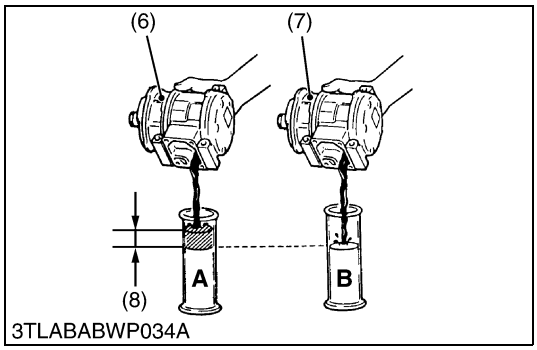
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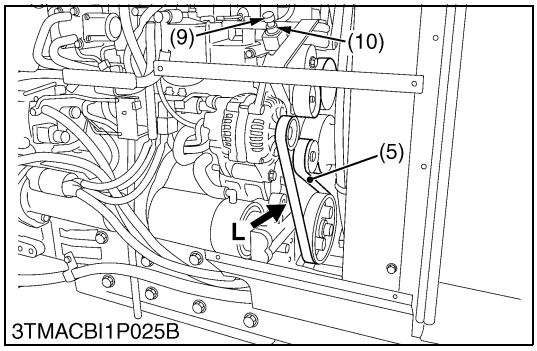


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(2) Compressor







Removing Compressor Assembly

1. Discharge the refrigerant from the system. (Refer to "Discharging the Refrigerant" in this section.)
2. Disconnect the low pressure pipe (suction) (4) and high pressure pipe (discharge) (2) from the compressor, then cap the open fittings immediately to keep moisture out of the system.
3. Disconnect the **1P** connector (3) of magnetic clutch.
4. Remove the fan belt (5) and remove the compressor (1) with stay.

(When reassembling)

- After reassembling the compressor, be sure to adjust the air conditioner belt tension and recharge the refrigerant to the system. (Refer to "(3) Charging the Refrigerant" in this section.)
- Apply compressor oil (DENSO CO. ND-OIL8 or equivalent) to the O-rings and take care not to damage them.
- **"S"** letter is marked on the compressor for connecting the low pressure pipe (suction side).
- **"D"** letter is marked on the compressor for connecting the high pressure pipe (discharge side).
- When replacing the compressor with a new one, meet the oil amount with old one.
- Push on the belt between the pulleys with a finger. Deflection **"L"** of 9.0 to 11 mm (0.36 to 0.43 in.) under a 98 N (10 kgf, 22 lbf) load is appropriate.

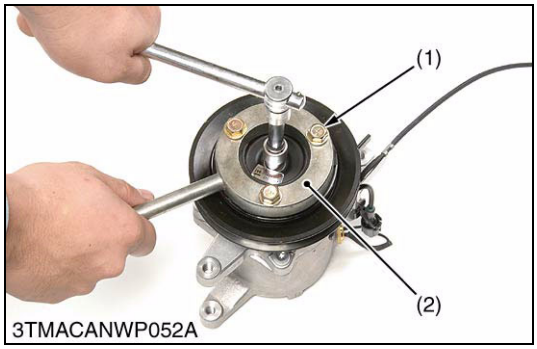
Tightening torque	High pressure pipe and low pressure pipe mounting screw	7.85 to 11.7 N·m 0.8 to 1.2 kgf·m 5.79 to 8.67 lbf·ft
	Compressor mounting screws	24.5 to 29.4 N·m 2.5 to 3.0 kgf·m 18.1 to 21.6 lbf·ft

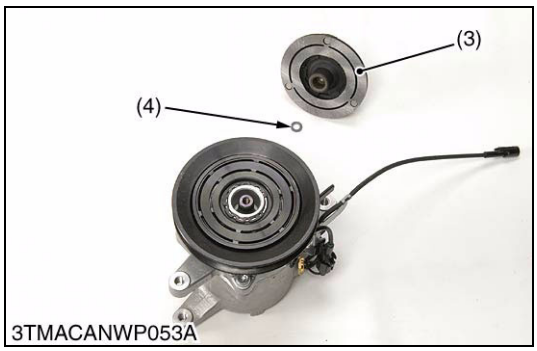
(1) Compressor
(2) High Pressure Pipe
(3) **1P** Connector Harness
(4) Low Pressure Pipe
(5) Fan/Air Conditioner Belt
(6) New Compressor
(7) Old Compressor
(8) Remove the Excess Oil (**A**-**B**)
(9) Adjusting Bolt
(10) Lock Nut

A: Oil Flow New Compressor
B: Oil Flow Replace Compressor
L: Deflection (9.0 to 11 mm (0.36 to 0.43 in.))

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Hub Plate

1. Three stopper bolts (1) are set in stopper magnet clutch (2) at the position corresponding to the shape of compressor. (Refer to "8. SPECIAL TOOLS" at "G. GENERAL" section.)
2. The stopper magnet clutch (2) is hung on hub plate (3) and it is fixed that the compressor rotates.
3. Remove the magnetic clutch mounting screw.
4. Remove the hub plate (3) and air gap adjustment shim (4).

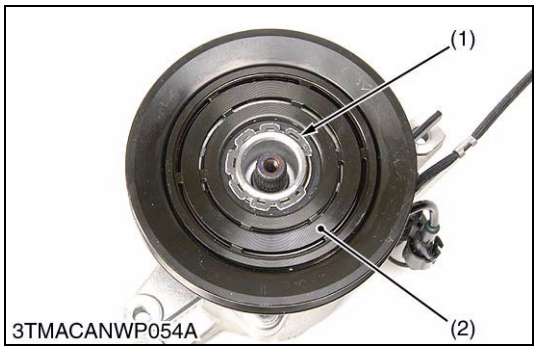
(When reassembling)

- Do not apply grease or oil on the hub plate facing.
- Do not use the magnet clutch mounting screw again.
- It is confirmed to turn rotor by hand after assembling and not contact with stator and hub plate.
- Check and adjust the air gap before tight the magnet clutch mounting screw to the specified torque. (Refer to "[3] SERVICING" in this section.)

Tightening torque	Magnetic clutch mounting screw	15.0 to 21.0 N·m 1.5 to 2.1 kgf·m 11.1 to 15.5 lbf·ft

(1) Stopper Bolt
(2) Stopper Magnet Clutch
(3) Hub Plate
(4) Shim

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Rotor

1. Remove the external circlip (1).
2. Remove the rotor (2).

(When reassembling)

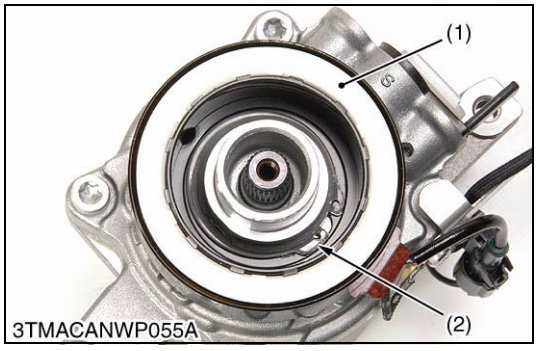
- Do not use the external circlip again.
- Assemble the external circlip for the tapered side to become outside of rotor.
- The width of expanding of external circlip is set in boss of shaft as a minimum.

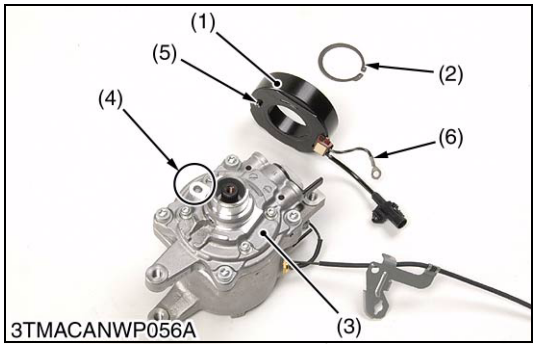
(Reference)

- Code No. for external snap ring: T1065-87450.

(1) External Circlip
(2) Rotor

9Y1210269CAS0053US0





Stator

1. Remove the lead wire (6) from compressor body.
2. Remove the external circlip (2).
3. Remove the stator (1).

(When reassembling)

- Do not use the external circlip again.
- Assemble the external circlip for the tapered side to become outside of front housing.
- The width of expanding of external circlip is set is boss of shaft as a minimum.
- Match and assemble the concave part (4) of the front housing (3) and the pin (5) of stator.

(Reference)

- Code No. for external circlip: T1065-87440.

(1) Stator
(2) External Circlip
(3) Front Housing
(4) Concave Part
(5) Pin
(6) Lead Wire

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(3) Removing Air Conditioner Unit

Draining Coolant

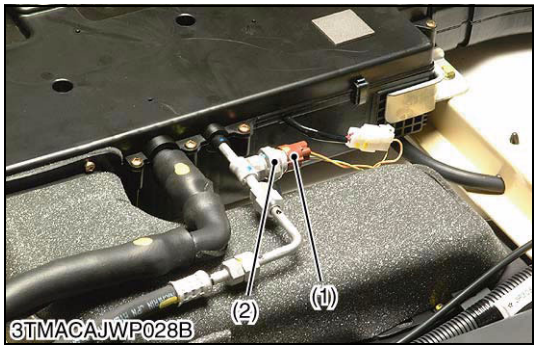
- Refer to "Draining Coolant" in this section.

