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Service Manual

CLG766A/CLG777A
Backhoe Loader

Applicable type and model: **CLG766A/777A**

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1. Overall Lubrication Part

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General Information

Machine identification plate

You machine has an identification plate mounted on the Loader tower. The serial numbers of the machine and its major units stamped on the plate.

The serial number of each major units is also stamped on the unit itself. If a major unit is replaced by a new one, the serial number on the identification plate will be wrong. Either stamp the new number of the unit on the identification plate, or simply stamp out the old number. This will prevent the wrong unit number being quoted when replacement parts are ordered.

The machine and engine serial numbers can help identify exactly the type of equipment you have.



Fig. 1.1 RUSSIA



Fig. 1.2 UK. and R.O.W.



Fig. 1.3 ISO

Serial plates



Fig. 1.4 Perkins Engine



Fig. 1.5 Weichai Engine

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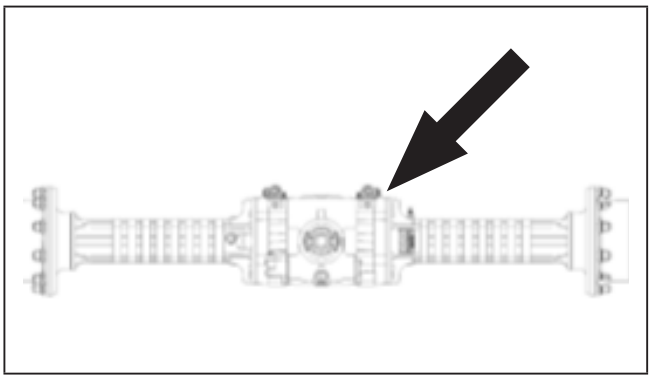


Fig. 1.6 Rear drive axle

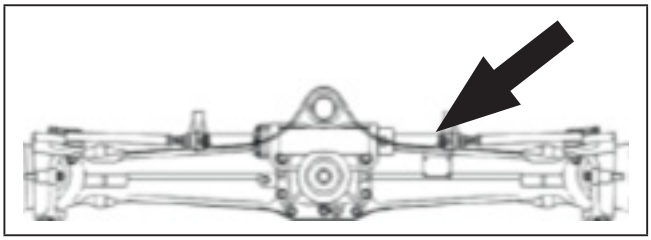


Fig. 1.7 Front drive axle

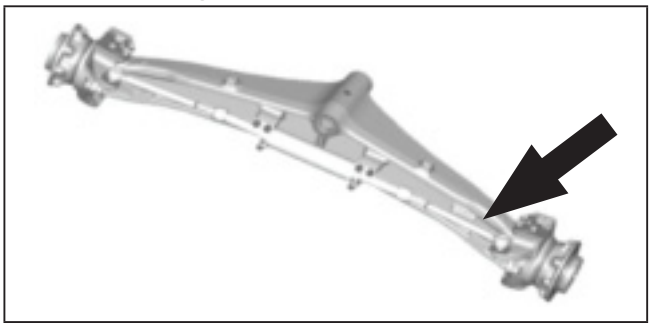


Fig. 1.8 Non- drive front axle

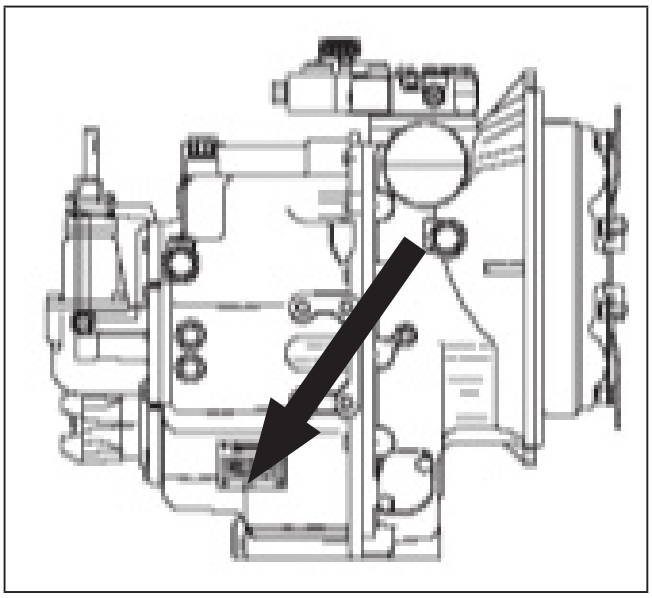


Fig. 1.9 Mechanical shift gearbox

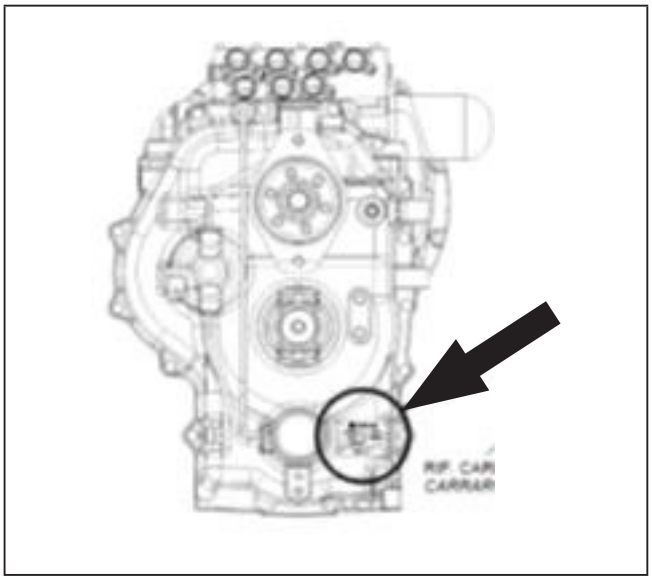


Fig. 1.10 Power shift gearbox

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Torque settings

Use only where no torque settings is specified in the text. Values are for dry threads and may be within three per cent of the figures stated. For lubricated the values should be REDUCED by one third.

Standard Thread Torque in Metric System

Thread Size	Standard Torque lb.ft (N•m)	
	Grade 8.8 strength	Grade 10.9 strength
M6	7.7±1.1 (10.5±1.5)	
M8	19±2.9 (26±4)	
M10	38±5 (52±7)	53±4 (72±6)
M12	66±9 (90±12)	89±7 (120±10)
M14	107±15 (145±20)	144±11 (195±15)
M16	166±26 (225±35)	225±18 (305±25)
M18	229±33 (310±45)	306±26 (415±35)
M20	302±37 (410±50)	443±37 (600±50)
M22	443±59 (600±80)	590±52 (800±70)
M24	561±74 (760±100)	752±74 (1020±100)
M27	811±111 (1100±150)	1106±74 (1500±100)
M30	1106±148 (1500±200)	1364±11 (1850±150)
M33	1512±221 (2050±300)	2139±295 (2900±400)
M36	1955±258 (2650±350)	2286±184 (3100±250)

Bolt, nut and stud in grade 12.9

In general, the required torque for tightening grade 10.9 will meet the tightening requirements of grade 12.9.

Standard Thread Torque in British System

Thread size	Standard Torque lb.ft (N•m)
1/4	9±3 (12±4)
5/16	18±5 (25±7)
3/8	33±5 (45±7)
7/16	52±11 (70±15)

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Thread size	Standard Torque lb.ft (N•m)
1/2	74±11 (100±15)
9/16	110±15 (150±20)
5/8	148±18 (200±25)
3/4	266±37 (360±50)
7/8	420±59 (570±80)
1	645±74 (875±100)

Standard torque of connector nut

Metric Thread

Thread	Nut Torque (N•m)
M12X1.5	10-20
M14X1.5	20-35
M16X1.5	25-40
M18X1.5	30-45
M20X1.5	35-50
M22X1.5	40-70
M24X1.5	40-70
M26X1.5	60-100
M30X2.0	80-120
M36X2.0	100-150
M42X2.0	150-220
M45X2.0	180-250
M52X2.0	200-300

British Thread

Thread	Nut Torque (N•m)
G1/8"X28	11-12
G1/4"X19	25-28

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Thread	Nut Torque (N•m)
G3/8"X19	41-48
G1/2"X4	72-82
G5/8"X14	96-110
G3/4"X14	124-137
G1"X11	151-165
G1.1/4"X11	192-206
G1.1/2"X11	261-275
G2"X11	343-357

JIC Thread in American System

Thread	Nut torque (N•m)
7/16"X20	15-16
1/2"X20	19-21
9/16"X18	24-28
3/4"X16	49-53
7/8"X14	77-85
1.1/16"X12	107-119
1.3/16"X12	127-140
1.5/16"X12	147-154
1.5/8"X12	172-181
1.7/8"X12	215-226
2.1/2"X12	332-350

ORFS Thread in American System

Thread	Nut torque (N•m)
9/16"X18	14-16
11/16"X16	27-27
13/16"X16	43-47

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Standard torque of connector nut

Thread	Nut torque (N•m)
1"X14	60-68
1.3/16"X12	90-95
1.7/16"X12	125-135
1.11/16"X12	170-190
2"X12	200-225

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Appendix: unit conversion table

Name	Unit	Conversion Unit	Conversion Ratio
Length	in	mm	25.4
	mm	in	0.03937
	ft	m	0.3048
	m	ft	3.28084
Area	in^2	cm^2	6.4516
	cm^2	in^2	0.1550
Volume	gal	l	4.54609
	l	gal	0.219969
	gal	l	3.78541
	l	gal	0.264172
	l	dm^3	1
Mass	lb	kg	0.453592
	kg	lb	2.204622
Torque	lbf•in	N•m	0.112985
	N•m	lbf•in	8.85075
Pressure	2 psi	bar	0.06895
	bar	2 psi	14.5038
	2 psi	MPa	0.006895
	MPa	2 psi	145.038
	MPa	bar	10
	bar	MPa	0.1
	Pa	bar	10-5
	bar	Pa	105
Speed	ft/s	m/s	0.3048
	m/s	ft/s	3.28084

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Flow	gal/min	l/min	4.54609
	l/min	gal/min	0.219969
	gal/in	l/min	3.78541
	l/min	gal/in	0.264172
Temperature	°F	°C	5/9* (°F-32)
	°C	°F	°C*9/5+32

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Care and Safety

Safety notices

All construction and agricultural equipment can be hazardous. When a backhoe loader is correctly operated and properly maintained, it is a safe machine to work with. But when it is carelessly operated or poorly maintained it can become a danger to you (the operator) and others.
In this handbook and on the machine you will find warning messages. Read and understand them. They tell you of potential hazards and how to avoid them. If you do not fully understand the warning messages, ask your employer or JOB distributor to explain them.
But safety is not just a matter of responding to the warnings. All the time you are working on or with the machine you must be thinking what hazards there might be and how to avoid them
Do not work with the machine until you are sure that you can control it.
Do not start any job until you are sure that you and those around you will be safe.
If you are unsure of anything, about the machine or the job, ask someone who knows. Do not assume anything.
Remember
BE CAREFUL
BE ALERT

General safety

⚠ Warning

Handbook

You and others can be injured if you operate or maintain the machine without first studying this handbook. Read the safety instructions before operating the machine. If you do not understand anything, ask your employer or JCB distributor to explain it. Keep this handbook clean and in good condition. Do not operate the machine without a handbook in the cab, or if there is anything on the machine you do not understand. INT-1-3-2

⚠ Warning

Clothing

You can be injured if you do not wear the proper clothing. Loose clothing can get caught in the machinery. Wear protective clothing to suit the job. Examples of protective clothing are: a hard hat, safety shoes, safety glasses, a well fitting overall, ear-protectors and industrial gloves. Keep cuffs fastened. Do not wear a necktie or scarf. Keep long hair restrained.
INT-1-3-6

⚠ Warning

Machine Modifications

This machine is manufactured in compliance with legislative and other requirements. It should not be altered in any way which would affect or invalidate any of these requirements. For advice consult your JOB Distributor.
Reference should also be made to Optional Attachments section where appropriate.

⚠ Warning

Alcohol and Drugs

It is extremely dangerous to operate machinery when under the influence of alcohol or drugs. Do not consume alcoholic drinks or take drugs before or whilst operating the machine or attachments. Be aware of medicines which can cause drowsiness.
INT-1-3-9

⚠ CAUTION

Passengers

Passengers in or on the machine can cause accidents. The JCB Backhoe Loader is a one-man machine. Do not
INT-2-2-2

⚠ Warning

Raised Attachments

Raised attachments can fall and injure you. Do not walk or work under raised attachments unless they are safely blocked.
INT-1-3-8

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⚠ CAUTION

Regulations

Obey all laws, work site and local regulations which affect you and your machine.
INT-1-3-3

⚠ Warning

Care and Alertness

ll the time you are working with or on the machine, take care and stay alert. Always be careful. Always be alert for hazards.
INT-1-3-5

Operating safety

⚠ Warning

Machine Condition

A defective machine can injure you or others. Do not operate a machine which is defective or has missing parts. Make sure the service procedures in this handbook are completed before using the machine.
INT-2-1-2

⚠ Warning

Lifting Equipment

You can be injured if you use faulty lifting equipment. Make sure that lifting equipment is in good condition Make sure that lifting tackle complies with all local regulations and is suitable for the job, Make sure that lifting equipment is strong enough for the job.
INT-1-3 7

⚠ Warning

Engine

The engine has exposed rotating parts. Do not open tile engine cover while the engine is running. Do not use the machine with the cover open.
INT-2-1-6/1

⚠ Warning

Machine Limits

Operating the machine beyond its design limits can damage the machine, it can also be dangerous, Do not operate the machine outside its limits. Do not try to upgrade the machine performance with unapproved modifications.
INT-2-t-4

⚠ Warning

Controls

You and others can be killed or injured if you operate the control levers from outside the cab. Operate the control levers only when you are seated correctly in the cab.
INT-2-1-3

⚠ Warning

Road Wheel Alignment

At the start of each working period, and at least once a day, or if having difficulty in steering, check and, if necessary, re-align the road wheels.
2-1-1-10

⚠ Danger

Sparks

Explosions and fire can be caused by sparks from the exhaust or the electrical system. Do not use the machine in closed areas where there is flammable material, vapour or dust.
INT~2-2-10

⚠ Warning

Visibility

Accidents can be caused by working in poor visibility. Keep windows clean and use your lights to improve visibility. Do not operate the machine if you cannot see properly.
INT-2-1-11

⚠ Warning

Ramps and Trailers

Water, mud, ice, grease and oil on ramps or trailers can cause serious accidents. Make sure ramps and trailers are clean before driving onto them. Use extreme caution when driving onto ramps and trailers.
INT-2-2-6

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⚠ Warning

Safety Barriers

Unguarded machines in public places can be dangerous. In public places, or where your visibility is reduced, place barriers around the work area to keep people away.

INT-2-2-8

⚠ Warning

Parking

An incorrectly parked machine can move without an operator. Follow the instructions in this handbook to park the machine correctly.

INT-2-2-4

⚠ Warning

Hazardous Atmospheres

This machine is designed for use in normal out door atmospheric conditions. It should not be used in an enclosed area without adequate ventilation. Do not use the machine in a potentially explosive atmosphere, i.e. combustible vapours, gas or dust, without first consulting your JCB Distributor.

INT-2-1-14

⚠ Warning

Should the machine start to roll over, you can be crushed if you try to leave the cab. If the machine starts to roll over, DO NOT TRY TO JUMP FROM THE CAB STAY IN THE CAB, WITH YOUR SEAT BELT FASTENED.

INT-2-1-12

Service Safety

⚠ Warning

Modifications and Welding

Non-approved modifications can cause injury and damage. Parts of the machine are made from cast iron; welds on cast iron can weaken the structure and break. Do not weld cast iron. Contact your JCB dealer before modifying the machine.

INT-3-1-2/1

⚠ Warning

Metal Splinters

You can be injured by flying metal splinters when driving metal pins in or out. Use a soft faced hammer or drift to remove and fit metal pins. Always wearsafety glasses.

INT-3-1-3

⚠ Warning

Safety strut

Raised loader arms can drop suddenly and cause serious injury. Before working under raised loader arms, fit the loader arm safety strut.

2-1 1-6

⚠ Warning

Communications

Bad communications can cause accidents. If two or more people are working on the machine, make sure each is aware of what the others are doing. Before starting the engine make sure the others are clear of the danger areas; examples of danger areas are: the rotating blades and belt on the engine, the attachments and linkages, and anywhere beneath or behind the machine. People can be killed or injured if these precautions are not taken.

INT- 3-1-5

⚠ Warning

Counterweights

Your machine may be fitted with counterweights. They are extremely heavy Do not attempt to remove them.

INT-3-2-5

⚠ Warning

Fires

If your machine is equipped with a fire extinguisher, make sure it is checked regularly. Keep it in the operator'cap until you need to use it.

Do not use water to put out a machine fire, you could spread an oil fire or get a shock from an electrical fire. Use carbon dioxide, dry chemical or foam extinguisher, Contact your nearest fire department

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as quickly as possible. Firefighters should use self-contained breathing apparatus.
INT-3-2-7/1

⚠ Warning

Battery Terminals

The machine is negatively earthed. Always connect the negative pole of the battery to earth.
When connecting the battery, connect the earth (-) lead last
When disconnecting the battery, disconnect the earth (-) lead first.
INT-3-1-9

⚠ Warning

Repairs

Do not try to do repairs or any other type of service work you do not understand. Get a Service Manual from your JCB distributor, or get the work done by a specialist engineer.
INT-3-1-1

⚠ Warning

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses. Make sure the engine cannot be started while the hoses are open.
INT-3-1-11/1

⚠ Warning

Hydraulic hoses

Damaged hoses can cause fatal accidents. Inspect the hoses regularly for:Damaged end fittingsChafed outer coversBallooned outer coversKinked or crushed hosesEmbedded armouring in outer coversDisplaces end fittings.
INT- 3-3-2

⚠ Warning

Accumulators

Tile accumulators contain hydraulic oil and gas at high pressure. Prior to any work being carried out on the braking system they must be discharged by a JCB distributor as the sudden release of the hydraulic oil or gas may cause injury.
7-1-1-4

⚠ Warning

Soft Ground

A machine can sink into soft ground. Never work under a machine on soft ground.
INT 3-2-4

⚠ Warning

Jacking

A machine can roll off jacks and crush you unless the wheels have been chocked. Always chock the wheels at the opposite end of the machine that is to be jacked. Do not work underneath a machine supported only by jacks. Always support a jacked-up machine on axle stands before working underneath it.
INT-3-2-8

⚠ Warning

Under no circumstances must the engine be run with the gearbox in gear and only one driving wheel jacked clear of the ground, since the wheel on the ground will move the machine.
INT-3-1-16

⚠ CAUTION

Rams

The efficiency of the rams will be affected if they are not kept freeof solidified dirt. Clean dirt from around the rams, regularly. When leaving or parking the machine, close all rams if possible to reduce the risk of weather corrosion.
INT-3-2-10

⚠ CAUTION

Arc Welding

Before carrying out arc welding on the machine, disconnect the battery and alternator to protect the circuits and components.
The battery must still be disconnected even if a battery isolator is fitted.
Make sure that the welding earth return path is kept

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as short as possible. This prevents high currents being induced in the machine chassis or wiring harnesses.
If the machine is equipped with amplifier drivers or electronic control units (E. C. U. s) , then disconnect them before welding. Failure to disconnect the amplifier drivers or E. C.U. s could result in irreparable damage to the electronic components.
INT-3-1-15/1

⚠ Warning

Oil

Oil is toxic. If you swallow any oil, do not induce vomiting, seek medical advice. Used engine oil contains harmful contaminants which can cause skin cancer. Do not handle used engine oil more than necessary. Always use barrier cream or wear gloves to prevent skin contact. Wash skin contaminated with oil thoroughly in warm soapy water. Do not use petrol, diesel fuel or paraffin to clean your skin.
INT-3-2-3

SAFETY DECALS

Keep all decals clean and readable. Replace lost or damaged decals. The decals and their attachment points are shown on the following page. Each decal has a part number printed on it, use this number to order a new decal from your JCB distributor.
INT-3-3-6

⚠ Warning

Decals

You can be injured if you do not obey the decal safety instructions. Keep decals clean. Replace unreadable or missing decals with new ones before operating the machine. Make sure replacement parts include warning decals where necessary.
INT-1-3-4
The illustration (s) show a typical machine model, your machine may look different from the model shown

⚠ Warning

If you need eye-glasses for reading, make sure you wear them when reading the safety decals. Decals are strategically placed around the machine to remind you of possible hazards. Do not over-stretch or place yourself in dangerous positions to read the decals.
INT-3-3-4

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Routine Service

Lubricants - health and safety

Overall lubrication third part - daily service

Lubricants - insurance of health and safety

It is very important for you to read and understand the following contents and involved information. Also, make sure your relevant colleagues have done so as well.

Health

CLG lubricant does no harm to your body in normal use. However, excessive or prolonged oil on your skin can cause degreasing of your skin, resulting in skin dryness and irritation.

Low-viscosity lubricant is prone to the above-mentioned symptom. Therefore, be careful to treat the oil contaminated by fuel.

Whenever you are exposed to any oil product, be sure to be careful and pay attention to your and your factory's sanitation. For detailed prevention measures, you are recommended to read the relevant publications of the local department of health.

Storage

Keep the lubricant away from children.

Do not store it in an open or unlabeled container.

Waste disposal

Dispose of all waste oil in accordance with the relevant regulations.

Collect or treat any used lubricant in accordance with the local regulations. Do not pour any engine oil into any sewer or drainage ditch or onto ground directly.

Treatment

New lubricant

No special protective measure is applied to new lubricant. However, be sure to be careful and pay attention to your health.

Used lubricant

The used lubricant in the engine crankcase contains harmful substances.

To treat the used engine lubricant, follow the following requirements:

1. Be sure to avoid prolonged, excessive or repeated exposure to any used lubricant.
2. Prior to exposure to any oil, coat your hands with cream.
3. To remove the engine oil on your skin, take the following actions:
   a Wash your skin with soap and water immediately.
   b Clean your skin with a brush.
   c Clean your skin with special cleaning solution.
   d Don't clean your skin with gasoline, diesel or petroleum wax.
4. Don't be exposed to any oily duster cloth.
5. Don't put any duster cloth with oil into your pocket.
6. Don't re-use any cloth before washing it clean.
7. Discard any oily shoes.

Emergency treatment

Eyes

If you get oil in your eyes, flush with clean water for fifteen minutes. If the irritation persists, Call a physician immediately.

Swallowing

Swallowing oil can cause serious vomiting. Call a physician immediately.

Skin

If you get oil on your skin badly, flush the skin with water and soap.

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Overflow

Suck the spill oil completely with sand or adsorbent granule materials. Wipe off the contaminated part, and then place the waste in a chemical waste tank.

Fire

To put out a fire, use carbon dioxide or dry powder or foam. The firefighters should use the self-contained breathing masks.

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Engine lubrication

Engine oil selection

Liugong machine use SHELL Rimula R3 Multi 10W30 (CH-4) engine oil, and it can be applied in the calibrated environment.

See the following table: Normal Oil Viscosity Within the Specified Temperature Range

Instruction: do not add performance additive or other oil additive product to engine crankcase. The oil drain intervals specified in the operation manual is measured under test method of Liugong lubrication.

Range chart of engine oil viscosity - temperature

Engine Oil Viscosity		
EMA LRG-1 API CH-4 Viscosity Grade	Ambient Temperature	
	Min.	**Max.**
SAE OW20	-40°C (-40°F)	10 °C (50°F)
SAE OW30	-40 °C (-40°F)	30 °C (86°F)
SAE OW40	-40 °C (-40°F)	40 °C (104°F)
SAE 5W30	-30 °C (-22°F)	30 °C (86°F)
SAE 5W40	-30 °C (-22°F)	40 °C (104°F)
SAE 10W30	-20 °C (-4°F)	40 °C (104°F)
SAE 15W40	-10 °C (14°F)	50 °C (122°F)

Diesel fuel system

The machine uses 0# diesel under standard condition, and engine power may be decreased or specific fuel consumption increased due to applying other fluids.

Be sure to fill the antifreezing solution by referring to the following proportion in cold areas:

Instruction: Please consult your local diesel dealer for the requirements of diesel operation in winter. If diesel temperature is lower than the critical point, the oil will crystallized, and even deactivate the fuel filter, then cause the engine power loss or failed to start.

The diesel that applied upon the complete machine shall be conformed to the following parameter requirements: “performance parameters of 0# diesel”

Diesel storage

If diesel needed to be stored for a certain period, you can put some water or irrelevant substances into the diesel storage box.

Keep the diesel storage box opened widely, and make sure the cooling status of diesel. Drain the water from the diesel storage box according to the required time cycle.

After daily work is over, diesel tank shall be refilled with diesel to prevent diesel in its tank from drying or condensing.

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Typical data for oil

0# Diesel

No.	Item		Specified Norms	Typical Data
1	Oxidative stability, total undissolved substance, mg/100ml		No more than 2.5	/
2	Sulfur content, % (m/m)		No more than 0.035	0.0198
3	Carbon residue on residuum 10%, % (m/m)		No more than 0.3	/
4	Ash content, % (m/m)		No more than 0.01	/
5	Copper corrosion (50°C, 3h) , grade		No more than 1	1
6	Water content, % (v/v)		Trace	None
7	Mechanical impurities		None	None
8	Lubricity Diameter of wear scar (60°C) / um		No more than 460	/
9	Palycyclic aromatic content d (mass fraction) /%		No more than 11	/
10	Kinematic viscosity (20°C) , mm^2 / s		3.0-8.0	/
11	Condensation point			/
12	Condensation point, °C		≤4	-1
13	Flashing point (closed) , °C		No less than 55	4
14	Cetane number		Not less than 46	51
15	Distillation range	50% recovered temperature, °C	No more than 300	286.0
		90% recovered temperature, °C	No more than 355	341.0
		95% recovered temperature, °C	No more than 365	352.0
16	Density (20℃) ,kg/m^3		810.0-850.0	8450.0
17	Fatty acid methyl ester (volume fraction) /%		No more than 0.5	

Note: typical values will change within the criteria at different periods.

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CH-4 10W-30 Diesel Engine Oil

No.	Item	Specified Norms	Typical Data
1	Appearance	Transparent	Transparent
2	Chroma/ No.	Report	4
3	Kinematic viscosity (100℃) / (mm2 /s)	9.3~<12.5	10.59
4	High temperature and high shear viscosity (150 ℃, 106s-1) / (mPa? S) not less than	2.9	3.084
5	Low temperature kinetic viscosity (CCS) / (mPa·s)	(-25℃)	6569
6	No more than	7000	
7	Flow point/°C No more than	-30	-35
8	Flashing point (opening) /°C No less than	205	220
9	Water content (mass fraction) /% No more than	Trace	None
10	Evaporative loss (mass fraction) /% No more than Noack method (250℃,1h)	20	9.86

Note: typical values will change within the criteria at different periods.

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L-HM 46 Antiwear Hydraulic Oil

No.	Item	Specified Norms	Typical Data
1	Appearance	Transparent	Transparent
2	Chroma, No.	Report	1
3	Kinematic viscosity (40℃) , mm^2/s	41.4~50.6	46.1
4	Viscosity index not less than	95	111
5	Pour point°C No more than	-9	-27
6	Flashing point (opening) °C No less than	180	238
7	Water content, % No more than	Trace	None
8	Copper corrosion (100, 3h) level No more than	1	1a
9	Air release value (50℃) , min No more than	10	3
10	Sealing applicable performance index, No more than	10	3
11	Spumescence ml/ml (froth tendency/ froth stability) Front 24℃ No more than 93.5℃ No more than Back 24℃ No more than	 150/10 150/10 150/10	 0/0 0/0 0/0
12	Resistance to emulsion (40-37-3) ,min	30	7'54"
13	Rust test in liquid phase (distilled water)	No rust	Qualified
14	Neutralization number, mgKOH/g	Report	0.67
15	Density (20℃) ,kg/m^3	Report	861.7

Note: typical values will change within the criteria at different periods.

Service schedules

A poorly-maintained machine is dangerous to the operators and personnel around. To ensure safety and efficiency of the machine, be sure to perform regular service and lubrication on the machine according to the intervals specified in the table.

⚠ Warning

Service

Service can only be carried out by the qualified personnel. Before service, make sure that the machine is safe. Be sure to park the machine on level ground. During service, if it is necessary to lift the loaderboom, be sure to install the safety strut. For details, see the relevant contents.

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In addition to routine service, during the operating time of the machine, be sure to maintain the machine regularly according to the interval in the timer. Don't continue to use the machine which has not been maintained as required. If any problem detected during service, be sure to solve it immediately.

Equivalent time:

10 hr. = per day

50 hr.= per week

500 hr. = 6months

1,000 hr. = one year

2,000 hr. = two years

Cold check before starting

Service Points and Oil Level	Job Content	10 Hours	50 Hours	100 Hours	500 Hours	1000 Hours	2000 Hours
Engine							
Lubricant level	Inspection	O	O				
Lubricant and filter	Replacement			O	O	O	O
Air filter external core	Replacement					O	O
Air filter internal core	Replacement						O
Fuel filter	Replacement			O	O	O	O
Fuel filter	Drainage		O				
Coolant quality and level	Inspection	O		O	O	O	O
Fuel settler	Drainage and cleaning		O	O	O	O	O
Fan belt tension	Inspection		O	O	O	O	O
Valve clearance and cleanliness of breather (optional)	Inspection and adjustment						O
Degree of tightening of engine mounting bolts	Inspection			O	O	O	O
Radiator	Cleaning	-			O	O	O
Conditions of all hoses	Inspection	-		O	O	O	O
Gearbox, Axle and Metering Pump	**Job Content**	**10 hours**	**50 hours**	**100 hours**	**500 hours**	**1000 hours**	**2000 hours**
Gearbox oil level	Inspection	O	O	O	O		

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Gearbox oil	Replacement	-				O	O
Gearbox filter	Replacement	-		O	O	O	O
Oil level in drive axle (including hub)	Inspection			O	O		
Oil in drive axle (including hub)	Replacement					O	O
Oil in drive axle (limited slip differential)	Replacement				O	O	O
Type pressure and conditions	Inspection		O	O	O	O	O
Front hub bearing	Inspection	-		O	O	O	O
Gearbox filter screen	Cleaning						O
Drive shaft	Fastening and Lubrication					O	O
Movement/gasket of steering axle	Inspection	-		O	O	O	O
Shaft pin and link of steering axle	Replacement	-		O	O	O	O
Main shaft of front axle	Lubrication	O	O	O	O	O	O
Hydraulic System	**Job Content**	**10 Hours**	**50 Hours**	**100 Hours**	**500 Hours**	**1,000 Hours**	**2,000 Hours**
Oil level	Inspection	O	O	O	O	O	
Hydraulic oil	Sampling and replacement						O
Oil filter	- Replacement			O	O	O	O
Cylinder, chromeplate conditions	- Inspection			O	O	O	O
Hydraulic oil cooler	Cleaning				O	O	O
Hydraulic oil screen	Cleaning						O
Filler cap of hydraulic oil tank (with filter element)	Replacement						O
Drive shaft of hydraulic pump	Commissioning and Lubrication						
Brake	**Job Content**	**10 Hours**	**50 Hours**	**100 Hours**	**500 Hours**	**1,000 Hours**	**2,000 Hours**
Brake fluid level of braking system	Inspection	O	O	O	O	O	O
Brake fluid of braking system	Replacement						O

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Hand brake	Inspection and adjustment			O	O	O	O
Electrical System	**Job Content**	**10 Hours**	**50 Hours**	**100 Hours**	**500 Hours**	**1,000 Hours**	**2,000 Hours**
Battery electrolyte level (if appropriate)	Inspection				O	O	O
Wiring	Inspection		O	O	O	O	O
Battery connection terminals	Inspection			O	O	O	O
Body and Cab	**Job Content**	**10 Hours**	**50 Hours**	**100 Hours**	**500 Hours**	**1,000 Hours**	**2,000 Hours**
Shaft pin and sleeve	Inspect lubrication	O	O	O	O	O	O
Door and window hinge joints	Lubrication				O	O	O
All harnesses					O	O	O
Cab heater filter	Cleaning / replacing				O	O	O
Telescopic bucket rod	Adjustment / lubrication		O	O	O	O	O
Clight	Inspection and adjustment			O	O	O	O
Doors - attachments and door locks	Inspection			O	O	O	O
Adjustment of cab seat	Inspection			O	O	O	O
Front fender	Inspection			O	O		
Liquid level of windshield washer	Inspection	O	O	O	O	O	O
Boom locking	Inspection	O	O	O	O	O	O
Painting conditions	Inspection			O	O	O	O
Outrigger	Inspection		O	O	O	O	O
Complete machine conditions	Inspection and adjustment	O	O	O	O	O	O
Wear-resistant pad of side way mechanism	Lubrication	O	O	O	O	O	O
Wear-resistant pad of side way mechanism	Inspection						O
Attachments	**Job Content**	**10 Hours**	**50 Hours**	**100 Hours**	**500 Hours**	**1,000 Hours**	**2,000 Hours**
Four in one bucket	Lubrication	O	O	O	O	O	O

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Work implement	Lubrication	O	O	O	O	O	O
Functional testing and final inspection							
Engine	**Job Content**	**10 Hours**	**50 Hours**	**100 Hours**	**500 Hours**	**1,000 Hours**	**2,000 Hours**
Idling speed	Inspection and adjustment			O	O	O	O
Idling speed	Inspection			O	O	O	O
Maximum no-load speed	Inspection and adjustment			O	O	O	O
Smoke displacement	Inspection			O	O	O	O
Safety of exhaust system	Inspection		O	O	O	O	O
Safety of air intake system	Inspection			O	O	O	O
Throttle system and control circuit	Inspection			O	O	O	O
Gearbox, Drive axle and Steering	**Job Content**	**10 Hours**	**50 Hours**	**100 Hours**	**500 Hours**	**1,000 Hours**	**2,000 Hours**
Steering mode and operation	Inspection	O	O	O	O	O	O
2WD/4WD option	Inspection			O	O	O	O
Tyre nut torque	Inspection	O	O	O	O	O	O
Forward and reversing gears and gear-shift operation	Inspection			O	O	O	O
Hydraulic speed control	Inspection			O	O	O	O
Steering loop pressure	Inspection			O	O	O	O
Main pressure of gearbox	Inspection				O	O	O
Gearbox cut-off operation	Inspection			O	O	O	O
Neutral engagement pressure	Inspection		O	O	O	O	O
Clutch engagement pressure	Inspection			O	O	O	O
Hydraulic System	**Job Content**	**10 Hours**	**50 Hours**	**100 Hours**	**500 Hours**	**1,000 Hours**	**2,000 Hours**
MRV pressure	Inspect and adjust			O	O	O	O
Service operation	Inspection		O	O	O	O	O

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Anti-burst pressure valve of pipeline	Inspection			O	O	O	O
Unloading valve pressure	Inspection and adjustment			O	O	O	O
Auxiliary circuits and pressure	Inspection and adjustment			O	O	O	O
Brake System	**Job Content**	**10 Hours**	**50 Hours**	**100 Hours**	**500 Hours**	**1,000 Hours**	**2,000 Hours**
Foot brake operation	Inspection	O	O	O	O	O	O
Hand brake operation	Inspection	O	O	O	O	O	O
Servo Control	Inspection			O	O	O	O
Electrical System	**Job Content**	**10 Hours**	**50 Hours**	**100 Hours**	**500 Hours**	**1,000 Hours**	**2,000 Hours**
Start motor	Inspection			O	O	O	O
Generator output	Inspection			O	O	O	O
Electrical equipment operation	Inspection	O	O	O	O	O	O
Frame and Cab	**Job Content**	**10 Hours**	**50 Hours**	**100 Hours**	**500 Hours**	**1,000 Hours**	**2,000 Hours**
Bucket teeth and side edges	Inspection			O	O	O	O
Airtightness of doors and windows	Inspection			O	O	O	O
Seat and safety belt	Inspection			O	O	O	O

Note: only service during the first 100 hours should be carried out by the CLG dealer.

1. Note: check for leakage every 50 hours. If any, also check the oil level.
2. Note: to check the oil level of the hydraulic system, let the bucket and excavator grab be in the driving position.
3. Note: the labeled service points can only be performed by the qualified specialized persons.
4. Note: if the operating conditions are bad, replace the engine oil and filter every 250 hours.
5. Note: check each system of the machine for overall leakage. Such as, hydraulic system, engine (coolant, fuel and lubricant) , gearbox, brakes, drive axle, etc. If any leakage, find out the leakage source and repair it. After repair, refill the system with the recommended oil. Meanwhile, repair the system as required. If there is any information not detailed in this manual, please consult the CLG dealer.
6. Note: if operating in a dusty environment, be sure to repair it frequently.
7. Note: high-performance lubricant has been applied to the drive axle and the drive shaft before leaving the factory. If the standard lubricant has been used during service, be sure to perform lubrication once every 50 hours. For details, consult the CLG dealer.
8. Note: after service of gearbox, to eliminate the dirt produced during service, let the new oil run at the

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operating temperature, and then replace it. If there is excessive dirt due to fault, let the new oil operate for 100 hours, and then replace the oil and filter element.

9. Note: after repair, to eliminate the dirt produced during repair, let the new oil run at the operating temperature, and then replace it. Moreover, after operating for 100 hours, replace the oil to remove the dirt produced during running-in, especially, after installation of new brake linings.

Loader arm safety strut

Installation

Install the boom safety strut before working below the lifting arm.

Warning

Since the lifting arm can fall off suddenly, resulting in danger, be sure to install the safety strut before working below the boom.

1. Empty the bucket, and then lift the loader boom.
2. Shutdown the engine

   Remove the start key.

Warning

If the loader control lever were operated suddenly, You would have life-threatening danger. Therefore, don’t remove the safety strut until no person is on the machine.

3. Remove safety strut
   a Unfasten the strap B.
   b Remove the safety strut C from the cylinder piston rod.
4. Install safety strut
   a Put the safety strut on the cylinder piston rod.
   b Fix the safety strut with the strap B.
5. Lowering the safety strut on the cylinder

To prevent the loader boom from falling and jamming your fingers, be sure to be careful to control its fall and let it fall onto the bracket as shown in the figure.

Start the engine, and then let the loader boom fall onto the safety strut. When the load on the loader boom falls onto the safety strut completely, stop the boom from moving immediately.

Note: in the process of lowering the boom, be careful to operate the control lever. Be sure to move the control lever slightly and lower the boom at a hyperslow speed.

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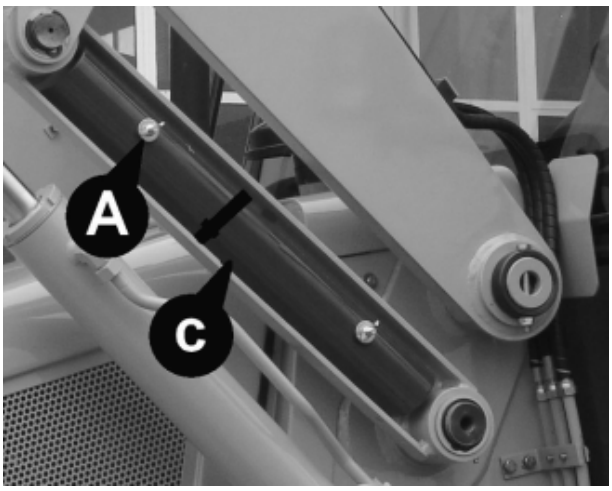


Fig. 3.1



Fig. 3.2

Removal

1. Lift the loader boom up to its extreme position.

   The purpose of this is to remove the load from the safety bracket.

2. Stop the engine

   Remove the start key.

> **⚠ Warning**
>
> If the loader control lever were operated suddenly, You would have life-threatening danger. Therefore, don't remove the safety strut until no person is on the machine.

3. Remove safety strut

   a Unfasten the strap B.

   b Remove the safety strut C from the cylinder piston rod.

4. Set safety strut

   Fix the safety strut with bolt A and put it on the rack.

Cleaning the machine

Park the machine on solid and level ground.

Apply the hand brake and shift the gearbox into the Neutral position. Lower the attachments onto ground and let the engine misfire.

Clean the machine with water and/or steam. Be careful to clean the lower part of the machine.

No mud or impurity in the following areas is permitted:

1. Hose port of the digging machine in the frame.
2. Both rotary cylinders.
3. Both rotary beds on the chassis (mid-mounted type) .
4. Slideway of sideway board (sideway type) .
5. Hose tray of sideway board and base cover (sideway type) .
6. Groove between rotary cylinder and sideway board casting (sideway type) .

No dust on the engine or gearbox is permitted. Make sure that the radiator gap is not clogged.

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⚠ Warning

No straw, wood chip or other combustible material on the engine and in the wind channel is allowed. Check the above-mentioned place regularly or before working. Make ensure that there is no dirt on the engine hood.

Don't use any undiluted cleaning solution. To avoid peeling paint, be sure to dilute the cleaning solution based on the manufacturer's recommendations.

Water under pressure can damage the seal rings and bearings. Therefore, don't flush directly the oil seal or knuckle bearing with high pressure water during routine cleaning of the machine.

Note: Re-lubricate it after cleaning the machine.

Be sure to observe the local regulations on waste disposal after cleaning the machine.

Some places where must be cleaned are shown in the Fig. below.

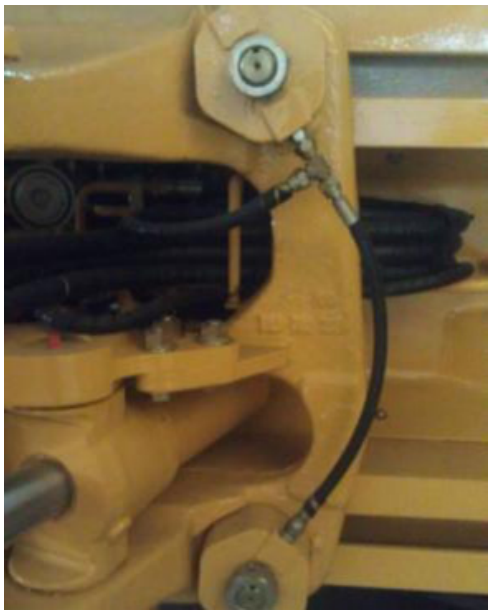


Fig. 3.3

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Lubrication of the complete machine

To make the machine work efficiently and prolong its service life, be sure to lubricate the machine regularly.

Be sure to lubricate it after cleaning the machine.

⚠ Warning

Complete the following operations before Lubrication the machine nearby: Lower the attachments to their lowest positions if necessary, remove the start key and turn off the electric lock to prevent the engine from starting unexpectedly, and make sure that the hand brake has been set up.

Check all the wheels before working under the bottom of the machine.

Use the grease gun for lubrication. In general, press the grease gun twice. Stop filling when the grease spills.

All lubrication points have been labeled in the following figure. Be careful to check each lubrication point. Close the protective cover after lubrication.

Loader boom

Each lubrication point is shown in the Fig. below, and it is also on the other side of the machine accordingly.

There is a total of 22 lubrication points.

Excavation side

22 lubrication points

Remark: the sequence of the lubrication points of the boom and the bucket rod is shown symbolically in the Fig. below.

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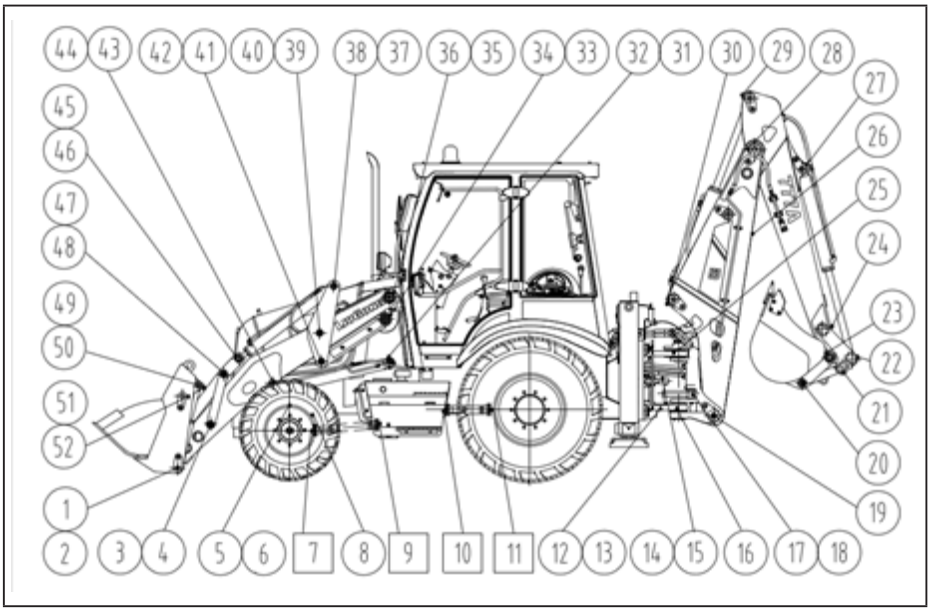


Fig. 3.4

Fig. 3.5

Front axle (4WD)

5 lubrication points

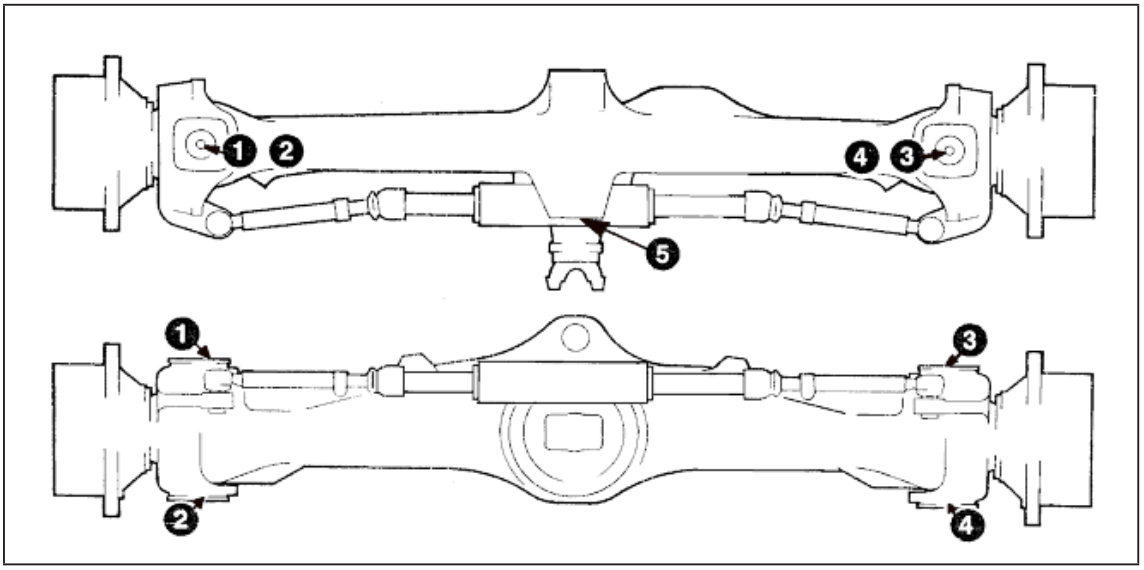


Fig. 3.6

Shaft

Front drive shaft

3 lubrication points

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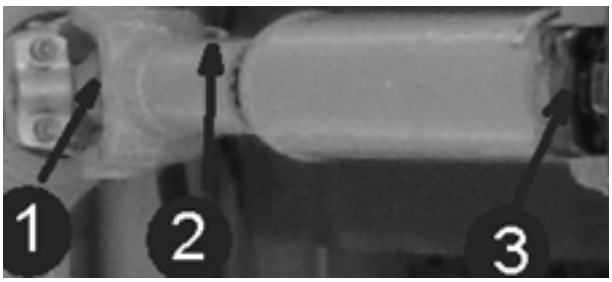


Fig. 3.7

Lubrication (continued)

Note: Lubrication point 5 is a remote one, which is installed on one side of the machine chassis (near the front left wheel) .

Rear drive axle

3 lubrication points

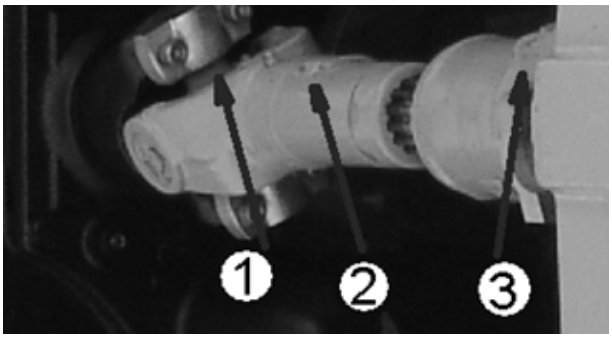


Fig. 3.8

Four in one bucket

There are 3 lubrication points on each end, totaling 6 lubrication points. b

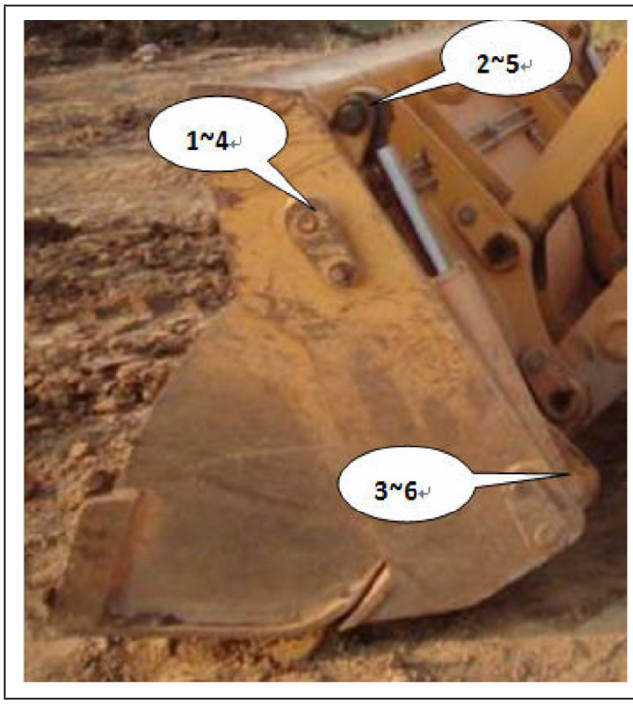


Fig. 3.9

Outrigger (for the mid-mounted type)

There are 3 lubrication points for each outrigger, totaling 6 lubrication points.

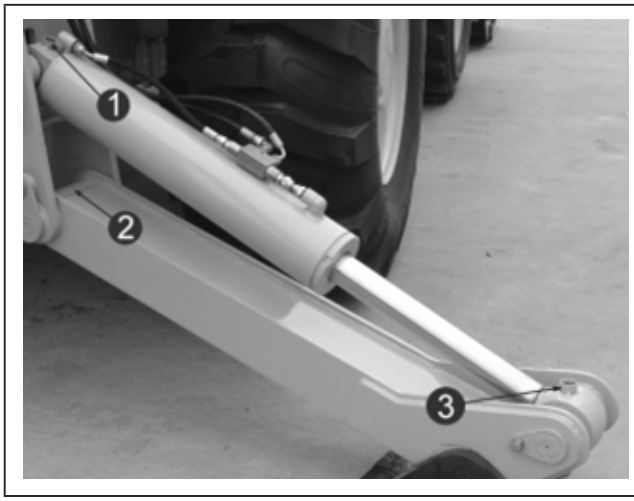


Fig. 3.10

Swing seat

9 lubrication points

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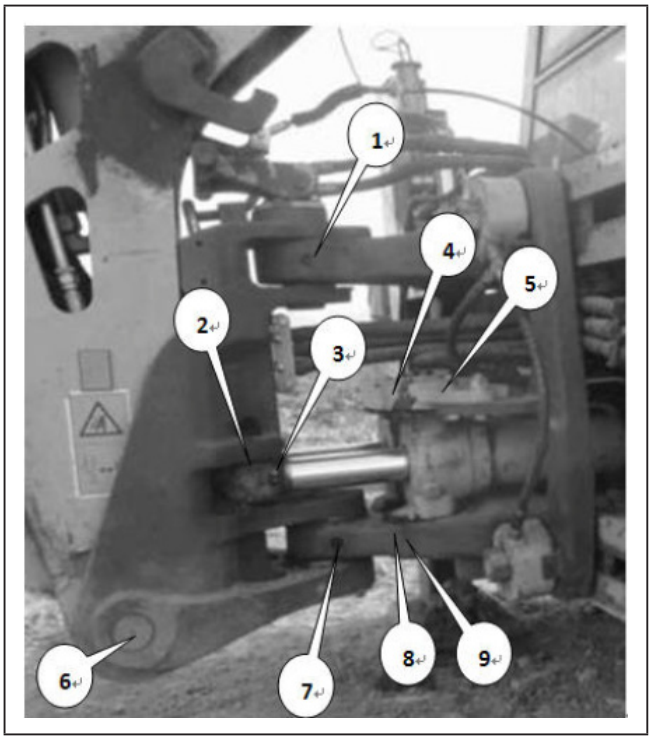


Fig. 3.11

Tyre and rim

Information on tyre inflation

It is recommended to inflate the tyres with dry nitrogen and adjust the tyre pressures. This is applied to all the machines equipped with rubber tyres. Since nitrogen is a type of inert gas, it will not help to combust in the tyres.

Using nitrogen (N_2) can not only reduce risk of explosion but also help to prevent oxidation and rubber ageing as well as corrosion of rim parts. This is especially important to the tyres to be used for more than four years.

⚠ Warning

It is necessary to train the operators to use the inflatable equipment. Using improper tyre inflation technique can cause personal injury or even death.

Don't set the pressure of the tyre inflatable equipment to be 14 higher than that of the recommended tyre pressure.

Keep all other person away from the dangerous area (around the tyres) .

The pressure of the nitrogen–inflated tyres is the same as that of the air-inflated tyres. It is recommended to select the tyre inflation pressure based on the machine operating conditions, and consult your tyre supplier.

The tyre inflation pressure listed in the table means the one at normal temperature.

	Front Wheel	Inflation Pressure (kPa)	Rear Wheel
Standard tyre	14-17.5 NHS	560	19.5L-24
Large tyres	12.5/80-18	430	18.4-26
			16.9-28

If the machine driving at freezing temperatures, the original tyre pressure at 18-21℃ will change greatly. Even if the tyre has been inflated to the correct pressure at normal temperature, it will be under-inflated at freezing temperature. Low tyre pressure can shorten the tyre's service life.

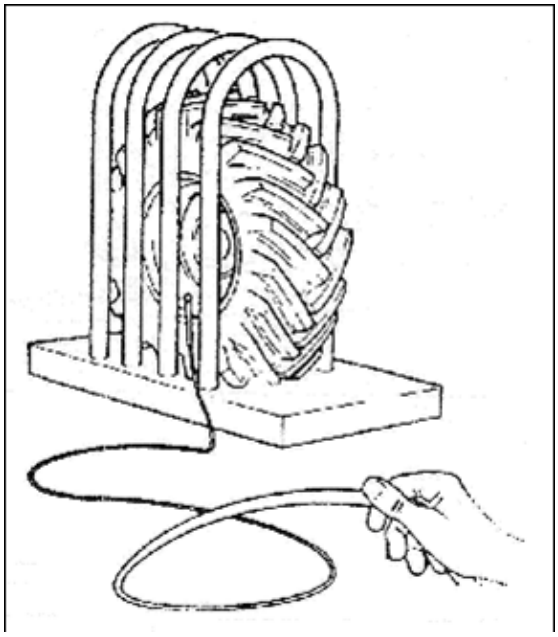


Fig. 3.12

Inspection of rim nut torque

Check the wheel nuts for tightness before daily work.

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The correct torque values are listed in the following table.

Front wheel ……350 N•m

Rear wheel ……500 N•m

⚠ Warning

Whatever the reason is, as long as you detect one bolt is damaged, be sure to replace all other bolts, because it is possible that all other bolts have also been damaged.

For a new machine or removed wheel, check the nut torque once every two hours until the torque keeps stable.

Brake

Hand brake-- Inspection

Note: usually check the hand brake device performance. Make sure that the machine can be braked safely and it is provided with good emergency brake performance.

Drive the machine forward by shifting into the 2nd gear position on level ground.

Pull up the hand brake lever slowly to allow the parking ratchet to click. Make sure that the machine can be stopped after hearing the 4th click or the 5th click.

Otherwise, press the brake pedal to stop the machine.

Follow the following procedures to adjust the hand brake, and then re-try to test it again.

Warning: when adjusting the hand brake, moving the machine can cause personal injury.

Adjustment of hand brake

1. Press the locking handle C,
2. Pull the control lever to its extreme position,
3. Check the hand brake,
4. If the hand brake is failed, repeat the above-mentioned steps. If the hand brake is still failed or the pin D has reached its maximum stroke, you have to adjust the brake lever on the rear drive axle.

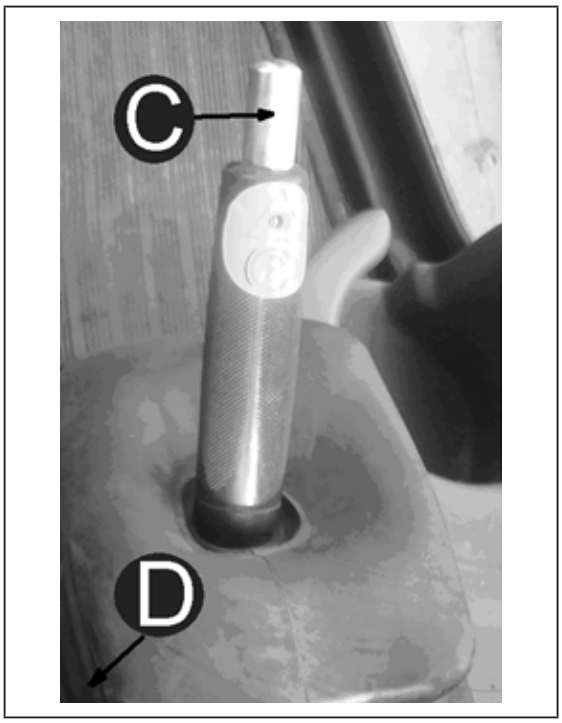


Fig. 3.13

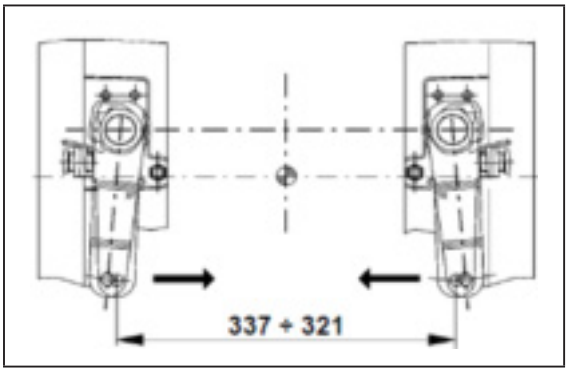


Fig. 3.14

Park the machine on level ground, and then lay the outriggers down to prevent the machine from moving.

Make sure that the hand brake lever is released.

Hang the “DO NOT OPERATE” sign on the machine.

Locate the adjusting screw on the left end of the hand brake lever on the rear axle.

Adjust the free travel of the pedal by adjusting the nut on the left end of the hand brake lever.

Repeat the steps to check the hand brake.

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Note: No excessive tension of the steel cable of the hand brake is permitted. Make sure there are four clicks from the ratchet at least along the free travel of the hand brake lever.

Inspect braking fluid level

⚠ Warning

Wrong parking can cause danger. Add the oil to the brake oil cup regularly, and make sure that the braking system is examined by the specialized persons. Don't operate the machine until the fault has been eliminated.

1. Park the machine on solid level ground. Pull up the hand brake and put the shifting control lever in the neutral position, and then lift and lock the loader boom. Lay the excavating gear down onto ground and shut off the engine.
2. Remove the oil cup cap A and check the oil level. Label the lower and upper marks on one side of the oil cup. If necessary, add the brake fluid following Step 3.

   If the oil level is below the lower mark, have the CLG dealer checked it.

⚠ Warning

Using unqualified brake fluid can cause damage to the braking system. Please refer to the relevant contents in the sections related to service. In addition, the brake fluid can do harm to your skin, be sure to wear gloves before working.

3. If necessary, be careful to fill the qualified brake fluid up until to the proper fluid level.
4. Screw the oil cup cap and wipe off the over spilled brake fluid.

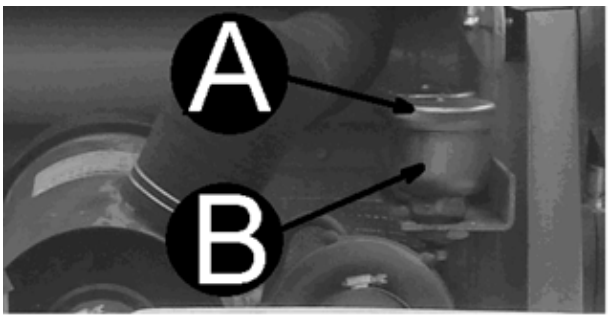


Fig. 3.15

Engine air filter

Air filter element--Cleaning and replacing

⚠ Warning

Clean or replace the air filter. It is recommended to wear a dust mask or other breathing equipment.

Note: to prevent dust from entering into the engine, don't clean or replace the air filter when the engine operating.

Don't start the engine without air filter or if the air filter damaged. Don't any air filter with damaged crease, gasket or seal. Dust entering into the engine can cause premature wear to the engine, resulting in damage to the engine parts. The air filter element can prevent floating dust in atmosphere from entering into the intake manifold.

When the air filter clog indicator piston reaches the red position, it is necessary to clean or replace the secondary filter element of the air filter.

Park the machine and pull up the hand brake lever, and then lift the loader boom and install the boom safety strut in place. Shut off the engine and remove the key.

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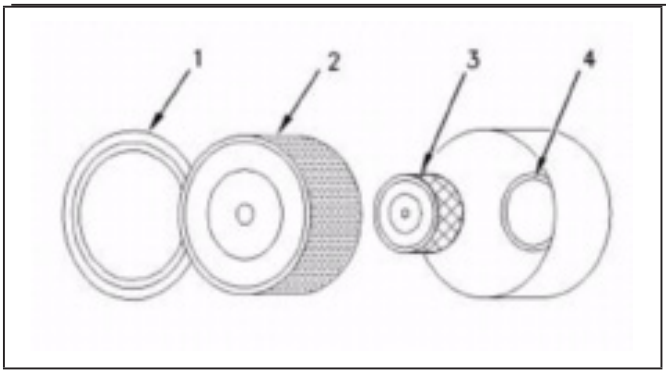


Fig. 3.16

1. Outer cover 2. Primary filter element
3. Secondary filter element 4. Air inlet

Open engine cover. Remove the outer cover and secondary filter element of the air filter. Make a mark on an obvious position on the fine element with a pen or similar tool. You can use this mark to record the number of times to remove the secondary filter element. Replace the fine element once the secondary filter element has been removed for three times. Don't clean the fine element.

Cleaning secondary filter element of air filter

Caution: to avoid damage to the engine, don't strike the filter element or wash it with water when cleaning the filter element.

Clean the filter element with the compressed air with a pressure no more than 25 psi (0.2 mpa) or a vacuum cleaner.

To avoid damage to the filter element, be careful to clean it.

Don't use any air filter with damaged crease, gasket or seal.

Discard the used or damaged air filter element properly.

⚠ Warning

Be sure to wear protective devices, such as gloves, goggles and dust mask when cleaning the air filter element with compressed air. Adjust the air pressure to 25 psi (0.2 mpa) . Don't let the compressed air blow toward any part of your body.

Flush the filter element from inside to outside along the crease with the compressed air. The air flow will blow off the dust on the crease. Note: to avoid micropore or damage to the crease, don't let the air flow close the crease very much.

Flush inside before washing out the loose sundries from the outside of the filter element to inwards. If possible, it is recommended to suck up the loose sundries from outside with a cleaner.

Check the filter element for damage after completion of cleaning. The best way to check the filter element is to place a blue bulb inside the filter element in a dark room. If any ray of light radiates in one direction, it indicates there is damage in the direction. Discard the damaged filter element properly and install the new one.

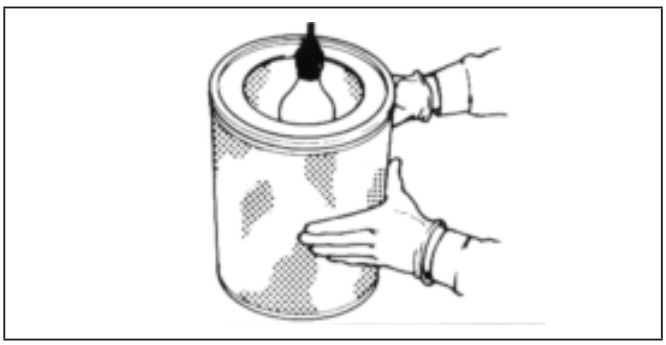


Fig. 3.17

After installation of filter element, reset the air filter clog indicator. Click on the RESET button on the upper of the air filter clog indicator for three times until you cannot see the yellow piston. Start the engine and let it operate for 3 minutes, and then let it idle at high speed for a period of time. Re-check the air filter clog indicator, and make sure that the yellow piston is outside the red zone.

Replacing air filter secondary filter element

If necessary, clean the dust inside the filter housing, and then get new fine element ready. Remove the old filter element and install the new one immediately. Discard the old filter element properly.

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Engine oil and filter

Inspection of engine oil level

1. Pull up the hand brake and put the shifting control lever in the neutral position, and then lay the loader boom and the excavating gear down onto ground. Shut off the engine and remove the start key.
2. Unscrew and remove the fill cap.
3. Check the oil level with the dipstick A. Make sure that the oil level should be between the lower and upper marks.
4. If necessary, unscrew and remove the side cover, and pour the oil into the filler B. Make sure to insert the oil dipstick and the filter cap in place and tighten them.

Replace engine oil and filter

1. Park the machine on solid level ground. Drain the oil when the engine is hot because the dirt is floating at the moment.

⚠ Warning

To ensure it is safe to work under the bottom of the machine, put the working devices on the ground and pull up the hand brake. And then, remove the start key and turn off the electric lock.

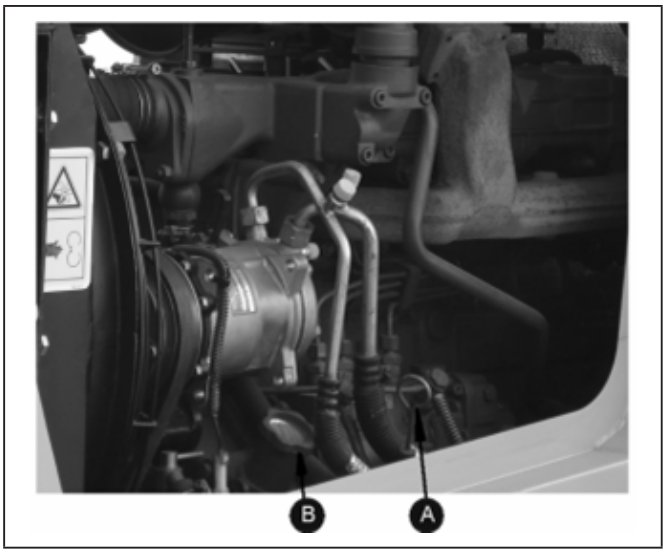


Fig. 3.18

2. Make sure that the hand brake is in effective use. Put the shifting control lever in the neutral position, and then lay the loader boom and the excavating gear down onto ground. Shut off the engine and remove the start key.
3. Open drain plug.
4. Drain out oil.

⚠ CAUTION

After removing the oil plug, the oil can spray out. The hot oil can scald you. To prevent the hot oil from scalding you, be sure to stand on the side when removing the oil plug.

a Place an appropriate container under the oil plug.

b Remove the oil plug and take out the O-ring. Drain the oil and clean the oil plug. Re-install the oil plug with new O-ring and tighten it to the torque of 34 N•m.

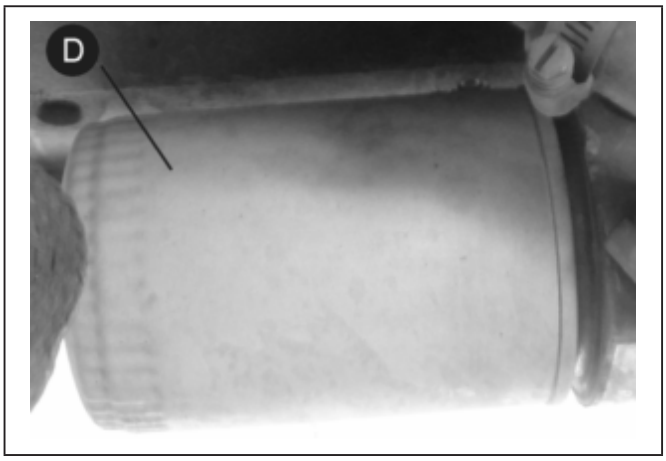


Fig. 3.19

5. Replace filter
   - a Unscrew the strainer D. Be careful for it is full of oil.
   - b Check the joint G for tightness.
   - c Clean the filter head F.
   - d Add clean oil to the new strainer. Leave enough time to let the oil pass through the filter element.
   - e Coat oil onto the seal ring E of the new filter. Screw the new strainer by hand.

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6. Pour oil into the engine through filler until to the upper mark of the dipstick. For the recommended oil grade, see the Chapter of Service and Servicing. Wipe off the spilled oil. Check for leakage and make sure the oil fill cap is installed properly.
7. Don't turn the start switch to start the engine until the oil pressure light goes out. (To prevent the engine from starting, turn off the negative switch.)
8. Turn on the negative switch and start the engine, and then check for leakage. Check the oil level after the engine cools down.

Engine cooling system

Check coolant level

⚠ Warning

When the coolant is hot, the cooling system is under pressure. To check the coolant level or drain the coolant, be sure to let the engine cool down.

1. Pull up the hand brake and put the shifting control lever in the neutral position, and then lay the loader boom and the excavating gear down onto ground. Shut off the engine and remove the start key.
2. Unscrew and remove the radiator cover.
3. The coolant level should be between the "COOLING/MIN" and "HOT/MAX" marks. If necessary, add pre-prepared water/anti-freezing solution mixture.

Replace coolant

⚠ Warning

When the coolant is hot, the cooling system is under pressure. To check the coolant level or drain the coolant, be sure to let the engine cool down.

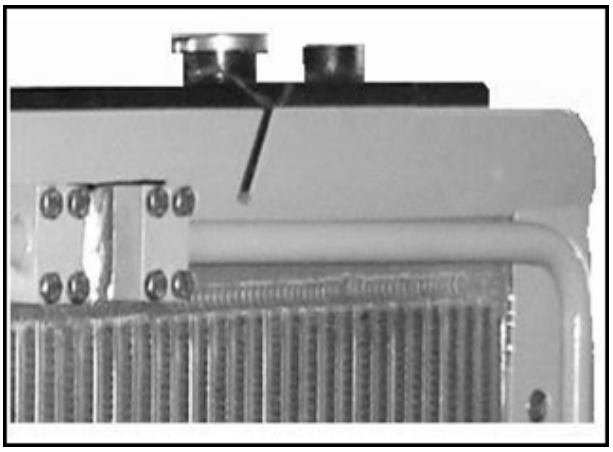


Fig. 3.20

1. Pull up the hand brake and put the shifting control lever in the neutral position, and then lay the loader boom and the excavating gear down onto ground. Shut off the engine and remove the start key.
2. Open the radiator cover.
3. Be careful to unscrew the cover and release the pressure.

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⚠ CAUTION

Keep your face away from the opening when removing the plug.



Fig. 3.21

4. Unscrew the engine outlet switch and drain the coolant.
5. Unscrew the radiator outlet switch and drain the coolant. Flush the cooling system with fresh water.

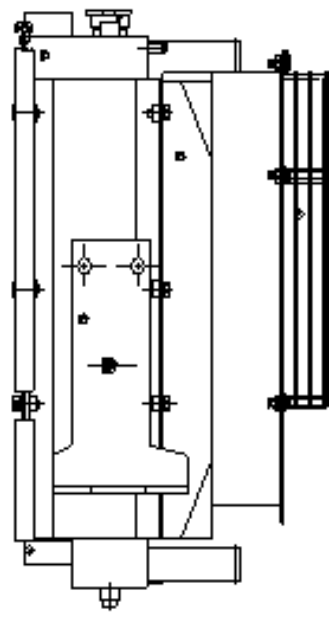


Fig. 3.22

6. Close the drain valve after the coolant has been drained from the engine cylinder and the radiator.
7. Bring the coolant level to reach the “COOLING/MIN” position using the valid mixture of soft-water and anti-freezing solution.
8. Start the engine and let it idle to circulate the coolant. If necessary, add the coolant.
9. Close the filler cover and tighten it.
10. After the engine operating, when the coolant rises to its working temperature and pressure, stop the engine and check for leakage.

Note: make sure that the cab heater button is at the “HOT” position. This can ensure that the coolant circulates in the whole cooling system.

Engine cooling system

Adjustment of fan belt

⚠ Warning

To prevent the engine from operating, disconnect the electric lock before adjusting the fan belt.

1. Park the machine on solid level ground. Pull up the hand brake and put the shifting control lever in the neutral position, and then lift and lock the loader boom. Lay the excavating gear down onto ground and shut off the engine.
2. Unscrew the bolts A, B, C and D.
3. Move the AC motor to leave a relaxation value of 10mm at the X position.
4. Tighten bolts A,B, C, D.

Note: with the new fan belt, re-check the belt tension after working for 20 hours.

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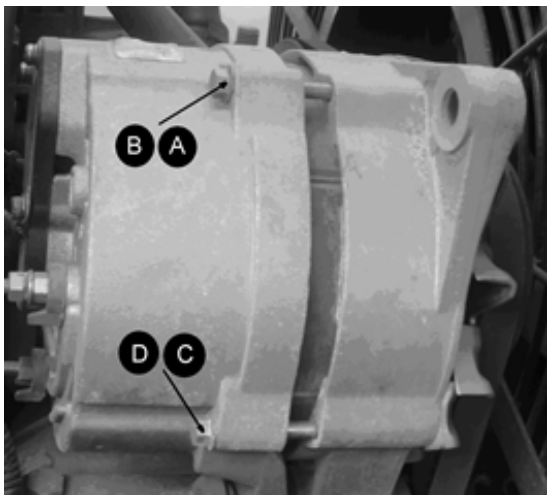


Fig. 3.23

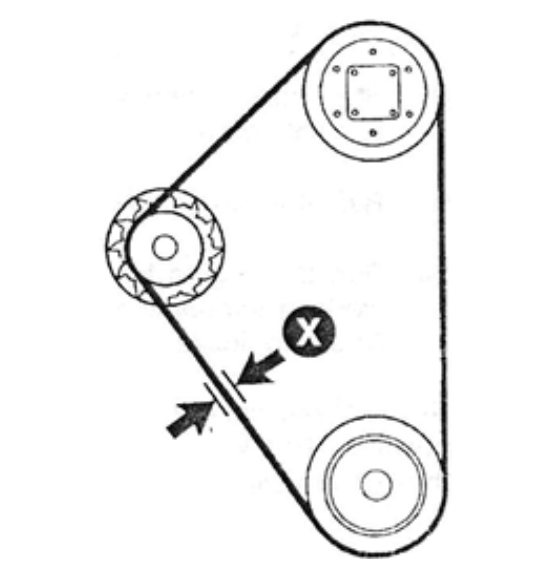


Fig. 3.24

Fuel system

Fuel type

Using high-quality diesel can achieve a proper power and performance. The recommended diesel parameters are shown as follows:

Cetane value: 45 (mini.)

Viscosity: 3~8 mm^2/s at 20℃ (68 ℉)

Sulfur content: 0.5% (max.)

Distilted temperature: 90% at 355°C (671°F)

Cetane number

It indicates the ignition performance. Low-Cetane fuel oil can produce cold-start problems and affect combustion.

Viscosity

It indicates the flow resistance. If the viscosity is outside the limit range, the engine performance will be affected.

Specific gravity

The fuel oil with low specific gravity can reduce the engine output. The fuel oil with high specific gravity can increase the engine power, but increasing the gas displacement as well.

Sulfur content

The diesel with high sulfur content will cause wear to the engine. If the diesel with high sulfur content has to be used, be sure to use the lubricant with high alkalinity or replace the oil frequently.

Low-sulfur fuel is used in the most regions around the world. Such fuel contains less lubricant additive. The fuel injection pump on the engine is lubricated by the fuel, so prolonged use of low-sulfur fuel can affect the fuel injection pump. If the low- sulfur fuel has to be used, it is recommended to use the additive recommended by the fuel oil supplier.

Distilled temperature

It represents the mixture of different hydrocarbons in the fuel. High-ratio light hydrocarbons can affect combustion characteristics.

Fuel standard

For the adaptability of the fuel, please consult the fuel supplier or the CLG dealer.

Low-temperature fuel

The winter fuel can be applied to the engine operating at low temperature (0 ℃ or 32 ℉) because such fuel has a lower viscosity and restrain the formation of wax in the fuel at low temperature because the formation of wax in the fuel can hinder the fuel to pass through the fuel filter.

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It is possible to increase the rate of flow. This can reduce the wax in the fuel.

FAME (fatty acid methyl ester) fuel can be used to replace the diesel.

It is necessary to consult the CLG dealer on how to use the FAME fuel because improper use of the FAME fuel can reduce the engine performance.

Gasoline

⚠ Warning

Don't use gasoline in the machine. Don't mix the diesel with gasoline because the gasoline in the oil tank can float to the surface and form inflammable gas.

If you want to use non-standard fuel, do consult the CLG dealer on the problems related to the adjustment of engine and interval of replacement of lubricant.

⚠ Warning

Since the diesel is inflammable, no open fire is permitted near the machine. Don't smoke when adding the diesel or working near the engine. Don't fill the engine when the engine is running. Non-compliance with such regulations can cause a fire or personal injury or even death.

Fuel system

Refill the fuel tank

⚠ Warning

Before refilling, lower the lifting arm and shut off the engine. Don't operate the machine control lever during refilling.

After end of daily work, add the diesel of the correct brand to prevent the fuel from being concentrated.

A lock is mounted on the filler port on the fuel tank. The lock can be unlocked only by the key. Once you remove the key, you cannot unlock or lock the fill cap.

Drain filter water

1. Park the machine on solid level ground. Pull up the hand brake and put the shifting control lever in the neutral position, and then lift and lock the loader boom. Lay the excavating gear down onto ground and shut off the engine.
2. Unscrew and remove the plug B and drain the water in the filter element A.

Replace filter element

1. Park the machine on solid level ground. Pull up the hand brake and put the shifting control lever in the neutral position. Lay the working devices down onto ground and shut off the engine.
2. Unscrew the filter element A. Although the filter element is tightened by hand, it is possible to need a strap wrench to unscrew it, because it is full of fuel.
3. To help to bleed air, fill the new filter element with fuel before installation. Install and tighten the new filter element by hand. Check for leakage.
4. Bleed the air in the system.

Fuel system

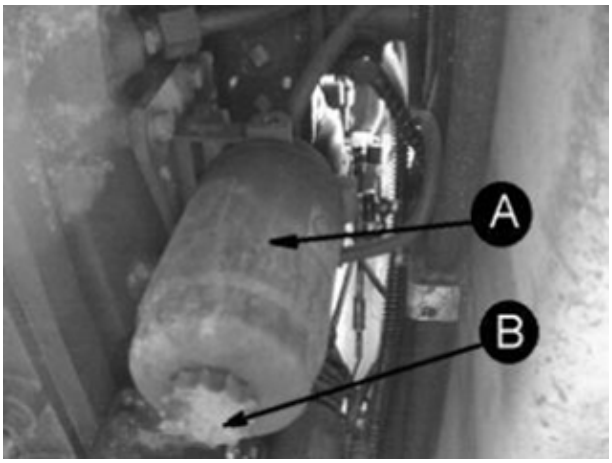


Fig. 3.25

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Empty the sediment cup

1. Park the machine on solid level ground. Pull up the hand brake and put the shifting control lever in the neutral position. Lay the working devices down onto ground and shut off the engine.
2. Observe the cup A. If any sediment in the cup, follow Step 3 to Step 6. If any water but sediment in the cup, remove the Plug B to drain water. Be sure to re-install the Plug B back in place.
3. Support the Cup A and unscrew and remove it.
4. Clean the cup with clean fuel.
5. Re-install the cup and make sure the gasket is installed properly.
6. Bleed the air in the system.

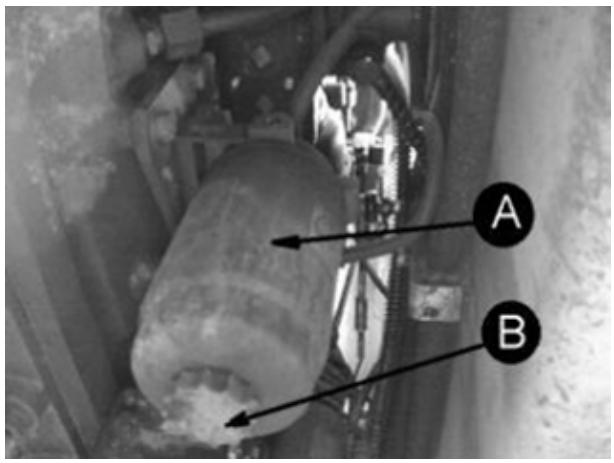


Fig. 3.26

System exhaust

⚠ CAUTION

When there is air in the system, it will damage the fuel injection pump. After service, bleed the air in the system in accordance with the following requirements.

1. Park the machine on solid level ground. Pull up the hand brake and put the shifting control lever in the neutral position, and then lift and lock the loader boom. Lower the excavating gear down onto ground and shut off the engine.
2. Turn the start key to the IGN position.

⚠ Warning

Hot oil and engine parts can scald you. Be sure to let the engine cool down before starting work.

3. Operate the manual fuel pump X slowly to pump fuel for 2 minutes and then start the engine. After the engine operating smoothly for a while, you can start enlarging the throttle or stop, and then re-check whether there is any air in the fuel system. Check all positions, especially the oil seals and connecting components on the low-pressure side of the system.

Note: when the manual fuel pump X working, if there is no fuel injection, it is that the diaphragm is in the “maximum fuel-supply” position. In this case, move the diaphragm and start the engine-with the key, and then re-try the manual fuel pump again.



Fig. 3.27

Fuel secondary filter/oil-water separator--drainage

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⚠ Warning

The fuel leaked or spilled on the hot surface or electrical components can cause a fire. To avoid personal injury, shut off the engine when replacing the fuel filter or separator element. If any fuel leakage or spilling, clean it immediately.

Note: The oil-water separator cannot be used as a filter. The oil-water separator is used to separate the fuel from the water. To avoid damage to the engine, don't start the engine if the liquid in the oil-water separator exceeds half of its volume.

Note: the oil-water separator should be in the oil-absorbing state when the engine operates normally. Therefore, to prevent air from entering into the fuel system, make sure that oil drain valve can be closed safely.

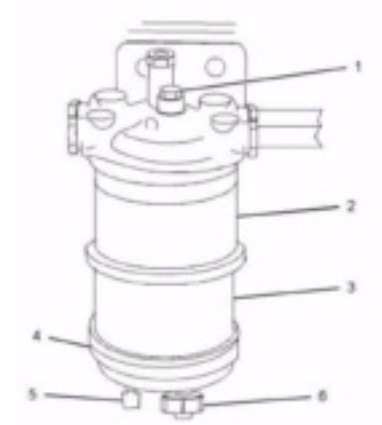


Fig. 3.28

1. Screw
3. Strainer
5. Oil drain hole
1. Screw
4. Bottom cover
6. Sensor connector

Put a proper container under the oil-water separator.

Remove the oil drain plug to allow the liquid to flow into the container.

When the liquid from the oil drain port becomes clean fuel, close the oil drain port. Screw the oil drain plug only by hand. Dispose of the waste liquid properly.

Synchronized shifting gearbox

Check oil level position

1. Pull up the hand brake and put the shifting control lever in the neutral position, and then lay the working devices down. Shut off the engine and remove the start key.
2. Open cover.
3. Add the recommended fluid to the gearbox and bring it up to the highest level.
4. Start the engine and let it run at low speed for no more than 5 minutes to allow the filter, the oil pump, the torque converter, the torque converter oil radiator and the pipelines to be filled with the gearbox fluid.
5. Let the engine misfire and remove the start key. After 20 seconds later, re-check the fluid level. If necessary, add the fluid to the required level.



Fig. 3.29

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Replace oil and oil filter

Gearbox oil filter--Replace



Fig. 3.30

1.Filter 2.Oil drain hole

3. Filter screen cover

With the engine shutdown, unscrew the filter on the top of the gearbox on the right side of the machine. Discard the old filter properly.

Coat a layer of engine oil or lubricant onto the O-ring on the top of the filter. Screw the filter until it touches the seal ring. And then turn the filter for 3/4 turns.

Note: Don't tighten the filter with any tool or excessively.

Note: To ensure the service life of the gearbox, only use a genuine filter of the CLG company to replace the filter.

Gearbox oil--Replacement

Replace the gearbox oil when it is hot.

Prepare an appropriate container to store the waste oil. Unscrew and remove the drain plug at the bottom of the gearbox and drain the oil into the container.

When there is no oil flowing out any longer, wait for a few minutes to let the oil drop to the greatest extent, and then clean and reinstall the drain plug back in the gearbox. Tighten oil drain plug.

Gearbox oil screen--Cleaning



Remove the two bolts and the cover, and then remove the oil screen. Use the appropriate solution to clean the oil screen.

Note: Please refer to the requirements for the solution/detergent in the Safety Instructions.

Re-install the clean screen back in the gearbox. Install the seal ring or gasket and the cover in place. Tighten cover bolt.

Gearbox oil--Refilling

Add the specified grade gearbox oil into the filler. When the engine shutdown, add oil into the filler to bring it to exceed the "MAX" mark a little. When starting the engine and let it idle, check the oil level again and add oil into the filler to bring it to the "MAX" mark.

Note: If it is difficult to add oil into the gearbox, it is possible that the vent hole on the top of the gearbox housing is clogged. (Refer to the part of "Gearbox Venting Device--Cleaning")

Hydraulic system

Check hydraulic fluid level

⚠ Warning

Since high-pressure hydraulic oil can penetrate your skin, don't use your finger to check the hydraulic oil for leakage. Keep your face away from any potential leakage point. Be sure to use a piece of paperboard to close any potential leakage point and check the paperboard for hydraulic oil mark. If any hydraulic oil sprays out

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onto your skin, call a physician immediately.

1. Park the machine on level ground and lay the loading bucket onto ground. If the machine is equipped with the telescopic bucket rod, be sure to retract it. Lift the boom and retreat the bucket rod, and then the excavator bucket. Turn off the engine and remove the start key.
2. Observe the oil level in the glass A. The oil level should be at the red mark (or above) .

⚠ CAUTION

If the liquid in the pipeline is turbid, it indicates that there is water and air in the hydraulic system. In this case, if you operate the machine, the hydraulic pump will be seriously damaged. Contact with the CLG dealer immediately.

3. If the oil level is below the red mark, if necessary, unscrew the fill cap B of the hydraulic oil tank to refill the recommended hydaulic oil.



Fig. 3.31

Hydraulic oil tank cover

The vent valve (and filter) of the hydraulic oil tank is part of the fill cap B. Replace the oil fill cap (vent valve, filter) at the specified period. For details, see the service schedule.

The lock mounted on the oil fill cap can only be unlocked by the door key.

Cap installation

Insert the key D and turn it counterclockwise, and then screw the cap B. If you feel a resistance, then screw it for 1/4 turns. Remove the key, and then the fill cap will reset automatically so that it cannot be opened.

Cap removal

To open the cap, insert the key and turn it clockwise.

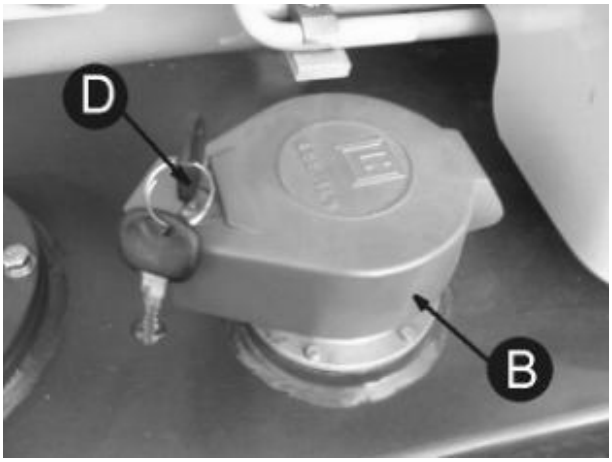


Fig. 3.32

Hydraulic system

Replace filter element

⚠ Warning

Since high-pressure hydraulic oil can penetrate your skin, don’t use your finger to check the hydraulic oil for leakage. Keep your face away from any potential leakage point. Be sure to use a piece of paperboard to close any potential leakage point and check the paperboard for oil mark. If any hydraulic oil sprays out onto your skin, call a physician immediately.

1. Park the machine on level ground and lay the loading bucket onto ground. If the machine is equipped with a telescopic bucket rod, be sure to retract it. Retreat the bucket rod and close the excavator bucket. Lower the boom to lay the excavator bucket onto ground and open the outriggers to place them onto ground. Turn off the engine and remove the start key.

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2. Remove the screws, cover, spring and gasket from the top of the hydraulic oil tank.

Remove the filter with a wrench. Discard the used filter element properly.

Install the new filter element in the housing. Install the new filter element on a fine tube at the bottom of the housing. Therefore, it is possible to apply a larger force to install the filter element properly.

After installing the filter element in place, reinstall the spring, washer and cover. Tighten setscrew.

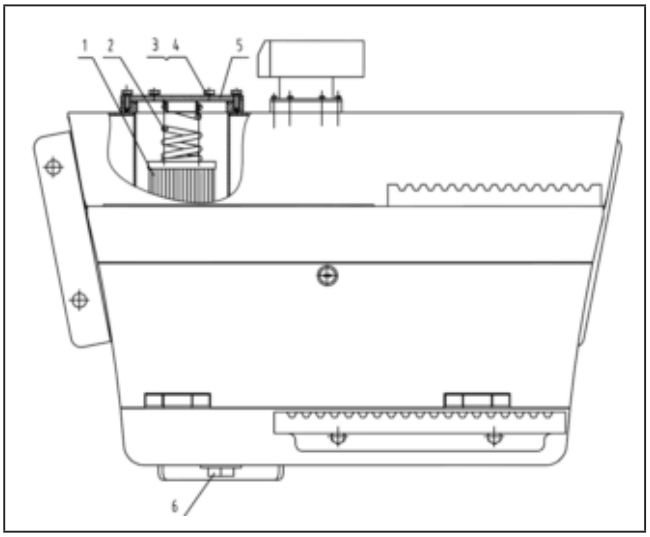


Fig. 3.33

1.Return oil filter element 2.Spring
3.Screw 4.Washer
5.Cover 6.Oil drain plug

Replacement of oil-absorbing filter

Warning

To ensure that it is safe to work under the bottom of the machine, lower the attachments onto ground and pull up the hand brake. Turn off the engine and remove the start key, and then disconnect the battery.

1. Park the machine on level ground. Tilt the loading bucket forward and lay it onto ground. Lower the boom and lay the excavator bucket onto ground, and then open the outriggers. Turn off the engine and remove the start key, and then disconnect the battery.
2. Remove the fill cap from the hydraulic oil tank.
3. Put a proper container under the hydraulic oil tank (see the Maintainability and Lubrication in this chapter) . Remove the drain plug and drain the hydraulic oil tank.

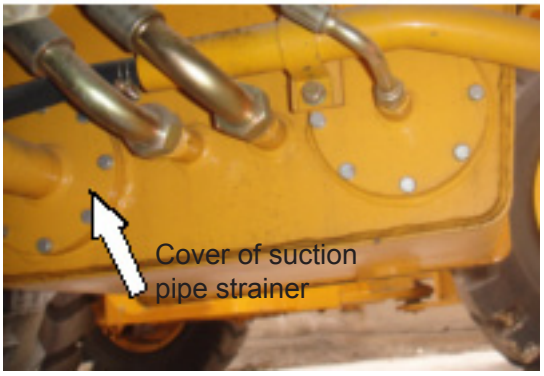


Fig. 3.34

4 After draining the hydraulic oil, remove the bolts of the cover of suction pipe strainer at the bottom of the hydraulic oil tank.

Remove and discard the used suction pipe strainer. Replace it with a new strainer.

Install the strainer cover in place. Make sure the seal ring/washer is full and complete. Tighten captive bolt.

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Front axle and rear axle

Inspection of differential oil level

⚠ Warning

To ensure that it is safe to work under the bottom of the machine, lower the working devices onto ground and pull up the hand brake. Turn off the engine and remove the start key, and then disconnect the battery.

⚠ CAUTION

To check the axle oil level, park the machine on level ground. This can ensure that the oil level will be displayed properly.

1. Park the machine on level ground and pull up the hand brake. Shift the gearbox in its neutral position and lower the working devices onto ground. Turn off the engine and remove the start key.
2. Clean the area near the oil drain plug A, and then remove the drain plug and the sealing washer. The oil level should be level with the bottom surface of the hole. If necessary, add the recommended oil.
3. Clean and re-install the drain plug and washer in place.

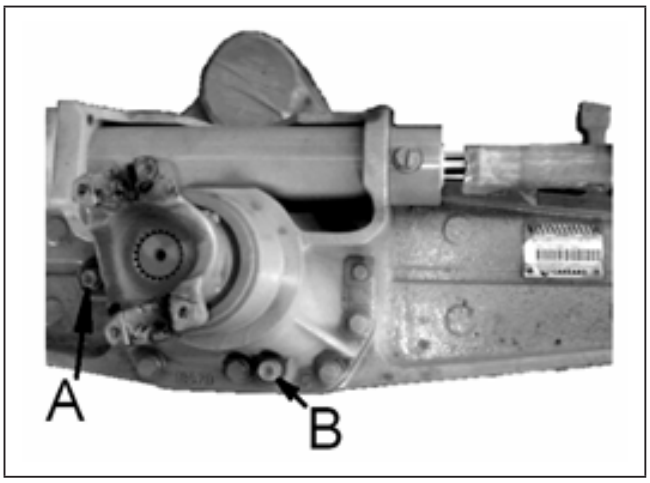


Fig. 3.35

Replace differential oil

⚠ Warning

To ensure that it is safe to work under the bottom of the machine, lower the working devices onto ground and pull up the hand brake. Turn off the engine and remove the start key, and then disconnect the battery.

The axle oil is used to lubricate the moving parts and to cool the brake discs, be sure to replace it periodically in accordance with the service schedule.

1. Park the machine on level ground and pull up the hand brake. Shift the gearbox in its neutral position and lower the working devices onto ground. Turn off the engine and remove the start key.
2. Put a proper container under the drain plug B. Remove the drain plug B and oil seal to drain the oil into the container. Since the drain plug is magnetic, be sure to wipe off it (be careful to remove its adhering particles) . Install the drain plug B and gasket.
3. Park the machine on level ground. Check the rear axle and repeat Step 2.

⚠ CAUTION

When removing the drain plug, the oil will spray out. Be sure to stand on the other side of the drain plug.

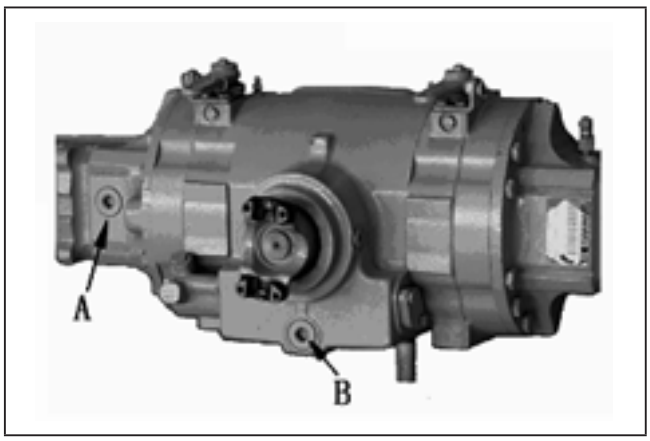


Fig. 3.36

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Front axle and rear axle

Inspection of wheel oil level

Check the two wheel hubs separately.