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Discharging Refrigerant Gas

- Refer to "Discharging Refrigerant Gas" in this section.

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Connectors

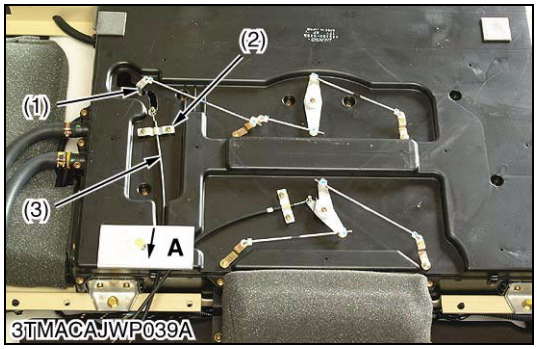
1. Remove the outer roof.
2. Disconnect the battery negative cable.
3. Disconnect the **2P** connector (1) for pressure switch (2).

(When reassembling)

Tightening torque	Outer roof mounting screw	3.5 to 4.0 0.36 to 0.40 2.6 to 2.9

(1) Pressure Switch Connector (2) Pressure Switch

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Air Mixing Door Control Cable

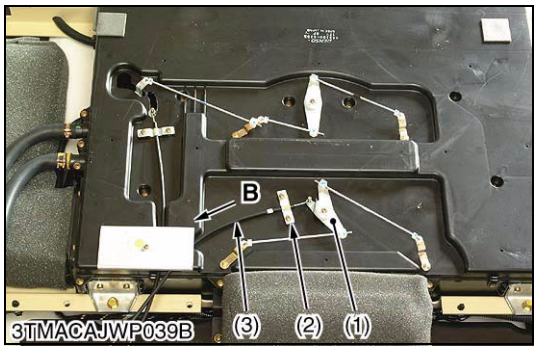
1. Disconnect the air mixing door control cable (3) from the lever (1) of air conditioner unit side.

(When reassembling)

- Set the damper lever (1) of the air conditioner unit at **MAX HOT** position. Reconnect the cable.
- Move the temperature control to **MAX HOT** position. Fit the inner cable in position, and press and fix the outer cable by the cable clip (2) while pulling in the direction of arrow **"A"** as shown at left.
- Move the temperature control lever several times and finally set it to **MAX HOT** position to make sure the damper lever is at **HOT** position too.

(1) Damper Lever **A: Direction of Pulling Outer Cable**
(2) Cable Clip
(3) Air Mixing Door Control Cable

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A/C Mode Door Control Cable (White Marked Cable)

1. Disconnect the air conditioner mode door control cable (3) from the def. control lever (1) of air conditioner unit side.

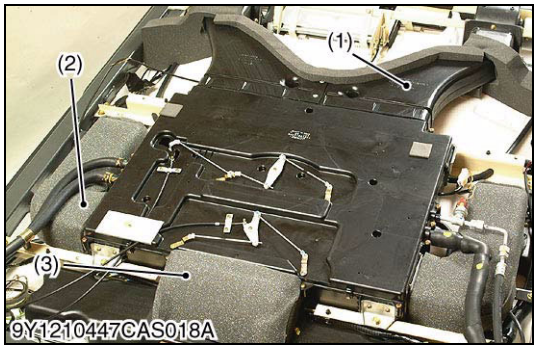
(When reassembling)

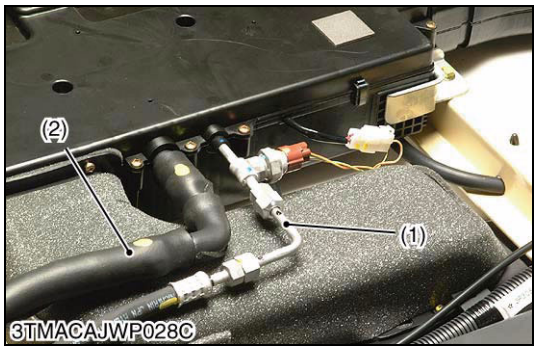
- Set the air conditioner unit to **DEF** mode position and reconnect the cable (3).
- Set the control at **DEF** position. Fit the inner cable in position, and press and fix the outer cable by the cable clip (2) while pushing in the direction of arrow **"B"** as shown at left.
- Move the mode lever several times and finally set it to **DEF** position to make sure to air conditioner unit is at **DEF** mode position.
- Lay and fix the mode door control cable over the water valve cable.

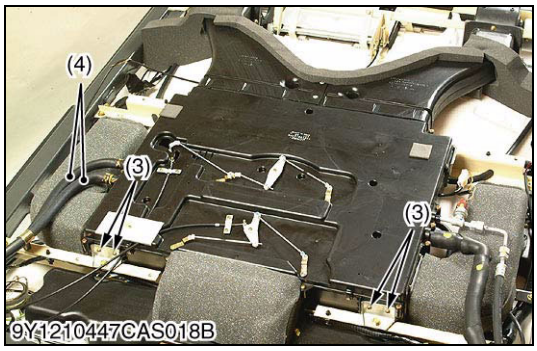
(1) **DEF**. Control Lever **B: Direction of Pulling Outer Cable**
(2) Cable Clip
(3) Mode Door Control Cable

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Air Conditioner Duct

1. Remove the duct 3 (1) mounting screws and nuts, and remove the duct 3 (1).
2. Remove the duct 2 (2) mounting screws.
3. Remove the duct 1 (3) mounting screws and remove the duct 1 (3).

(When reassembling)

- Replace the duct gaskets with new ones.

(1) Duct 3
(2) Duct 2 R.H.
(3) Duct 1

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Air Conditioning Unit

1. Disconnect the heater hoses (4).
2. Disconnect the high pressure pipe (1) and low pressure pipe (2).
3. Remove the four screws (3) and take off the unit.

■ **NOTE**

- **Open parts are cap and moisture is prevented from going into the system at once.**

(When reassembling)

- When reconnecting the cooler pipes with the unit, apply compressor oil (DENSO OIL8 or equivalent) to O-rings.
- When remounting the unit, tighten five screws by hand and finally retighten them after aligning the inner roof duct with the unit duct.

Tightening torque	A/C unit mounting screw (M8)	23.6 to 27.4 N·m 2.4 to 2.8 kgf·m 17.4 to 20.2 lbf·ft
	Low pressure pipe retaining nut	29.5 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft
	High pressure pipe retaining nut	11.8 to 14.7 N·m 1.2 to 1.5 kgf·m 8.08 to 10.8 lbf·ft

(1) High Pressure Pipe (Cooler Pipe (Liquid)) (High Pressure)
(2) Low Pressure Pipe
(3) Screws
(4) Heater Hoses

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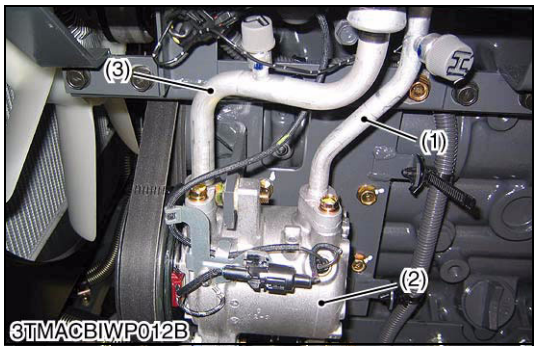
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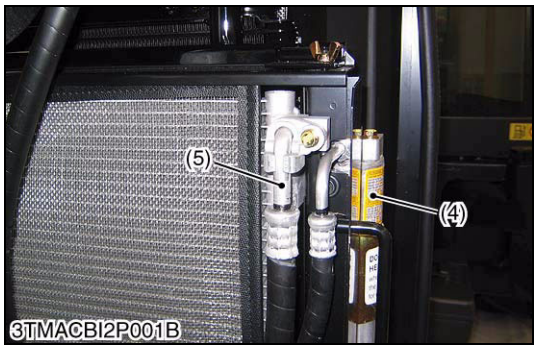
(4) Removing Air Conditioner Pipes

Discharging Refrigerant Gas

- Refer to "Discharging Refrigerant Gas" in this section.

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High Pressure Pipe 1 and Low Pressure Pipe

1. Disconnect the low pressure pipe (3) from the compressor (2) and cap the open fittings immediately to keep moisture out of the system.
2. Disconnect the high pressure pipe 1 (1) from the compressor (2) and condenser.
3. Disconnect the high pressure pipe 2 (5) from the receiver (4).

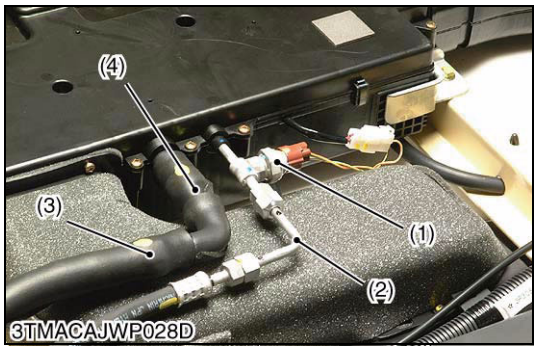
(When reassembling)

- Apply compressor oil (DENSO CO. ND-OIL8) to the O-rings and take care not to damage them.

Tightening torque	Low pressure pipe mounting screw (compressor side)	7.85 to 11.7 N·m 0.8 to 1.2 kgf·m 5.79 to 8.67 lbf·ft
	High pressure pipe 1 mounting screw (compressor side)	7.85 to 11.7 N·m 0.8 to 1.2 kgf·m 5.79 to 8.67 lbf·ft
	High pressure pipe 1 retaining nut (compressor side)	19.7 to 24.5 N·m 2.0 to 2.5 kgf·m 14.5 to 18.0 lbf·ft
	High pressure pipe 2 retaining nut (receiver side)	11.8 to 14.7 N·m 1.2 to 1.5 kgf·m 8.68 to 10.8 lbf·ft

(1) High Pressure Pipe 1
(2) Compressor
(3) Low Pressure Pipe
(4) Receiver
(5) High Pressure Pipe 2

9Y1210447CAS0015US0



High Pressure and Low Pressure Pipe

1. Remove the outer roof.
2. Disconnect the high pressure pipe 2 (2), then cap the open fitting immediately to keep moisture out of the system.
3. Remove the rubber (3) and disconnect the low pressure pipe (4), then cap the open fittings immediately to keep moisture out of the system.
4. Pull out the pressure pipes (2) and (4) from the bottom of the cabin and take out the pressure pipes.

(When reassembling)

- Replace the rubber (3) with a new one.
- Apply compressor oil (DENSO CO. ND-OIL8) to the O-rings and take care not to damage them.

Tightening torque	High pressure pipe 2 retaining nut	11.8 to 14.7 N·m 1.2 to 1.5 kgf·m 8.68 to 10.8 lbf·ft
	Low pressure pipe retaining nut	29.5 to 34.3 N·m 3.0 to 3.5 kgf·m 21.7 to 25.3 lbf·ft

(1) Pressure Switch
(2) High Pressure Pipe 2
(3) Rubber
(4) Low Pressure Pipe

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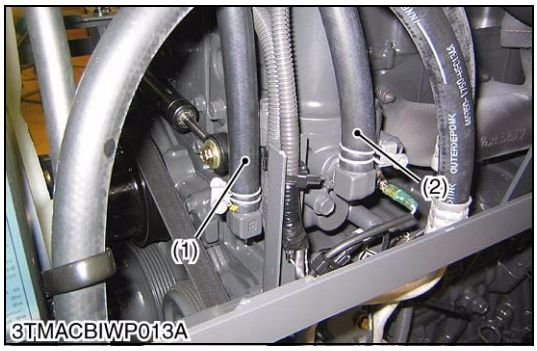
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(5) Removing Heater Hoses

Draining Coolant

- Refer to "Draining Coolant" in this section.

9Y1210269CAS0065US0



Heater Hose

1. Disconnect the heater hoses (1), (2) from the engine.
2. Remove the clamp (3).

(When reassembling)

- Note the inlet hose and outlet hose.

(1) Heater Hose 1
(2) Heater Hose 2
(3) Clamp

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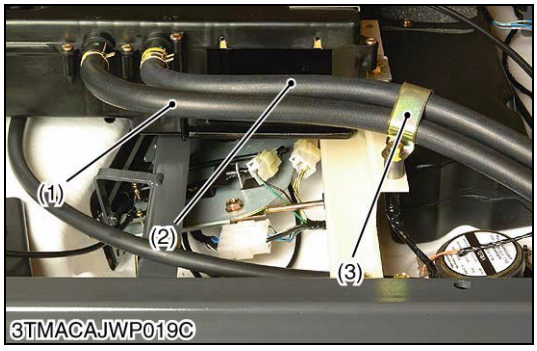


Removing Heater Hose

1. Remove the outer roof.
2. Remove the clamp (3).
3. Disconnect the heater hoses (1), (2) from air conditioner unit.
4. Pull out the heater hoses (1), (2) from bottom of cabin and take out the hoses.

(When reassembling)

- When connecting the heater hose with A/C unit, hose should be put into the A/C unit pipe more than 30 mm (1.2 in.).
- Be sure to fix the heater hose (2) to the original position. Note the inlet hose and outlet hose.



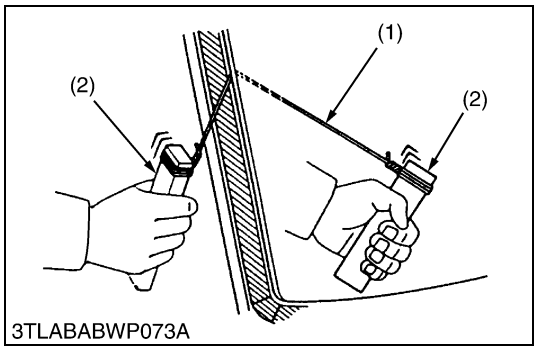
Tightening torque	Outer roof mounting screw	3.5 to 4.0 N·m 0.36 to 0.40 kgf·m 2.6 to 2.9 lbf·m

(1) Heater Hose 1
(2) Heater Hose 2
(3) Clamp

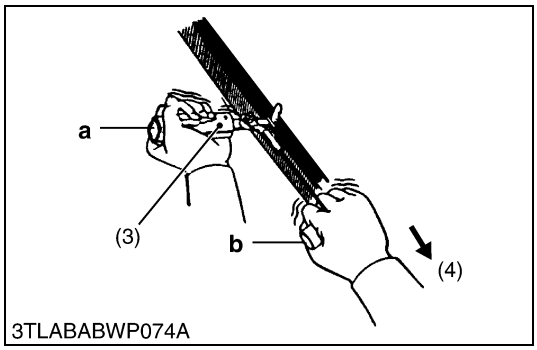
9Y1210269CAS0067US0

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(6) Cabin Windshields



3TLABABWP073A



3TLABABWP074A

Preparation

1. Prepare the followings.
   – Cutter knife (1 piece)
   – Scraper (1 piece)
   – Gun for coating (1 piece)
   – Sika Tack-Ultrafast or equivalent
   – Gummed tape
   – Sika-Activator
   – Sika primer 209
   – Shin Etsu silicon KE45

■ **NOTE**
- **Sika product are made by Sika Corporation.**
- **Shin Etsu silicon KE45 is made by Shin Etsu Polymer Corporation.**
- **These materials can't be provided by KUBOTA Corporation.**
- **Therefore, please find the local made equivalent materials in your country and use them when you need.**
- **Do not repaint even if painting peels off.**

9Y1210269CAS0068US0

Before Replacing Windshields (1)

[In case of using piano wire (When glass is cracked)]
1. Thread the piano wire from the inside of cabin. Tie its both ends to a wooden blocks or the like. (See the left figure.)
2. Pull the piano wire inward/outward alternately to cut the adhered part.

■ **NOTE**
- **Do not let the piano wire make sliding contact with the edge of glass plate forcibly.**

[In case of using cutter knife (When glass is totally crushed finely)]
1. Insert the knife (3) into the adhered part.
2. Keep the edge of knife blade square to the glass edge at the part **"a"**. Slide the knife blade along the glass surface and the edge. Pull the part **"b"** in the direction parallel to the glass edge to cut them off.

■ **NOTE**
- **Find a wider gap between the glass and body.**
- **Take care of handling the cutter knife not to damage your hand.**

(1) Piano Wire
(2) Wood Peace
(3) Cutter Knife
(4) Pulling

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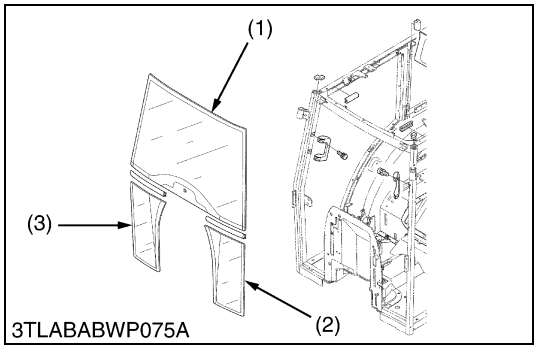
Before Replacing Windshields (2)

1. When the Sika Tack-Ultrafast or equivalent attached to the cabin frame and the glass are reused, remove the bond clearly.
2. Clean the frame surface with Sika-cleaner No. 1.