1. Park the machine on level ground. Make sure the oil level mark is horizontal. However, an error of 5mm (0.2in) is permitted.
2. Pull up the hand brake. Shift the gearbox in its neutral position, and lower the working devices onto ground. Turn off the engine and remove the start key.
3. Clean the area near the oil plug C, and then remove the oil plug. The oil level should be level with the bottom surface of the oil filler hole. If necessary, add the recommended oil. Clean and install the drain plug.



Fig. 3.37

Replacement of wheel oil

The axle case oil is used to lubricate the moving parts and to cool the brake discs. It is important to replace the oil periodically in accordance with the intervals specified in the service manual because the brake wear can cause reduction of lubrication performance.

If necessary, consult the CLG dealer.

Replace the oil of the two hubs separately.

1. Park the machine on level ground and allow the tyres to be off the ground. Turn the wheel to allow the oil level mark on the hub and the oil plug C to be in the vertical position.
2. a Put a proper container under the oil plug C.
   b Remove the oil plug C to drain the oil.
3. a Let the oil level mark be in the horizontal position.
   b Pour the recommended hub oil into the oil plug hole C until the oil is level with the bottom surface of the hole.
   c Clean and re-install the drain plug C.

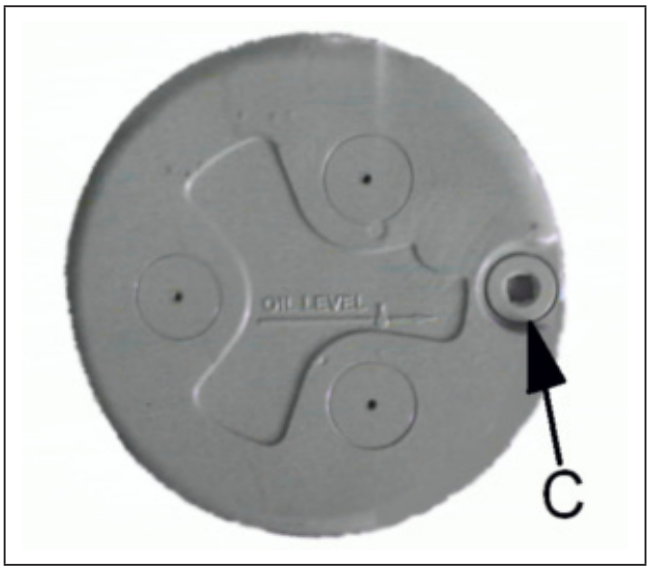


Fig. 3.38

Outriggers - Adjustment (Sideway type)

Wear-resistant pads

The wear-resistant pads are used as the support and guide rails of the outriggers.

As shown in the figure, the upper wear-resistant pads mounted on the top of the internal outrigger has three types of sizes in different colors, namely, 5mm (green) , 6mm (red) and 7mm (blue) . The lower wear-resistant pad consists of the shim B and the fixed pad C. When pad A and pad C are worn to the minimum thickness of 0.5mm (0.02in) , be sure to replace them. To

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replace the pad, remove the internal outrigger. Please consult your CLG dealer.

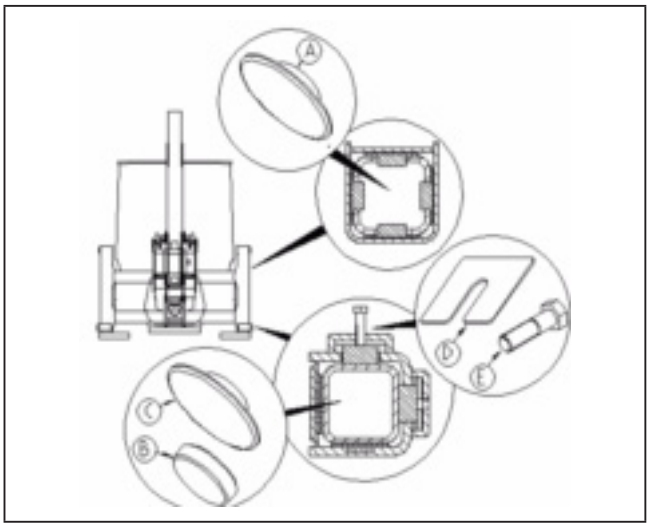


Fig. 3.39

Note: since pad C is designed to bear most load when the outrigger operating, be sure to check it for wear regularly.

In addition, be sure to replace the whole lower wear-resistant pad (B and C) . Also, check the upper wear-resistant pad regularly. If necessary, replace it.

Adjustment of wear-resistant pads

Note: Adjust the wear-resistant pads based on the service period properly. Since contact of the external outrigger with the internal outrigger can produce scratch, this can reduce the service life of the wear-resistant pads greatly.

Make sure that there is a clearance about 1mm between the external and internal outriggers. During adjustment, make sure the outriggers are off the ground but they cannot be retreated fully.

During adjustment, screw the bolt E, and screw the wear-resistant pad B completely until it can touch the internal outrigger.



Fig. 3.40



Fig. 3.41

Add the adjusting washer D until tightness. And then, loosen the bolt E.



Fig. 3.42

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Fig. 3.43

After completion of adjustment, turn the bolt to its original position and tighten the nut.



Fig. 3.44

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Main Removal and Installation

Loader equipment

Tools list

Name	Specification
Wrench	16x18, round head wrench16,18
Snap spring pliers	External snap spring pliers
Wind trigger	MI-16
Socket	16,18
Nipper pliers	
Iron hammer/copper bar	
Pin remover	

Removal

1. Pressure relief
   Start the complete machine. Lift up the lifting arm and turn over the bucket to allow the bucket mouth to be down. Lower the lifting arm slowly to allow the bucket to be put on the wood pre-placed onto the ground. Let the engine misfire and move the control lever for pressure-relief.
2. Removal of bucket
   To remove and install the hydraulic pipelines, refer to 5.4.8 Four-in-One Bucket Cylinder.

   Remove the captive bolts from the plate of the pin at the hinge joint between the lifting arm and the bucket with the 18# wrench (or pneumatic tools +18# socket) , as shown in the figure, two bolts on the right/left side, respectively;



Knock away the pin at the hinge joint between the lifting arm and the bucket with the pin remover and a sledgehammer, and set the pin aside. Don’t throw away the shim;



Lift up the lifting arm to separate the bucket from the lifting arm.

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3. Removal of four-in-one bucket cylinder (If the complete machine is equipped with the flat bucket, this step will be omitted.)
   Remove the captive bolts from the plate of the pin on the four-in-one bucket with the 18# wrench (or pneumatic tools +18# socket) , totaling four bolts.



Remove the bolts from the joint between the piston rod end and the support lug with the 16# wrench (or pneumatic tools +16# socket) , and remove the T-shaped sleeve;



Remove the hose AS connected to the four-in-one bucket cylinder and wrap it with clean plastic paper to prevent impurities from entering into it.



Remove the pin from the piston rod end. Lift the cylinder with a sling. Remove the pin on the other end of the cylinder, and then take out the cylinder.

4. Remove lifting arm
   To remove the hydraulic pipeline, refer to the

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hydraulic working system.

Remove the captive bolts from the plate of the pin at the hinge joint between the lifting arm and the lifting cylinder with the 18# wrench (or pneumatic tools +18# socket) , one bolt on the right/ left side, respectively;



Hike the lifting arm about 1m with the travelling crane, and withstand the lifting arm with the tooling.



Hang the lifting arm cylinder with the sling and pry out the fixed pin with the crowbar.



Take out the pin and lay the cylinder down slowly. Take out the pin of the other side in the same manner.

Remove the snap spring from the hinge joint between the draw bar and the frame with the snap spring pliers and take out the shim and the plug (black plastic cover) ;



Remove the front hood by referring to 5.3.1 Method for Removal of Front hood.

Remove the four captive bolts (on the inside of the frame) from the pressure plate of the pin with the 16# wrench, and set the pressure plate aside.

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Remove the captive bolts of the pin of the rear draw bar on the other side in the same manner;

Remove the double nuts from the bolts at the hinge joint between the lifting arm and the frame with two 18# wrenches, and take out the bolts;



Remove the captive bolts from the pin on the inside of the frame with the 18# wrench.



Lift the lifting arm with the travelling crane. Remove the two pins at the hinge joint between the rear draw bar and the frame with the pin remover and hammer, and set the pins aside.



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Pull out the bolts at the hinge joint between the lifting arm and the frame using the pneumatic impact wrench and the M20*65 bolts by increasing steel sleeves stepwise, and set the pins aside. Pull out the pins on the other side just in the same manner.



Lift the lifting arm to one side with the travelling crane.



Remove the snap spring from the mounting pin of the rotating bucket cylinder with the snap spring pliers, and take out the gaskets.



Knock out the pins, and remove the cylinder and set it aside.

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Remove the snap spring from the pins at the hinge joint between the front draw plate and the two side plates and take out the shims. Knock out the pins and remove the front draw plate.





Remove the plate from the lifting arm just in the same manner.



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Remove the snap spring from the pins at the hinge joint between the front draw plate and the two side plates and take out the shims. Knock out the pins and remove the front draw plate;





Remove the plate from the lifting arm just in the same manner.



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Installation

1. Install lifting arm
   Knock the copper bar slightly into the mounting hole with the pin. Install the two sets of side plates on the pins until the two side plates close the lifting arm;

   Add the shims to the outside of the side plates to make sure that the snap springs can restrain the horizontal movement of the side plates.

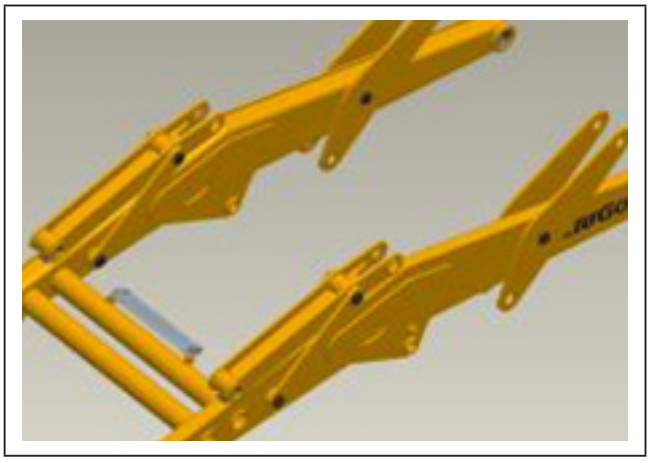


Note: make sure that the clearance between the shim and the snap spring should be no more than1.5mm after installation and the parts can free rotate. The difference between the quantities of the shims on the two ends of the pins should be no more than one. Moreover, priority should be given to use the adjustable thicker pads.

Install the two sets of side plates fixing the front draw bar in place in the same manner.



Align the mounting hole on the front draw bar to the hole of the fixing plate of the draw bar, and knock the copper bar into the pin;

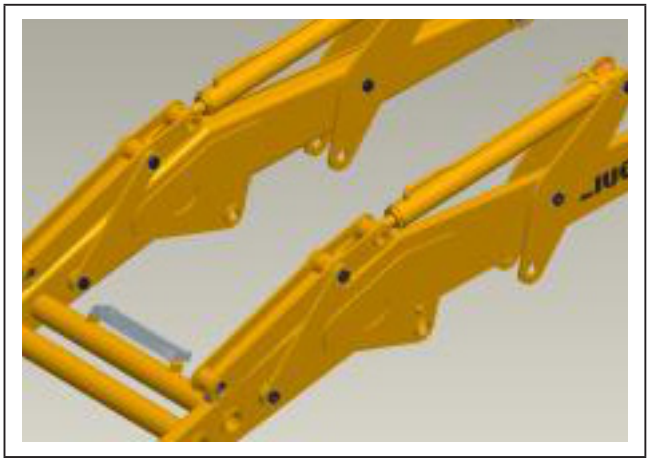


Add the shims to the outside of the fixing plate of the front draw bar. Install the snap spring in the pin snap spring groove with the snap spring pliers. Make sure that the movement clearance of the shims should be no more than 1.5mm after installation;

Lift the left and right cylinders of the rotating bucket to the mounting positions with the travelling crane (3t) . Let the pin pass through the plate, the cushion cover, the shims--the quantity should be determined based on the actual

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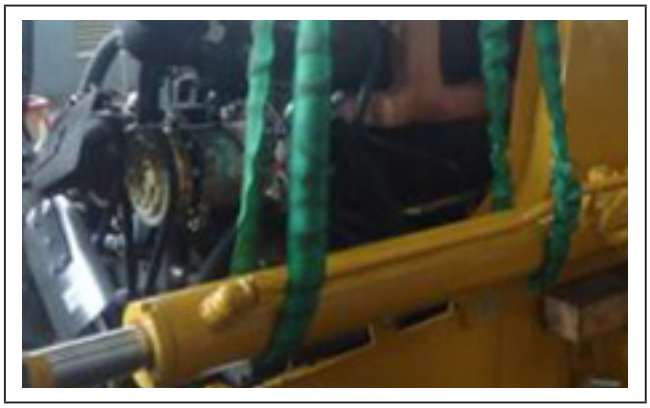
conditions, the cylinder, the shims--the quantity should be determined, the cushion and the plate in turn. Add the shims outside the plates. The shims should be added based on the actual conditions to make sure that the movement clearance of the shims should be no more than 1.5mm. Install the snap spring in the pin snap ring groove with the snap spring pliers. Install the pin on the piston rod end in the same manner.



2. Installation of lifting arm cylinder
Knock the pin into the mounting hole with the copper bar. Adjust the position of the pin. Fix the pin on the inside of the frame with the 16# wrench.



Lift the lifting arm cylinder to the mounting position with the travelling crane. Let the assembled pin pass through the cylinder end. Add the shims if necessary. Install the snap spring in the pin snap spring groove with the snap spring pliers. Make sure that the movement clearance of the shims should be no more than 1.5mm after installation.







3. Hoisting lifting arm
Lift the lifting arm to the frame position with the travelling crane. Adjust the positions of the lifting arm and the frame to allow the mounting hole of the lifting arm to align to that on the frame. Adjust the left and right positions of the lifting arm to allow the distance from the inside of the

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lifting arm to the outer plate to be consistent. Based on the deviation conditions, determine the quantity of the shims to be added. Knock the pin with the copper bar. Let the pin to pass through the lifting arm, the shims and the frame;





Install the sleeve on the pin. Let the bolt pass through the sleeve and the hole in the pin from the upper end. Use double nuts to tighten the lower end of the sleeve with the 18# wrench (or pneumatic tools +18# socket) .



Shim

4. Installation of rear draw bar

Knock the pin into the mounting hole of the frame with the copper bar. Turn the pin to allow the pressure plates to be aligned with the pin groove. Fix the plates with the 16# wrench.



Install the removed shims onto the pins. Mount the rear draw bar on the pin and add the shims to the other end. Install the snap spring in the pin snap spring groove with the snap spring pliers. After installation, make sure that the movement clearance of the shims should be no more than1.5mm, and then install the plug.





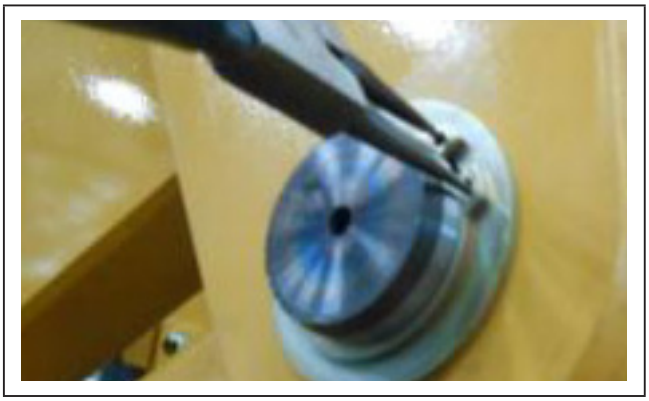
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Place the other end of the rear draw bar between the side plates. Add the shims. Let the pin pass through the plate, the shims, the rear draw bar, the shims and the plate in turn with the copper bar. After adding the shims to both ends of the pin, install the snap spring in the pin retaining groove with the snap spring pliers.







5. Lifting arm cylinder and lifting arm hinge joint
   Lift the lifting arm cylinder with the travelling crane to the mounting position of the lifting arm and add the shims. Let the pin pass through the lifting arm and cylinder with the copper bar. Tighten the captive bolts of the plate with the 18# wrench;



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For the connection of pipelines, refer to 5.4.7 Two Types of Cylinders on Loading End;

6. Hoisting four-in-one bucket
   Lift the four-in-one bucket with the travelling crane;



Adjust the position to allow the four-in-one bucket to align to the mounting position of the lifting arm.



Determine the quantity of the shims and their mounting positions in accordance with the clearance at the mounting location between the left/right lifting arm and the bucket body. Ensure that the center plane of the lifting arm coincides with the center plane of the bucket body. Knock the hinge pin with the copper bar;



Adjust the bucket position, if necessary, add the shims. Knock the fixing pin between the front draw bar and the bucket body with the copper bar or hammer.

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Tighten the captive bolts of the plate with the pneumatic impact wrench and the 18# socket.



Connect the hose AS with the cylinder by referring to the connection mode of the pipelines shown in the following figure.



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Backhoe Equipment

Removal

1. Removal of bucket
   Remove the captive bolts of the pins with two 18# wrenches (or the pneumatic impact wrench and the 18# socket) , and take out the circular sleeve.



   Withstand the pin with a M20×100 bolt or other columnar metal and knock the pin out with the copper bar.





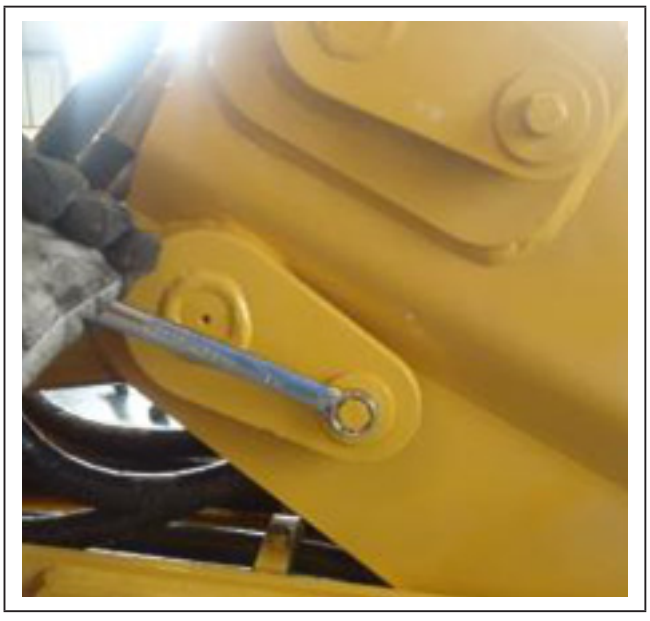
2. Removal of bucket rod
   Lift the bucket rod with the travelling crane to separate the bucket rod from the bucket. Lay the bucket rod onto the rack or stand.



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Remove the captive bolts of the pin plate with the 18# wrench (or the pneumatic impact wrench and the 18# socket) , and set it aside.





Remove the pin in the Fig. with the copper bar (hammer) and bolt (or iron rod) . Lift the bucket rod to one side with the travelling crane. Remove the retaining ring from the counterweight.





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3. Removal of shims of telescopic bucket rod
Remove the bolts from the shims with the 18# wrench (or the pneumatic impact wrench and the 18# socket) ;



Move the shims to one side with the Cross-screwdriver and take out the shims;



Unscrew the adjustable bolts from the upper and lower bucket rods with the 21# wrench (or the pneumatic impact wrench and the 21# socket) ;



Unscrew the captive bolts of the pin of the telescopic cylinder with the 19# socket;



Knock out the pin with the copper bar;



Separate the upper and lower bucket rod from the lower one with the travelling crane, sling and

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crowbar;



4. Boom removal
   Lift and hold the boom with the travelling crane. Remove the bolts from the plate with the 18# wrench. Withstand the pin with a M20×100 bolt or other columnar metal. Knock out the pin with the copper bar (or hammer) . To avoid injury resulting from the pin falling off, be careful to knock the pin.



Lift the boom to one side with the travelling crane.

Installation

1. Boom installation
   Lift up the boom with the travelling crane to align the mounting holes on the swing seat;



Let the pin pass through the hole and tighten the captive bolts of the pin plate with the pneumatic impact wrench.



2. Installation of upper and lower bucket rods
   Lift up the upper bucket rod with the travelling crane;



Put the shims into the track;



Move the travelling crane and install the upper bucket rod in the groove of the lower one. Be sure to make sure that the shims close the

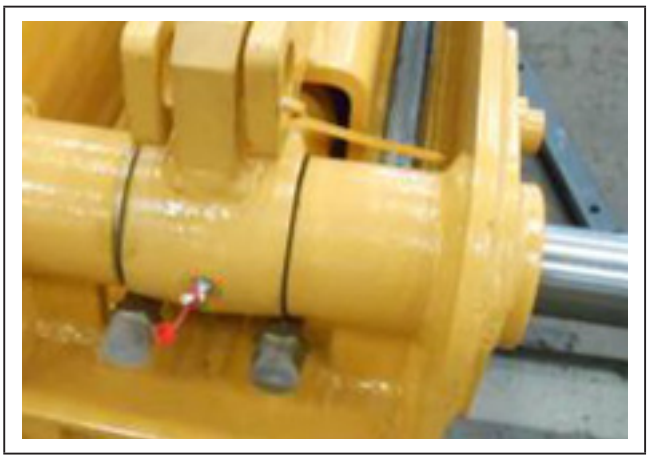
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inside of the track;





Adjust the travelling crane to align the holes of the upper and lower bucket rods. Add the shims based on the left and right clearances. Let the pin pass through the mounting holes;



Tighten the captive bolts of the plate with the pneumatic impact wrench and the 18# socket;

3. Installation of plates of bucket rods
   Put the plate to the location shown in the figure. Adjust the positions of the shims in the track with the Cross-screwdriver to align the mounting holes;





Tighten the captive bolts with the pneumatic impact wrench and the 16# socket;



4. Hoisting of bucket rods
   Lift up the bucket rod with the travelling crane to align the mounting holes of the boom. Add the shims based on the actual conditions. Make sure the swing range of the bucket rod should be less than the thickness of one shim after installation. Let the pin pass through the mounting holes. Fix the pin plate with the bolts.

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Refer to “5.4.5 Installation Steps of Three Types of Cylinders on Excavation Side”, install the cylinder with the pin;

5. Installation of excavator bucket
Lift up the bucket rod and lay the position-limit hook down. Lift the bucket to a safe place with the travelling crane.



Adjust the position of the bucket. Add the shims based on the actual conditions. Make sure that the movement clearance of the bucket should be less than the thickness of one shim after installation. Let the pin pass through the mounting holes.



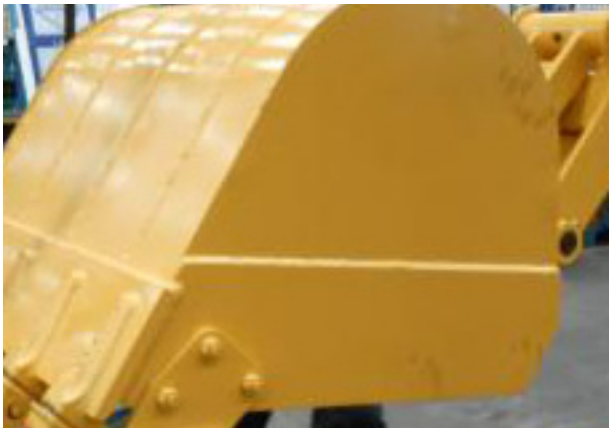
Knock the pin into the mounting holes with the hammer or copper bar.



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Lower the travelling crane slowly and remove the sling. Hook the sling onto the bucket teeth.



Adjust the position of the bucket. Add the shims based on the actual conditions. Make sure that the movement clearance of the bucket should be less than the thickness of one shim after installation. Hinge it with the pin.





Install the columnar sleeve and bolts on the pin. Fix the bolt with double nuts. Tighten the nuts with two 18# wrenches.





Lay the travelling crane down and remove the sling to complete the installation of bucket.

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Frame system

Tools list

Name	Specification
Wrench	10×12,1 6×18,18×21,19×22,36×41
Lifting tool	Sling hook and sling
Nipper pliers	
Wind trigger	MI-17
Socket	16#, 18#, 24#, 36#
Copper bar	
Remark: removed standard parts should be placed with relevant material together to avoid mixing.	

Counterweight (optional for 777A)

Removal

1. Removal of working devices for loading
   Refer to 5.2.1 Working Devices for Loading and remove the working devices on the front end.
2. Removal of radiating system and hood
   Refer to 5.5.4 Radiating System and 5.3.1 Front hood, and remove the radiator and the hood and other.
3. Removal of counterweight
   Install the sling ring onto the counterweight. Hang the two lifting hooks onto the travelling crane to allow the travelling crane to hoist the counterweight.

   Unscrew and remove the bolts with the 36# wrench (or the pneumatic impact wrench and the 36# socket) , and place them in a safe place.





Remove the bolts from the additional counterweight with the 18# wrench (or the pneumatic impact wrench and the 18# socket) to separate the additional counterweight (optional) from the counterweight.



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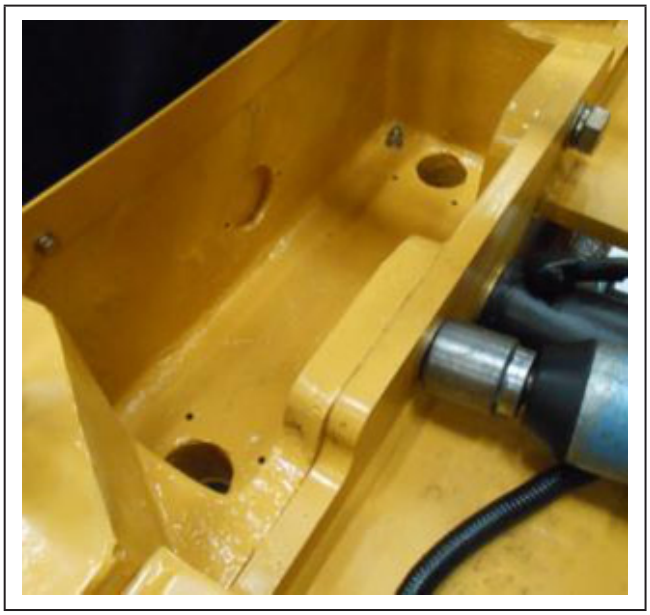
Installation

1. Installation of additional counterweight and counterweight
   Lift up the counterweight with the travelling crane to align the mounting holes of the counterweight to those of the additional counterweight. Let the bolts pass through the mounting holes from the lower end and pre-tighten the upper end with the nuts. Tighten the bolts with the 18# wrench (or the pneumatic impact wrench and the 18# socket) .



2. Hoisting of counterweight
   Lift the counterweight with the travelling crane to the mounting position of the frame. Pre-tighten the bolts for 3~5 threads by hand. Tighten the bolts with the pneumatic impact wrench and the 36# socket.





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Swing seat

Removal

1. Removal of working devices for excavation and hydraulic pipelines
   Refer to the removal procedures in 5.2.2 Working Devices for Excavation and 5.4.9 Swing Cylinders
2. Removal of hinged pin between swing cylinder and swing seat
   Remove the captive bolts from the pin with the 18# wrench (or the pneumatic impact wrench and the 18# socket) . Remove the bolts from the lower end of the pin with the 18# wrench and take out the bolts to put them in a safe place.



   Put a M24*100 bolt or other columnar metal on the upper end of the pin. Knock the bolt with the copper bar to knock the pin out. To avoid injury resulting from the pin falling off, be careful to knock the pin.



3. Removal of pin hinging swing seat with lower part of frame
   Remove the captive bolts from the lower pin plate with the 16# wrench (or the pneumatic impact wrench and the 16# socket) .



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Lift and hold the swing seat with the travelling crane and strain the sling only. Put a M24*100 bolt or other columnar metal on the upper end of the pin. Knock the bolt with the copper bar to knock the pin out. To avoid injury resulting from the pin falling off, be careful to knock the pin.



4. Removal of pin hinging swing seat with frame
   Remove the captive bolts from the upper pin plate with the 18# wrench (or the pneumatic impact wrench and the 18# socket) .





Put a M24*100 bolt or other columnar metal on the lower end of the pin with your left hand and knock the bolt with the copper bar with your right hand to knock out the pin. Place the pin in a safe place. However, first of all, beat out the pin to the lower end of the swing seat with the copper bar.

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Move the travelling crane and lift the swing seat to one side.



5. Removal of swing cylinder
   Lock the lower bolts with the 36# wrench. Remove the captive bolts from the gland with the pneumatic impact wrench and the 36# socket, and remove the gland.



Pry the swing cylinder with the crowbar and move it to one side.



Installation

1. Installation of swing cylinder
   Move the swing cylinder to the mounting position of the frame to allow the mounting pin of the cylinder to enter into the mounting grove of the sideway bracket.

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Cover the gland on the mounting pin on the upper end of the swing cylinder. Lock the lower nut with the 36# wrench. Tighten the bolts with the pneumatic impact wrench and the 36# socket.



2. Installation of swing seat
   Lift up the swing seat with the travelling crane. Align the mounting hole of the swing seat to the axis of the mounting hole of the sideway bracket slowly.



Knock the upper pin into the mounting hole with the copper bar. And then, tighten the captive bolts of the upper pin plate with the 18# wrench (or the pneumatic impact wrench and the 18# socket) .



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Knock the pin into the lower hinge hole with the copper bar. If necessary, add the shims. Make sure that the clearance at the hinge joint between the swing seat and the sideway bracket should be less than the thickness of one shim. Adjust the position of the hole of the mounting pin with the wrench. Fix the pin with the stop plate to prevent it from turning.







Connect the air source to push out the swing cylinder piston rod to an appropriate length with the compressed air. Align the cylinder mounting hole to the axis of the mounting hole of the swing seat. Fix the swing seat and the cylinder with the pin.



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Rotate the pin. Let the bolt pass through the holes of the swing seat and the pin. Tighten the bolt with the 18# wrench (or the pneumatic impact wrench and the 18# socket) .



3. Pipeline connection
   Refer to 5.4.9 Swing Cylinder, connect the pipelines.

Sideway bracket and clamping cylinder (777A)

Removal

1. Removal of swing seat and swing cylinder
   To remove the swing seat and swing cylinder, refer to the procedures for removal in 5.1.2 Swing seat and 5.4.9 Swing Cylinder.
2. Removal of clamping cylinder
   Remove the hose AS from the clamping cylinder with the 21# wrench and store it in a safe place.



Strain the sideway bracket with the travelling crane and sling. Unscrew the fixing nuts of the clamping cylinder with the 54# wrench and remove the clamping cylinder.



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Hoist the sideway bracket to one side with the travelling crane.



Unscrew the bolts on both sides of the frame and take out the bolts and baffle.



Installation

1. Bolt installation
   Put the baffle in the both sides of the chute. Let the bolt pass through the hole of the baffle. Install other bolts and baffles onto the frame in the same manner.



2. Hoisting of sideway bracket
   Lift up the sideway bracket with the travelling crane and move it to the mounting location. Adjust the positions of the bolt and the baffle to align the bolt to the mounting hole of the sideway bracket. Move the sideway bracket to let the bolt pass through the mounting hole of the sideway bracket;

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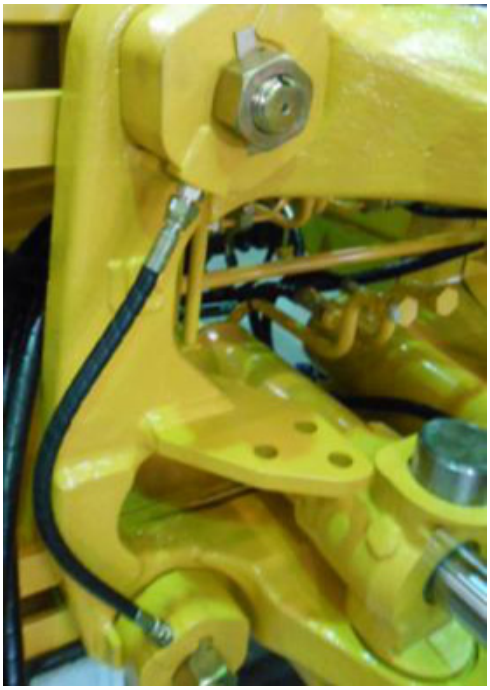
Move to both sides to take out the bolts and baffles.

3. Installation of clamping cylinder
   Install the clamping cylinder on the bolts and pre-tighten the nuts by hand.



Adjust the angle of the joint of the clamping cylinder and connect the hose AS.





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Tighten the bolts with the 54# wrench or a large monkey wrench to complete the installation.



Outrigger (766A)

Removal

1. Removal of hydraulic pipelines
   Start the complete machine to open the outriggers until the support frame off the ground for 2-3 cm. After misfiring and pressure-relief, refer to the procedures of removal in 5.4.10 766A Outrigger Cylinder, and then remove the hose AS and the outrigger cylinder.
2. Removal of captive bolts of pin plates
   Remove the captive bolt from the pin of the outrigger with the 18# wrench (or the pneumatic impact wrench and the 18# socket) and place it properly.



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3. Removal of support frame (stand bar)
   To remove the support frame, knock the pin out with the copper bar.



4. Remove outrigger
   To remove the outrigger cylinder, refer to 5.4.10 766A Outrigger Cylinder

   Lift up the outrigger with the travelling crane to level the outrigger. Knock the pin out with the copper bar or pry the pin out with the crowbar. Lift the outrigger with the travelling crane to one side.



Installation

1. Installation of outrigger
   Lift up the outrigger with the travelling crane to align the outrigger mounting hole to the mounting hole of the frame. Knock the pin into the mounting holes with the rubber hammer or copper bar.



2. Installation of support frame (sole)
   Move the support frame to the outrigger and put the outrigger onto the mounting location of the support frame. Adjust the position of the support frame. Knock the pin with the rubber hammer.

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3. Captive bolts of plates
   Tighten the removed captive bolts of the plates with the pneumatic impact wrench and the 18# socket (or the18# wrench) ;



Outrigger 777A

Removal

1. Removal of holder
   Remove the harness connector. Remove the bolt with the 10# wrench. Remove the harness connector and remove the holder.





2. Removal of hose
   Remove the connector with the 22# wrench. Cover the hose end of the hose coupler to prevent oil contamination from entering the pipeline.

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3. Removal of bracket
   Remove the bolts from the fixing pin of the support with the pneumatic impact wrench and the 16# socket.





Knock out the pin with the copper bar;

4. Guide cylinder removal
   Install the M16 bolt in the position shown in the Fig. and tighten it.



Withstand the shim with the bolt. Knock the shim with the copper bar to remove it.

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Installation

1. Install the upper part of outrigger cylinder
   Lift the cylinder to the mounting position with the travelling crane and sling.



Put the backup rings into both sides of the mounting hole on the upper end of the cylinder. Knock the pin into the mounting hole with the copper bar.





Install shim at both sides of pin shaft, and install snap spring into mounting groove of pin shaft with snap spring plier.



2. Install the lower part of outrigger cylinder
   Knock the pin into the mounting hole with copper bar. Fix the pin with the bolts and nuts. Tighten the bolts and nuts with two 16# sockets

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to 52±7 N•m.





3. Installation of shims
   Install the M16 bolt in the position shown in the Fig. with the pneumatic impact wrench and the 24# socket, tighten it.



Install the shim in the support shown in the figure. Beat out the shim with copper bar to level it with the support. Give priority to use the thick shims. Make sure that the clearance should be less than the thickness of one thin shim.



Put the cover on the support. Fix the bolt with the 10# wrench.



4. Installation of holder
   Put the holder in the mounting position. Connect the holder harness with the frame harness. And then, fix the bolt and pads with the 10# wrench and tighten the bolt to 10.5±1.5 N•m.

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Limit hook

Removal

1. Remove snap spring
   Remove the snap springs on both sides with the snap spring pliers.



Knock out the pin with the copper bar and the M20×100 bolt (or iron bar) and remove the position-limit hook.



Installation

Put the position-limit hook in the mounting position and align the holes. Knock the pin into the holes with the copper bar.

Install the snap springs on both sides into the groove with the snap spring pliers.

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Cab and engine cover

Cover

Removal

Preparations

Open the upper cover and support the lifting arm. Fix the lifting arm with the safety strut.



1. Remove front cover door
   Unscrew the four captive bolts from the front hood door with the 16# wrench (or socket) and remove the front hood door.



2. Remove horn
   Cut off the fixing harness of the front horn. Unscrew the captive bolts of the horn with two 13# wrenches. Be careful to store the horn properly.

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3. Remove relay
   Pull out the front relay.



Also, remove the support for fixing relay with the Cross-screwdriver. Be careful to store the relay properly.



4. Remove front cover

Remove the four captive bolts of the front hood on both sides of the front end with the 16# wrench. Take out the front hood along the forward direction of the complete machine. Be careful to store the front hood properly.



Front cover

Installation

1. Install front cover
   Insert the lower end of the front hood in the fixing position of the frame. Adjust the front hood. Make sure it is bilaterally symmetric. Tighten the four flat gaskets, spring gaskets and bolts on both sides with the 16# wrench.

   Tighten torque 52±7 N•m



2. Install relay

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Screw the relay support to the mounting position with the Cross-screwdriver.



Insert the relay in place.



3. Install horn
   Screw the horn to the mounting position with two 13# wrenches, and bind the harness to the corresponding position. Tightening torque 26±4 N•m



4. Install front cover door
   Put the front hood door in the mounting position. Adjust the mounting position until the front hood door will not interfere with the front hood or the counterweight. Tighten the flat gaskets, spring gaskets and bolts with the 16# wrench. Tighten torque 52±7 N•m

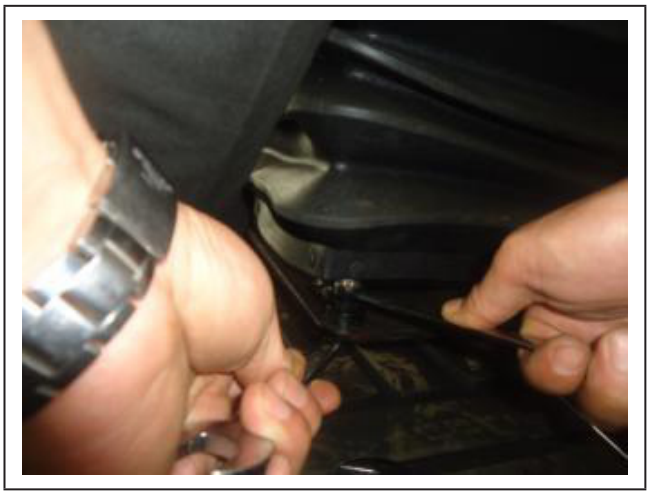


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Cab

Removal

1. Remove seat
   Separate the seat from the seat base with the two 13# wrenches.



Separate the seat base from the cab with the 16# wrench.



2. Removal of control lever on excavation side
   Remove the upper end of the control handle knob with the Cross-screwdriver.



Remove the two lock nuts from the handle knob with two 25# wrenches, and unscrew the handle knob.



Remove the cover with the 8# wrench.



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and take out the cover and the dustproof hood.





Remove the bolts from the load control box with the 8# wrench.



Take out the box.



Remove the bolts from the load control leather cushion with the 8# wrench (or socket) and take out the leather cushion.



Remove the connecting bolts between the control lever and the link with the 11# and 13# wrenches and separate the control lever from the link.

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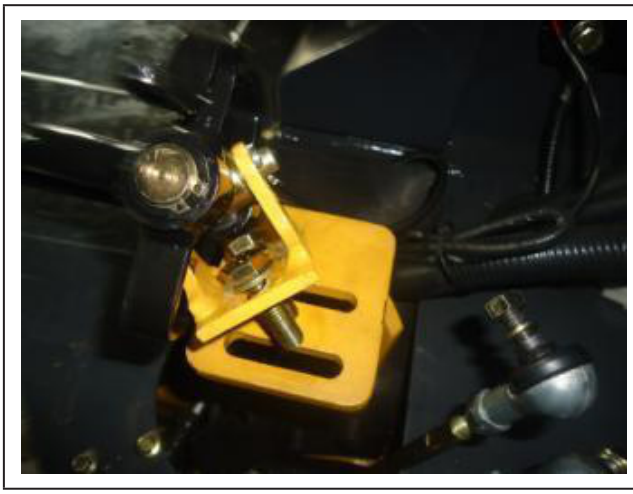




Remove the connecting bolts between the control lever base and the support with two 16# wrench.



Separate the load control lever from the frame completely.



Pull out the connecting harness between the control lever and the complete machine and take out the control lever.



3. Remove shift lever
   Remove the cover of the shift lever with the 8# wrench or socket.

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Pull out the harness connector of the shift lever from the complete machine harness from the machine bottom.



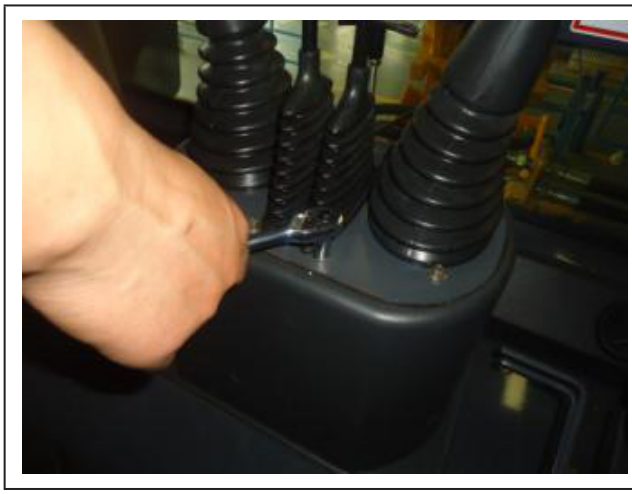
Remove the captive bolts connecting the shift lever with the gearbox with the 18# wrench.



Take out the shift lever.

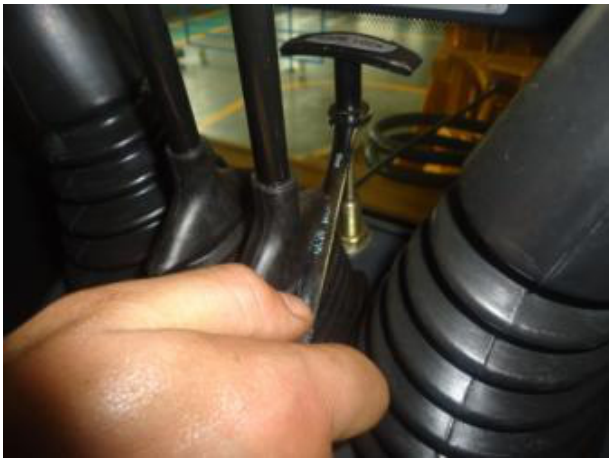


4. Remove excavation control
   Remove the bolts from the excavation control cover with the 8# wrench or socket.

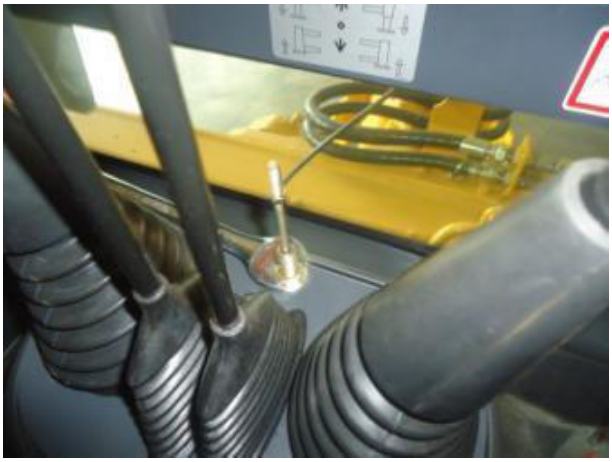


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Remove the position-limit flexible shaft handle with the 10# wrench.



Remove the position-limit flexible shaft from the excavation control box with the 22# wrench.



Remove the upper cap of the excavation control knob with the cross-screwdriver.



Remove the lock nut of the knob with the 18# wrench.



Screw off handle knob;



Remove the lock nut from the outrigger control

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lever with the 16# wrench.



Unscrew the outrigger control lever.

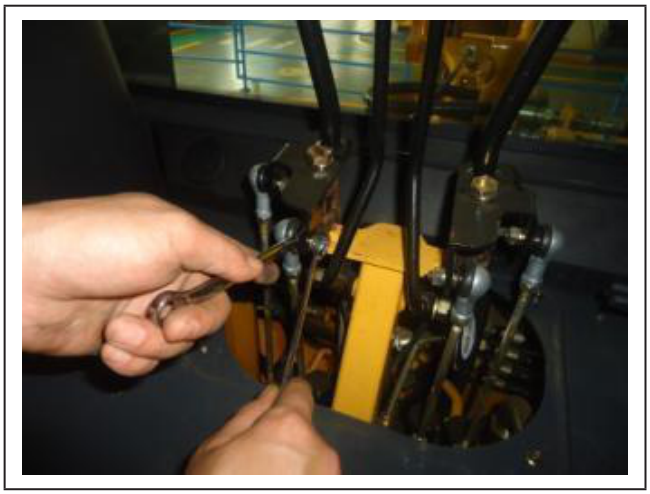


Remove the captive bolts from the excavation control box with the 8# wrench and remove the box, cover and the upper dustproof hood together.

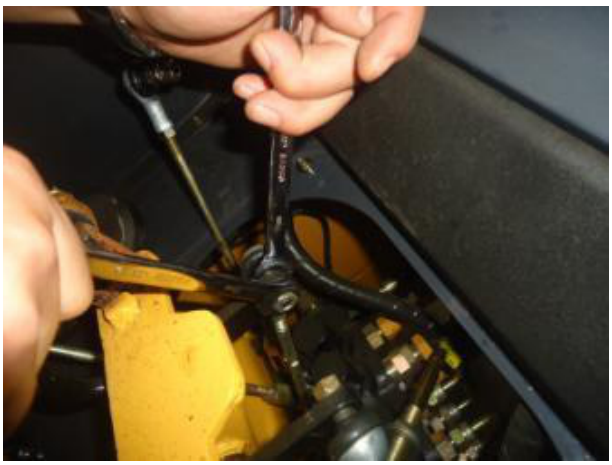




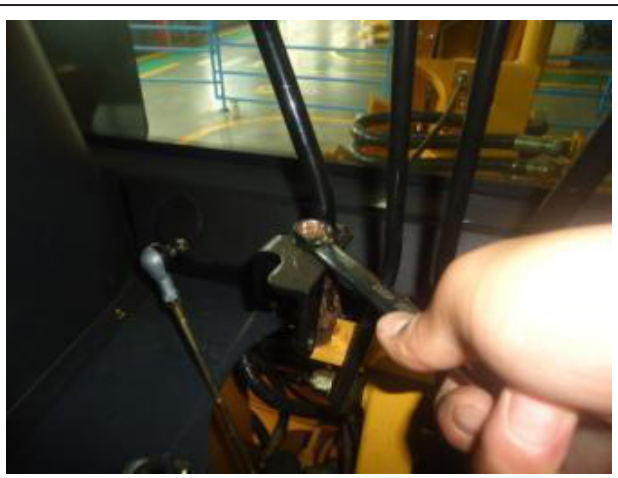
Remove the lock nuts from the 6 (six) links with the 11# and 13# wrenches.



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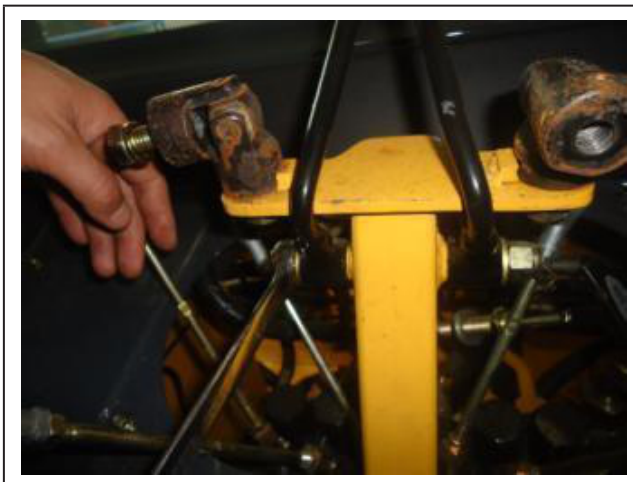
Remove the bolts connecting the control lever and the support with the 18# wrench.



Pull out the harness connecting with the complete machine and remove the excavation control lever.

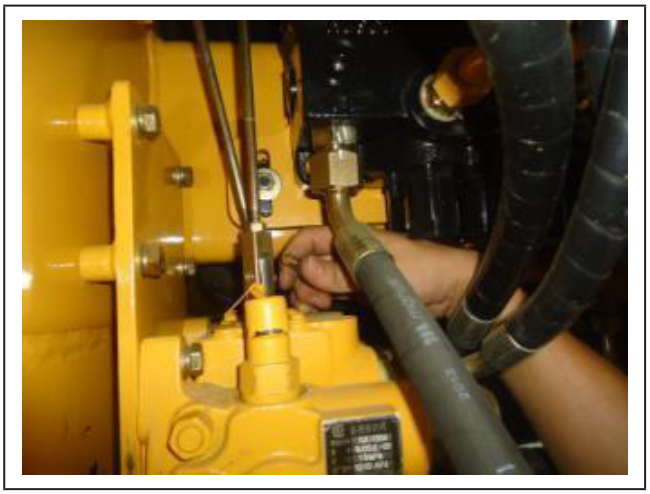


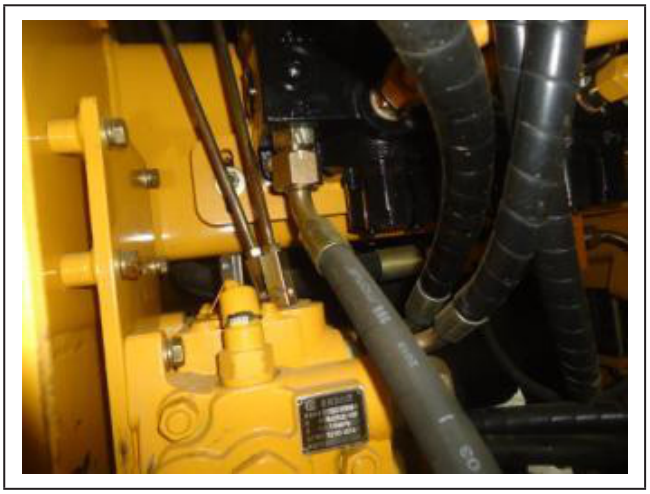
Remove the bolts connecting the outrigger control lever and the support with the 18# wrench and take down the outrigger control lever.



5. Remove multi-way valve
   Remove the plug pin with the needle-nose pliers and separate the multi-way valve link from and the multi-way valve.

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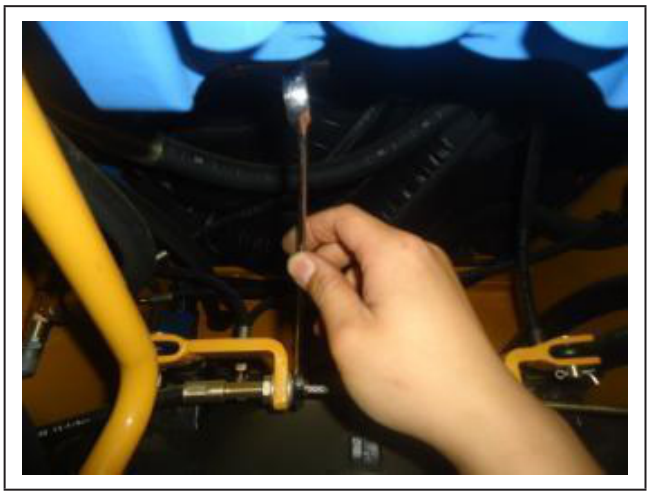




6. Remove the parking brake flexible shaft
   Remove the left nut connecting the hand brake flexible shaft with the rear axle with the 10# wrench.



Remove the right nut connecting the hand brake flexible shaft with the rear axle with the 18# wrench. Separate the hand brake flexible shaft from the rear axle.



7. Remove cable of accelerator
   Remove the connecting nut between the throttle cable flexible shaft and the engine throttle with the 10# wrench. Remove the connecting nut between the throttle cable flexible shaft and the frame with two 13# wrenches. Separate the throttle cable flexible shaft from the frame.



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8. Remove fender
   Remove the fenders on the left and right sides with the 13# wrench. Each fender is equipped with six bolts.



9. Remove plate
   Remove the left and right plates with the 13# wrench. Each plate is equipped with five bolts.





10. Remove A/C pipe
    Unscrew the two caps on the compressor by hand and connect them with the two connectors of the machine to extract the Freon.



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Start the machine to extract the Freon.



Remove the clight of the heater tube on the right side of the cab with the 8# wrench or socket.



Remove the two A/C tubes on the right side of the cab with the 27# wrench.



Remove the clight of the A/C tube of the evaporator on the left side with the 13# wrench.

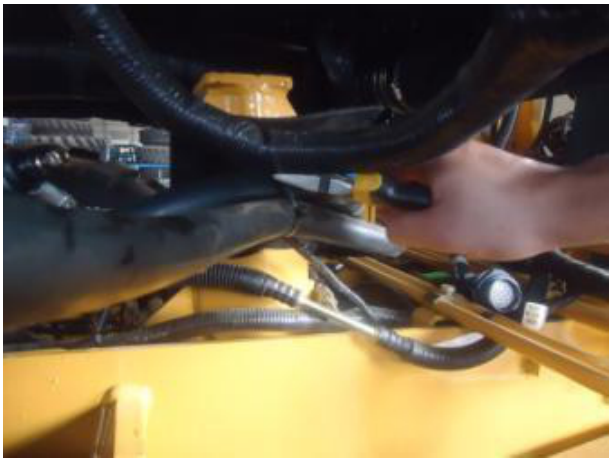


Remove the evaporator connector with the 19# and 17# wrenches. Wrap the connectors of the hose and the evaporator with clean plastic bags and belts to prevent foreign matters from entering.

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11. Remove the main fuse box and the harness connector at the bottom of the cab.
Cut off the belts used to bind the harness under the machine.







Unscrew the earthing harness connecting with the frame with the 13# wrench.



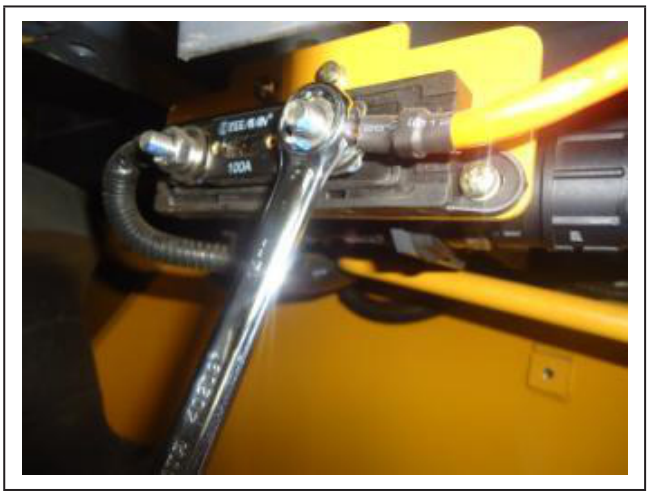
Pull out the harness connector of the front work light from the mounting hole of the shift lever.



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Remove the plastic cap of the main fuse box on the right side of the machine bottom. Unscrew the terminal studs of the main fuse box with the 14# wrench. Unscrew the fuse box with the Cross-screwdriver.







Unplug the master socket of the outside wiring harnesses.





Tear off the adhesive tape on the outer of the master socket of the inside wiring harnesses.

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Open the protective housing and unplug the master socket of the wiring harnesses.







Pull out the master light wiring harness socket on the left side of the cab.



Remove the wiper flow pipes at the bottom under the front and rear of the cab separately.





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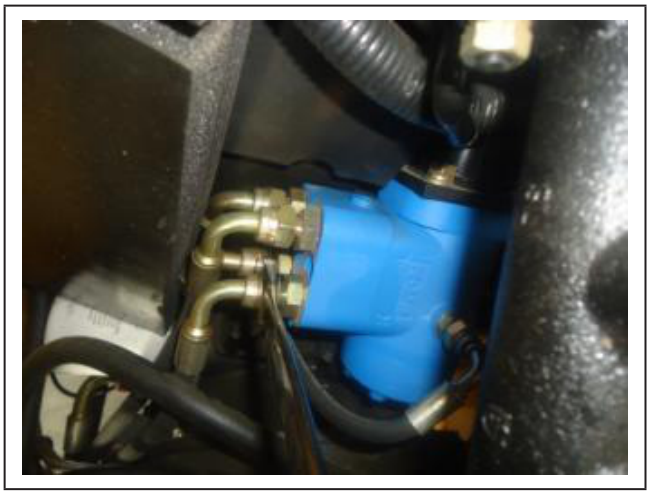
12. Removal of traveling brake hose and metering pump hose
    Remove the clight of the connecting hose between the assistor and the oil cup with the 8# wrench.



Remove the clight of the assistor vacuum pipe with the 8# wrench.



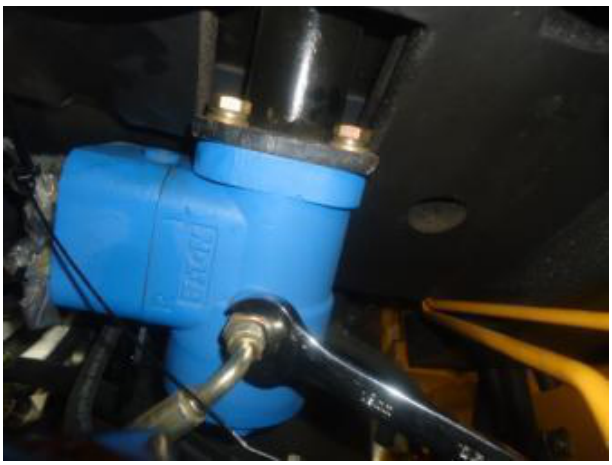
Remove the four hoses from the metering pump with the 24# wrench. Wrap the connectors of the hoses, assistor and metering pump with the clean plastic bags and belts to prevent foreign matters from entering.

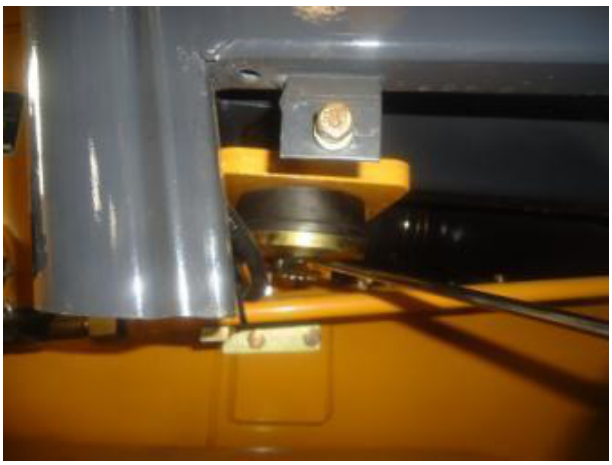




Remove the hose on the side of the metering pump with the 19# wrench. Wrap the connectors of the hose, assistor and metering pump with the clean plastic bags and belts to prevent foreign matters from entering.

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13. Lift the cab
    Hold the cab in place with the travelling crane and sling.



Remove the captive bolts connecting the frame and the cab with the 24# wrench. Lift up the cab with the travelling crane and sling.

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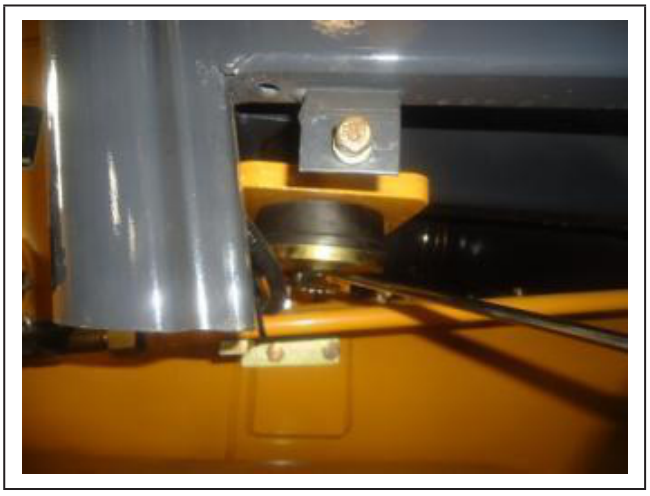
Cab

Installation

1. Hoisting of cab
   Lift the cab to the mounting position with the travelling crane and sling.



Align the four mounting holes at the bottom. Tighten the connecting bolts between the frame and the cab with 24# wrench. Tightening torque 225±35 N•m



2. Installation of travelling brake hose and metering pump hose
   Remove the shield on the assistor and the hose. Connect the hose with the assistor connector. Tighten the clight with the 8# wrench. Be careful to prevent the clight from interfering with any other part. Screw the clight until it touches the inside of the steel tube boss.



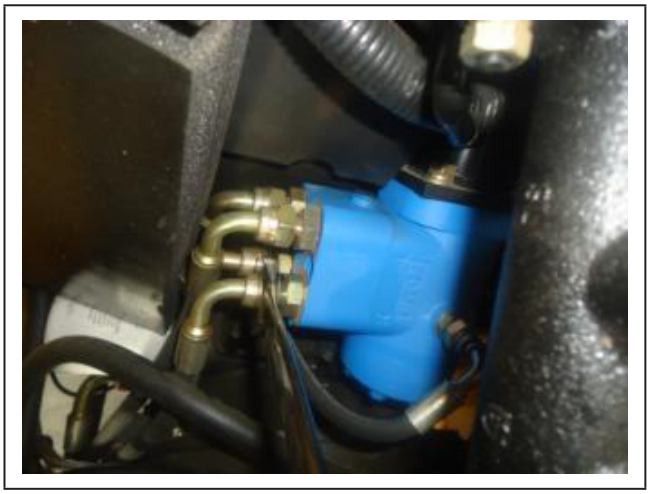
Remove the shield on the assistor and the vacuum pipe. Connect the hose with the assistor connector. Tighten the clight with the 8# wrench. Be careful to prevent the clight from interfering with any other part. Screw the clight until it touches the inside of the steel tube boss.

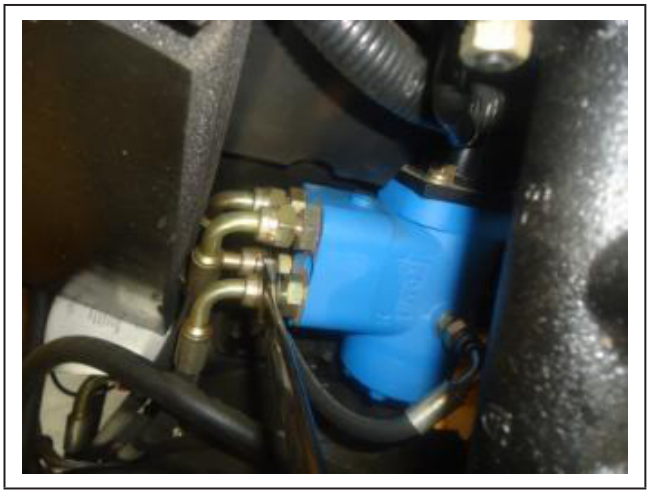


Remove the shield on the front end of the metering pump. Observe the hose connecting the metering pump. Make sure that the hose O-ring is in good condition. Connect the hose with the metering pump’s connector. Be careful to avoid interfering with any other part. Tighten the four hoses with the 24# wrench to 26±2 N•m.

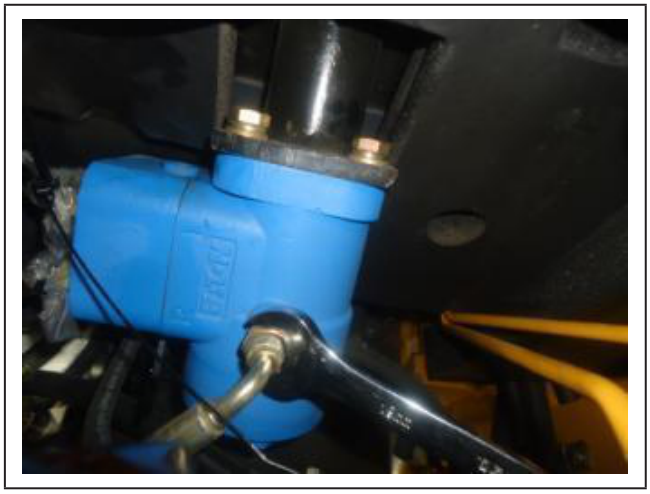
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Remove the shield on the side of the metering pump. Observe the hose connecting the metering pump. Make sure that the hose O-ring is in good condition. Connect the hose with the metering pump's connector. Be careful to avoid interfering with any other part. Tighten the connector with the 19# wrench. Tightening torque is 16±1N•m



3. Installation of main fuse box and wiring harness connector at bottom of cab
   Tighten the earthing wiring harness connecting the frame with the 13# wrench to 26±4 N•m.



Insert the wiring harness connector of the front work light from the mounting hole of the shift lever.

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Screw the fuse box with cross screwdriver, and screw the wiring bolt on the main fuse box with 14# wrench, tightening torque 52±7 N•m, and then put the plastic cover on the main fuse box.





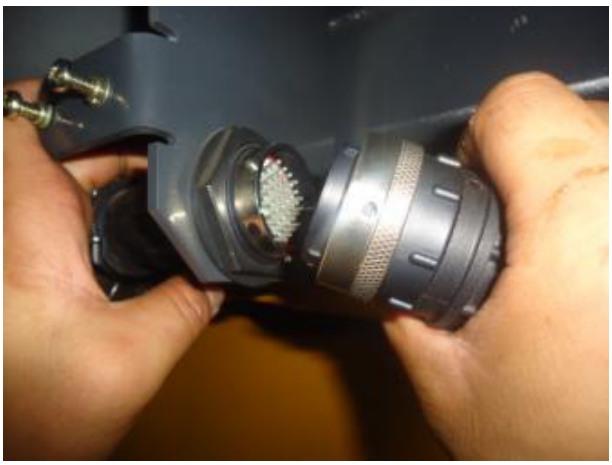


Plug the master socket of the outside wiring harnesses.



Plug the master socket of the inside wiring harnesses.

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Install the protective housing and then wind the outer of the master socket of wiring harness with electrical adhesive tapes.







Plug the main light wiring harness socket on the left side of the cab.



Connect the wiper flow pipes at the bottom of front and rear cab separately.



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4. Removal and installation of A/C tube
Remove the shield on the evaporator and heater pipe on the right side of the cab. Connect the heater pipe with the evaporator connector. Screw the clight until it touches the inside of the steel tube boss. Tighten the clight with the 8# wrench or socket.



Remove the shield on the evaporator and the air-conditioning tubes on the right side of the cab. Observe the hose connected to the evaporator connector. Make sure the hose O-ring is in good condition. Connect the hose with the evaporator connector. Be careful to avoid interfering with any other part. Tighten the two air-conditioning tubes with the 27# wrench to 37±2 N•m.



Remove the shield on the evaporator and the air-conditioning tubes on the left side of the cab. Observe the hose connected to the evaporator connector. Make sure the hose O-ring is in good condition. Connect the hose with the evaporator connector. Be careful to avoid interfering with any other part. Install the clight on the left evaporator air-conditioning tube with the 13# wrench. Tightening toruqe is 26±4 N•m.



Connect the evaporator connector with the air-conditioning tube with the 19# and 17# wrenches and tightening torque is 16±1 N•m.

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Unscrew the two caps on the compressor by hand and connect them with the two connectors of the machine to charge the Freon. Start the machine to add the Freon.





5. Install the plate
   Install the left and right plates with the 13# wrench. Each plate is equipped with five bolts with a tightening torque of 26±4 N•m.





6. Installation of fenders
   Install the left and right fenders with the 13# wrench. Each fender is equipped with six bolts with a tightening torque of 26±4 N•m.

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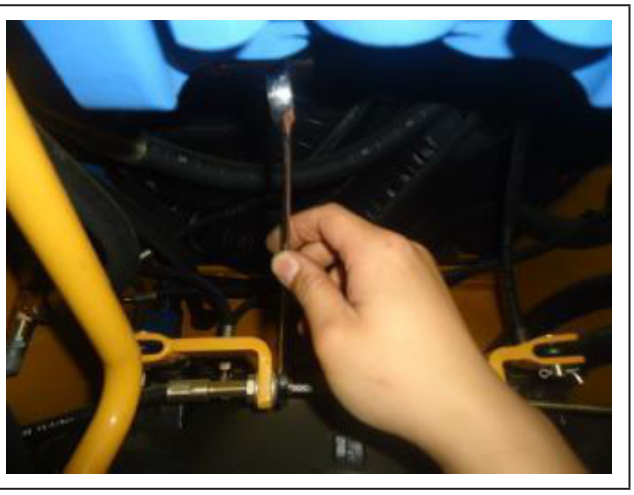
7. Installation of throttle cable
   Tighten the connecting nut between the throttle cable flexible shaft and the engine throttle with 10# wrench. The tightening torque is 15±2 N•m.



8. Install the parking brake flexible shaft
   Tighten the right connecting nut between the hand brake flexible shaft and the rear axle with the 18# wrench to 100±12 N•m.



Tighten the connecting nut between the throttle cable flexible shaft and the frame with two 13# wrenches to 32±4 N•m.

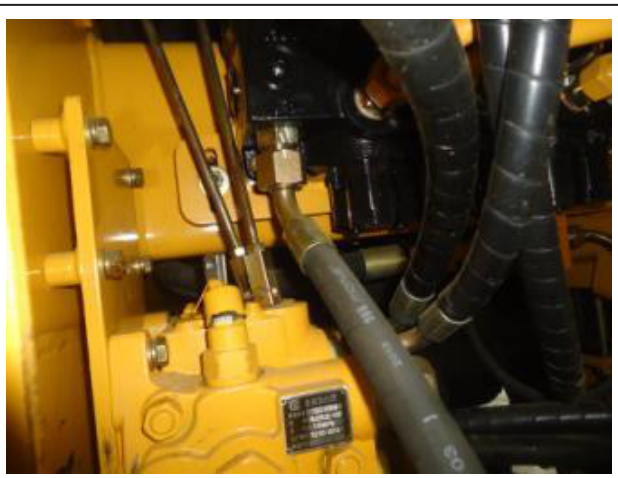


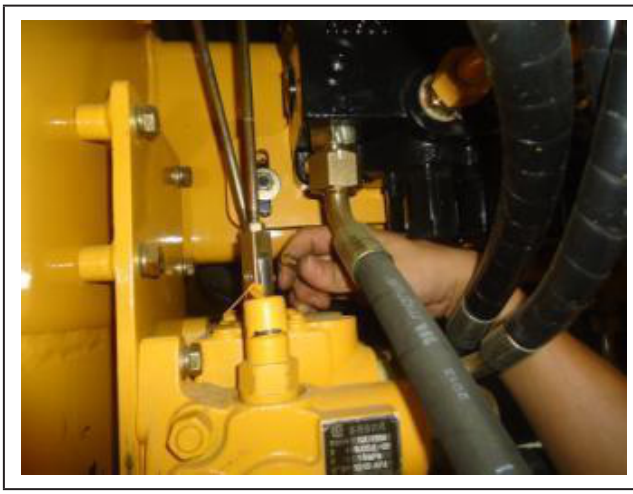
Tighten the left nut between the hand brake flexible shaft and the rear axle with the 10# wrench to 15±2 N•m.

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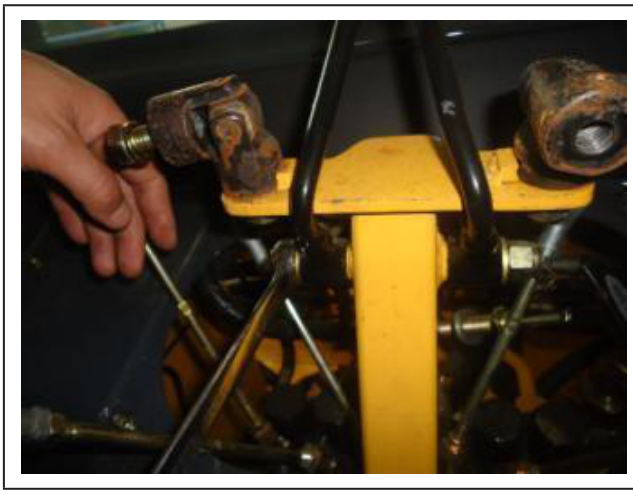


9. Installation of multi-way valve
   Install the plug pin into the connecting hole of the link and the multi-way valve with the needle-nose pliers and connect the link with the multi-way valve.





10. Installation of excavation control
    Tighten then connecting bolts between the out-rigger control lever and the support with the 18# wrench to 100±12 N•m.

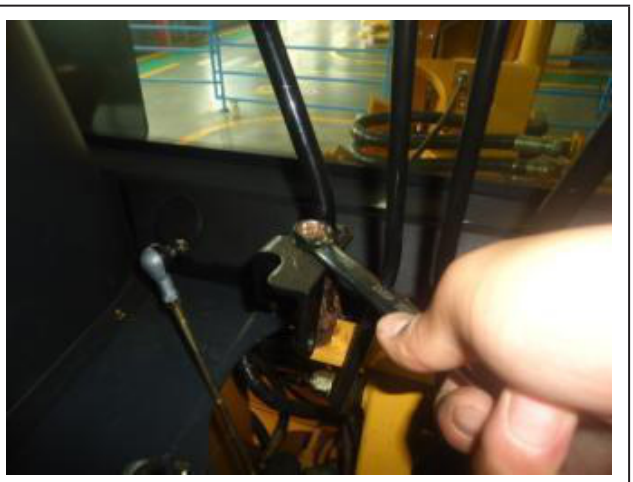


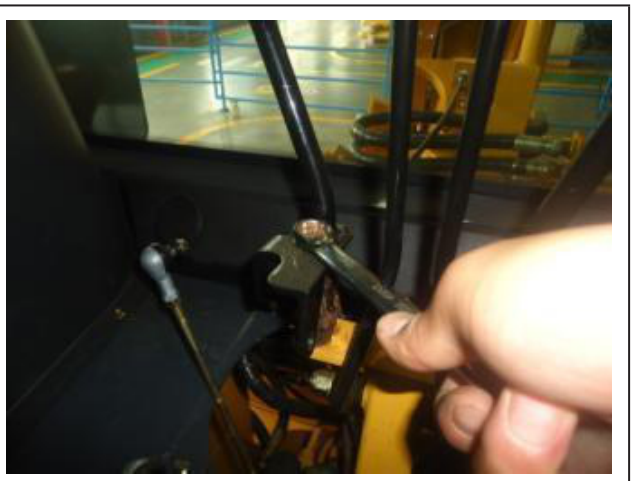
Install the excavation control lever and insert the harness of the control lever connected to the machine.

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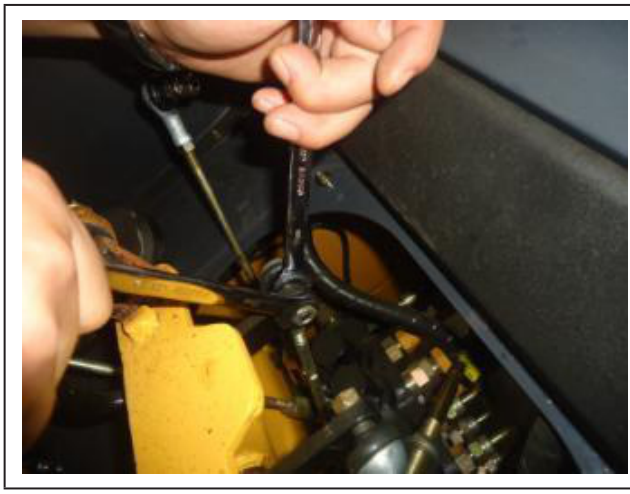


Tighten the connecting bolts between the control lever and the support with the18# wrench to 90±12 N•m.





Tighten the lock nuts to connect the six links with the 11# and 13# wrenches to 26±4 N•m.





Tighten the captive bolts between the excavation control box and the cab with the 8# wrench to 10.5±1.5 N•m.

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Tighten the box, the cover and the upper dust-proof hood with the 8# wrench to 10.5±1.5 N•m.





Tighten the nuts on the position-limit flexible shaft and the excavation control box with the 22# wrench to 160±20N•m.



Install the position-limit flexible shaft knob, and tighten its lock nut with the 10# wrench to 15±2 N•m.



Screw the excavation control lever knob.

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Tighten the lock nut of the knob with the 18# wrench to 100±12 N•m.



Install the upper cap of the knob with the cross-screwdriver.



Screw the outrigger control lever knob.



Tighten the lock nut of the outrigger control lever with the 16# wrench to 60±5 N•m.



11. Install shift lever
    Install the shift lever in the corresponding position of the gearbox.

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Tighten the captive bolts with the 18# wrench to 90±12 N•m.



Connect the harness connector of the shift lever with the machine wiring harness from the machine bottom.



Install the dustproof hood on the shift lever. Tighten the cover of the shift lever with the 8# wrench or socket to 10.5±1.5 N•m.

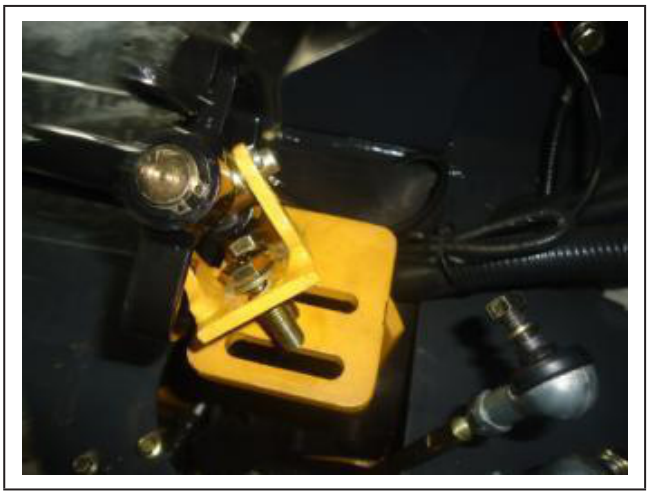


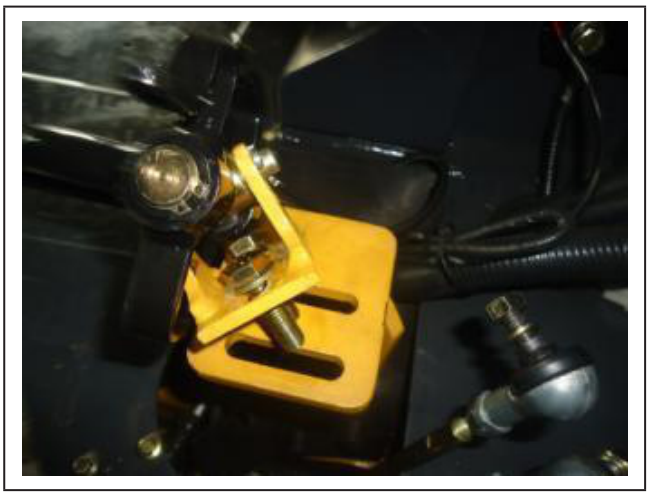


12. Installation of control lever on load end

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Put the load control lever in the mounting position of the frame.





Tighten the connecting bolts between the control lever base and the support with two 16# wrenches to 52±7 N•m.



Connect the wiring harness of the control lever connected to the complete machine.



Put the control lever in the mounting position of the link of the loading valve. Tighten the connecting bolts between the control lever and the link with the 11# and 13# wrenches to 26±4 N•m.

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Put the leather cushion in the mounting position. Tighten its bolts with the 8# wrench (or socket) to 10.5±1.5 N•m.



Put the box in the mounting position of the cab. Tighten the bolts of the load control box with the 8# wrench to 10.5±1.5 N•m.







Put the cover and the dustproof hood in the mounting positions. Tighten the cover with the 8# wrench to 10.5±1.5 N•m.

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Screw the knob. Tighten the two lock nuts of the knob with two 25# wrenches to 250±30 N•m.



Tighten the upper end of the load control lever knob with the cross-screwdriver.

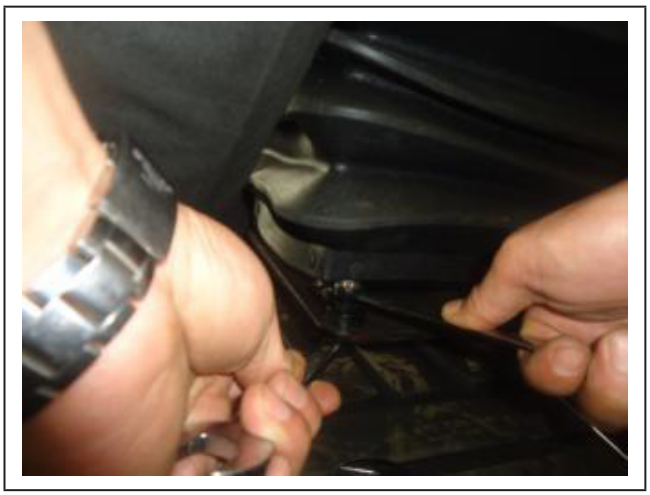


13. Installation of seat
Tighten the connections between the seat base and the cab with the 16# wrench to 52±7 N•m.

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Tighten the connections between the seat and the seat base with two 13# wrenches to 26±4 N•m.



Battery

Removal

1. Remove front cover door
   Remove the four captive bolts from the front hood door with the 13# wrench and take out the front hood door, and then place it in a safe place.



2. Turn off the negative switch and make sure that it is in O (OFF) state.



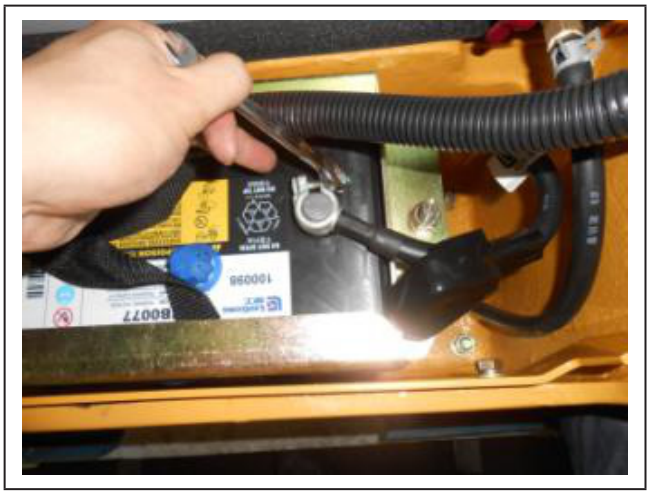
3. Removal of wiring harness between start motor and battery
   Push aside the jacket on the wiring harness between the start motor and the battery, and remove the wiring harness with the 10# wrench.

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4. Removal of wiring harness between negative switch and battery
   Push aside the jacket on the wiring harness between the negative switch and the battery, and remove the wiring harness with the 10# wrench.



5. Remove negative switch
   Remove the two bolts from the mounting board of the negative switch with the 16# wrench. Remove the wiring harness between the start motor and the negative switch with the 17# wrench and remove the negative switch, and then place it properly.



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6. Remove battery plate
   Remove the two bolts from the plate of the battery with the 17# wrench and take down the plate.



7. Replace the battery
   Pick up the strap on the battery and move the counterweight out of the used (or waste) battery, and then install a new battery.



Installation

1. Place the battery
   Install the battery in place. Make sure that the battery is placed upright. No deflection of battery is permitted.



2. Installation of plate of battery
   Put the battery plate in the mounting position and let the bolt pass through the bracket and install the nut, and then tighten it with the 16# wrench.

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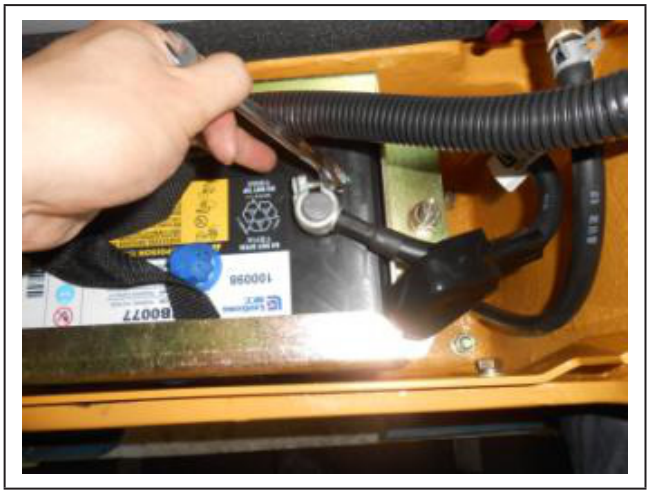


3. Install negative switch
   Install the wiring harness between the start motor and the negative switch on the downside of the negative switch and put the nut on it and tighten the nut with the 17# wrench. Put the mounting board of the negative switch in the corresponding position. Align the bolt to the hole of the frame and tighten it with the 16# wrench.





4. Installation of wiring harness between negative switch and battery
   Remove the protection on the battery. Connect the wiring harness between the negative switch and the battery to the negative battery terminal. And then tighten it with the 10# wrench and put the jacket properly.

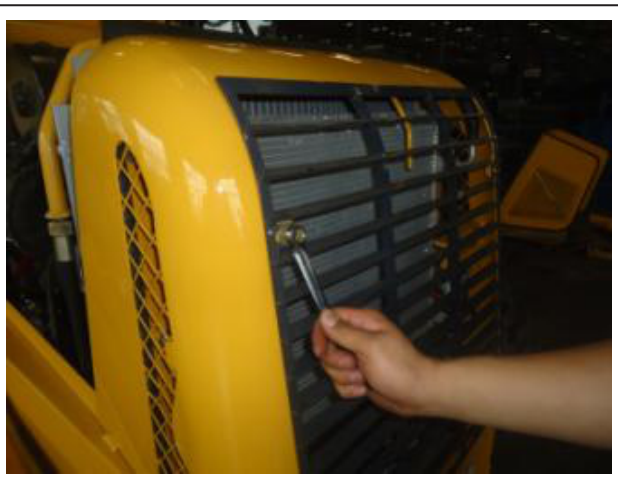


5. Installation of wiring harness between start motor and battery
   Remove the protection on the battery. Connect the wiring harness between the start motor and the battery to the positive battery terminal. And then tighten it with the 10# wrench and put the protection in place.

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6. Install front cover door
   Put the front hood door in the mounting position. Align the bolt to the mounting hole and tighten it with the 13# wrench.



Work light

Removal

1. Removal of outrigger upside signal light
   Remove the outer glass cover of the outrigger upside signal light and rotate the bulb, and then take out it.





2. Remove left and right main lights
   Remove the screws around the left and right main lights (lighting lights) with the cross-screwdriver.Take out the headlight. Remove the setscrews of the snap spring with the cross-screwdriver and take out the bulb and its wiring harness, and then pull out the bulb.

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3. Remove front and rear work lights
   Remove the screws around the work light with the Cross-screwdriver and take out the work light. Remove the snap spring inside and take out the bulb and its wiring harness, and then pull out the bulb.



Remove the screws around the left and right main lights (steering lights) with the Cross-screwdriver. Rotate the bulb and take it out.

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4. Remove rear combined signal light
   Unplug the connector between the rear combination signal light and the wiring harness.

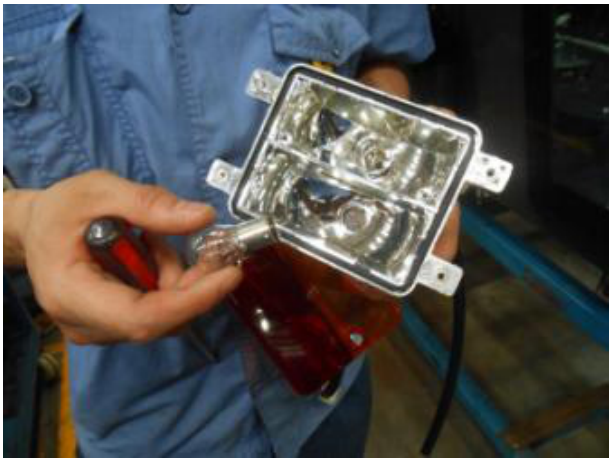
Remove the setscrews of the rear combination signal light with the cross-screwdriver and take out the signal light. Remove the screws around the outer glass cover of the signal light with the cross-screwdriver and rotate the bulb, and then take out the bulb.





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5. Remove rotary signal light
   Unplug the connector between the rotating signal light and the wiring harness. Remove the screws around the rotating signal light with the Cross-screwdriver, and then take out the rotating signal light.



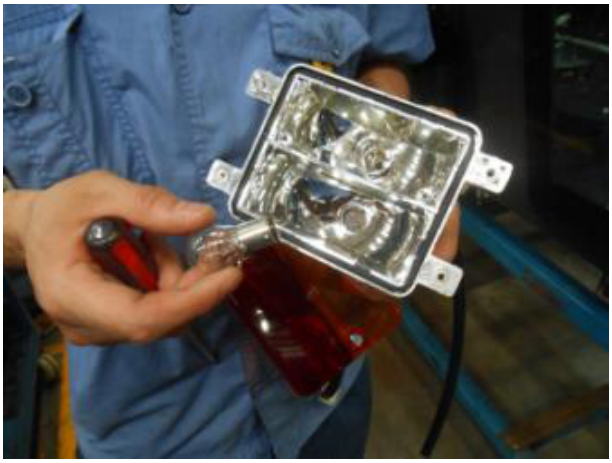
Installation

1. Install rotary signal light
   Put the rotary signal light in the mounting position at the top of the cab. Align to the mounting hole at the top and install the screw. Tighten the screw with the Cross-screwdriver and connect the plug between the rotating signal light and the wiring harness.



2. Install rear combined signal light
   Rotate the bulb and snap in it in place. Tighten the screws around the outer glass cover of the signal light with the Cross-screwdriver. Install the signal light in the corresponding position of the cab. Tighten the captive bolts around the signal light with the Cross-screwdriver, and then connect the plug between the signal light and the wiring harness.

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3. Install front and rear work lights
   Put the bulb in the mounting position. Press the snap spring to hold the bulb. Put the work light in the mounting position of the cab. Tighten the setscrews of the work light with the cross-screwdriver.



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4. Install left and right main lights
   Put the bulb in the mounting position. Press the snap spring to hold the bulb. Tighten the set-screws of the snap spring with the cross-screw-driver. And then, put the front and rear main lights (lighting lights) in the mounting position of the cab. Tighten the setscrews of the main lights with the Cross-screwdriver.



Rotate the bulb and hold it and install it in place. Tighten the screws around the left and right main lights (steering lights) with the Cross-

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screwdriver.





5. Installation of outrigger upside signal light
   Rotate the bulb and hold it and install it in place. And then install the outer glass cover of the outrigger upside signal light.





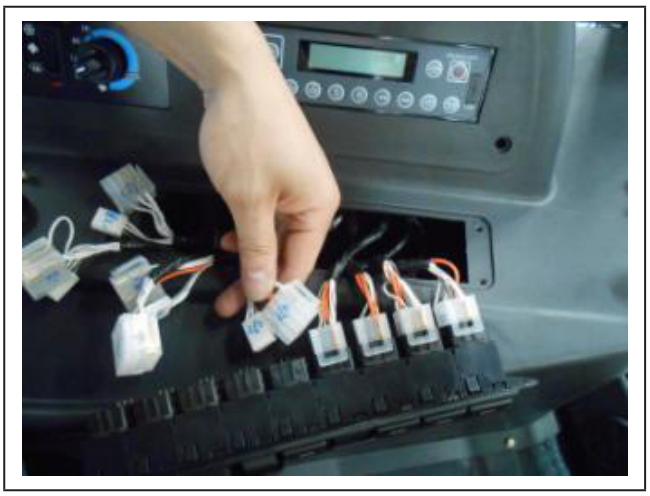
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Instrument

Removal

1. Remove switch
   Remove the screws around the switch with the cross-screwdriver. Disconnect the wiring harness on the rear side of the switch and remove the switch.

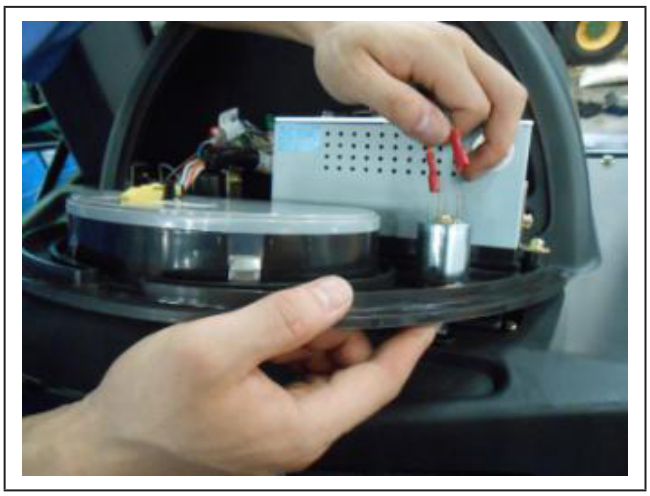




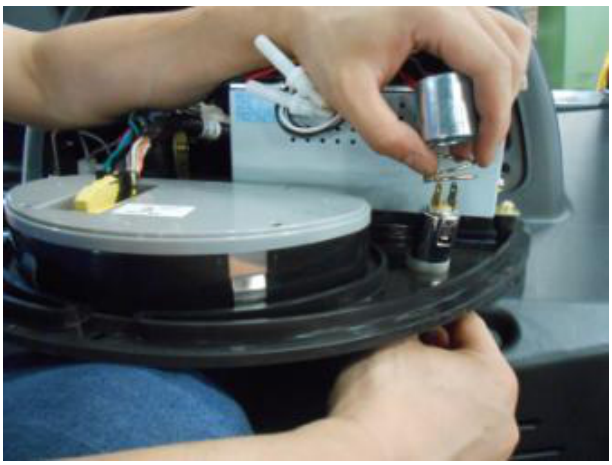
2. Remove side instrument
   Remove the three setscrews of the dashboard with the Cross-screwdriver.



3. Remove cigarette lighter
   Disconnect the wiring harness of the cigarette lighter and rotate the cigarette lighter, and then remove the cigarette lighter and put it in safe place.

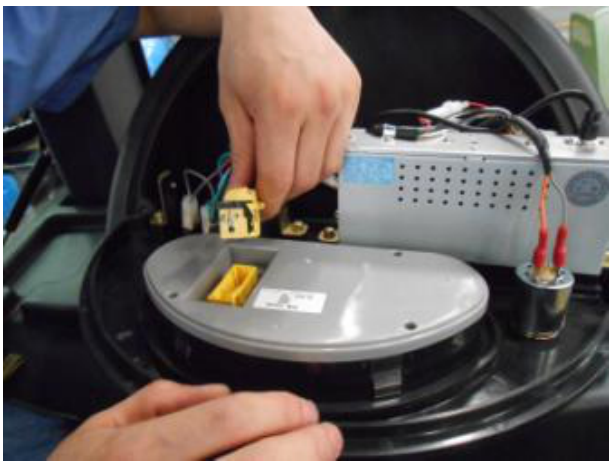


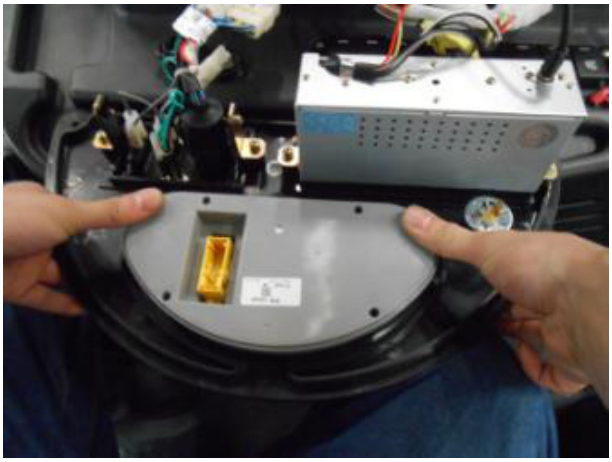
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4. Remove instrument panel
   Turn the (black) switch of the harness on the rear side of the instrument panel rearward. Disconnect the wiring harness. Knock the instrument panel down. Press the instrument panel down by your hands to remove it and put it in a safe place.