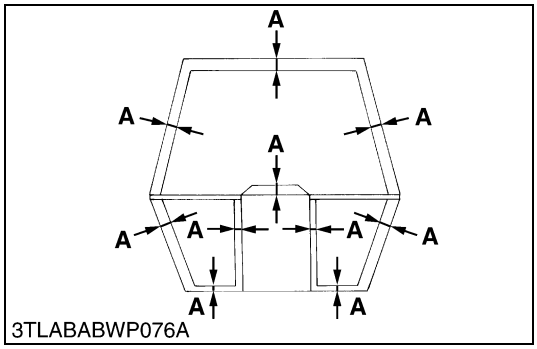
■ **NOTE**
- **Remove the bond completely.**

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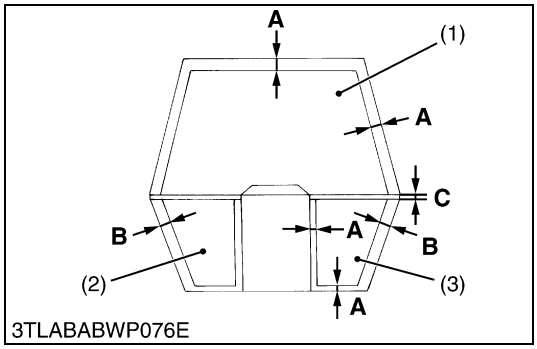
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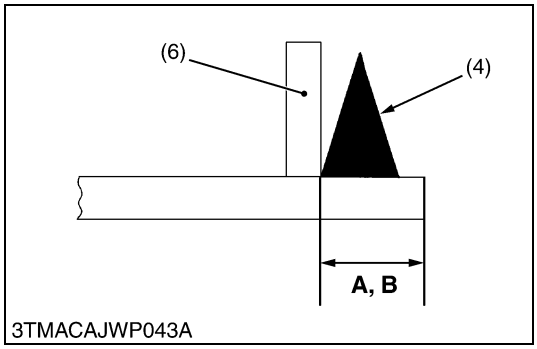
3TLABABWP075A



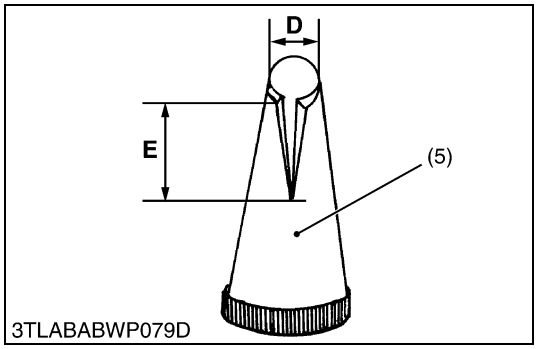
3TLABABWP076A



3TLABABWP076E



3TMACAJWP043A



3TLABABWP079D

Before Replacing Windshields (3)

1. Check that the glasses are not damaged and cracked.
2. Turn over the glass and clean this surface of the glass by Sika-Activator.
3. The cleaning area of the rear surface is indicated "**A**" in the figure left.

■ **NOTE**
- **If not cleaning the glass, it may result in adhesive failure.**

(1) Upper Windshield
(2) Lower Windshield (Left)
(3) Lower Windshield (Right)

A: 25 mm (1.0 in.)

9Y1210269CAS0071US0

Applying Sika Tack-Ultrafast

1. Apply a Sika Tack-Ultrafast (or equivalent) on the glasses as shown in figure left.

■ **NOTE**
- **Apply the Sika Tack-Ultrafast (or equivalent) with the jig having the specified tip shape as shown in the figure left.**
- **Apply it with a uniform speed to minimize unevenness.**
- **Follow the instruction manual of Sika Tack-Ultrafast.**

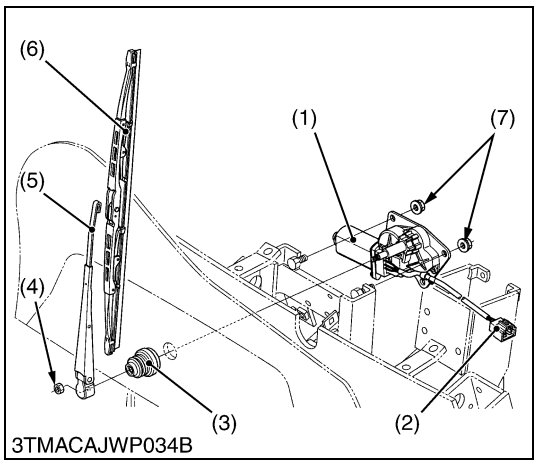
(1) Upper Windshield
(2) Lower Windshield (Left)
(3) Lower Windshield (Right)
(4) Sika Tack-Ultrafast
(5) Jig
(6) Shield

A: 10 to 15 mm (0.39 to 0.59 in.)
B: 27 mm (1.06 in.)
C: 4 mm (0.16 in.)
D: 8 mm dia. (0.31 in. dia.)
E: 12 mm (0.47 in.)

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(7) Wiper Motor



Front Wiper Motor

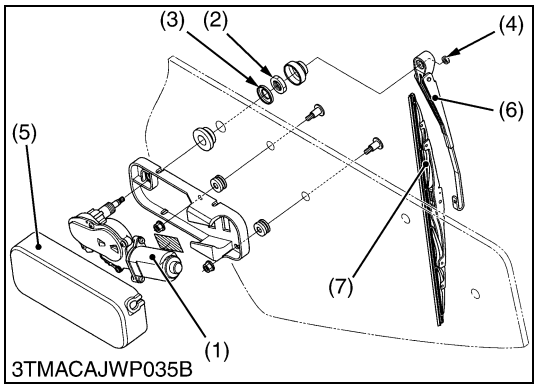
1. Remove the steering wheel and the steering post under covers.
2. Remove the meter panel.
3. Remove the panel under cover.
4. Disconnect the front wiper motor **4P** connector (2).
5. Remove the wiper arm mounting nut (4) and wiper arm (5).
6. Remove the wiper link cap (3).
7. Disconnect the earth lead setting screw.
8. Remove the front wiper motor mounting screw (7), then take out the front wiper motor (1).

(When reassembling)

Tightening torque	Wiper arm mounting nut	6.4 to 9.3 N·m 0.65 to 0.95 kgf·m 4.7 to 6.8 lbf·ft

(1) Front Wiper Motor
(2) Front Wiper Motor Connector **4P**
(3) Wiper Link Cap
(4) Nut
(5) Wiper Arm
(6) Wiper Blade
(7) Wiper Motor Mounting Screw

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Rear Wiper Motor (Option)

1. Remove the wiper motor cover (5).
2. Disconnect the rear wiper motor **4P** connector.
3. Remove the wiper arm mounting nut (4) and wiper arm (6).
4. Remove the wiper link cap (3) and nut (2).
5. Remove the rear wiper motor mounting screws, then take out the rear wiper motor (1).

Tightening torque	Wiper arm mounting nut	7.8 to 9.3 N·m 0.80 to 0.95 kgf·m 5.80 to 6.80 lbf·ft
	Wiper motor mounting screw	7.8 to 9.3 N·m 0.80 to 0.95 kgf·m 5.80 to 6.80 lbf·ft

(1) Rear Wiper Motor
(2) Nut
(3) Wiper Link Cap
(4) Nut
(5) Wiper Motor Cover
(6) Wiper Arm
(7) Wiper Blade

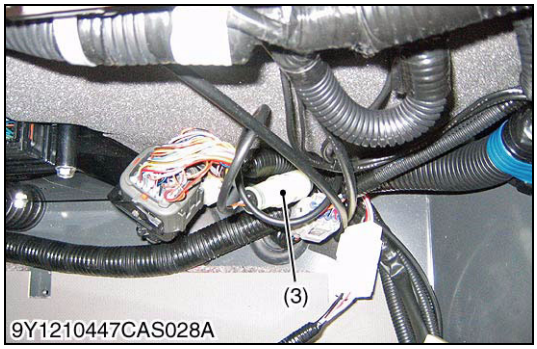
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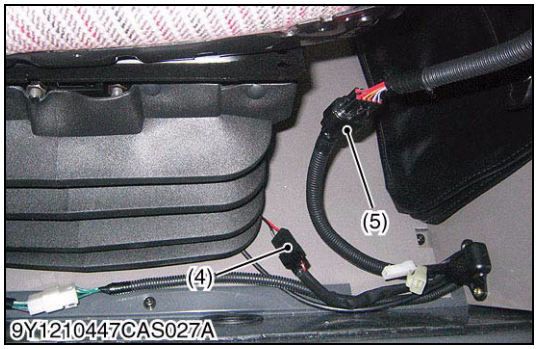
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[4] DISASSEMBLING AND ASSEMBLING (AIR SUSPENSION SEAT)

(1) Separating from Cabin







Preparation

1. Remove the cover beside the seat (1).
2. Disconnect the **2P** connectors (3), (4) and **10P** connector (5) which has come from seat and arm rest.
3. Remove the seat mounting nuts and seat (1).
4. Remove the arm rest (2).