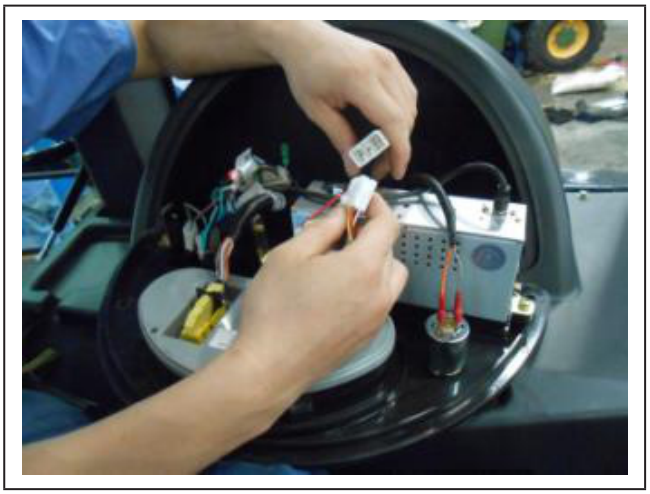


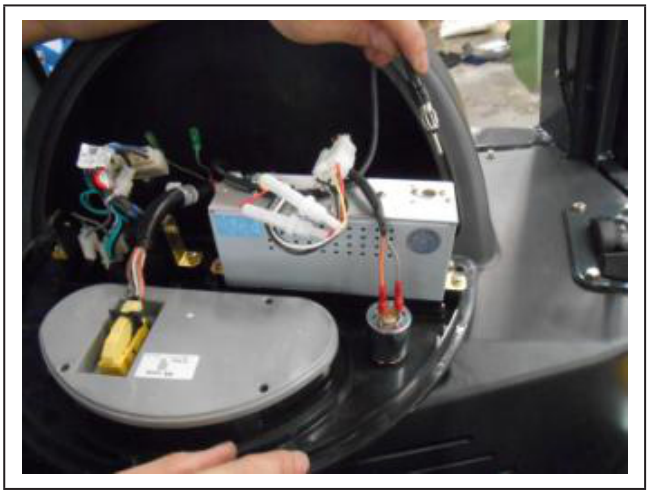


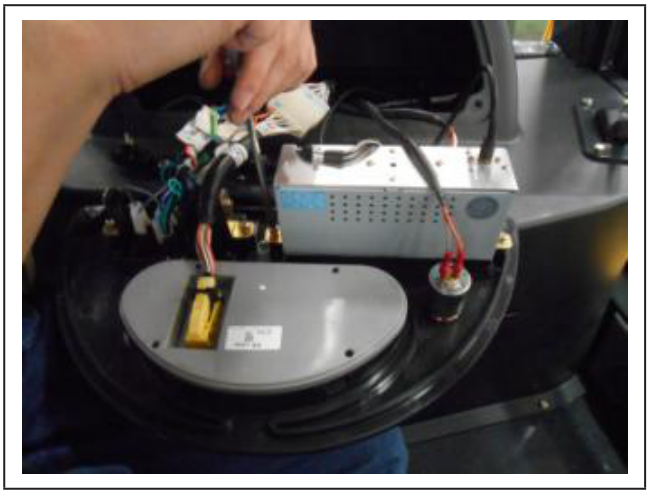


5. Remove the radio
   Unplug the connector between the radio and the wiring harness. Remove the radio antenna. Remove the setscrews of the radio with the cross-screwdriver, and then remove the radio and put it in a safe place.

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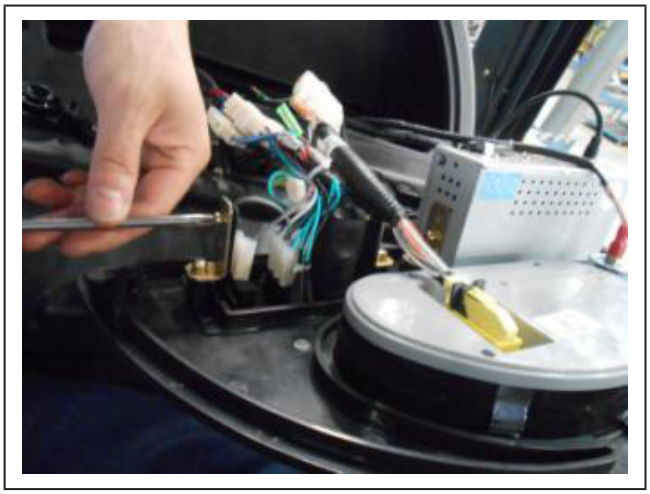






6. Remove A/C panel
   Unplug the connector between the air-conditioning panel and the wiring harness. Remove the radio with the cross-screwdriver before removing the setscrews of the air-conditioning panel. And then, remove the air-conditioning panel and place it properly.

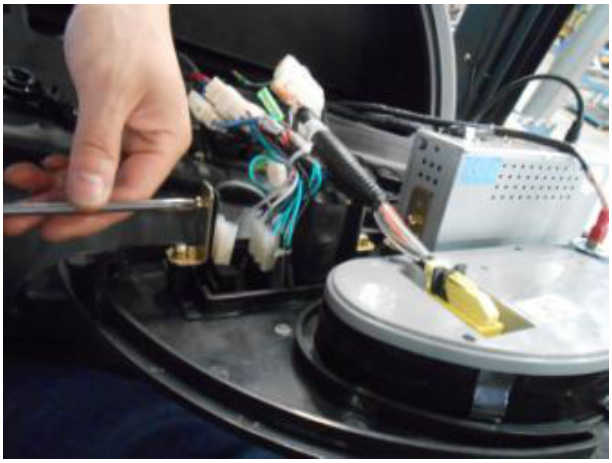


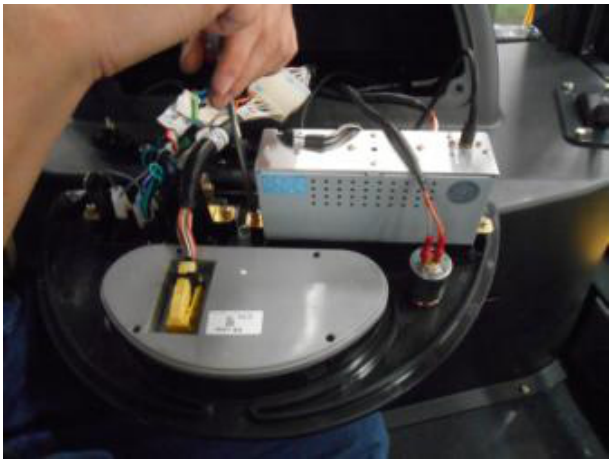


Installation

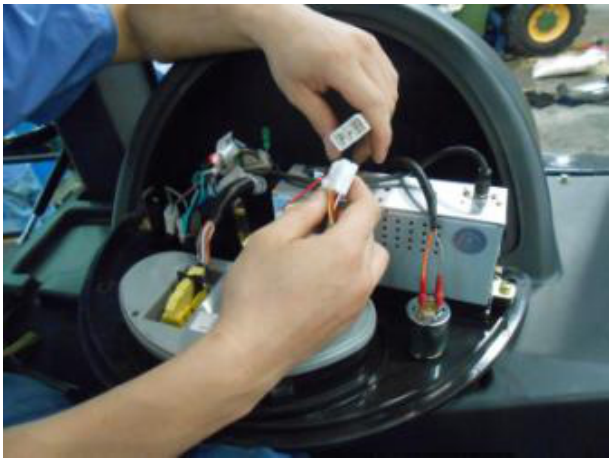
1. Install A/C panel
   Install the air-conditioning panel in the corresponding position of the side instrument. Align the mounting hole on the rear side and install the screw. Tighten the screws with the Cross-screwdriver, and then connect the wiring harness connector with the air-conditioning panel.

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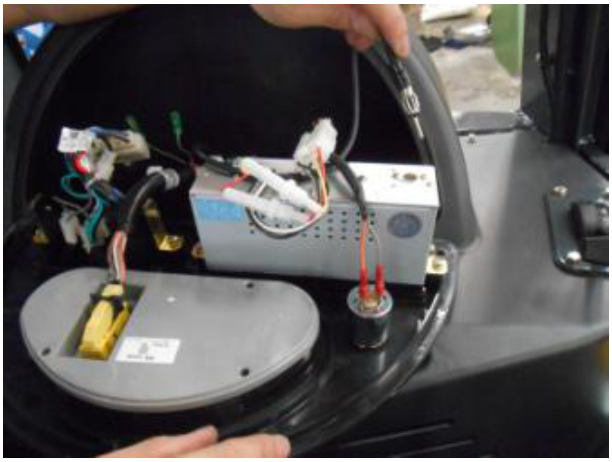








2. Install the radio
   Install the radio in the corresponding position of the side instrument. Align the mounting hole on the rear side and install the screw. Tighten the screws with the cross-screwdriver, and then connect the wiring harness connector as well as the antenna with the radio.



3. Install the instrument panel
   Install the instrument panel in the corresponding position of the side instrument. Press the

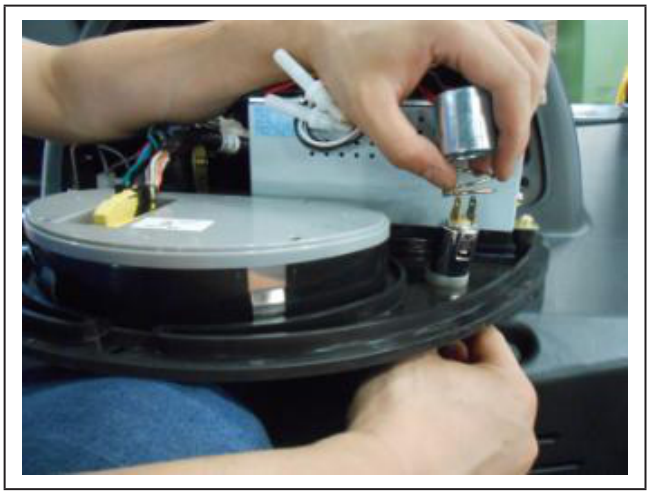
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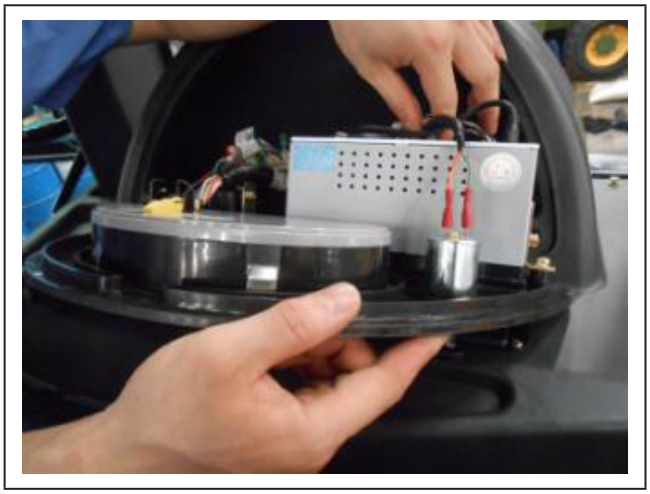
instrument panel down by your hands until it has been installed in place. And then, connect the wiring harness connector with the instrument panel.





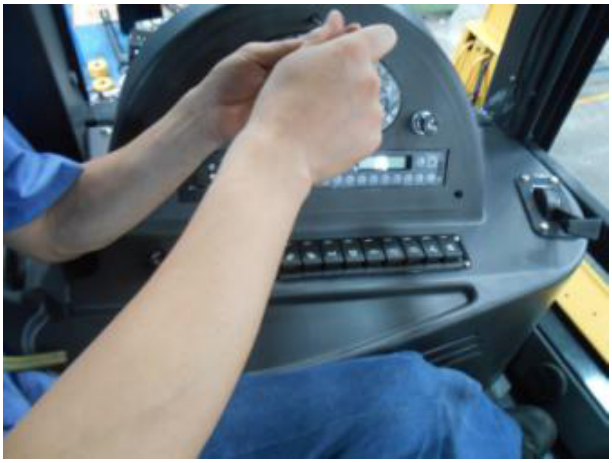
4. Install cigaret lighter
   Install the cigarette lighter in the corresponding position of the side instrument. Turn the cigarette lighter until it has been installed in place. And then, connect the wiring harness with the cigarette lighter.





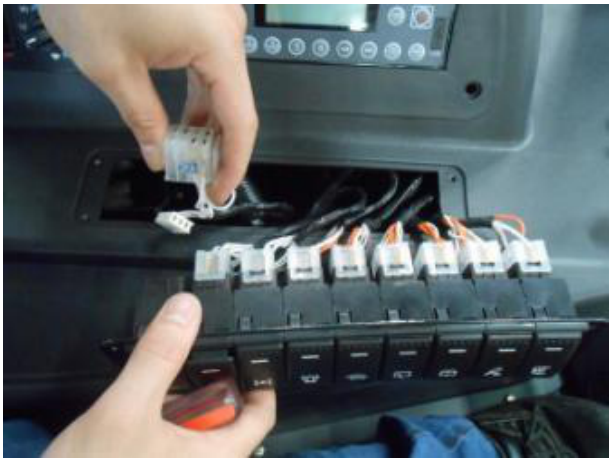
5. Install side instrument
   Install the side instrument in the corresponding position of the instrument mask. Align the mounting hole and install the screw. Tighten the screws with the cross-screwdriver.

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6. Install the switch
   Insert the wiring harness on the rear side of the switch in the corresponding interface. From left to right, and from top to down, the combination is shown in the figure, respectively. After completion of connection of wiring harness, install the switch in the corresponding position of the side instrument. Align the mounting hole and install the screw. Tighten the screws with the cross-screwdriver.



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Radiator

Removal

1. Preparations
   Open the upper hood door. Remove the upper end of the air spring on both sides with the 13# wrench. Hook the mounting hole of the air spring with the lifting hook.



2. Remove gas spring
   Remove the captive bolt of the air spring on the left side with the 12# wrench. Remove the captive bolt of the air spring on the right side with the 13# wrench, and then place the air springs properly.





3. Remove top cover
   Remove the captive bolts between the upper hood and the hinged plate with two 13# wrenches. Lift the upper hood with the travelling crane, and then place it properly. Be careful to protect its surface paint.



4. Remove front cover door
   Remove the four mounting bolts of the front hood door with the 13# wrench. Remove the front hood door and place it properly. Be careful to protect its surface paint.

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5. Remove relay
   Turn the negative switch to O position. Disconnect the relay inside the front hood. Remove the wiring harness connected to the frame with the Cross-screwdriver.



6. Remove horn
   Remove the horn fixed on the bracket with two 13# wrenches, and cut off the nylon belt used to connect the horn wiring harness with the frame with the diagonal pliers.





7. Remove front cover
   Remove the four mounting bolts of the front hood with the 16# wrench. Hold the upper surface of the front hood by your hands and apply a force backward, and then take down the front hood and put it on level ground. Be careful to protect its surface paint.

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8. Removal of side plates
   Remove the six mounting bolts of the side plates on the left and right sides of the radiator with 13# wrench, and take down the side plates on the left and right sides and place them on level ground. Be careful to protect their surface paint.



9. Extraction of Freon
   Remove the plastic shield on the two connectors of the compressor. Using the special Freon charger, connect its connectors to those of the compressor, as shown in the figure. Extract the Freon in the machine pipelines back into the Freon charger to avoid damage to person and environment due to release of Freon during follow-up removal.





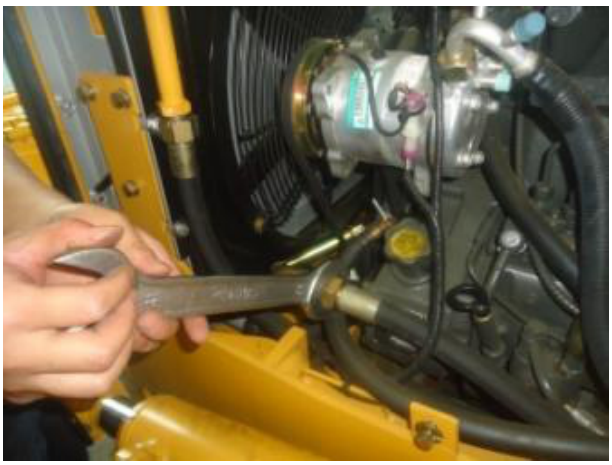
10. Removal of air-conditioning tubes on condenser
    Remove the upper and lower hoses connecting the compressor with the condenser with the 10# wrench. After removal, wrap the hoses with clean plastic bags and belts to prevent foreign matters from entering. Also, cut off the fixing belt of the air-conditioning hoses with the diagonal pliers.

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11. Removal of left hydraulic pipeline of radiator
    Put a container right under the rear hose of the radiator. Remove the hose connecting the radiator→oil return valve block on the upper of the left side, as well as the hose connecting the radiator→hydraulic oil tank on the lower of the left side, respectively, with the 36# wrench. After removal, wrap the hoses with clean plastic bags and belts to prevent foreign matters from entering.





12. Removal of gearbox oil pipeline on right side of radiator
    Remove the two hoses connecting the radiator→gearbox on the upper and lower of the right side, respectively, with the 32# wrench. After removal, wrap the hoses with clean plastic bags and belts to prevent foreign matters from entering.

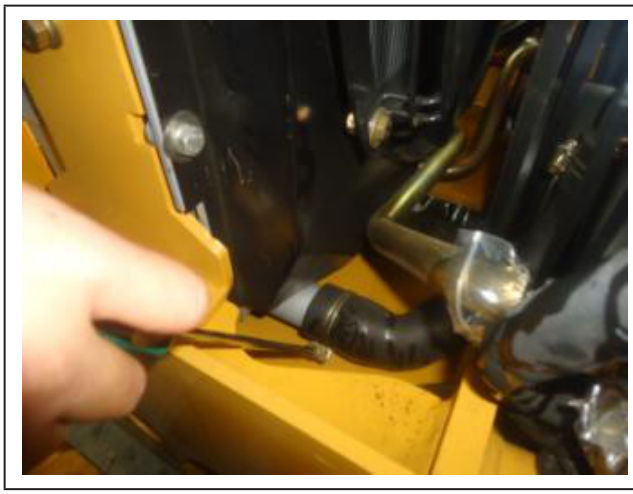


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13. Removal of upper and lower water pipes and filling water pipe of radiator
    Put a clean container under the water drain port of the radiator. Open the water drain valve to let the antifreezing solution flow into the container through the hoses. Once the antifreezing solution has been drained up, remove the upper and lower water pipes connecting the engine→radiator as well as the filling water pipe with the Cross-screwdriver or 8# socket wrench.









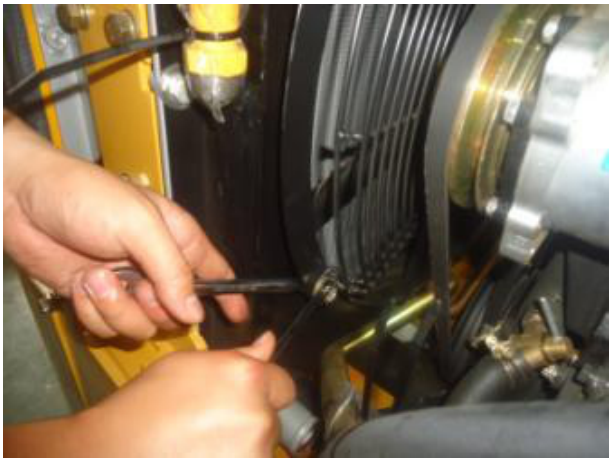
14. Removal of radiator supports
    Remove the ten bolts of the left and right supporting seats of the radiator with the 18# socket

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wrench.



15. Removal of radiator-fan wind shield
    Remove the five captive bolts from the radiator wind shield with two 13# wrenches and take down the wind shield. Be careful not to scratch any fan blade.



16. Remove radiator
    Install two sling rings in the two holes on the top of the radiator (with a nominal thread diameter of M14) and screw the sling rings in place. Lift up the radiator at the positions of the sling rings with the travelling crane and sling. Be careful to tilt the radiator during lifting. When lifting up the radiator, be sure to prevent the protective cover from touching any fan blade. Lift the radiator away for repair or replacement.



Installation

1. Install radiator
   Lift the radiator to the mounting position of the frame with the travelling crane, sling and sling rings (with a nominal thread diameter of M14) . During installation, lower the radiator slowly. Let the diesel engine fan blades pass through the rear protective cover and then lower the radiator and put the radiator in place.

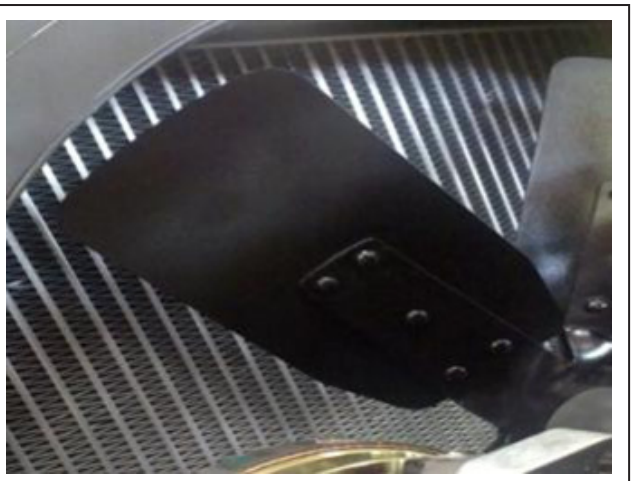


2. Install radiator bracket
   Install the brackets on both sides of the radiator. Adjust the position of the radiator. Make sure that 2/3 of the radiator fan blades enters the wind shield and there is a clearance of 7-13 mm between the periphery of the fan blades and the wind shield. After completion of adjustment, install the bolts into the mounting holes and tighten them with the 18# socket wrench.

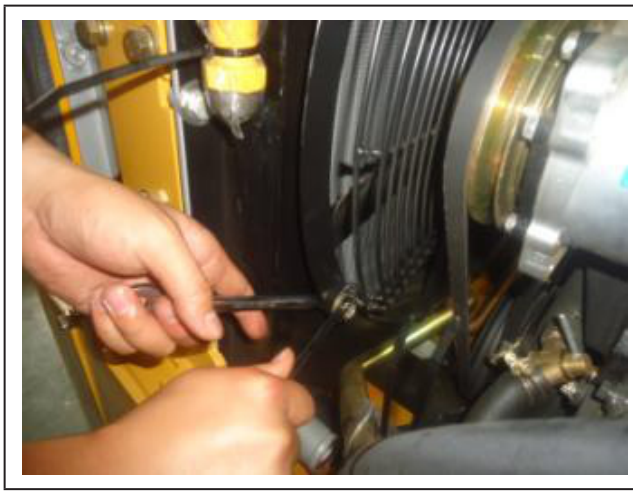
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The clearance between the fan blade and the shield is between 7-13 mm.



3. Installation of wind shield of radiator fan
   Let the wind shield pass through the fan blades from top to bottom. After aligning the holes of the radiator protection shield, install the connecting bolts and nuts. Tighten the mounting bolts with two 13# wrenches.



4. Re-installation of radiator upper and lower water pipes and filling-water pipe
   Remove the hoses and the protection on the connectors of the radiator. Replace the O-rings in the connectors. Connect the upper and lower water pipes to the upper and lower interfaces of the radiator. Connect the filling-water pipe to the filling-water interface of the radiator. Tighten the setscrews of the clamps with the Cross-screw-driver or the 8# socket wrench.



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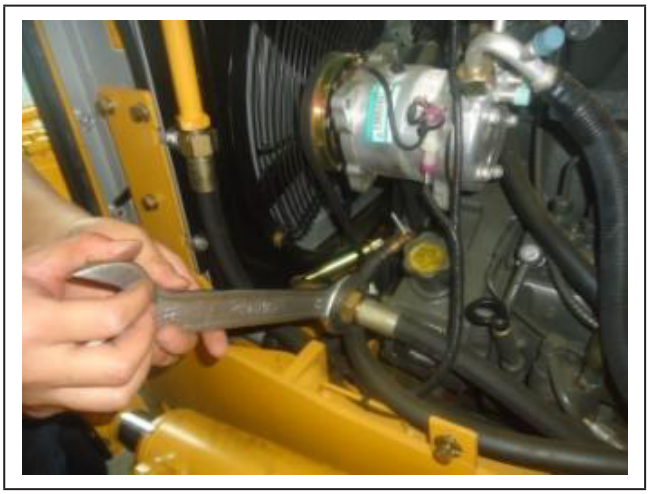


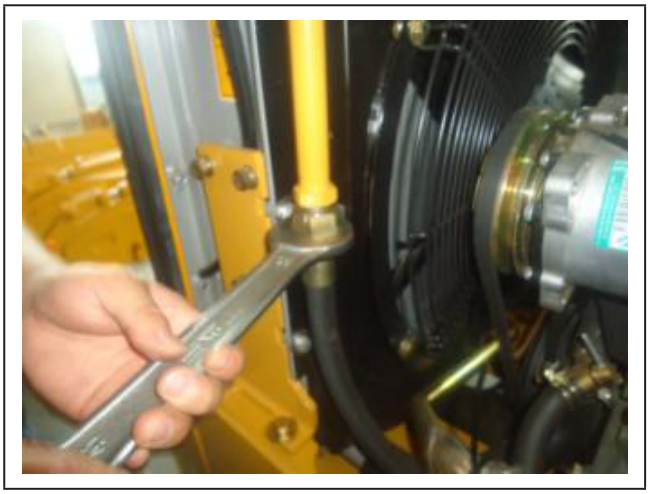
5. Re-installation of gearbox oil pipeline on right side of radiator
   Remove the hoses and the protection on the connectors of the radiator. Replace the O-rings in the connectors.Connect the two hoses to the corresponding connectors of the radiator, respectively, and tighten them with the 32# wrench.



6. Re-installation of hydraulic oil pipeline on left side of radiator
   Remove the hoses and the protection on the connectors of the radiator. Replace the O-rings in the connectors. Connect the two hoses to the corresponding connectors of the radiator, respectively, and tighten them with the 36# wrench.

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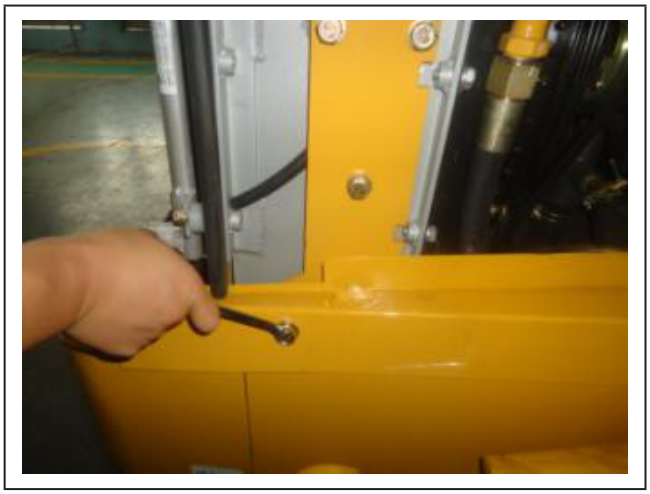




7. Re-installation of air-conditioning pipelines of condenser
   Remove the protection on the hoses. Connect the upper hose to the upper connector of the condenser. Connect the lower hose to the lower connector of the condenser.And then, tighten the captive bolts with the 10# wrench.



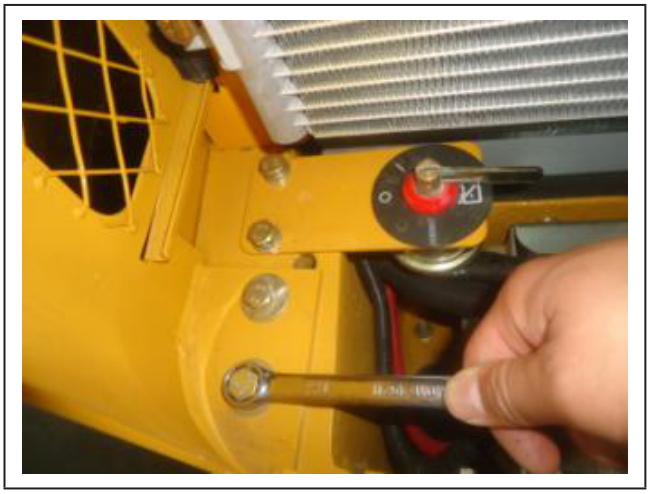
8. Install side panel
   Put the side plates in the mounting positions on both sides of the frame. After aligning the mounting holes of the frame, install the connecting bolts and nuts. Adjust the positions of the side plates from side to side to make sure there is no clearance between the side plates and the frame. Be careful to adjust to make sure there is no clearance between the side plates. And then, tighten the mounting bolts with the 13# wrench.



9. Install the cover
   Put the cover in the mounting position in the middle of the frame. After aligning the mounting holes of the frame, install the connecting bolts and nuts. Adjust the position of the front hood from side to side to make sure the difference between the distances which both sides of the cover exceed the counterweight should

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be<2mm. And then, tighten the mounting bolts with the 16# wrench.



10. Install horn
    Put the horn in the mounting position accordingly. After aligning the mounting holes of the frame, install the connecting bolts and nuts. Tighten the mounting bolts with the 13# wrench. And then, fix the horn harness onto the frame with the belt.



11. Install relay
    Put the relay wiring harness in the mounting position accordingly. After aligning the mounting holes of the frame, install the screws. Tighten the screws with the Cross-screwdriver. And then, insert the relay into the wiring harness interface.



12. Install cover door
    Put the front hood door in the mounting position accordingly. After aligning the four bolt holes of the front hood, install the bolts. And then, tighten the bolts with the 13# wrench.

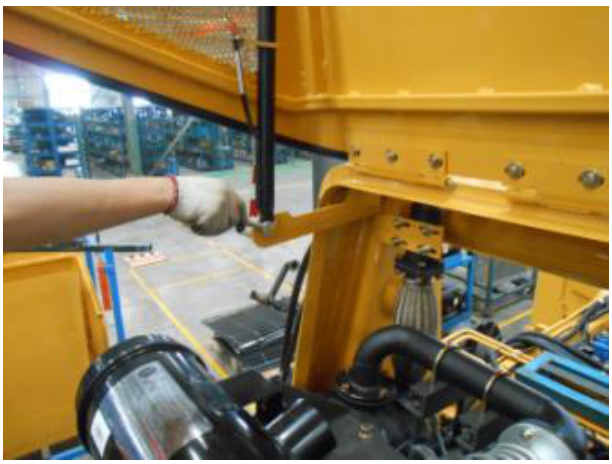


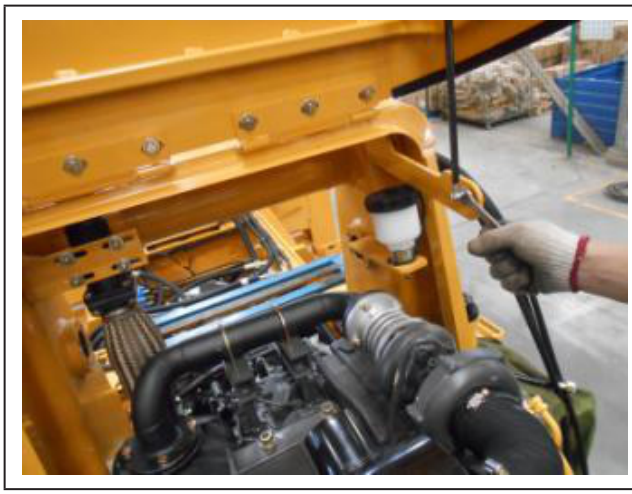
13. Install upper cover
    Let the sling pass through the handle of the upper hood. Lift the upper hood to the proper mounting position with the travelling crane. After aligning the holes of the hinged plates, install the bolts and nuts. Adjust the upper hood to make sure that the distances of the lower edges of its both sides from the side plates should be equal and should be < 5 mm. Tighten the bolts with the 13# wrench.

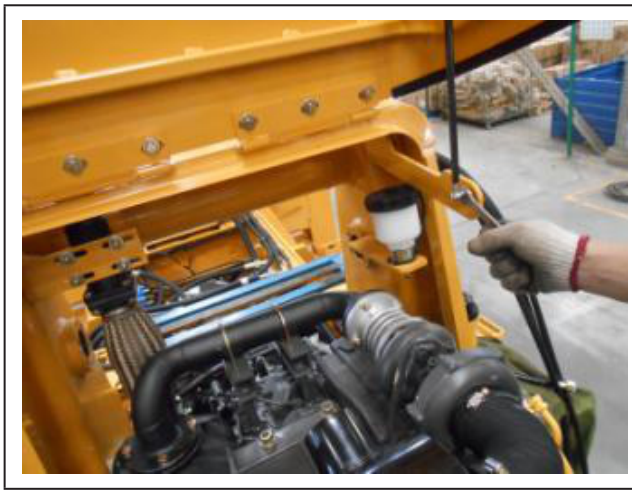
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14. Install air spring
    Let the bolt on the side of the air spring connected to the upper hood enter into the hole of the bracket. Install the nut and then tighten the bolt with the wrench. (For the left air spring bolt, use the 12# wrench and for the right air spring, use the 13# wrench.)







15. Adding antifreezing solution and hydraulic gearbox oil, and charging Freon
    Unscrew the cap on the upper of the radiator to add antifreezing solution. Fill 16L KH antifreezing solution and screw the cap. Unscrew the plug of the filler tube of the gearbox and the fill 16L 8# hydraulic gearbox oil (10W-30 CH-4) , and then re-install the rubber plug and tighten it. Fill the machine with the refrigerant 2.1kg (R134a) using the Freon charger until the prompt appears (press any button to exit) .

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Steering

Removal

1. Remove upper switches of glass fiber reinforced plastic
   Press the switch from inside to outside, and disconnect the wiring harness connected to the switch. Remove the four switches in this manner.







2. Remove steering cover
   Remove the bolts around the glass fiber reinforced plastic with the 8# wrench and take out the cover of the steering upward.



3. Remove front instrument
   Pull out the horn button on the steering wheel.

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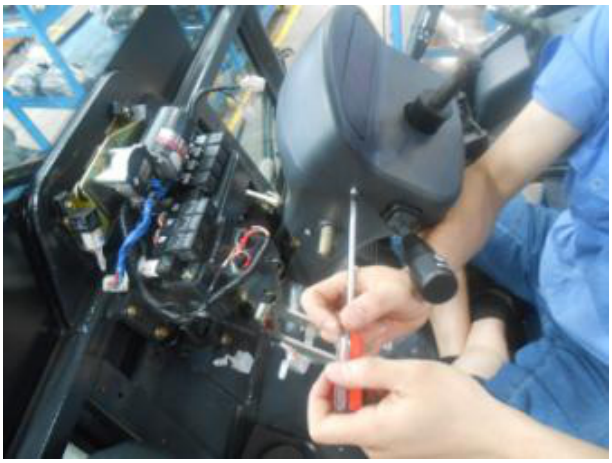
Remove the fixing nuts of the steering wheel with the 22# socket, extension rod and ratchet wrench or special wrench.



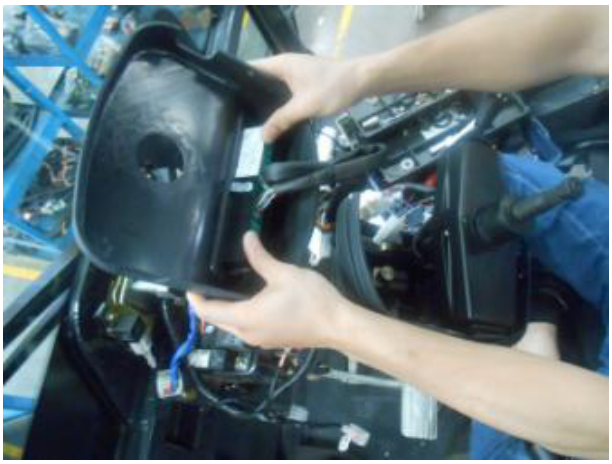
Knock down the steering wheel with your hands upward.



4. Remove front instrument
   Remove the screws on the upper cover of the steering with the Cross-screwdriver.



Press the front instrument out with your hands downward.



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Disconnect the wiring harness connected to the front instrument and remove the front instrument.



5. Remove sliencer
   Refer to “5.5.3 Removal of Silencer”, remove the silencer from the machine and place it properly to remove metering pump.
6. Remove metering pump
   Remove the four connecting bolts between the metering pump and the steering wheel with the 16# wrench. Remove the metering pump and place it properly.



7. Remove steering
   Remove the four connecting bolts between the metering pump and the cab with the 16# wrench, and take out the metering pump and place it properly.



Installation

1. Install steering
   Put the steering in the mounting position. Align the mounting holes and install the bolts. And then, tighten the bolts with the 16# wrench.



2. Install metering pump
   Put the steering in the mounting position. Align the mounting holes of the metering pump and install the bolts, and then tighten the bolts with the 16# wrench.

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3. Install silencer
   Refer to “5.5.3 Installation of Silencer”, install the silencer in the corresponding position of the engine.
4. Install front instrument
   Connect wiring harness with front instrument.



Press the front instrument with your hands to install it onto the top cover of the steering.



Tighten the setscrews on the upper cover of the metering pump with the cross-screwdriver.



5. Install steering wheel
   Put the steering wheel in the mounting position of the metering pump. Tighten the fixing nuts of the steering wheel with the 22# socket, extension rod and ratchet wrench or special wrench.

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Install the horn button on the steering wheel.



6. Install steering cover
   Put the metering pump cover in the mounting position from top to bottom. Align the mounting holes of the cab and adjust the metering pump cover to allow the left/right clearance between the steering and its cover to be consistent. And then install the bolts and tighten the bolts with the 8# wrench.





7. Install steering cover switches
   Connect the wiring harness with the switch and install the switch in place with your hands.

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2. Hydraulic System

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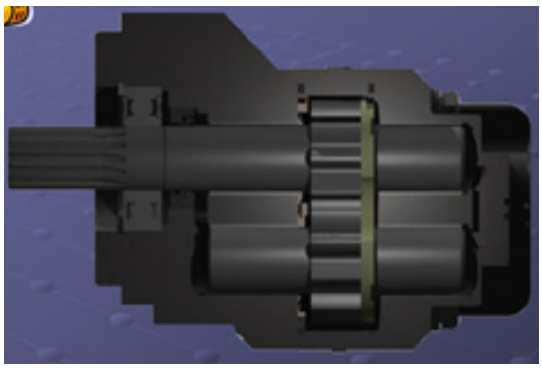
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Technical Data

Hydraulic pumps fixed flow

Table 1: Pumps Fixed Flow	
Model/Referenc	Double pump/P257
Rotation (viewed on end of driveshaft)	Anti-clockwise
Mounting	Classis (driveshaft driven)
Theoretical displacement:	cc/rev
Pump section 1 (mounting flange end)	40
Pump section 2	25
Flow at 2200 rev/min and system pressure (90% min displacement)	Liters/min
Pump section 1 (mounting flange end)	79.2
Pump section 2	49.5
Maximum speed @ pressure P1	2400 rev/min
Minimum speed @ pressure P1	800 rev/min
Approximate Weight	24kg
Pumps Fixed Flow	
Model/Reference	Double pump/JHP2040/2025
Rotation (viewed on end of driveshaft)	Anti-clockwise
Mounting	Classis (driveshaft driven)
Theoretical displacement:	cc/rev
Pump section 1 (mounting flange end)	40
Pump section 2	25
Flow at 2200 rev/min and system pressure (90% min displacement)	Liters/min
Pump section 1 (mounting flange end)	79.2
Pump section 2	49.5
Maximum speed @ pressure P1	2400 rev/min
Minimum speed @ pressure P1	800 rev/min
Approximate Weight	24kg

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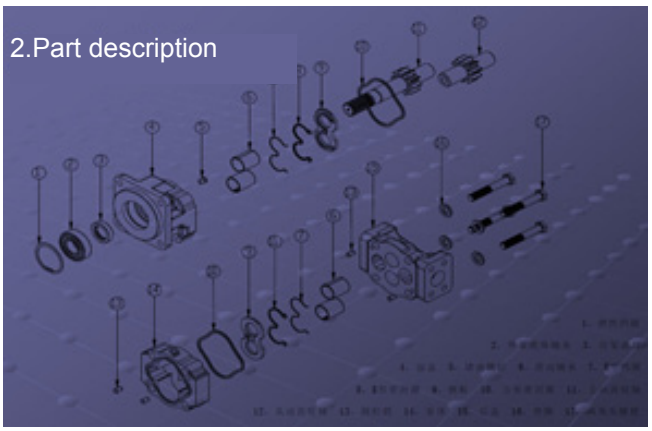


Fig. 1.1

Safety valve pressures

Loader valve - fixed flow

	MPa
Main Safety valve (M.R.V.) Unloader Valve	23.5-24.5
Auxiliary Safety valves (A.R.V.)	20.2 -21.2

Component Key:

1 Arms lift service
2 bucket service
3 Auxiliary (optional)
4 Pump section 1 - inlet
5 Pump section 2 - inlet
6 Pressure test port
7 Unloader Installation
8 Unloader solenoid
9 Auxiliary safety valve
10 Tank port
11 High pressure carry-over (HPCO) port
12 Service ports
13 Load hold check valve assemblies
14 Data plate

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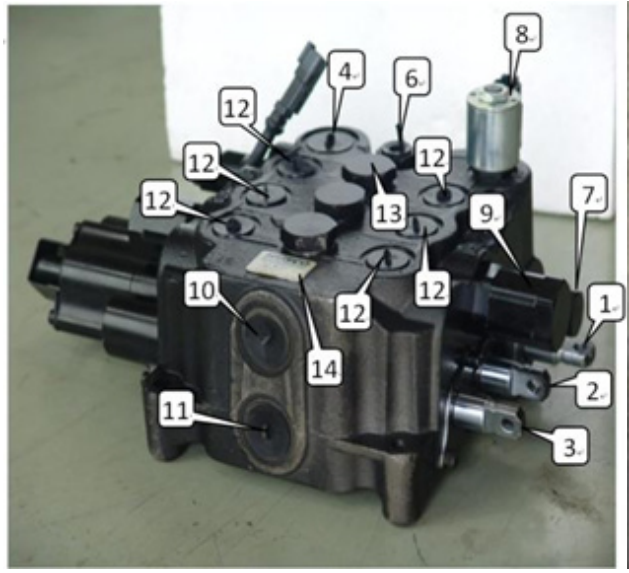


Fig. 1.2

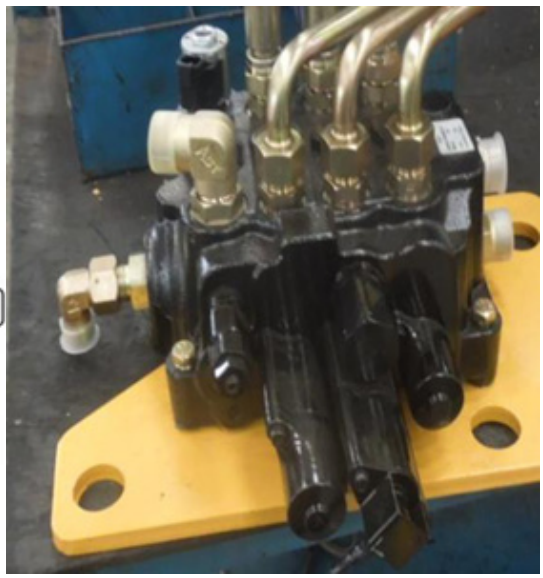


Fig. 1.3

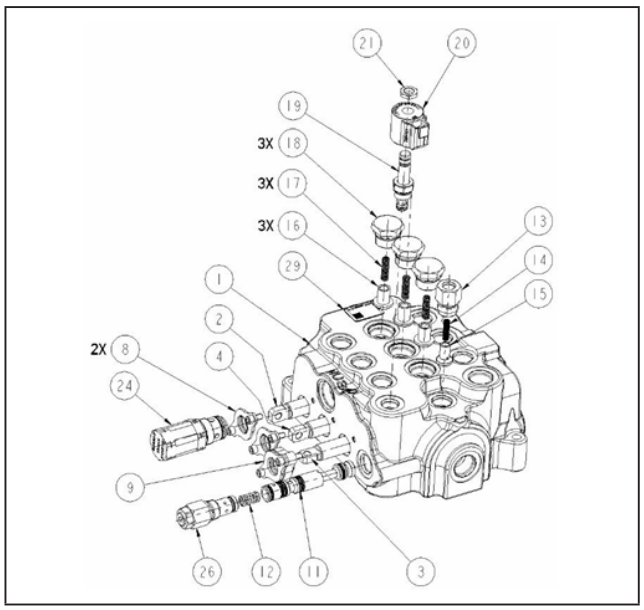
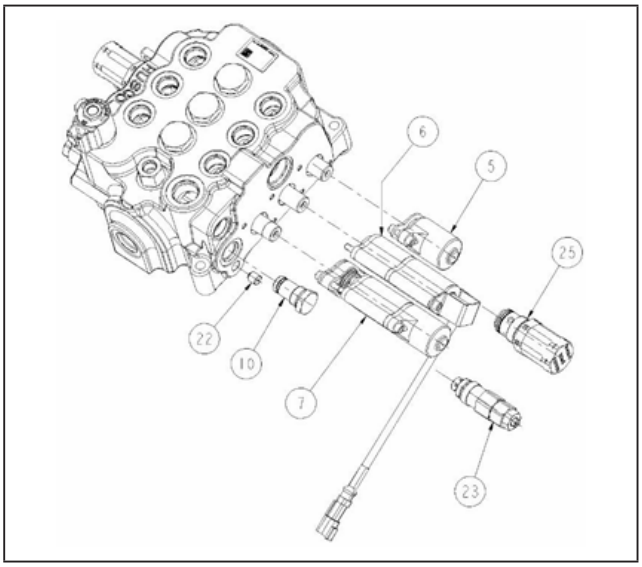


Fig. 1.4

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EXPLODED VIEW FOR PARTS ASSEMBLED ON 6600-C41 CONTROL VALVE

BILL OF MATERIAL FOR PARTS ASSEMBLED ON 6600-C41 CONTROL VALVE

ITEM No.	DESCRIPTION	Qty	REMARKS
1	Housing-Valve	1	
2	Spool	1	
3	Spool	1	
4	Spool	1	
5	Spool End Group	1	Torque to 7 ± 1 Ft. Lbs. (9.5 ± 1.0 N•m) .
6	Detent Group- Magnetic	1	Torque to 7 ± 1 Ft. Lbs. (9.5 ± 1.0 N•m) .
7	Spool End Assy.- Detent	1	Torque to 7 ± 1 Ft. Lbs. (9.5 ± 1.0 N•m) .
8	Seal Plate Group	2	Torque to 7 ± 1 Ft. Lbs. (9.5 ± 1.0 N•m) .
9	Seal Plate Group	1	Torque to 7 ± 1 Ft. Lbs. (9.5 ± 1.0 N•m) .
10	Plug Assy.-SAE, Special	1	Torque to 60 ± 6 Ft. Lbs. (81 ± 8 N•m) .
11	Spool-Unloader	1	
12	Spring	1	
13	Plug Assy.- Adapter	1	Torque to 60 ± 6 Ft. Lbs. (81 ± 8 N•m) .
14	Spring	1	
15	Poppet-C.V.	1	

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BILL OF MATERIAL FOR PARTS ASSEMBLED ON 6600-C41 CONTROL VALVE (Continued)

ITEM No.	DESCRIPTION	Qty	REMARKS
16	Poppet-C.V.	3	
17	Spring	3	
18	Plug Assy.-C.V.	3	Torque to 90 ± 9 Ft. Lbs. (122 ± 12 N•m) .
19	Body-Solenoid	1	Torque to 20 Ft. Lbs (27 N•m) .
20	Coil-Solenoid	1	
21	Nut-Special	1	Torque to 5 Ft. Lbs. (6.8 N•m)
22	Plug-Avseal	1	
23	Safety valve Assy.**	1	Torque to 33 ± 3.5 Ft. Lbs. (44.7 ± 4.7 N•m)
24	Safety valve Assy.**	1	Torque to 48 ± 5 Ft. Lbs. (65 ± 6.8 N•m) .
25	Safety valve Assy.**	1	Torque to 48 ± 5 Ft. Lbs. (65 ± 6.8 N•m) .
26	Unloader Pilot Assy.**	1	Torque to 25 ± 2.5 Ft. Lbs. (34 ± 3.4 N•m) .

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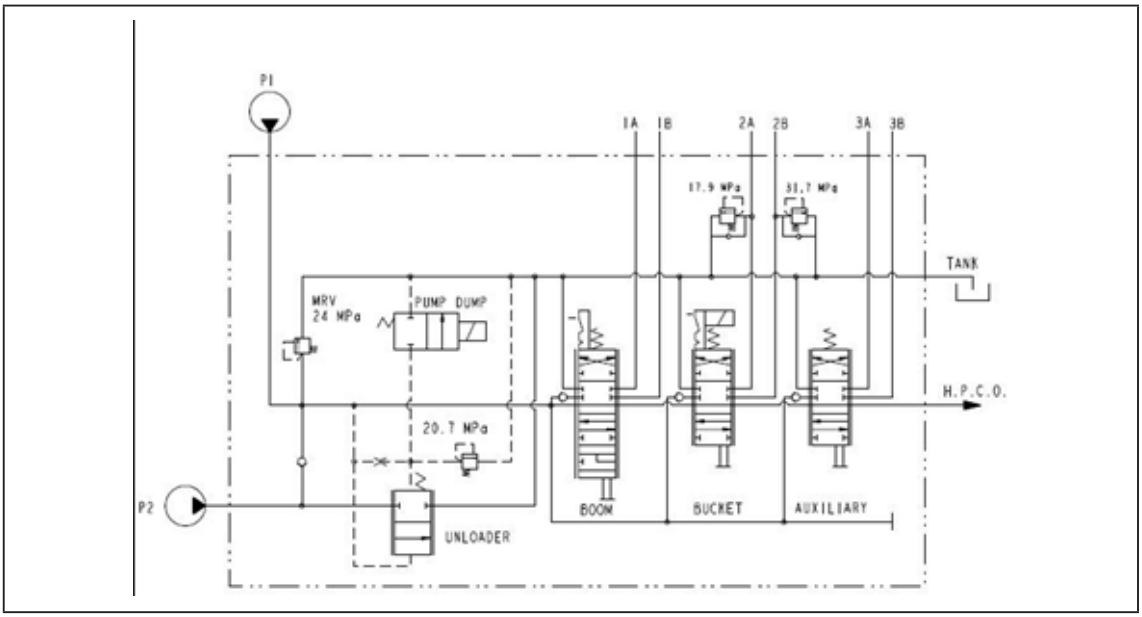


Fig. 1.5

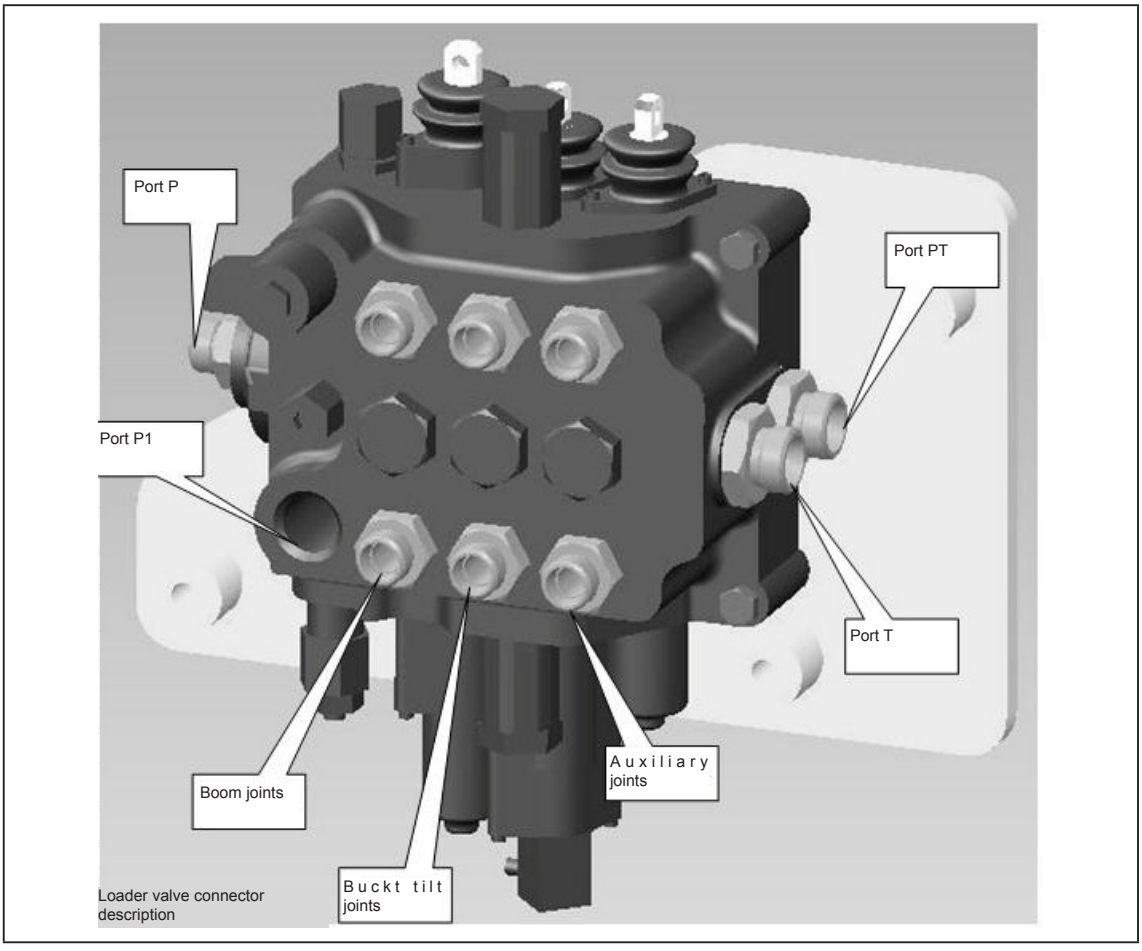


Fig. 1.6

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Loading valve connector description

Loader	
Bucket Ram Head Side	17.4 -18.4
Bucket Ram Rod side	31.2-32.2
Weight	25kg -3 spool

Excavator valve - fixed flow

Component Key:

1 Bucket
2 Dipper
3 Stabiliser
4 Stabiliser
5 Boom
6 Slew
7 Auxiliary safety valve
8 Tank port
9 High pressure carry-over (HPCO) port
10 Service ports
11 Load hold check valve assemblies
12 Make-up check valve installation
13 Inlet port
14 Hydraclamp solenoid

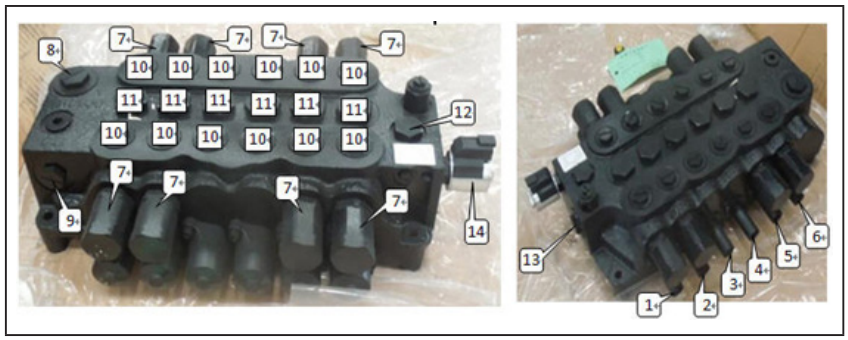


Fig. 1.7

Boom Ram Head Side	25.2 – 25.8
Boom Ram Rod Side	34.2 – 34.8
Bucket Ram Head Side	31.4 – 32.0
Bucket Ram Rod Side	25.2 – 25.8
Dipper Ram Head Side	25.2 – 25.8

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Dipper Ram Rod Side	25.2 – 25.8
Slew Left and Right	26.6 – 27.2
Weight	46 kg

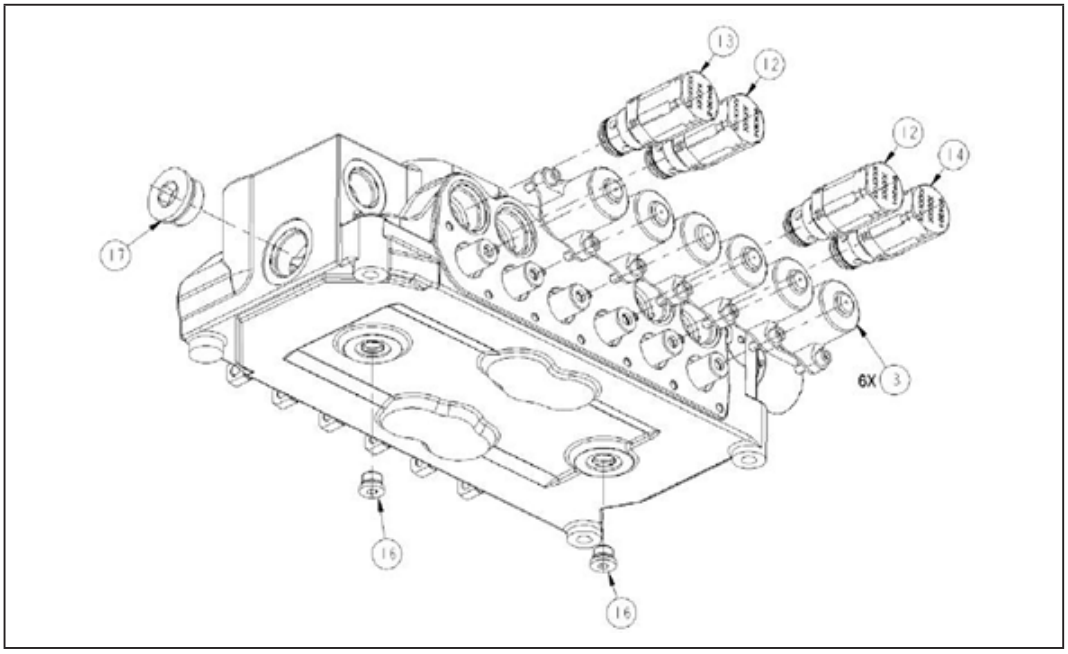


Fig. 1.8

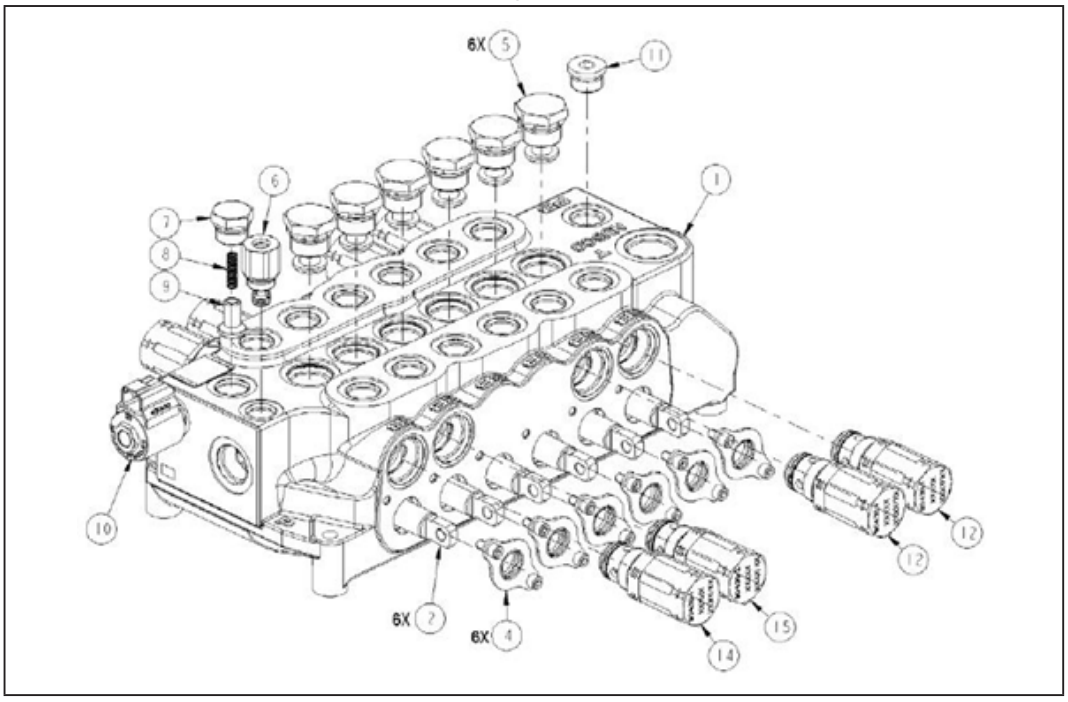


Fig. 1.9

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ITEM No.	DESCRIPTION	Qty.	REMARKS
1	Housing-Valve	1	
2	Spool	6	
3	Spool End Group	6	Torque to 7 ± 1 Ft. Lbs. (9.5 ± 1.0 N•m)
4	Seal Plate Group	6	Torque to 7 ± 1 Ft. Lbs. (9.5 ± 1.0 N•m)
5	Check Valve Assy.	6	Torque to 60 ± 6 Ft. Lbs. (122 ± 12 N•m)
6	Clamp Valve Assy.	1	Torque to 33 ± 3.5 Ft. Lbs. 45 ± 5 N•m)
7	Plug Assy.-SAE	1	Torque to 90 ± 9 Ft. Lbs. (122 ± 12.2 N•m)
8	Spring	1	
9	Poppet-C.V.	1	
10	Solenoid Cartridge Valve	1	Torque to Body 20 Ft. Lbs. (27.1 N•m) Torque to Nut 5 Ft. Lbs. (6.8 N•m)
11	Plug Assy.-SAE	1	Torque to 48 ± 5 Ft. Lbs. (65 ± 6.8 N•m)
12	Safety valve Assy.**	4	Torque to 48 ± 5 Ft. Lbs. (65 ± 6.8 N•m)
13	Safety valve Assy.**	1	Torque to 48 ± 5 Ft. Lbs. (65 ± 6.8 N•m)
14	Safety valve Assy.**	2	Torque to 48 ± 5 Ft. Lbs. (65 ± 6.8 N•m)
15	Safety valve Assy.**	1	Torque to 48 ± 5 Ft. Lbs. (65 ± 6.8 N•m)
16	Plug Assy.-SAE	2	Torque to 18 ± 2 Ft. Lbs. (24.40 ± 2.71 N•m)
17	Plug Assy.-SAE	1	Torque to 105 ± 11 Ft. Lbs. (142.36 ± 14.91 N•m)

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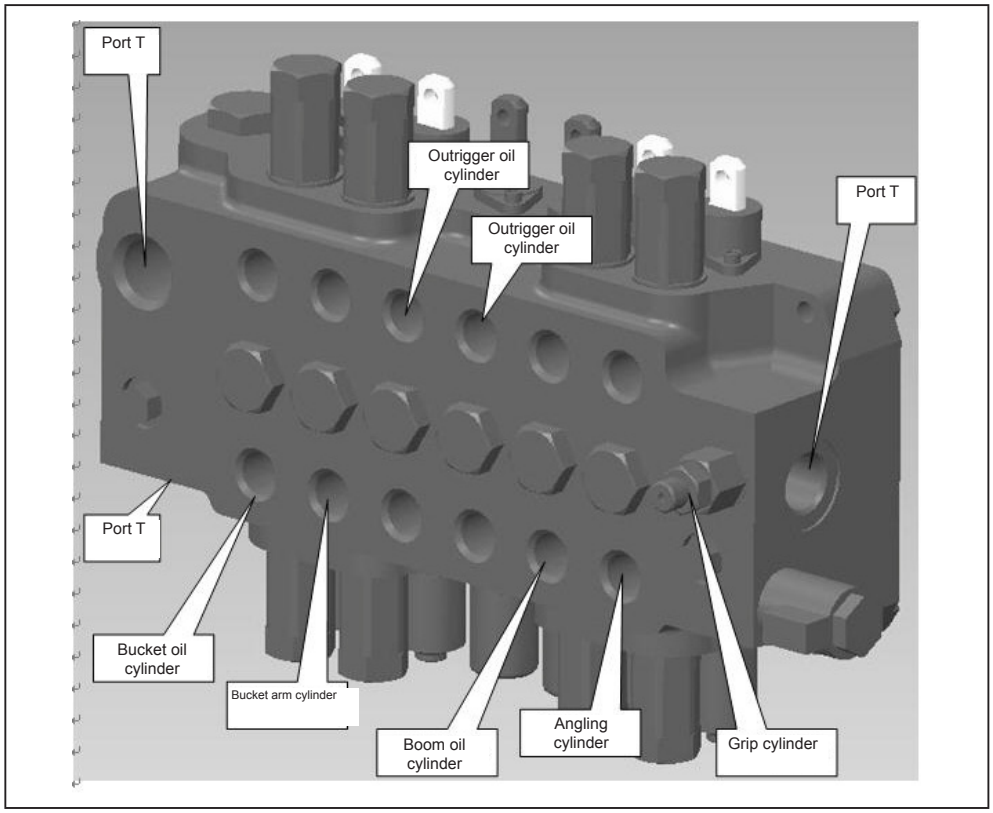


Fig. 1.10

Backhoe valve connector description

Auxiliary valve - fixed Flow

Safety valve Pressures

Component Key:

1 Auxiliary Spool
2 inlet port
3 Outlet port
4 Auxiliary safety valve
5 Service ‘A’ ports
6 Service ‘B’ ports

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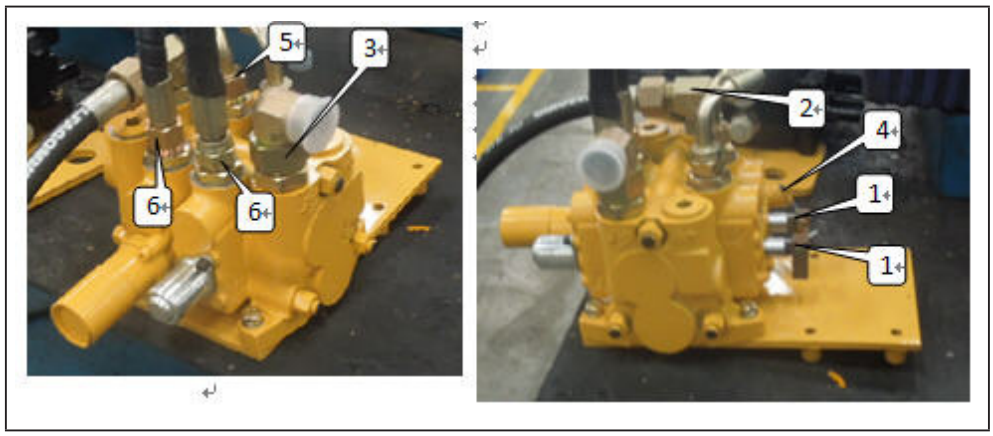


Fig. 1.11

	MPa
Extendable stick Ram Head Side	17-19
Extendable stick Ram Rod Side	17-19
Hammer master	17-19

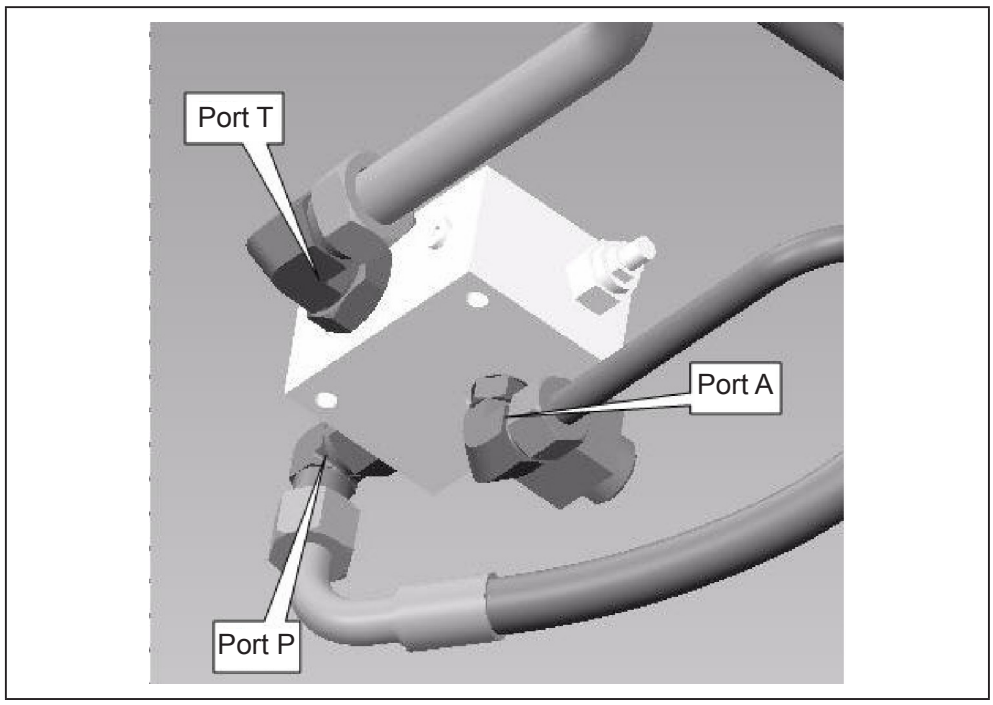


Fig. 1.12
Hydraulic hammer valve (Solenoid valve)

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Fixed Flow Double Pump Neutral Circuit Descriptions

Circuit schematics

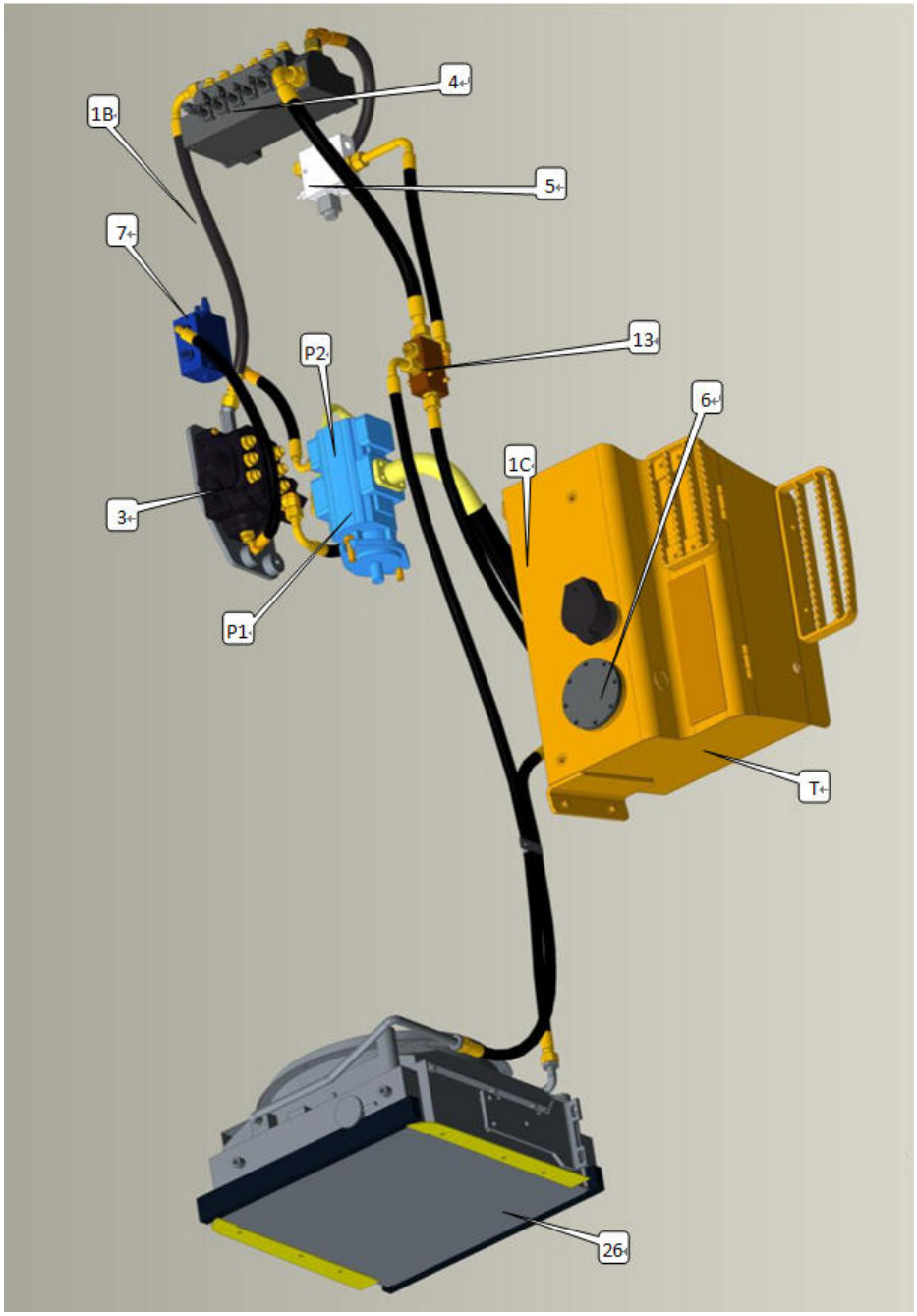


Fig. 2.1

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Fixed flow double pump

Inlet return system assembly and circuit description:

Component Location

Component Key:

T Hydraulic Tank

P1 Hydraulic Pump (main section)

P2 Hydraulic Pump (secondary section)

1B Hose - High Pressure Carry Over

3 Loader Valve Block

4 Excavator Valve

5 Auxiliary Valve

6 Return Line Filter (inside hydraulic tank)

7 Steer Circuit Priority Valve

13 Return Line Check Valve

26 Hydraulic Oil Cooler

62 Hyclraclamp exhaust hose

Neutral Circuit Description

Fixed Flow Double Pump

Oil is drawn from the hydraulic tank T by the hydraulic pump. The pump has two sections P1 and P2

The hydraulic pump is mounted on the rear of the gearbox and is driven by the engine via a driveshaft

Oil from the larger section P1 flows direct to the loader valve 3.

Oil from pump section P2 flows to steering priority valve 7 and in neutral circuit flows through the priority valve to join the flow from P1 at the loader valve.

From the loader valve neutral gallery oil flows via a high pressure carry-over line 1B to the excavator valve 4

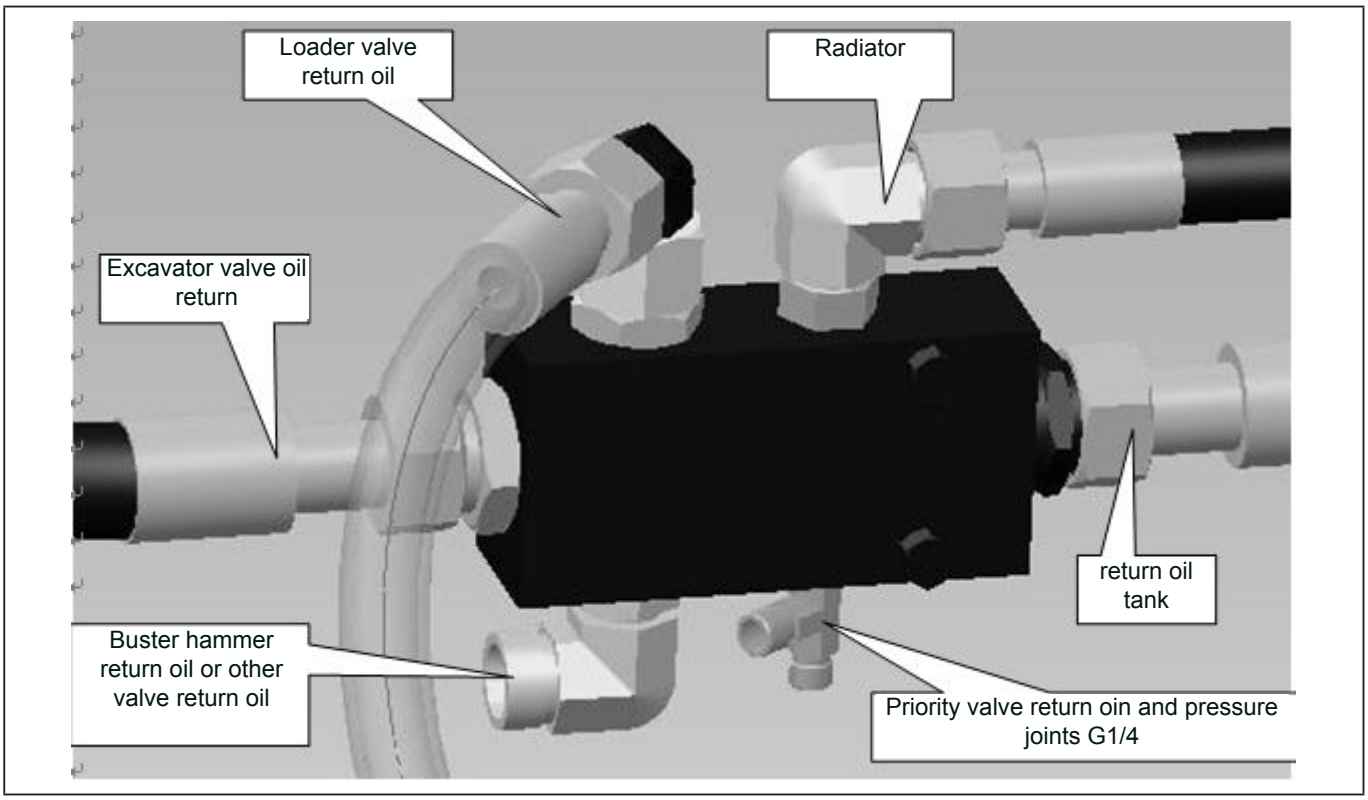
Some of the exhaust oil flows directly back to the tank through an in tank filter 6 and some of the exhaust oil returns to tank via the hydraulic oil cooler 26.

To help prevent excavator dipper ram and loader lift ram cavitation, there is a check valve 13 fitted to the return line. The check valve raises approximately 5 bar of pressure in the line which improves the operation of the respective anti-cavitation valves

On sideshift machines only hydraclamp exhaust hose 62 is fitted. The hose connects the hydraclamp spool directly into the exhaust circuit.

This prevents the clamps from ‘locking-up’ when the sideshifting operation is required

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Return valve block connector description

Fig. 2.2

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766A/777A circuit descriptions

Circuit Schematics - Fixed Flow

766A

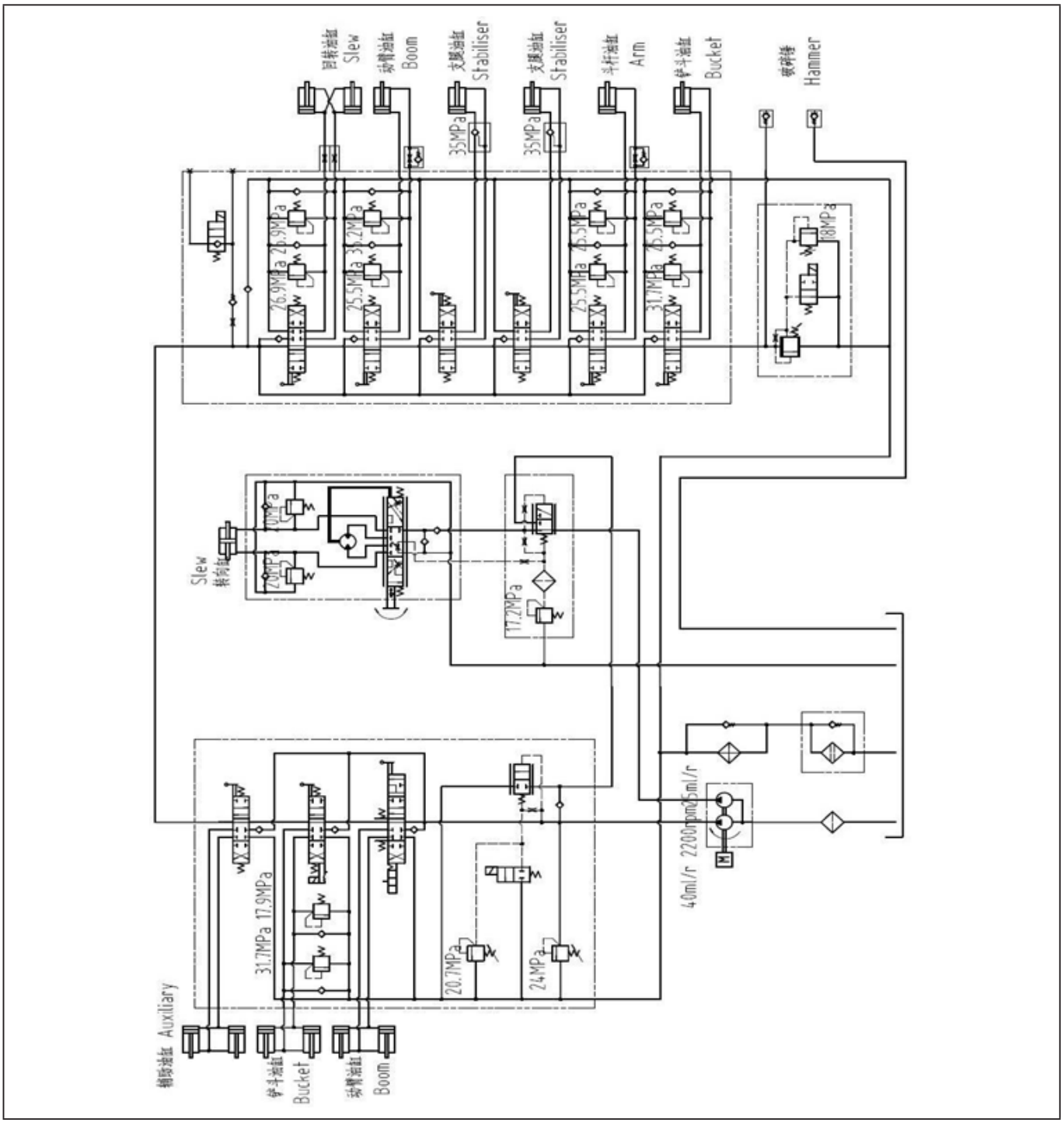
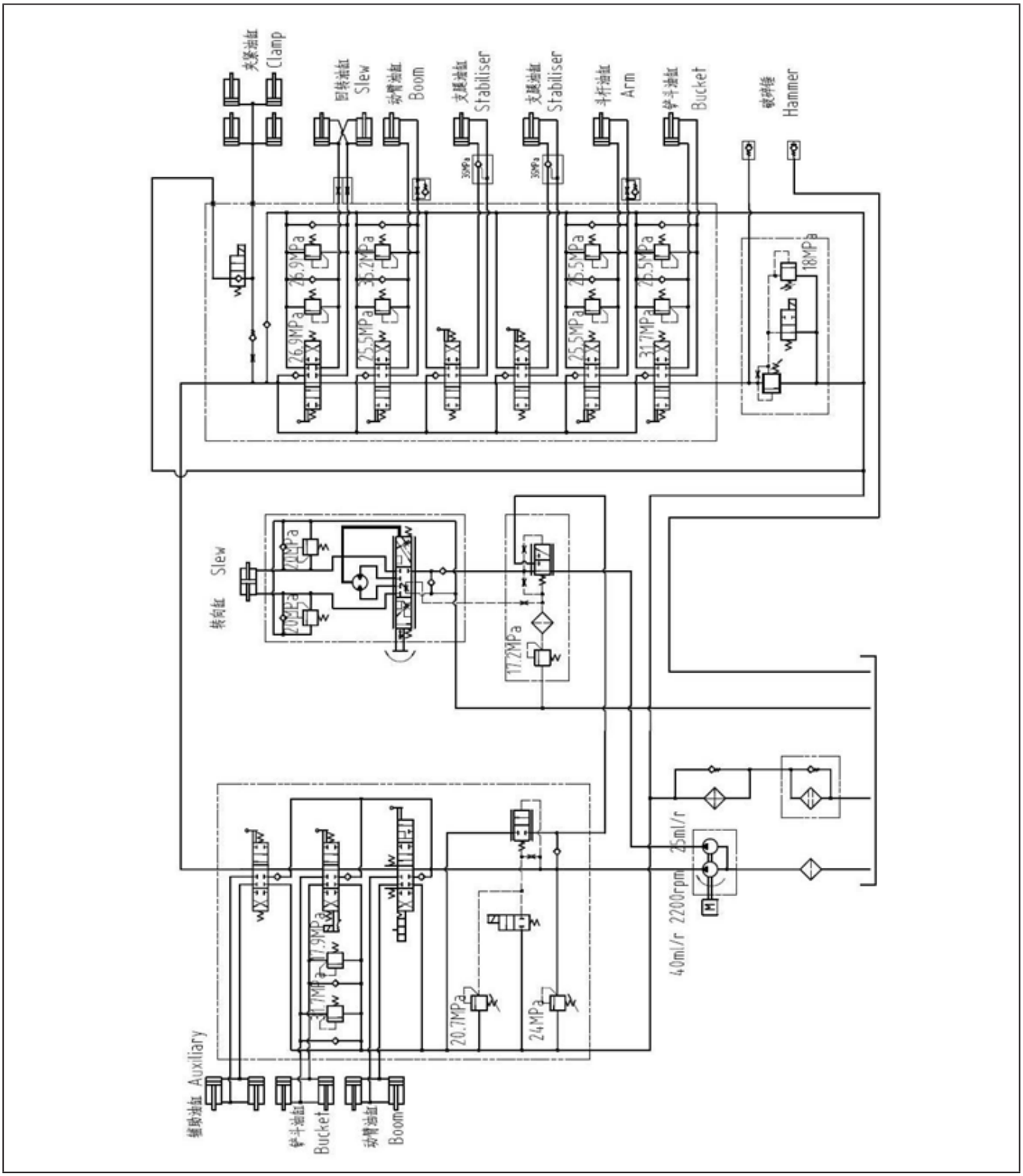


Fig. 2.3

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Circuit Schematics - Fixed Flow

777A Fig. 2.4

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Fault Finding

Hydraulic system

Fixed Flow

Introduction

1. Lack of power in all hydraulic functions
2. All hydraulic rams slow to operate
3. One hydraulic service fails to operate or is slow to operate
4. A spool is sticking
5. Leaking Oil Seal
6. Ram creep
7. Hydraulic oil becomes too hot

The purpose of this section is to help you trace hydraulic faults to a faulty unit (valve actuator ram etc) . Once you have traced the faulty unit refer to the appropriate removal inspecting and test instructions given elsewhere in the hydraulics section

Fault	Probable Cause	Action
Lack of power in all hydraulic function	Insufficient hydraulic fluid	Check for leaks and top up as required
	Hydraulic leaks in system	Check hoses ,replace as required
	Engine performance	Check engine performance ,see gearbox section for stall speed test procedures
	Main safety valve setting incorrect	Check and adjust as required
	Low pump flow	Check pump flow ,if required service or replace pump
	Hydraulic tank breather	Clean or replace the breather
	Tank filter by pass valve	Check condition or hydraulic filter
	Unloader valve pressure setting too high	Check pressure setting of the unloader valve

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Fault	Probable Cause	Action
All hydraulic rams slow to operate	Neutral circuit or low pressure lines leaking, damaged, trapped or kinked	Check pipe lines and replace as required
	Low pump flow	Check pump flow, if required service or replace pump
	Priority valve operating	Check if the priority valve is sticking, rectify as required
	Main safety valve setting incorrect	Check and adjust as required
	Unloader valve	Check if unloader valve is sticking
	Tank filter by pass valve	Check condition of hydraulic filter
	Hydraulic tank breather	Clean or replace the breather

Fault	Probable Cause	Action
One hydraulic service fails to operate or is slow to operate	Associated service pipe lines, leaking damaged, trapped or kinked	Check hoses replace as required
	Associated ram leaking	Complete ram leakage check replace seals as required
	Auxiliary safety valve (ARV) setting incorrect	Check and adjust as required
	Associated valve block section leaking or not operating	Check for leaks, rectify as required. Also, see fault 6 Leaking Oil Seal
	Check valve malfunctioning	Test check valve, rectify as required
	Piston rod is bent	Replace piston rod, check pressure setting of MRV and ARV. Check that associated pivot pins are adequately greased

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Fault	Probable Cause	Action
The engine tends to stall when hydraulics are under load.	M.R.V setting incorrect	Check and adjust as required
	Poor engine performance	Check engine performance see gearbox section for stall speed test procedures
	Unloader valve pressure setting too high	Check pressure setting of the unloader valve

Fault	Probable Cause	Action
A spool is sticking	Oil temperature abnormally high	Check for correct fluid. Check oil cooler and grille for blockage
	The hydraulic fluid is dirty	Clean the tank strainer. If strainer badly clogged, drain and flush hydraulic system Fill with clean hydraulic fluid
	The service pipe connection is over tightened	Check tightening torque
	The valve housing was twisted during installation.	Loosen retaining bolts and tighten to correct torque figures
	Pressure too high	Check system pressure
	A control linkage is bent	Disconnect the linkage. Repair the linkage if possible, or fit a new one
	A spool is bent	Remove the control valve. Renew spool as necessary
	A return spring is broken	Renew as necessary
	A return spring or cap is out of alignment	Remove the cap, check that the spring is in the correct position. Refit cap and torque tighten bolts
	Temperature distribution within control valve not uniform	Warm the entire system up before using service

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Fault	Probable Cause	Action
Leaking Oil Seal	Paint or dirt on the seal face	Remove the seal and clean
	The back pressure in the valve circuit is excessively high	Check circuit pressures adjust if possible. Otherwise investigate thoroughly
	Spool damaged	Remove. Inspect all parts. Renovate or renew as necessary
	The seal is not secured	Clean the seal and tighten the retaining bolts to the correct torque
	The seal is cut or damaged	Fit a new seal

Fault	Probable Cause	Action
Ram creep	Associated ram or pipe lines from ram leaking	Check and rectify as required
	Check valve malfunctioning	Test check valve, rectify as required
	Associated valve section spools leaking	Rectify, check for contamination
	Associated ARV leaking	Rectify, check for contamination

Fault	Probable Cause	Action
Hydraulic oil becomes too hot	Oil cooler obstructed	Remove debris from cooler fins
	Restriction in neutral circuit lines	Check hoses, replace as necessary
	Hydraulic filter clogged and by pass valve not working	Check hydraulic filter

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Hydraulic contamination

Hydraulic fluid quality

Construction machinery uses a large volume of fluid in the hydraulic system for power gearbox equipment lubrication rust prevention and sealing

According to a survey conducted by a pump manufacturer seventy per cent of the causes of problems in hydraulic equipment were attributable to inadequate service of the quality of the hydraulic fluid

Therefore it is obvious that control of the quality of the hydraulic fluid helps prevent hydraulic equipment problems and greatly improves safety and reliability. Furthermore from an economic angle it extends the life of the hydraulic fluid if quality

Effects of contamination

Once inside the system, hydraulic circuit contaminants greatly effect the performance and life of hydraulic equipment. For example contaminants in a hydraulic pump develop internal wear to cause internal leakage and hence lower discharges. Wear particles generated will circulate with the hydraulic fluid to cause further deterioration in the performance of this and other equipment

Contaminants also enter principal sliding sections of the equipment causing temporary malfunction scuffing sticking and leakage and can lead to major problems

The main contaminants can be classified as follows:

1. Solid Particles - sand fibres metallic particles welding scale sealing materials and wear particles etc
2. liquid - usually water and incompatible oils and greases
3. Gases - Air, sulphur dioxide etc. which can create corrosive compounds if dissolved in the fluid
   These contaminants can appear during manufacture assembly and operation

Cleaning Operation

The purpose of cleaning oil is to remove contaminants of all types and sludge by filtering hydraulic fluid through a cleaning unit, as illustrated or similar.

Procedure

Connect the cleaning unit in place of the hydraulic filter and run the system for sufficient time to pump all the hydraulic fluid through the unit. Disconnect the cleaning unit and reconnect the filter. Top up the system with clean hydraulic fluid as required.

Contaminant standards

Dirt that damages your system is in many cases too small to be seen with the eye. The particle size is measured in microns.

1 micron = 0.001mm (0.0000394 in)

Listed below are a few typical comparisons:

Red Blood Cell = 8 microns (0.008 mm 0.000315 in)

Human Hair = 70 microns (0.07 mm 0.00275 in)

Grain of Salt = 100 microns (0.1 mm 0.00394 in)

Smallest particle visible to the naked eye is 40 microns (0.00157) approximately.

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Standards will often be quoted to ISO for which literature can be obtained

Filters

The filter assembly fitted to all product ranges is designed to filter all the contamination that is generated through use to the required level of cleanliness. The filter must be serviced to the requirements of the machineService Schedules

To ensure optimum performance and reliability it is important that the machines hydraulic system is serviced periodically in accordance with the manufacturers requirements.

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Hydraulic Service Tools and Test

Hydraulic service tools



Fig. 4.1



Fig. 4.2



Fig. 4.3



Fig. 4.4



Fig. 4.5

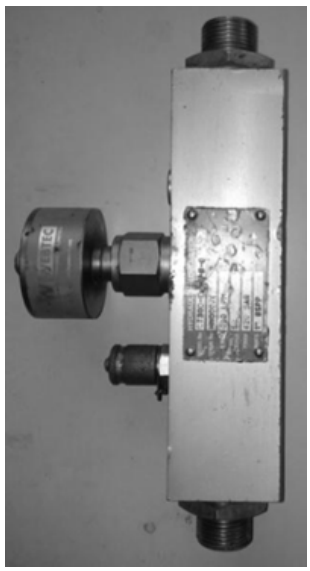


Fig. 4.6

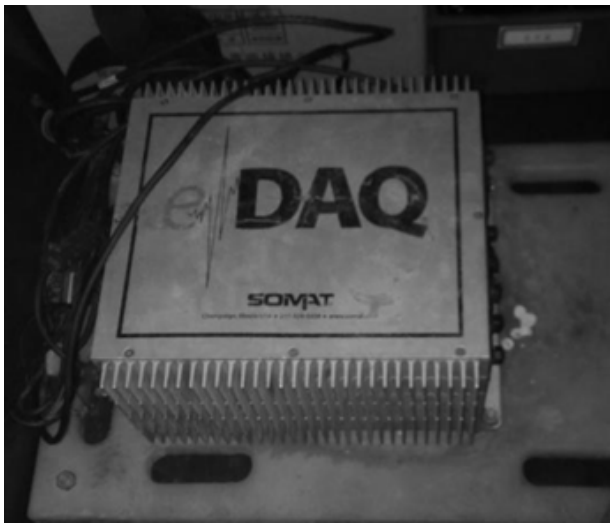


Fig. 4.7

Fig. 4.1	Tee, used for pressure test
Fig. 4.2	Pressure joint
Fig. 4.3	Pressure gage
Fig. 4.4	Pressure pipeline
Fig. 4.5	Transition joint
Fig. 4.6	Flow sensor
Fig. 4.7	Precise flow and pressure multifunction tester

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Flow and pressure test

Fixed Flow Pumps

Flow and pressure test

Before removing the pump it is necessary to determine the source of any problem by measuring the output flow at system pressure from both of the pump outlet ports

To check flow it is necessary to fit flow meter into the output line of each pump section in turn. If available load valve should also be installed (see Note 1) . Make sure the flow meter is installed with its arrow pointing away from the pump and , if applicable , located between the pump and the load valve

Note 1: If no load valve is available, ignore the references to the load valve in Fitting/Removing a Flow Meter and Load Valve below. An alternative method of determining flow is included in the Check Flow procedures following.

Fitting/removing a flow meter and load valve

Before fitting/removing a flow meter and load valve , switch off the machine and operate the loader/excavator controls a few times to vent system pressure

⚠ Warning

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hose, stop the engine and operate the controls to release pressure trapped in the hoses. Make sure the engine cannot be started while the hoses are open.

⚠ Warning

Take care when disconnecting hydraulic hoses and fitting as the oil will be HOT

Fitting

a Pump section 1 - Pipeline A is connected with tee and attached with pressure joint which could connect with pressure gauge, if flowmeter needs to be connected, please remove pipeline A, and connect flowmeter and sensor.

b Pump section 2 - Pipeline B is in pressure test and needs to be connected with pressure joint; if flowmeter needs to be connected, please remove pipeline B, connect flowmeter and sensor.

Removing

Removing is the reverse of fitting

Checking flow

Check the setting of the Main Safety valve as described in Loader Valve, Pressure Testing. Adjust if necessary.

1. a Using a load valve- fit a flow meter and load valve, as described in Fitting, to each pump outlet in turn. Fit a 0-400 bar pressure gauge to the load valve pressure test connector
2. b If no load valve is available - fit a flow meter , as described in Fitting , to each pump output in turn.
3. Start the engine and bring the hydraulic up to working temperature 50˚C Set the engine speed to 2200rpm.
4. a Using a load valve- adjust the load valve so that the pressure gauge reading is just below the MRV SET-

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TING
b If no load valve is available- raise or lower the loader arms until the rams are fully open or closed . Continue to operate the raise/lower control so that system pressure builds up .Watch the flow meter and note its reading at the moment the MRV operates.

5. The flow reading should be as listed in Technical Data.

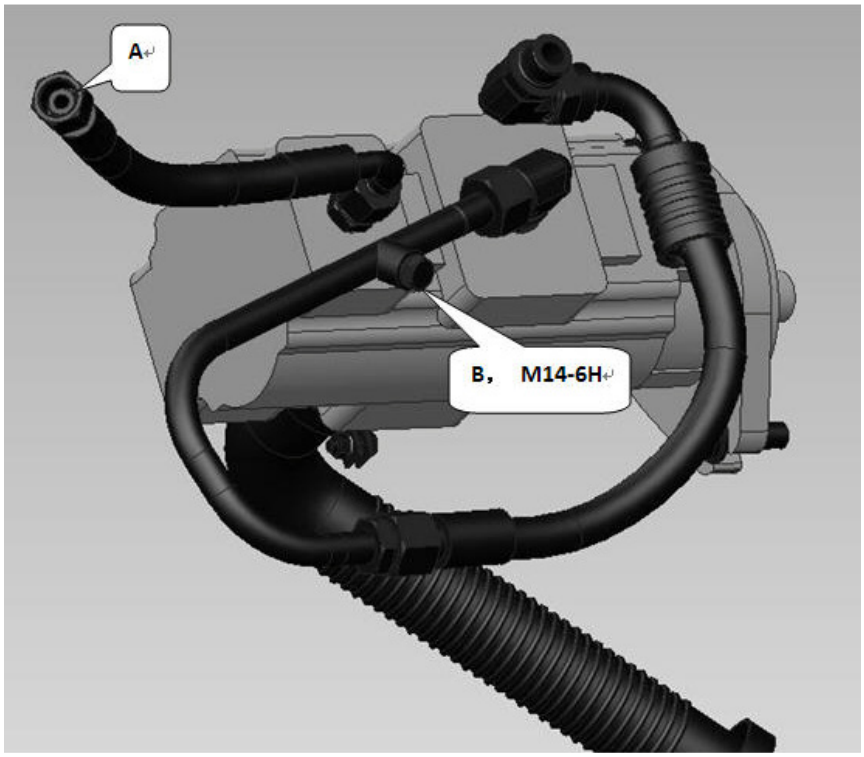


Fig. 4.8

Hammer and extended arm valve pressure test

Make sure that the hydraulic oil is at working temperature,50℃

Lower the backhoe bucket and loader shovel to rest on the ground; stop the engine; operate the control levers to vent residual hydraulic pressure

1. Connect a 0 - 400 bar) pressure gauge to pressure test connector Y on the loader valve
2. With the engine running at 1500 revs/min
3. Open corresponding hydraulic hammer circuit or telescopic bucket rod circuit, to create pressure in relevant circuit; take back auxiliary coupling hammer or telescopic bucket rod, increase auxiliary coupling load or stretched out bucket rod to the end in pressout way.
4. Take the readings of pressure tester at pump outlet B, please refer to hydraulic technical parameters for correct reference valve.

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Loader valve - pressure test

Unloader Valve

Make sure that the hydraulic oil is at working temperature 50˚C

Lower the backhoe bucket and loader shovel to rest on the ground; stop the engine; operate the control levers to vent residual hydraulic pressure

Make sure that the correct unloader valve pressure can be obtained

If the machine has a front-mounted hammer, ensure that the hammer control valve lever is in the “off” position, otherwise the hammer safety valve will operate and prevent unloader valve pressure from being reached.

1. Connect a 0-400bar pressure gauge to pressure test connector Y
2. With the engine running at 1500 revs/min, slowly operate arms raise or lower
   Note 1: The arms raise or lower service is specified because it has no auxiliary safety valve (ARV) . Selecting this service ensures that the pressure vents through the MRV and not an ARV.
3. When the service reaches full travel, return the lever to the neutral position. Select the service again, very slowly, the pressure gauge will rise until a step/kick is seen in the rate of change in the pressure increase. This is the start of unloader operation. Keep selecting the service until a sudden sharp increase in pressure is observed with a change of engine sound , this point is the unloader setting and should be as specified in Technical Date
4. If the pressure is incorrect, slacken locknut and adjust cap E. Turn it clockwise to increase pressure and anti-clockwise to decrease the pressure. When the pressure in correct ,tighten the locknut and check the pressure again. Adjust as required.
   If the correct pressure cannot be achieved, add or subtract shims as required, refer to Loader Valve- Fixed Flow, Removal and Installation- Unloader valve

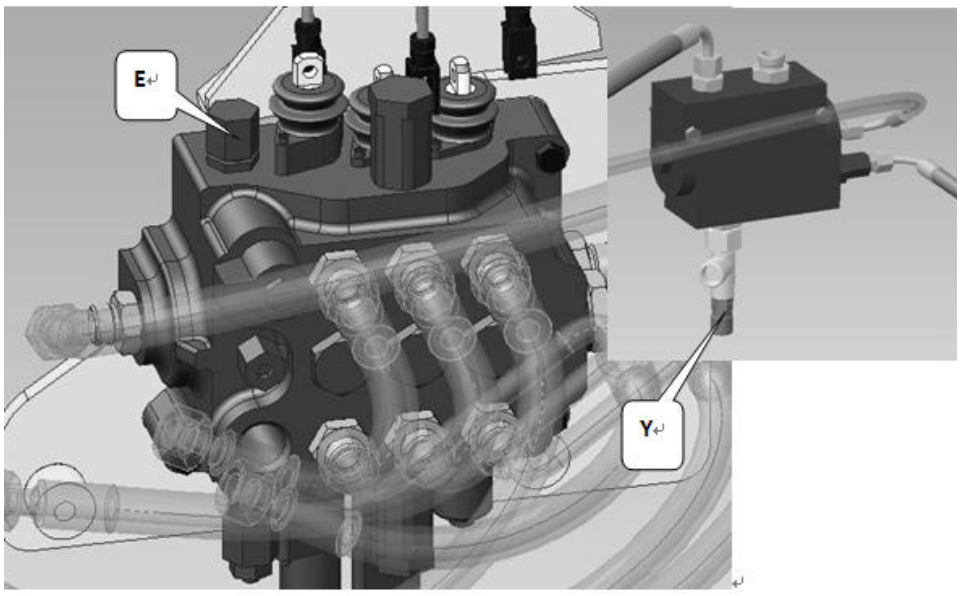
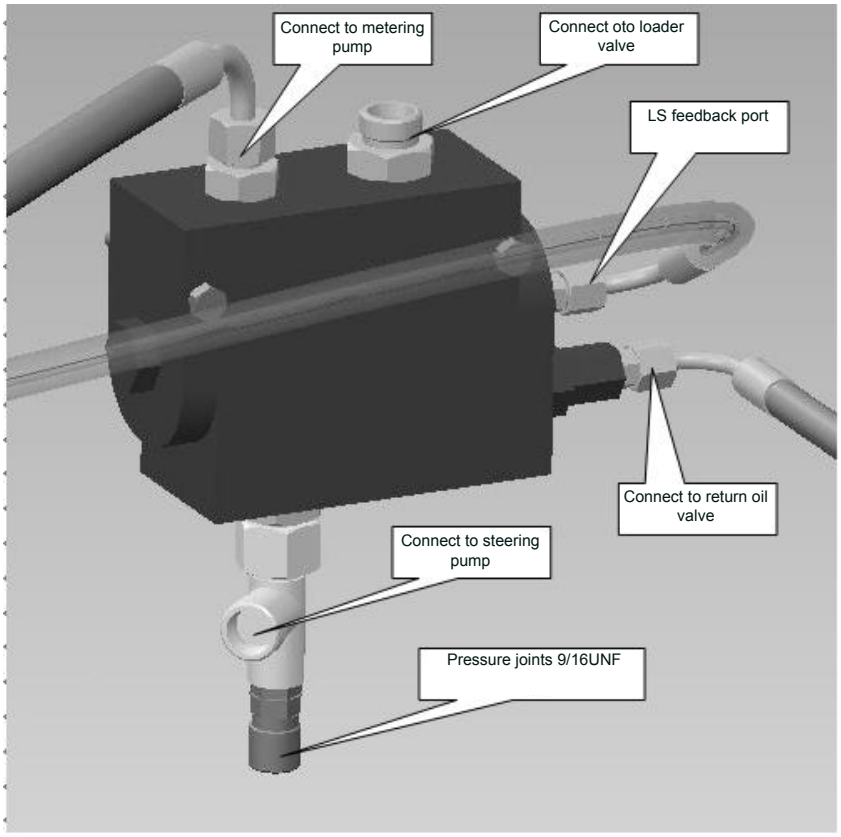


Fig. 4.9

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Steering priority valve Fig. 4.10

Loader valve - pressure test

Auxiliary Relief Valves And Main Relief Vlave- Using Hand Pump

NOTE: The item belongs to profession category, and it must be tested by professional with professional tool. Don't suggest that users or deals test on their own.

Quick release couplings - connecting & disconnecting

Quick release couplings

Flat face quick release couplings allow the operator to remove and install attachments swiftly and efficiently Generally your machine pipe work will have female couplings fitted and the optional attachment hoses will have male couplings fitted

The quick release couplings should be trouble free and relatively easy to connect and disconnect provided they are kept clean and used correctly. The recommendations listed below should always apply when using flat face quick release couplings

Finally please read the correct fitting and releasing procedures before installing or removing any optional attachment fitted with quick release couplings

Quick release couplings - Do's & Don'ts

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Do wipe the two faces of the coupling and make sure they are clean before connecting

Do make sure the outside sleeve is pulled back when disconnecting

Do connect and disconnect a new coupling two or three times to work the PTFE seals - sometimes a new coupling will stick if the seals have not been worked

Do use a spanner on the hexagon flats of the coupling when fitting adaptors

Do use a rubber or hide hammer to disconnect a coupling if it sticks- sticking may occur if there is dirt present in the coupling

Don't attempt to re-connect a damaged half coupling - this will destroy the seals and necessitate replacing both half couplings.

Don't leave the coupling where it may be run over by machine or otherwise crushed- this will distort the coupling sleeve and prevent correct connection and disconnection

Don't clamp on the smooth diameter of the coupling when fitting adaptors - always use the hexagon

Don't try to turn the sleeve when the coupling has been disconnected- the locking ball will wedge underneath the sleeve and destroy the coupling

Don't damage the faces of the coupling - this can prevent connection and disconnection, or damage seals and cause leakage,

Don't try to remove the coupling - they are non serviceable parts, IF a coupling is damaged it should be replaced with a new one.

⚠ Warning

Hydraulic fluid at pressure can injure you. Make the machine safe before connecting or disconnecting quick release couplings; stop the engine and then operate the attachment control a few times to vent residual hydraulic pressure in the attachment hoses

Before connecting or removing any hydraulic hose residual hydraulic pressure trapped in the service hose line must be vented. This is usually achieved by switching off the engine and then operating the attachment control lever several times. Make sure the hose service line has been vented before connecting or removing hoses - refer to the appropriate attachment information in this section

Connecting quick release couplings

1. Remove any residual hydraulic pressure trapped in the service line hose
2. Wipe the two faces of the male and female couplings and make sure they are clean
3. Make sure that ball in the female coupling is located in one of its slots
4. Fit the male coupling into the female coupling; To e sure that the coupling is not accidentally released rotate sleeve half a turn and make sure that the locking ball does not align with the slot
Disconnecting Quick Release Couplings

Remove any residual hydraulic pressure trapped in the service line hose

Align the slot with ball

Pull back sleeve to release the coupling.

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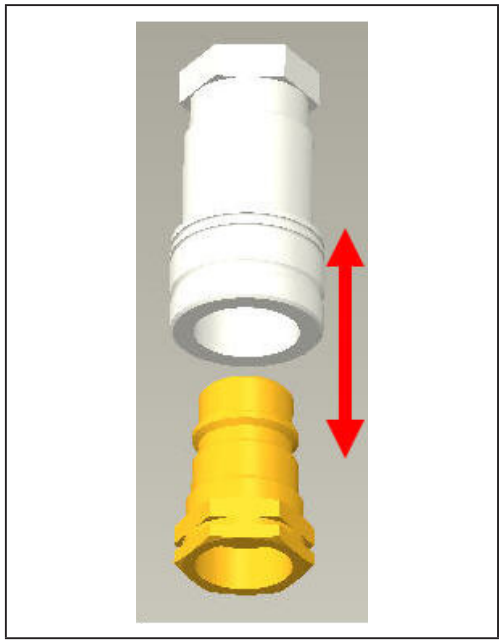


Fig. 4.11

Removal of Hydraulic System Parts

Removal of priority valve

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove right hose of steering priority valve upper end
   Remove right hose of steering priority valve upper end with 30# wrench.



Pack up the connector of hose and steering priority valve with clean plastic bag and tie to prevent foreign matters dropping in.



2. Remove lower hose of steering priority valve
   Remove lower hose of steering priority valve with 30# wrench.

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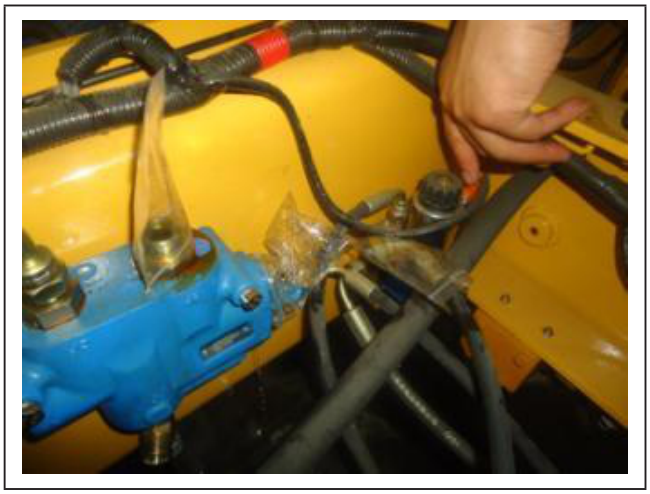
Pack up the connector of hose and steering priority valve with clean plastic bag and tie to prevent foreign matters dropping in.



Pack up the connector of hose and steering priority valve with clean plastic bag and tie to prevent foreign matters dropping in.



3. Remove upper hose of steering priority valve right end
   Remove upper hose of steering priority valve right end with 19# wrench.



4. Remove lower hose of steering priority valve right end
   Remove lower hose of steering priority valve right end with 19# wrench.

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Pack up the connector of hose and steering priority valve with clean plastic bag and tie to prevent foreign matters dropping in.



Pack up the connector of hose and steering priority valve with clean plastic bag and tie to prevent foreign matters dropping in.



5. Remove left hose of steering priority valve upper end
   Remove left hose of steering priority valve upper end with 24# wrench.



6. Remove steering priority valve
   Support steering priority valve by hands, remove two blots and spring washer which connect steering priority valve with frame with 13# wrench, and take down steering priority valve.

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Installation of priority valve

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Installation of steering priority valve
   Place steering priority valve to position of installing, connect steering priority valve and frame by washer and bolt with 13# wrench. Tightening torque is 26±4N•m



2. Install left hose of steering priority valve upper end
   Remove left shield of steering priority valve upper end, observe the hose connected with it to ensure O-Ring of hose intact,



Connect hose with left connector of steering priority valve upper end; do not mix it with other parts, and tighten it with 24# wrench. Tightening torque is 37±2 N•m

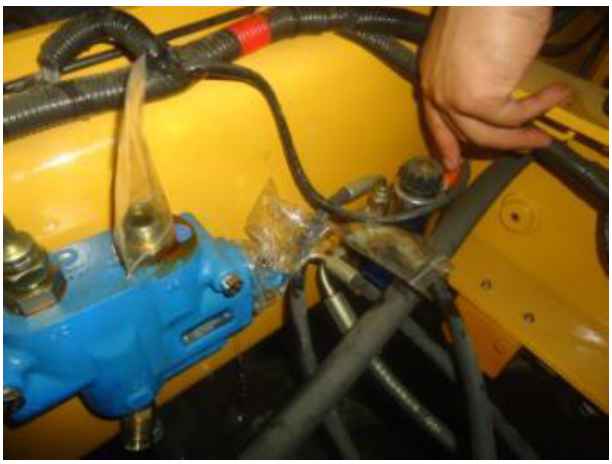


3. Install lower hose of steering priority valve right end
   Remove lower shield of steering priority valve right end, observe the hose connected with it to ensure O-Ring of hose intact,

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Connect hose with lower connector of steering priority valve right end; do not mix it with other parts, and tighten it with 19# wrench. Tightening torque is 16±1N•m



Connect hose with upper connector of steering priority valve right end; do not mix it with other parts, and tighten it with 19# wrench. Tightening torque is 16±1N•m.



4. Install upper hose of steering priority valve right end
   Remove upper shield of steering priority valve right end, observe the hose connected with it to ensure O-Ring of hose intact,



5. Install lower hose of steering priority valve
   Remove shield of steering priority valve lower end, observe the hose connected with it to ensure O-Ring of hose intact,

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Connect hose with lower connector of steering priority valve; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3N•m.



Connect hose with upper connector of steering priority valve right end; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3N•m.





6. Install right hose of steering priority valve upper end
   Remove right shield of steering priority valve upper end, observe the hose connected with it to ensure O-Ring of hose intact,

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Removal of loading valve

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove A/C pipe and water pipe fixed clamp
   Remove four clamps used to fix A/C hose and water pipe by wind trigger with13# sleeve and rod, move A/C hose to other side to make loading valve fully exposed.









2. Remove upper harness connector of loading valve
   Pull out the harness connected left side and

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bottom of loading valve, put connector beside to prevent it being polluted by hydraulic oil.





3. Remove left end hose of loading valve
   Remove left end hose of loading valve with 30# wrench.



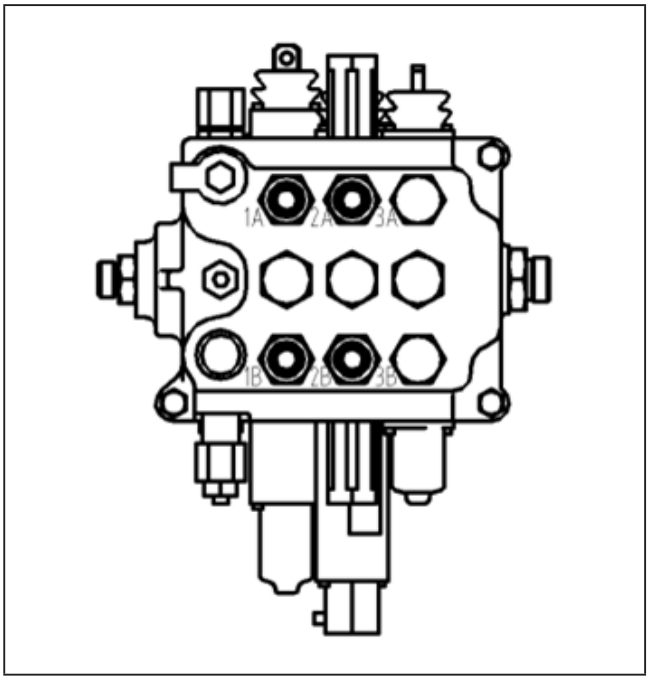
Pack up the connector of hose and loading valve with clean plastic bag and tie to prevent foreign matters dropping in.



4. Remove the first hose from the left at lower side of loading valve front end.
   Remove the first hose from the left at lower side of loading valve front end by 30# wrench.

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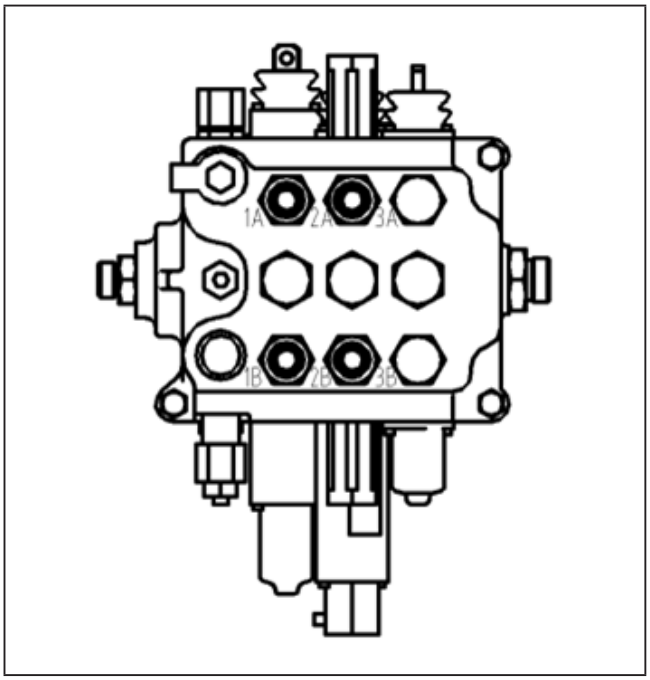
Pack up the connector of hose and loading valve with clean plastic bag and tie to prevent foreign matters dropping in.



5. Remove the third hose from the left at upper side of loading valve front end.
   Remove the third hose from the left at upper side of loading valve front end with 30# wrench.



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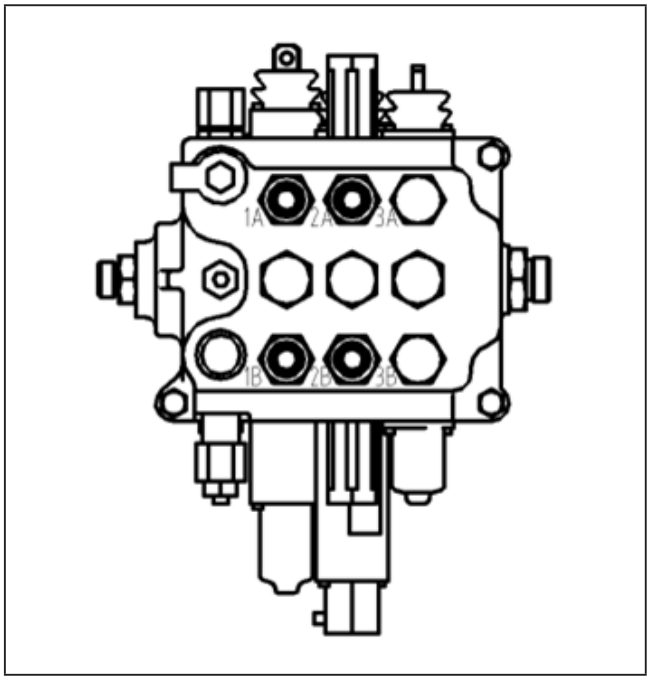


Pack up the connector of hose and loading valve with clean plastic bag and tie to prevent foreign matters dropping in.



6. Remove the second hose from the left at upper side of loading valve front end.
   Remove the second hose from the left at upper side of loading valve front end with 30# wrench.





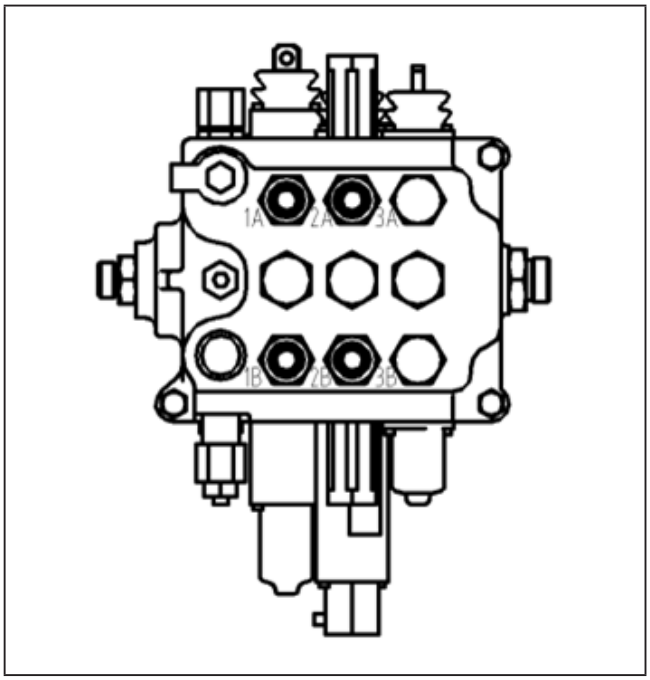
Pack up the connector of hose and loading valve with clean plastic bag and tie to prevent foreign matters dropping in.

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7. Remove the first hose from the left at upper side of loading valve front end.
   Remove the first hose from the left at upper side of loading valve front end with 30# wrench.





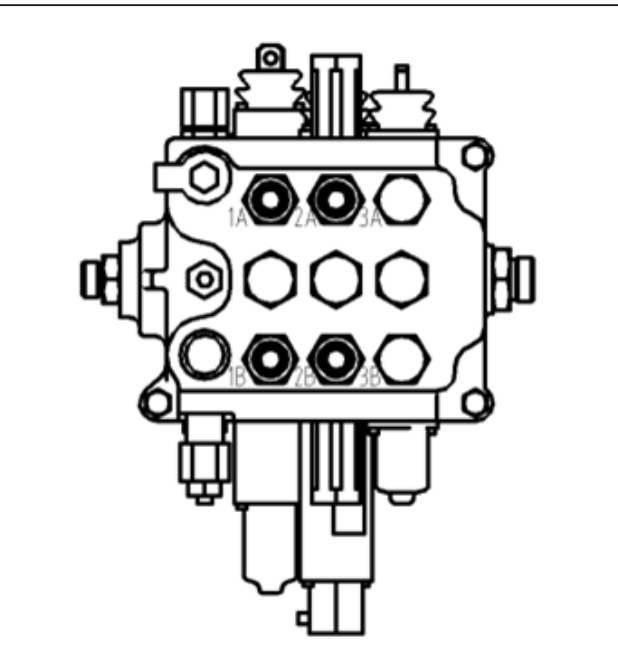
Pack up the connector of hose and loading valve with clean plastic bag and tie to prevent foreign matters dropping in.



8. Remove the fourth hose from the left at lower side of loading valve front end.
   Remove the fourth hose from the left at upper side of loading valve front end with 30# wrench.

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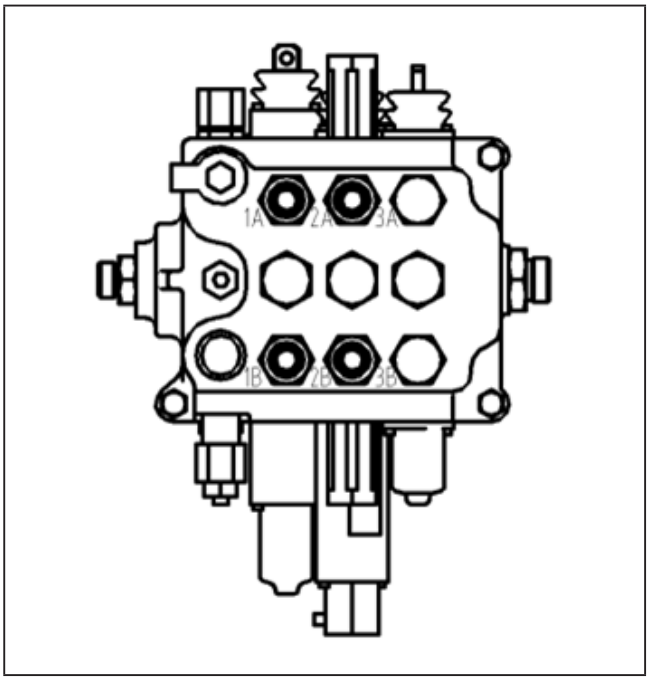
Pack up the connector of hose and loading valve with clean plastic bag and tie to prevent foreign matters dropping in.



9. Remove the third hose from the left at lower side of loading valve front end.
   Remove the third hose from the left at upper side of loading valve front end with 30# wrench.



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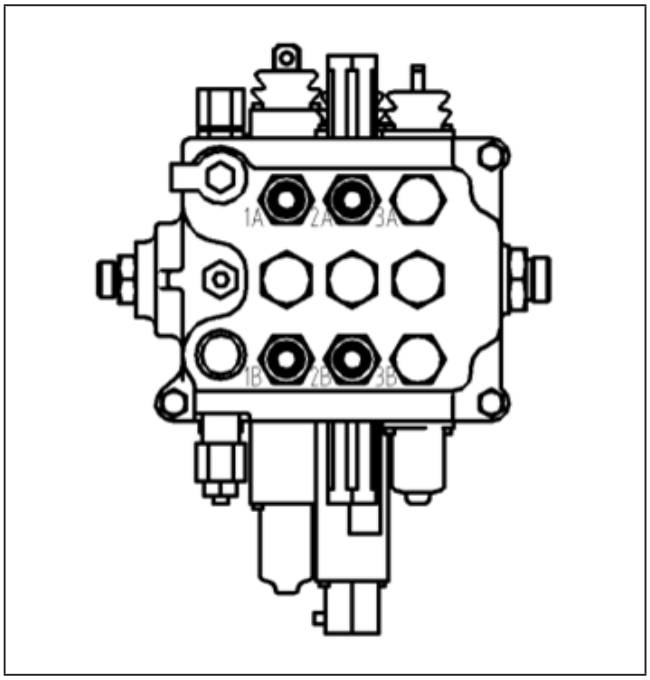


Pack up the connector of hose and loading valve with clean plastic bag and tie to prevent foreign matters dropping in.



10. Remove the second hose from the left at lower side of loading valve front end.
    Remove the second hose from the left at upper side of loading valve front end with 30# wrench.





Pack up the connector of hose and loading valve with clean plastic bag and tie to prevent foreign matters dropping in.

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11. Remove front hose of loading valve right end
Remove front hose of loading valve right end with 36# wrench.



12. Remove rear hose of loading valve right end
Remove rear hose of loading valve right end with 36# wrench.



Pack up the connector of hose and loading valve with clean plastic bag and tie to prevent foreign matters dropping in.



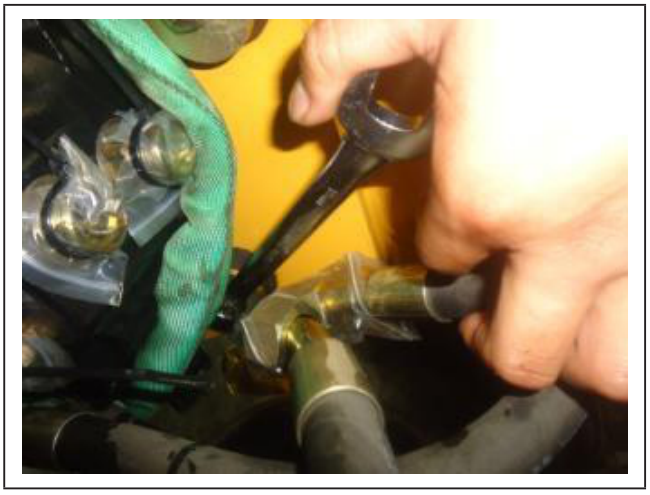
Pack up the connector of hose and loading valve with clean plastic bag and tie to prevent foreign matters dropping in.

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13. Remove loading valve
Lift and hold loading valve with crane and sling,



Remove 3 bolts of loading valve installing plate with 18# wrench (please recycle the 3 shock absorber cushions and shims) , lift out loading valve with crane.

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Installation of loading valve

Preparation work

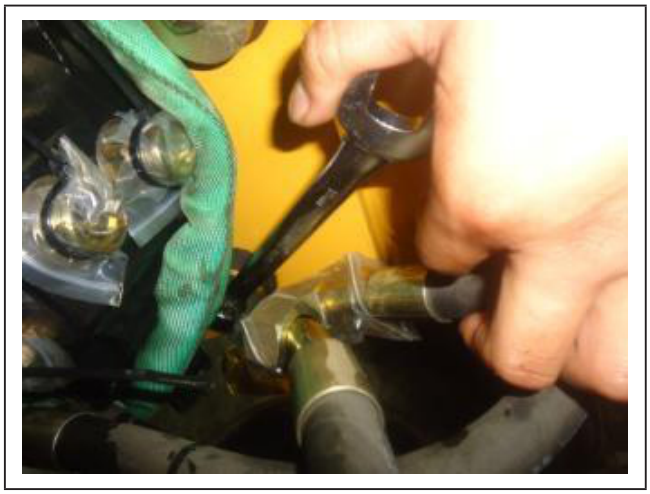
Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Install loading valve
   Lift loading valve to mounting position of frame with crane and sling.



Place bolt, spring washer, shock absorber cushion and shim in order used for installation to installing plate, tighten three bolts on loading valve installing plate with 18# wrench. Tightening torque is 90±12N•m



2. Install rear hose of loading valve right end
   Remove rear shield of loading valve right end, observe the hose connected with it to ensure O-Ring of hose intact,



Connect hose with rear connector of steering priority valve right end; do not mix it with other parts, and tighten it with 36# wrench. Tightening torque is 84±4N•m

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3. Install front hose of loading valve right end
   Remove front shield of loading valve right end, observe the hose connected with it to ensure O-Ring of hose intact,



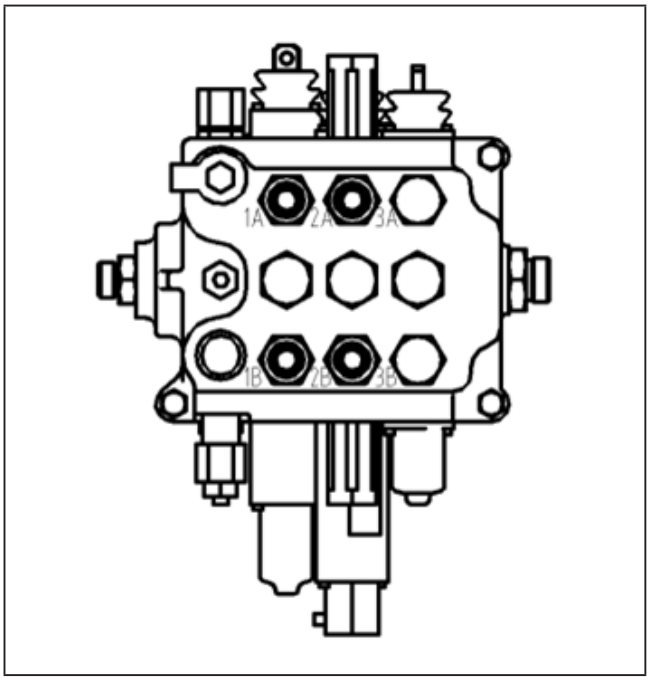
   Connect hose with front connector of steering priority valve right end; do not mix it with other parts, and tighten it with 36# wrench. Tightening torque is 84±4 N•m



4. Install the second hose from the left at lower side of loading valve front end.
   Remove shield of the second hose from the left at lower side of loading valve front end, observe the hose connected with it to ensure O-Ring of hose intact,



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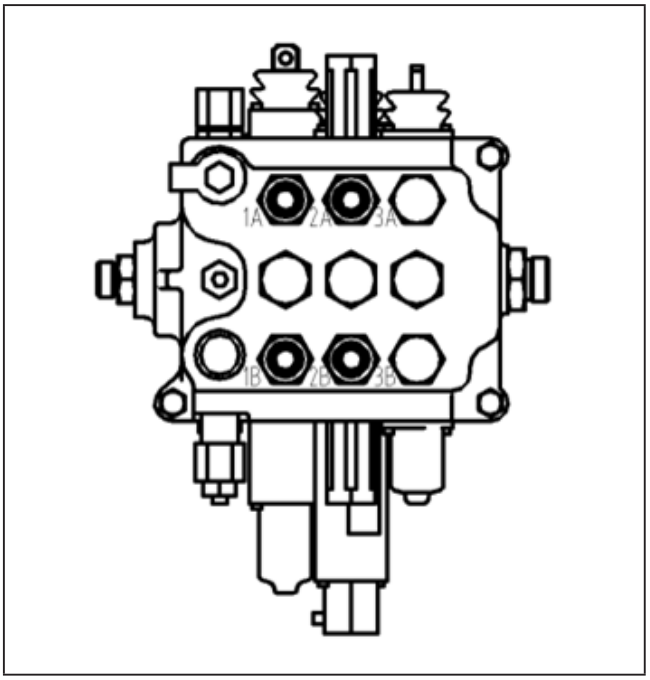


Connect hose with front connector of loading valve right end; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m



5. Remove the third hose from the left at lower side of loading valve front end.
   Remove shield of the third hose from the left at lower side of loading valve front end, observe the hose connected with it to ensure O-Ring of hose intact.





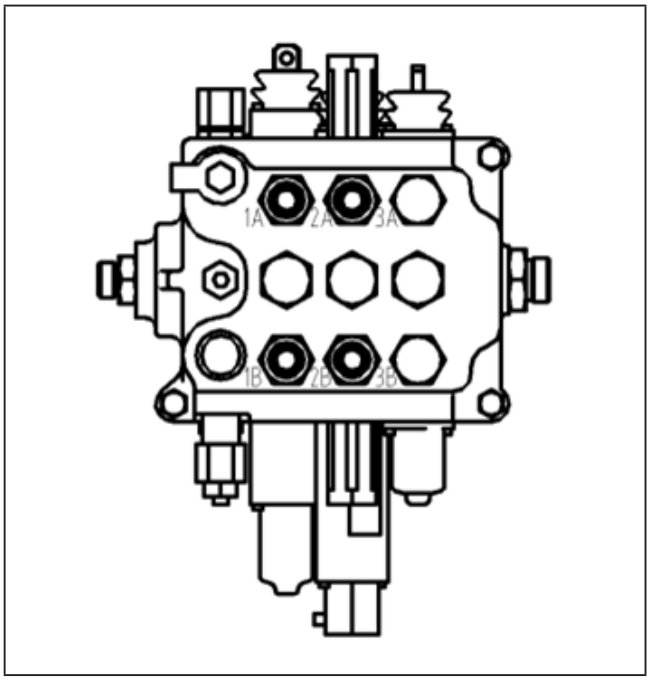
Connect hose with front connector of loading valve right end; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m

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6. Remove the fourth hose from the left at lower side of loading valve front end.
   Remove shield of the fourth hose from the left at lower side of loading valve front end, observe the hose connected with it to ensure O-Ring of hose intact.





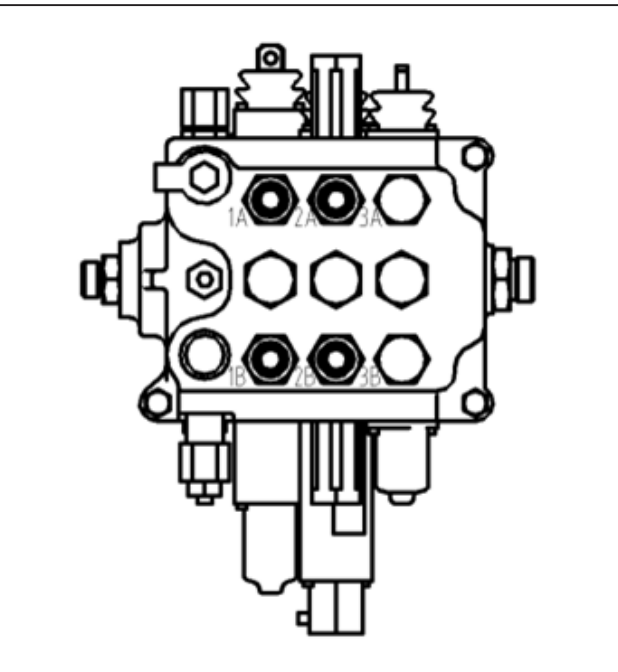
Connect hose with front connector of loading valve right end; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m



7. Install the first hose from the left at upper side of loading valve front end.
   Remove shield of the first hose from the left at upper side of loading valve front end, observe the hose connected with it to ensure O-Ring of hose intact,

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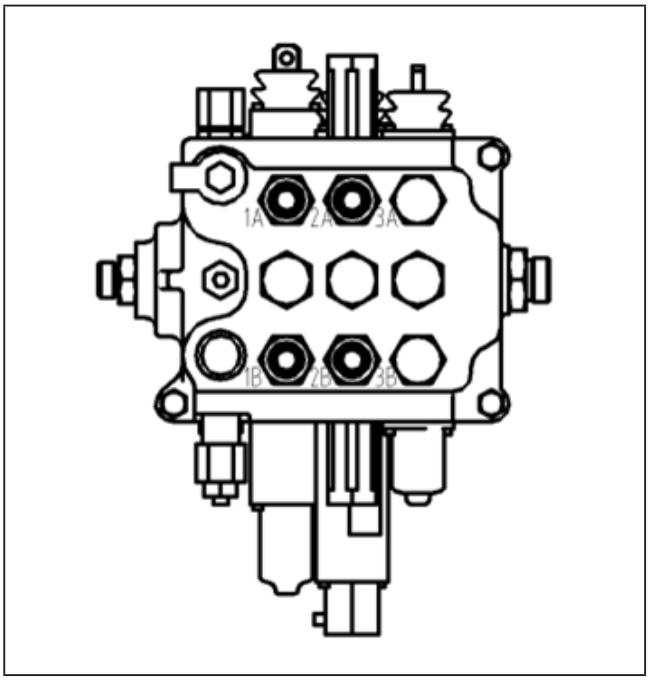
Connect hose with front connector of loading valve right end; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3N•m



8. Install the second hose from the left at lower side of loading valve front end.
   Remove shield of the second hose from the left at lower side of loading valve front end, observe the hose connected with it to ensure O-Ring of hose intact.



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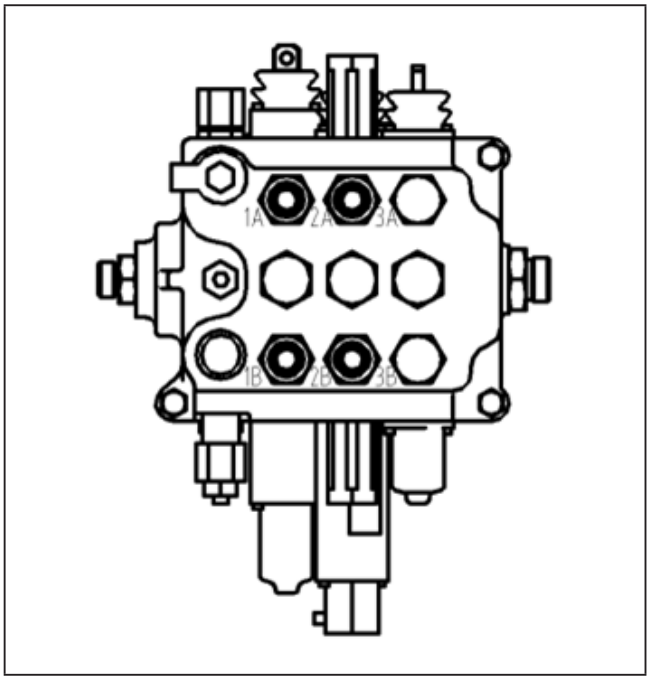


Connect hose with front connector of loading valve right end; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m



9. Install the third hose from the left at lower side of loading valve front end.
   Remove shield of the third hose from the left at upper side of loading valve front end, observe the hose connected with it to ensure O-Ring of hose intact,





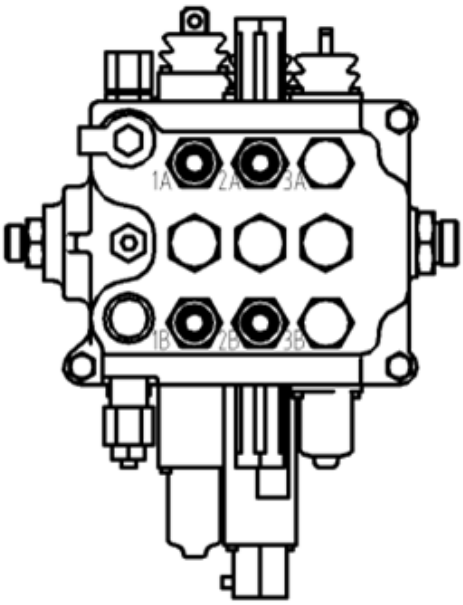
Connect hose with front connector of loading valve right end; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m

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10. Remove the first hose from the left at lower side of loading valve front end.
    Remove shield of the first hose from the left at lower side of loading valve front end, observe the hose connected with it to ensure O-Ring of hose intact.





Connect hose with front connector of loading valve right end; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m



11. Install left end hose of loading valve
    Remove hose shield of loading valve left end, observe the hose connected with it to ensure O-Ring of hose intact,

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Connect hose with front connector of loading valve right end; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m



12. Install upper harness connector of loading valve
Connect harness used to connect left side and bottom of loading valve with loading valve socket.



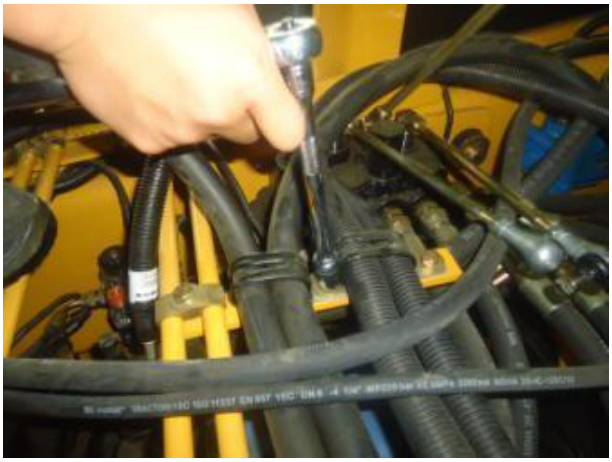


13. Install A/C pipe and pipe fixed clamp
Place four clamps used to fix A/C hose and pipe to mounting position, install them with wind trigger,13# sleeve and rod, and ensure the hose is not twisted and deformed. Tightening torque is 26±4 N•m

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Remove double pump

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove fixed plate of clamp
   Remove fixed plate used to fix A/C hose and water pipe clamp by wind trigger with 13# sleeve and rod (or 13# wrench) .





2. Remove A/C hose
   Remove A/C hose with 17# and 19# wrench, (Refer to removal of cab for removal of A/C pipe and water pipe from cab) ,



Pack up hose connector with clean plastic bag and tie to prevent foreign matters falling into, and put A/C hose and water pipe aside to make couple pump fully exposed.

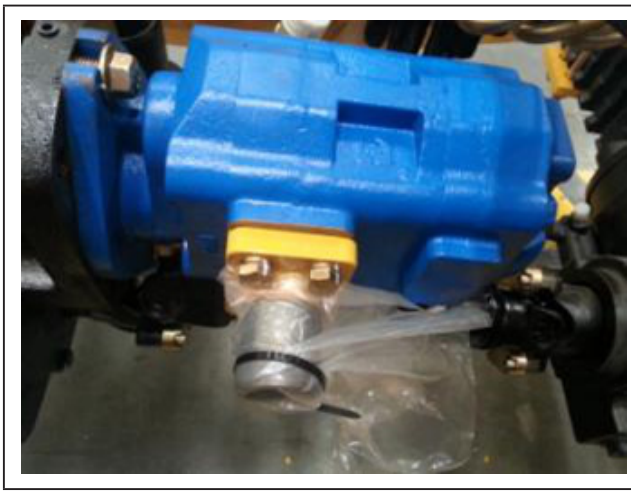
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3. Remove oil suction rubber pipe of double pump
   Remove clamp on oil suction rubber pipe with cross screwdriver,



Pull out oil suction rubber pipe, and pack up the connector of hose and double pump with clean plastic bag and tie to prevent foreign matters dropping in.



4. Remove front hose of double pump
   Remove front hose of double pump with 36# wrench

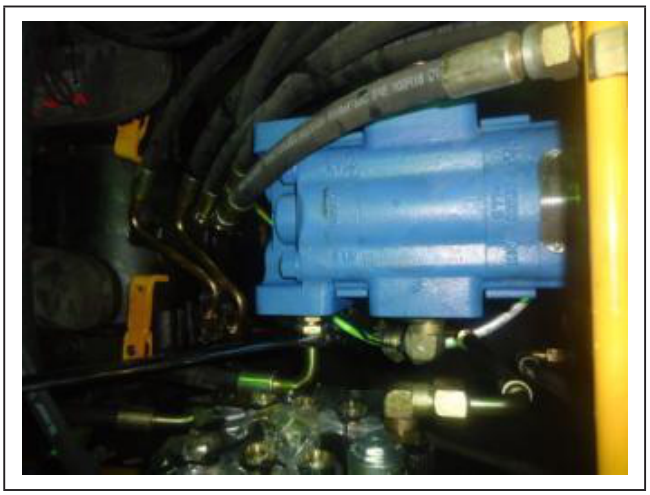


Pack up the connector of hose and double pump with clean plastic bag and tie to prevent foreign matters dropping in.

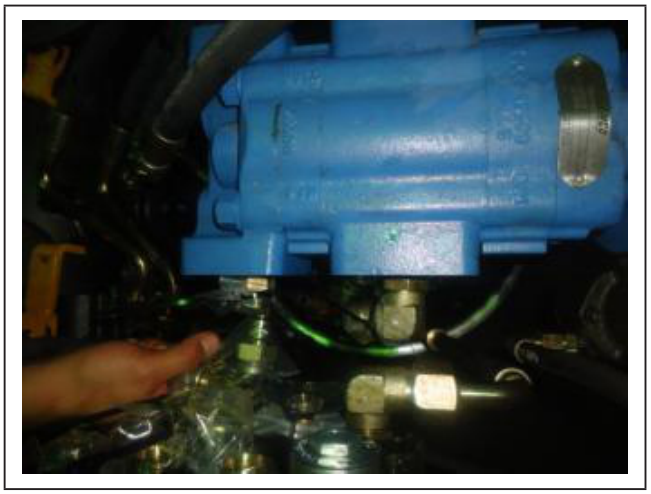
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5. Remove rear hose of double pump
   Remove rear hose of double pump with 30# wrench



Pack up the connector of hose and double pump with clean plastic bag and tie to prevent foreign matters dropping in.



6. Remove double pump
   Lift and hold double pump with crane and sling,



Remove 2 bolts used to connect double pump and gearbox box with 24# wrench, pull double pump outwards along vertical direction of gear-box junction surface, to prevent deformation and bend of spline; pack up the connector of hose and double pump with clean plastic bag and tie to prevent foreign matters dropping in, and lift out double pump with crane.

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Installation of double pump

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Install double pump
   Apply hydraulic oil on O-rings and put it along the groove of double pump, lift double pump to mounting position of gearbox box with crane and sling.



Embed double pump into gearbox box along direction of spline, install two flat gaskets, spring washer and blot used to connect double pump and gearbox box with 24# wrench. Tightening torque is 200±20 N•m

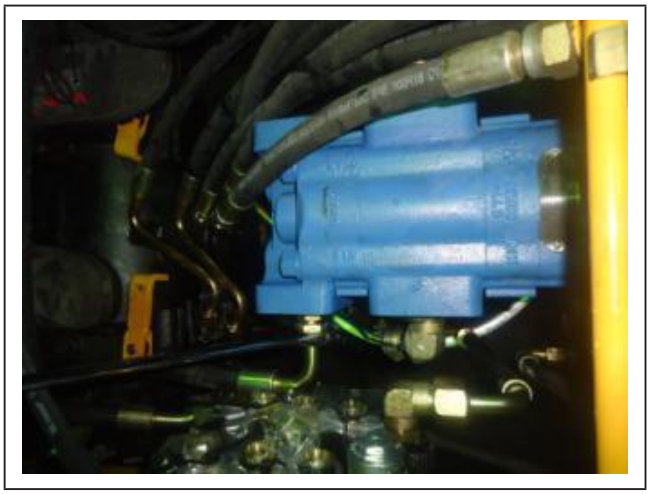
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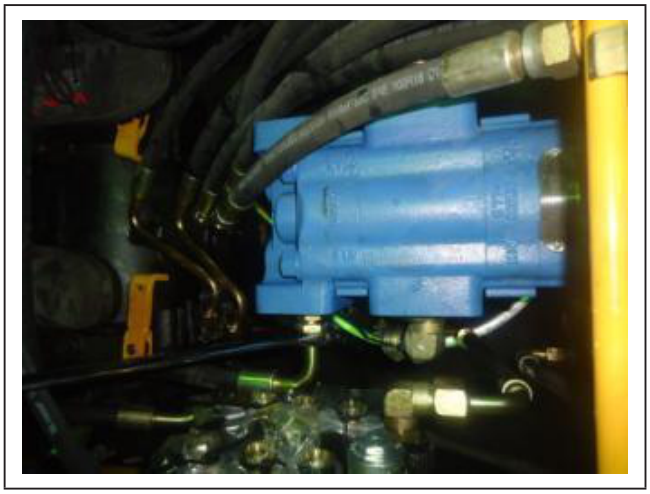
2. Install rear hose of double pump
Remove hose shield of loading valve rear end, observe the hose connected with it to ensure O-Ring of hose intact.



Connect hose with rear connector of double pump; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m .



3. Install front hose of double pump
Remove hose shield of double pump front end, observe the hose connected with it to ensure O-Ring of hose intact.



Connect hose with front connector of double pump; do not mix it with other parts, and tighten it with 36# wrench. Tightening torque is 84±4 N•m .

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4. Install oil suction rubber pipe of double pump
Remove oil suction rubber pipe of double pump and shield of double pump connector.



Connect hose with front connector of double pump with double wire clamp; do not mix it with other parts, and tighten it with cross screwdriver. Fix double wire clamp behind boss of connector.



5. Install A/C hose
Remove A/C hose shield, observe the hose connected with it to ensure O-Ring of hose intact, and connect A/C hose with 17# and 19# wrench. Tightening torque is 16±1 N•m



6. Install fixed plate of clamp
Install fixed plate used to fix A/C hose and water pipe clamp to corresponding steel pipe by wind trigger with 13# sleeve and rod (or 13# wrench) , and keep fixed plate and steel pipe in vertical without deflection. Tightening torque is 26±4 N•m

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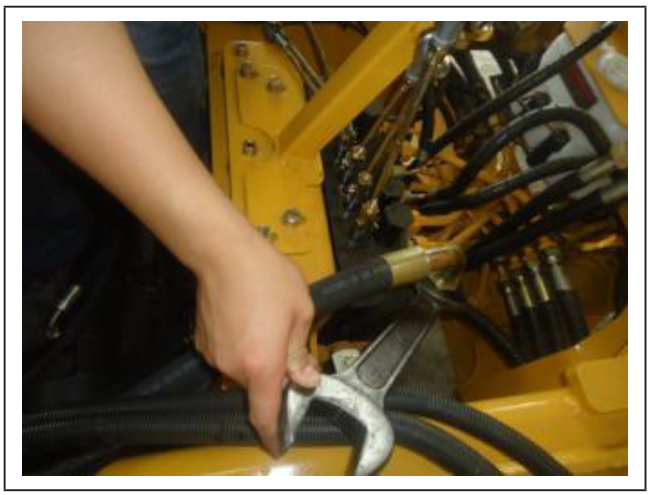
Remove backhoe valve

Preparation work

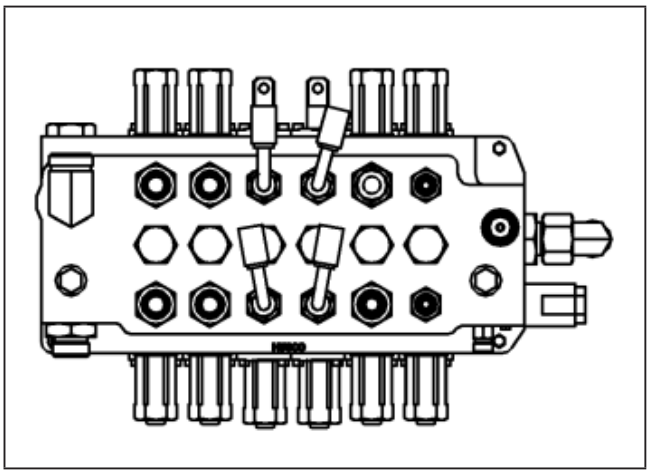
Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove the first hose from the left at upper side of backhoe valve front end.
   Remove the first hose from the left at upper side of backhoe valve front end with 41# wrench.



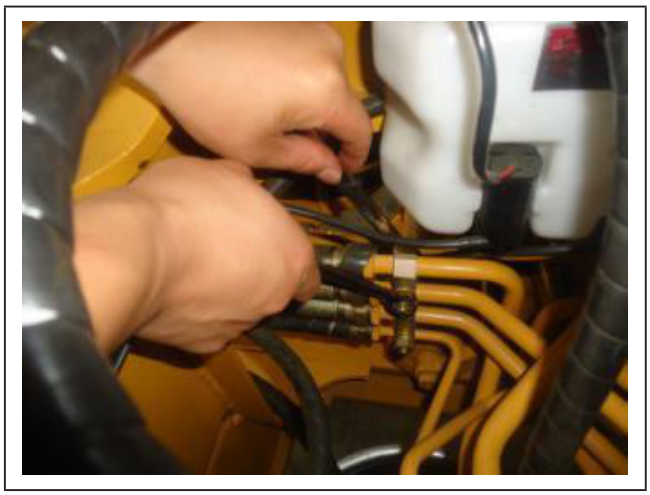
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Pack up the connector of hose and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



2. Remove steel pipe clamp of backhoe valve
Remove steel pipe clamp at both sides of backhoe valve with two 16# wrenches.

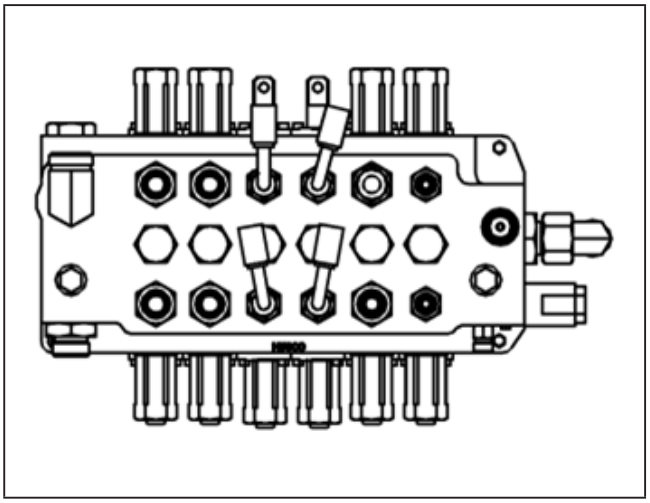




3. Remove the second steel pipe from the left at upper side of backhoe valve front end.
Remove the second steel pipe from the left at upper side of backhoe valve front end with 30# wrench.

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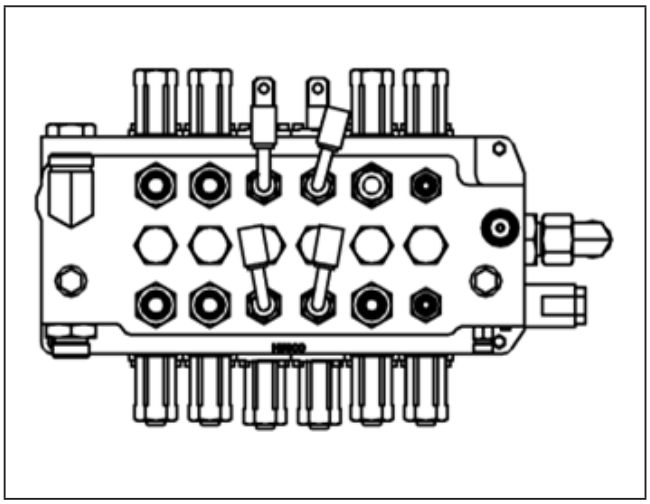


Pack up the connector of steel pipe and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



4. Remove the third steel pipe from the left at upper side of backhoe valve front end.
   Remove the third steel pipe from the left at upper side of backhoe valve front end with 30# wrench.





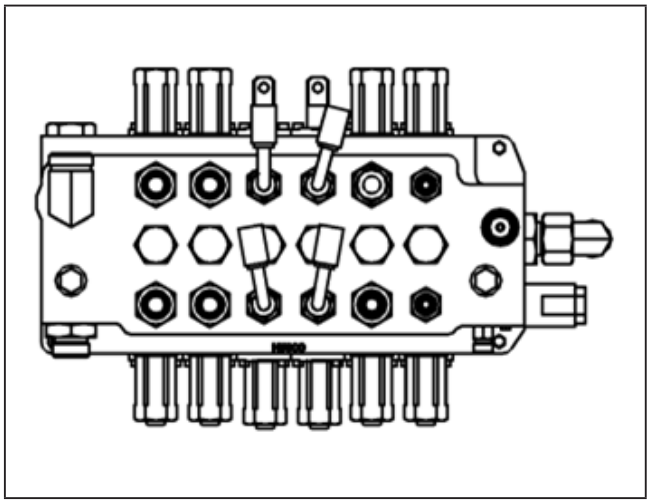
Pack up the connector of steel pipe and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.

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5. Remove the fourth hose from the left at upper side of backhoe valve front end.
   Remove the fourth hose from the left at upper side of backhoe valve front end with 21# wrench.





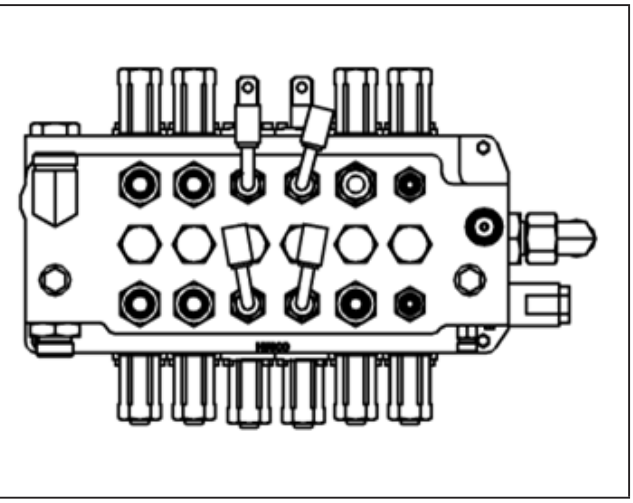
Pack up the connector of hose and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



6. Remove the fifth hose from the left at upper side of backhoe valve front end.
   Remove the fifth hose from the left at upper side of backhoe valve front end with 21# wrench.

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Pack up the connector of hose and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.

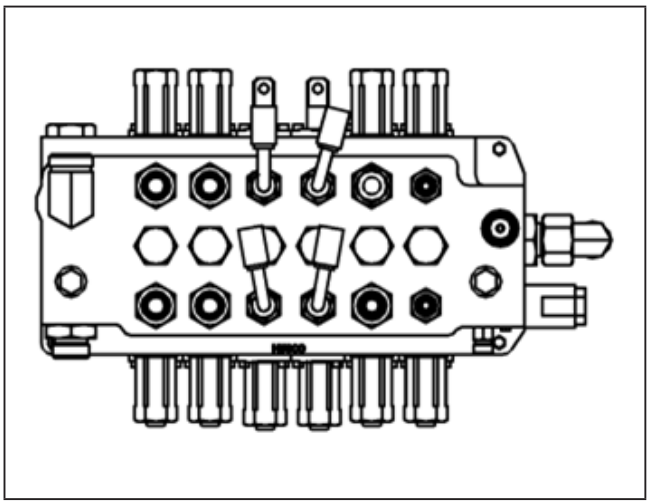




7. Remove the sixth steel pipe from the left at upper side of backhoe valve front end.
   Remove the sixth steel pipe from the left at upper side of backhoe valve front end with 30# wrench.



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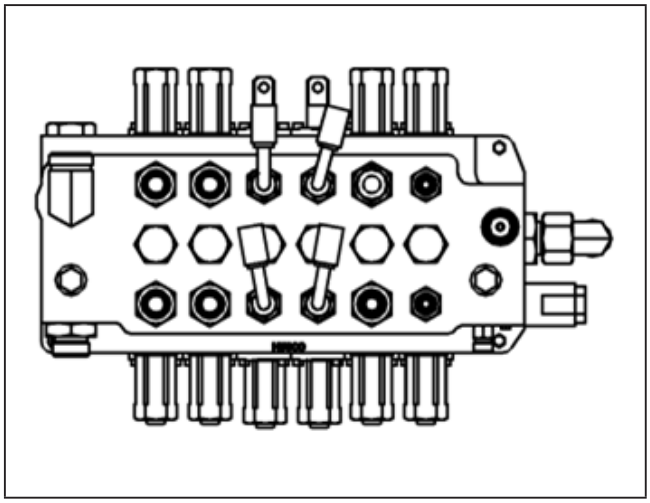


Pack up the connector of steel pipe and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.

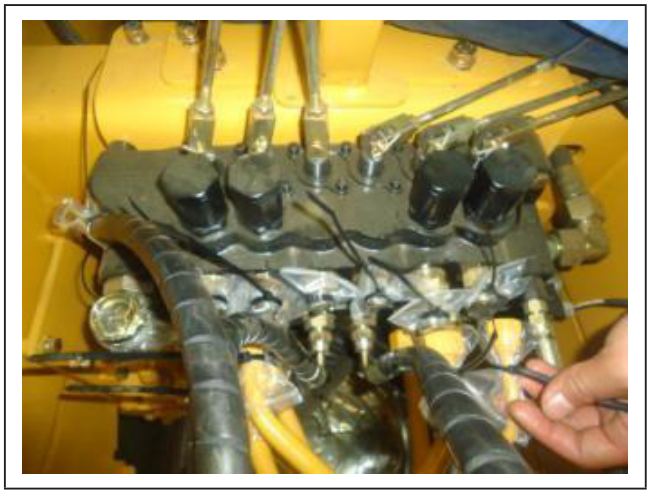


8. Remove the seventh steel pipe from the left at upper side of backhoe valve front end.
   Remove the seventh steel pipe from the left at upper side of backhoe valve front end with 24# wrench.





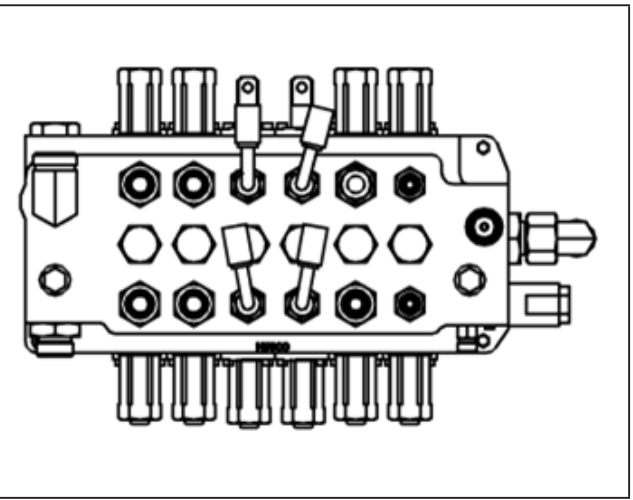
Pack up the connector of steel pipe and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



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9. Remove the second steel pipe from the left at lower side of backhoe valve front end.
   Remove the second steel pipe from the left at lower side of backhoe valve front end with 30# wrench.





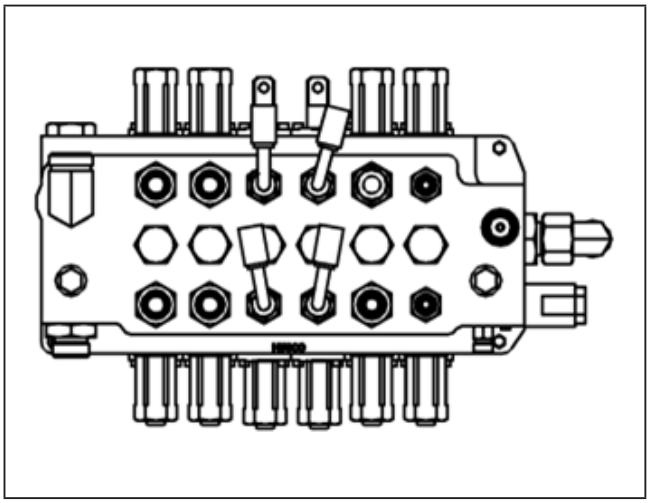
Pack up the connector of steel pipe and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



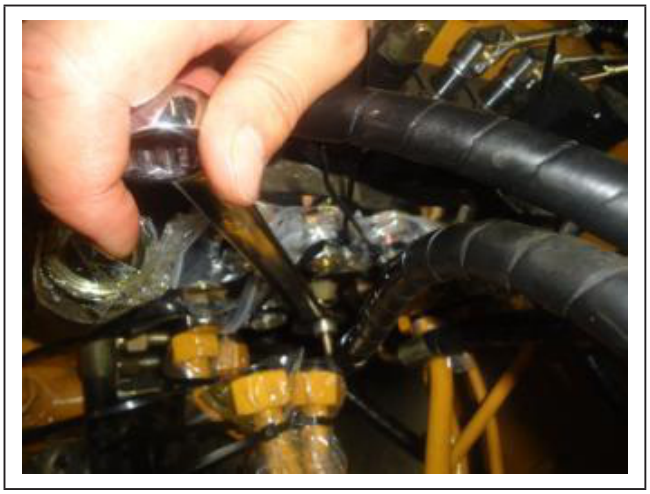
10. Remove the third steel pipe from the left at lower side of backhoe valve front end.
    Remove the third steel pipe from the left at lower side of backhoe valve front end with 30# wrench.



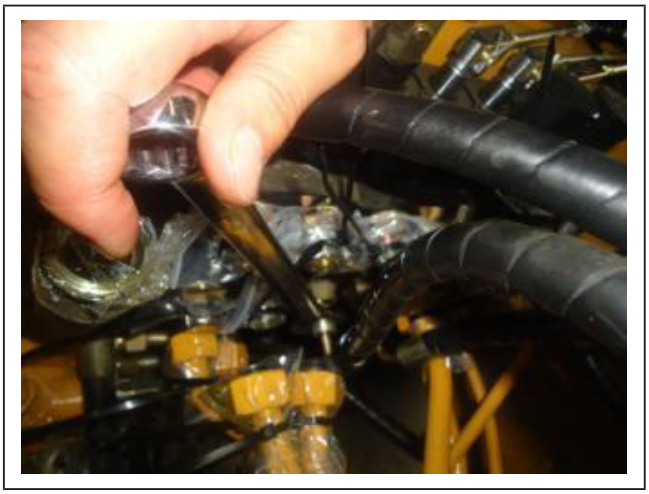
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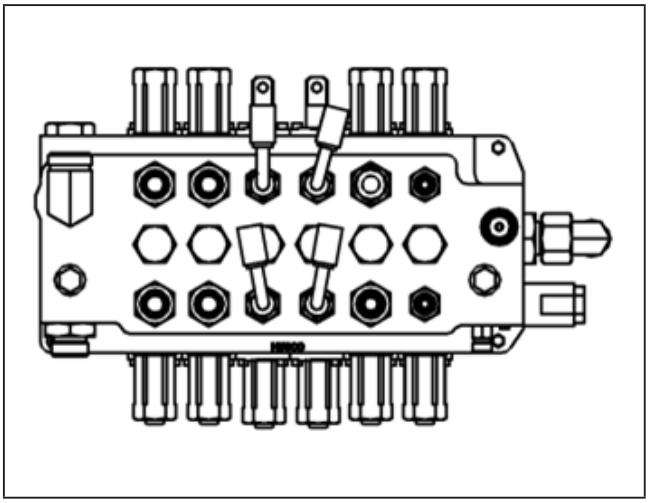


Pack up the connector of steel pipe and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.

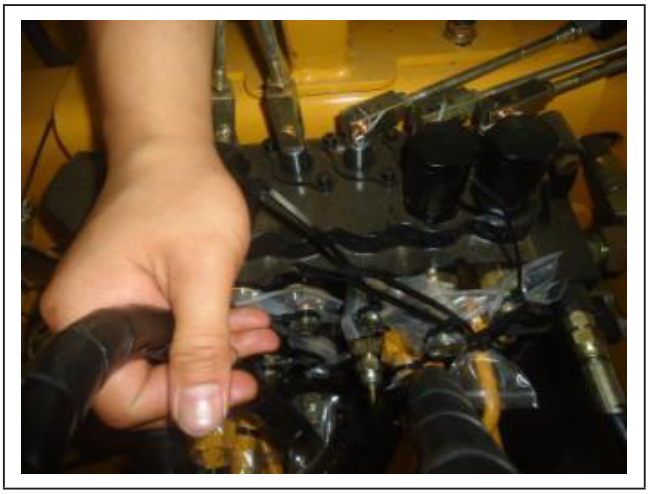


11. Remove the fourth hose from the left at lower side of backhoe valve front end.
    Remove the fourth hose from the left at lower side of backhoe valve front end with 21# wrench.





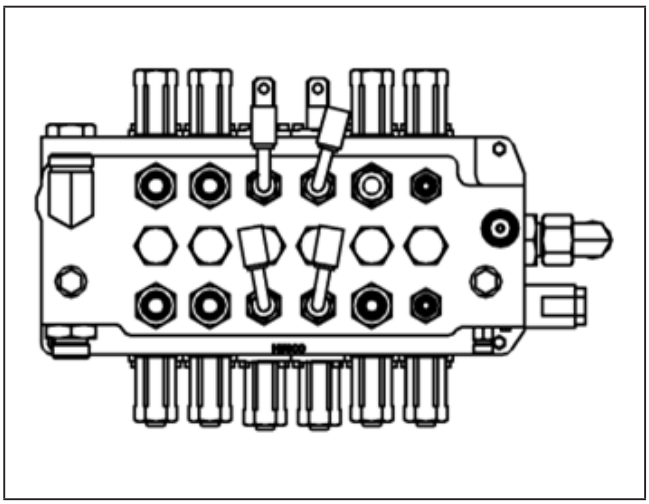
Pack up the connector of hose and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



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12. Remove the fifth hose from the left at lower side of backhoe valve front end.
    Remove the fifth hose from the left at lower side of backhoe valve front end with 21# wrench.





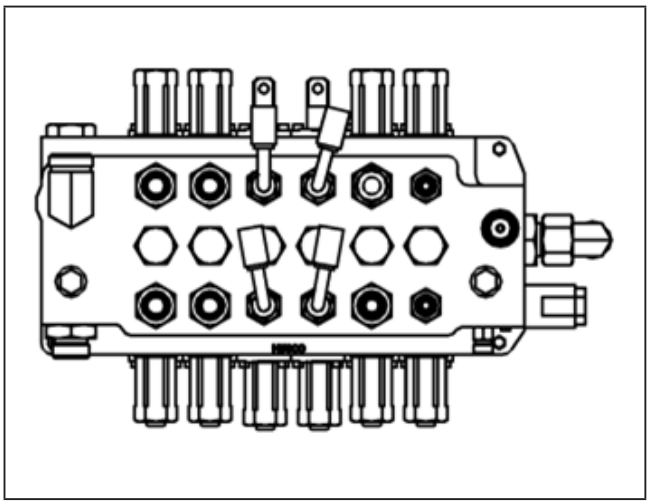
Pack up the connector of hose and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



13. Remove the sixth steel pipe from the left at lower side of backhoe valve front end.
    Remove the sixth steel pipe from the left at lower side of backhoe valve front end with 30# wrench.



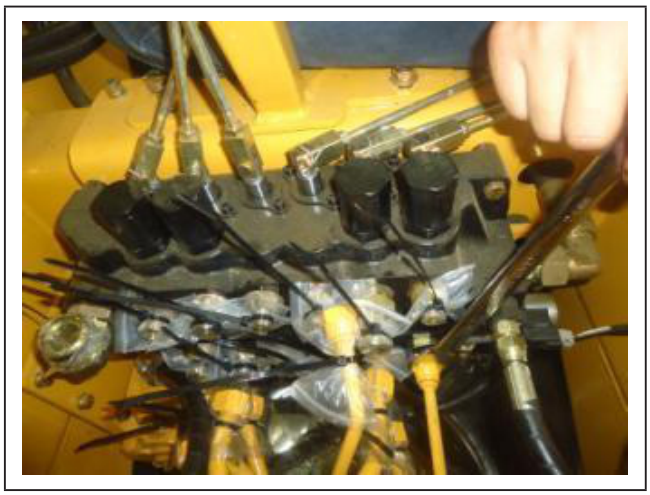
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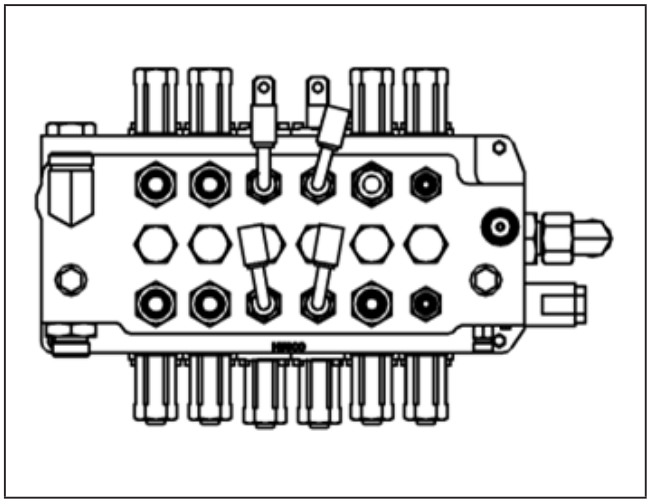


Pack up the connector of steel pipe and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



14. Remove the seventh steel pipe from the left at lower side of backhoe valve front end.
    Remove the seventh steel pipe from the left at lower side of backhoe valve front end with 24# wrench.





Pack up the connector of steel pipe and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



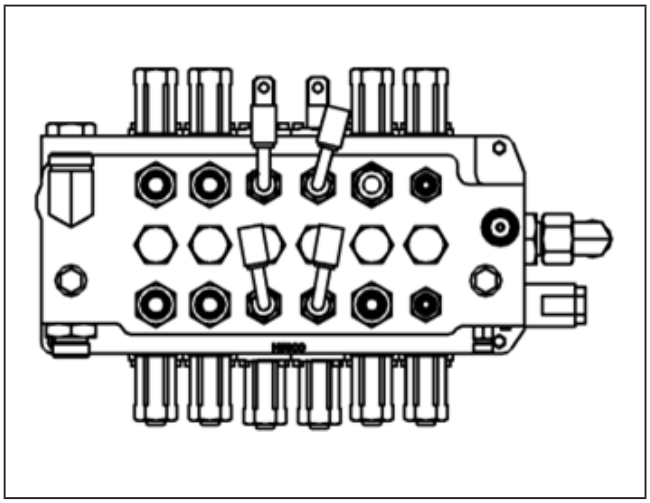
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15. Remove harness connector of backhoe valve right end
    Pull out harness connector of backhoe valve right end, to prevent it being polluted by hydraulic oil.



16. Remove the eighth hose from the left at upper side of backhoe valve front end.
    Remove the eighth hose from the left at upper side of backhoe valve front end with 21# wrench.





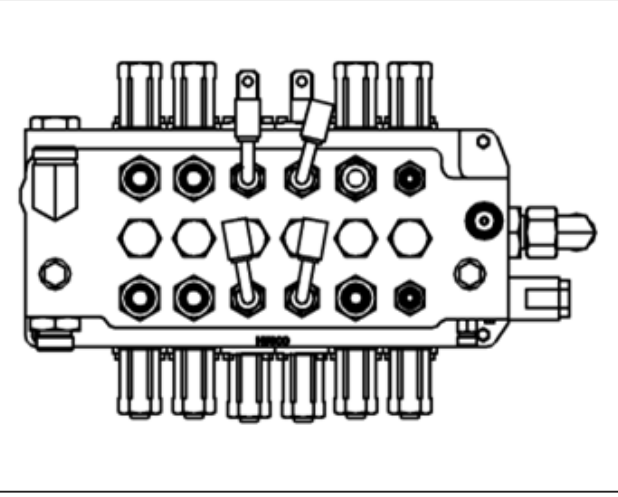
Pack up the connector of hose and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



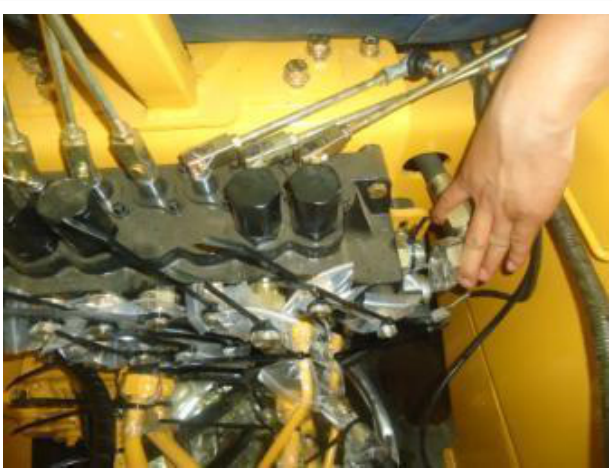
17. Remove right hose of backhoe valve
    Remove right hose of backhoe valve with 36# wrench.

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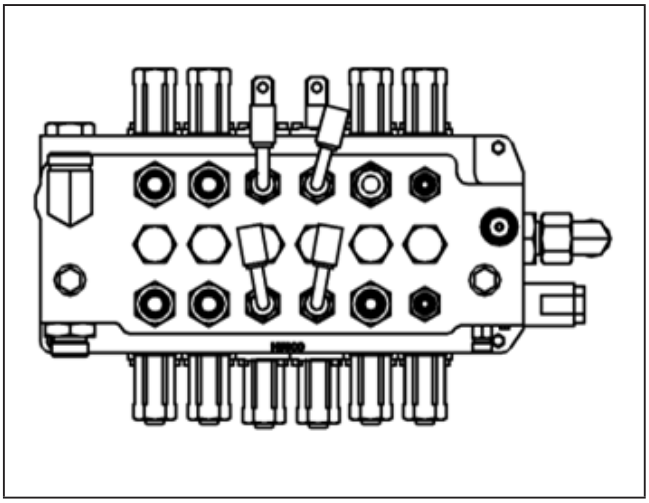


Pack up the connector of hose and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



18. Remove right hose of backhoe valve lower end
Remove right hose of backhoe valve lower end with 21# wrench.



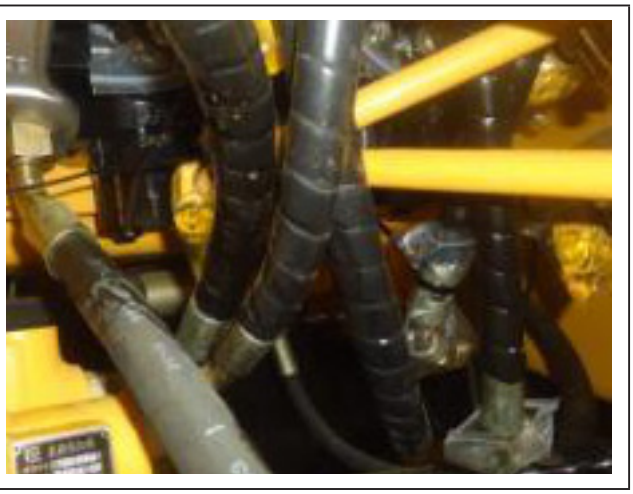


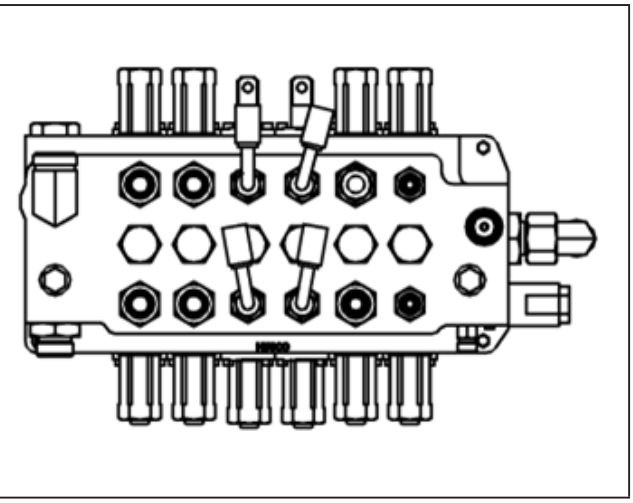
Pack up the connector of hose and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.

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19. Remove left hose of backhoe valve lower end
Remove left hose of backhoe valve lower end with 36# wrench





Pack up the connector of hose and backhoe valve with clean plastic bag and tie to prevent foreign matters dropping in.



20. Remove backhoe valve
Hold bracket of backhoe valve upper end with crane and sling.



Remove 5 bolts of backhoe valve installing plate with 16# wrench, and lift backhoe valve.

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Installation of backhoe valve

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Install backhoe valve
   Hold bracket of backhoe valve upper end with crane and sling.



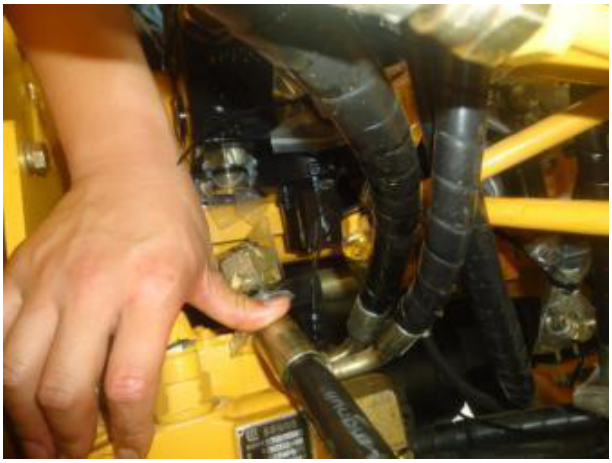
Place bolt, spring washer, and flat gasket in order used for installation to 5 holes of backhoe valve installing plate, and tighten 5 bolts of backhoe valve installing plate with 16# wrench. Tightening torque is 52±7 N•m

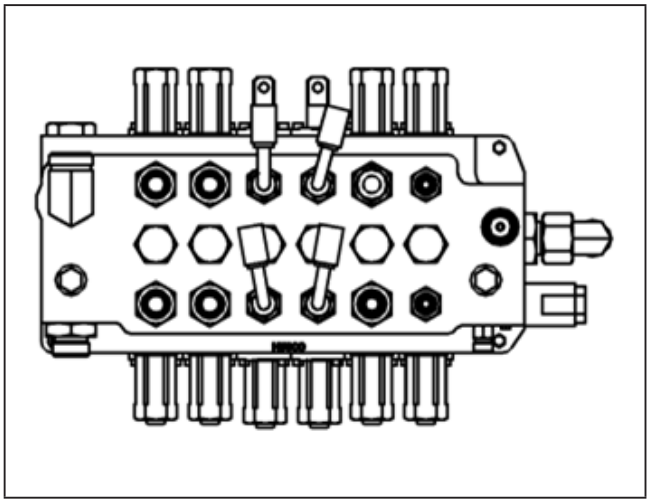
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2. Install left hose of backhoe valve lower end
Remove left hose shield of backhoe valve lower end, observe the hose connected with it to ensure O-Ring of hose intact.





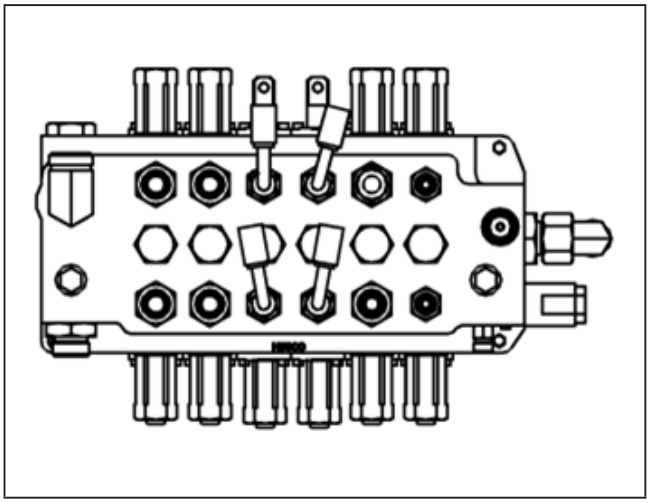
Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 36# wrench. Tightening torque is 84±4 N•m.



3. Install right hose of backhoe valve lower end
Remove right hose shield of backhoe valve lower end, observe the hose connected with it to ensure O-Ring of hose intact.

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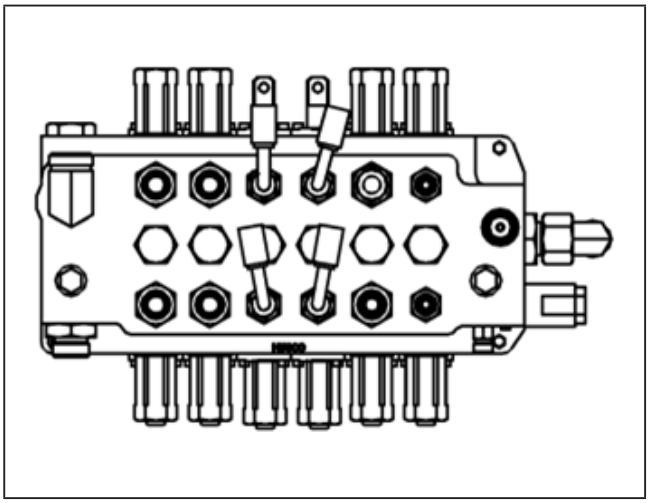
Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 21# wrench. Tightening torque is 16±1 N•m.



4. Install right hose of backhoe valve
   Remove hose shield of loading valve right end, observe the hose connected with it to ensure O-Ring of hose intact.



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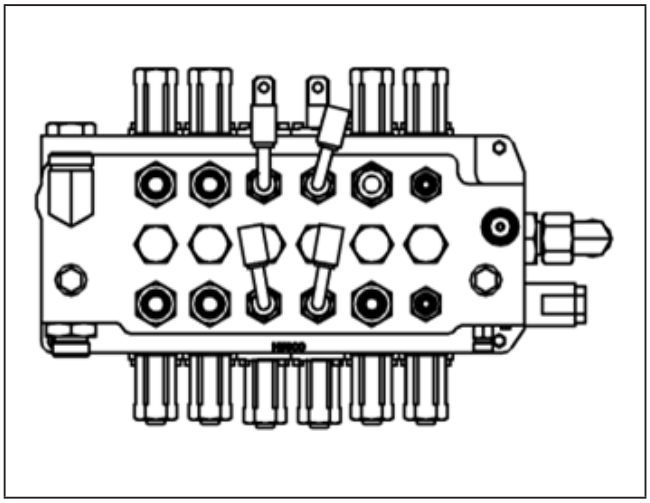


Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 36# wrench. Tightening torque is 84±4 N•m



5. Install the first hose from the left at upper side of backhoe valve front end.
   Remove shield of the first hose from the left at upper side of backhoe valve front end, observe the hose connected with it to ensure O-Ring of hose intact.





Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 21# wrench. Tightening torque is 16±1 N•m

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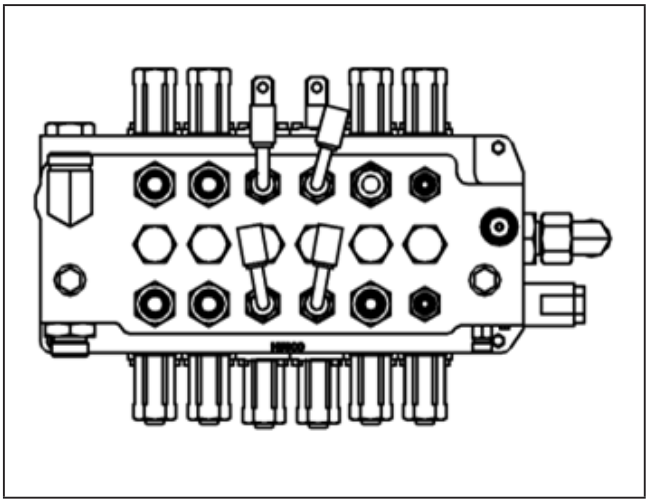


6. Install harness connector of backhoe valve right end
   Connect harness connector of backhoe valve right end



7. Install the No. 7 steel pipe from the left at lower side of backhoe valve front end.
   Remove shield of the seventh hose from the left at lower side of backhoe valve front end, observe the steel pipe connected with it to ensure O-Ring of hose intact.





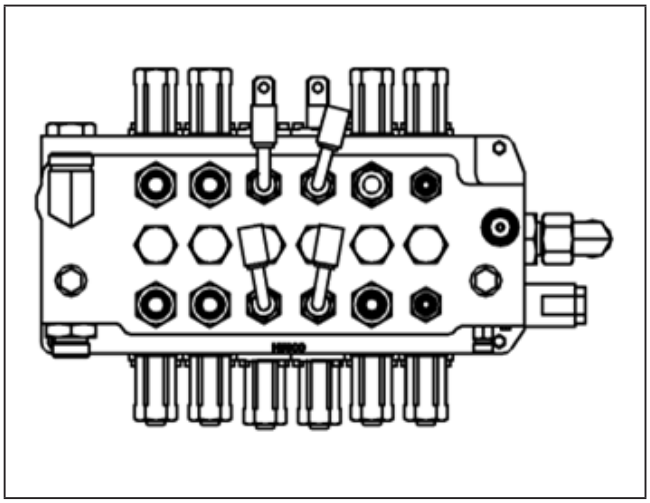
Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 24# wrench. Tightening torque is 42±2 N•m.

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8. Install the No. 6 steel pipe from the left at lower side of backhoe valve front end.
   Remove shield of sixth steel pipe from the left at lower side of backhoe valve front end, observe the steel pipe connected with it to ensure O-Ring of hose intact.