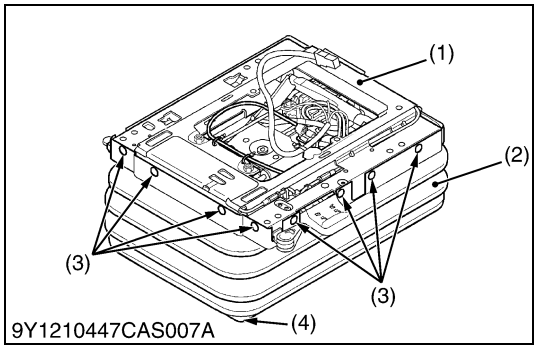
Tightening torques	Seat mounting nut	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Arm rest mounting nut	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

(1) Seat
(2) Arm Rest
(3) **2P** Connector
(4) **2P** Connector
(5) **10P** Connector

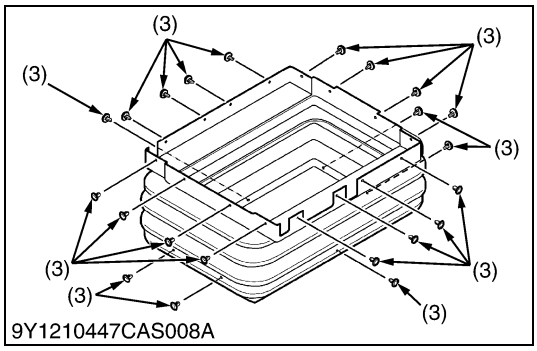
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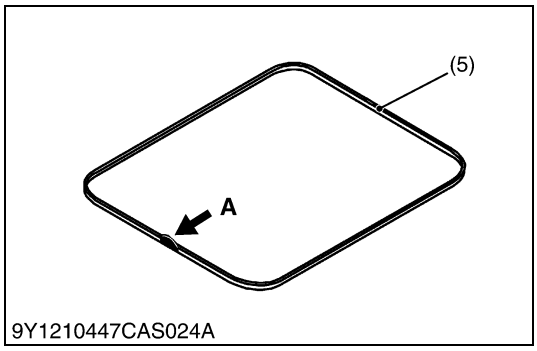
(2) Disassembling the Seat



9Y1210447CAS007A



9Y1210447CAS008A



9Y1210447CAS024A

Preparation 2

1. Remove the upper part of the seat.
2. Remove the cover.
3. Remove bellows pins (3) around the upper part of suspension part (1).
4. Pull the back of the bellows (2) down over the lower part of the suspension system (4).
5. Lift the front part of the bellows (2) over the lower part of the suspension system (4) and remove the bellows (2) downwards.
6. Remove wire insert (5) from the bellows (2).

(When reassembling)

■ **NOTE**

- **The welding joint "A" of the wire insert (5) must be in the second fold of the bellows (2) and inside the bellows (2).**

Tightening torques	Seat mounting nut	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

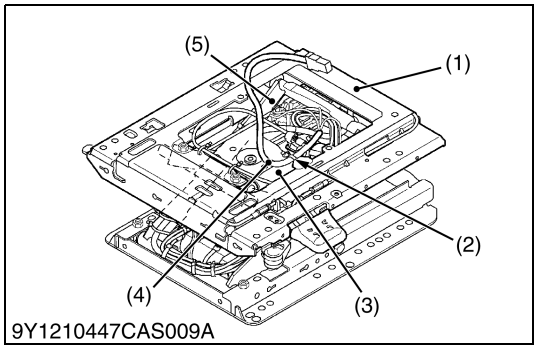
(1) Upper Part of Suspension
(2) Bellows
(3) Bellows Pin
(4) Lower Part of Suspension
(5) Wire Insert

A: Welding Joint

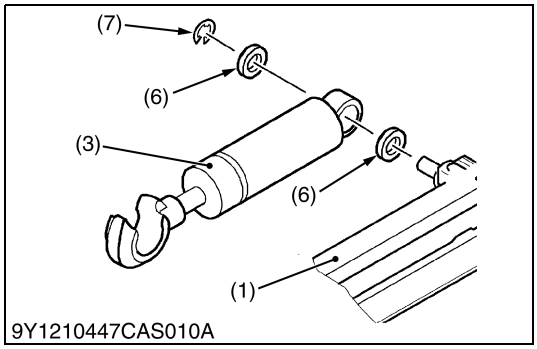
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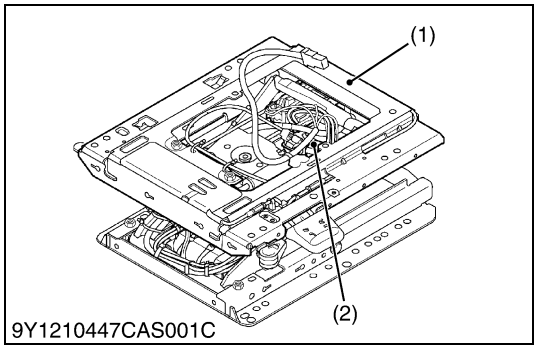
(3) Shock Absorbers



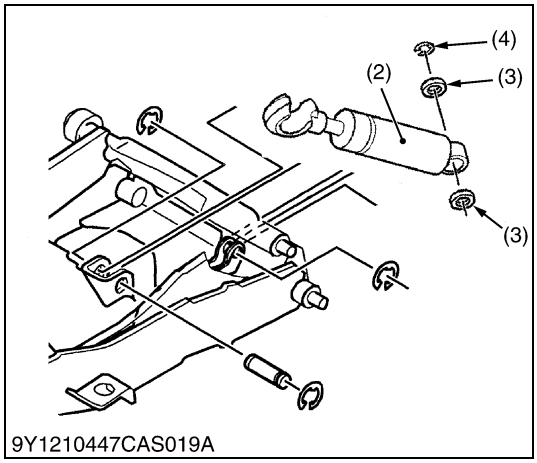
9Y1210447CAS009A



9Y1210447CAS010A



9Y1210447CAS001C



9Y1210447CAS019A

Removing Horizontal Shock Absorber

1. Loosen up the circlip (7) from the axle of the upper part of suspension (1) and remove the washer (6).
2. Lever out the horizontal shock absorber (3) at the swinging tube (5) and push it off the axle of the upper part of suspension (1).

(When reassembling)

■ **NOTE**
- **Press the horizontal shock absorber (3) onto the swinging rod (5) without using driving or hammering tools.**
- **Apply multi-purpose grease to the mounting surfaces of the horizontal shock absorber (3).**

(1) Upper Part of Suspension
(2) Cable Tie
(3) Horizontal Shock Absorber
(4) Connection Cable
(5) Swinging Structure
(6) Washer
(7) Circlip

9Y1210447CAS0027US0

Removing Vertical Shock Absorber

1. Loosen up the circlip (4) from the axle of the upper suspension part of suspension (1) and remove the washers (3).
2. Lever out the vertical shock absorber (2) and push it off the axle of the upper part of suspension (1).

(When reassembling)

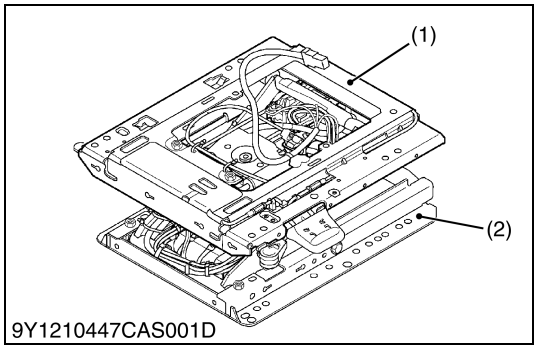
■ **NOTE**
- **Press the horizontal shock absorber (3) onto the swinging rod (5) without using driving or hammering tools.**
- **Apply multi-purpose grease to the mounting surfaces of the horizontal shock absorber (3).**

(1) Upper Part of Suspension
(2) Vertical Shock Absorber
(3) Washers
(4) Circlip

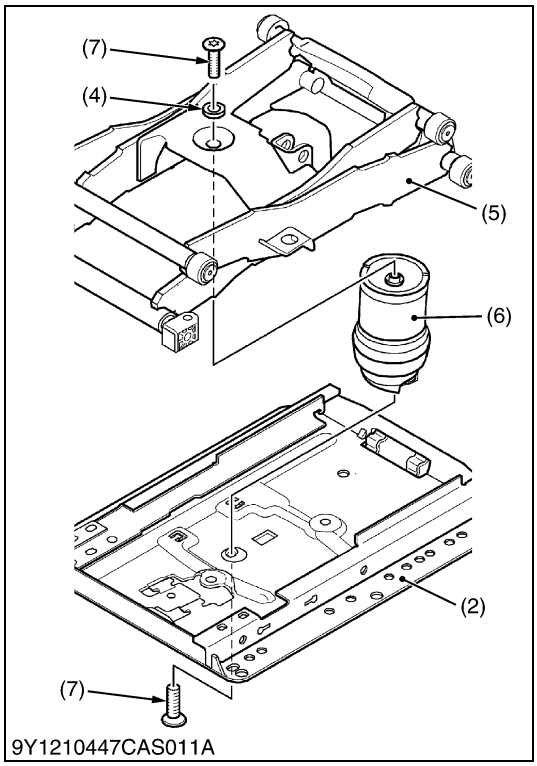
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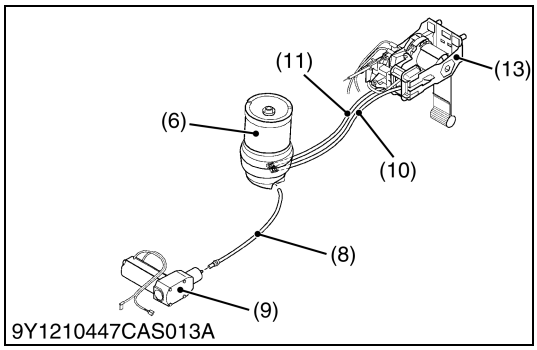
(4) Pneumatic Spring



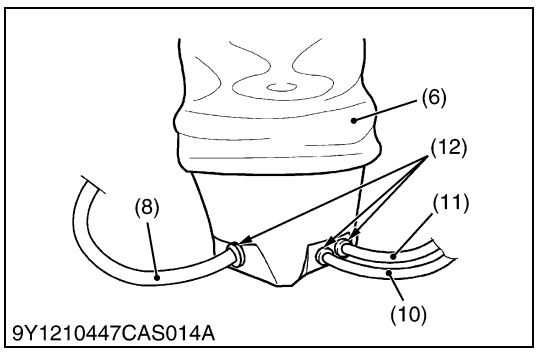
9Y1210447CAS001D



9Y1210447CAS011A



9Y1210447CAS013A



9Y1210447CAS014A

Removing Pneumatic Spring and Compressor

1. Connect the suspension connector.
2. Turn on the main key switch.
3. Pull up the weight / height adjust lever (3) until the seat becomes the highest position, and then install the spacers to secure it there.

■ **NOTE**
- **Secure the suspension between the swinging structure and lower part of the suspension system with suitable spacers.**

4. Remove the two air input hoses (10), (11) and compressed-air hose (8) and air input hose with angle from pneumatic spring.

■ **NOTE**
- **When removing the air input hoses (10), (11) and compressed-air hose (8) from pneumatic spring, press the couplers (12) by your finger and pull the air input hoses carefully not to tear it.**

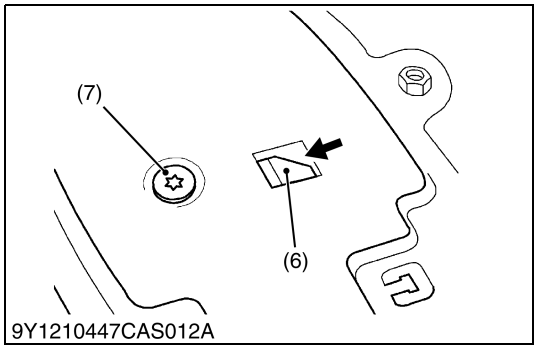
5. Remove the counter sunk screws (7) from the pneumatic spring (6).

(When reassembling)

Tightening torque	Counter sunk screw (3), (7)	6 N·m 0.6 kgf·m 4 lbf·ft

- Be sure to install the washer (4) to the original position.
- Slightly compress the pneumatic spring (6) and remove it from the swinging structure (5) and lower part of the suspension (2).

■ **NOTE**
- **The step on the underside of the pneumatic spring (6) must fit into the cut-out (arrow) in the lower part of the suspension (2).**



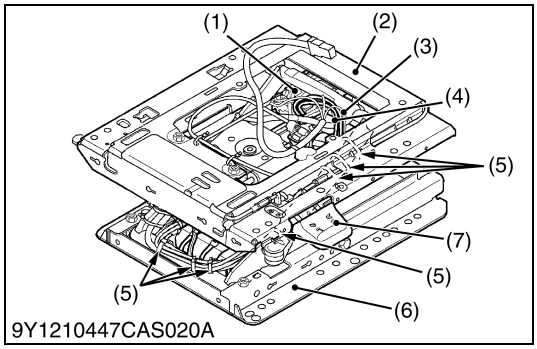
9Y1210447CAS012A

(1) Upper Part of Suspension
(2) Lower Part of Suspension
(3) Weight / Height Adjust Lever
(4) Washer
(5) Swinging Structure
(6) Pneumatic Spring
(7) Counter Sunk Screw
(8) Compressed-air Hose
(9) Compressor
(10) Air Input Hose
(11) Air Input Hose
(12) Coupler
(13) Height Level Unit

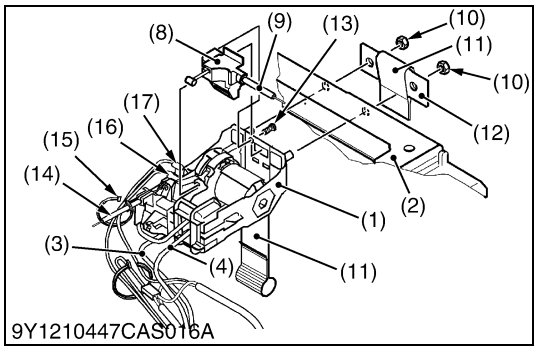
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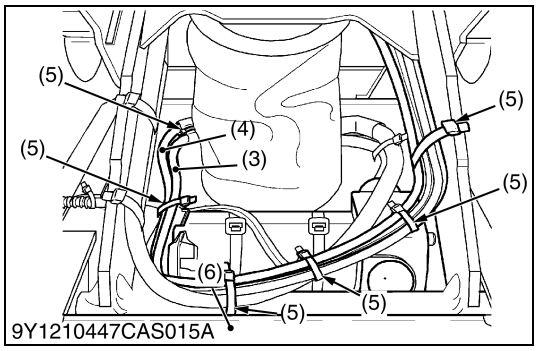
(5) Height Level Control Unit



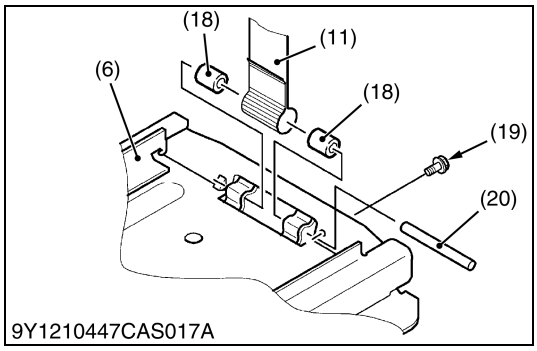
9Y1210447CAS020A



9Y1210447CAS016A



9Y1210447CAS015A



9Y1210447CAS017A

Height Level Control Unit

1. Connect the suspension connector.
2. Turn on the key switch.
3. Pull up the handle until the seat becomes the highest position, and then install the spacers to secure it there.

■ **NOTE**

- **Secure the suspension between the swinging structure and lower part of the suspension system with suitable spacers.**

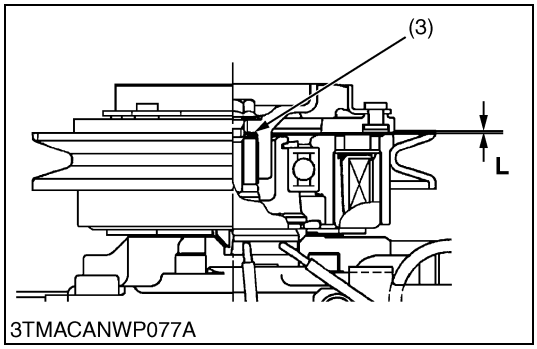
4. Remove the screw (19).
5. Knock out the fulcrum pin (20) from the lower part of the suspension (6) and withdraw it through the loop of the webbing (11).
   Hold the webbing (11) and let it carefully roll back to the rewinder on the height level control unit (1).
6. Secure by re-insert the fulcrum pin (20) temporarily again through the loop of the webbing (11).
7. Mark the points where the air intake hose (3), (4) is fastened with nine cable ties (5) and remove the cable ties (5).
8. Secure any further hoses and connecting lines temporarily to prevent them from falling down.
9. Remove the air intake hose (3), (4) from the pneumatic spring.
10. Mark the point where the cable is fastened with the right-angle plug (16), (17) with a cable tie (15), and then remove the cable tie (15).
11. Mark and disconnect the right-angle plugs (16), (17) from the height level control unit (1).
12. Unhook the bowden pull wire (9), (14) from the height level control unit (1).
    To release the tension from the bowden pull wire (9), (14) pull weight / height adjust lever (7) upwards.
13. Remove the nuts (10) and the plate (12) from the thread of the height level control unit (1).
14. Pull the plate (12) out of the loop of webbing (11).
15. Remove the height level control unit (1) from the upper seat part (2) and put it down.
16. Remove the torx screw (13) and the retainer for bowden pull wire (8) from the height level unit (1).
    This procedure is shown as below.
    - At first, release the two catches on the backside of the support (8).
    - Remove the retainer for the support (8) from the height level valve (1).
17. Pull the bowden pull wire (9) out of the support (8).
18. Remove the height level unit (1).

(1) Height Level Unit
(2) Upper Part of Suspension
(3) Air Intake Hose
(4) Air Intake Hose
(5) Cable Ties
(6) Lower Part of Suspension
(7) Weight / Height Adjust Lever
(8) Support
(9) Bowden Pull Wire
(10) Nut
(11) Loop of Webbing
(12) Plate
(13) Torx Screw
(14) Bowden Pull Wire
(15) Cable Tie
(16) Right-angle Plug
(17) Right-angle Plug
(18) Cushion
(19) Screw
(20) Fulcrum Pin

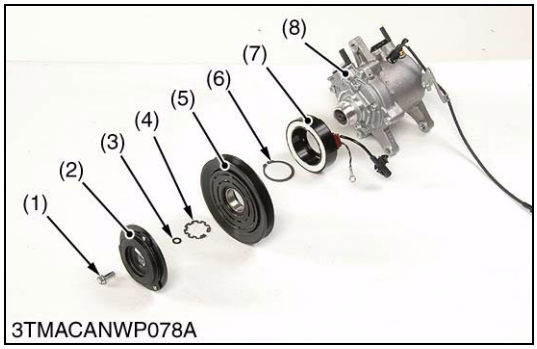
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[5] SERVICING



3TMACANWP077A



3TMACANWP078A

Adjustment of Air-gap

1. Measure the air-gap with a feeler gauge.
2. When the measurement value comes off from factory specification, adjustment shim (3) is added or deleted.