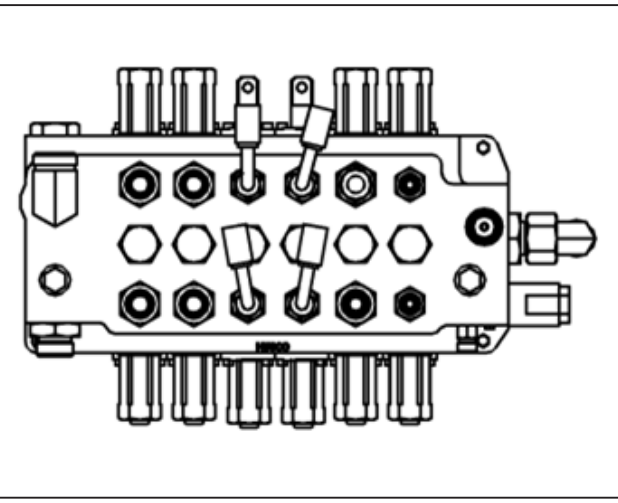
   Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m.



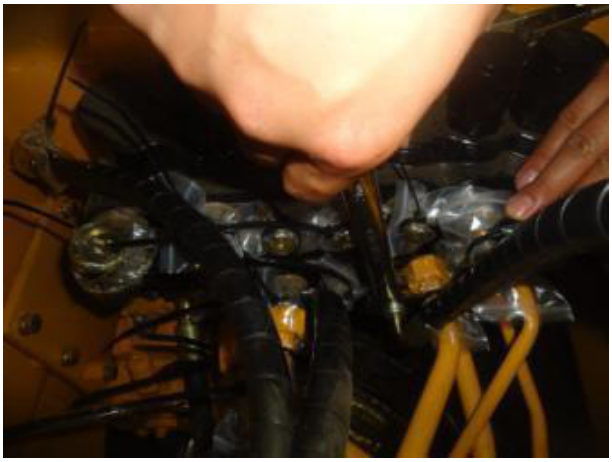
9. Install the No. 5 hose from the left at lower side of backhoe valve front end.
   Remove shield of the fifth hose from the left at lower side of backhoe valve front end, observe hose connected with it to ensure O-Ring of hose intact.

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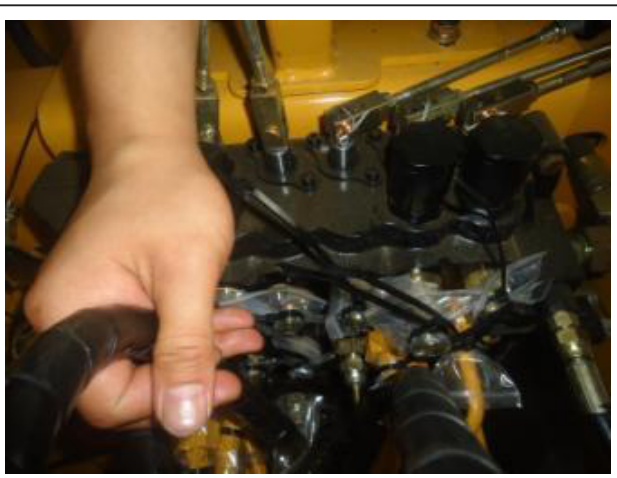




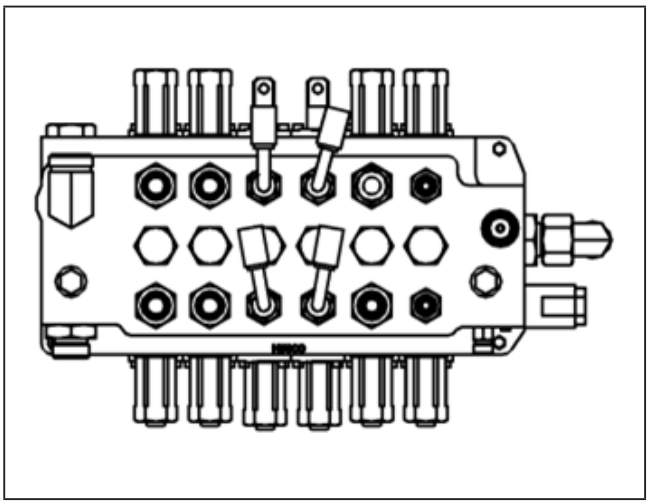
Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 21# wrench. Tightening torque is 16±1 N•m.



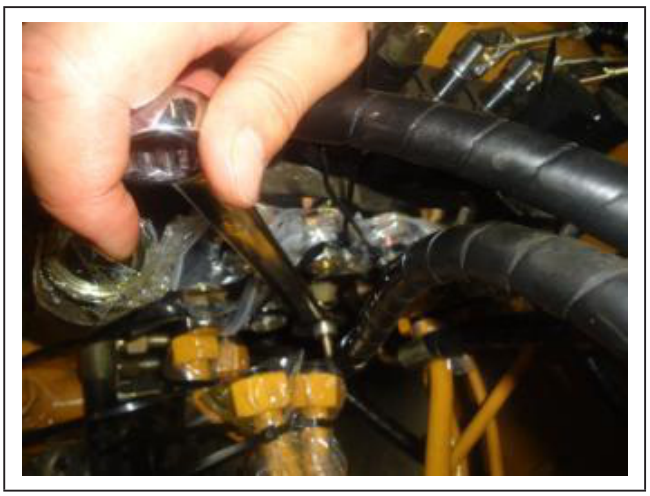
10. Install the No. 4 hose from the left at lower side of backhoe valve front end.
    Remove shield of the fourth hose from the left at lower side of backhoe valve front end, observe hose connected with it to ensure O-Ring of hose intact.



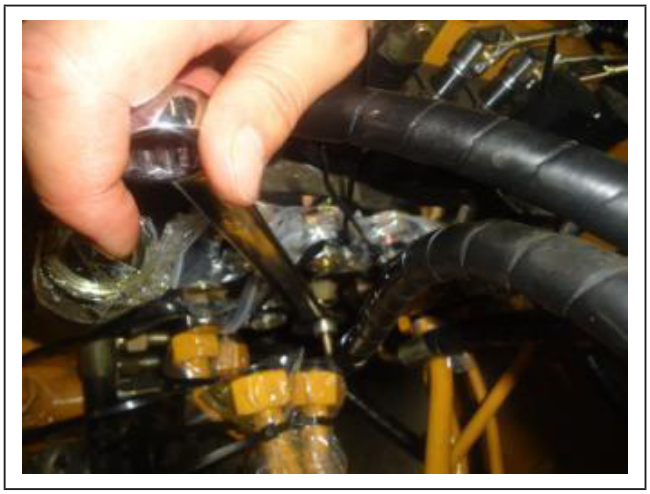
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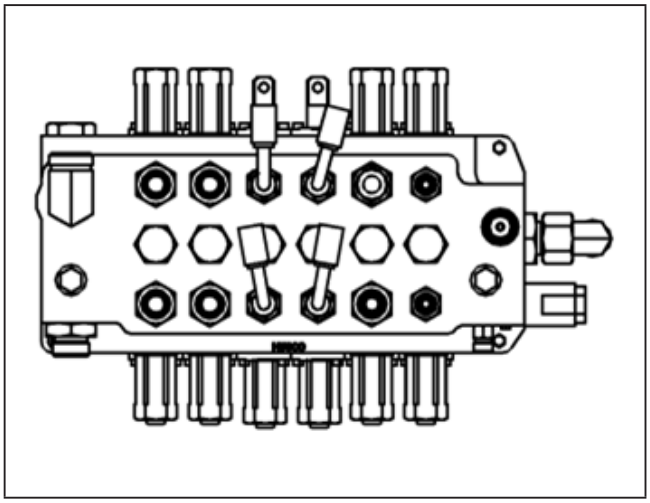


Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 21# wrench. Tightening torque is 16±1 N•m.



11. Install the No. 3 steel pipe from the left at lower side of backhoe valve front end.
Remove shield of third steel pipe from the left at lower side of backhoe valve front end, observe the steel pipe connected with it to ensure O-Ring of hose intact.





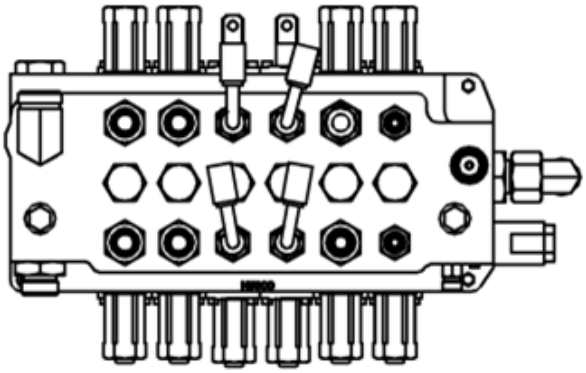
Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m.

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12. Install the No. 2 steel pipe from the left at lower side of backhoe valve front end.
    Remove shield of second steel pipe from the left at lower side of backhoe valve front end, observe the steel pipe connected with it to ensure O-Ring of hose intact.





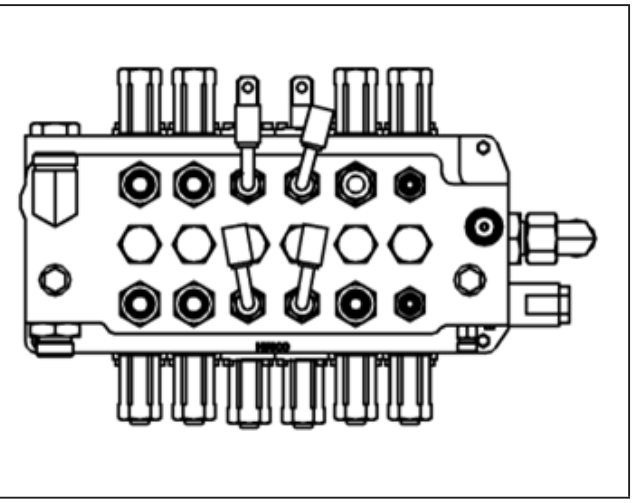
Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m.



13. Install the No. 7 steel pipe from the left at upper side of backhoe valve front end.
    Remove shield of seventh steel pipe from the left at upper side of backhoe valve front end, observe the steel pipe connected with it to ensure O-Ring of hose intact.

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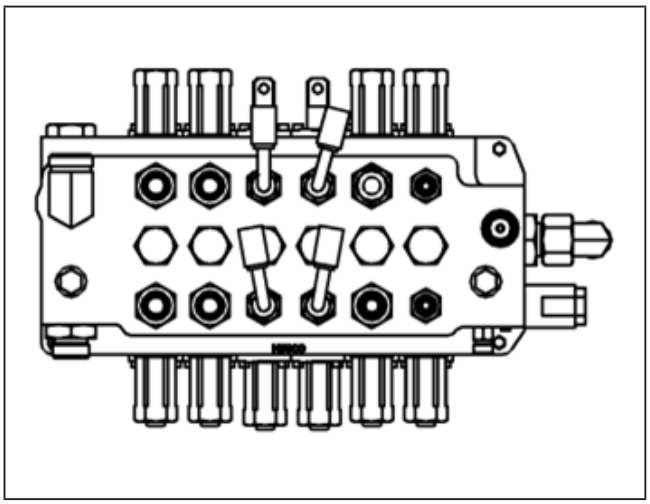
Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 24# wrench. Tightening torque is 26±2 N•m.



14. Install the No. 6 steel pipe from the left at upper side of backhoe valve front end.
    Remove shield of sixth steel pipe from the left at upper side of backhoe valve front end, observe the steel pipe connected with it to ensure O-Ring of hose intact.



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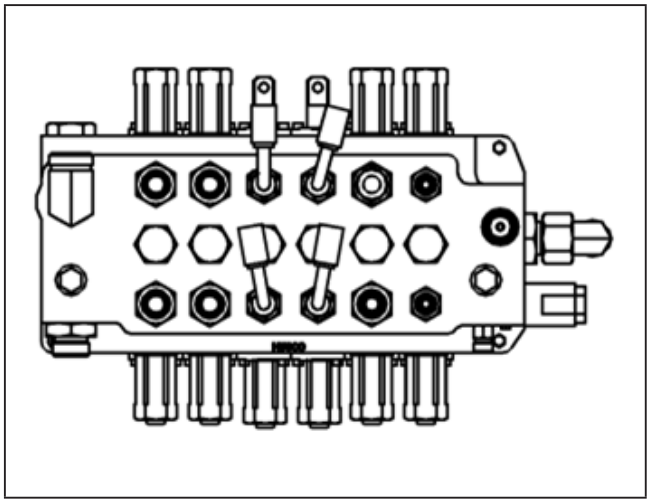


Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m.



15. Install the fifth hose from the left at upper side of backhoe valve front end.
    Remove shield of the fifth hose from the left at upper side of backhoe valve front end, observe the hose connected with it to ensure O-Ring of hose intact.





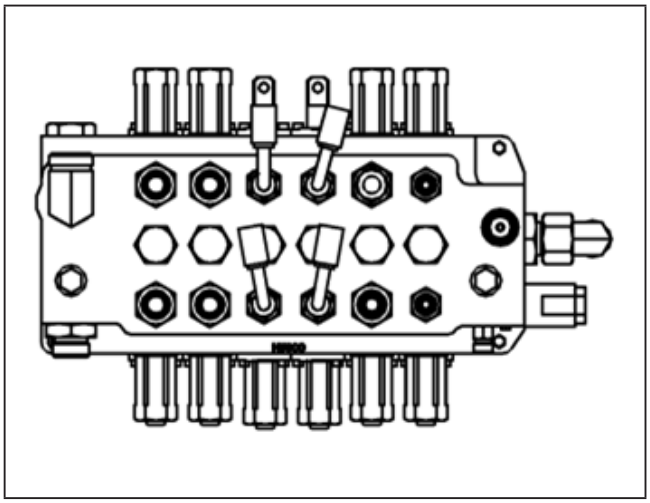
Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 21# wrench. Tightening torque is 26±2 N•m.

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16. Install the fourth hose from the left at upper side of backhoe valve front end.
    Remove shield of fourth hose from the left at upper side of backhoe valve front end, observe the hose connected with it to ensure O-Ring of hose intact.





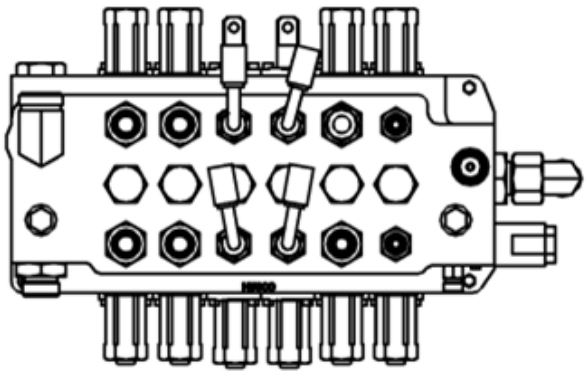
Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 21# wrench. Tightening torque is 26±2 N•m.



17. Install the No. 3 steel pipe from the left at upper side of backhoe valve front end.
    Remove shield of third steel pipe from the left at upper side of backhoe valve front end, observe the steel pipe connected with it to ensure O-Ring of hose intact.

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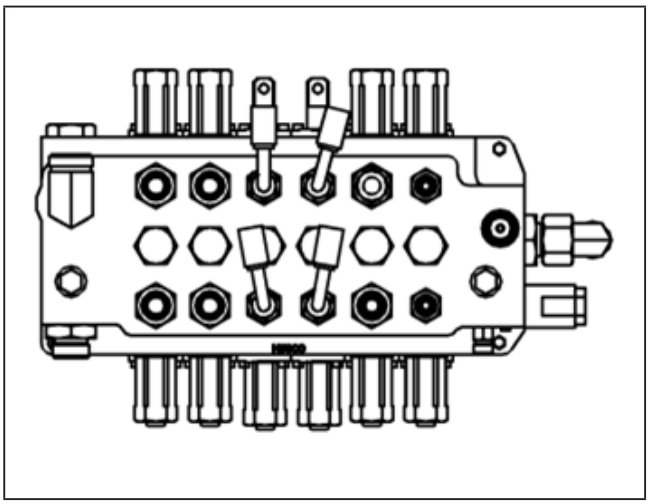
Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m.



18. Install the No. 2 steel pipe from the left at upper side of backhoe valve front end.
    Remove shield of second steel pipe from the left at upper side of backhoe valve front end, observe the steel pipe connected with it to ensure O-Ring of hose intact.



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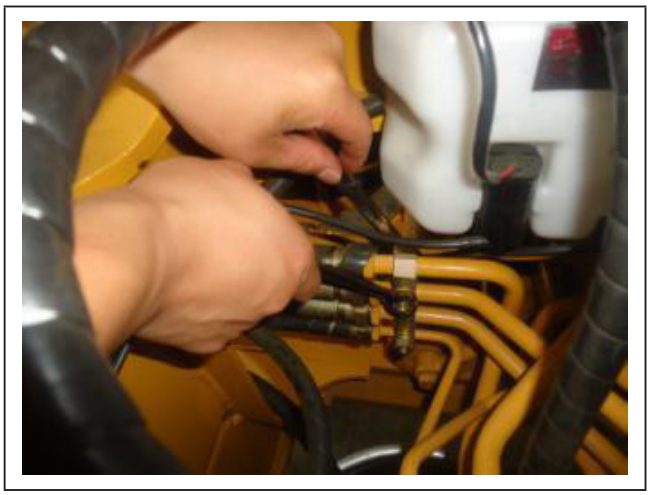
Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m.



19. Install steel pipe clamp of backhoe valve
Place clamps at both sides to mounting position



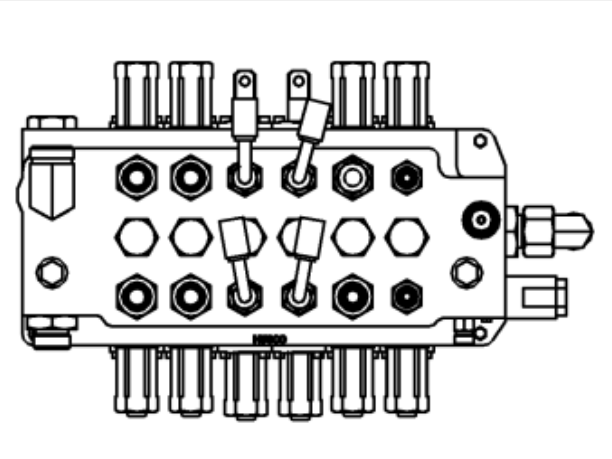
Tighten steel pipe clamp at both sides of backhoe valve with two 16# wrenches. Tightening torque is 52±7 N•m.



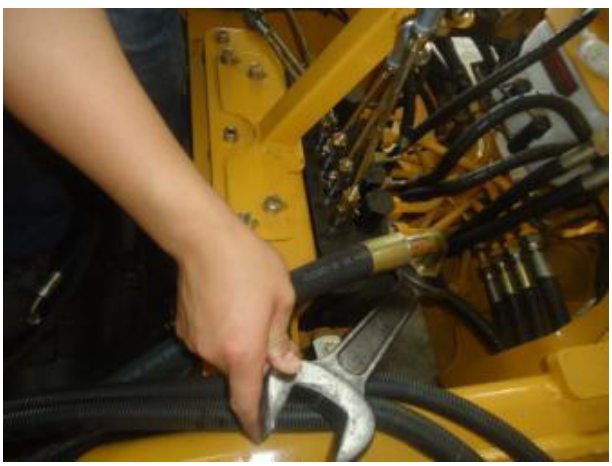
20. Install the first hose from the left at upper side of backhoe valve front end.
Remove shield of the first hose from the left at upper side of backhoe valve front end, observe the hose connected with it to ensure O-Ring of hose intact.

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Connect hose with rear connector of backhoe valve; do not mix it with other parts, and tighten it with 41# wrench. Tightening torque is 89±4 N•m.



Removal of boom cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove the boom cylinder grease nozzle
   Remove nut of fixed hose with 24# wrench, and remove baffle of boom bottom with 10# wrench.



2. Remove the boom oil cylinder pin shaft
   Lift and hold boom oil cylinder with crane and sling.

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Remove lug bolt used to fix boom oil cylinder front pin shaft with 19# wrench, and knock out pin shaft with copper bar.



Start complete machine, return boom oil cylinder jogger to its position, and turn off complete machine; remove plug bolt used to fix boom oil cylinder rear pin shaft with 19# wrench, recycle shim and knock out pin shaft with copper bar.

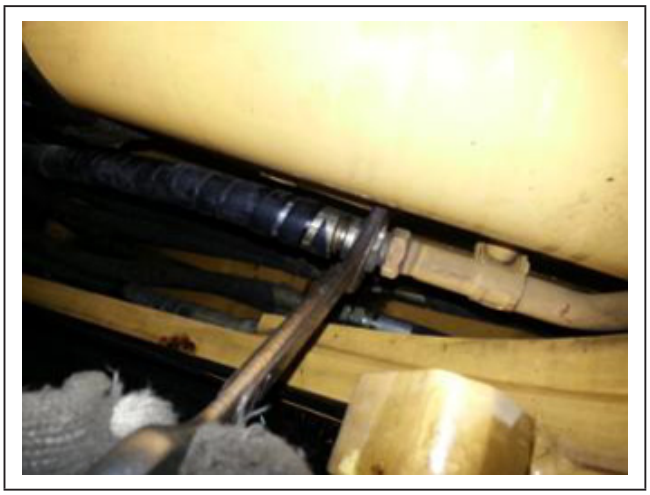




3. Remove the boom oil cylinder oil pipe
   Release pressure of boom oil cylinder, and remove hose connected with oil cylinder with 30# wrench.



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Pack up the connector of hose and oil cylinder with clean plastic bag and tie to prevent foreign matters dropping in. Lift up oil cylinder with crane sling.





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Installation of boom oil cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Install the boom oil cylinder oil pipe
   Lift boom oil cylinder to mounting position with crane and sling, remove shield of oil cylinder and hose, observe the hose connected with it to ensure O-Ring of hose intact,





Connect hose with connector of cylinder; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m.





2. Install the boom oil cylinder pin shaft

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Align with rear installing hole of boom oil cylinder to swing seat installing hole with crane and sling, place shim at both sides of installing hole, knock out pin shaft with copper bar, and ensure total clearance between both sides is 1±0.5 mm.



Tighten bolt, spring washer and flat gasket used to fix pin shaft with 19# wrench; start complete machine, stretch oil cylinder jogger out, align front installing hole of oil cylinder to boom installing hole, knock pin shaft into installing hole with copper bar, and tighten bolt, spring washer and flat gasket used to fix pin shaft with 19# wrench. Take down sling of crane, and move crane. Tightening torque is 90±12 N•m.





3. Install the boom cylinder grease nozzle
   Connect hose with baffle with 24# wrench and tighten. Align hole of installing plate to boom bottom installing hole, and tighten it with 10# wrench. Tightening torque is 10.5±1.5 N•m.



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Remove bucket arm oil cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove oil pipe of bucket arm oil cylinder
   Release pressure of bucket arm oil cylinder, and remove hose connected with oil cylinder with 30# wrench,



Pack up the connector of hose and oil cylinder with clean plastic bag and tie to prevent foreign matters dropping in.





2. Remove pin shaft of bucket arm oil cylinder
   Lift and hold bucket arm oil cylinder with crane and sling.



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Remove lug bolt used to fix pin shaft at the front and rear end of bucket arm oil cylinder with 19# wrench,





Knock pin shaft out with copper bar,





Recycle shim. Lift up oil cylinder with crane sling.





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Installation of bucket arm oil cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Install pin shaft of bucket arm oil cylinder

Lift bucket arm oil cylinder to mounting position with crane and sling, align front and rear installing hole of oil cylinder with installing hole of boom bucket arm.







Place shim at both sides of installing holes, install pin shaft with copper bar, and ensure total clearance at both sides of oil cylinder is 1±0.5 mm.



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Tighten lug bolt, spring washer and flat gasket used to fix pin shaft at the front and rear end of bucket arm oil cylinder with 19# wrench, Tightening torque is 90±12 N•m





2. Install oil pipe of bucket arm cylinder
   Remove oil cylinder and hose shield, observe the hose connected with it to ensure O-Ring of hose intact,





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Connect hose with connector of cylinder; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m





Removal of bucket cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove oil pipe of bucket cylinder
   Release pressure of bucket cylinder, and remove hose connected with cylinder with 30# wrench.



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Pack up the connector of hose and oil cylinder with clean plastic bag and tie to prevent foreign matters dropping in.





2. Remove pin shaft of bucket cylinder
   Lift and hold bucket arm oil cylinder with crane and sling.



Remove bolt used to fix pin shaft at the front end of bucket arm cylinder with two 19# wrenches,



Take down snap ring,

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Knock pin shaft out with copper bar,



Recycle shim.





Remove lug bolt used to fix pin shaft at the rear end of bucket arm cylinder with 19# wrench,



Knock pin shaft out with copper bar,



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Lift up oil cylinder with crane sling.



Installation of bucket cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Install pin shaft of bucket cylinder
   Lift bucket arm oil cylinder to mounting position with crane and sling, align front and rear installing hole of oil cylinder with installing hole of boom bucket arm,



Place shim at both sides of installing holes, and ensure total clearance at both sides of oil cylinder is 1±0.5 mm.

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Install pin shaft with copper bar.



Install pin shaft with copper bar.



Tighten baffle, bolt and nut used to fix pin shaft at the front end of bucket arm cylinder with two 19# wrenches, Tightening torque is 90±12 N•m.



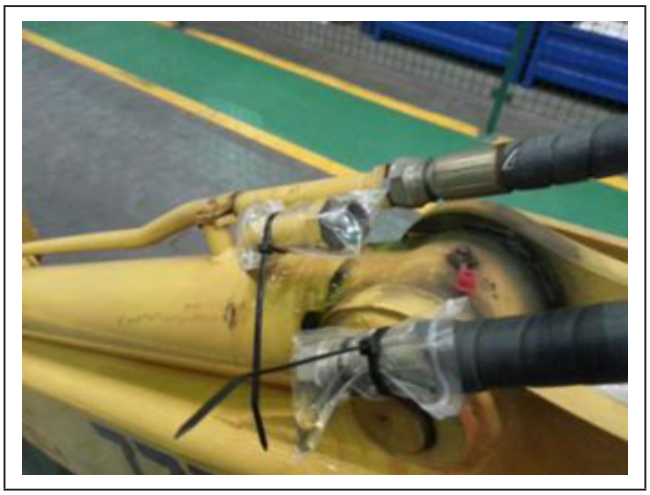
Tighten baffle, bolt and nut used to fix pin shaft at the rear end of bucket arm oil cylinder with 19# wrench, Tightening torque is 90±12 N•m.





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2. Install oil pipe of bucket arm cylinder
   Remove oil cylinder and hose shield, observe the hose connected with it to ensure O-Ring of hose intact.



Connect hose with connector of cylinder; do not mix it with other parts, and tighten it with 30# wrench. Tightening torque is 63±3 N•m.





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Removal of four in one bucket cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove four in one bucket cylinder hose
   Release pressure of four in one bucket cylinder, and remove two hoses connected cylinder in order with 24# wrench.



Pack up the connector of hose and oil cylinder with clean plastic bag and tie to prevent foreign matters dropping in.



2. Remove pin shaft of four in one bucket cylinder
   Remove lug bolt used to fix pin shaft at the rear end of four in one bucket cylinder with 18# wrench.



Knock pin shaft out.

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Remove bolt and nut used to fix pin shaft at the front end of four in one bucket cylinder with 16# wrench.





Remove snap ring, and knock pin shaft out with copper bar.

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Installation of four in one bucket cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Install pin shaft of four in one bucket cylinder
   Align front and rear installing hole of cylinder to installing hole of of four in one bucket, and install pin shaft out with copper bar. Tighten lug bolt, spring washer and flat gasket used to fix pin shaft at the rear end of four in one bucket cylinder with 18# wrench. Tightening torque is 90±12N•m



Tighten snap ring, bolt and nut used to fix pin shaft at the front end of four in one bucket cylinder with 16# wrench. Tightening torque is 52±7N•m





2. Install oil pipe of four in one bucket cylinder
   Remove oil cylinder and hose shield, observe the hose connected with it to ensure O-Ring of hose intact,

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Connect hose with connector of cylinder; do not mix it with other parts, and tighten it with 24 # wrench. Tightening torque is 84±4N•m



Removal of lifting arm cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove hose of lifting arm cylinder
   Release pressure of lifting arm cylinder, and remove two hoses connected cylinder with 27# wrench,



Pack up the connector of hose and oil cylinder with clean plastic bag and tie to prevent foreign matters dropping in.

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2. Remove pin shaft of lifting arm cylinder
Lift and hold lifting arm cylinder with crane and sling.



Remove lug bolt used to fix pin shaft at the front end of lifting arm cylinder with 18# wrench,



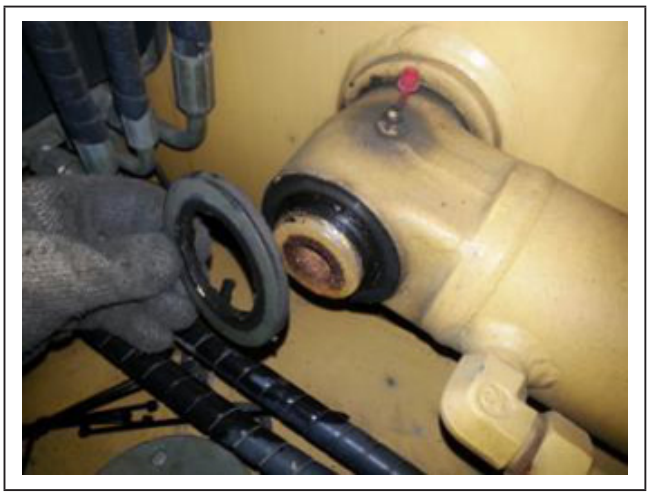
Recycle shim, knock out pin shaft out;



Remove circlip and shim used to fix pin shaft at the rear end of lifting arm cylinder with circlip pliers, recycle shim, and pull out lifting arm.



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Installation of lifting arm cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.

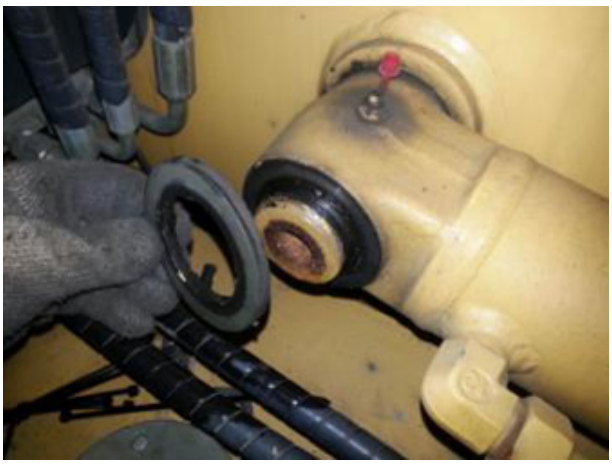


1. Install pin shaft of lifting arm cylinder
   Lift lifting arm cylinder to mounting position with crane and sling, embed rear end of lifting arm cylinder into lifting arm rear end pin shaft, align installing hole at the front end of lifting arm cylinder to corresponding installing hole of lifting arm,



Put into shim at both sides, ensure the total clearance is 1±0.5 mm, and knock in pin shaft with copper bar.

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Tighten lug bolt used to fix pin shaft at the front end of lifting arm cylinder with 18# wrench; install circlip and shim used to fix pin shaft at the rear end of lifting arm cylinder with circlip pliers. Tightening torque is 90±12 N•m





2. Install oil pipe of lifting arm cylinder
   Remove oil cylinder and hose shield, observe the hose connected with it to ensure O-Ring of hose intact,



Connect hose with connector of cylinder; do not mix it with other parts, and tighten it with 27 # wrench. Tightening torque is 37±2 N•m



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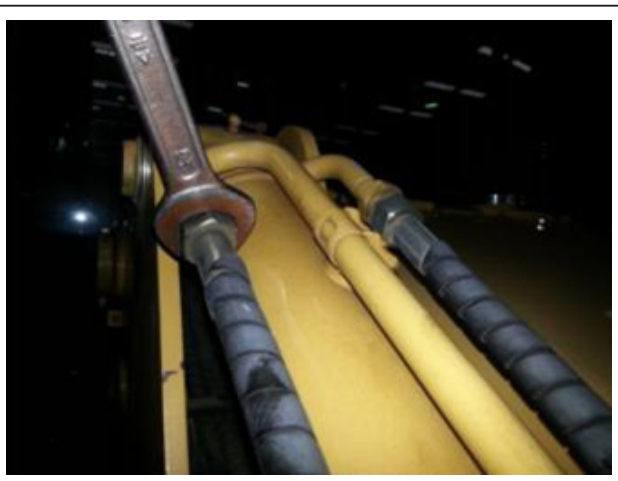
Removal of bucket tilt cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove hose of bucket tilt cylinder
   Release pressure of bucket tilt cylinder, and remove two hoses connected with cylinder with 27# wrench,



Pack up the connector of hose and oil cylinder with clean plastic bag and tie to prevent foreign matters dropping in.



2. Remove pin shaft of bucket tilt cylinder
   Lift and hold lifting arm cylinder with crane and sling, remove circlip and shim used to fix pin shaft at the rear end of lifting arm cylinder with circlip pliers.

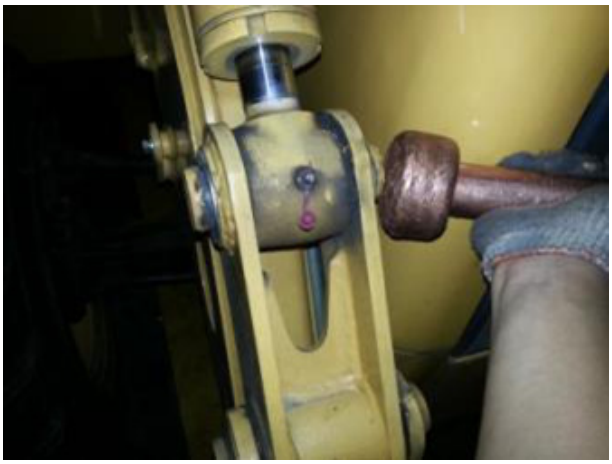


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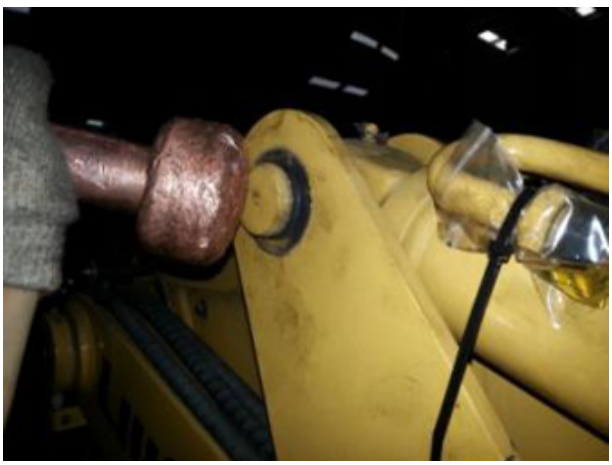




Knock pin shaft out with copper bar, recycle shim and lift up lifting arm.







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Installation of bucket cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.

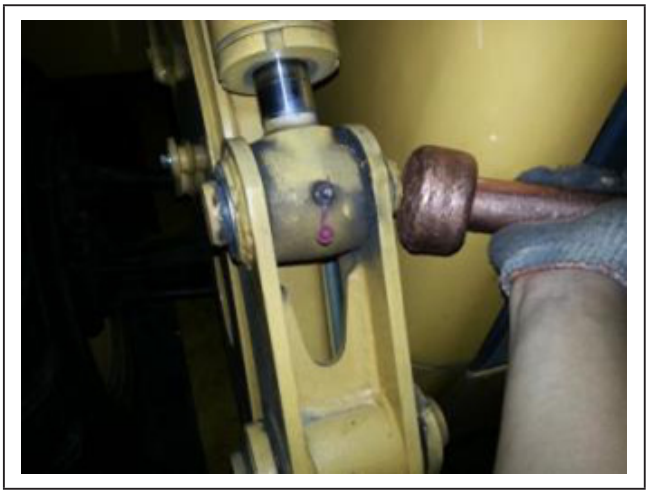


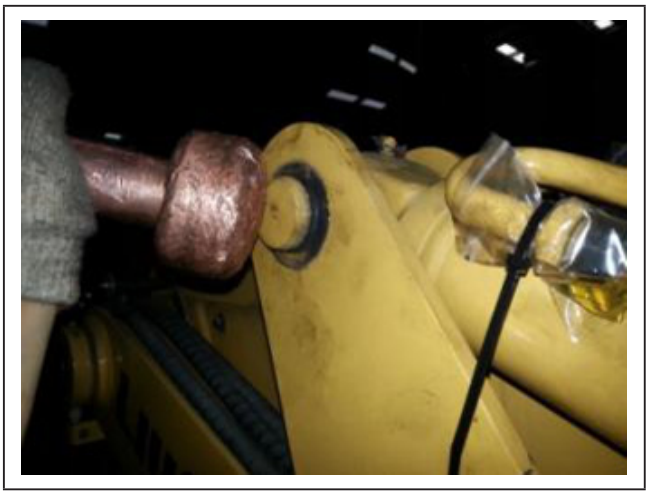
1. Install pin shaft of bucket tilt cylinder
   Lift bucket tilt cylinder to mounting position with crane and sling, align rear installing hole of bucket tilt cylinder to corresponding installing hole of lifting arm, place shim between both sides to adjust clearance, and ensure total clearance between both sides is 1mm±0.5mm.





Make pin shaft go forward by copper bar





Assemble circlip with circlip pliers.

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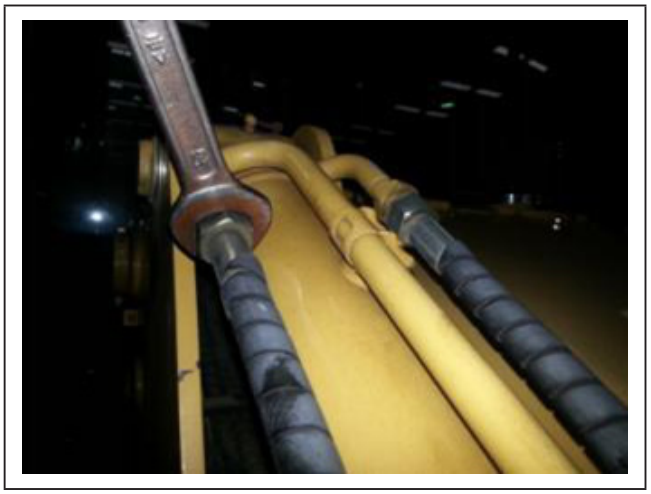




2. Install oil pipe of bucket tilt cylinder
   Remove oil cylinder and hose shield, observe the hose connected with it to ensure O-Ring of hose intact,



Connect hose with connector of cylinder; do not mix it with other parts, and tighten it with 27 # wrench. Tightening torque is 37±2N•m



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Removal of 777A outrigger cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Removal of light holder
   Remove 3 bolts used to fix light holder with 10# wrench, and take out light holder,





Disconnect connector used to connect light holder with frame harness.



2. Remove hose
   Remove two hoses connected with cylinder with 22# wrench,

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Pack up the connector of hose and oil cylinder with clean plastic bag and tie to prevent foreign matters dropping in.



3. Remove lower end pin shaft
   Remove bolt and nut used to fix pin shaft at the lower end of cylinder with two 16# socket.



Remove pin shaft by copper bar



4. Remove upper end pin shaft
   Lift and hold cylinder with crane and sling.



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Remove circlip used to fix upper pin shaft with circlip pliers.



Recycle shim, knock out pin shaft with copper bar,



Take out snap ring in the middle,



Lift up cylinder with crane sling.



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Installation of 777A outrigger cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Install upper end pin shaft
   Lift up cylinder to mounting position with crane and sling.



Put snap ring into both sides of installing hole at cylinder upper end,



Knock pin shaft into installing hole with copper bar.



Install shim at both sides of pin shaft, and install snap ring into installing groove of pin shaft with circlip plier.



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2. Install lower end pin shaft
   Knock copper bar into installing hole with pin shaft.



   Fix pin shaft with nut and bolt, tighten bolt and nut with two 16# sleeves, and tightening torque is 52±7 N•m.



3. Install hose
   Remove oil cylinder and hose shield, observe the hose connected with it to ensure O-Ring of hose intact.



   Connect hose with cylinder connector, and please do not mix with other parts; tighten two hoses connected with cylinder with 22# wrench, and tightening torque is 16±1 N•m.



4. Install light holder
   Place light holder to mounting position.

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Connect harness of light holder with harness of frame, fix bolt and shim with 10# wrench, and tightening torque is 10.5±1.5 N•m.





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Removal of 766A frog legs cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove guard plate of hydraulic lock
   Remove bolt on hydraulic lock guard plate with 13# wrench and sleeve, and take down guard plate.



2. Remove cylinder upper hose and hydraulic lock
   Remove three hoses connected with cylinder with 27# wrench.



Pack up the connector of hose and oil cylinder with clean plastic bag and tie to prevent foreign matters dropping in.





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Remove hydraulic lock with 27# wrench, note installing direction of hydraulic lock.



Pack up the connector of hose and oil cylinder with clean plastic bag and tie to prevent foreign matters dropping in.



3. Remove cylinder pin shaft
   Lift and hold cylinder with crane and sling.



Remove bolts of two pin shafts in vertical direction with 18# wrench or sleeve.



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Knock out two pin shafts with copper bar, and lift up cylinder with crane and sling.





Installation of 766A frog legs cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Install pin shaft of cylinder
   Lift up cylinder to mounting position with crane and sling.



Knock two pin shafts into installing hole with copper bar.

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Tighten bolts and shims of two pin shafts in vertical direction with 18# wrench or sleeve, and tightening torque is 90±12 N•m. Remove crane and sling





2. Install cylinder upper hose and hydraulic lock
Remove hydraulic lock and cylinder connector shield, observe the hose connected with it, ensure hose O-ring intact; connect hydraulic lock with cylinder, keep direction of hydraulic lock same after removal; tighten three hoses connected with cylinder with 27# wrench, and tightening torque is 37±2 N•m.



Remove cylinder and hose shield, observe the hose connected with it, ensure hose O-ring intact; connect hose with cylinder, do not mix it with other parts; tighten three hoses connected with cylinder with 27# wrench, and tightening torque is 37±2 N•m.

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3. Install guard plate of hydraulic lock
   Place guard plate to mounting position, tighten bolt and nut of hydraulic lock guard plate with 13# wrench and sleeve, and tightening torque is 26±4 N•m.



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Removal of angling cylinder

Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Remove cover plate
   Remove six bolts of guard plate with two 30# wrenches.



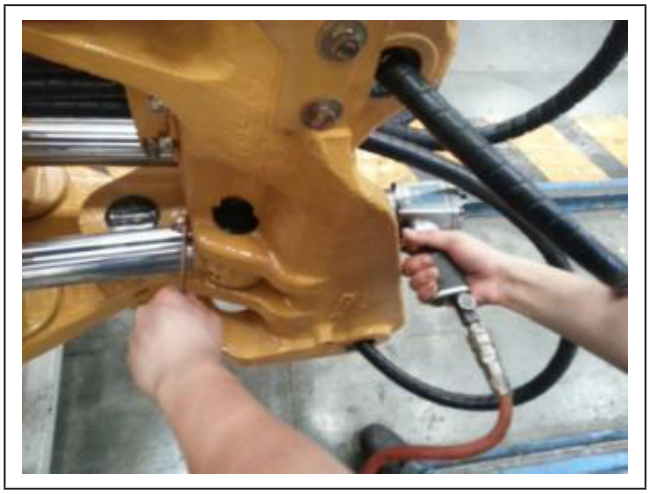
Recycle shim at bottom of guard plate.



Take out cover plate.



2. Remove cylinder front end pin shaft
   Remove bolts used to fix pin shaft at front end of cylinder with two18# wrenches or sleeves.



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Knock out pin shaft from up to down with copper bar,



Retract cylinder to proper position.



3. Remove hose
Remove hose connected with cylinder with 22# and 24# wrench respectively.



Pack up the connector of hose and oil cylinder with clean plastic bag and tie to prevent foreign matters dropping in.



Take out cylinder.



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Installation of angling cylinder

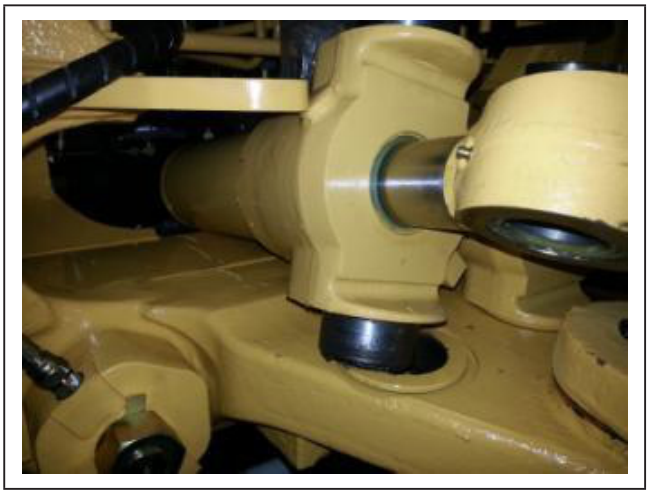
Preparation work

Place oil container under the bottom of vehicle to prevent hydraulic oil polluting ground.



1. Install hose

Place cylinder to mounting position



Remove oil cylinder and hose shield, observe the hose connected with it to ensure O-Ring of hose intact.



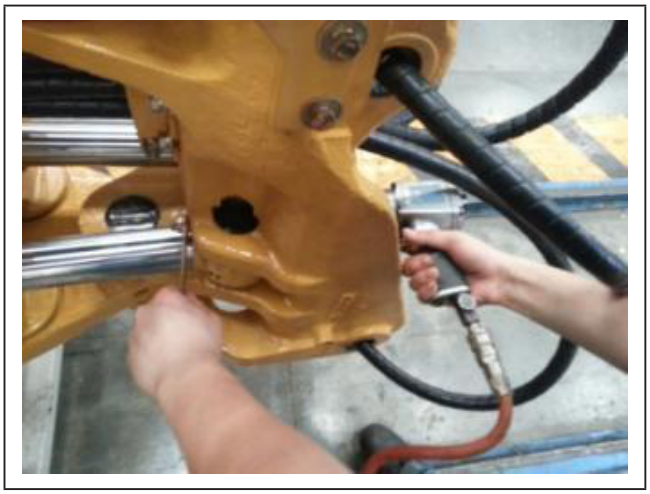
Connect hose with cylinder connector, and please do not mix it with other parts; tighten hose connected with 22# and 24# wrench respectively, and tightening torque is 90±12 N•m.



2. Install cylinder front end pin shaft

Draw out front end of cylinder, align it to installing hole of swing seat; knock in pin shaft from up to down with copper bar; tighten bolts used to fix pin shaft at the front end of cylinder with two 18# wrenches or sleeves, and tightening torque is 26±2 N•m.

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3. Install cover plate
   Place cover plate to mounting position, and place shim at the bottom.



Tighten six bolts of cover plate with two 30# wrenches, and tightening torque is 430±50 N•m.

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Removal of telescoping cylinder

1. Remove adjusting bolt
   Screw off eight bolts used to fix nylon bar with 12# socket, and do not remove;



   Screw off lock nut of adjusting bolt at both sides of bucket arm with 22# wrench, and do not remove.



   And screw off adjusting bolt.



2. Remove pin shaft of telescoping cylinder
   Screw off bolt used to fix pin shaft of telescoping cylinder with 19# socket.



   Knock pin shaft out by copper bar

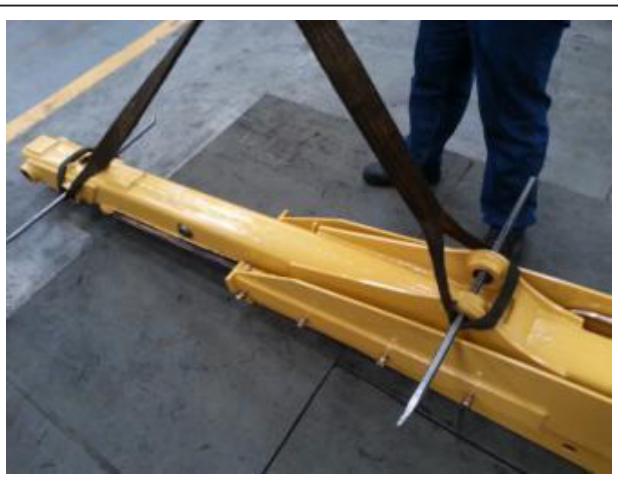


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Recycle adjusting shim;



Stretch upper bucket arm outward with crane, sling and crossbar.



Remove circlip used to fix pin shaft at front end of cylinder with circlip pliers.



Knock off the copper bar with a pin.



3. Remove telescoping cylinder
   Pull out cylinder from back.



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Lift up cylinder with crane and sling.



Installation of telescoping cylinder

1. Install telescoping cylinder
   Lift telescoping cylinder to corresponding position of upper bucket arm with crane and sling.



Push telescoping cylinder into upper bucket arm,align installing hole at front end of cylinder to installing hole of upper bucket arm, and align installing hole at rear end of cylinder to installing hole of lower bucket arm.



2. Install pin shaft of telescoping cylinder
   Knock front and rear pin shaft into installing hole respectively with copper bar,

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Put shim into both sides of front pin shaft respectively, and tighten pin shaft with circlip pliers.



Put in shim at the same time of installing rear pin shaft, and require the clearance between two ends of cylinder installing holes is 1±0.5 mm,





Tighten captive bolt of rear pin shaft with19# wrench, and tightening torque is 90±12 N•m.



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3. Install adjusting bolt
   Tighten eight bolts used to fix nylon bar with 12# socket, and tightening torque is 26±4N•m;



Tighten bolts of adjusting bolts at both sides of bucket arm with 22# wrench, and ensure upper bucket arm is in the middle.



And tighten lock nut. Tightening torque of nut is 160±20 N•m.



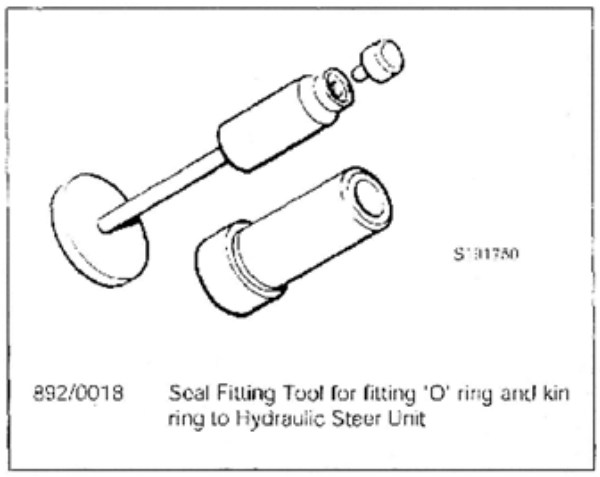
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3. Steering System

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Basic System Operation 5
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Fault Finding Contents 7
Failure modes 7
Steering system - pressure test 7
Hydraulic Steer Unit - Disassmbly and Replacement 9

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Service Tools



892/0018 Seal Fitting Tool for fitting 'O' ring and kin ring to Hydraulic Steer Unit

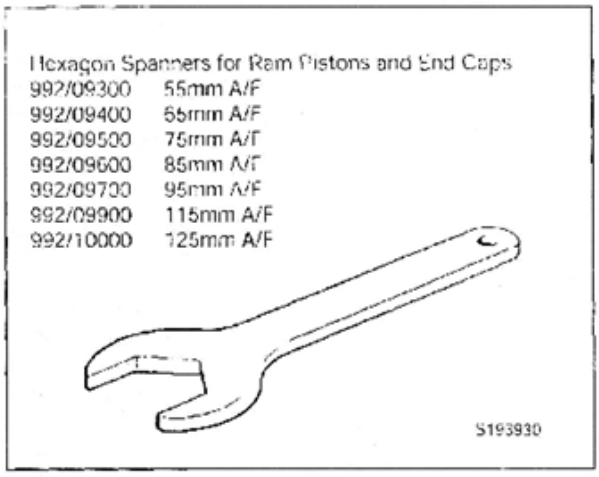


Fig. 1.1

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System Type

LIUGONG Backhoe loader is 2 Wheel Steer Machines

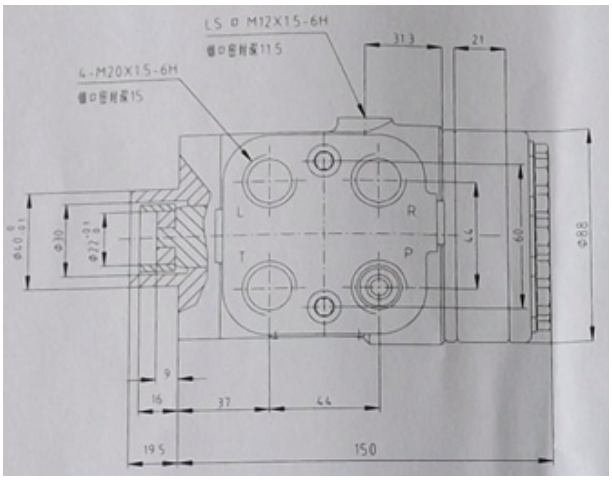
STEER UNIT – view 1

Model

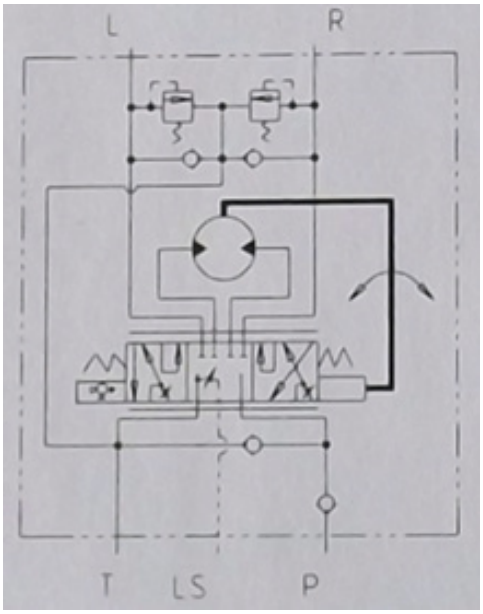
- Volumetric Displacement
- Safety valve
- Check Valve
- Shock Valve
- Safety valve Operating Pressure (at 1500 revs/min)
- Shock Valve Operating Pressure

Model

- Volumetric Displacement
- Safety valve
- Check Valve
- Shock Valve
- Safety valve Operating Pressure (at 1500 revs/min)
- Stand by Pressure



The view of the steer unit Fig. 2.1



The view of the steer unit schematic Fig. 2.2

The parameter of the steer unit

Model:BZZ-160

Serial numbers:530-7174

Signal load sensing,displacement:160ml/r

Maximum inlet pressure:17.2Mpa

Maximum continuous pressure 2.1Mpa

Maximum system temperature:93℃ ,

Maximum temperature difference:28℃

Steer torque:1.7-2.8N•m

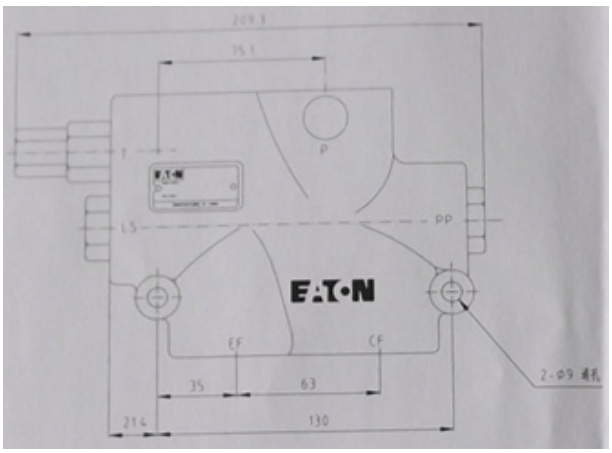
Recommend pollution lever:ISO18/13

Shock valve operation pressure:200bar

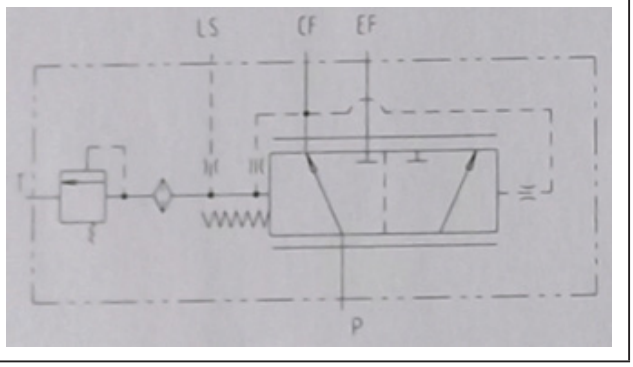
PRIORITY VALVE – view 2

- Stand by Pressure

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The view of the priority valve Fig. 2.3



The view of the priority valve schematic Fig. 2.4

The parameter of the steer unit

Model:VLE-150

Serial numbers:882-2902-072

Flow:150L/min

Dynamic signal,control pressure:8.6bar

Safety valve setting pressure:17.2Mpa

P,EF interface:M27×2

CF interface:M22×1.5

LS,Tinterface:M12×1.5

Safety valve operation pressure:172bar

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Basic System Operation

Steering system schematics

Component Key:

1 Front axle (steer oil cylinder)
2 Oil tank
3 Pump
P1 Pump, Main Section
PP Pump, Secondary Section
4 Priority valve
5 Steer unit
CF To the unit
EF To the main hydraulic circuit
C Pressure Test Point
D Steer unit safety valve
E Shock valve
S Suction Line

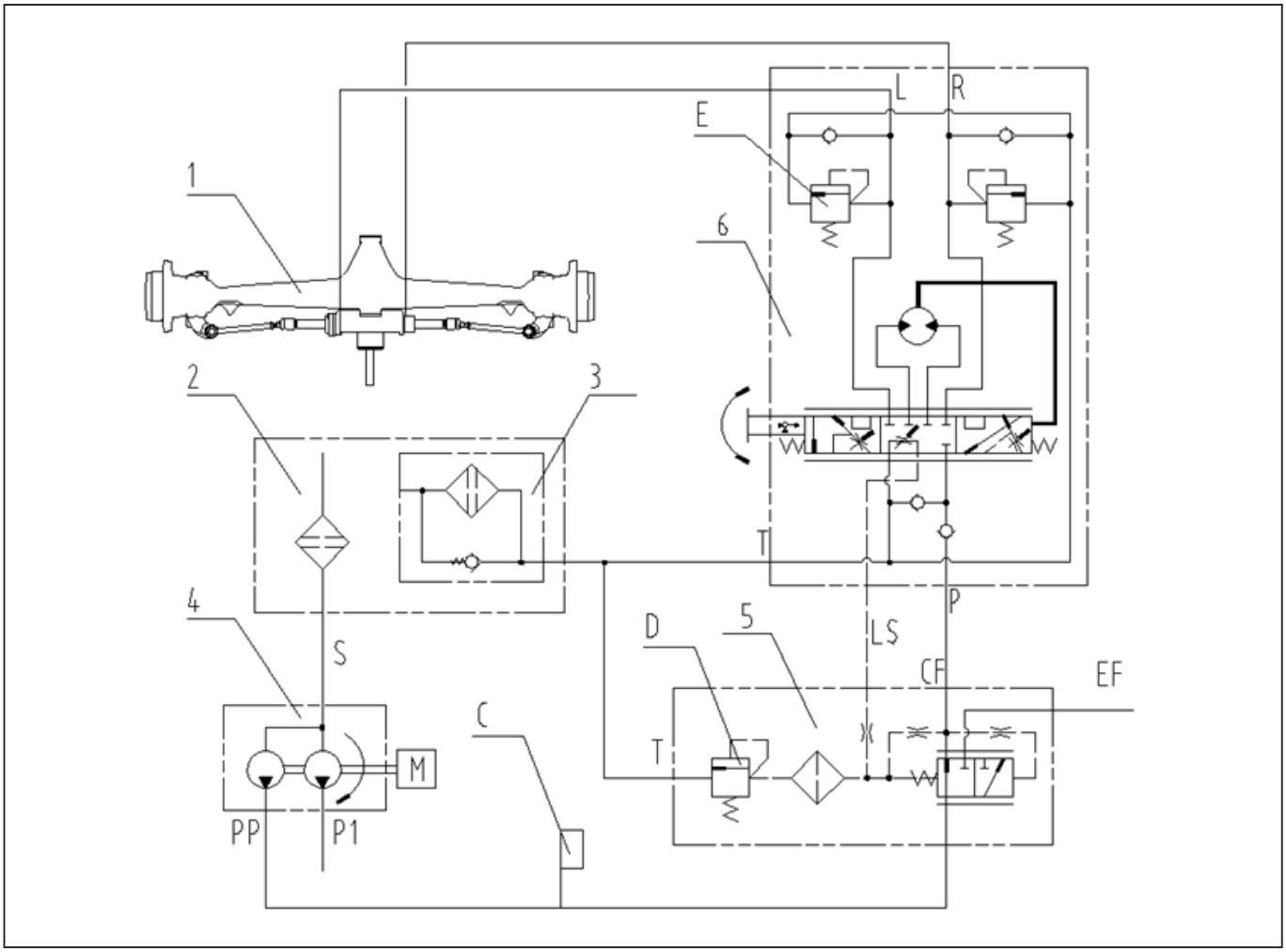


Fig. 3.1

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Basic system operation

Hydraulic operation

The main components of the steering system are the front Axle (steering oil cylinder) 1,oil tank 2,pump 3,priority valve 4,steer unit 5,and some hoses.

When the steering wheel is not turned, flow from the hydraulic pump P2 is now distributed to the main hydraulic circuit via the priority valve 4

When the steering wheel is turned,Oil from the hydraulic pump P2 is then distributed via the priority valve to the steer unit 5, which then directs the oil to the front power track rod ram of the front axle 1,untill the required steering lock is achieved.

When the steering lock is held, flow from the hydraulic pump P2 is now distributed to the main hydraulic circuit via the priority valve 4.

Maximum steering system pressure is controlled by a safety valve D, located in the priority valve 4,it's working pressure is 17.2Mpa.

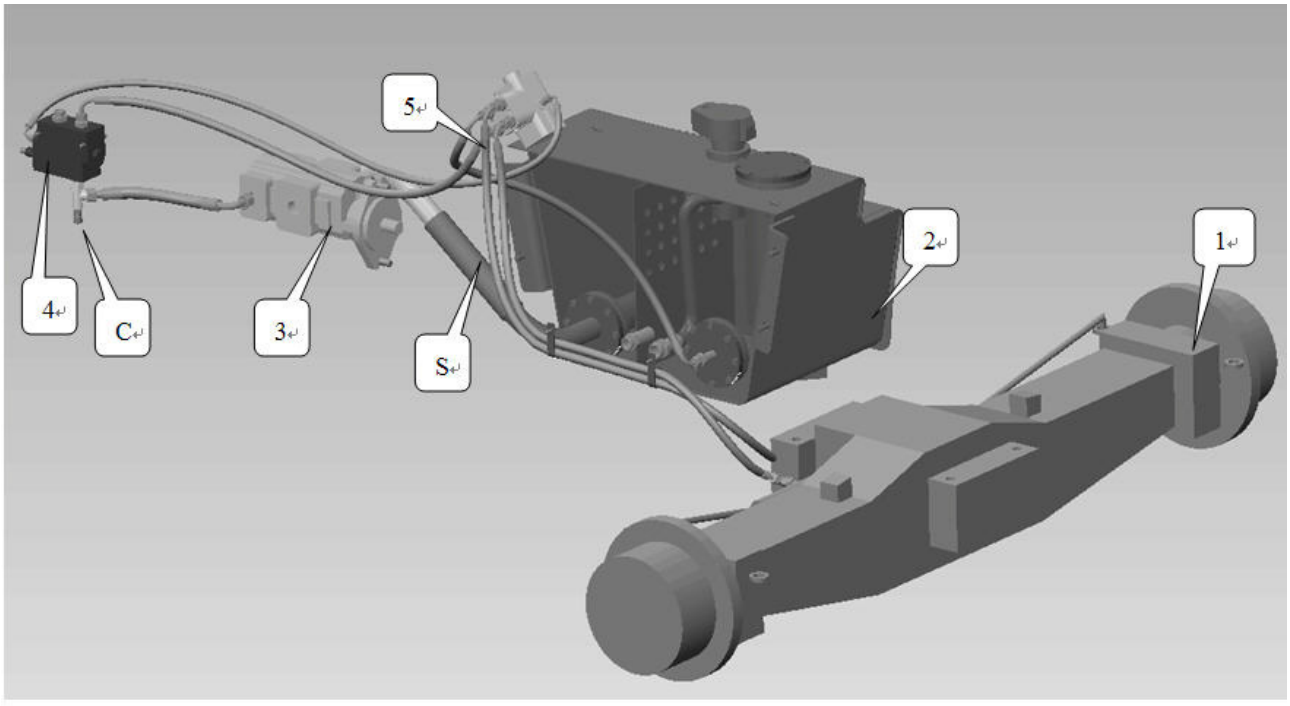


Fig. 3.2

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Fault Finding Contents

Failure modes

1. When the steering wheel turned.the machine will not turn.
2. Steering wheel very hard to turn.
3. Steering wheel turns on its own.
   The following contents is to help you trace hydraulic faults to a faulty unit (for example:the valve, pump,hoses, ram etc) . Once you have traced the faulty unit, according to the corresponding directions inspecting and test instructions given elsewhere in the next.

1. Before you begin fault finding, read the Safety informationat the beginning of this manual.
2. Make sure that the hydraulic fluid is at correct working temperature (50℃) .
3. What ever the fault, check the condition of the hydraulic fluid. Drain and replace if necessary. Make any relevant electrical checks before moving on to the hydraulics.
4. Be sure to remove ALL contamination and if possible identify its origin. It may be part of a component from elsewhere in the circuit. Replace any seals such as 'O' rings before re-assembling hydraulic components

	failure	action
1.When the steering wheel turned.the machine will not turn.		
1	the cylinder of axle leaks	check if the rod is worned
2	lacking of hydraulic fluid	check hoses and connection for leaks,and check the level of the tank
3	some parts or interfaces leaks	check hoses and connection for leaks
4	some parts of the steer control valve damaged	inspect and replace the damage parts, if possible
5	the relief valve in the priority set in correctly	check pressure and adjusting as required
6	the pump has low flow	check pump flow,if required ,replace a new one
2.Steering wheel very hard to turn.		
1	lacking of hydraulic fluid	check hoses and connection for leaks,and check the level of the tank
2	some parts or interfaces leaks	check hoses and connection for leaks
3	some parts of the steer control valve damaged	inspect and replace the damage parts, if possible
4	the relief valve in the priority set in correctly	check pressure and adjusting as required
5	the pump has low flow	check pump flow,if required ,replace a new one
6	the steering tyres not inflated to correct pressure	inflate tyre to correct pressure
7	mechanical failure	check for the damage of the axle
3.Steering wheel turns on its own.		
1	the steering system is too dirty	clean and inspect the part,especially the steer unit
2	steer column splined shaft not fully engaged in the steer unit	engagement

Fig. 4.1

Steering system - pressure test

⚠ Warning

Before you check the pressure,remember you have to proceed the following steps:

1. Park the machine on level ground,and engage the parking brake
2. set the gearbox to neutral.
3. Lower the attachments to the ground.

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4. Stop the engine and remove the starter key.
5. Turn the steering wheel to the left and to the right several times to vent system pressure.
6. To cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
7. Chock all four wheels to prevent unexpected move of the machine.

And then

8. Connect a 0-400 bar (0-6000 lbf/in9 pressure gauge to test adaptor c (see the pic)

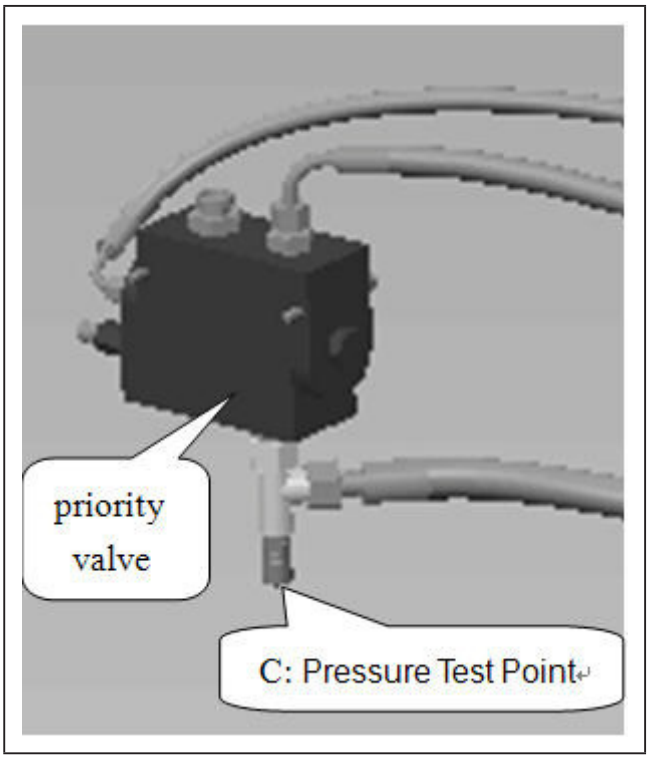


Fig. 4.2

9. Run the engine at 1500 revs/rain and turn the steering to full lock. Check the gauge reading which should equal the safety valve pressure, refer to Technical Data.

   ⚠ Note: The steering wheel must be held on full lock while the gauge reading is being checked.

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Hydraulic Steer Unit - Disassmbly and Replacement

⚠ Warning

Before you check the pressure,remember you have to proceed the following steps:

1. Park the machine on level ground,and engage the parking brake
2. set the gearbox to neutral.
3. Lower the attachments to the ground.
4. Stop the engine and remove the starter key.
5. Turn the steering wheel to the left and to the right several times to vent system pressure.
6. Make sure the engine cannot be started while the hoses are open.so,To cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
7. Chock all four wheels to prevent unexpected move of the machine.

DANGER

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses.

Next is the detailed steps

Some of the following pictures may not show exactly your steering unit ,but the indicated operations are correct anyway.

Disassmbly:

8. Disconnect and cap all hydraulic hoses from the steering unit as shown at following picture. Label the hoses to ensure correct refitting.

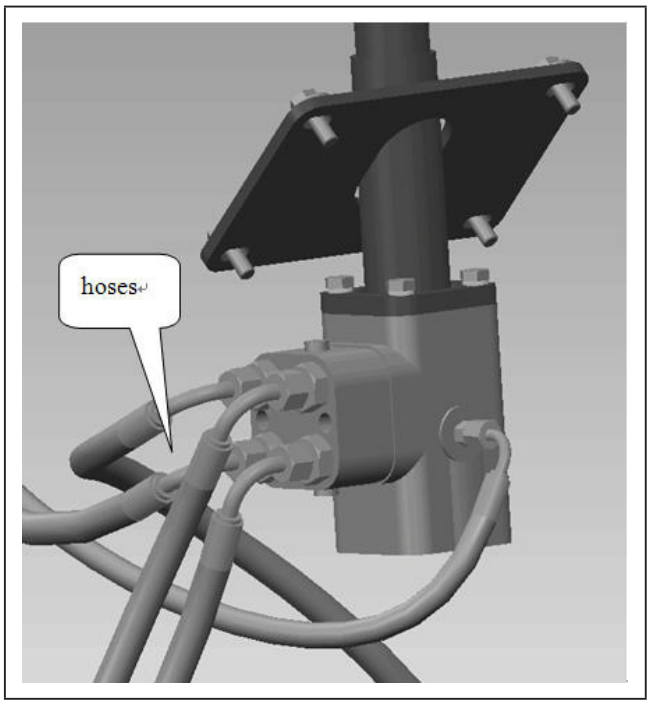


Fig. 5.1

9. inside the cab, Get an assistant to hold the steering unit, loosen and remove 4 bolts Lift the steering column off the spline ,and then lift the steering unit from the machine. as shown as the following picture.

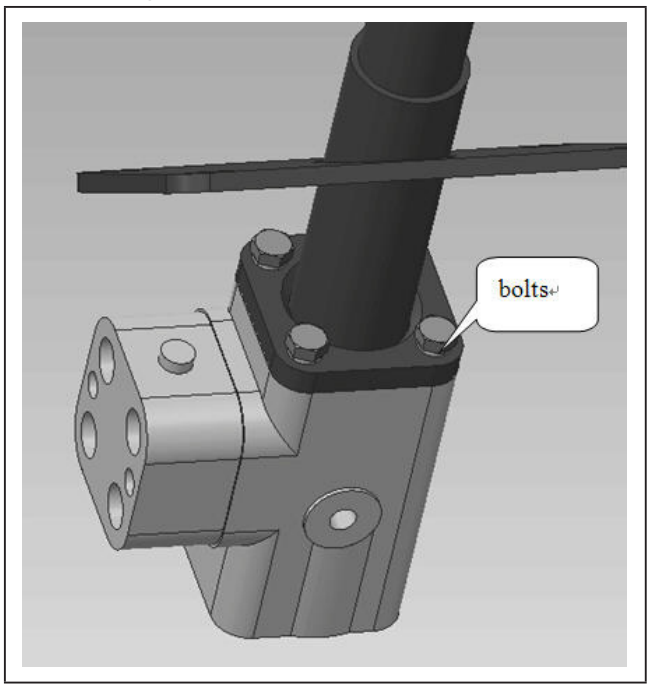


Fig. 5.2

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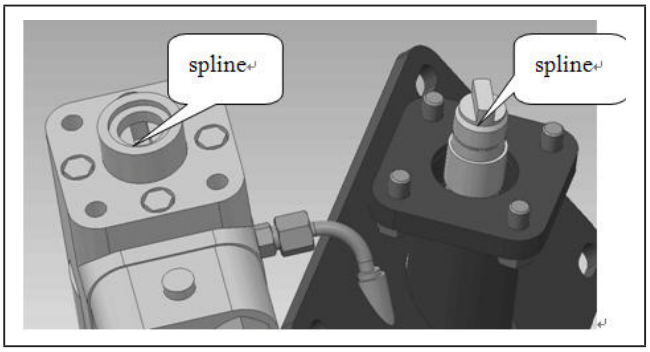


Fig. 5.3

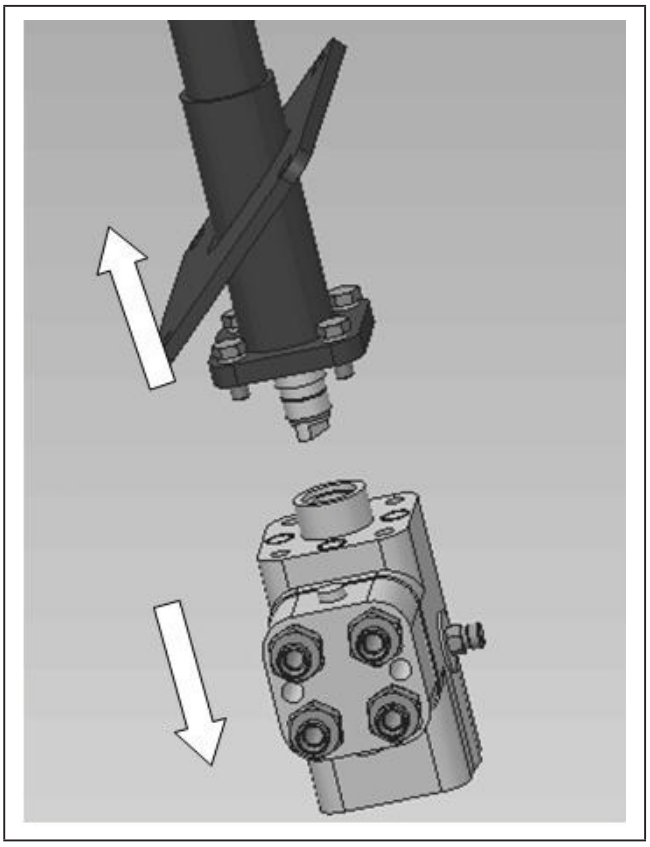


Fig. 5.4

Replacement

Warning

The jets of hydraulic fluid at high pressure can penetrate the skin. Do not use your fingers to check for hydraulic fluid leaks. Wear your classes to protect your eyes.Do not put your face close to suspected leaks. Hold a piece of cardboard close to suspected leaks and then inspect the cardboard for signs of hydraulic fluid. If hydraulic fluid penetrates your skin, get medical help immediately.

10. Replacement is a reversal of the disassmbly sequence.
11. Make sure that the hoses are correctly installed.
12. If a new steering unit has been fitted then the system safety valve must be tested for correct pressure setting. Refer to **Service Procedures, Steering System - Pressure Test**

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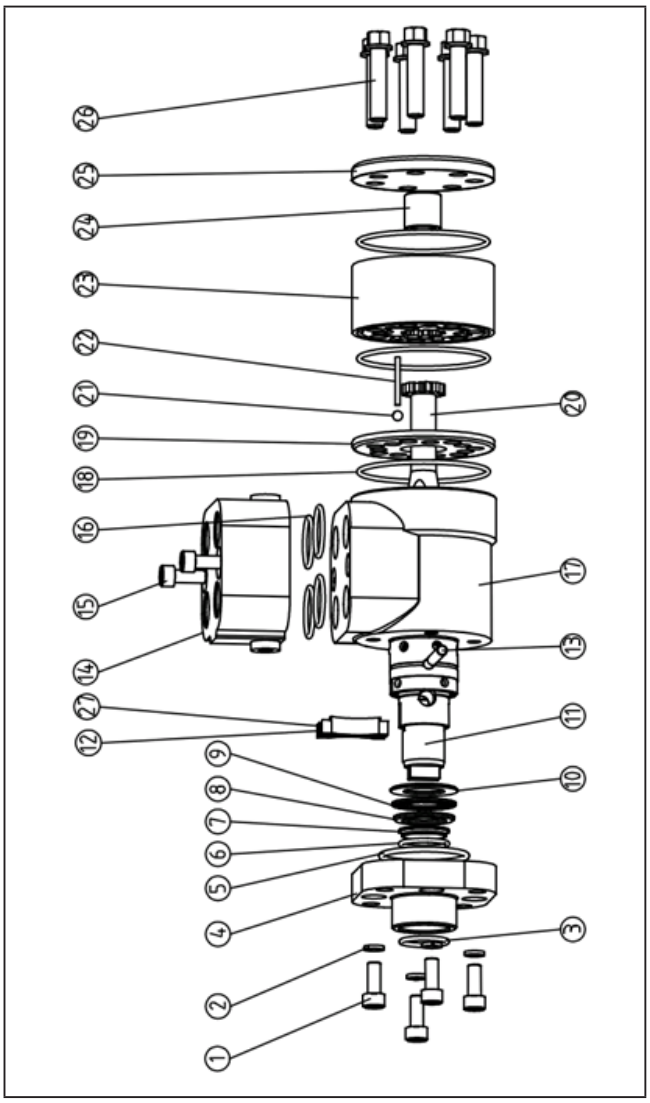


Fig. 5.5

item	name	quantity
27	keep piece	2
26	bolt	7
25	cover	1
24	limit block	1
23	stator-rotor	1
22	pin	1
21	ball	1
20	joint shaft	1
19	plate	1
18	"O"ring 77.5×2.65	3
17	valve body	1
16	"O"ring	4
15	screw	2
14		1
13	pin	1
12	spring	4
11	valve core-valve sleeve	1
10	slip ring	1
9	bearing	1
8	ring	1
7	seal assy	1
6	seal assy25×2.6	1
5	"O"ring 50×3.1	1
4	cover	1
3	seal 25.8×2.65	1
2	spring washer	4
1	screw	4

Fig. 5.6

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Priority Valve

Disassmbly and replacement

Before you check the pressure,remember you have to proceed the following steps:

1. Park the machine on level ground,and engage the parking brake
2. set the gearbox to neutral.
3. Lower the attachments to the ground.
4. Stop the engine and remove the starter key.
5. Turn the steering wheel to the left and to the right several times to vent system pressure.
6. Make sure the engine cannot be started while the hoses are open.so,To cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
7. Chock all four wheels to prevent unexpected move of the machine.

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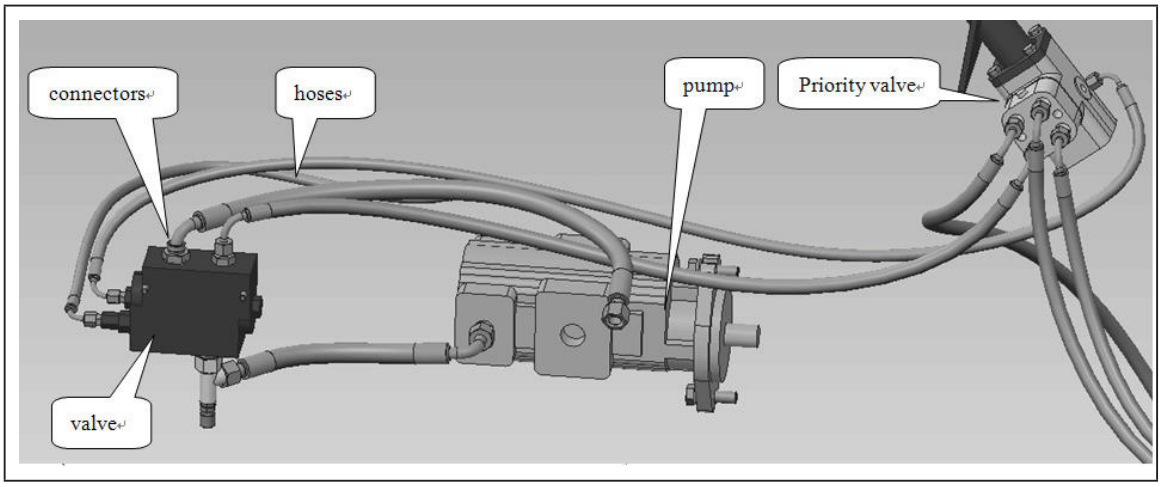


Fig. 5.7

DANGER

Hydraulic Pressure

Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses.

Next is the detailed steps

Some of the following pictures may not show exactly your steering unit ,but the indicated operations are correct anyway.

8. Disconnect and cap all hydraulic hoses from the steering unit as shown at following picture. Label the hoses to ensure correct refitting.

After disassembly the hoses and connectors

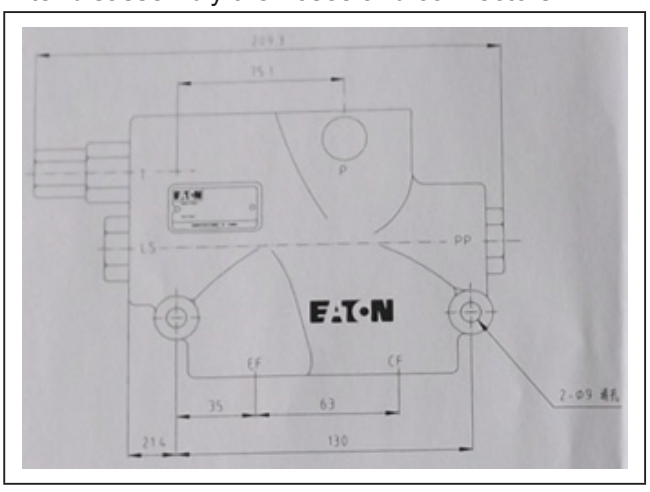


Fig. 5.8

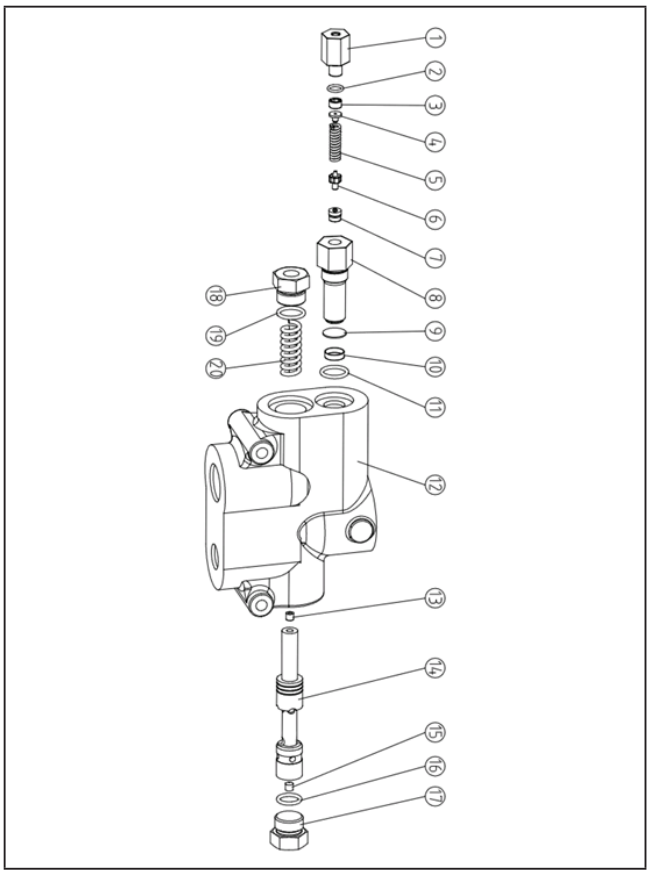


Fig. 5.9

⚠ Note:the priority valve is not serviceable beyond the removal of foreign matter,the faulty unit must be replaced.

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item	name	quantity
20	spring	1
19	"O"ring	1
18	cap	1
17	cap	1
16	"O"ring	1
15	throttle cap	1
14	valve core	1
13	throttle cap	1
12	valve body	1
11	"O"ring	1
10	pressure ring	1
9	filter screen	1
8	cap	1
7	safety valve seat	1
6	safety valve core	1
5	spring	1
4	spring cap	1
3	adjust screw	1
2	"O"ring	1
1	cap	1

Fig. 5.10

Removal

Press out the item 14,and take care not to damage the bores of the valve.

Installation

Make sure the item 14 faces toward ls connector

Clean all parts

Lubricate all parts with hydraulic fluid ,replace the O ring.

Link Arms-Disassmbly and replacement

This section is for removal and replacement of the steering track rod (which is in the steering cylinder)

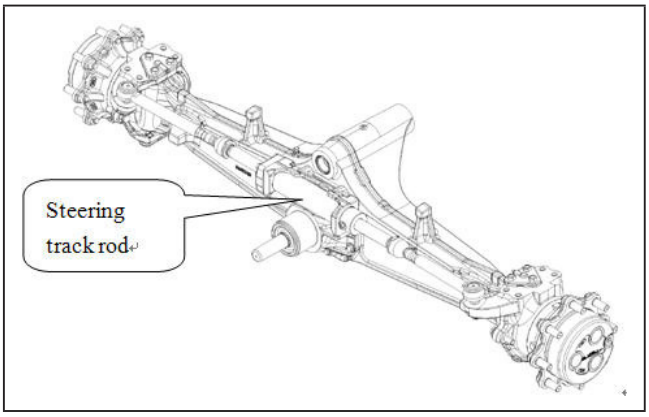


Fig. 5.11

⚠ Warning

Before you check the pressure,remember you have to proceed the following steps:

1. Park the machine on level ground,and engage the parking brake
2. set the gearbox to neutral.
3. Lower the attachments to the ground.
4. Stop the engine and remove the starter key.
5. Turn the steering wheel to the left and to the right several times to vent system pressure.
6. To cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
7. Chock all four wheels to prevent unexpected move of the machine.
   Next is the detailed steps

   Some of the following pictures may not show exactly your axle,but the indicated operations are correct anyway.

   Disassmbly:

   Steering track rod assy

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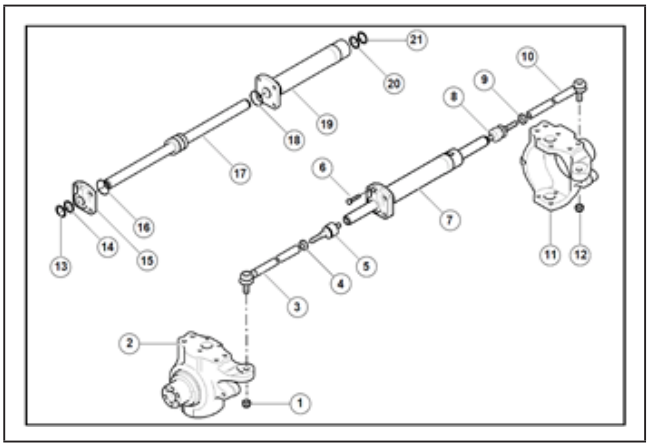


Fig. 5.12

*Unloose the nut (**1**) of some turns till it is over the threaded pin end of the tie rod (**3**).*
*Beat on the nut (**1**) with a hammer in order to disjoin the tie rod (**3**) from the swivel housing (**2**).*
***Warning:** don't beat on the threaded pin end of the tie rod (**3**).*
***Note:** this is a destructive operation for the nut (**1**).*
Repeat the whole sequence of the mentioned operations to the other side.

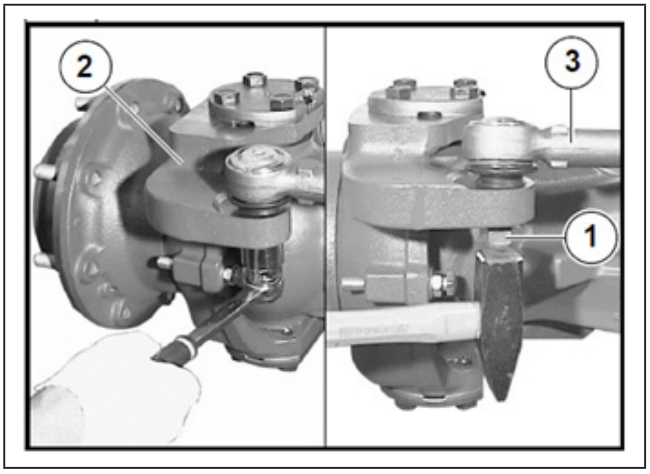


Fig. 5.13

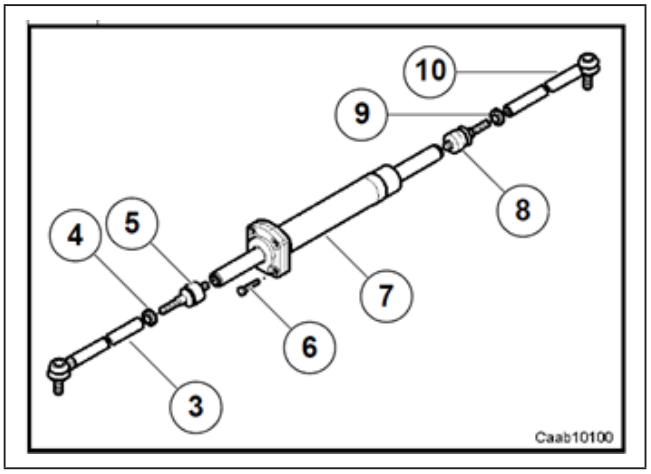


Fig. 5.14

*Detach the cylinder head (**15**) from the cylinder case (**19**) and remove it from the rod (**17**).*
*Remove off the rod (**17**) from the cylinder case (**19**).*
*Remove all the sealings and O-Rings (**13**, **14**, **16**, **18**, **20** and **21**) from the cylinder case (**19**), the cylinder head (**15**), and the rod (**17**).*

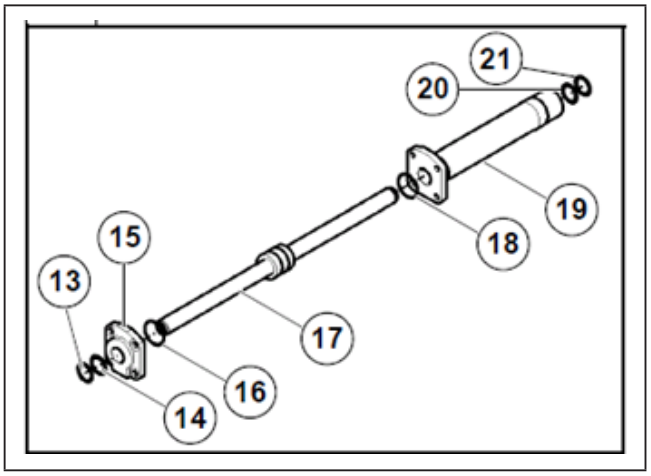


Fig. 5.15

Assmbly (replacement) :

*Assemble new sealings and O-Rings (**13**, **14**, **16**, **18**, **20** and **21**) on the cylinder head (**15**), on the rod piston (**17**) and on the cylinder body (**19**).*

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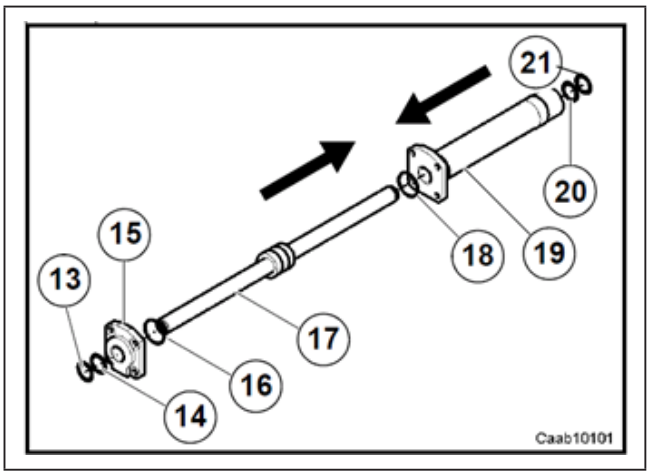


Fig. 5.16

*Fit the cylinder head (**15**) on the rod (**17**).*
*Slide the pre-assembled rod (**17**) into the cylinder body (**19**).*

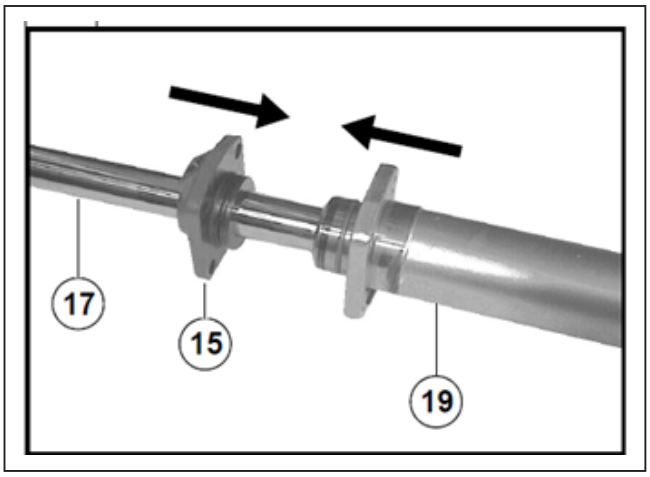


Fig. 5.17
Link Arms-Disassmbly and replacement

*Fit the tie rods (**3**) and (**10**), the ball joints (**5**) and (**8**), the nuts (**4**) and (**9**) to the ends of the rod (**17**), then tighten with a dynamometric wrench to the requestd torque*

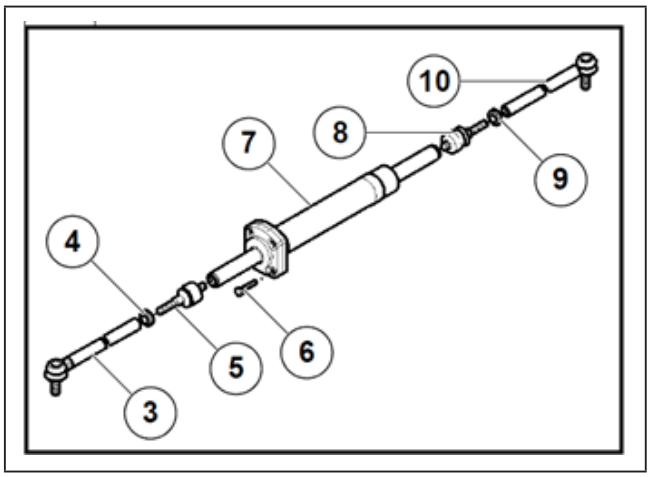


Fig. 5.18

*Install the steering cylinder (**7**) already assembled on the central body. Assemble and tighten the bolts (**6**) with dynamometric wrench to the requested torque*

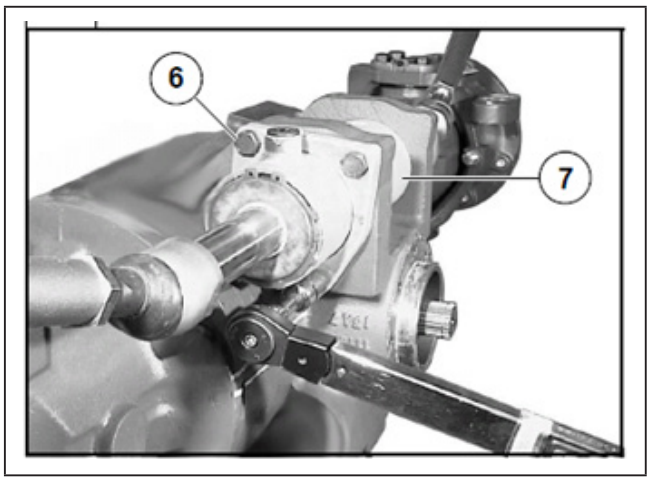


Fig. 5.19

*Align the swivel housing (**11**) with the axle.*
*Screw the tie rod (**10**) so that its ball joint can be inserted into the swivel housing (**11**) arm.*
***Note:** it is important to unscrew the lock nut (**9**) to carry out this operation.*
Repeat the whole sequence of the mentioned operations to the other side.