Air-gap **"L"**	Factory specification	0.30 to 0.65 mm 0.0118 to 0.0255 in.

(Reference)

Adjusting Shim Size	Code No.
0.10 mm (0.0039 in.)	T1065-87340
0.15 mm (0.0059 in.)	T1065-87350
0.40 mm (0.016 in.)	T1065-87360
0.60 mm (0.024 in.)	T1065-87370
1.0 mm (0.0394 in.)	T1065-87380

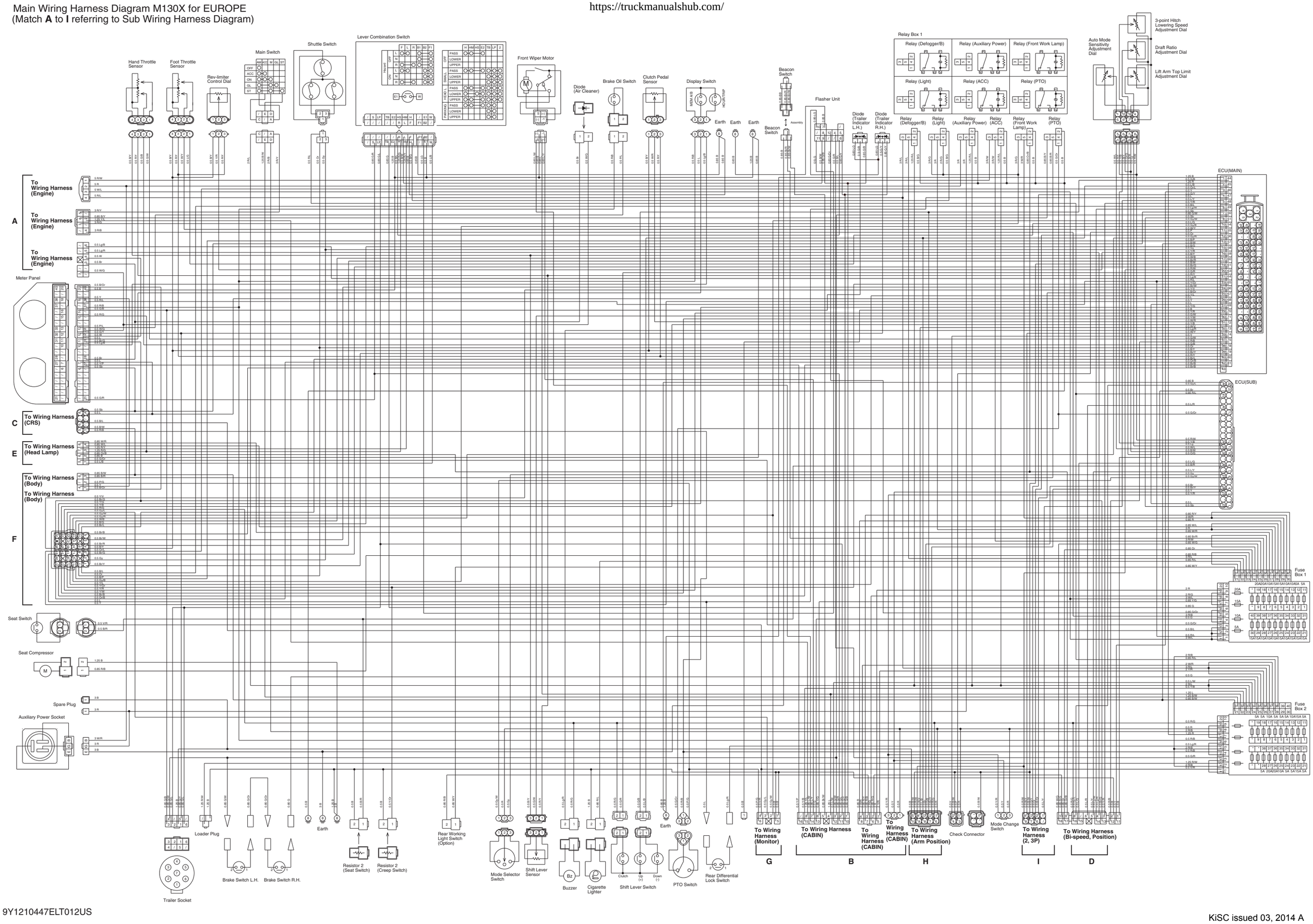
(1) Magnet Clutch Mounting Screw
(2) Hub Plate
(3) Shim
(4) External Snap Ring
(5) Rotor
(6) External Snap Ring
(7) Stator
(8) Compressor Body

L: Air-Gap

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Main Wiring Harness Diagram M130X for EUROPE
(Match **A** to **I** referring to Sub Wiring Harness Diagram)

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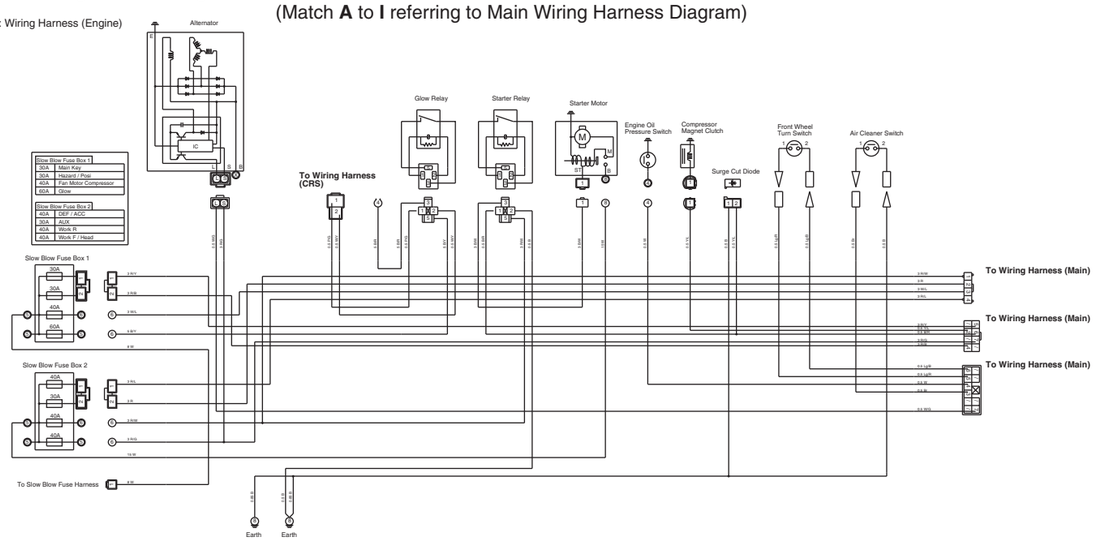


Sub Wiring Harness Diagram M130X for EUROPE

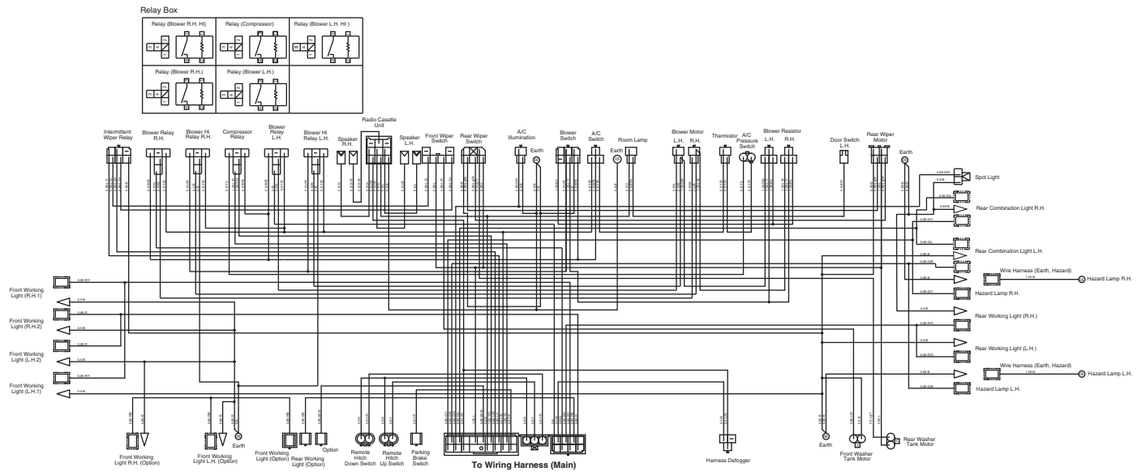
(Match **A** to **I** referring to Main Wiring Harness Diagram)