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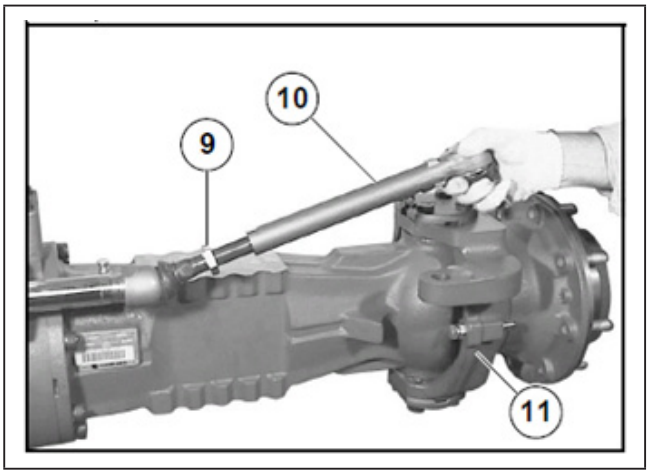


Fig. 5.20

*Insert the ball joint of the tie rod (**3**) into its housing on the swivel housing (**2**).*
*Assemble and tighten the lock nut (**1**) with a dynamometric wrench to the requested torque*
Repeat the whole sequence of the mentioned operations to the other side.

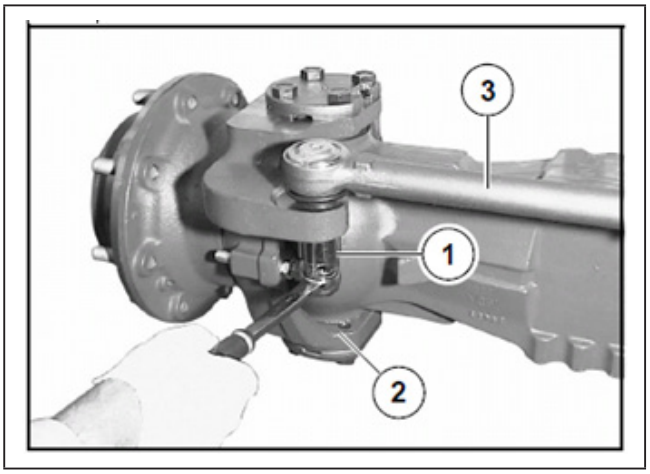


Fig. 5.21
Link Arms-Disassmbly and replacement

*Screw in the lock nuts (**4**) and (**9**) of the tie rods (**3**) and (**10**) only when the toe-in adjustment has been carried out*

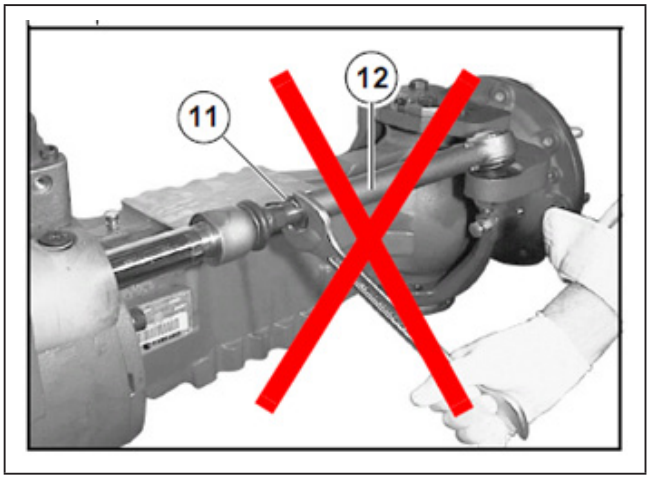


Fig. 5.22

Torque Settings:

NUT 1:220N.M

BOLT 6:120N.M

NUT 9.250NM

THE BALL JOINTS 5 AND 8:300N.M

Toe-in/steering angle

After disassembly and assembly (replacement) the track rod,you need to adjust “toe-in/steering angle”,this is very important for the axle and the machine !!

Next is the detailed steps

Some of the following pictures may not show exactly your axle,but the indicated operations are correct anyway.

Disassmbly:

Put two equal one-meter-long linear bars on the wheel sides and lock them with two nuts on the wheel hub stud bolt.
***Warning:** the two bars should be fixed on their middle so that they are perpendicular to the supporting surface and parallel to the pinion shaft axis; align the two bars.*

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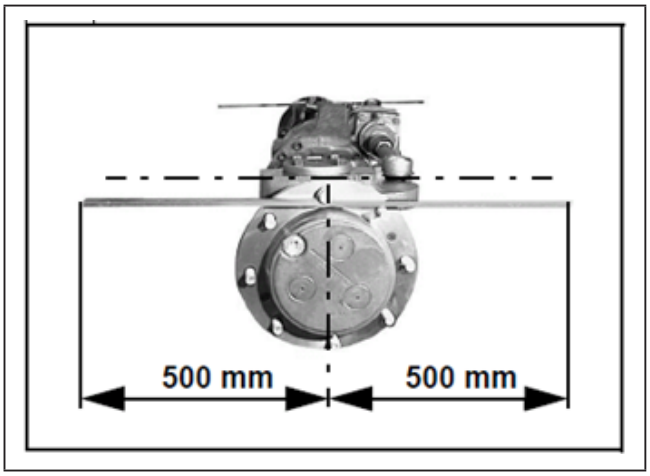


Fig. 5.23

*Measure the distance in mm **M** between the bars ends with a tapeline.*
***Note:** keep the minimum value, swinging the measurement point.*

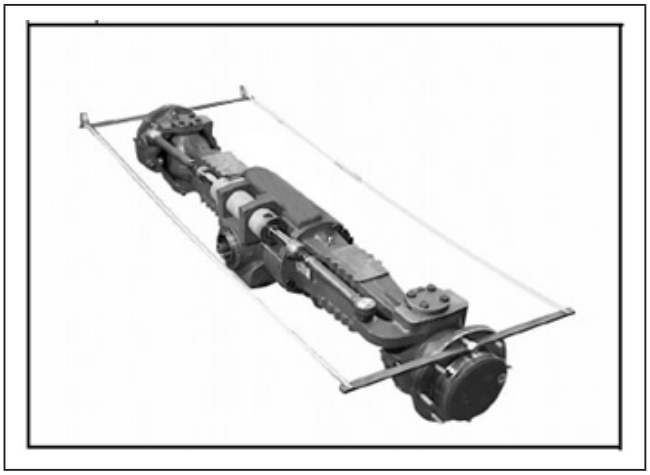


Fig. 5.24

Toe-in/steering angle

Check that the difference of the measurements between the wheel hubs diameters ends is within the requested tolerance range.
***See:** "Toe-in" in sec.C.4.*
*The nominal toe-in value (**A**) is referred to the external diameter of the wheel hubs flange, therefore the measured value (**M**) at the bars ends must be related to the ratio between length of the bar and flange diameter*

nominal toe-in (sec.C.4) = A $^{0}_{-2}$ ⟶ measured toe-in = M $^{0}_{-5}$

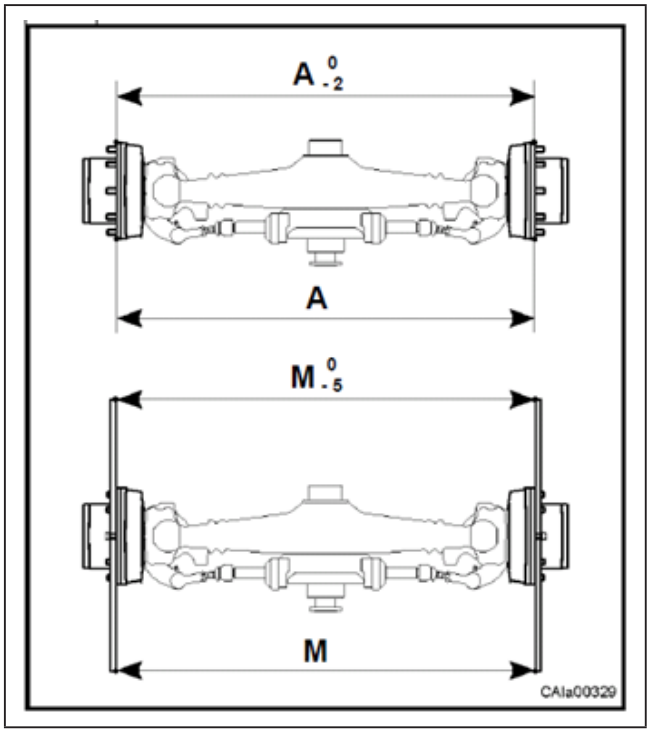


Fig. 5.25

*If toe-in is incorrect, operate with two wrenches on the guide rods (**1**) screwing in and out the two joint tie rods (**3**) equally till the toe-in is within the requested tolerance.*

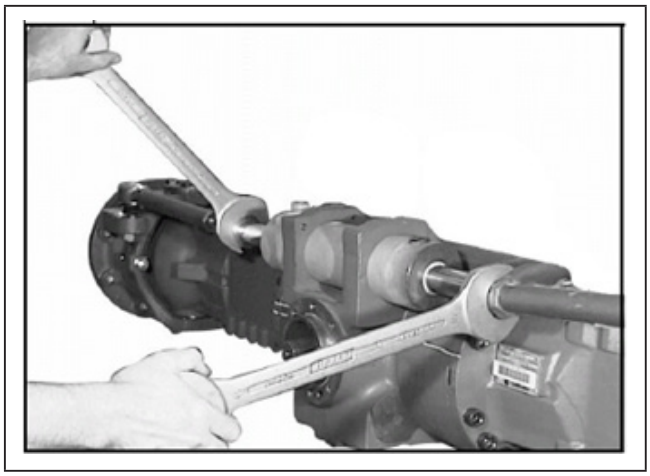


Fig. 5.26

*After adjusting, screw in the lock nuts (**2**) of the guide rods (**1**) to the requested tightening torque (Sec. C.8).*

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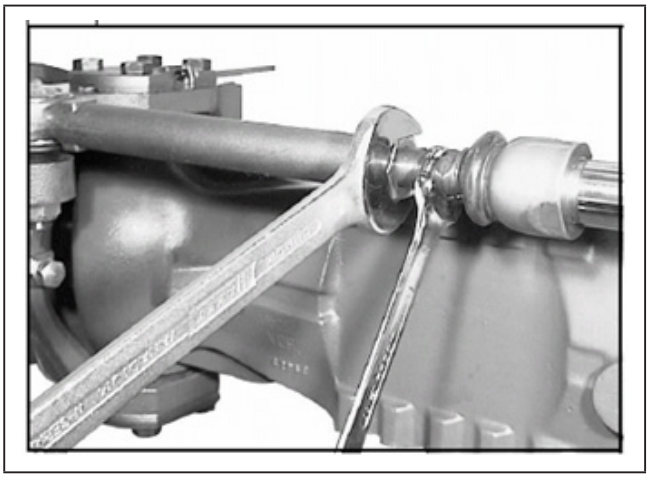


Fig. 5.27

Steering angle adjustment

Use the same bars assembled for the toe-in adjustment and a long bar perfectly leaned over the machined part of the central body (pinion side), so that the two bars form an acute angle at the maximum steering.

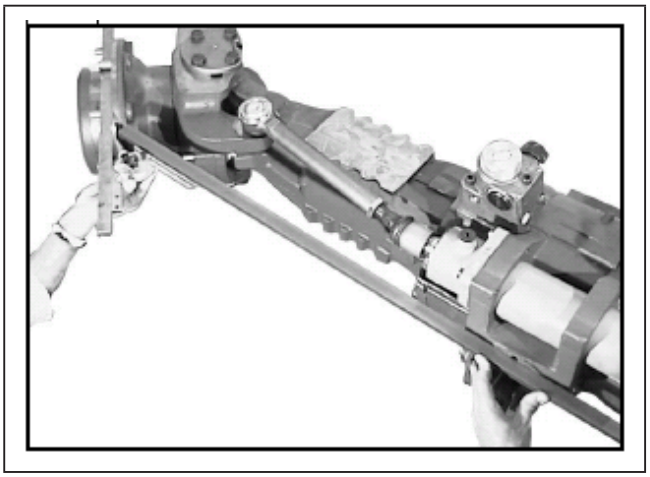


Fig. 5.28

Adjust a protractor to the requested angle (Sec. C.4) and position it on the long bar.
Move a wheel side till it forms, with the two bars, the angle fixed by the protractor.

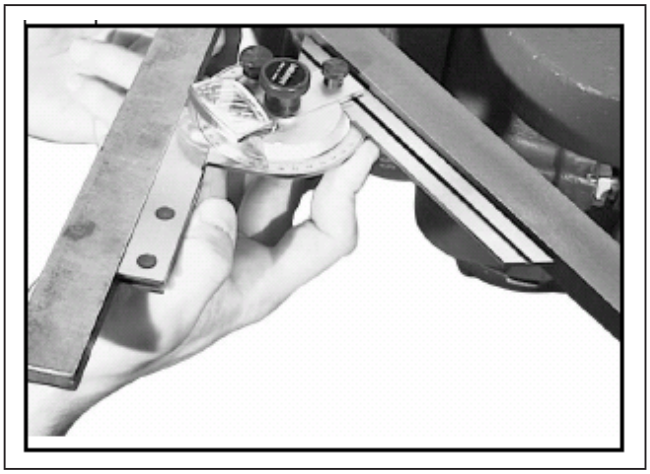


Fig. 5.29

*Adjust the mechanical steering stop, screwing in or out the stop bolt (**4**), locking them with the locknut (**5**) to the requested tightening torque (Sec. C.8).*

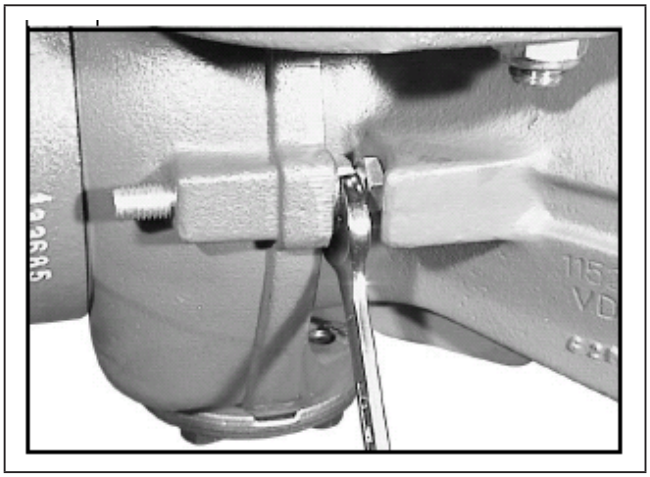


Fig. 5.30

Steer completely towards the other side and repeat the same operations.

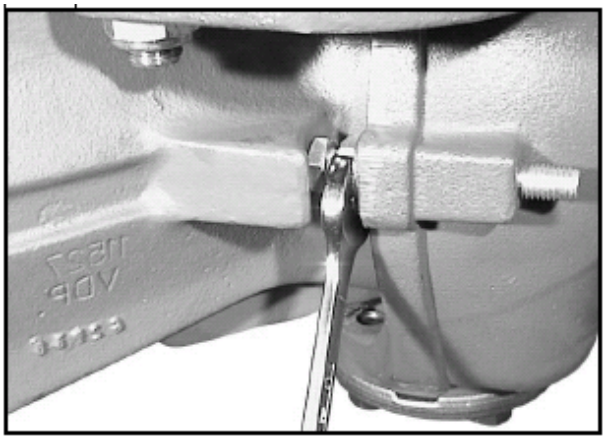


Fig. 5.31

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4. Brake System

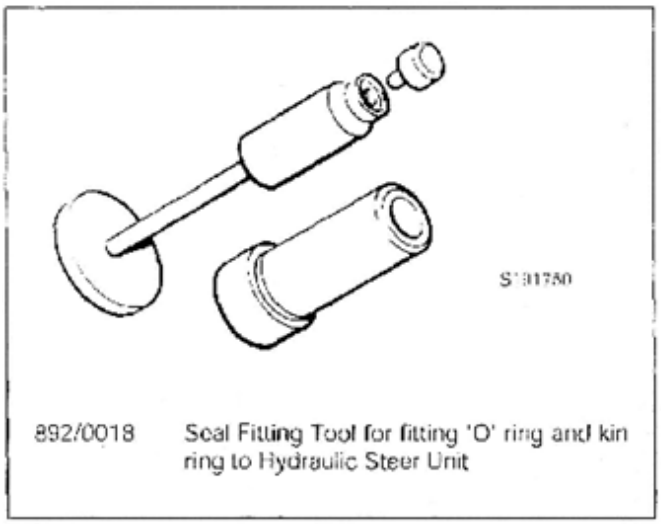
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Service Tools



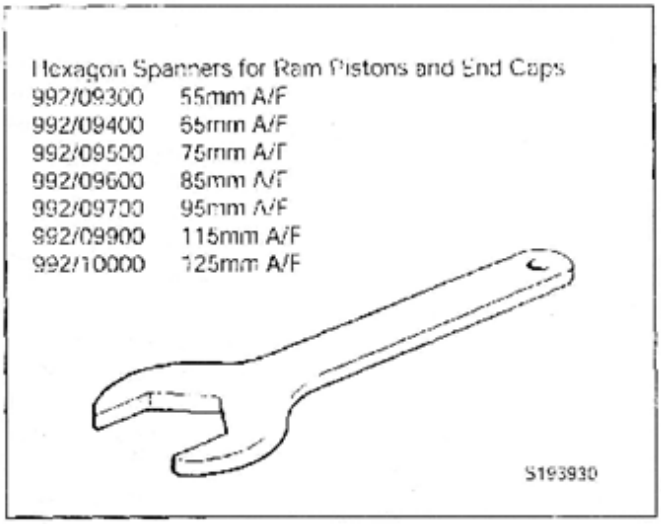


Fig. 1.1

1. Technical Data

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Hydraulic Service Brake System

System type

BRAKE ASSISTOR

The view of the brake assistor

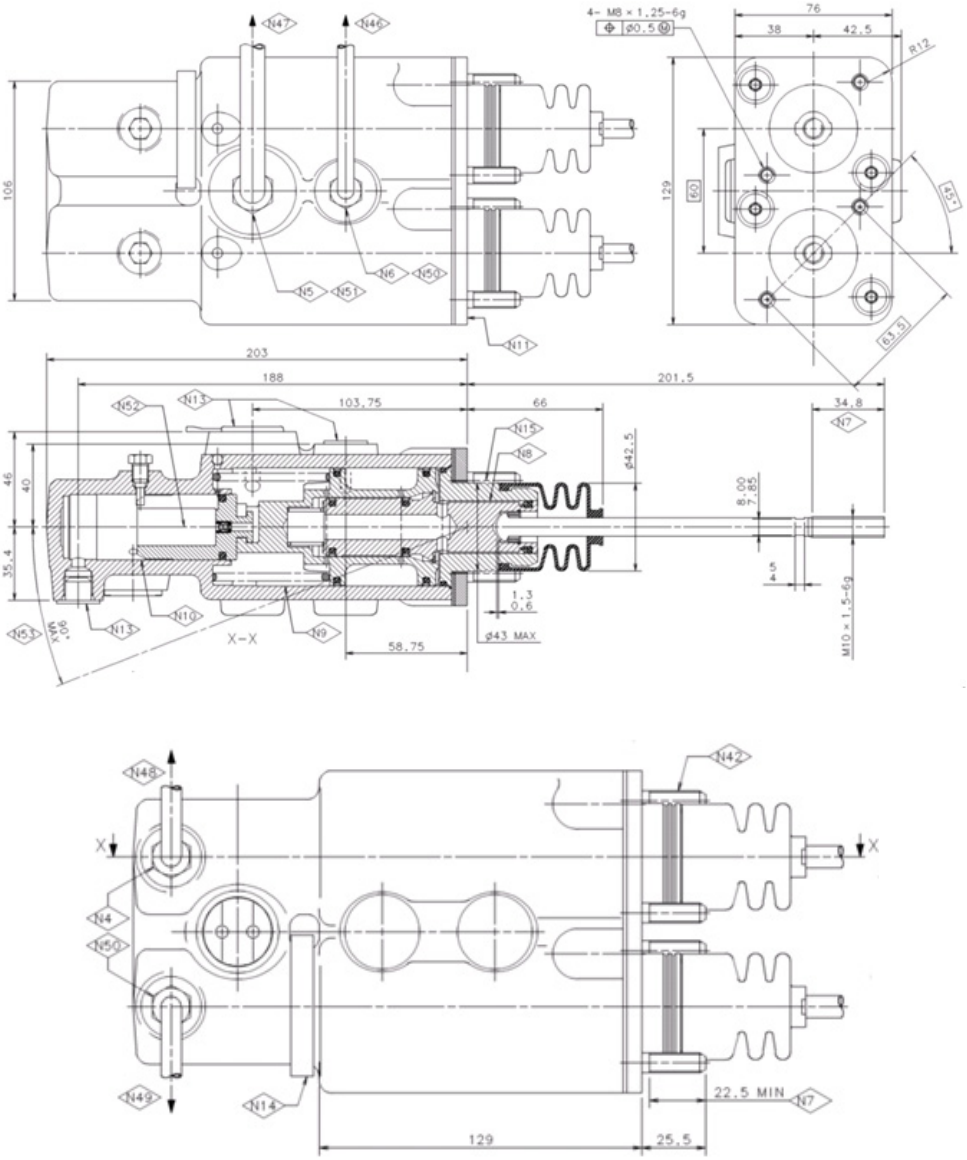


Fig. 2.1

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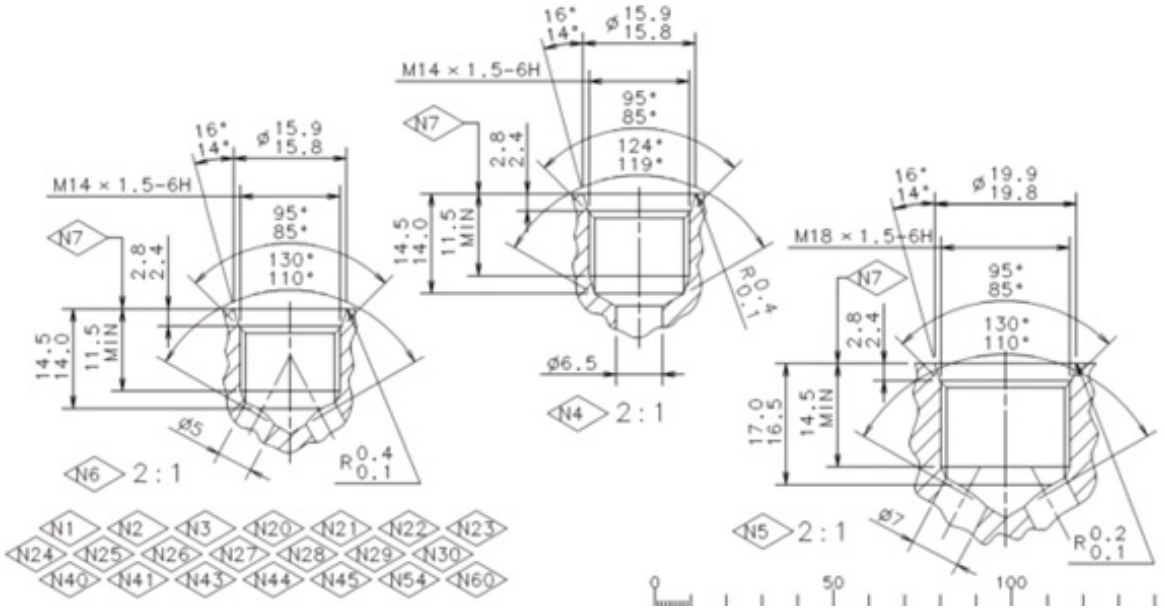


Fig. 2.2

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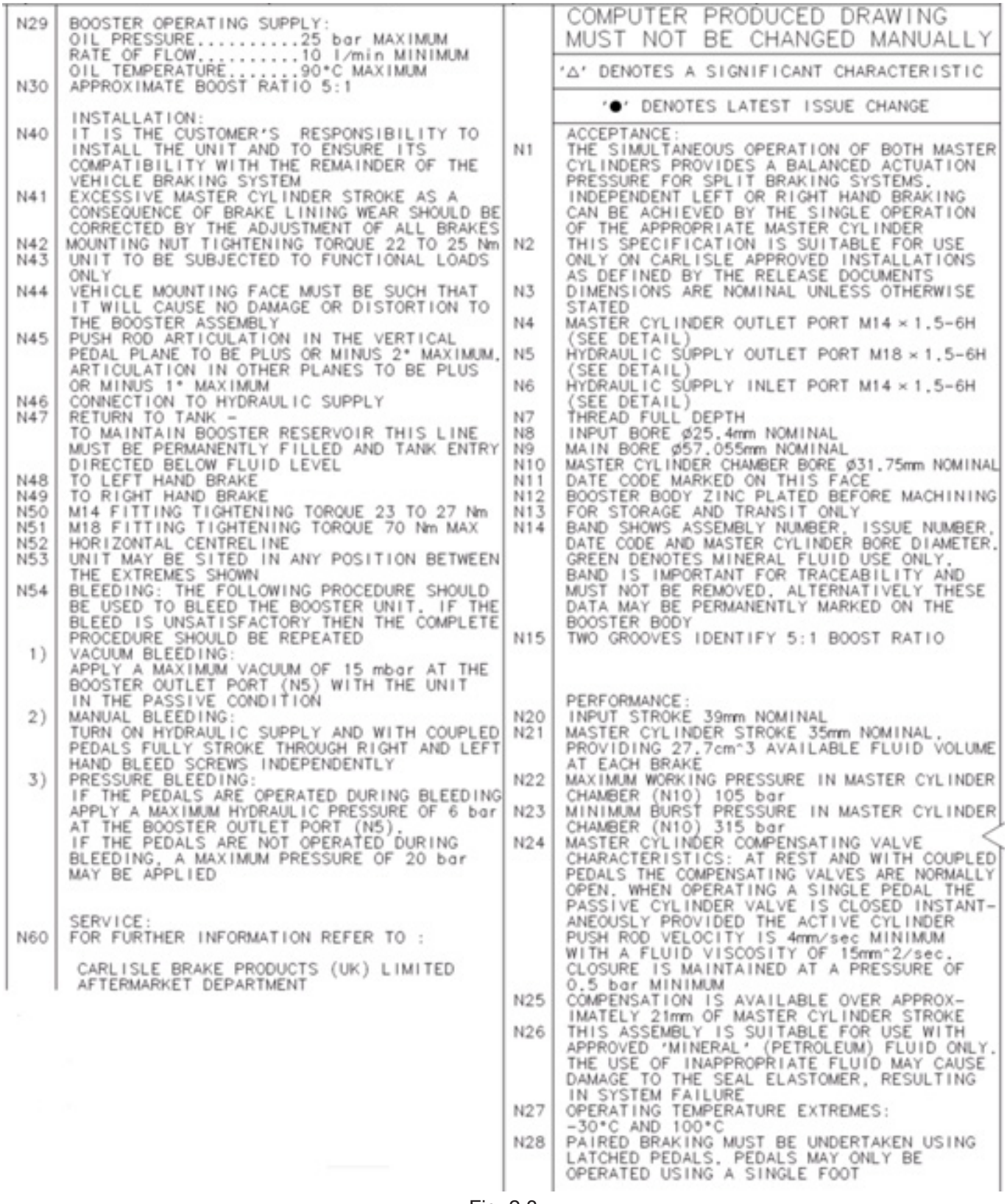


Fig. 2.3

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Basic system operation

Brake system schematics

Component Kwwey:

1. Gearbox (the gearbox pump effort the hydralic oil)
2. Rear axle
3. Hoses (connect the rear axle and assistor)
4. Hoses (assistor oil back to the gearbox)
5. Hoses (gearbox to assisitor)
6. Assisitor
7. Right pedal
8. Left pedal

A: Cowwnnector (connect the hoses 5)
B: Connector (connect the hoses 4)
C: Connector (connect the hoses 3)

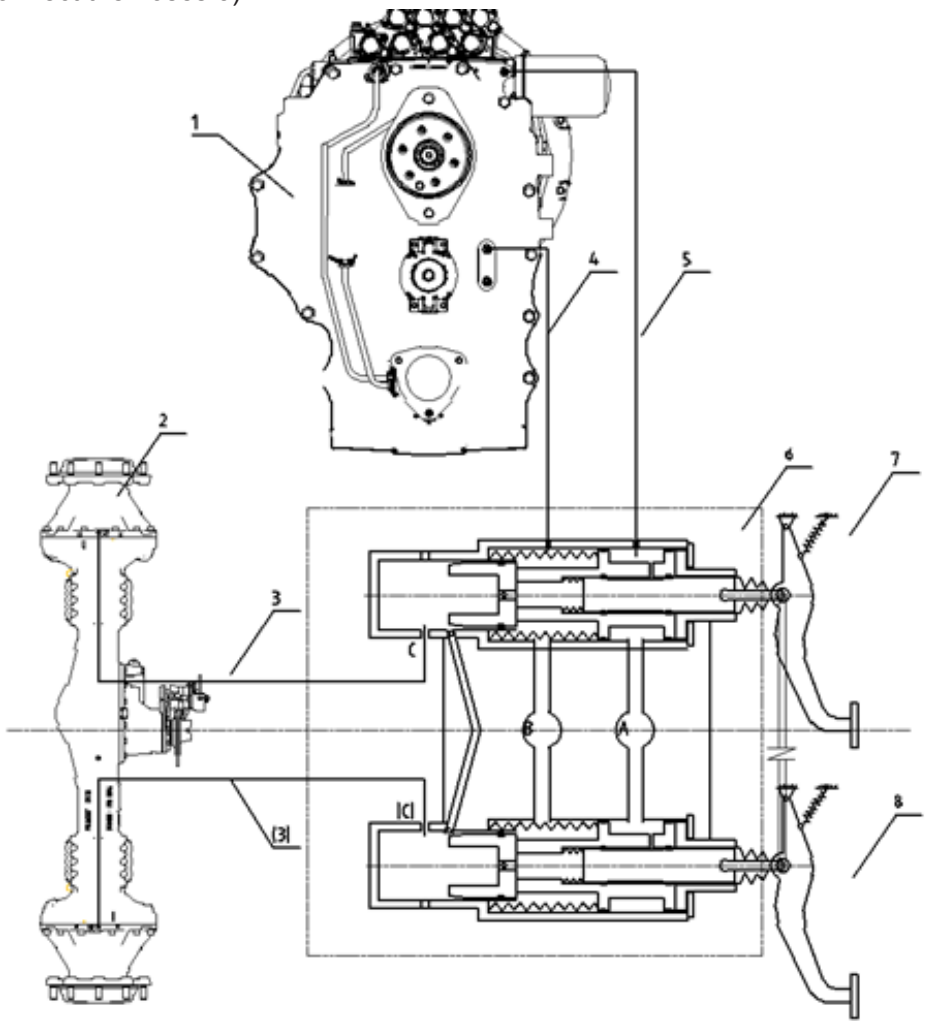


Fig. 2.4

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Hydraulic operation

Some of the following pictures may not show exactly your braking system ,but the form is the same.

The main wcomponents of the driving braking system are the

Gearbox 1; rear axle (bwrake clutch connectors) 2; hoses 3,4,5; assistor 6;and the pedals 7,8.

When step the pedals 7,8,the brake oil from the gearbox 1 will go to the clutch which are in the rear axle 2,realize the brake.

When step the pedals 7,8,the booster oil from the gearbox pump push the pistons which in the assistor 6,the pressure can help the handlers feel easily.

When release the pedals 7,8,the pistons will go back because of the springs in the assistor 1.

The system can realize the one sides brake if you step the pedal 7 or 8.**see the section"compensation pressure balance valve"**

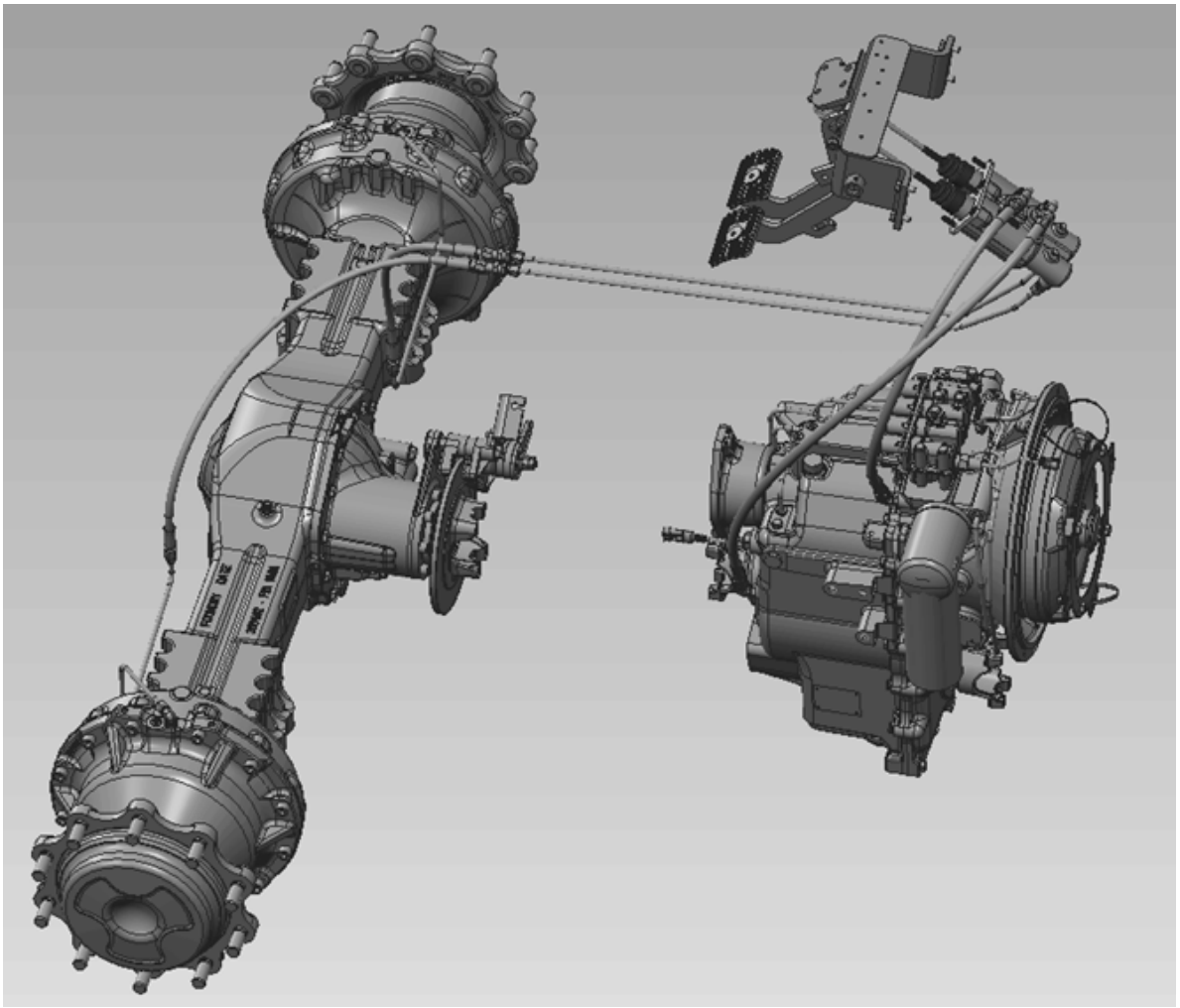


Fig. 2.5

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Driving braking-disassmbly and replacement

⚠ Warning

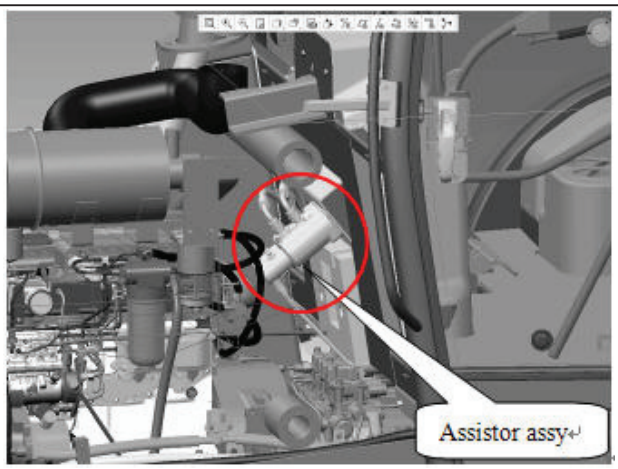
Before you disassmble,remember you have to proceed the following steps:

1. Park the machine on level ground,and engage the parking brake
2. set the gearbox to neutral.
3. Lower the attachments to the ground.
4. Stop the engine and remove the starter key.
5. Make sure the engine cannot be started while the hoses are open.so,To cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
6. Chock all four wheels to prevent unexpected move of the machine.

⚠ Danger

Hydraulic Pressure
Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses.
Next is the detailed steps
Removal:

7. Opening the engine cover,confirm the position of the assistor assy.



(the internal of the cab) Fig. 2.6

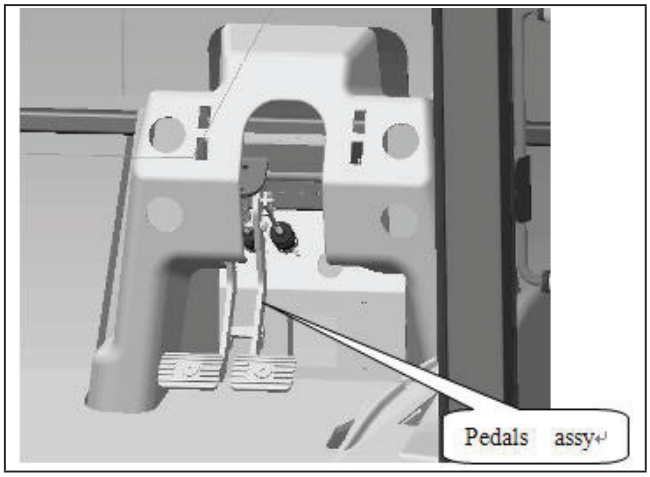


Fig. 2.7

8. Disconnect all hydraulic hoses ,steel tubes and connectors from the assistor as shown at following picture. Label the hoses to ensure correct refitting.

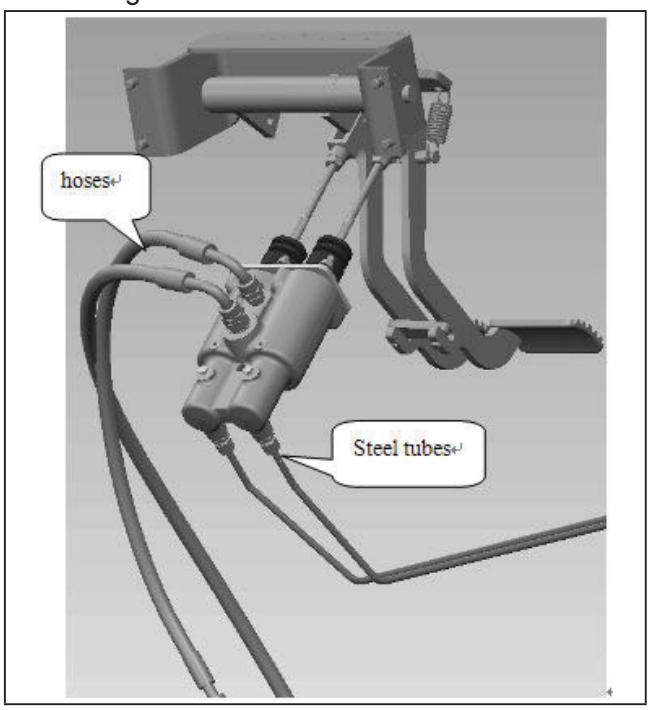


Fig. 2.8

9. Disconnect the springs

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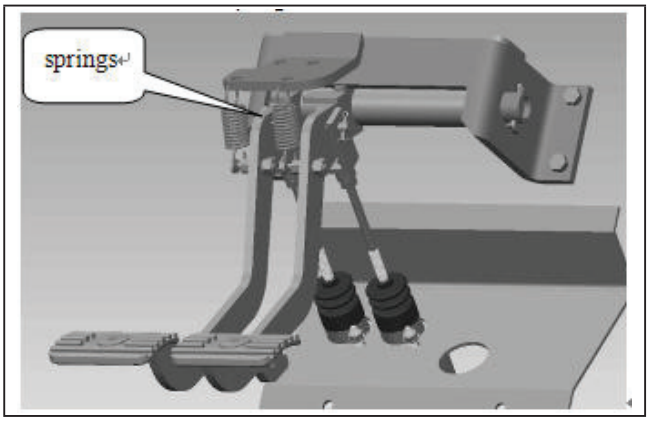
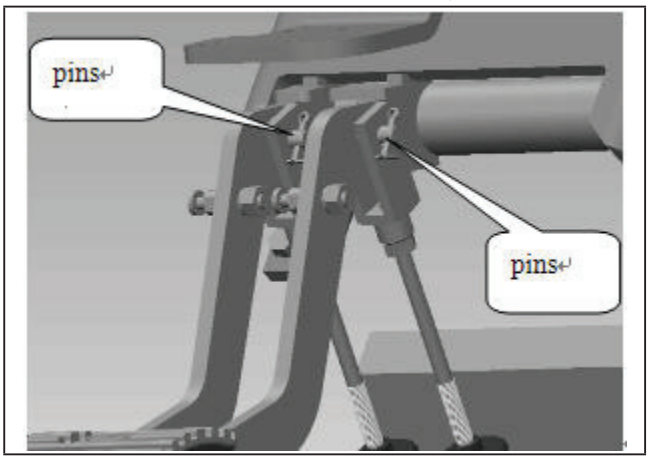


Fig. 2.9

10. Disconnect the cotter pins and cylindrical pins



Driving braking -Removal and replacement

Fig. 2.10

11. Disconnect the nuts,get off the forks.

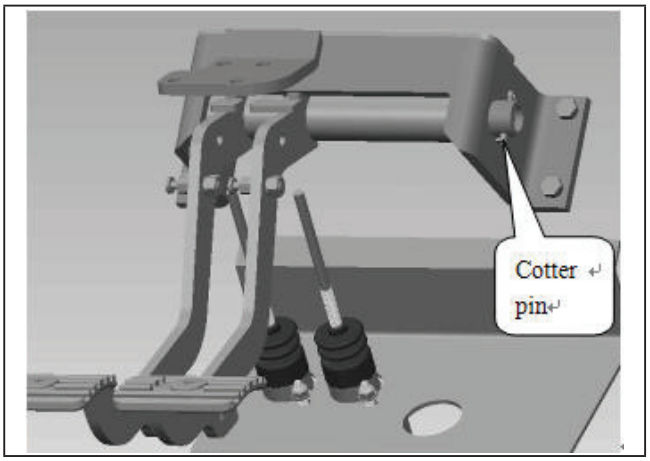


Fig. 2.11

12. Take down the cotter pin,and unpin the cylindrical pin,so the pedal assy Can take down from the system

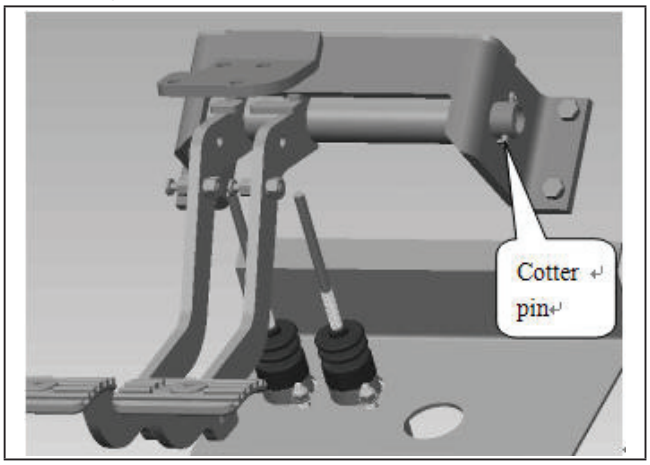


Fig. 2.12

The pedal assy

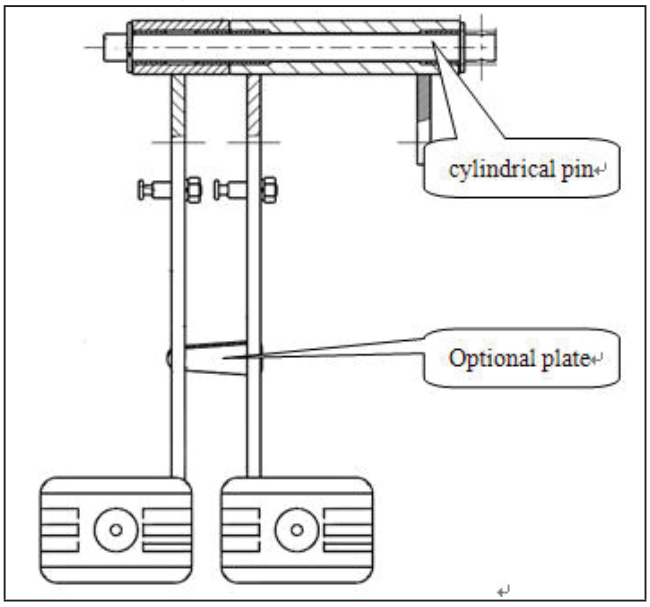
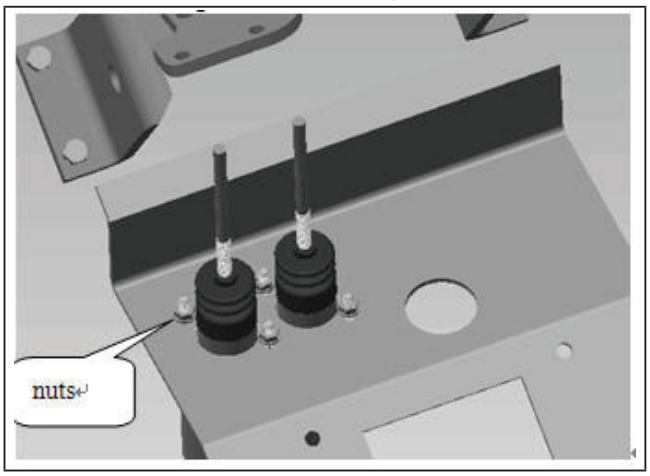


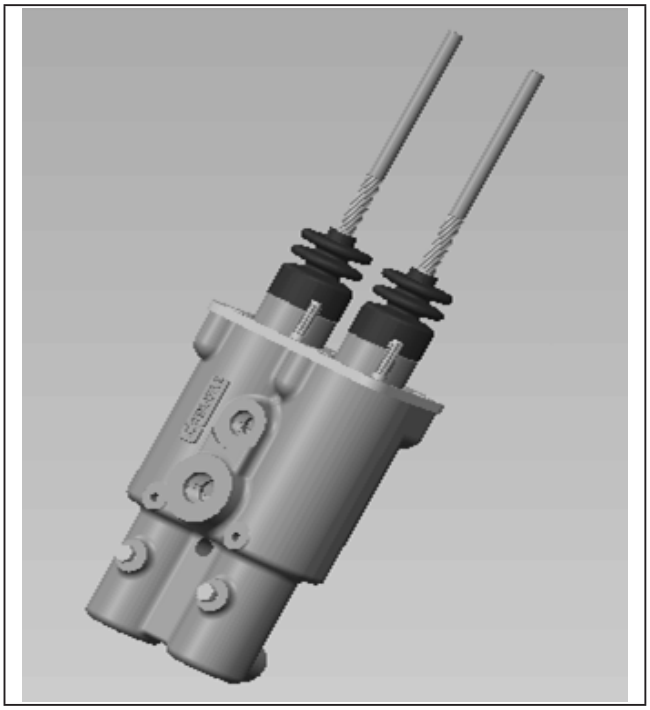
Fig. 2.13

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13. Take down the nut,and draw out the assistor from the Direction of the engine



The assy of the assistor
Fig. 2.14



The assemble process is the reversible
Fig. 2.15

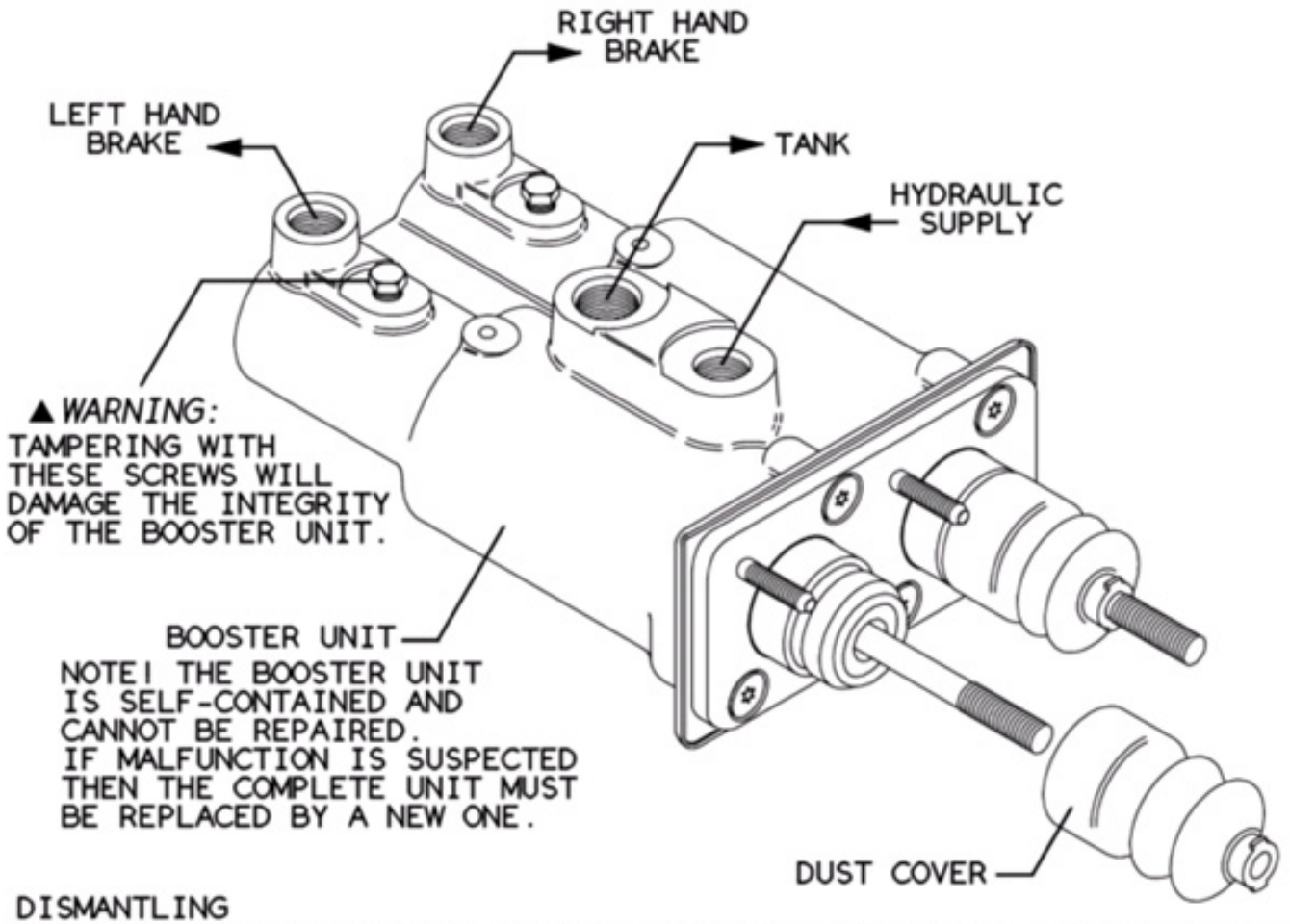
⚠ Warning

The optional plate is choose one-side or both-sides braking,
Before you launch the engine,make sure theOptional plate is in the potision that you want.And make sure the plate is not damaged.

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The assistor disassembly inspection and assembly

▲ *WARNING:* *For optimum results and safety, Carlisle recommends that all work should be carried out by a suitably trained fitter/mechanic and that worn units be replaced by new units. If in doubt or difficulty, fit a new unit or seek professional help. Always consult the vehicle handbook*



DISMANTLING

Drain the braking system of fluid by attaching a rubber tube to a bleed screw, unscrew half a turn and pump out the fluid by operating the foot pedals.
Clean any dirt or debris from around the hydraulic connections, unscrew the fittings and disconnect the pipes from the booster unit.
Disconnect the push rods from their foot pedal linkages and unscrew the securing nuts or bolts to permit removal of the booster unit from the vehicle bulkhead. Take care to avoid spillage of any residual fluid from the supply and tank ports.
NOTE! The attitude of the brake ports and the method of securing the booster unit may vary due to different vehicle installations.

INSPECTION

NOTE! The booster unit components are not interchangeable and dismantling must not be attempted.
The rubber dust covers should be soft and flexible and fit tightly in their locating grooves and around the push rods. Dust covers exhibiting cracking, embrittlememt, swelling or any other damage must be replaced.
The discovery of a substantial volume of fluid within the dust covers may indicate the failure of the booster's internal sealing elements and replacement of the unit should be considered.

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ASSEMBLY

Smear the sealing areas of the rubber dust cover with rubber grease. Gently ease the dust cover over the push rod screw thread and over the booster spigot, snapping the large diameter into its locating groove. Repeat for the second dust cover.
Refit the booster unit to the vehicle bulkhead and reconnect the push rods to the foot pedals.
NOTE! The pedals must be in the at rest position, urged against an independent backstop by return springs. The push rods should then be connected to the pedal linkages and adjusted towards the pedals until the push rod heads just contact the internal backstops in the booster unit. This wil automatically set the correct push rod head clearance and enable effective funtioning of the unit
Reconnect the pipework.
Reference should be made to the following table for the correct tightening torque for each of the various hydraulic fittings, mounting bolts or nuts and push rods.

FUNCTION	THREAD FORM	TIGHTENING TORQUE
MOUNTING BOLT / NUT	M8 × 1.25-6g/H	22-28 Nm
PUSH ROD	M10 × 1.5-6g	22-27 Nm
HYDRAULIC CONNECTION	M12 × 1.0-6H	20-24 Nm
HYDRAULIC CONNECTION	M14 × 1.5-6H	23-27 Nm
HYDRAULIC CONNECTION	9/16-18UNF-2B	23-27 Nm
HYDRAULIC CONNECTION	M16 × 1.5-6H	41-47 Nm
HYDRAULIC CONNECTION	M18 × 1.5-6H	70 Nm MAX
HYDRAULIC CONNECTION	3/4-16UNF-2B	70 Nm MAX

BLEEDING

In order to purge the braking system of air, the following procedure should be adopted:
Turn on the hydraulic supply by starting the engine and latch the pedals together. Apply the latched pedals and fully stroke the booster push rods approximately twenty times to expel air from the booster unit. Now continue this action whilst permitting the escape of aerated fluid from the left hand and right hand bleed screws independently.
Depending on the type of installation, a number of strokes may be required to expel all the air from the system and the procedure should be repeated until a satisfactory condition is obtained.

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Compensation pressure balance valve

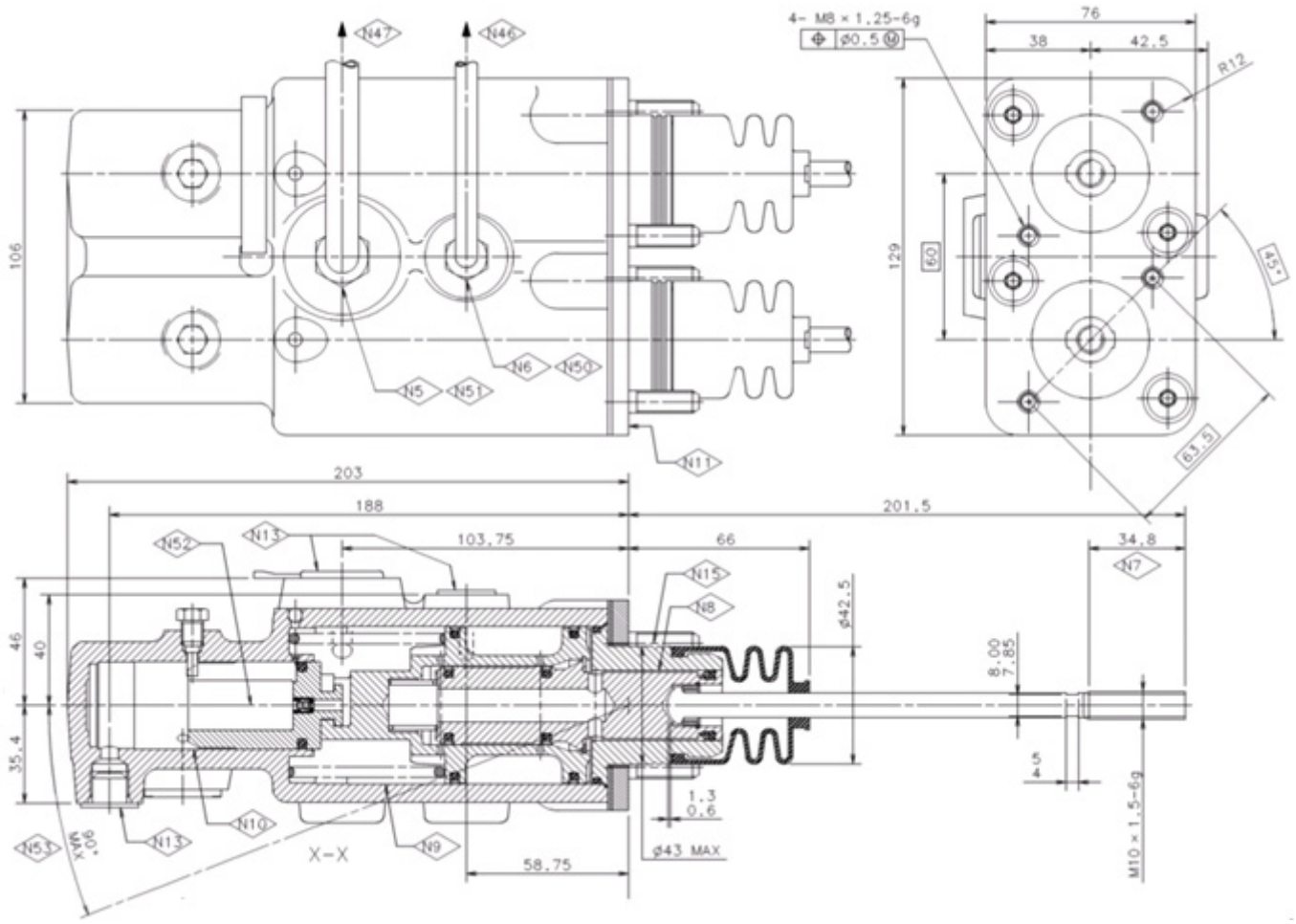


Fig. 2.18

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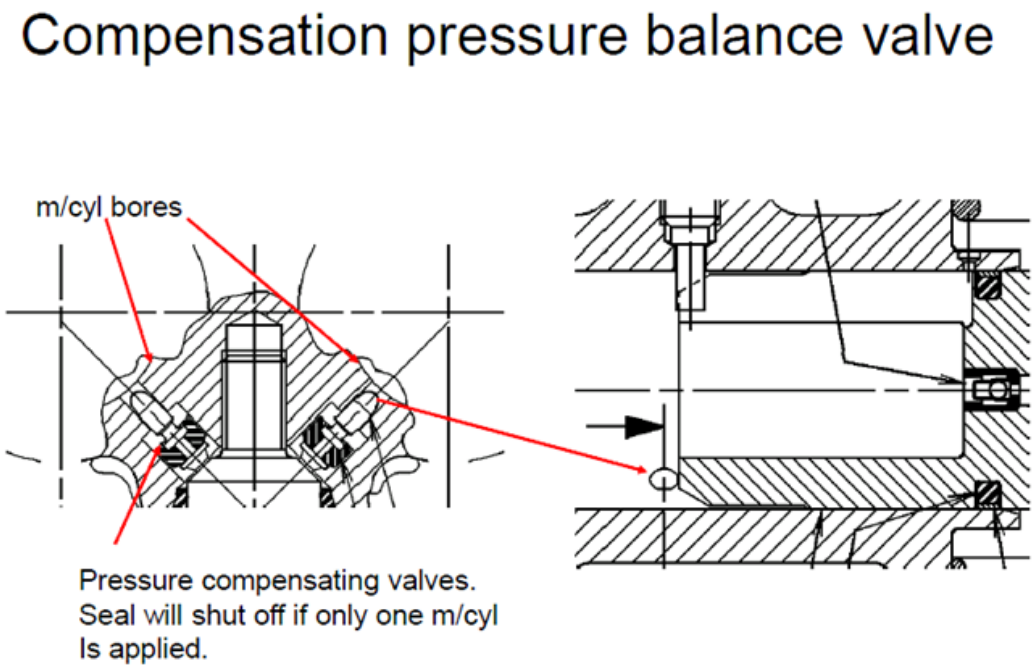


Fig. 2.19

FAULT

This section tell you how to determine the fault,and corresponding action.

⚠ Note:The braking part surface maybe in high temperature to touch,so inspect or disassembly be carefully.

1.Pedal travel excessive(not touching floor)		
	failure	action
1	Air in hydraulic system	check fluid reservoir level,rectify as required
2	Friction/counter plate serious wear	replace the Friction/counter plate
3	leak in system	check for fluid loss at master cylinder can brake piston all pipes and steel tubes,rectify as required
2.Pedal hard to operate		
	failure	action
1	fluid contamination or seal damage	flush system andrenew all the seals
2	misaligned push rod/pedal	check and rectify as required
3	kinked or crushed brake pipes	check /renew brake pipe
4	blocked/leaking vacuum pipe	check /renew brake pipe
5	vacuum failure due to low vacuum at source	inspect/service engine mounted exhauster as required
3.Pedals touch floor under constant pressure -no fluid loss		
	failure	action
1	Air in hydraulic system	check fluid reservoir level,rectify as required
2	Friction/counter plate serious wear	replace the Friction/counter plate
3	master cylinder fault	check master cylinder in single and coupled pedal modes to identify fault area.
4.Pedals touch floor under constant pressure-fluid loss		
	failure	action
1	external fluid leaks	visually check brake circuit for fluid loss
2	internal fluid leaks	refer to "Carrro axle disassemble and replacement manual"

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5.Pulling to one side when pedals locked together		
	failure	action
1	compensating feature not working	inspect master cylinder compensating operation , check if blockage in bridging pipe.
2	braking system inoperative on one side	unlatch pedals to test circuits individually
3	friction plates worn beyond limits or distorted on one side	renew friction/counter plate Both sides
4	badly adjusted push rods	adjust push rod
6.Poor braking(not pulling to one side)		
	failure	action
1	friction plates worn beyongd limits or distorted on one side	renew friction/counter plates Both sides
2	master cylinder fault	check master cylinderin single and coupled pedal modes
3	incorrect /low axle oil	fill axle with correct type oil
4	vacuum failure	inspect vacuum source/pipes service as required
7.One or both brakes not releasing)		
	failure	action
1	friction /counter plates not free on splines and /or dowels	check friction/counter plates for free movement,replace if required.
2	kinked or crushed brake pipes	check and renew pipes as required
3	annular brake piston(s) binding in axle	check that correct vrake fluid has been used
		check if annular brakepiston seals in good condition
		check that annular brake piston rotates freely in its housing with no seals gitted
		check that the annular brake piston seal retracts the piston approximately 0.4-0.5mm.
4	fluid contamination /seal damage	flush system and renew hydraulic seals
5	brake pedal free travel incorrect	adjusting pedal free travel
6	blocked hole in master cylinder reservoir cap	fit a new reservoir cap
7	master cylinder fault	service as required
8	brakepedal spring fault	fit a new spring
8.Poor braking when hot		
	failure	action
1	moisture in systemvapourizing when axle is hot	strip axle and clean annular piston to remove moisture,remove master cylinder and check for corrosion service as required,flush hydraulic brake system
9.excessive brake noise in operation		
	failure	action
1	deterioration of axle oil or wrong type of axle oil	change axle oil
2	friction/counter plates in poor condition	check for distortion or surface pitting and /or roughness of friction/counter plates.
3	friction plates worn beyond limits	renew friction/counter plates
4	axle oil loss	refill axle with correct oil and check for leaks.

Fig. 2.20

Pressure test

Same as the “vacuum service braking pressure test”

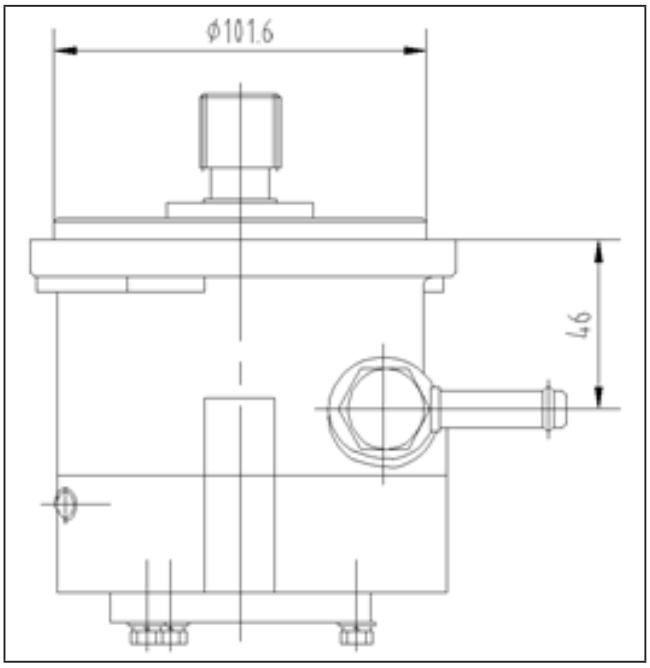
See the corresponding section.

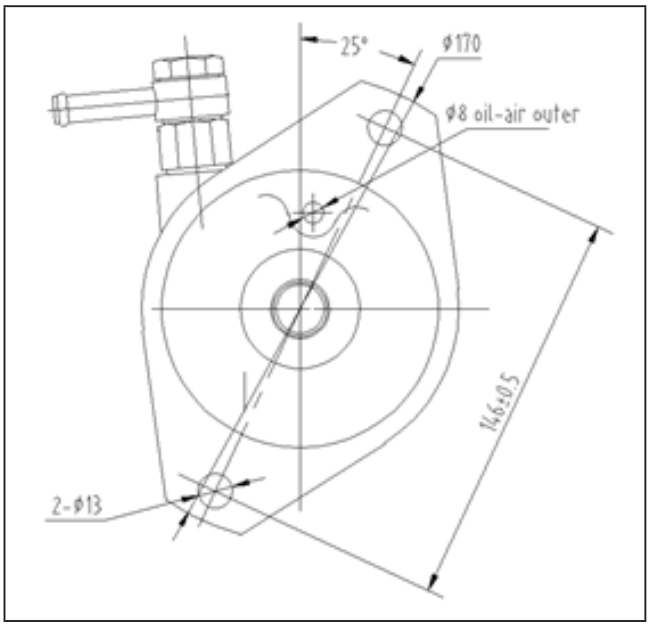
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Vacuum Service Brake System

System type

vacuum pump





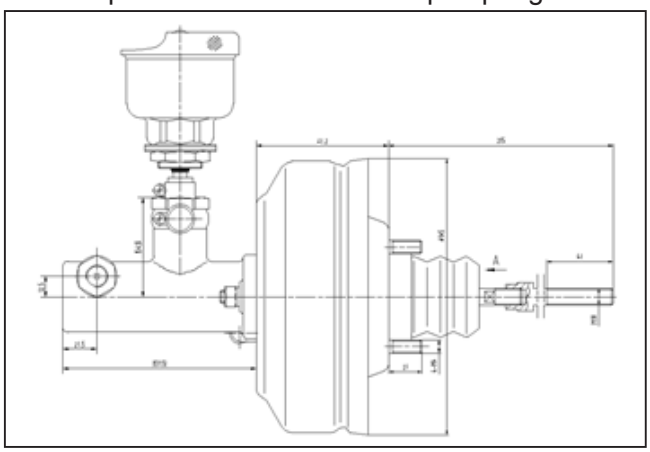
The view of the vacuum pump Fig. 3.1

PUMP CAPABILITY PARAMETER

MOST VACUUM DEGREE KPa	CAPABILITY cm^3	MOST ROTATO SPEED r/min	OIL FEED PRESSURE KPa	ROTATO DIRECTION (VIEW GEAR WHEEL)
≥90	95	3200	700	ANTICLOCKWISE

EXTERNAL INVOLUTE SPLINE PARAMETER		
APELLATION	sign	VALUE
NUMBER OF TEETH	Z	13
PITCH	DP	16/32
PRESSURE ANGLE	α_p	30°
MAJOR DIA	Dee	$\phi 21.81\ ^{0}_{-0.05}$
MINOR DIA	Die	$\phi 18.63\ ^{0}_{-0.13}$
PIN DIAMETER	de	φ3
PIN SPACE BETWEEN UTMOST NUMERICAL VALUE	Me	$\phi 24.868\ ^{0}_{-0.05}$

The parameter of the vacuum pump Fig. 3.2



The view of the vacuum service cylinder Fig. 3.3

The parameter of vacuum service cylinder:

The distance of move:32mm

Booster ratio:3:1

The diameter of cylinder:32mm

Working temperature:-40℃ -100℃

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Brake system schematics

Component Key:

1. Store braking oil cup
2. Right vacuum service cylinder
3. Right pedal
4. Left pedal
5. Left vacuum service cylinder
6. Left braking clutch (in the rear axle)
7. Right braking clutch (in the rear axle)
8. Balance valve
9. Vacuum pump
10. One-way valve (in the service cylinder)

A: hoses connect the oil cup and service cylinders
B: hoses connect the cylinder-balance valve-braking cylinder (in the rear axle)
C: hoses connect the vacuum pump and service cylinder

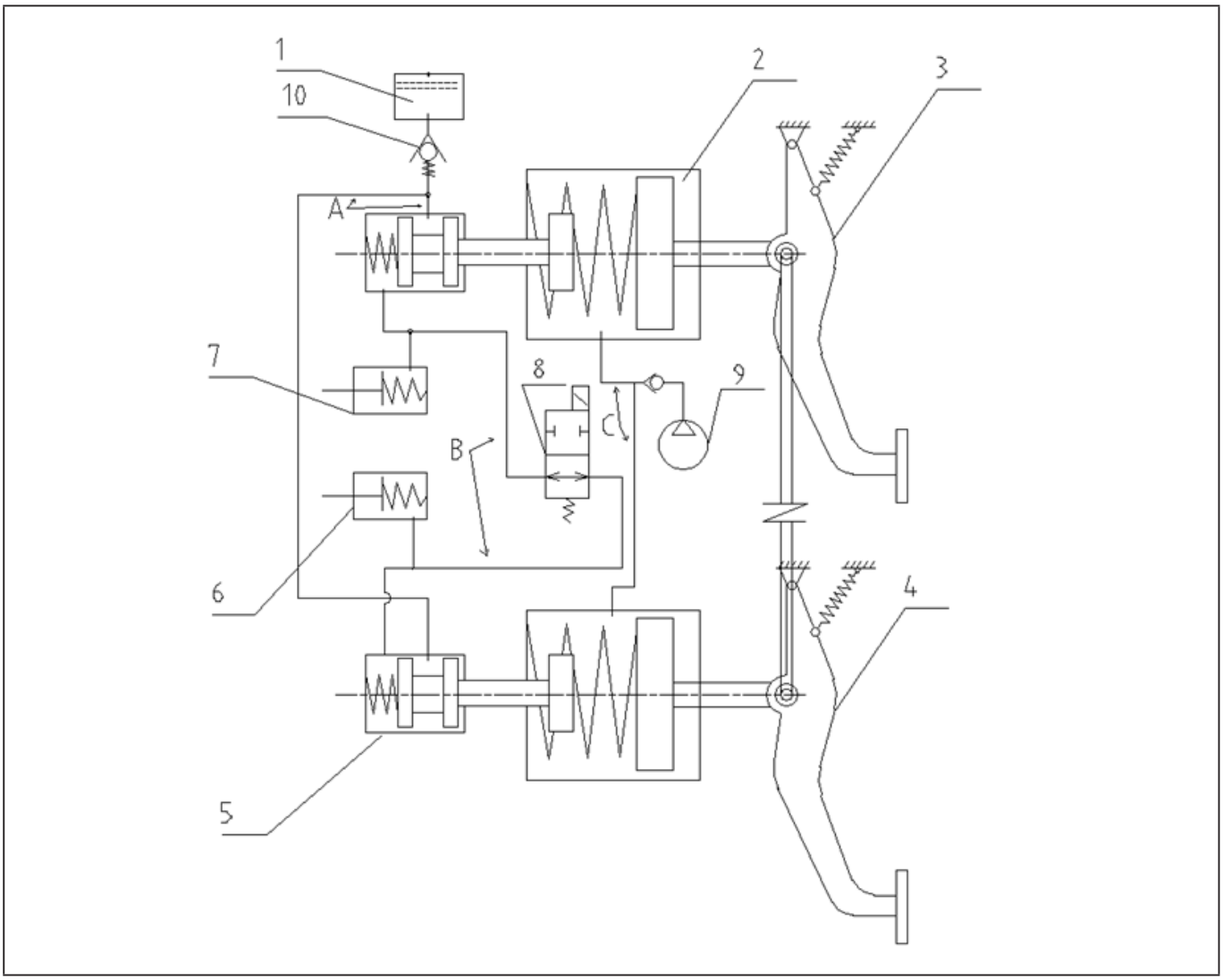


Fig. 3.4

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Hydraulic operation

Some of the following pictures may not show exactly your braking system ,but the form is the same.

The main components of the driving braking system are the Braking oil cup 1; service cylinders 2,5; braking pedals 3,4; braking clutch (in the rear axle) 6,7; the balance valve8; the vacuum pump and related hoses and steel tubes.

When step the pedals 3,4,the brake oil from the cup 1 will go to the clutch 6,7 which are in the rear axle,realize the brake.

because the vacuum pump extract vacuo from the service cylinder,the negative pressure will make the handlers feel easily when step the pedals 3,4,

When release the pedals 3,4,the pistons will go back because of the springs in the service cylinder..

The system can realize the one sides brake if you step the pedal 3 or 4.see the section "braking pressure balance valve"

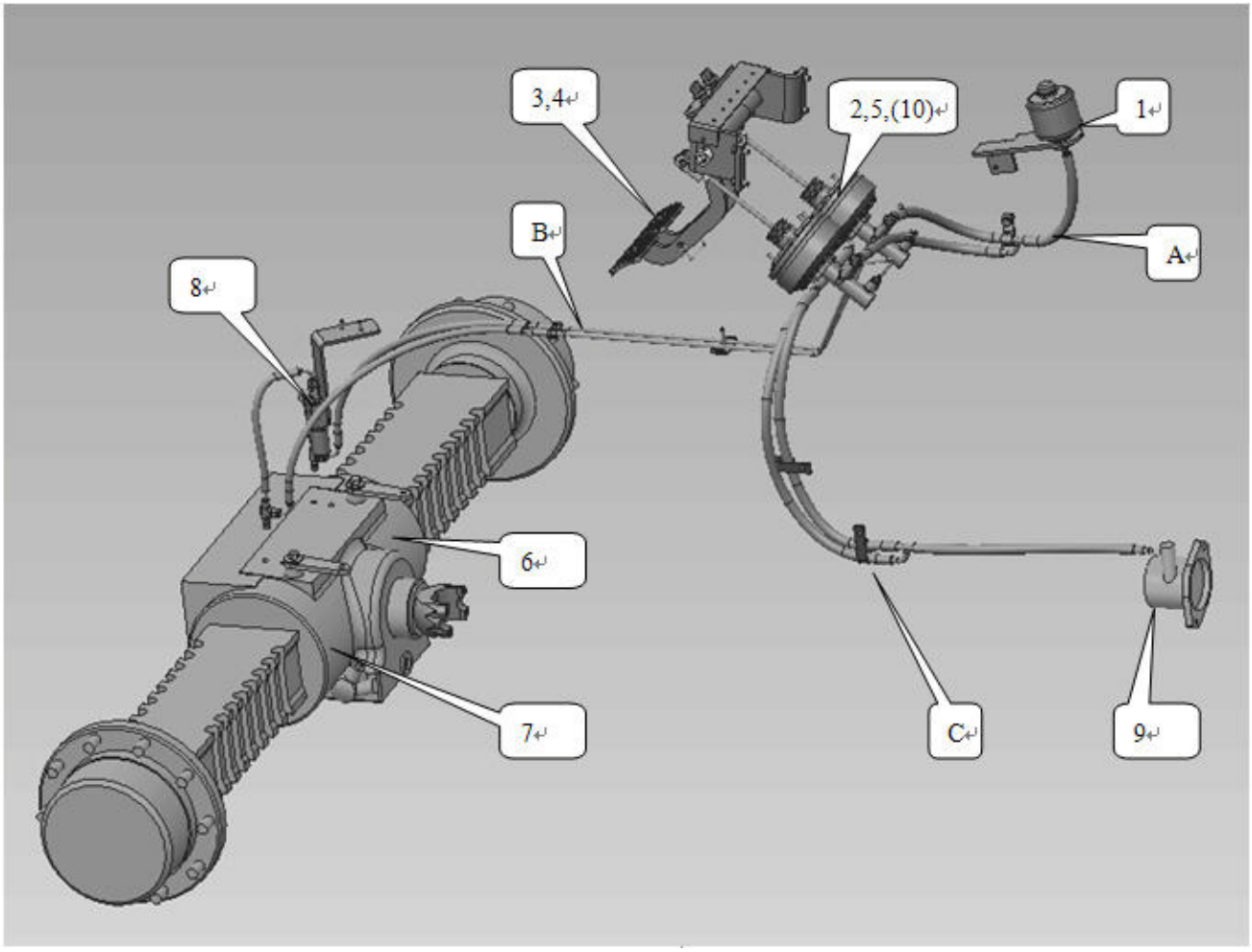


Fig. 3.5

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Driving braking

Disassmbly and replacement

Pedals and service cylinder

⚠ Warning

Before disassmbling,remember you have to proceed the following steps:

1. Park the machine on level ground,and engage the parking brake
2. Set the gearbox to neutral.
3. Lower the attachments to the ground.
4. Stop the engine and remove the starter key.
5. Make sure the engine cannot be started while the hoses are open.so,to cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
6. Chock all four wheels to prevent unexpected move of the machine.

⚠ Danger

Hydraulic Pressure
Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses.
Next is the detailed steps
Removal:

7. Opening the engine cover,confirm the position of the assistor assy.

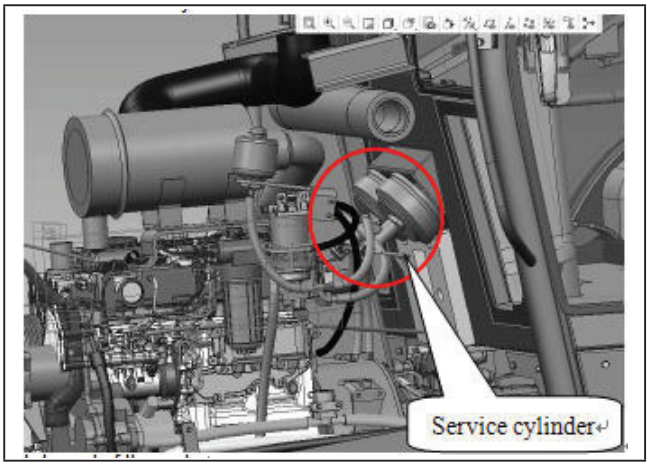
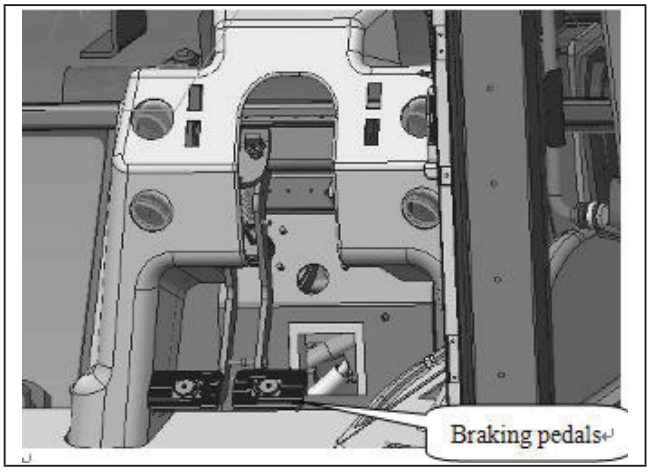


Fig. 3.6



Internal of the cab Fig. 3.7

8. The connection of the service cylinder

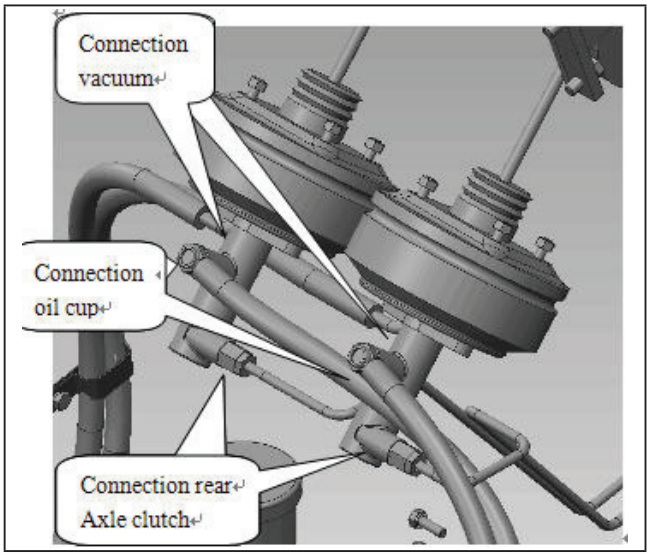


Fig. 3.8

9. Disconnect all hydraulic lathedog and hoses ,use wrench to disconnect two steel tubes and connectors from the service cylinder as shown at following picture. Label the hoses to ensure correct refitting.

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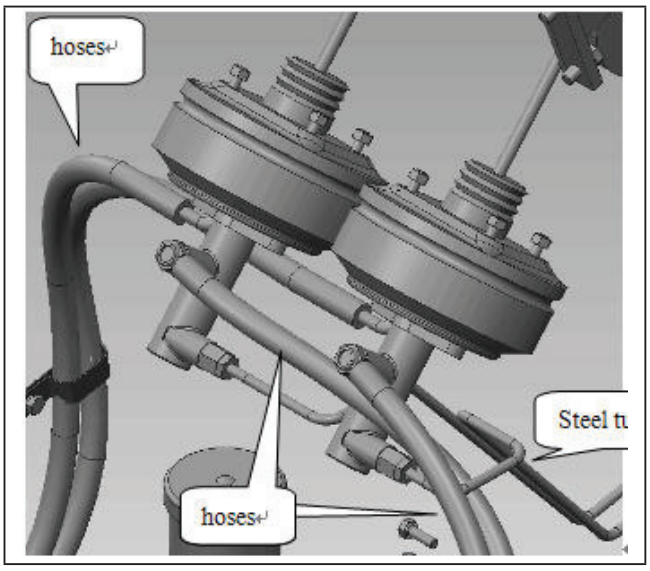
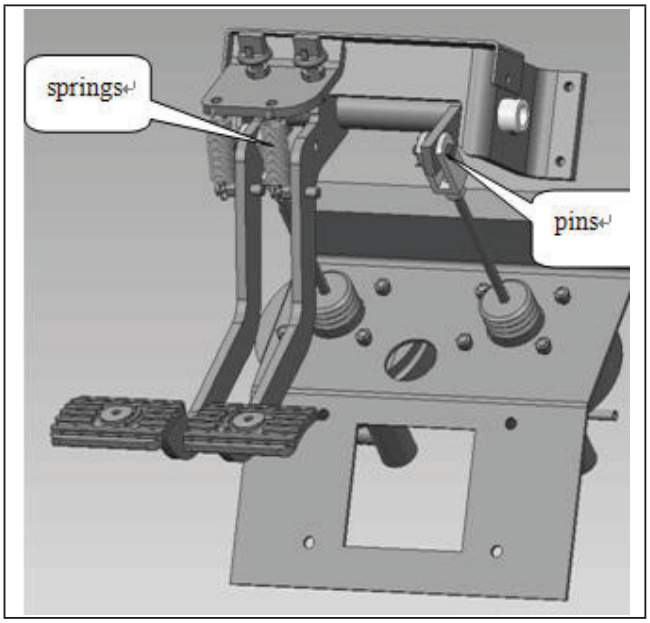


Fig. 3.9

10. Disconnect the springs ,cotter pins and cylindrical pins



Pedals and service cylinder Fig. 3.10

11. Disconnect the nuts,take down the forks.

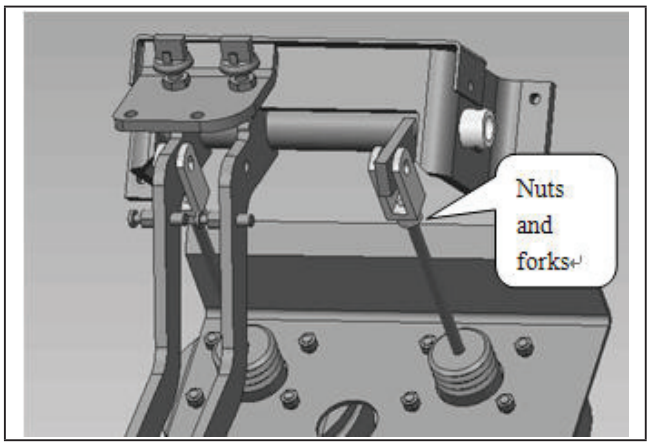
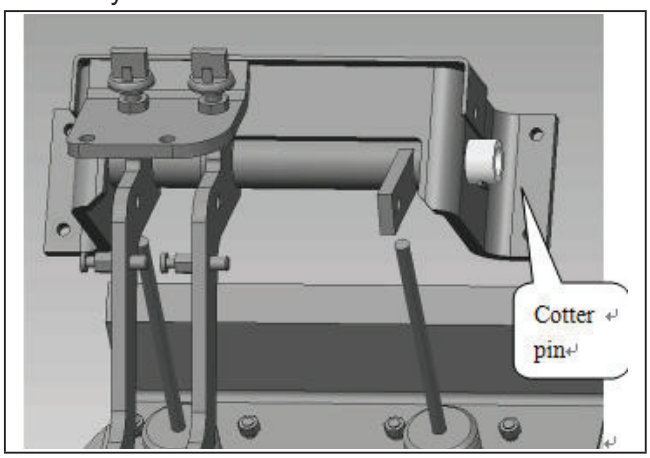


Fig. 3.11

12. Take down the cotter pin,and unpin the cylindrical pin, so the pedal assy Can take down from the system



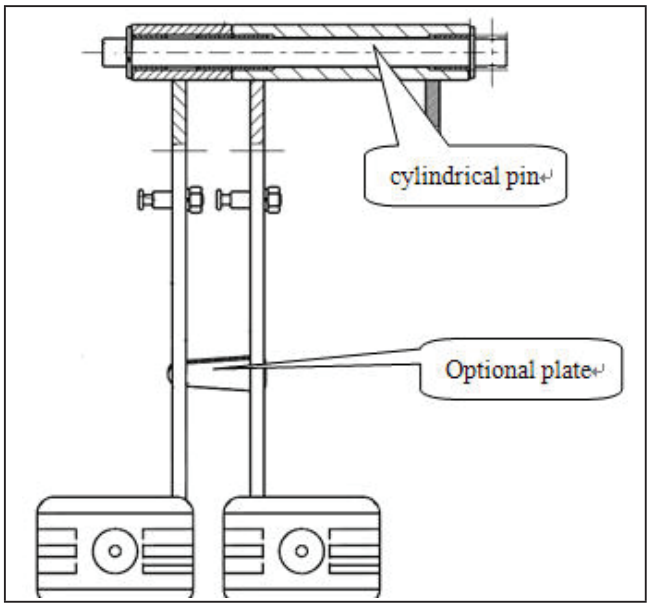


Fig. 3.12 The pedal assy

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13. Take down the nut,and draw out the assistor from the Direction of the engine

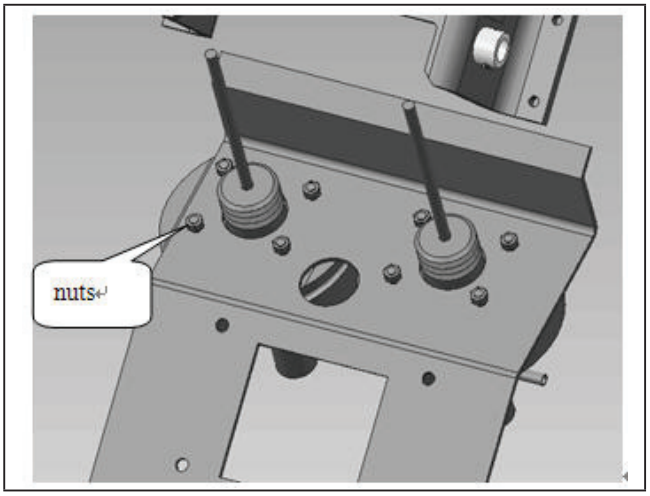
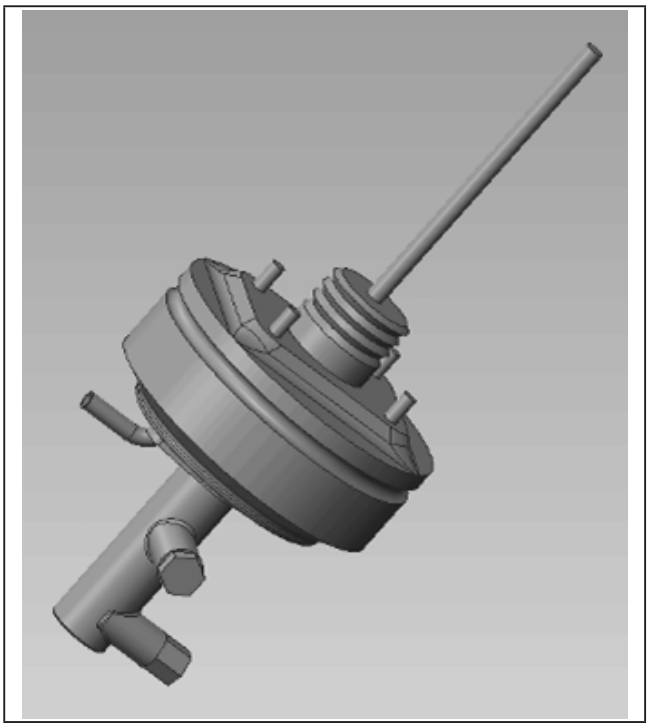


Fig. 3.13
Pedals and service cylinder

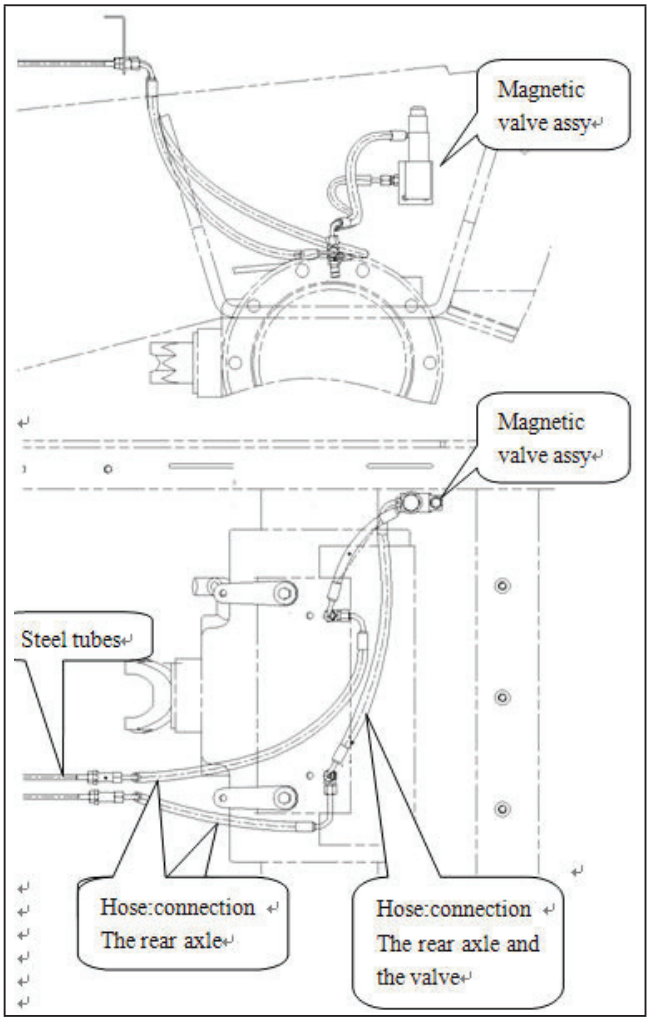


The assy of the service cylinder Fig. 3.14

The assemble process is the reversible

⚠ Warning

The optional plate is choose one-side or both-sides braking,
Before you launch the engine,make sure theOptional plate is in the potision that you want. And make sure the plate is not damaged.



Magnetic valve Fig. 3.15

⚠ Warning

Before you check the pressure,remember you have to proceed the following steps:

1. Park the machine on level ground,and engage the parking brake
2. set the gearbox to neutral.
3. Lower the attachments to the ground.
4. Stop the engine and remove the starter key.

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5. Turn the steering wheel to the left and to the right several times to vent system pressure.
6. Make sure the engine cannot be started while the hoses are open.so,To cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
7. Chock all four wheels to prevent unexpected move of the machine.

⚠ Danger

Hydraulic Pressure
Hydraulic fluid at system pressure can injure you. Before disconnecting or connecting hydraulic hoses, stop the engine and operate the controls to release pressure trapped in the hoses.
Magnetic valve

8. Take down the hoses as the view

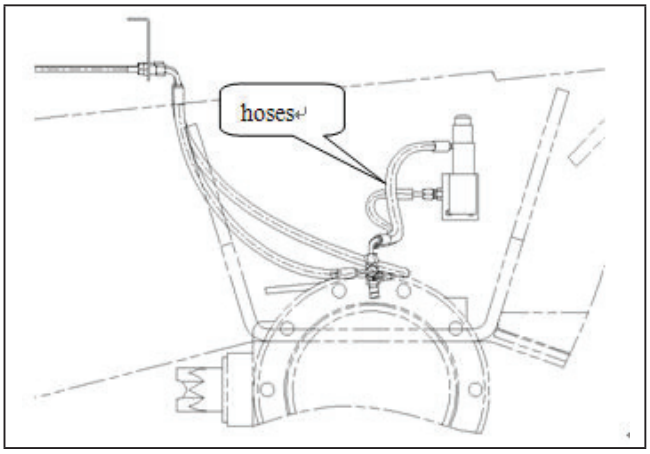


Fig. 3.16

9. Next view is the assy of the magnetic valve, Takedown the screws as the view shown

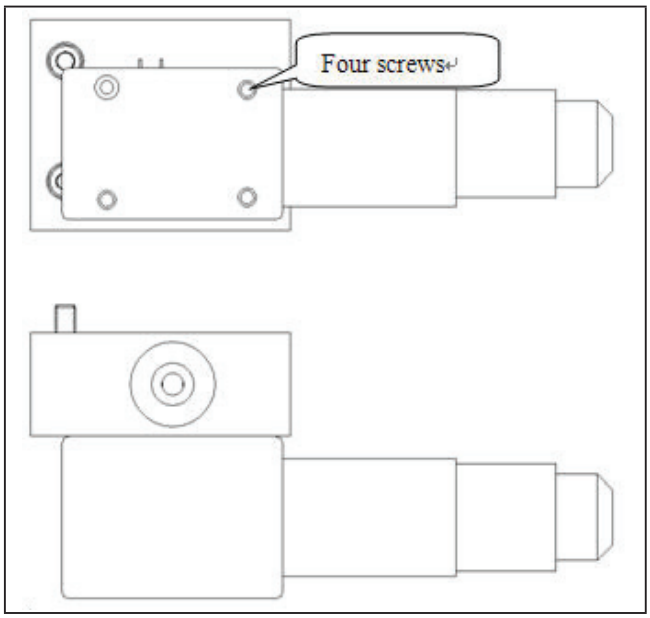


Fig. 3.17

10. Takedown the valve

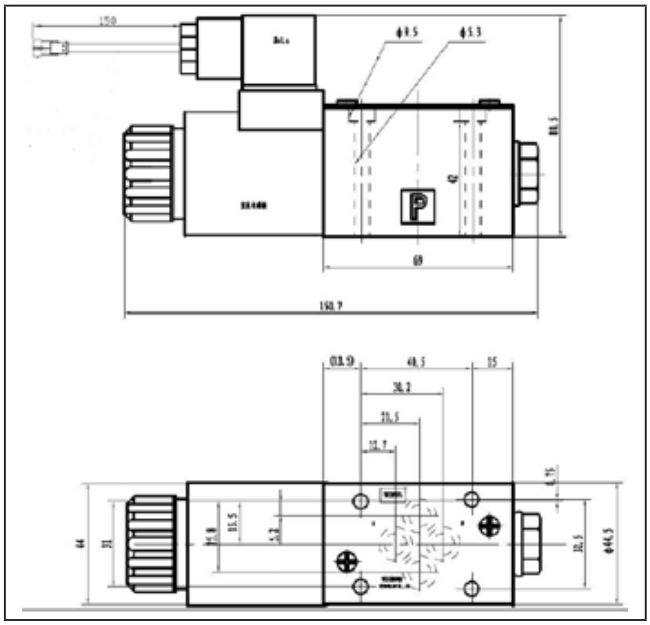


Fig. 3.18

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11. Takedown the two screws as shown

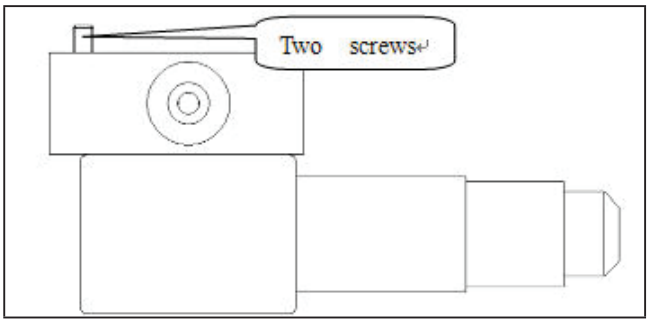
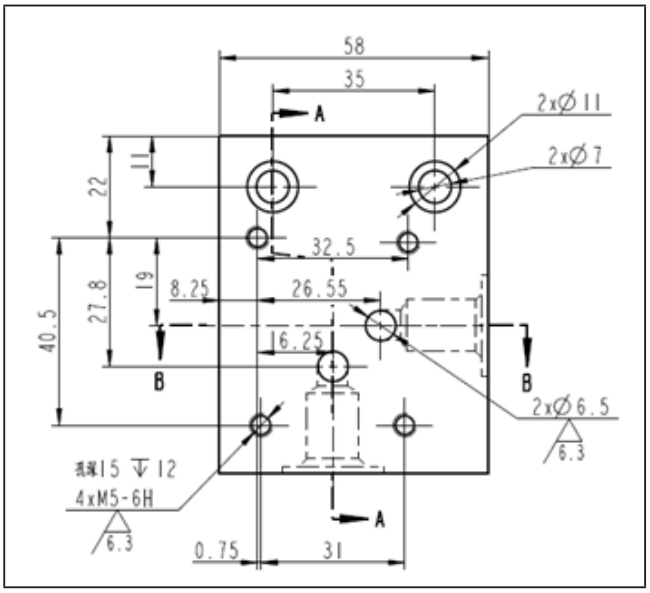


Fig. 1.19



This is the valve block Fig. 3.20

Braking pressure balance valve

If the handle step the both-sides pedals,the signal will transmit to the balance valve througn the sensor which in the bottom of the braking pedals to two clutchs ,pressure will balance through the balance valve.

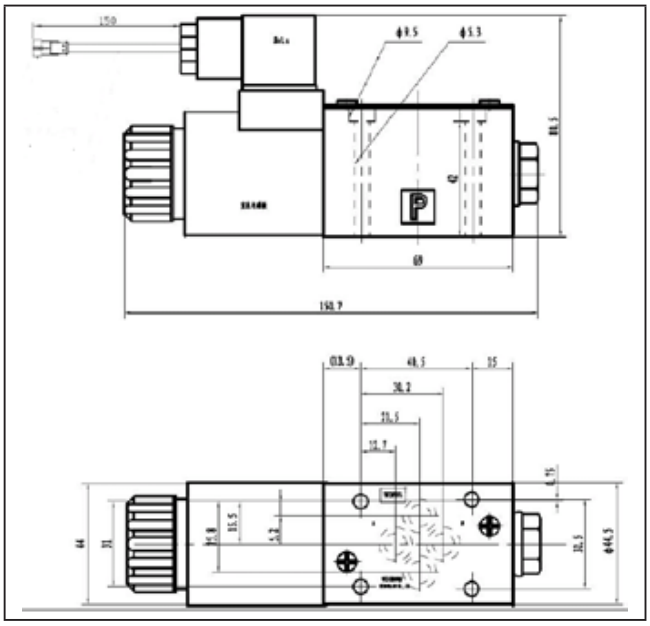


Fig. 3.21

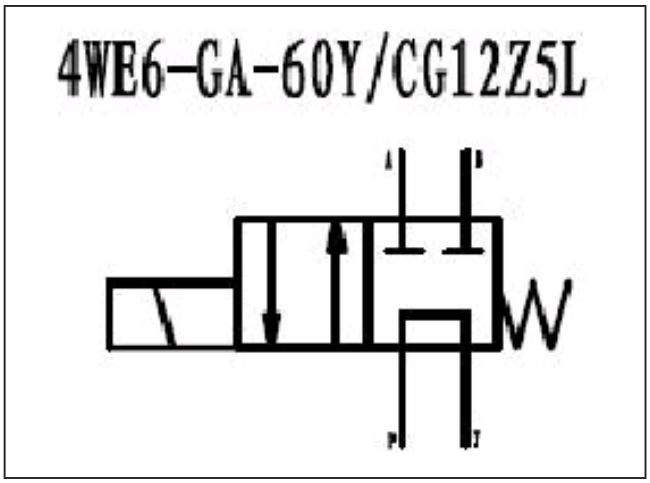


Fig. 3.22

Pressure test

We don't obligate special test connector in the braking system,so the user need assemble the connector by

Himself.we will provide the corresponding dimensions.

⚠ Warning

if you need to intrance the bottom of the machine,Before you disassemble the hoses ,remember you have to proceed the following steps:

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1. Support the machine with legs and loading attachment reach the height as you need,remember you need to turn over the loader completely as shown.
2. Use the leg safety struts,and put them in the leg cylinder rod as next view shown.
   If your machine is CLG766A:

   Take down the safety strut which in the left of the machine,



Fig. 3.23

Put it into the leg, and make sure the safety strut is fit firm.



Fig. 3.24

Pressure test

If your machine is CLG777A

Take the special safety strut to assemble the leg,see the view as shown,and make sure the safety strut is fit firm.

The safety strut

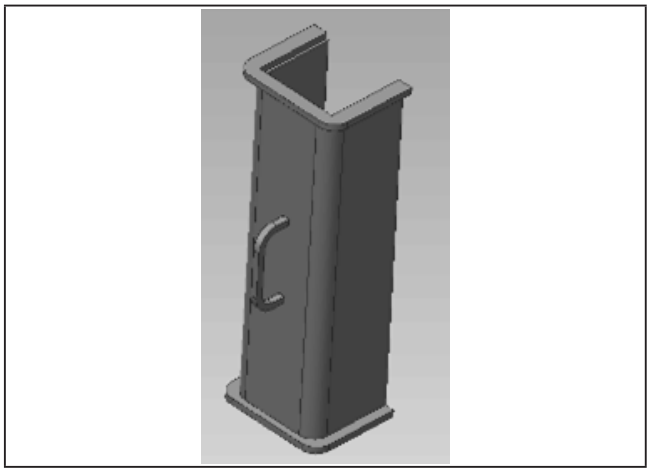


Fig. 3.25

Put it here!



Fig. 3.26

3. set the gearbox to neutral.
4. Stop the engine and remove the starter key. To cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
   Some of the following pictures may not show exactly your braking system ,but the form is the same.
5. You can replace the connectors “tee joints” and takedown the hoses B in the rear axle as shown

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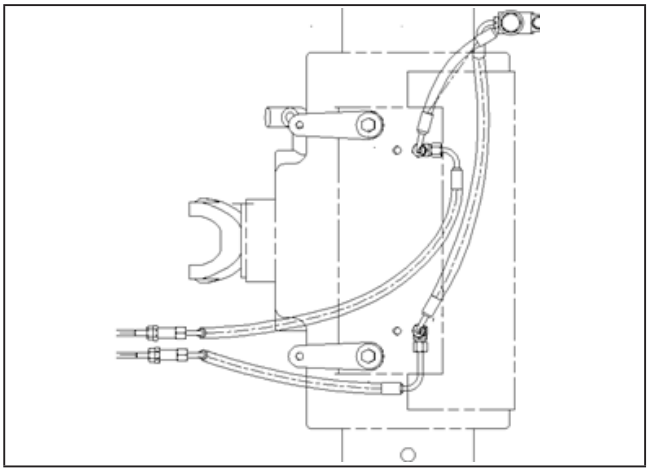
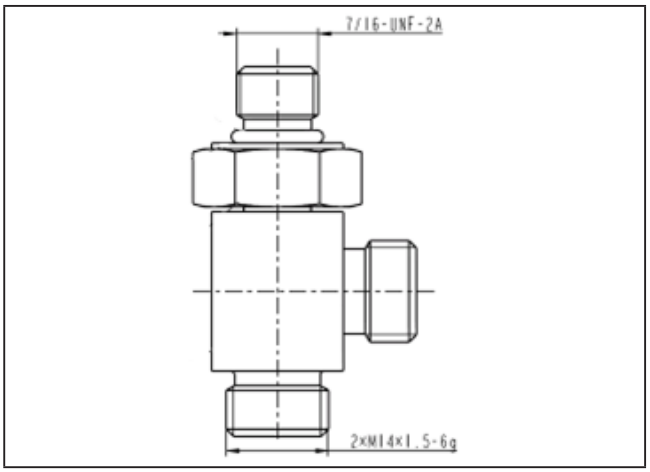


Fig. 3.27

6. And then you can assemble the new connectors to replace the tee joints for pressure test.the hoses B can cancel ,the connection form and dimensions are as follows:



Tee joins: Fig. 3.28

The connection of hose A and B

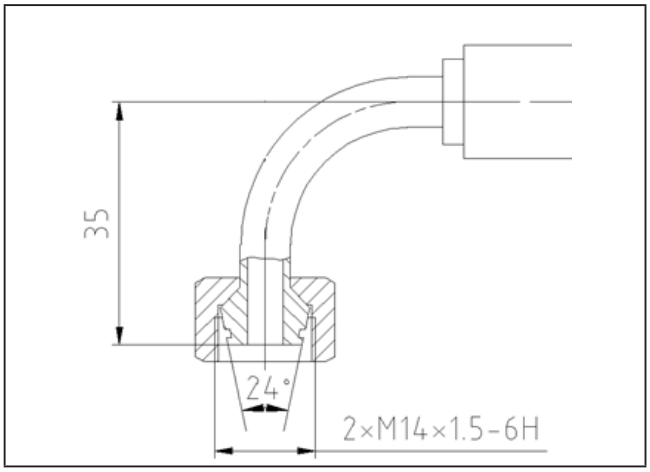


Fig. 3.29

Pressure test

7. connection the pressure gages

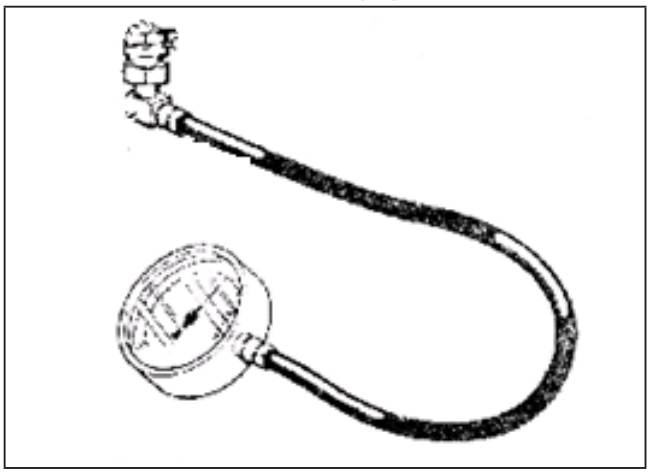


Fig. 3.30

8. after connection the pressure gage,you need to exclude the air in the braking air.

   ⚠NOTE:You need exclude the air in the system after takedown or replace the connectors or hoses,or the braking system with no effect. Next is the detailed steps

9. you need three man to exclude the air.
   One refuel the braking oil;one step the pedal in the cab;one adjust the plug in the bottom of the machine.

10. Step the pedals with all one's strength for three-five times,and keep the position to the end,the one who is bottom the machine unscrew the two plugs as shown,some oil will outflow.

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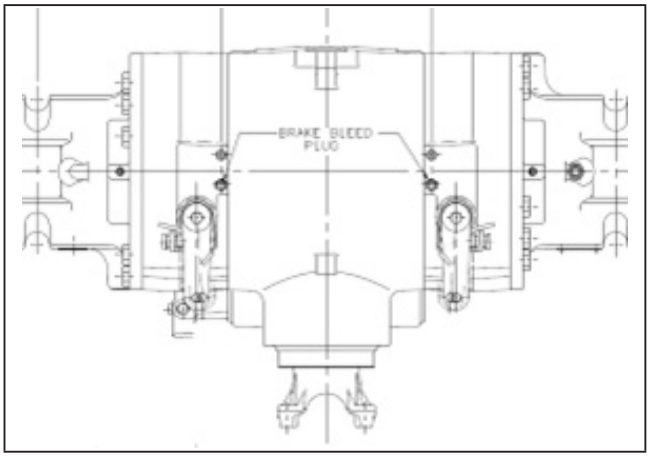


Fig. 3.31

11. And then screw down the plugs,the one in the cab loosen the pedals, continue to step the pedals with all one's strength for three-five times again,and keep the position to the end,the one who is bottom the machine unscrew the two plugs again,repeat four-ten times.the man who is refuel the oil must make sure the cup is full,to avoid air ingress the system
12. And then you can test the pressure.the pressure is about 40 bar.

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FAULT

This section tell you how to determine the fault,and corresponding action.

⚠ Note:The braking part surface maybe in high temperature to touch,so inspect or disassembly be carefully.

1.Pedal travel excessive(not touching floor)		
	failure	action
1	Air in hydraulic system	check fluid reservoir level,rectify as required
2	Friction/counter plate serious wear	replace the Friction/counter plate
3	leak in system	check for fluid loss at master cylinder can brake piston all pipes and steel tubes,rectify as required
2.Pedal hard to operate		
	failure	action
1	fluid contamination or seal damage	flush system andrenew all the seals
2	misaligned push rod/pedal	check and rectify as required
3	kinked or crushed brake pipes	check /renew brake pipe
4	blocked/leaking vacuum pipe	check /renew brake pipe
5	vacuum failure due to low vacuum at source	inspect/service engine mounted exhauster as required
3.Pedals touch floor under constant pressure -no fluid loss		
	failure	action
1	Air in hydraulic system	check fluid reservoir level,rectify as required
2	Friction/counter plate serious wear	replace the Friction/counter plate
3	master cylinder fault	check master cylinder in single and coupled pedal modes to identify fault area.
4.Pedals touch floor under constant pressure-fluid loss		
	failure	action
1	external fluid leaks	visually check brake circuit for fluid loss
2	internal fluid leaks	refer to "Carrro axle disassemble and replacement manual"
5.Pulling to one side when pedals locked together		
	failure	action
1	compensating feature not working	inspect master cylinder compensating operation , check if blockage in bridging pipe.
2	braking system inoperative on one side	unlatch pedals to test circuits individually
3	friction plates worn beyond limits or distorted on one side	renew friction/counter plate Both sides
4	badly adjusted push rods	adjust push rod
6.Poor braking(not pulling to one side)		
	failure	action
1	friction plates worn beyongd limits or distorted on one side	renew friction/counter plates Both sides
2	master cylinder fault	check master cylinderin single and coupled pedal modes
3	incorrect /low axle oil	fill axle with correct type oil
4	vacuum failure	inspect vacuum source/pipes service as required
7.One or both brakes not releasing)		
	failure	action
1	friction /counter plates not free on splines and /or dowels	check friction/counter plates for free movement,replace if required.
2	kinked or crushed brake pipes	check and renew pipes as required
3	annular brake piston(s) binding in axle	check that correct vrake fluid has been used
		check if annular brakepiston seals in good condition
		check that annular brake piston rotates freely in its housing with no seals gitted
		check that the annular brake piston seal retracts the piston approximately 0.4-0.5mm.
4	fluid contamination /seal damage	flush system and renew hydraulic seals
5	brake pedal free travel incorrect	adjusting pedal free travel
6	blocked hole in master cylinder reservoir cap	fit a new reservoir cap
7	master cylinder fault	service as required
8	brakepedal spring fault	fit a new spring

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8.Poor braking when hot		
	failure	action
1	moisture in systemvapourizing when axle is hot	strip axle and clean annular piston to remove moisture, remove master cylinder and check for corrosion service as required, flush hydraulic brake system
9.excessive brake noise in operation		
	failure	action
1	deterioration of axle oil or wrong type of axle oil	change axle oil
2	friction/counter plates in poor condition	check for distortion or surface pitting and /or roughness of friction/counter plates.
3	friction plates worn beyond limits	renew friction/counter plates
4	axle oil loss	refill axle with correct oil and check for leaks.

Fig. 3.32

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Parking Braking (Moist-Brake)

The structure

The view of the structure (hide the hand-rod cover)

If your rear axle is “moist-braking”

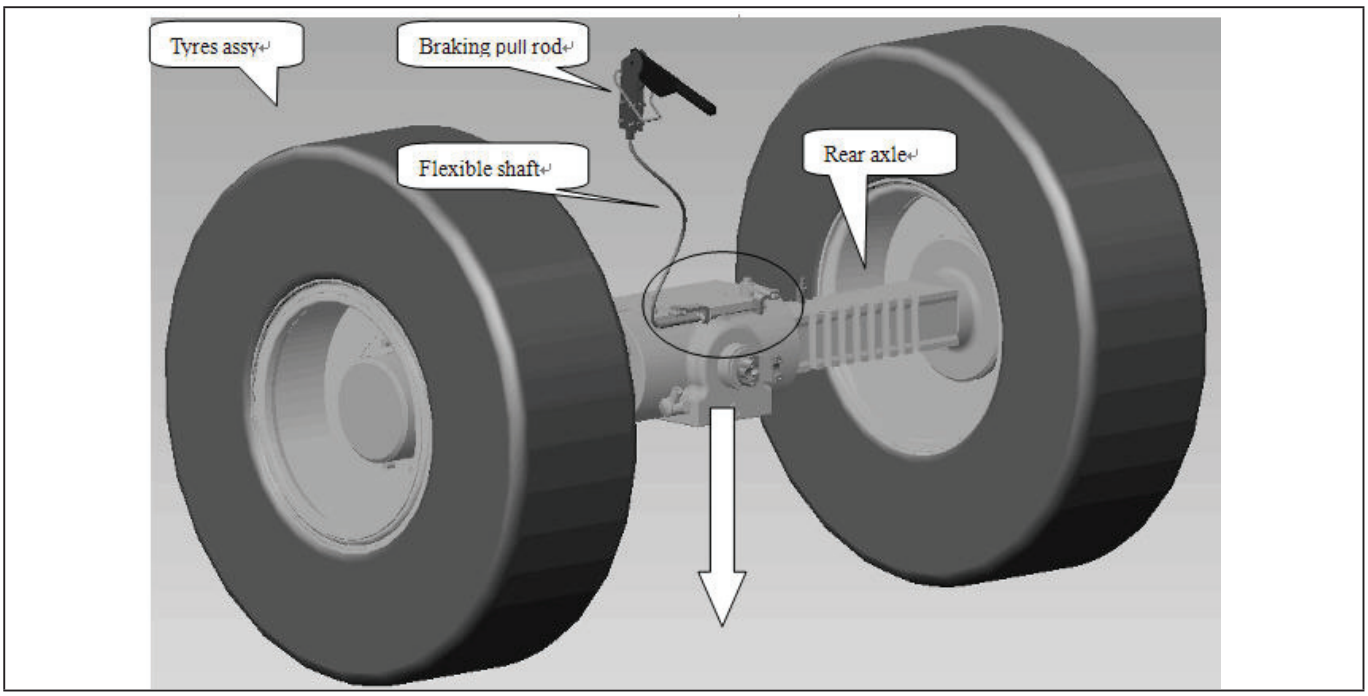


Fig. 4.1

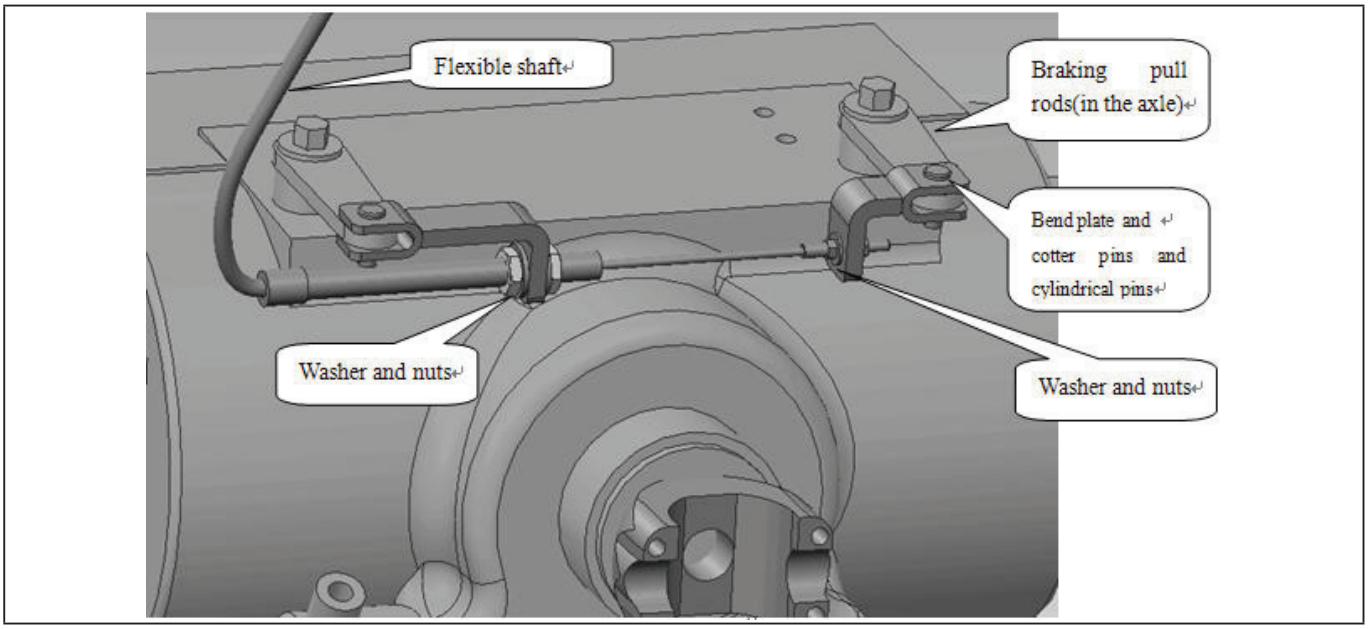


Fig. 4.2

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The braking principle

The view of the clutch of the rear axle.

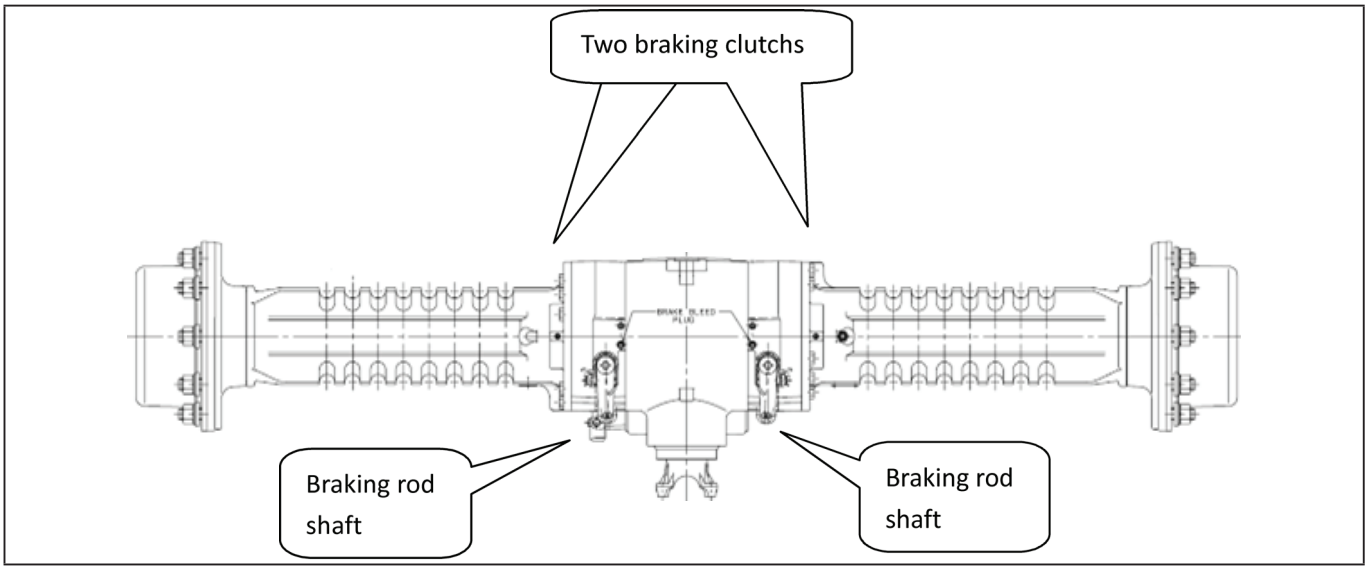


Fig. 4.3

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Disasseble the clutch ,The friction plates

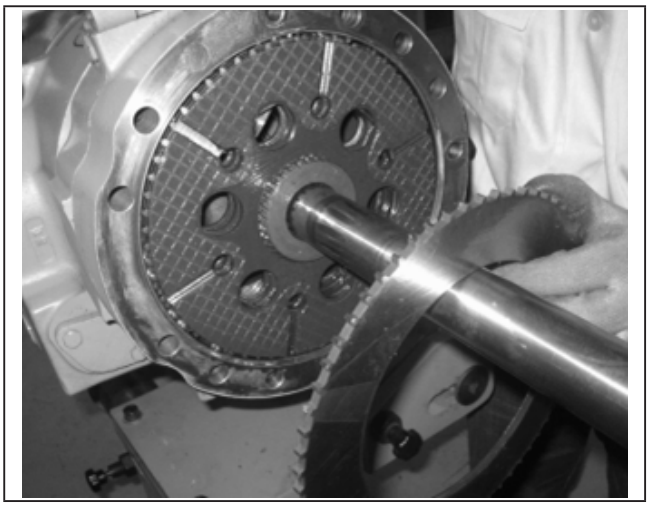


Fig. 4.4

The cam in the shaft

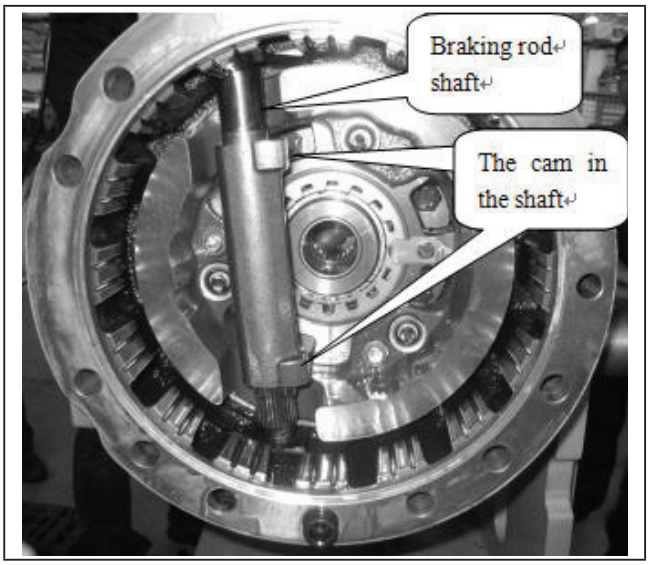


Fig. 4.5

The handle pull the parking braking pull rod in the cab,the flexible shaft pull the braking tie rod shaft rotate,the cams in the shaft will Extrusion the friction plates,realize the parking braking.

⚠NOTE:The driving braking and parking braking use the same Clutch assy!

Disassembly and replacement

Parking braking pull rod

Position of the rod

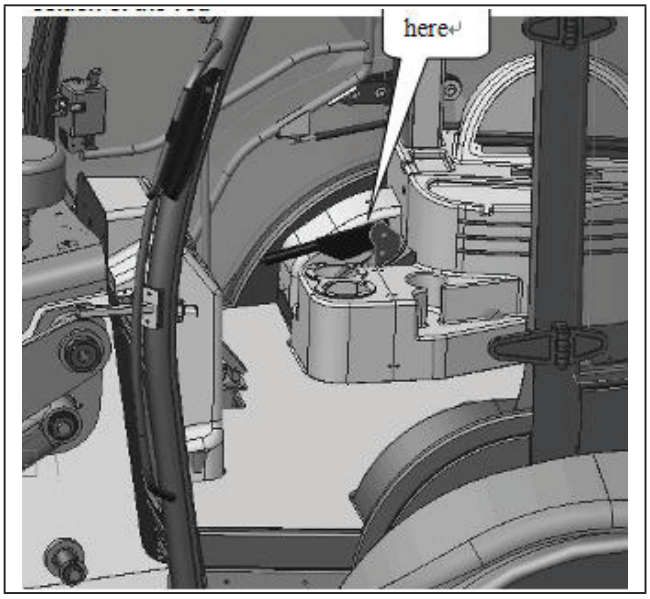


Fig. 4.6

⚠ Warning

Before you disassmble,remember you have to proceed the following steps:

1. Park the machine on level ground
2. set the gearbox to neutral.
3. Lower the attachments to the ground.
4. Stop the engine and remove the starter key.
5. Make sure the engine cannot be started while the hoses are open.so,To cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
6. Chock all four wheels to prevent unexpected move of the machine.

Next is the detailed steps

Removal:

1. Our pull rod has the cover,unscrew the screws,takedown the plate,and then takedown the cover

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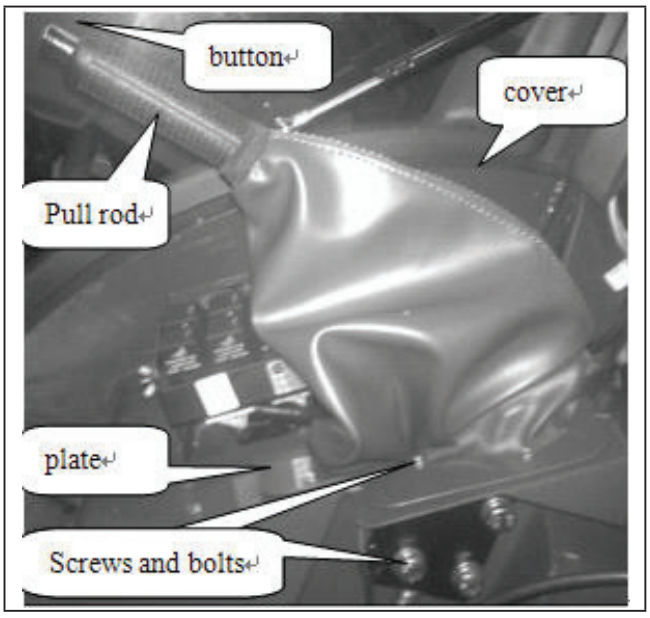


Fig. 4.7

2. Unscrew the bolts in the box,and then takedown the box as shown

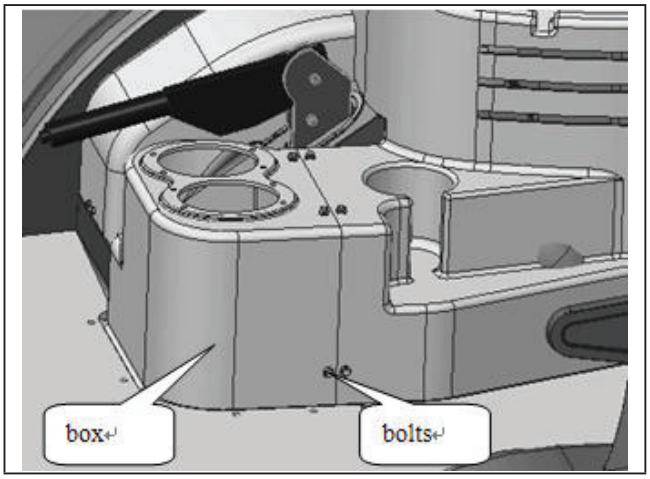


Fig. 4.8

3. Unscrew the four bolts and washers,the braking pulling rod is down.

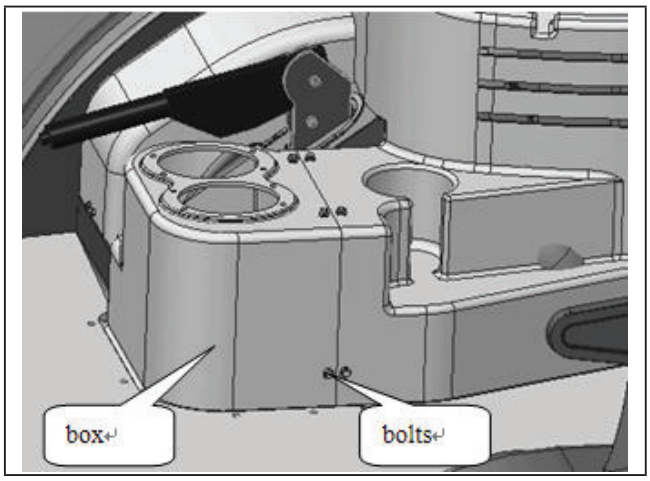


Fig. 4.9

4. The assemble process is the reversible

⚠NOTE:When you release the braking rod,push the button at the same time as shown in left view.

Parking braking-Removal and replacement

Parking braking pull rod (in the axle) and bends

Position of the pull rods and bends (in the bottom of the machine)

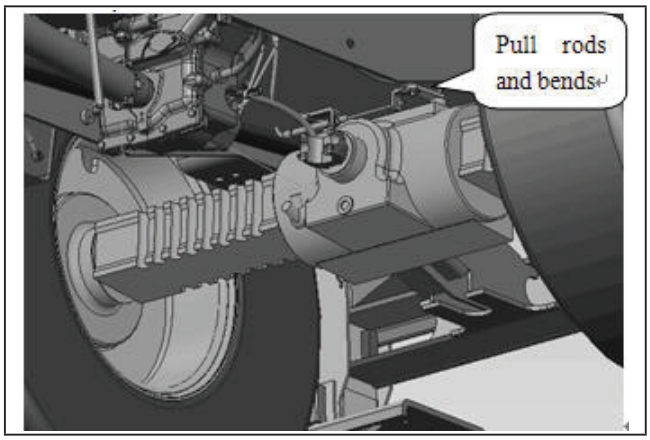


Fig. 4.10

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⚠ Warning

Before you disassmble,remember you have to proceed the following steps:

1. Park the machine on level ground
2. set the gearbox to neutral.
3. Lower the attachments to the ground.
4. Stop the engine and remove the starter key.
5. Make sure the engine cannot be started while the hoses are open.so,To cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
6. Chock all four wheels to prevent unexpected move of the machine.

Next is the detailed steps

Dissmbly:

7. Unscrew the washers and bolts,and then you can takedown the flexible shaft assy from the cab.

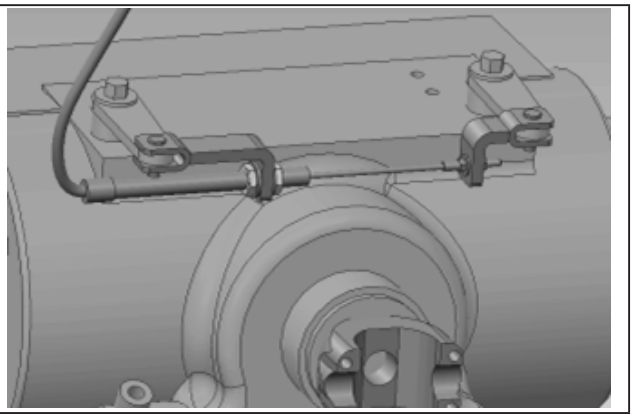


Fig. 4.11

8. Disassmble the cotter pins and cylindrical pins. And you can takedown the bends

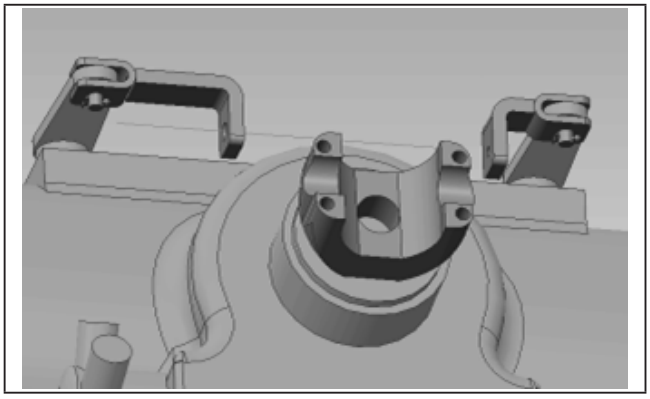


Fig. 4.12

9. The assemble process is the reversible
10. The flexible shaft drawing as shown

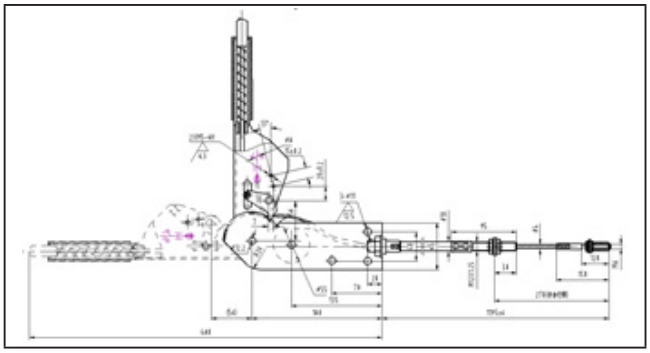


Fig. 4.13

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FAULT

This section tell you how to determine the fault,and corresponding action.FAULT

This section tell you how to determine the fault,and corresponding action.

1.Poor braking(the braking pull rod is light)		
1	the flexible core lengh is not matching the scarfskin	adjusting the position of the flexible core of the flexible of replace it.
2	friction plates worn beyond limits or distorted	renew friction/counter plate Both sides
2.To put down the rod in the cab,the braking is still keeping		
1	the spring of the rod in the axle is damaged	replace it/them
2	Friction/counter plate is stucked	check or replace the Friction/counter plate
3	the flexible is kinked or crushed	check and renew pipes as required

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Parking Braking (Caliper Disc)

Structure

The view of the structure

If your rear axle is “caliper disc brake”

Fig. 5.1

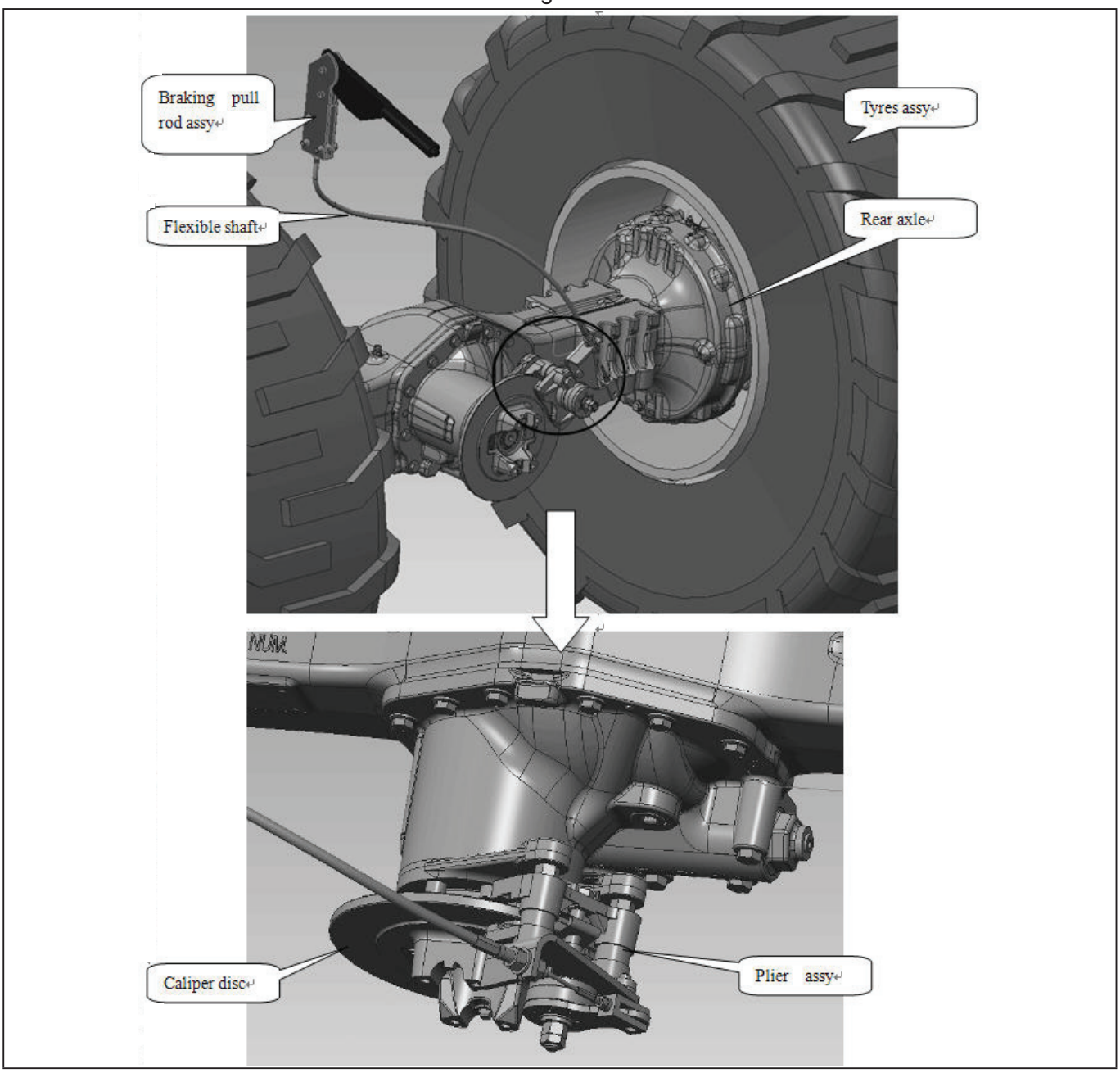


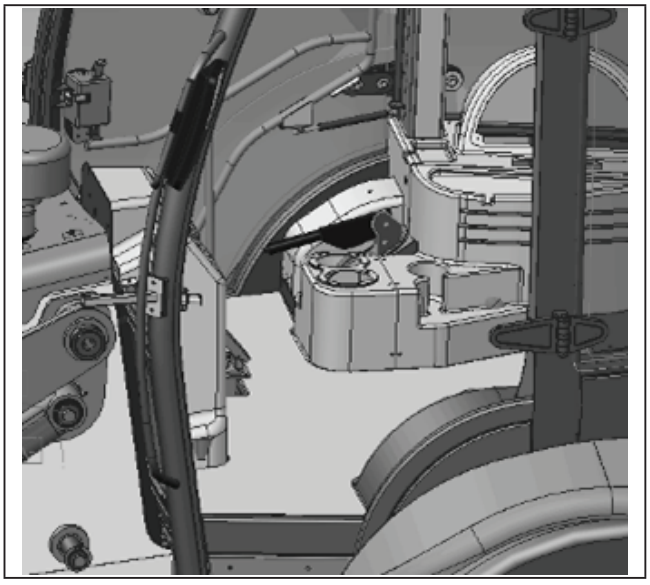
Fig. 5.2

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The braking principle

When driver pull the braking rod in the cab,the plier assy will clamp the disc through the flexible,the input shaft Cannot rotate,and the tyres of the rear axle.The whole machine will braking in the ground.

Disassmbly and replacement



Pisition of the rod Fig. 5.3

⚠ Warning

Before you disassmble,remember you have to proceed the following steps:

1. Park the machine on level ground
2. set the gearbox to neutral.
3. Lower the attachments to the ground.
4. Stop the engine and remove the starter key.
5. Make sure the engine cannot be started while the hoses are open.so,To cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
6. Chock all four wheels to prevent unexpected move of the machine.

Next is the detailed steps

Removal:

7. Our pull rod has the cover,unscrew the screws,takedown the plate,and then takedown the cover

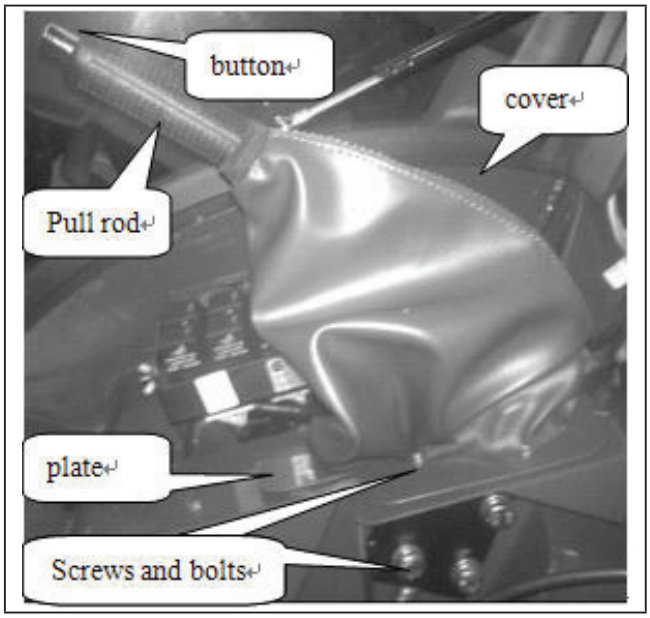


Fig. 5.4

8. Unscrew the bolts in the box,and then takedown the box as shown

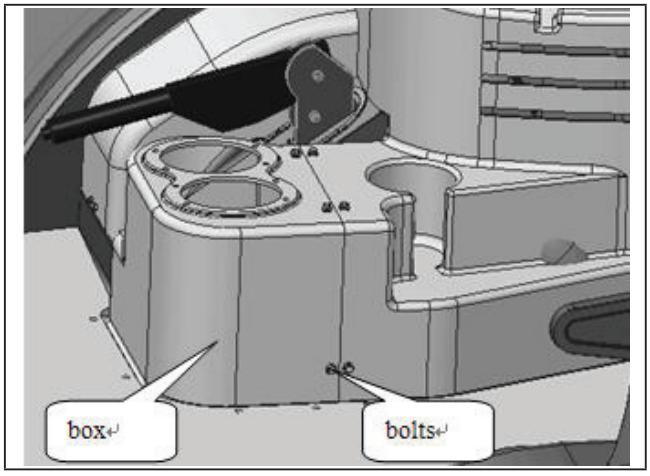


Fig. 5.5

9. Unscrew the four bolts and washers,the braking pulling rod is down.

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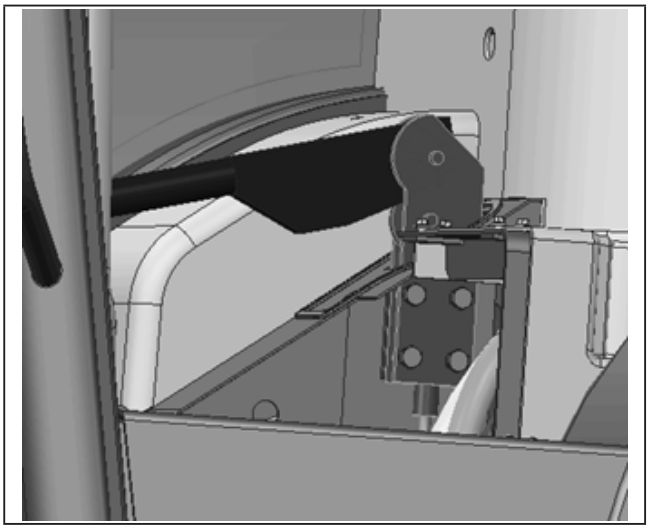


Fig. 5.6

10. The assemble process is the reversible

⚠NOTE:When you release the braking rod,push the button at the same time as shown in left view.

The flexible and disc

Position of the flexible and caliper disc (in the bottom of the machine)

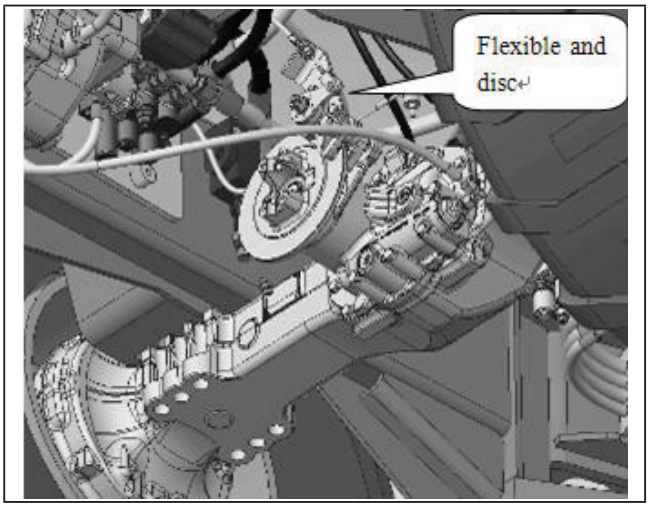


Fig. 5.7

⚠ Warning

Before you disassmble,remember you have to proceed the following steps:

1. Park the machine on level ground
2. set the gearbox to neutral.
3. Lower the attachments to the ground.
4. Stop the engine and remove the starter key.
5. Make sure the engine cannot be started while the hoses are open.so,To cut off the power of the battery, to prevent the engine being started while you are beneath the machine.
6. Chock all four wheels to prevent unexpected move of the machine.
   Next is the detailed steps

   Dissmbly:

7. Unscrew the washers ,nuts ,and the pins,then you can takedown the flexible shaft assy from the cab.

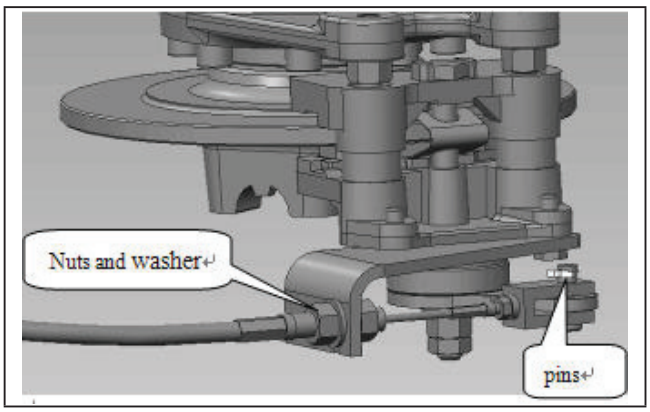


Fig. 5.8

8. The assemble process is the reversible
9. The flexible shaft drawing as shown

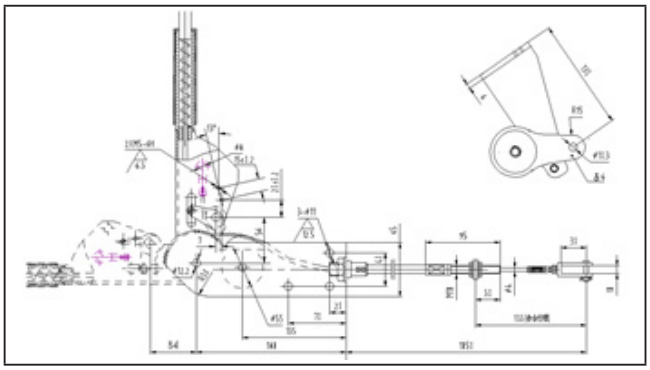


Fig. 5.9

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FAULT

This section tell you how to determine the fault,and corresponding action.

1.Poor braking(the braking pull rod is light)		
1	the flexible core lengh is not matching the scarfskin	adjusting the position of the flexible core of the flexible of replace it.
2	friction plates worn beyond limits or distorted	renew friction/counter plate Both sides
2.To put down the rod in the cab,the braking is still keeping		
1	the spring of the rod in the axle is damaged	replace it/them
2	Friction/counter plate is stucked	check or replace the Friction/counter plate
3	the flexible is kinked or crushed	check and renew pipes as required

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5. Electrical Use and Maintenance of A Series of Backhoe Loaders

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Introduction

This document is the maintenance and repair guideline of a three-phase electrical system of the backhoe loader. It presents each electrical function schematic diagram in the form of functional modules, and describes every function's realization principle, common faults and repair, maintenance methods.

Three-phase backhoe loader is divided into five electrical systems according to the engine manufacturer, leg form and gearbox.

22E1192	777A Weichai + synchronous shift	50E0659
22E1197	766A Perkins + synchronous shift	50E0659
22E1198	777A Perkins + synchronous shift	50E0659
22E1199	766A Weichai + synchronous shift	50E0659
22E1276	Perkins + automatic shift	50E0753
22E1414	Perkins electronic control three phase + automatic shift	50E0935
22E1502	Perkins electronic control three phase + synchronous shift	50E2058

In the electrical system layout, the entire electrical system is divided into three large sections: frame wiring, cab wiring, steering gear box wiring. But implementation of most electrical functions are carried throughout these three sections, so in this document, introduction is made in accordance with the electrical functions. In this paper, the electrical functions will be divided into 4 sections to introduce, namely starting and running, alarms and display, lighting, work systems according to the different functional properties. Important electrical components are disassembled in details, such as a battery, alternator, electrical centralized control box etc.

Electrical system is rated at 12V, using Weichai/Perkins engines. Its main characteristics are as follows:

| Adopt Perkins three-phase electronically controlled engines, cut off the power, cut the oil, flameout, electronic control throttle.
| All lights and solenoid valves are powered up through relays.
| Reverse alarm is installed.
| It is optional to install rotating warning lights, outrigger alarm function, bucket flat features, power off function.
| With a neutral start, 2WD/4WD lock function.
| Daily marked line is used for all wires, that is AVSS line with line mark.

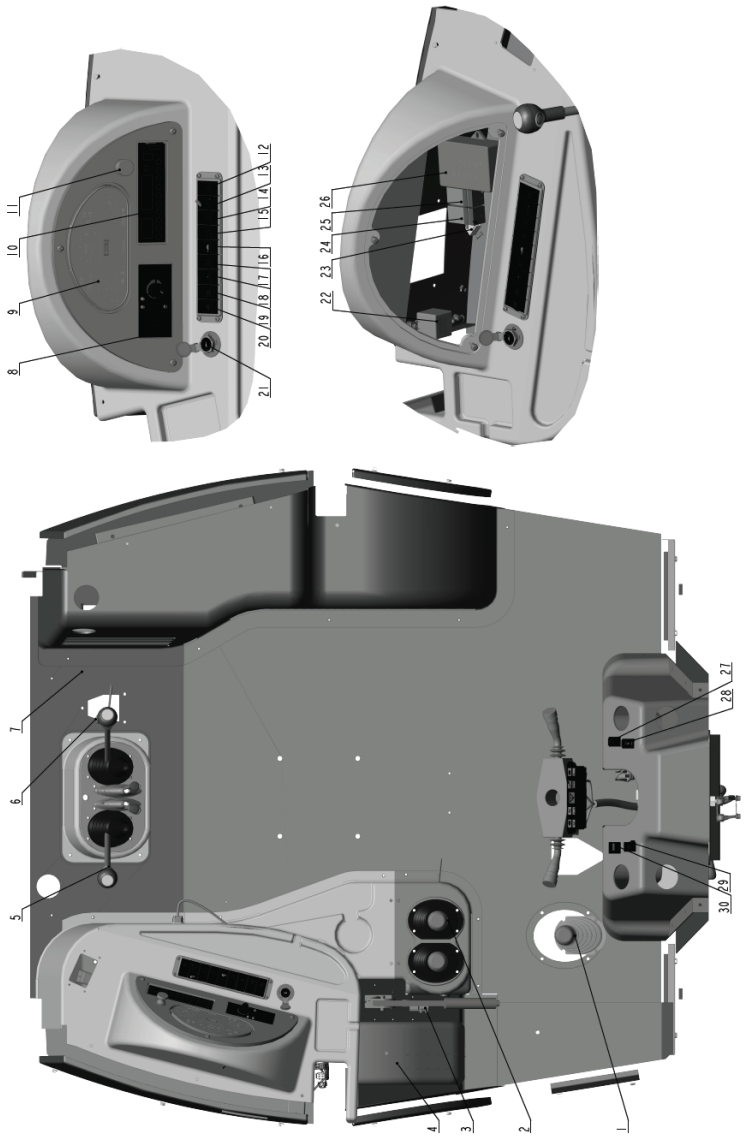
This part is composed on the basis of relevant electrical system principle diagram and electrical working principle during production. Please be subject to the delivery attached documentation from Liugong dealers when purchasing machine if modifications of product are various according to different types of machine.

Maintenance personnel must master general knowledge of maintenance electrician and be familiar with electrical system and working principle of Liugong skid steer loader before fault diagnosis and maintenance.

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I. Basics Introduction of the Electrical System Layout

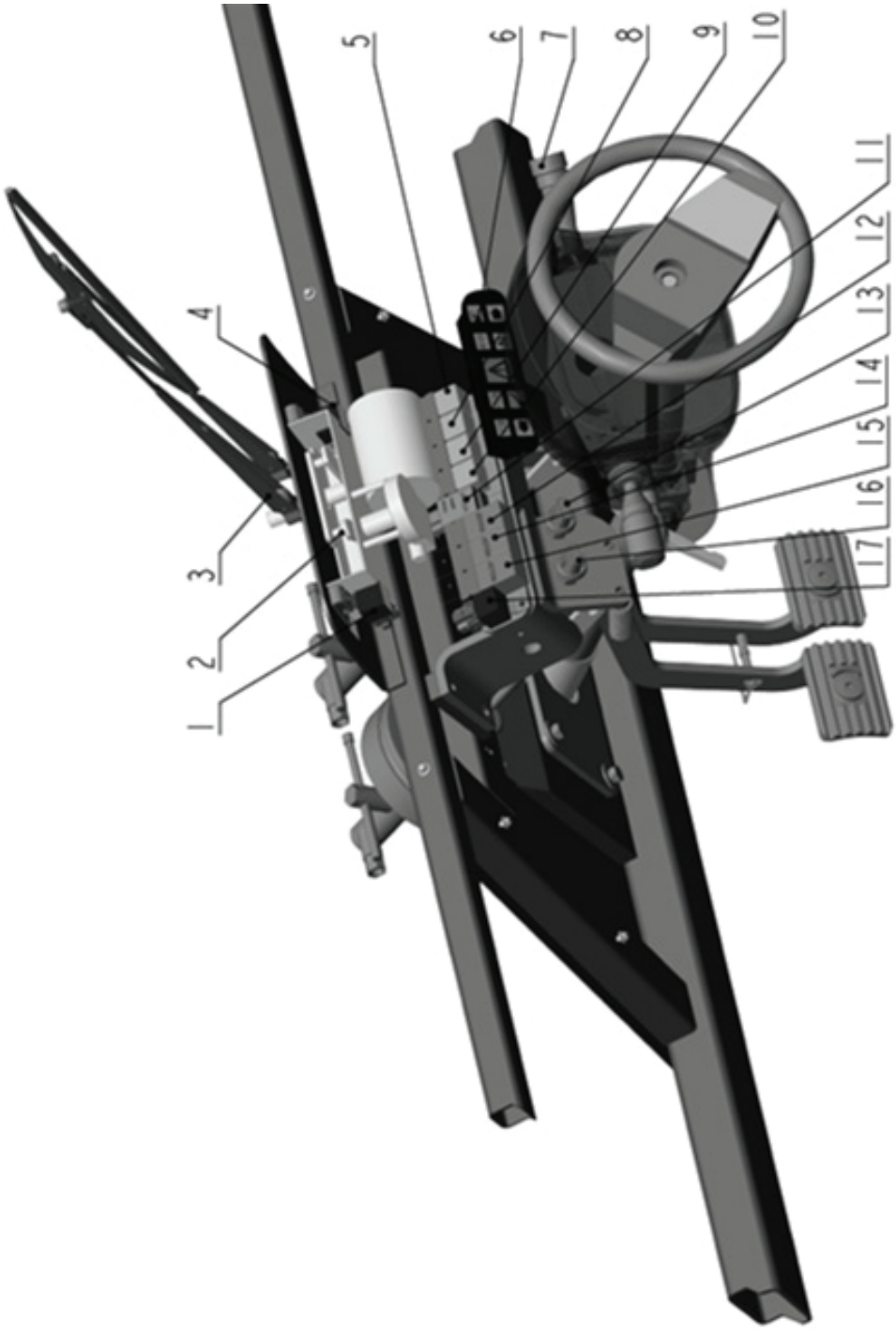
1.1. Description of the cab wiring AS position



1. Unload switch of load handle 2. Hand brake switch 3. Fuse box 4. Rear horn switch 5. Unload switch of backhoe handle 6. Pedal switch of hydraulic hammer 7. Shift unload switch 8. A/C control panel 9. Combination instrument 10. Radio 11. Cigarette lighter 12. Sideway clamping switch 13. Hydraulic hammer 14. Rear window cleaning switch 15. Rear window wiper switch 16. interflow switch 17. Switch of rotating light 18. Switch of differential lock 19. Rear working light swtich 20. Front working light switch 21. Electrical lock 22. Power supply relay 23. Connect wiring hamess of work light 24. Buzzer 25. Buzzer 26. Rear wiper controller 27. Main light 28. Power cut 29. Hazard lamp 30. 2WD/4WD

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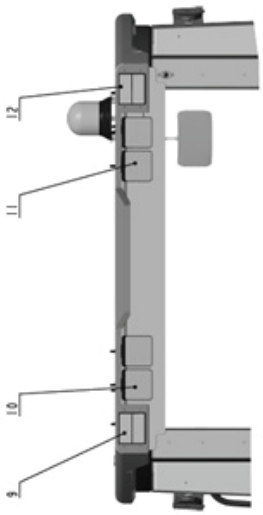
1.2. Description of steering gear box wiring AS position



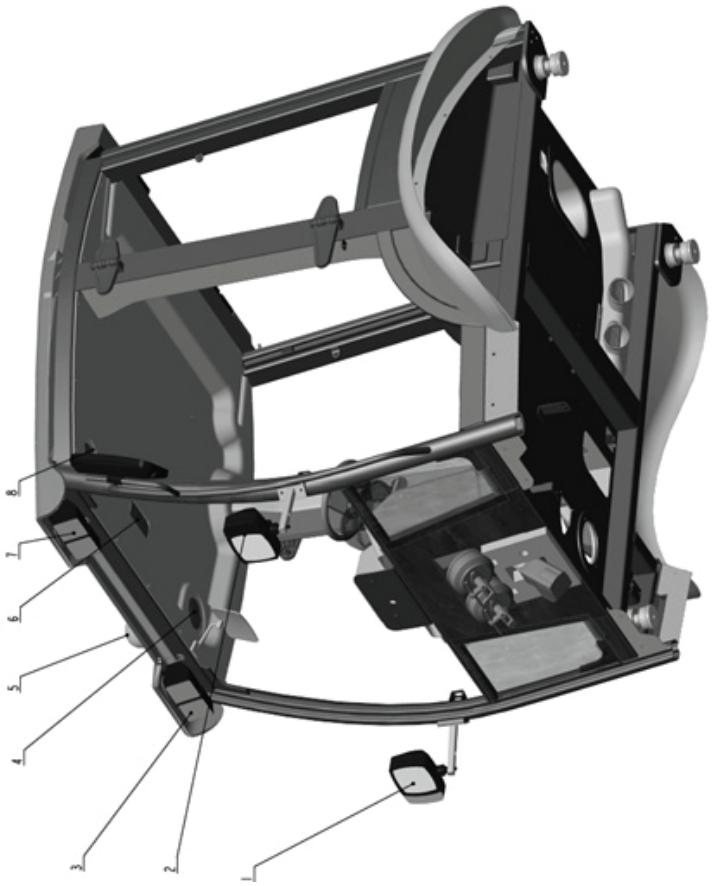
1. R10-neutral start relay 2. Front wiper motor 3. Front wiper 4. R11-brake balance relay 5. R9 ---Combination diode relay 6. Front alarm unit 7. Combination switch 8. R8---Combination diode relay 9. R7---Combination diode relay 10. R6---Combination diode relay 11. R4---flash relay 12. R3---foot brake relay 13. Right foot brake switch 14. R2---horn brake light relay 15. R1---forward/backward relay 16. Left foot brake switch 17. R5---2WD/4WD relay

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1.3. Basic description of dome light circuit AS position

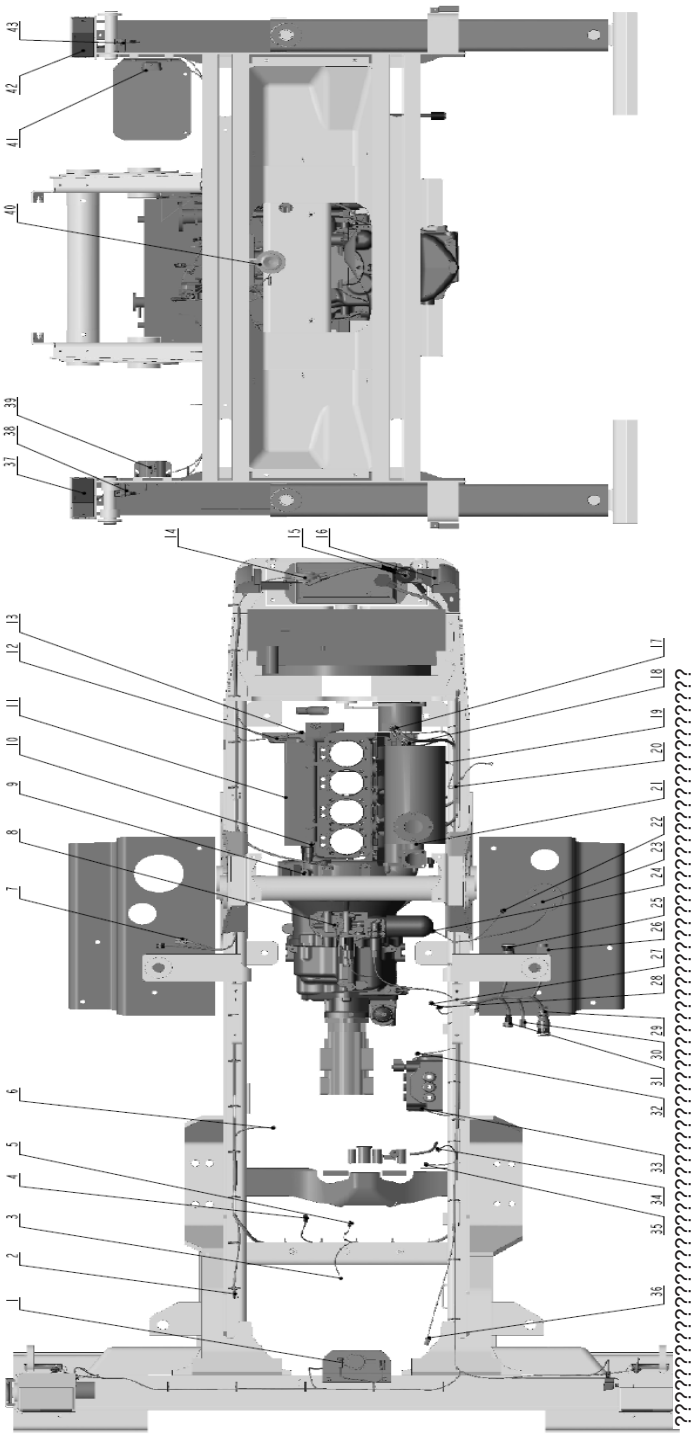


1. Right floodlight 2. Left floodlight 3. Front work light 4. Audio 5. Rotating beacon 6. Dome light 7. Front work light 8. Audio 9. Left rear combination beacon 10. Rear work light 11. Rear work light 12. Right rear combination beacon



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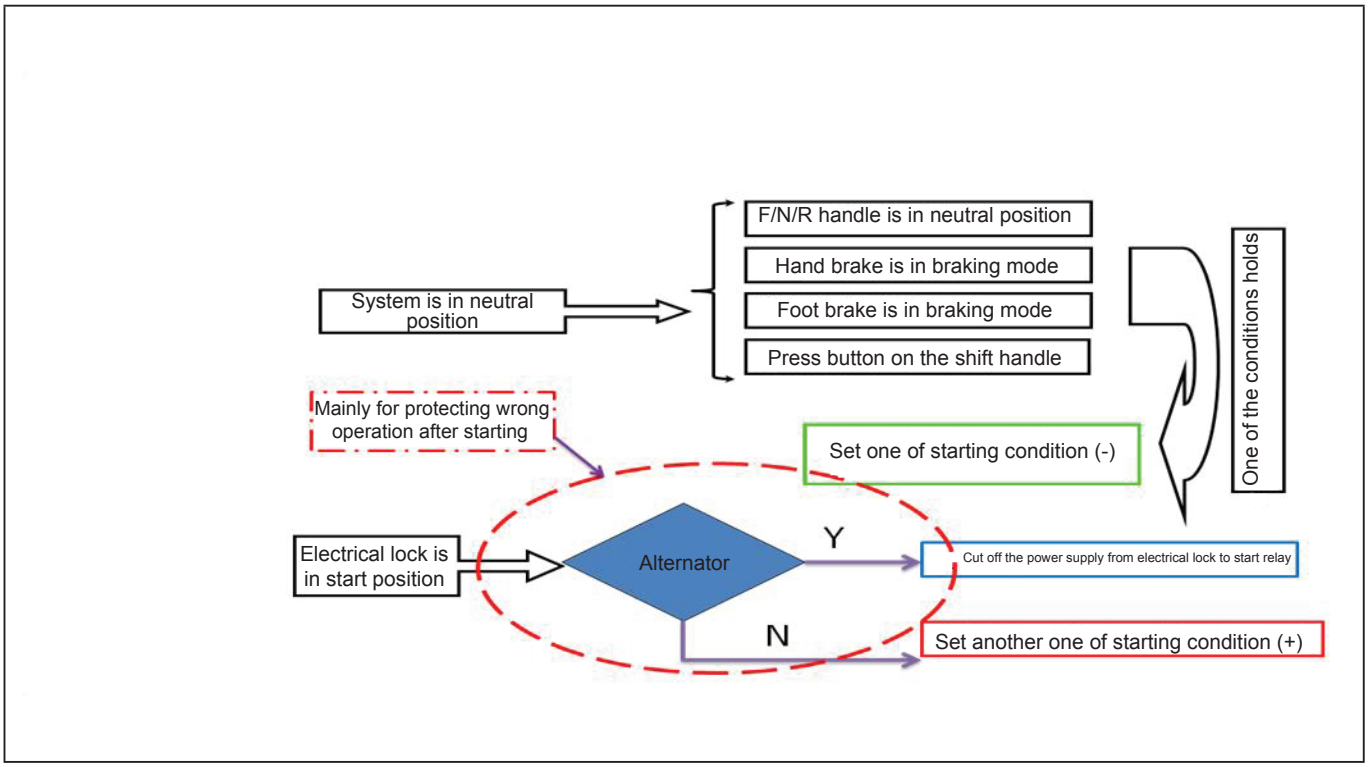
1.4. Description of the frame wiring AS position



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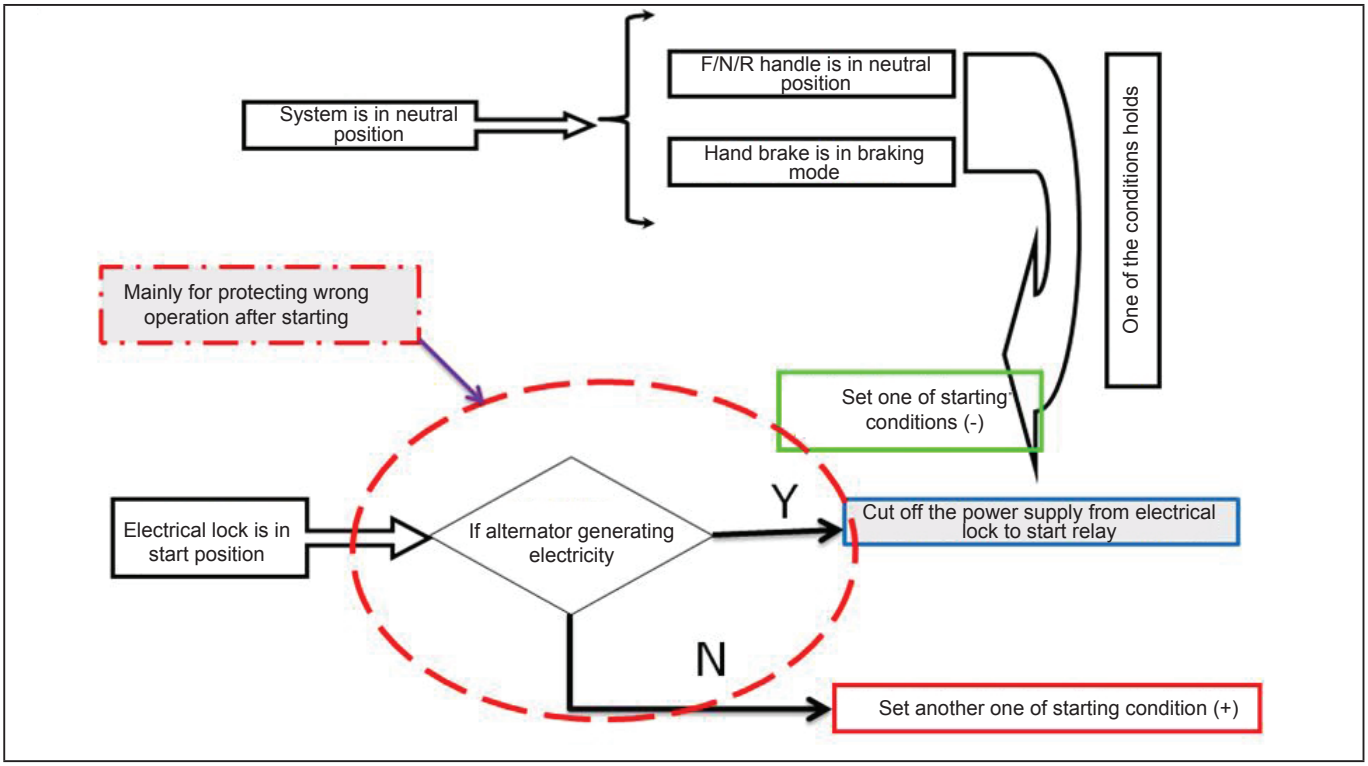
II. How to Use Machine

2.1. Allowing the starting conditions (synchronization shift)



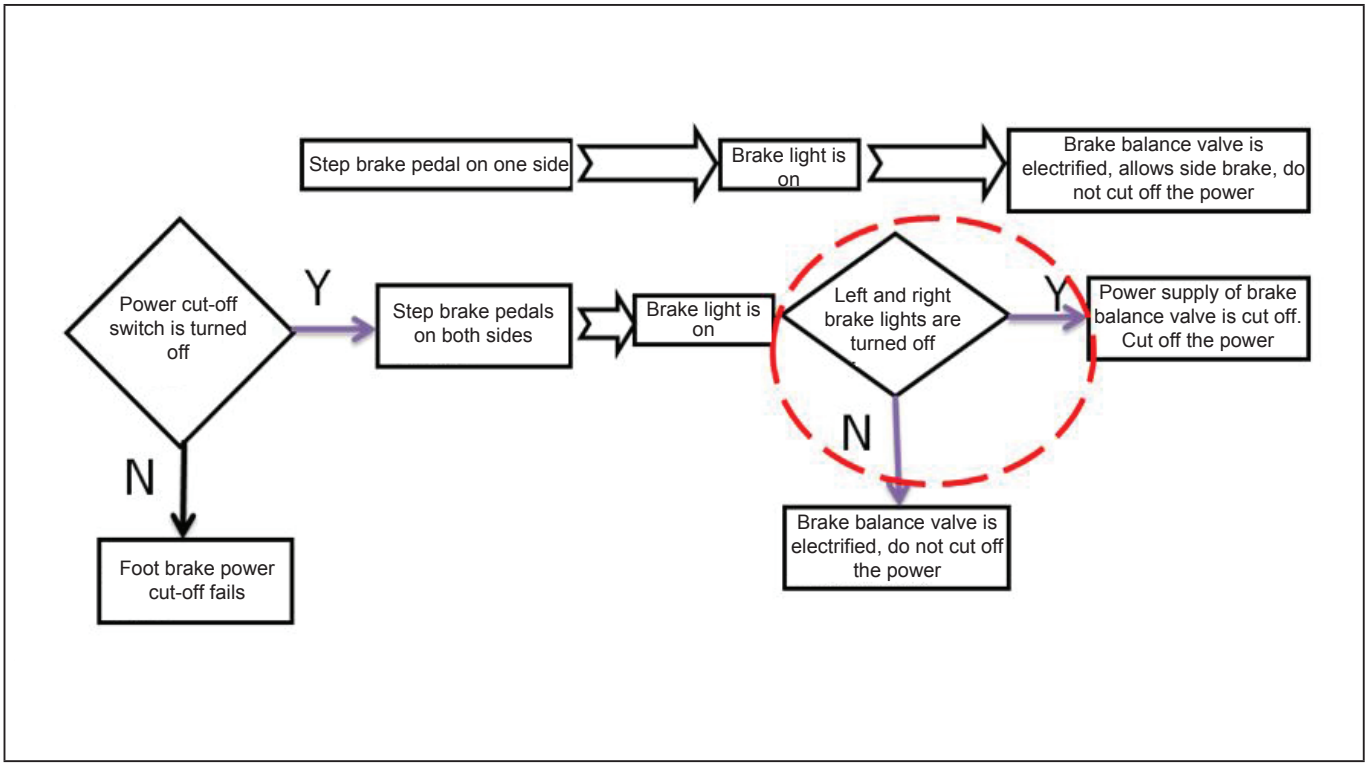
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2.2 Start-up conditions (automatic shift)



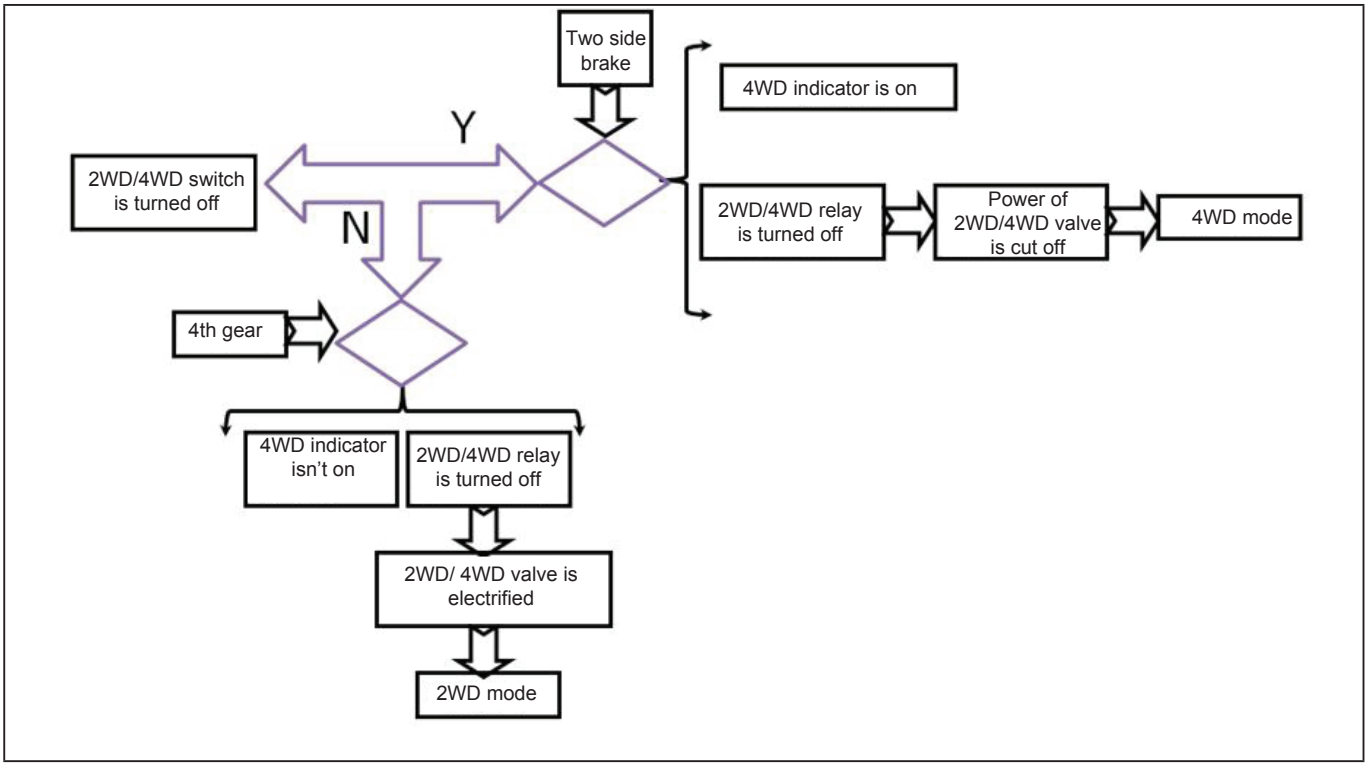
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2.3. Foot brake power cut (synchronization shift)



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2.4 2WD/4WD functions (synchronous shift)



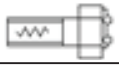
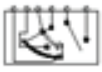
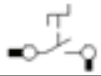
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III. Description and Troubleshooting of the Electrical System

3.1 General information

3.1.1 Electrical graphical representation:

The following symbols and practices have been used in the electrical wiring described in this guide:

	Diode		Switch		4th gear sensor
	Fuse		Fuel level sensor		Temp alarm switch
	Cigarette lighter		Pressure switch		Rev sensor
	LED		Buzzer		Fuel lifting pump
	Button switch		Flash relay		Connector
	Alternator		Electrical lock		Audio
	Bulb		Choke electric magnet		Electric fan
	Motor		Disconnect switch		Solenoid valve
	Switch		Horn		Backward alarm
	Switch				

Cable identification: for example: 602GN1.5 602: Wire NO. GN: Color 1.5: AWG (mm^2), AWG unlabeled is 0.85mm^2. Power line, No.1 of the line is in red (RED), earthing cable; No. 2 of the line is in gray (GY), the remaining cables are in white (WH).

3.1.2 Multimeter

Electrical system test of the excavator loader requires use of a multimeterto carry out five tests. This section provides the user with a common guideline on multimetercorrect measurement techniques. This section provides pictures, so that it is relatively easy for users to compare required reading information, which have been collected.

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Digital automatic range multimeter and manual range multimeter



Before using the equipment, make sure that 2 probes connect to correct interface for test; black probes connect to COM interface, red probes connect to voltage, resistence and diode test interface.

Continuity test



Before run a continuity test, cut off the power supply of tested units to insure safety. However, only 12 V voltage can be used to electrify the coils of relay to test the condition of relay units controled switch.

Resistance test





Select Ω position on automatic range multimeter, select 200 Ω position on manual range multimeter. Use probe to test resistance according to the method in manual, compare actual measurement result with the value listed in manual. Correct value should be zero or minimum, which indicates that the circuit is in good situation.

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Resistance 20KΩ



Max. resistance is shown in picture below



Select Ω position on automatic range multimeter, select 20KΩ manual range multimeter. Test resistance with probe according to the method in manual. Compare actual measurement result with the value listed in manual.

Test of diode



Select diode symbol. When testing diode, if connect the two probes to both ends of diode, a high value will appear, vice versa. Compare actual measurement with the value listed in manual. If the difference is very big, replace the diode.

AC voltage



Select AC voltage. Select AC voltage on automatic range multimeter, select AC voltage 200V on manual range multimeter. If select AC voltage letter V and AC, they will show on the screen.

DC voltage



Select DC voltage. Select DC voltage on automatic range multimeter. Select DC voltage 200V on manual range multimeter. If select DC voltage letter V and DC, they will show on the screen.

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3.1.3 Relay

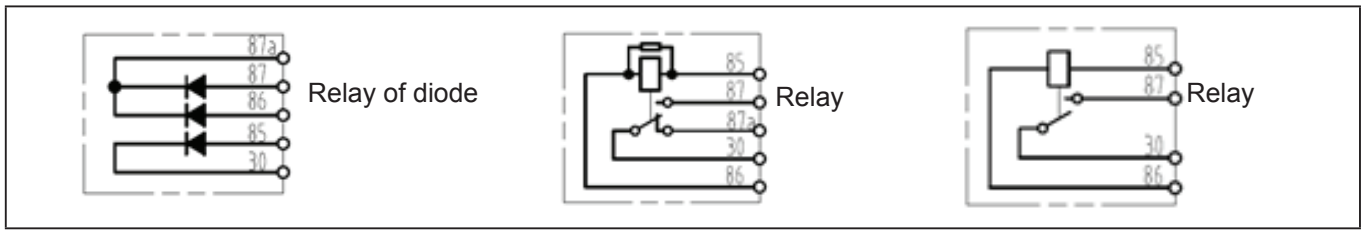
Relay usage: control action, which uses very small current to control very large current. Moreover, the relay can also use DC to control AC, or AC to control DC.

Switchover function: the logical function can be achieved through the combination of relays (relationship of and, or,no). But inferior to plc etc.

A controller with a microprocessor is easy to use; it is more used for relatively simple logic.

Generally, the larger the volume of relay is, the stronger its capacity of loading current is.

Basic structure chart:



Working principle:

The function of diode relay is to ensure single-way conduction and offer protection to prevent backflow of current. The forward cunduction.

1. Reverse cut-off follow current. If the backward current is too large, the diode relay will be easily to be breakdown and caused failure. Multimetercan be used to check whether it is good or bad, (diode gear) red probe connects inlet wire of the diode, and the black probe connects with the diode, which is breakover. Conversely, if the diode won't conduct, it means the diode is normal without breakdown. If the backward direction of it is also conductive, it means the diode has failed and please replace it.
2. Figure 2 shows the working principle of the relay, when two terminals of the electromagnetic relay coil are applied with a certain voltage or current, the magnetic flux generated by the coil is through the magnetic circuit, which are composed by the iron core, the yoke, the armature, the magnetic circuit working air gap. Under the magnetic field action, the armature is attracted to the core pole face, thereby promoting contacts constant-off contacts to disconnect, constant-oned contact to be closed; when the both ends voltage or current of the coil is less than a certain value, the mechanic reaction force is greater than the electromagnetic suction, the armature is back to the initial state, normal-open contacts are open, constant-off contacts are connected.

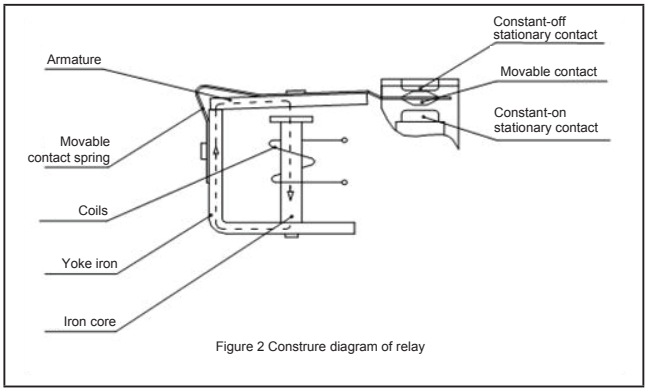


Figure 2 Construre diagram of relay

Attentions during Installation:

1. The installation position of magnetic sensitive elements should be far away from the relay.
2. Do not install the electromagnetic relay onto the mounting plate made of ferromagnetic material;

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3. Install several time delay relays at the same time with a gap of more than 5.08 mm to avoid damages to semiconductor in the relay caused by high heat due to intensive installation.
4. Pull-on direction of the contacts does not parallel with the driving direction of the machine, so as to avoid machine movement may cause the relay malfunction.
5. The relay generally should not be installed upside down (except sealed waterproof ones).

3.1.4 Repair method of commonly used components in the electrical system

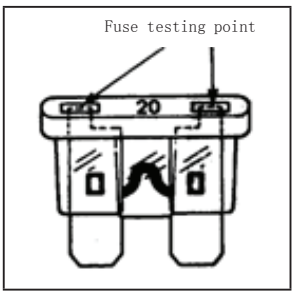
I. Objective
1. Control operational steps of wire repairing.
2. Control measures to test the automotive switch, fuse, relay etc intermediate components.
3. Master disassembly and inspection of the truck connector.

II. Instruments and Tools
Truck harness, switch, fuse, relay, connector, welding tool, multimeterand so on.

III. Contents
1. Wire maintenance
Most manufacturers recommend that all wires should be repaired by welding. When repair the wires, it is important to use the correct operations as the circuit diagram shown.

(1). Remove 12.7 mm (1/ 2 in.) of insulation from each wire, which needs to be repaired and spliced.
(2). Prepare heat tubing with adhesive lining to be placed on the wire side. Ensure the tube long enough to cover and seal the entire repair area.

3. Switch test
Turn the switch to the appropriate location; use a multimeterresistance gear to detect the corresponding resistance between the terminals, and the contact resistance can not be out of range.

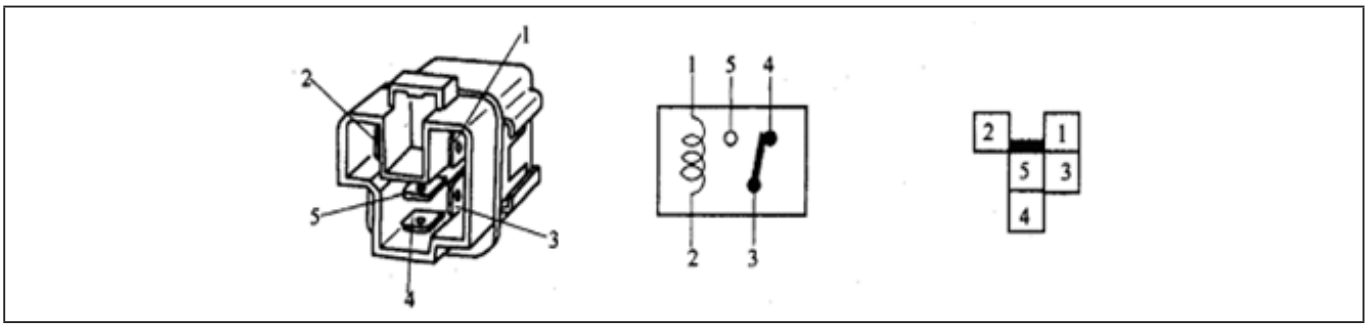


4. Fuse inspection
Observation method can be used to check, the resistance gear of a multimetercan also be used to measure whether the fuse is blown out.

5. Relay test
(1). Open circuit test
The method uses a multimeterto measure resistance, taking a relay as an example which is shown in the following figure, it uses the multimeter R X 100 Ω gear to check: if

Pin ① - Pin ② , connected
Pin ③ - Pin ④ , connected
Pin ③ - Pin ⑤ , resistance ∞.
It Is normal, or else it has problems.

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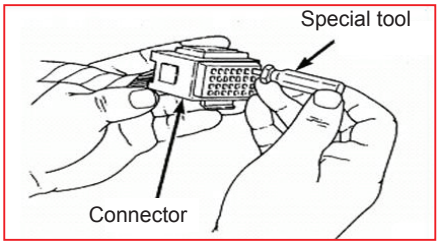
(2). Power-on detection

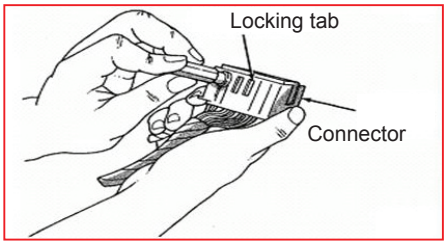
Apply 12v voltage between the feet ① and ② , then: feet ③ and ④ are not connected, feet ③ and ⑤ are through, this state is as normal.

3. Removal, installation and test of the connector

Removal:

(1). Disconnect the battery or disconnect switches.
(2). Disconnect the connector from its paired half/component.
(3). Press the locking tabs on the yellow connectors to release the terminals.
(4). Use the special tool to crimp terminals and remove the wires from the connector.
(5). Repair or replace the terminals.





Installation:

(1). Reset the lock tabs.
(2). Plug the removed wire into the original jack of the repair plug.
(3). Repeat to plug each wire into the connector, and ensure that all wires are plugged into the correct jacks. To the Identification of another connector pinout, pls see the relevant circuit.
(4). When re-assembly connectors, the locking tabs must be placed in the locked position, so as to prevent the terminal prolapse.
(5). Connect the connector to its paired half/component.
(6). Connect the battery and test all affected systems.

Inspection

When checking the line voltage or conduction condition, it is not necessary to disengage the connectors, only use two probes of the multimeterto plug into cable holes of the connector end to check.