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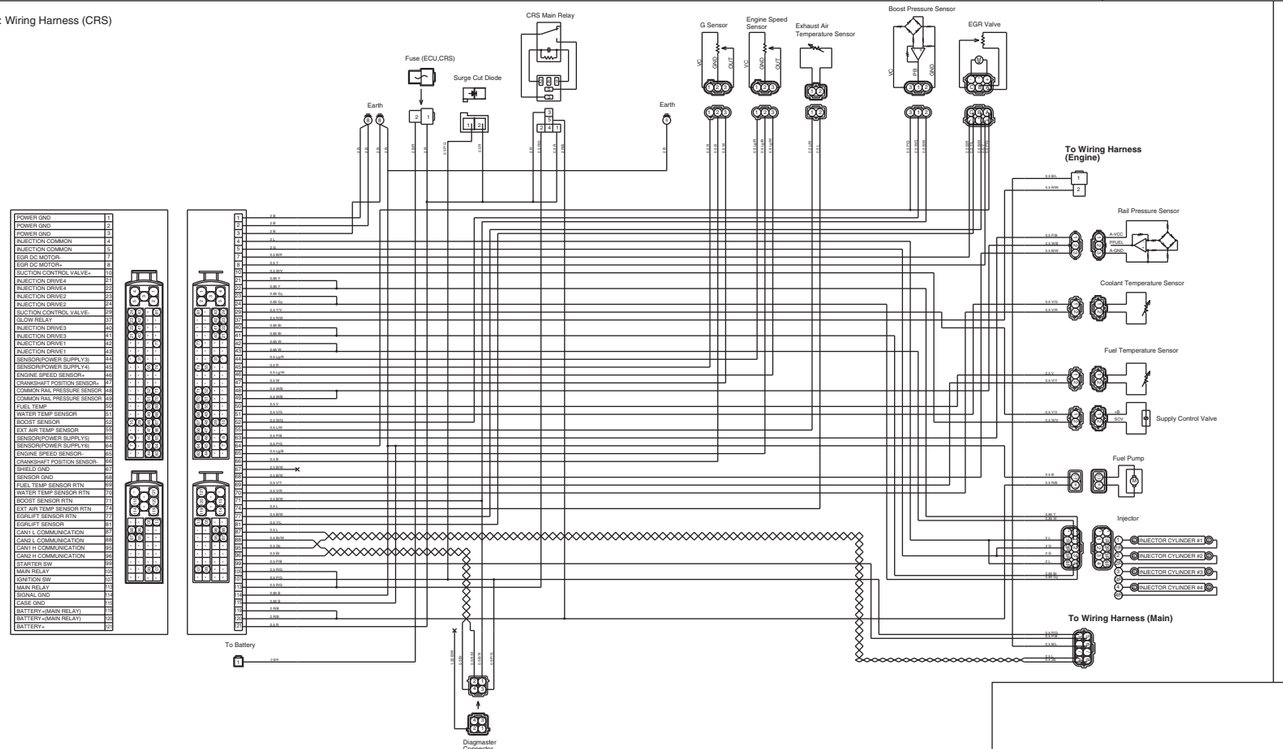
A : Wiring Harness (Engine)



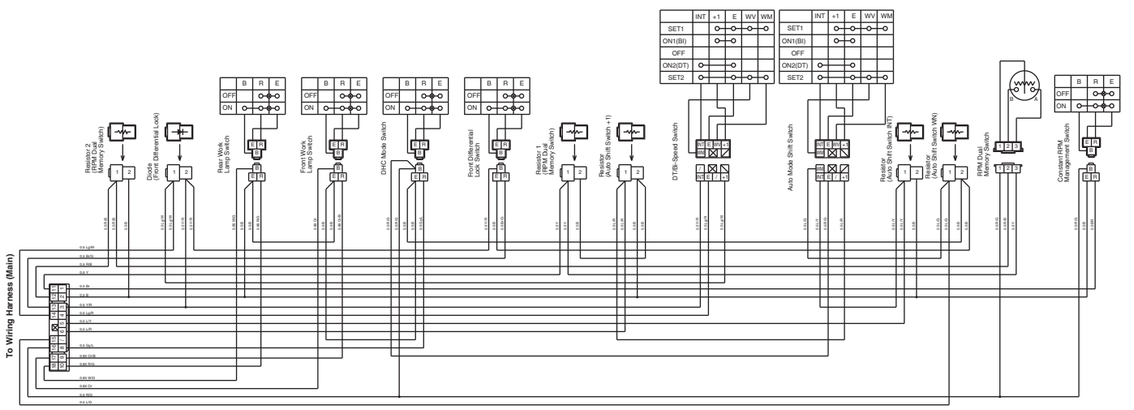
B : Wiring Harness (Body)



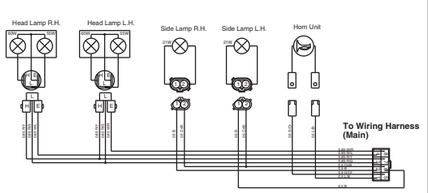
C : Wiring Harness (CRS)



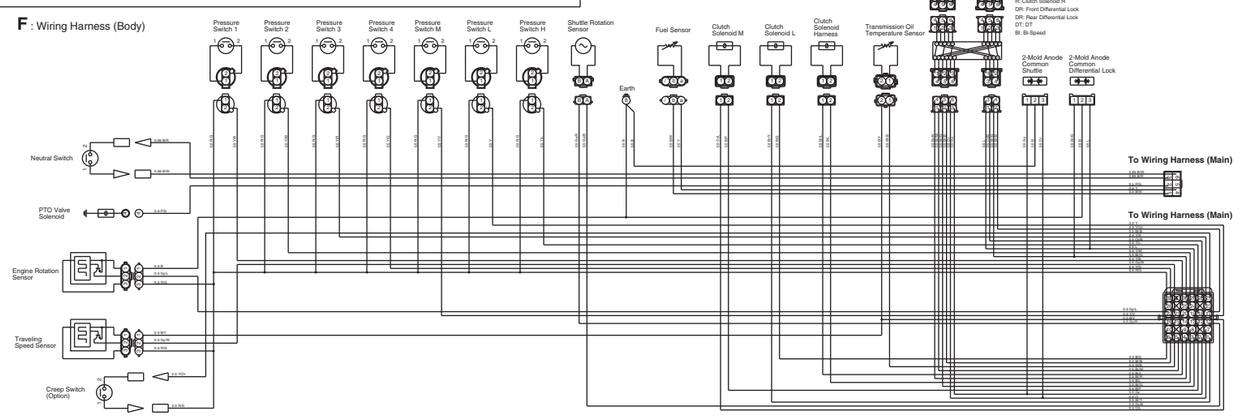
D : Wiring Harness (Bi-speed, Position)



E : Wiring Harness (Head Lamp)



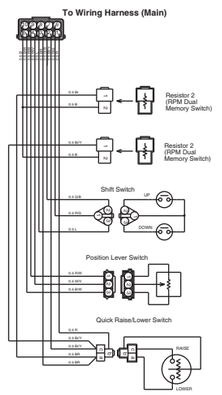
F : Wiring Harness (Body)



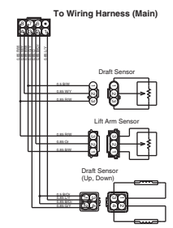
G : Wiring Harness (Monitor)



H : Wiring Harness (Arm Position)



I : Wiring Harness (2, 3P)



Color of Wiring

B ..... Black	B/L ..... Black / Blue	G/B .....Green / Black	Lg/B ..... Light Green / Black	W/B .....White / Black	Pu/Y ..... Purple / Yellow
G .....Green	B/P ..... Black / Pink	G/L .....Green / Blue	Lg/R ..... Light Green / Red	W/G .....White / Green	Pu/R ..... Purple / Red
L .....Blue	B/Pu ..... Black / Purple	G/R ..... Green / Red	Lg/W ..... Light Green / White	W/L ..... White / Blue	Pu/B ..... Purple / Black
P ..... Pink	B/R .....Black / Red	G/W .....Green / White	Lg/Y ..... Light Green / Yellow	W/R .....White / Red	Pu/W ..... Purple / White
W ..... White	B/W ..... Black / White	G/Y .....Green / Yellow	Or/W ..... Orange / White	W/Y .....White / Yellow	P/G .....Pink / Green
Y ..... Yellow	B/Y ..... Black / Yellow	G/P .....Green / Pink	Or/B ..... Orange / Black	W/Pu .... White / Purple	P/L ..... Pink / Blue
Br ..... Brown	B/Or ..... Black / Orange	G/Or ..... Green / Orange	Or/G ..... Orange / Green	Y/B .....Yellow / Black	P/B .....Pink / Black
Lg .....Light Green	Br/B .....Brown / Black	L/B ..... Blue / Black	Or/L .....Orange / Blue	Y/G .....Yellow / Green	P/W .....Pink / White
Or .....Orange	Br/Y .....Brown / Yellow	L/G ..... Blue / Green	R/B .....Red / Black	Y/L ..... Yellow / Blue	Gy/L ..... Gray / Blue
Sb ..... Sky Blue	Br/W .....Brown / White	L/Or .....Blue / Orange	R/G ..... Red / Green	Y/R .....Yellow / Red	Gy/W .....Gray / White
Gy ..... Gray	Br/R .....Brown / Red	L/R ..... Blue / Red	R/L ..... Red / Blue	Y/Br .....Yellow / Brown	Gy/R .....Gray / Red
Pu ..... Purple	Br/G ..... Brown / Green	L/W ..... Blue / White	R/W .....Red / White	Y/Pu ..... Yellow / Purple	Gy/B .....Gray / Black
B/G ..... Black / Green	Br/L ..... Brown / Blue	L/Y ..... Blue / Yellow	R/Y .....Red / Yellow	Y/Or ..... Yellow / Orange	

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