Precautions for maintenance

Before maintenance, please do understand and keep safety and warning information & precautions in mind in case of personal injuries or damages to electrical elements and its relevant equipments. Please obey the following precautions strictly during the maintenance of electrical system.

| Read and understand the Manual for Testing Equipments to use the testing equipments correctly.
| Complete machine power should be cut off before maintenance; and then disconnect wires and connectors. If not, harness will be damaged and the fuse will be blown; even fire will be caused because of short circuit of wires.
| Please identify colors and functions of different wires correctly: the colors and wire gauge should be

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correspond to the three-digit figures of wire labels in the principle diagram. Please distinguish colors and wire gauges correctly for easy maintenance.

| Please connect the connectors correctly: letter codes of connectors should be correspond to colors of wire during connection. Otherwise, damages to connectors will be caused and even harness will be burnt down.

| Pull out the connector, grasp the connector main wires, do not pull it hardly. Make sure the fitting and good contact of lock buckles when connecting the connectors.

| Make sure the connectors are dry and protective measure should be taken to meet the requirements of damp proof and water proof.

| Understand the schematic circuit diagram which indicates mutual relationships and functions of each elements and devices of the electrical system. This will be helpful to make a quick and correct judge of fault and save maintenance time. Don't remove the machine to a large extent blindly.

| Understand "ground" means correctly: battery (-) is the "ground", engineering machinery generally use negative earth, namely connect the battery's negative pole to the whole body (including the frame, cab and other metallic conductors connected together). Therefore, when the battery (-) connects the whole body tightly and reliably, the whole body is the "ground." (Note: surface of the measuring earth position can be coated with butter, it should be appropriate to avoid the bad ground; paint, oil, dust etc are not allowed.).

| Bundled with the harness correctly: 1, Avoid bend the harness off; 2, It should stay away from moving parts and prevent breakage and wear; 3. Avoid friction with sharp metal edges; 4. Try to be far away from oil and water; 5, Make the best to be away from hot parts (such as the engine block).

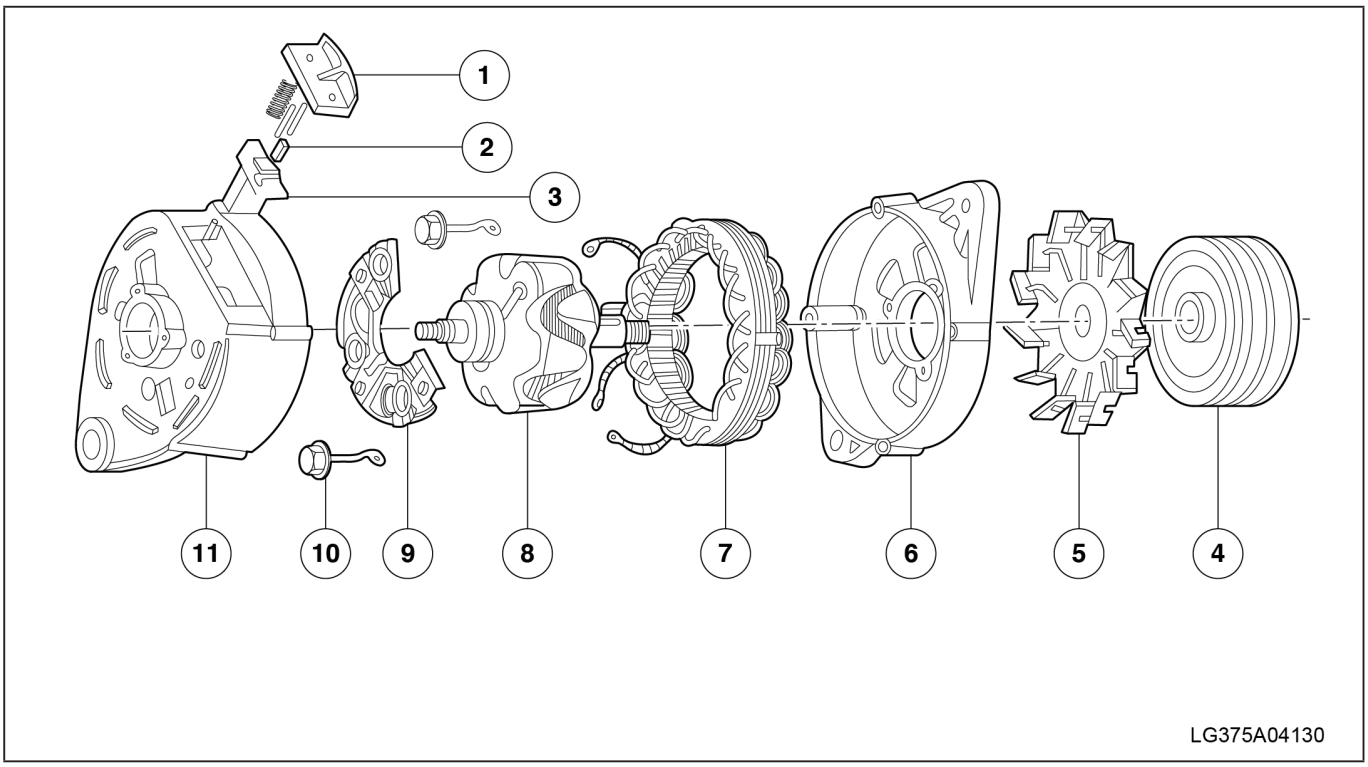
| Bind and replace the harness immediately once find wear of them; and fix the wiringharness on the place where there is no wear.

| Correctly replace the fuse: when replace the fuse, you must use one in the same specification, it does not allow use of copper wire for emergency treatment. Chip type fuse and flat plate type fuse used in this product should meet relevant regulations of QC/T 420 Fuses for Auto. Therefore, please use the authentic parts from Liugong when replacing fuses during maintenance.

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3.2 Alternator

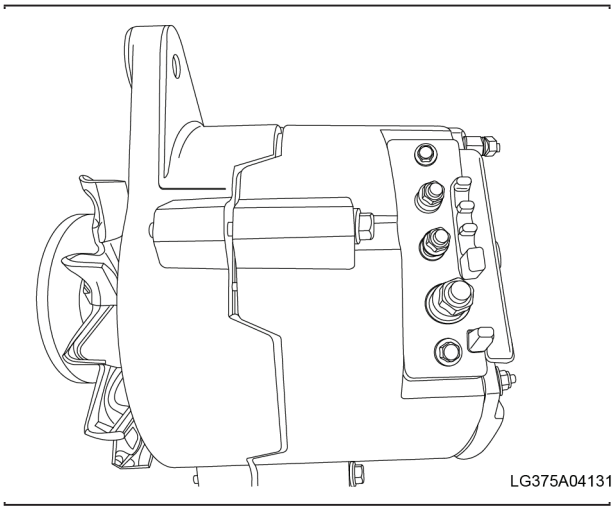
1. Functions of alternator
   (1). The alternator is the diesel kit with built-in electronic regulator, its operating voltage is 14V.
   (2). After starting the engine, the whole machine is powered, such as power for A/C, lighting, relay, all kinds of electromagnet.
   (3). Use with the starting battery in parallel, so as to achieve charging the battery.
   (4). Provide part of the control and monitoring signals, such as: signal to measure the engine speed used on the W-side, measure power generating used on the D-side.
2. Structure of alternator
   Currently, alternator has many types but their basic structures are the same that is, they are all composed of three-phase alternator and silicon rectifier. Three-phase synchronous alternator generates three-phase AC, which output through Silicon output rectifier, its structure is shown as Fig.



1- Carbon brush spring cover;
2- Carbon brush;
3- Carbon brush holder;
4- Belt Pulley;
5- Fan;
6- Front cover
7- Armature set
8- Field rotor;
9- Component plate;
10-Diode;
11- Rear cover

3. Connection of alternator
   B+ of alternator connects to the positive pole of battery, and D+ to charging indicator to excite the alternator.

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4. Simple check of alternator faults
   The first step, check whether there are disconnection, wrong connection and short circuit on the outer wires connection positions of the alternator; moreover, use a voltinstrument to measure whether the B + has the battery voltage.

   The second step, turn the ignition switch to the “ON” position, but do not start the engine, use a voltinstrument to measure whether D + point has voltage, and observe the charging indicator.

   The third step, start the engine, and use a voltinstrument to measure voltage of the engine B + point, it should reach the following values:

   12V system with voltage of 13V or more, while add and subtract the throttle, there is little change in the voltage (0.1 ~ 0.2V).

   The fourth step, open part of the load, such as lights 12V system with voltage more than 13V while add and subtract the throttle, there is moderate change in the voltage (0.2 ~ 0.4V).

   To the third step, if the alternator has no voltage output, the following methods can be taken to check. For D +point yielding excitation, a 2.5mm2 wire can be led from the battery positive; after starting the engine, use the other end to click D + point (within 1S) instantaneously, and then use voltinstrument to measure point B + whether there is the voltage output:

| If so, start checking from the third step to the fifth step, and judge whether the machine charging indicator line occurs open circuit (generally it means indicator is damaged, instrument panel lever fittings loose, circuit is broken). If there is no voltage output, it means the alternator has no electricity failure.

5. Precautions for alternator operation

|. Prohibit strictly supplying power to electric equipments when alternator is separated from the battery; prohibit strictly disconnecting the disconnect switch when the engine is running.

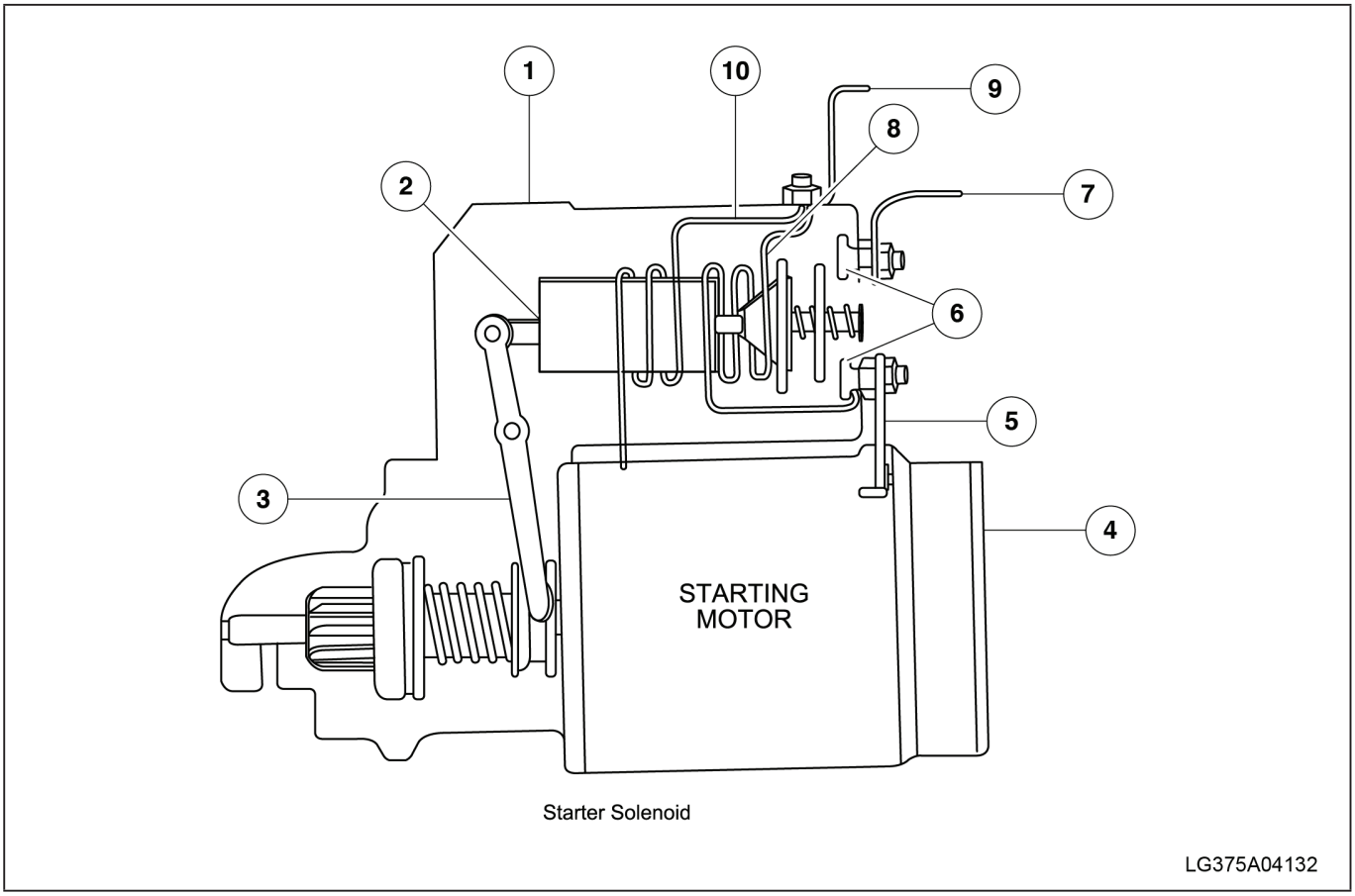
|. Prohibit checking the alternator for electricity generation with the method of generating sparkle through instant short circuit of negative and positive poles. To avoid burning down the silicon diode and damaging electronic voltage regulator.

|. Prohibit any metal conductor closing to the positive wiring terminal of alternator randomly. Please shut the electronic lock when checking the two wiring terminals for fastening and stability.

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3.3 Starter motor

1. Structure of starter motor
   Starter motor is the matched component of diesel engine. It is mainly composed of electromagnetic switch, DC motor, fork and drive gear.



1. Electromagnet
2. Iron core
3. Fork
4. Movable disc
5. To motor coils
6. Contact 1 and contact 2
7. Connect to battery (+)
8. Push and pull coils
9. Connect to control wire
10. Holding coils

1. Precautions of starter operation
   1. After starting the engine, the starter motor should be stopped immediately, otherwise it will cause damage to the drive gear, DC motor burn, flame electromagnet damaged, and will seriously affect the battery capacity and life.
   2. Prohibits any metal conductor close to contacts and S terminals at random! Make sure the fuel pipe across the starter motor nearby and other metal objects can’t touch or have friction with contacts and terminal S after violent and vibrative running of the machine for a long time. Otherwise, fire will be caused.
   3. Please always check the wiring between contacts and S terminals are tight and reliable. Do disconnect the disconnect switch before the check. Otherwise, short circuit sparkles might generate to damage the wrench and wiring terminal.
3. FAQs of the starter motor

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Turn off power locks, the engine does not stall

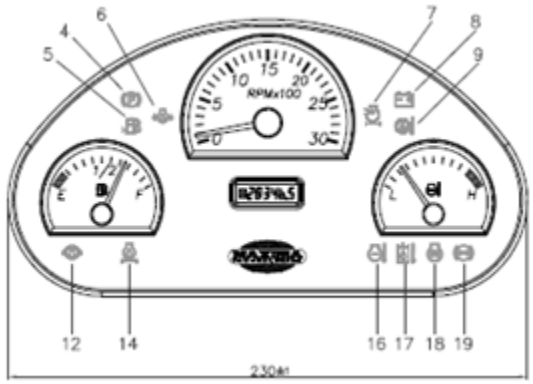
Fault features	Possible causes and treatment methods
After turn off the power lock, machine electrical load still has power (for example, when control lighting switch, lights are lit; steering the wiper switch, wiper works, etc.).	Contacts of the power relay sinter, replace the power relay.
	The power lock is damaged, replace it
	Alternator is damaged, and the generating voltage is much higher than 15V.

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3.4 Instruments and connector pin definitions (mechanical engine Weichai/Perkins)

Parameters

1. Rated voltage: 12VDC. Working voltage range: 9-16 V.
2. Working temperature: -40℃ -85℃ .
3. Storage temperature: -40$C ----



ID	LED INDICATORS NAME	COLOR	ID	LED INDICATORS NAME	COLOR
1	N/A	N/A	11	N/A	N/A
2	N/A	N/A	12	Transmission Oil Pressure	RED
3	N/A	N/A	13	Oil Filter Block Warnign	YELLOW
4	Parking Brake	RED	14	Engine Warning	YELLOW
5	LOW FUEL	YELLOW	15	Engine Stop	RED
6	Oil Pressure	RED	16	Coolant Temp	RED
7	Air Filter Warning	YELLOW	17	Hyd Oil Temperature	RED
8	Battery	RED	18	Pre-Heat	YELLOW
9	Trans Oil Temp	RED	19	Brake Pressure Low	RED
10	N/A	N/A			

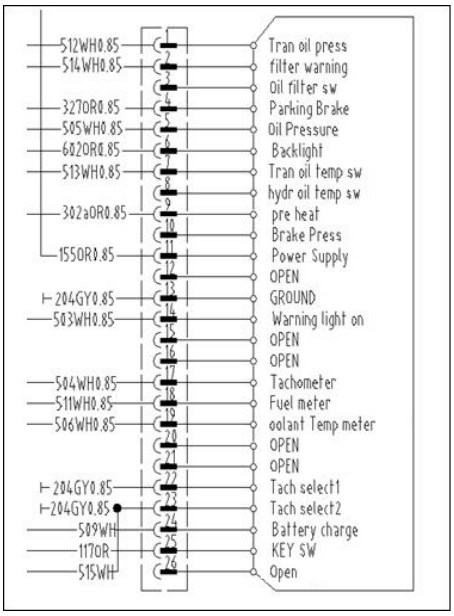
When the speed exceeds 300 rpm or instruments begin to detect the motor starts charging and oil pressure light is off, the timer will start working.

The output of the combination instrument is pin 14, and should drive an external bulb or relay, the other end should be earthed. Maximum output current of the instrument is 200mA. The combination instrument will have output only its power is turned on and meet at least one of the following six conditions.

- The engine is running and low engine oil pressure warning light is lit.
- Engine is in running condition and charging indicator is ON.
- Gearbox oil temperature warning light goes on.
- Gearbox oil pressure warning light goes on.
- High-temperature cooling water warning light goes on.
- Hydraulic oil temperature high warning light goes on.
- Low brake pressure warning light is lit.

Other cases, the instrument is not output.

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The instrument can be compatible three engines, for different engine speed ratio corresponding to different selection and a temperature sensor of the curve. Through two different pins combination options are as follows:

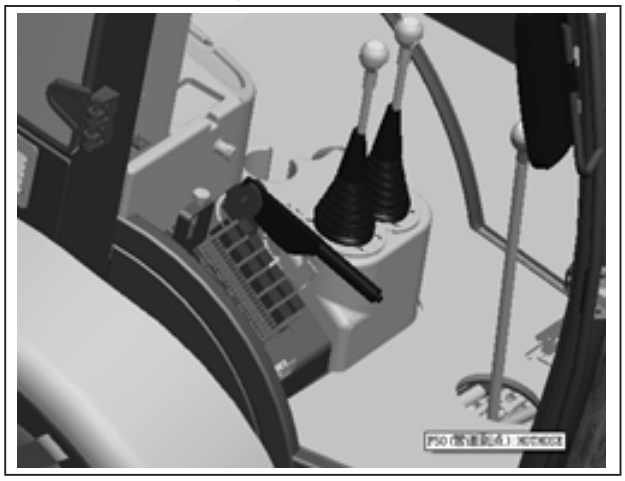
	PIN 22 OPEN 22	**PIN 22 GROUND 22**
PIN 23 OPEN 23 vacant	WeiChai engine	Cummins engine
PIN 23 GROUND 23	Perkins engine	YITUO engine

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3.5 Definitions of electrical centralized control box and connector pin

Parameters

1. The electrical centralized control box are provided by the manufacturers as a whole, the specific details are used for the guidance test and purchasing aftersales spare parts.

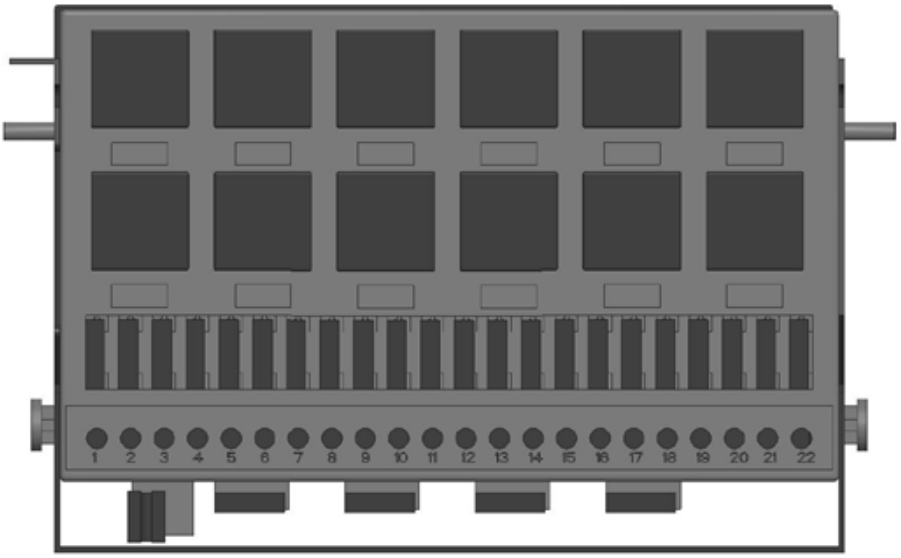


2. Rated voltage of all electrical appliance: 12 V
   Generally, our automotive electrical components provides power to the electrical devices after through fuses in the fuse box, mainly to protect the wires, when the wire is overheating, the fuse is burn-out before the wire sends out smoke, so as to protect the machine lines. Except cigarette lighter, dome light, emergency stop lights and the controller, the other machine electrical components are powered through the electric lock control.

   Fuse parameters: 5A-Orange; 7.5A-Brown; 10A-Red; 15A-Blue; 20A-Yellow; 30A-Green

   There is a small light next to the fuse, when the fuse is burned out, a small light next to the fuse will be lit, usually red lights. If the fuse is burned out, replace fuse piece in the same specification.

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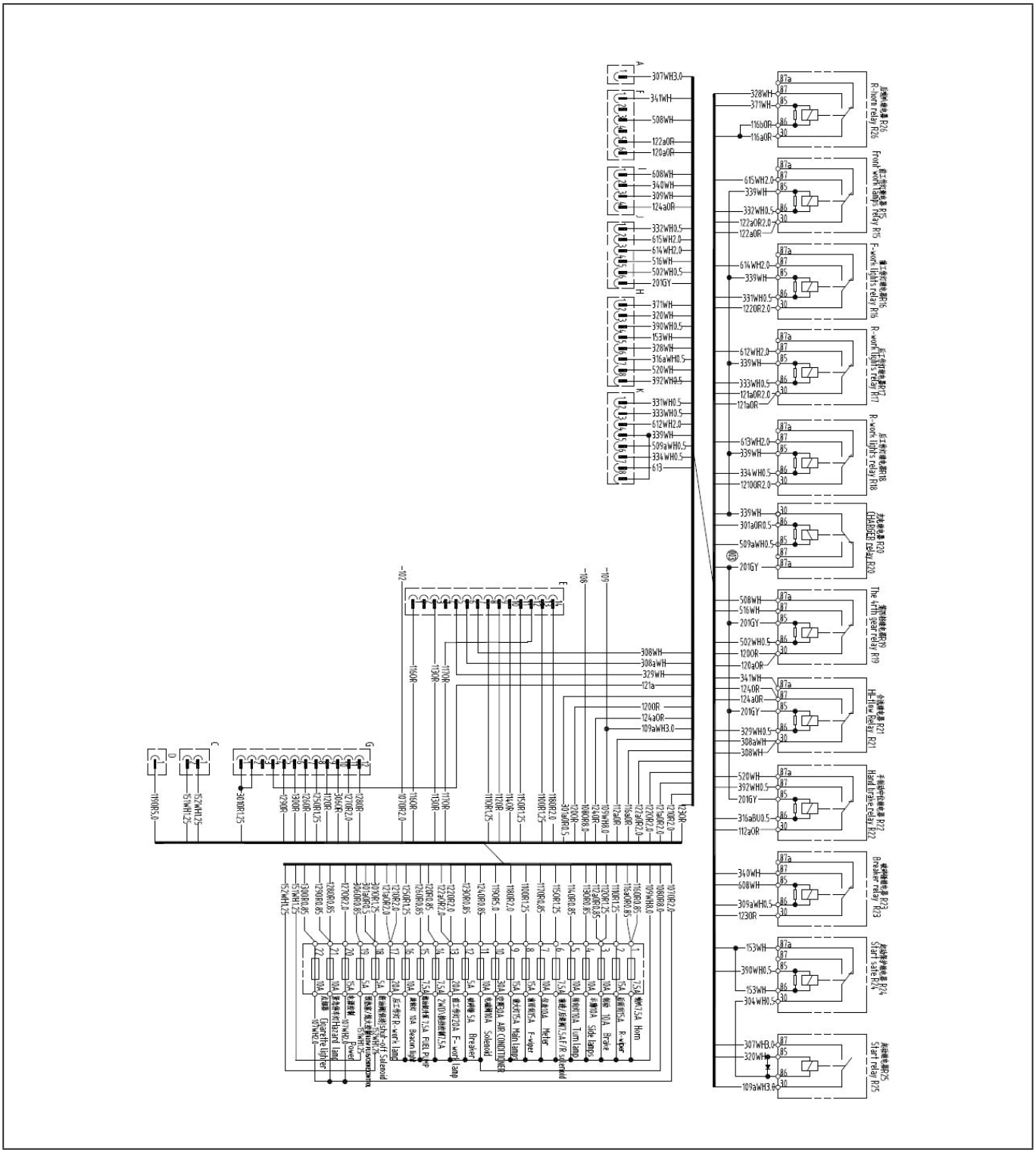
1 Holder 2 Rear work light relay 3 Charging relay 4 4th gear relay 5 Rear work light relay 6 Front work light relay 7 Front work light relay 8 Hydraulic hammer relay 9 Start protection relay 10 Start relay 11 Interflow relay 12 Manual brake neutral relay 13 Rear horn relay 14 Horn 15 Rear wiper 16 Brake 17 Clearance 18 Turn signal light 19 Forward/backward valve 20 Instrument 21 Front wiper 22 Front floodlight 23 A/C 24 Solenoid valve 25 Hydraulic hammer 26 Rear work light 27 Shift control 28 Fuel lift pump 29 Rotating light 30 Front work light 31 Oil cut-off valve 32 Preheating plug chock control 33 Power control 34 Emergency stop light 35 Cigarette lighter

Operation

The electrical centralized control box collects all fuses and most relays of the system except the primary fuse. When the disconnect switch is closed, the power supply line 107 supplies electricity. If the electric lock gear is in the ON position, the power supply lines 107, 108 and 109 supply electricity. Specific use will be described in detail in the following sections for specific functions.

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Wiring diagram



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Troubleshooting

1. The electrical centralized control box consists of a circuit board, relay and fuse.
2. If there are no quality problems when leave the factory, the circuit boards are generally not damaged;
3. The fuse end has fault indicators, if a fuse has failures, its corresponding indicator is lit, and the fuse needs to be replaced;
4. If it is judged to be the electrical centralized control box fault, the corresponding relays should be checked according to the circuit diagram of the function.

3.6 Definitions of the front alarm unit and the connector pin

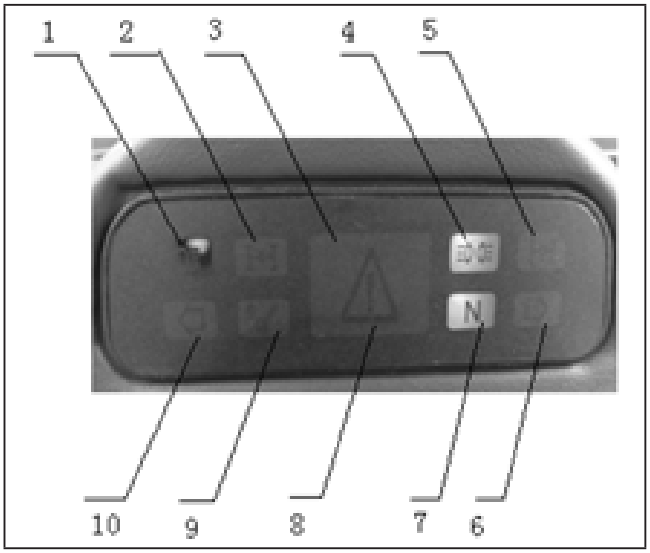
Parameters

Working ambient temperature (˚C): -30 ~ 65

Wiring method: DJ7021-2-21

Rated voltage: DC12V

Display method: LED indicator



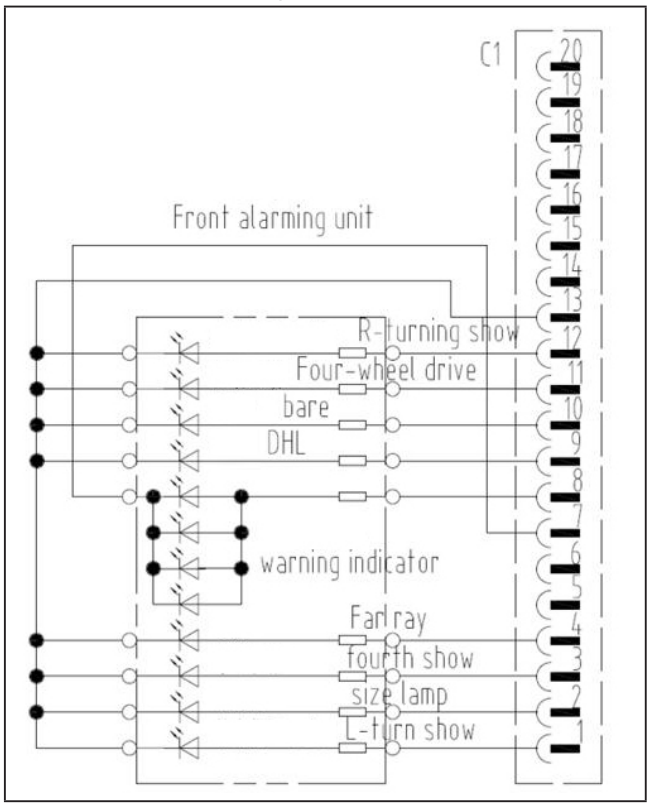
1. beam 2. differential lock 3. main light alarm 4. Clearance 5. 4WD 6. Right steering 7. Middle-position 8. fourth gear indicator 9. left steering

After starting the engine, if the side of the instrument has the following alarm signal, the first warning light goes on

1. Low engine oil pressure
2. Charging indicator light goes on
3. High shift oil temperature
4. Low shifting oil pressure
5. High cooling water temperature

Troubleshooting

1. Check the earthing wire is good.
2. Check the suspected fault indicator corresponding pins on the connector, whether there is voltage input. If so, LED inside the alarm unit may be damaged. If not, initially ruled out that the alarm unit may be failed. Check according to this function testing method.



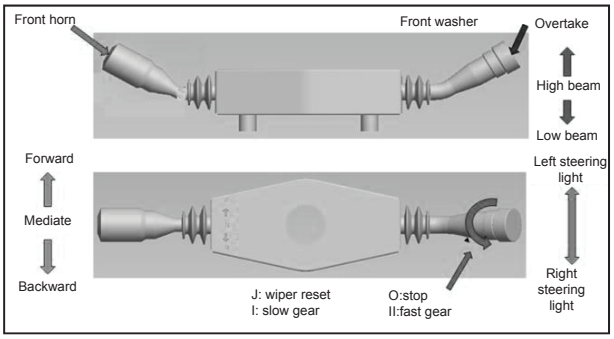
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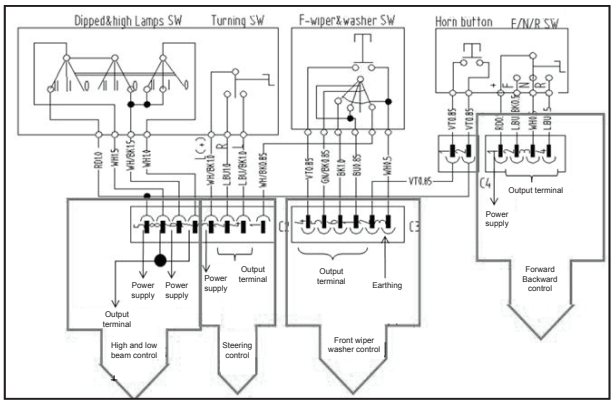
3.7 Combination switch (synchronous shift)

Operation

The combination switch is made up of left and right handles.

(1). Left handle button is for the front horn; left handle intermediate position is the neutral position, push forward means going ahead, the back dial is backward.
(2). Right handle pushing forward is the left turn signal light, rear dial is the right turn signal light;
(3). Press the right handle end, and the front washing switch;
(4). The right handle knob is the front wiper switch, 0 gear is closed, rotation forward I gear is the reset gear, the backward rotation J gear is the slow gear, backward rotation I gear is the fast gear.





(5). Right handle has three positions (upper, middle and lower) in the vertical direction, upper gear from self-resetting gear is back to the mid-gear. When the main light switch is turned off, the middle and lower gears are invalid, the upper gear is overtaking light, and the high beam light is lit. When the main light switch is closed, the mid-gear is the low beam, the lower gear is high beam, the upper gear is overtaking light, high and low beam lights both are lit.

Troubleshooting

Combination switch in the electrical system control multiple functions in later chapters for a single function of the failure analysis.

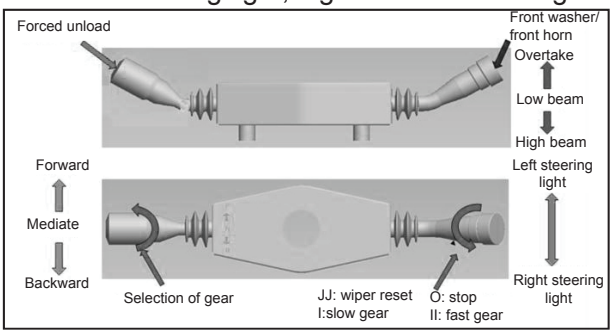
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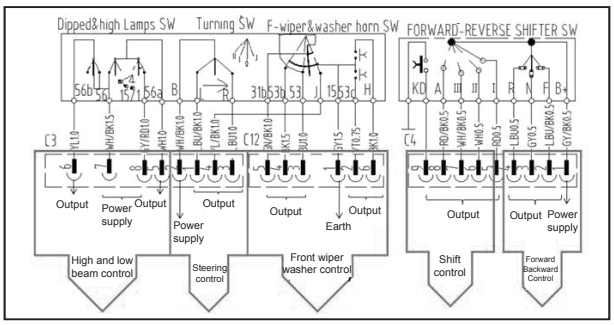
3.8 Combination switch (automatic shift)

Operation

The combination switch is made up of left and right handles.

(1). Press the end face of the left handle to force unloading; the middle of the left handle is in the middle position, pushing forward is moving forward, the rear dial is backward.
(2). The knob of the left handle is the shift selector switch;
(3). Right handle pushing forward is the left turn signal light, rear dial is the right turn signal light;
(4). Button on the right handle is for washing/front horn;
(5). The right handle knob is the front wiper switch, 0 gear is closed, rotation forward I gear is the reset gear, the backward rotation J gear is the slow gear, backward rotation I gear is the fast gear.
(6). Right handle has three positions (upper, middle and lower) in the vertical direction, the upper gear from self-resetting gear is back to the mid-gear. When the main light switch is turned off, the middle and lower gears are invalid, the upper gear is overtaking light, and the high beam light is lit. When the main light switch is closed, the mid-gear is the low beam, the lower gear is high beam, the upper gear is overtaking light, high and low beam lights both are lit.





Troubleshooting

Combination switch in the electrical system control multiple functions in later chapters for a single function of the failure analysis.

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3.9 Gearbox controller (automatic shift)

Parameters

1. Rated voltage: 12 V.
2. Rated load: 180 A.
3. Working temperature: -30℃ -80℃ .

Operation

This section briefly describes how to achieve established functions of the electronic controller:

1. Reading the input signal from the machine
2. Have the gearbox to work correctly
3. Read and send data through the CAN bus (optional) and the serial line (optional).
4. Protect gearbox gearbox from harm gearbox management (Gearbox management)
   The controller is used for signal gearbox management shown as follows:

   (1). By adjusting the pressure on the clutch to drive the proportional solenoid, so as to provide forward and backward functions.
   (2). By adjusting the pressure on the clutch to drive the proportional solenoid, so as to provide the first and second gear function.
   (3). By appropriate adjustment of the pressure on the clutch to drive the proportional solenoid and the digital control valve, in order to provide the third and fourth gear function.
   (4). Understand the operator's intention: start machine, shift, and so on.
   (5). Realize automatic shift function in case of need.
   (6). Calculate the machine speed and the output of the drive shaft by the frequency signals measured by the speed sensor.

Forward/backward management

Pins 18 and 46 are directly connected to the gear control handle, forward and backward signals are detected by these two pins. If when the engine starts, the gear control handle is not placed in the neutral position, then hanging any gear is invalid for the consideration of safety. When the gear control handle is placed back in the neutral place, and then put to the forward or reverse gear, the gear engagement will be effective.

The gear control handle is put in the F position, the machine is in forward condition; put in the R position, the machine will be in reversing condition.

Gear control handle position	FWD(18)	RVS(46)
Forward gear	ON (12V)	OFF (0V)
Neutral gear	OFF (0V)	OFF (0V)
Reverse gear	OFF (0V)	ON (12V)
Undefined	ON (12V)	ON (12V)

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Shift selector position logic

1st: manual mode, 1st gear meshing (if the speed is same as that of 1st gear)

2nd: manual mode, 2nd gear meshing (if the speed is same as that of 2nd gear)

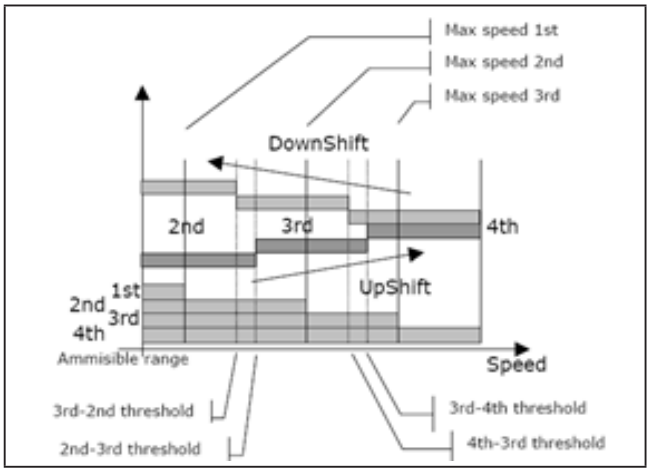
3rd: manual mode, 3rd gear meshing (if the speed is same as that of 3rd gear)

4th: auto mode.

Shifter position	Order 1 (19)	Order 2 (47)
1st gear	ON(12V)	OFF(0V)
2nd gear	OFF(0V)	OFF(0V)
3rd gear	OFF(0V)	ON(12V)
4th gear	ON(12V)	ON(12V)

Gear control signal command 1 and gear control signal 2, use the position of the gear control handle to detect the electric signal, the logic relationship is as follows:

Manual mode: when the operator selects 1st, 2nd and 3rd gear, the system works in manual mode, and meshes corresponding gears. Before completing the shift, the system will detect the current speed is suitable shift: If the current speed is greater than a set value (see the Fig. “Maximum Speed”). Therefore, only until the speed is consistent with the setting value, shift operation can be performed (see downshift speed protection).



Auto mode: automatic mode will be effective when in the 4th gear; manual selection of 4th gear can not be achieved. Generally, when the machine is stationary, the 2nd gear is engaged.

Downshift speed protection

In order to shift to the lower gear to protect the gearbox when the machine is in high speed, the downshift speed protection parameters are as follows:

from	to	kmph
2nd gear	3rd gear	7.6

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from	to	kmph
3rd gear	4th gear	17
4th gear	3rd gear	12.7
3rd gear	2nd gear	6.2

Higher gears inhibition

In some cases, ECU setting 3rd and 4th is invalid.

Gears	Maximum speed (kmph)
3rd gear	26.5
2nd gear	10.2
1st gear	8.3

(1). When move backwards, the automatic mode 4th gear is invalid.
(2). When using the crab-shaped steering, the 3rd and 4th gears are invalid.
(3). When using the round steering, the 4th gear is invalid.

Kickdown

Forced low button operation is as follows:
(1). Continuous shift from the 2nd into the 1st gear; and then shift from the 1st into the 2nd gear.
(2). When hanging the 2nd gear, the machine speed can be less than 8.5kph.
(3). Without considering gear control handle's position (forward, backward, or neutral)
(4). The shift (to the 1st, 2nd, 3rd or automatic gear), the forced downshift is invalid.
(5). In the automatic gear, if the 1st gear is engaged, when the speed is faster than 5.5kph, the forced downshift is to be canceled.
(6). When forced downshift switch handle is pulled up, a toggle switch is switched from turn-off to close.
(7). Whether to activate the speed limit is programmed to control.

Declutch

(1). When power cut-off switch is activated, the gearbox of the main clutch is disconnected.
(2). When the power cut-off switch is in a non-active state, adjust the clutch according to the handle operation command, and then adjust the power output.
(3). When the toggle switch is turned off, the power cut-off switch is active.

Hydraulic differential lock

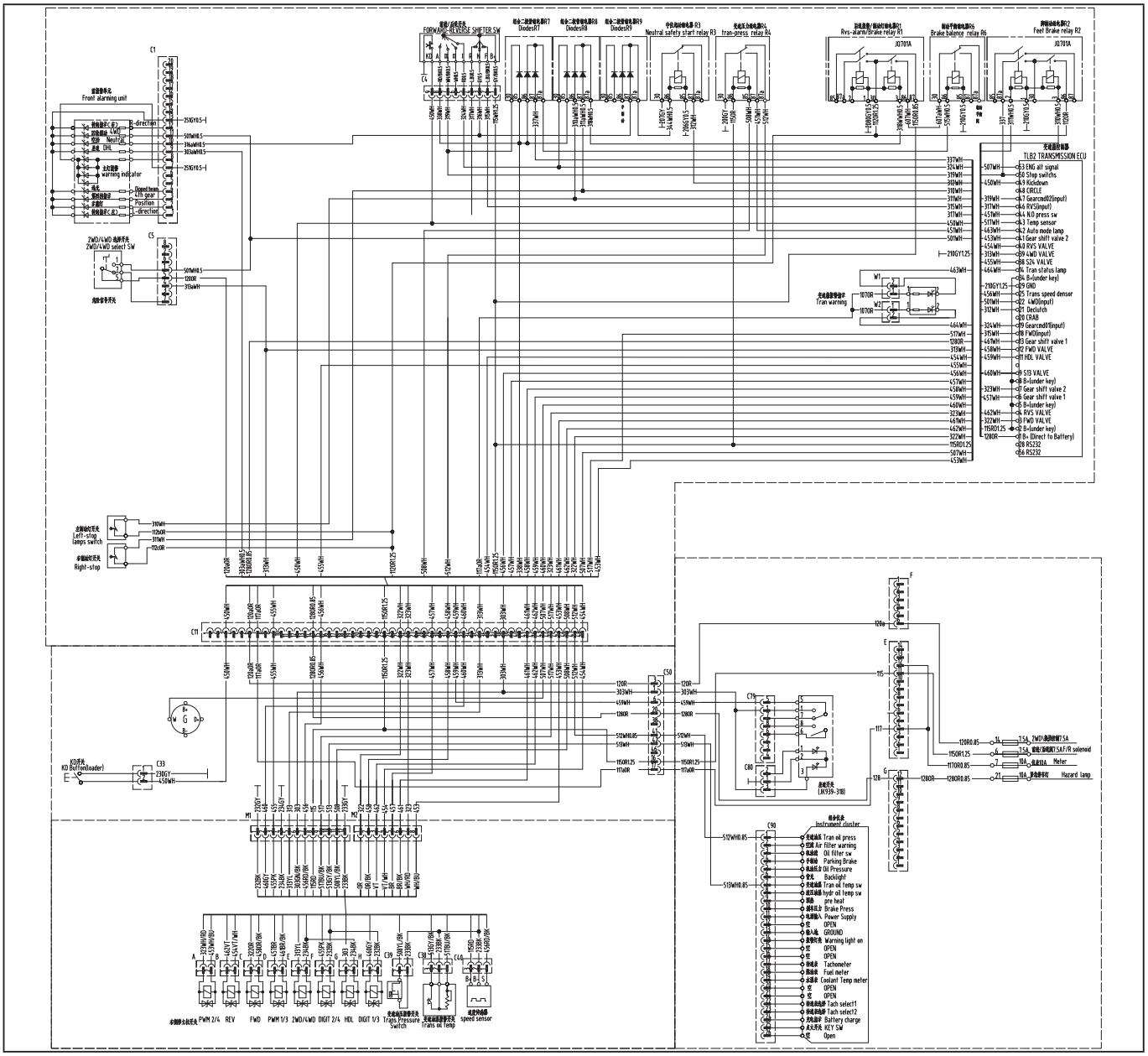
(1). Power supply output is connected to the valve through a switch.
(2). 1st or 2nd gear meshing output the enable signal (+12 V).

Four wheel drive

(1). When the 4 WD valve is in the de-energized state, the 4 WD is activated.
(2). When the operator closes the switch, or depress the brakes (brakes on both sides) when in the 3rd or 4th gear, when the gearbox is in 4 WD state. This is a safety protection.

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Wiring diagram



Troubleshooting

Fault: problems in the circuit or wiring caused by poor contact, insulation damage, earthing, or short. When the sensor is damaged or bad contact, it will generate a fault.

| Warning: when working in an abnormal gearbox conditions, that is, gearbox oil temperature is too high, wrong operation, and so on.

| When a fault or a warning is generated, in order to protect the safety of the operator, this event will be processed by the controller, but will allow the machine to travel as much as possible (lame home mode). If a failure occurred Is very dangerous, in order to protect the gearbox, the controller will cut off all the power output (in the neutral position).

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Troubleshooting methods:

Neutral position: All controller outputs are cut off and the machine and gearbox can not be driven

Lame home mode 1: You can select forward and back, but can not adjust; allow only 1st gear

Lame home mode 2: you can select forward and back, but can not adjust; allow only 2nd gear

Error/fault code is a numeric code (called DTC, Diagnostic Trouble Code), the code is composed of two digits (in addition to 2, no error): The first number is shown as a long pulse, the second number is a short pulse. That is, if you see four long and two short flashes, then this error code is 42, the current highest priority code will continue to flash.

Handling method

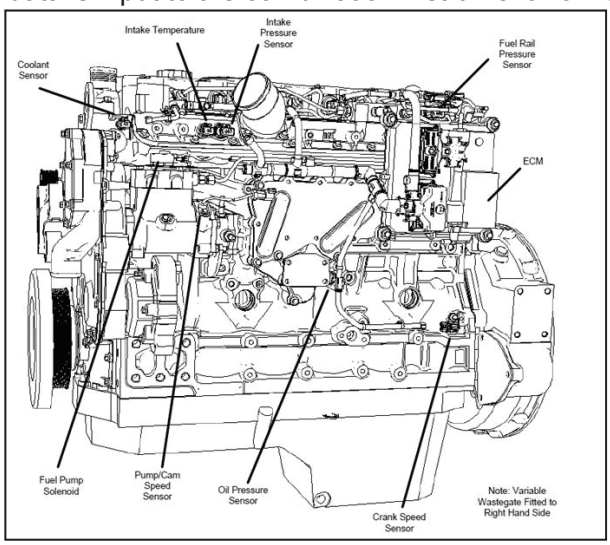
1. Gearbox function is failure, check the fuse; check contacts of the gearbox controller connector are good;
2. Gearbox of a functional failure or working conditions do not meet the operational logic, the display switches from a fault at the fault code read by the action items in the fault code table to determine the failure mode, according to the failure mode, determine the point of failure in the wiring diagrams to troubleshoot.

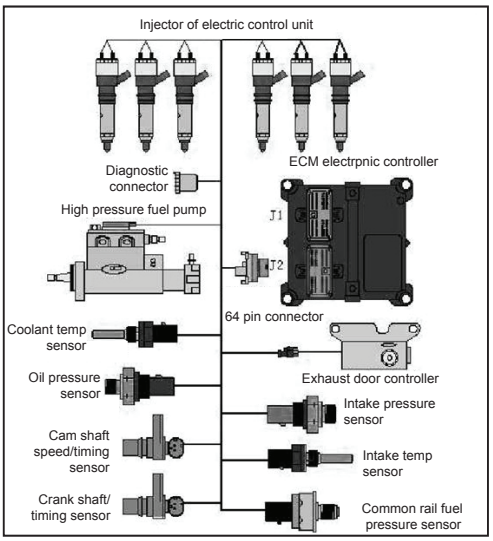
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3.10 Engine ECU (three phase electronic control engine)

Parameters:

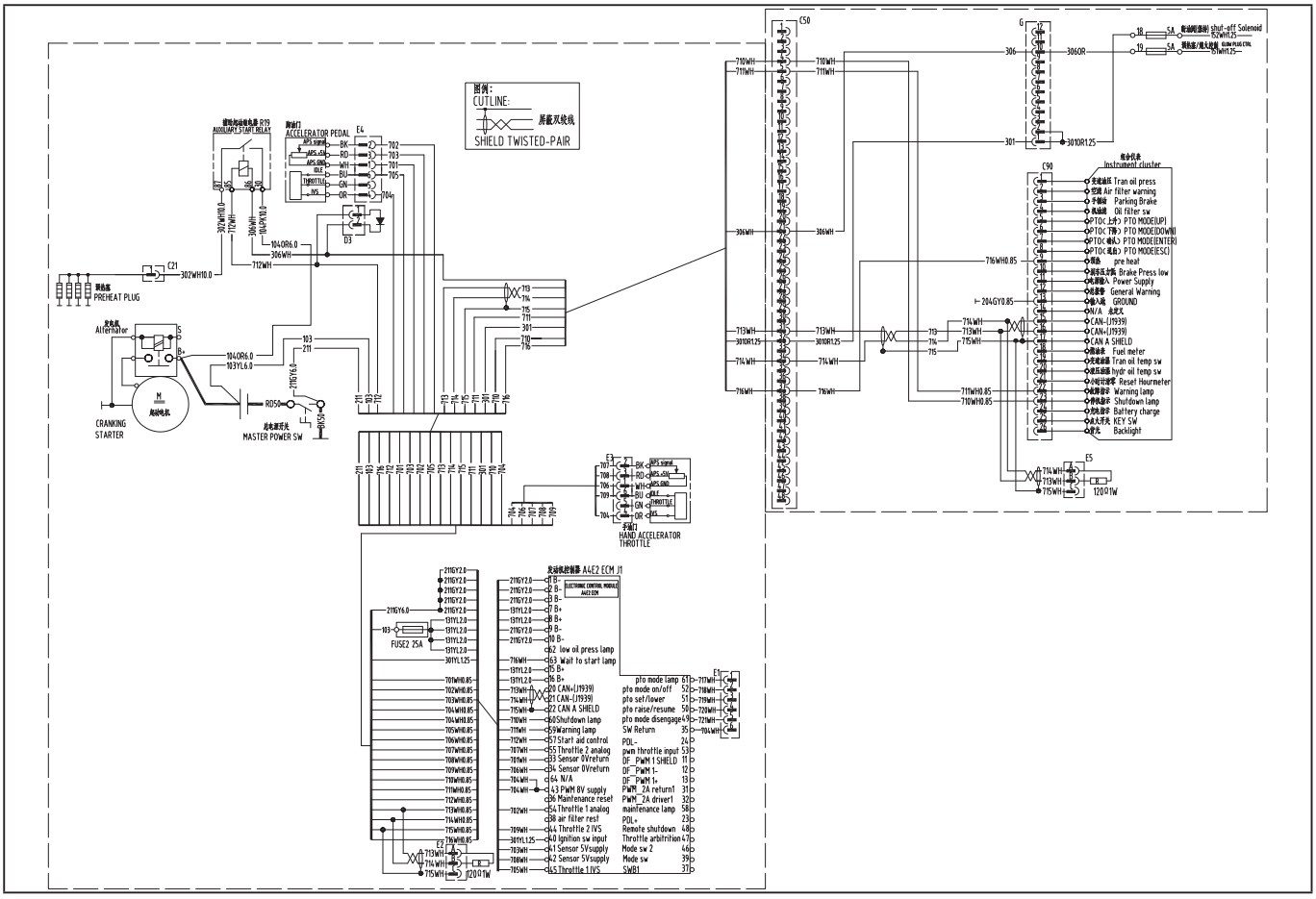
1. Electronic control engine adopts its matched electronic control hand and feet throttle;
2. Sensors for oil pressure, coolant temperature and speed signal are provided together with the engine, the read data is input to the combination instrument from the CAN bus.





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Wiring diagram



Troubleshooting

1. Check the engine ECU power supply and earth are valid;
2. Check the CAN communication lines from ECU to the combination instrument and shielded wire are valid;
3. Read the fault code on the combination instrument to determine the failure mode;
4. Refer to circuit diagram according to the fault mode, determine whether it is the external line fault or engine electrical control system failure;
5. After confirm it is the engine electrical system failure, contact the Perkins service personnel.

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3.11 Starting and running fault

3.11.1 Battery

Parameters

20 hours rate capacity (Ah): 100; (It indicates total capacity obtained from the battery, the value is the released electricity, in A/H unit at 20 hours, below 27℃ .)

Low temperature start current (CCA): 750; (It indicates starting power which the battery can supply the engine in the low temperature; i.e. the value is what the battery is discharged at -18℃ for 30s, A number that can be released when the battery terminal voltage is 7.2V.);

RC: 180; (It indicates at night or in bad weather, when the charging system is fail, the battery can provide machine load to work for the minimum time. The value is the time to reach the terminal voltage 10.5V when discharging in 25A current at 27℃ , in min unit);

Terminal voltage: 12 V;

End column shape: conical.





Safety operation

Sequence of connecting battery wiring: first connect the positive terminal of battery, then connect the negative terminal.

Sequence of disconnecting battery wiring: first disconnect the negative terminal of battery, then disconnect the positive terminal.

When the battery positive and negative electrode poles at both ends are accidentally shorted by metal conductors (such as: metal tools, metal wires, metal parts, etc.), namely the battery occurs external short circuit, it will cause the arc to melt poles, and cause the molten lead alloy to splash, generate a lot of heat in the severe condition and cause burning.

Drop or overcharge the battery, it will cause the housing rupture, sulfuric acid may be an outflow from the rupture or spill.

During the battery charging and testing process, a mixture of oxygen and hydrogen is discharged from the discharge hole. If the concentration of hydrogen in the environment is more than 4%, it will explode if encountered fire, sparks or heat.

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Fault judgment of battery

Visual inspection of hydroinstrument condition

If one density instrument installed into the battery is designed on the battery, the density instrument top has a color point in the top of the battery, in the event that there are unexplained battery failure or starting problems, visual test the hydroinstrument condition, you may know that the battery current state of charge and measures to be taken. (Note: Due to hydroinstrument can only reflect the state of a single cell, sometimes it needs comprehensive judgments combining with the open circuit voltage)

Color	Green	Black	Bright color (white)
Charging status	Charge larger than 65%	Charge smaller than 65%	Electrolyte level is too low
Measure	Load test	Charge the battery, then do the load test	The battery should be replaced

Inspection items	Cause	Handling method	Remarks
Voltage	Above 12.5 V, hydroinstrument is green	Normal	Load test
	Between 11-12.4 V, hydroinstrument is black	Undercharge	Charging
	About 10.5 V or less	1.Overdischarge (hydrometers are black)	Charging
		2.Short circuit (most hydrometers are green)	Replacement
		3.Open circuit (most hydroinstrument are green)	Replacement
Load test	Green zone	Normal	-
	Yellow zone	Undercharge	Charging
	Red zone	Undercharge	Charging
		Short circuit or open circuit	Replacement

Maintenance

If terminal is contaminated, wash it with hot water and coated with an appropriate amount of Vaseline (or butter).

Electrolyte is acidic, avoid clothes and skin being stained, do not splash it into human’s eye. If the event occurs, wash with water and immediately seek medical attention.

Check the connecting cable of battery post terminal frequently and do keep the cable connector contacting with the terminal tightly.

The negative wiring of battery should be disconnected if the machine is stored for 15 days or above.

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3.11.2 Disconnect switch

Parameters

Stud thread size: M10

Current continued through the contacts≤ 200A momentary (5S) current: 1200A



Operation

Battery disconnect switch is operated via a switch handle. This switch handle can be turned to the following two locations.

O - disconnect switch is in the OFF state, the machine electrical system is cut off.

I - disconnect switch is in the ON state, the machine electrical system is powered on.

Note: before using the engine start switch device, you must turn the disconnect switch handle clockwise to the ON state.

Negative battery switches and their settings



On position

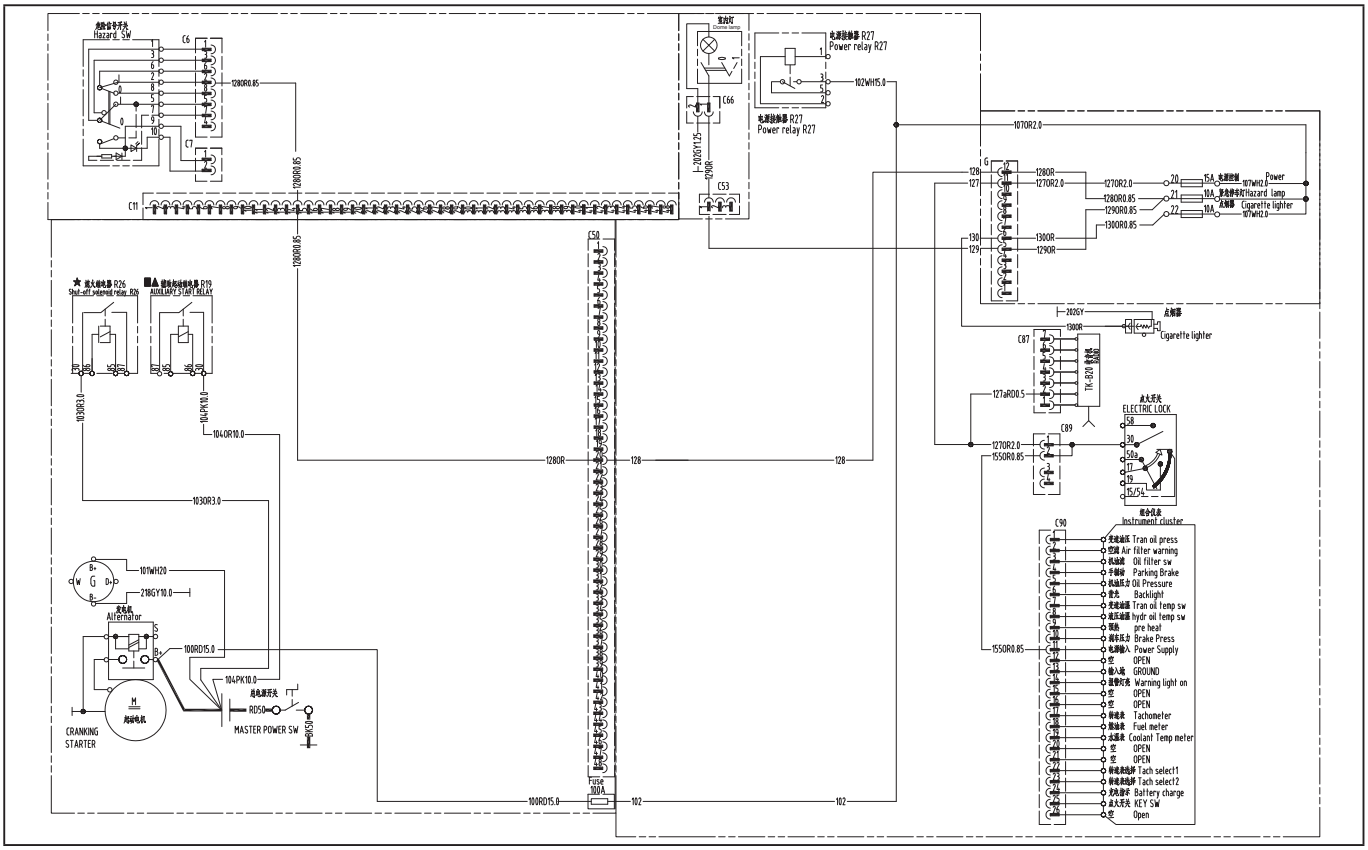


Off position



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Wiring diagram



Troubleshooting

1. When the battery disconnect switch is in the ON position, the starter or the ignition switch should work properly.
2. If all circuits are not energized, the primary fuse has no fault, check 12V DC voltage of two terminals of the battery negative poles.
3. If the output terminal is 0V when the switch is turned on and off, then the switch is faulty and should be replaced.
4. If the disconnect switch input terminal of the battery has no 12V DC voltage, and then check the battery connections.
5. If the battery connections are good, check the battery voltage. Failed battery voltage measured is less than 12 V, the battery should be replaced or repaired.

3.11.3 Fuel lift pump (Perkins)

Position

Fuel lift pump is built with the Perkins engine.

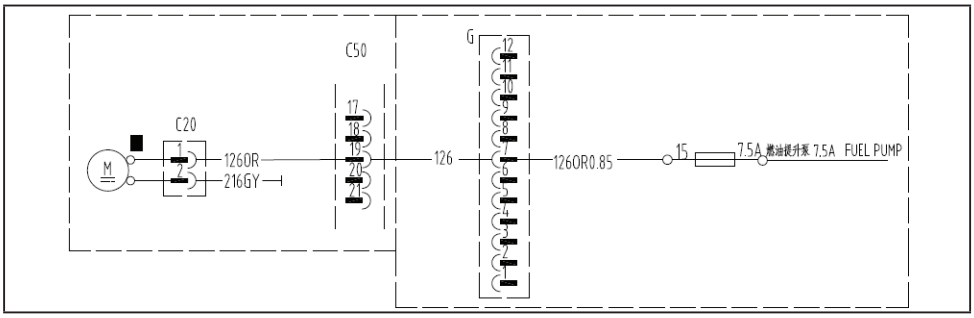
Operation

When the electric lock is in ON position, the fuel lift pump power is turned on, begins to work, there is a slight vibration sound during work.

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Troubleshooting

1. When the electric lock is in ON position, the fuel lift pump is not working, or a fuel lift pump stops working when the machine is running, causing the machine to be stalled due to lack of fuel, first rule out the fuse failures.
2. Detect the 2nd pin of the connector C20 is good.



3. Detect 1 pin of fuel lift pump connector C20 is in 12V voltage, if not, it may be open circuit, poor contact and other problems in the wiring. If so, it may be the fuel lift pump failure.

3.11.4 Oil cut-off valve

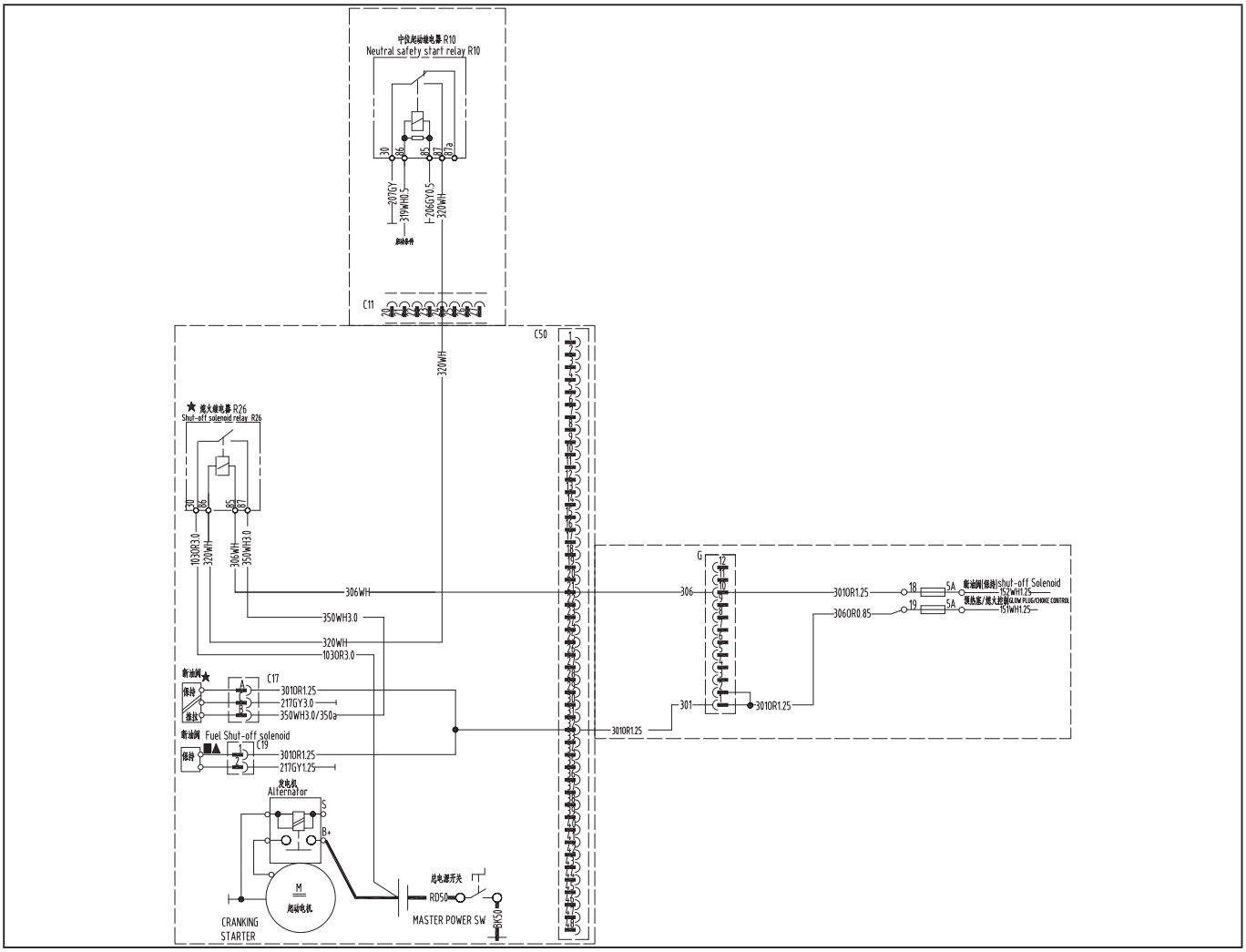
Operation

In the existing models, there are two types of oil cut-off valve.

1. Weichai. Switch the electric lock to the ON gear, turn-off electromagnet holds coils to be energized. When ignition, push and pull coil to get power, and then push the electromagnet to the pull gear; after normally starting, the electric lock is back to the 0N gear, push and pull coil to cut off power, the electromagnet maintains in the suction gear location. If the electric lock is closed, maintain the coil to be cut-off powered, the solenoid is back to its original position.
2. Perkins. If the electric lock is switched to the ON gear, turn off solenoid maintains coil energized until the electric lock is off.

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Wiring diagram



Troubleshooting

Weichai

1. Electric lock ignition, if flameout solenoid does not pull, detecting whether C17 pin B has 12V voltage, if no, check the flameout relay is energized. If you do not pull, it is judged that the mediate relay does not pull, so 320 is not grounded, may not satisfy the starting conditions; if the pull, then check 320 on the line for open circuit.
2. Electric ignition lock, if the flameout solenoid can be pulled and pushed, but can not hold, test C17 pin A to detect whether it has voltage of 12V. If not, check the cut-off valve maintaining fuse, and detect whether there is disconnection in the circuit 301 after excluding safety fault.
3. When the electric lock ignites, if A and B of C17 are normal, C is earthed effectively, and then check flameout solenoid mounting angle and rod length is reasonable.

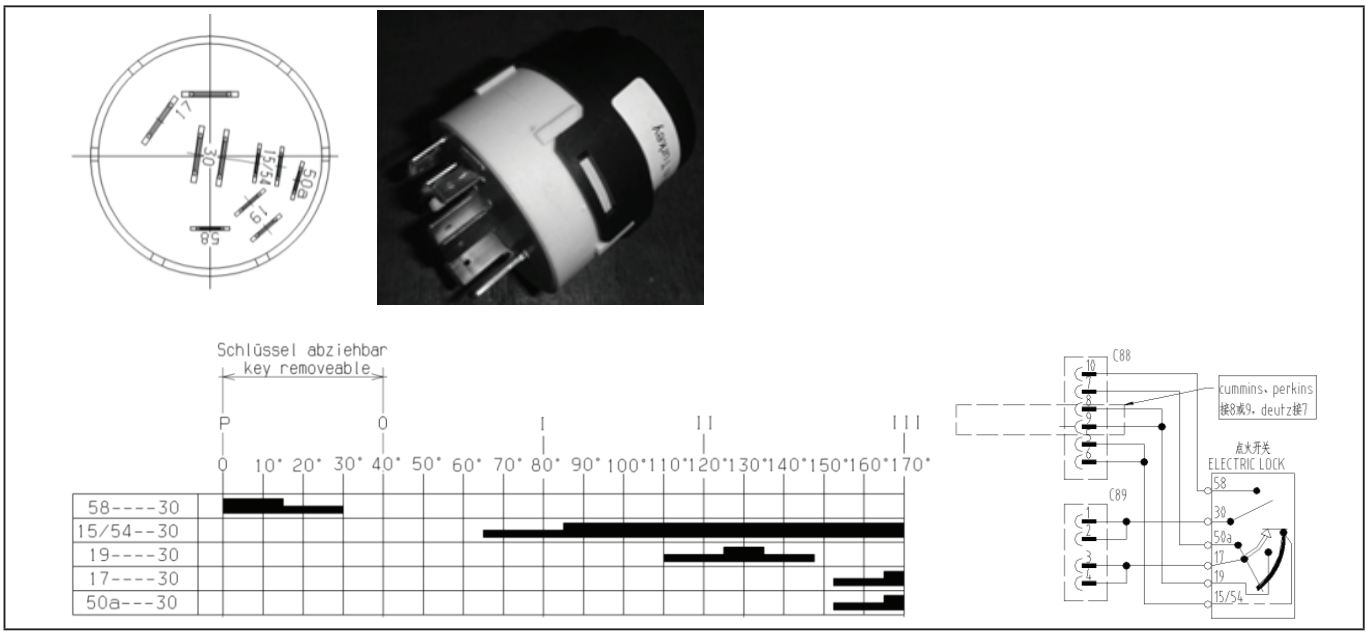
Perkins

1. When the electric lock is in the ON gear, detect the 1st pin of C19 has 12V voltage, if not, check the cut-off oil valve maintaining fuse, detect whether there is disconnection present in the circuit 301 after excluding the fuse fault. If so, test whether earthing of the 2nd pin is valid. If the voltage and earthing both are normal, it might be cut-off oil valve failure.

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3.11.5 Ignition switch (electric lock)

Parameters

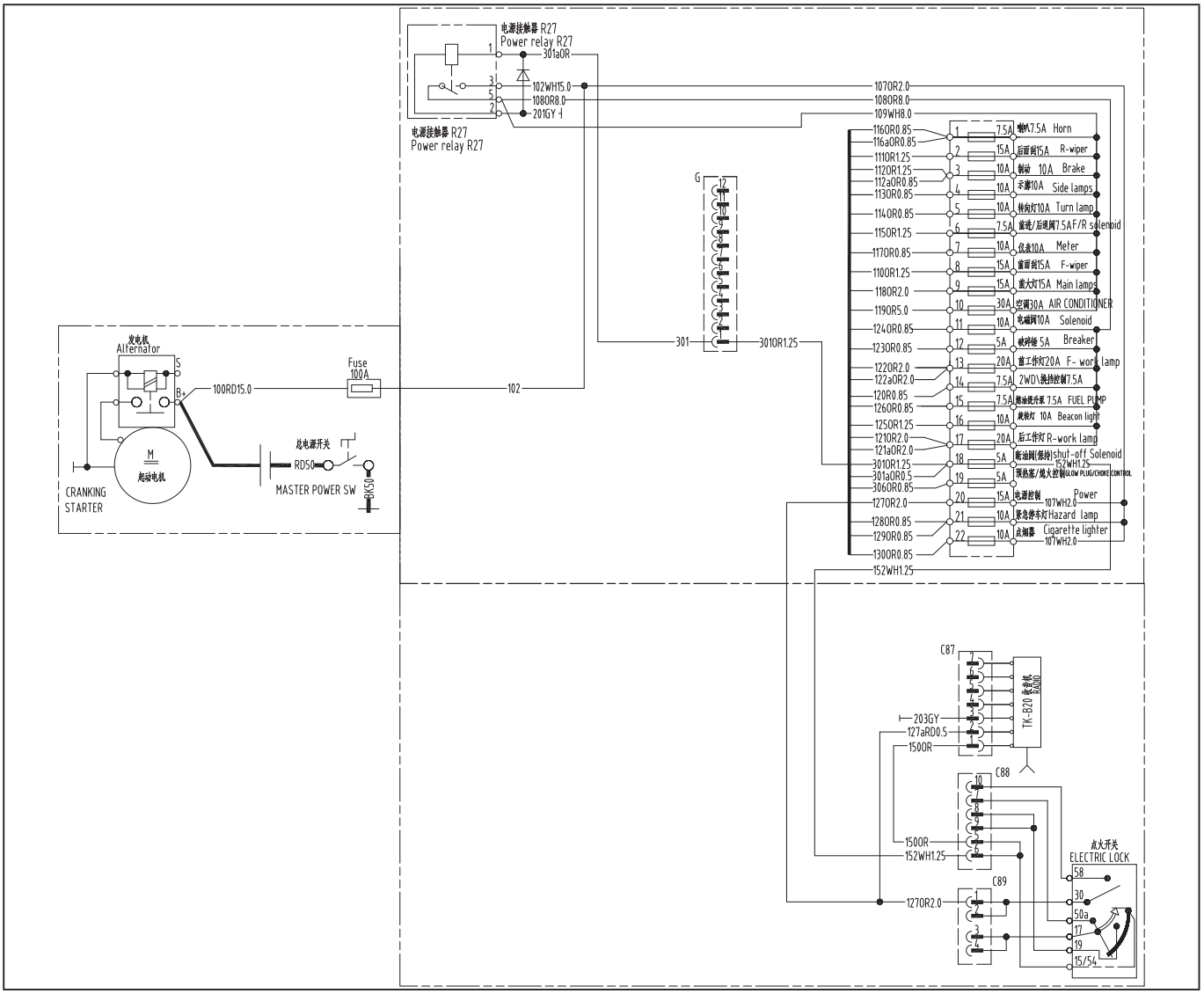


Operation

1. Insert the ignition switch key and turn to the OFF position. In this gear, the machine's electrical equipment is only dome light, the hazard warning lights and cigarette lighter can be used, other electrical equipment have no power.
2. 1st gear is vacant.
3. Turn the starter switch key clockwise to the II gear position, the switch will remain in this gear after let it go, the following electrical equipment is energized and working normally.
4. Turn the starter switch key clockwise to the III gear position, the switch will spring back II gear position under the spring pressure after let it go. In the III gear location, the following electrical equipment is energized besides electrical equipment energized in the II gear location.

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Wiring diagram



Troubleshooting

Measure the conduction condition between the terminals in all positions of the starter switch with a multimeter(for more information see chapter test with a multimeter), and record the conduction test. Compare recorded values with expected ones, which are shown as below. The pained black portion in the table indicates that the terminals are conductive.

If the following situations occur, replace the starter switch:

1. The obtained parameters by measuring the start switch do not match exactly those in the above table.
2. Reset function of the starter switch spring is fail.
3. Start switch key may be inserted or removed in any position, not only in the OFF position.
   Check the starter switch connection

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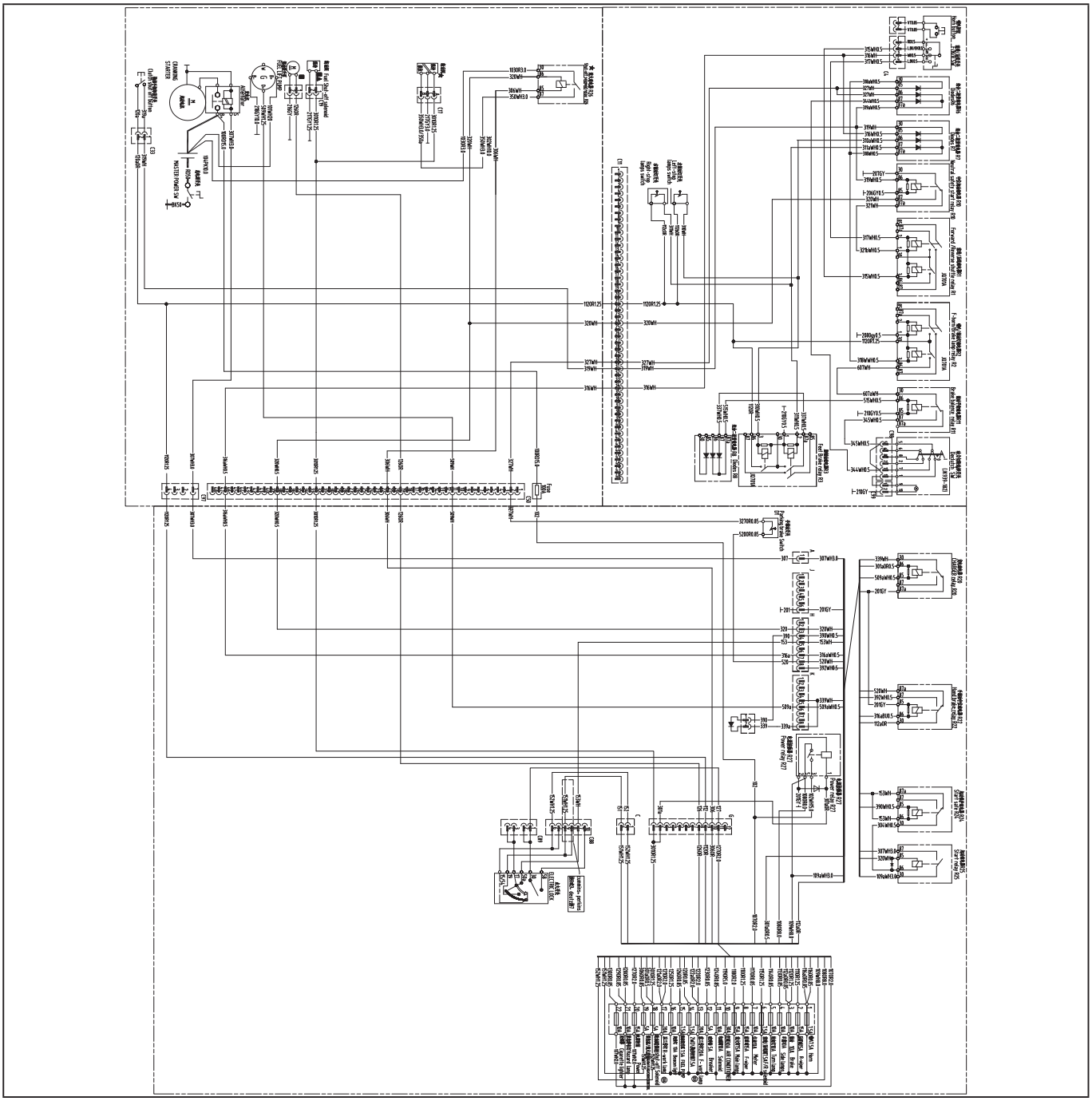
3.11.6 IGN start signal

Operation

1. Meet the starting conditions (cut off the power of the foot brake and hand brake, the handle neutral position, shift handle unloading)
2. The alternator does not work before starting, the charging relay is pulled in, and the starter protection relay does not pull in. When the electric lock is turned to the ignition gear, the power supply is connected with the electric lock by fuses. The starter protective relay contacts supply power to the relay coil, the starter relays are pulled together, the starter motor S terminal is energized, the starter motor begins to work.
3. When the electric lock is in ON gear, the flameout solenoid keep coil being energized, until the electric lock is turned off. When the electric lock is switched to the ignition gear, the sliding end of the flameout solenoid is energized, the plunger is pushed to the suction position, pulled by the holding coil.
4. After the alternator starts working, the charging relay is cut off. The starting protection relay is pulled, starter relay is disconnected, and the starter motor stops to work, play a protective effect. The Electric lock is back from the ignition position to the ON gear, when back to the ignition gear, the starting relay can’t be pulled because of the starting protective relay is pulled, and the starter motor will not work.

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Wiring diagram



Troubleshooting

1. Check whether voltage meets the starting conditions (< 12.5V);
2. The machine does not start, check whether it meets the starting conditions, if met, check whether the neutral starter relay is pulled, starter relay coil is earthed through the neutral starter relay; if not, eliminate faults in the wiring.

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3. When starting, check the starter relay is pulled, if not pull, check the wire (from the power supply to the fuse by the electric lock to the start protective relay contacts in the fuse box) is faulty;
4. Check the charge relay is pulled, the starter protective relay coil is grounded not passing the charging relay contacts. If the charging relay is pulled, then check the alternator D + terminal is normal;
5. During the ignition, if starter relay of the starter motor is pulled, it can not be started, check the flameout solenoid (Weichai)/cut-off valve (Perkins) is faulty.

3.11.7 Forward and backward/backward alarm (synchronization shift)

Parameters

Voltage range: DC12V-33V

Current: ≤0.5A

Polarity: positive and negative polarity protection

Sound level: when in DC24V, the maximum sound is 110 ± 10dB (A)

Interval: 0.9Sec

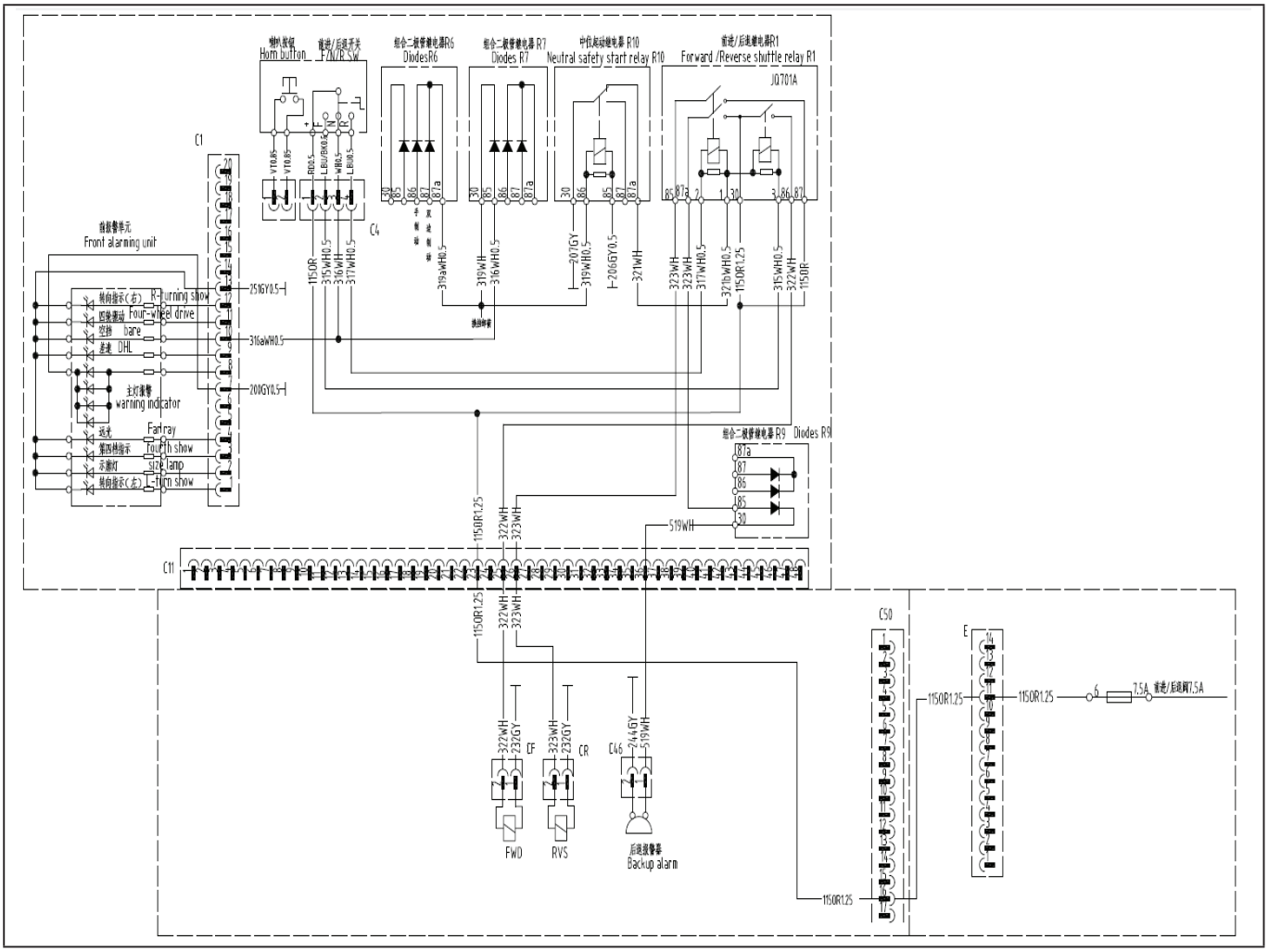
Quota of work: continuous operating frequency 1K ± 2% K

Operation

1. After starting the machine, determine besides the forward and backward handles are in the neutral position, the other starting conditions are not met, the power supply is via fuse box fuse 6, provide power to the front alarm unit neutral indicator light by the handle.
2. In the electric lock in the ON gear, push forward the left handle of the combination switch to the forward gear, the power is supplied to the forward/backward relay coils via the fuse box fuse 6 and through the handle switch, the forward/backward relays are pulled, the power is supplied to the forward valve through relay contacts.
3. If the electric lock in the ON position, push backward the left handle of the combination switch to the reverse gear, the power is supplied to the forward/backward relay coils via the fuse 6 in the fuse box and through the handle switch, then forward/backward relay sucks close thus to supply power to forward valve and back-up alarm through relay contacts.

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Wiring diagram



Troubleshooting

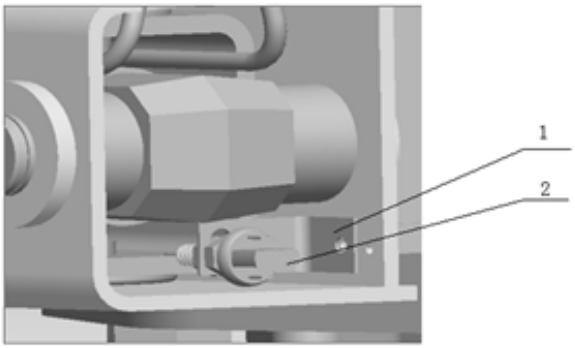
1. If the machine is started, unable to move forward and backward, check the fuse; moreover check whether the neutral relay is pulled. If pulled, check whether the following switches are closed: the hand brake switch, shift handle unloading switch, foot brake switch, outrigger alarm switch. Check the forward/ backward relay connector terminals for poor contact. Check the voltage between the fuse box to the relay wiring, and determine whether there is an open failure.
2. If the machine is started, unable to move forward or backward, examine the handle and the forward /back relay, and then use the multimeterto determine points of failure according to the gear condition and circuit diagrams.
3. If the above are all have no problems, check the solenoid valve connectors are faulty. After exclusion of all faults and in the openness of the electric lock, switch the forward and backward gears, forward and backward valves have actions, then check the hydraulic system.

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3.11.8 Outrigger alarm (optional)

Parameters

Brake light switch assembly is a mechanical constant-off switch, in the normal state, the extension rod is in the extended state, and the switch is in the closed mode. After the extension rod is compressed 3 ~ 5mm, the switch is in the off mode, the disconnected mode extension rod stroke has 3 ~ 5mm.



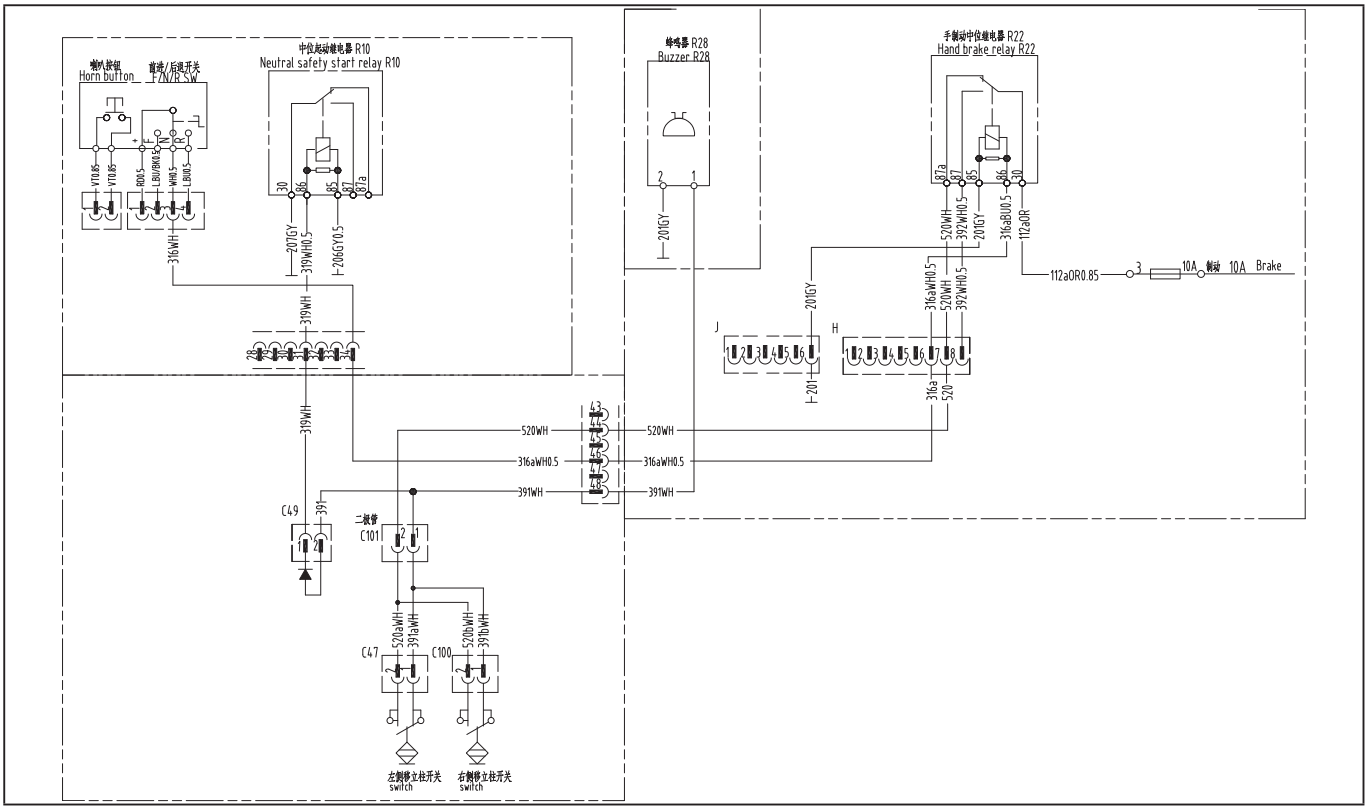
1. plate 2. brake switch

Operation

1. After passing No.3 fuse in the fuse box, the power supply is supplied to the neutral starting relay coils of the steering machine, after passing contacts of hand brake neutral relay R22 and outrigger alarm switch.
2. After the machine starts and exclusion of other starting conditions, if the left and right outriggers are not closed, then the outrigger alarm switch is in the closed state, the neutral starter relay coil is energized, and the neutral starter relay is closed, earthing of the forward/backward relay coil is disconnected, the crane can not move forward and backward. The buzzer alarms until the outriggers recover in place, forward/backward limits and alarm is released.

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Wiring diagram



Troubleshooting

1. If the outrigger alarm function fails, check the fuse box on the No.12 fuse; use a multimeterdetection function to detect on-off between the two terminals, and judge whether the brake light switch is failure; use a multimeterto check whether there are fails in the wiring according to the circuit diagram.
2. If the outrigger alarm persists, check the installation status of the outrigger alarm switch, whether it can not be compressed to disconnect.

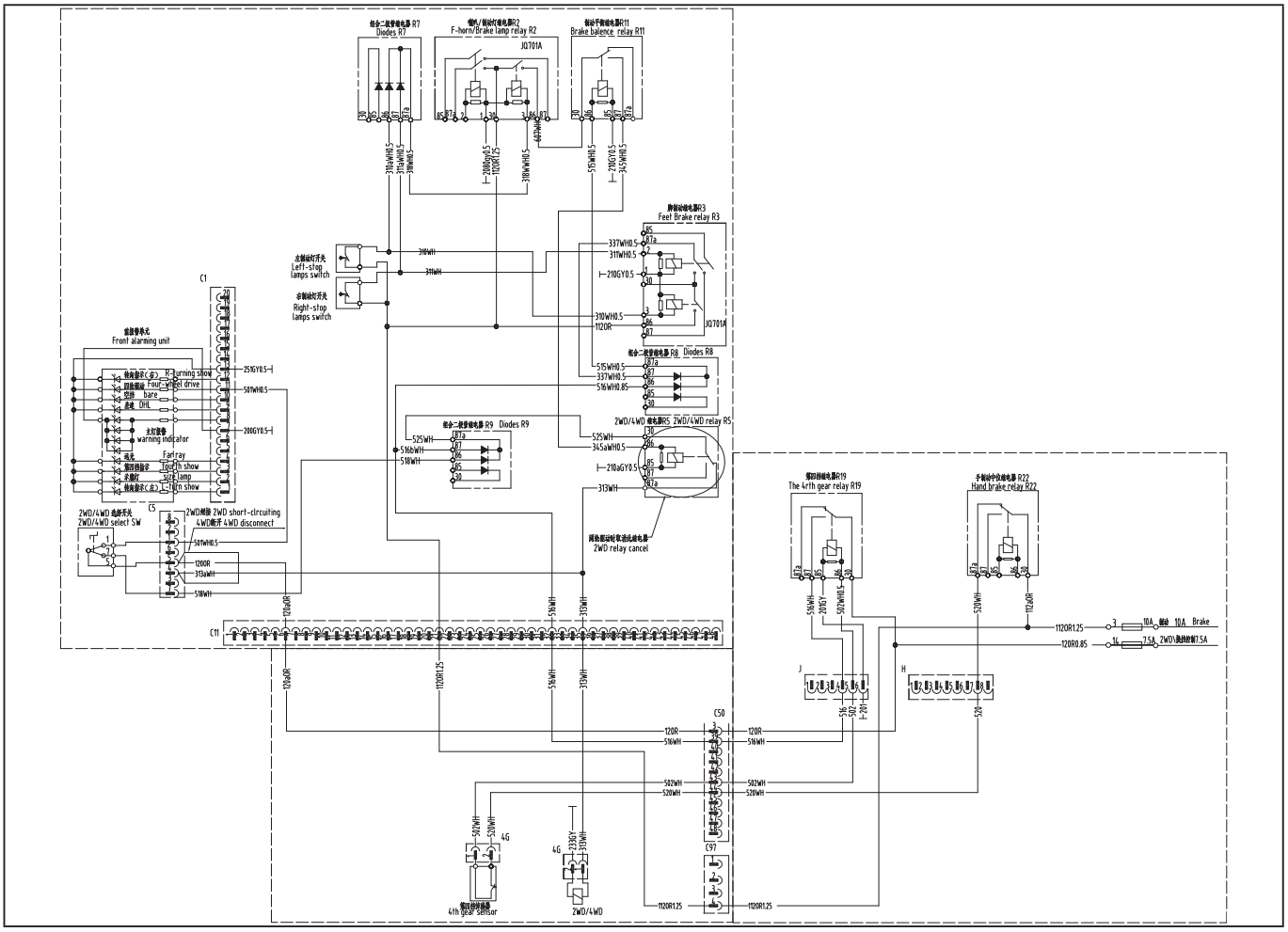
3.11.9 2WD/4WD shift (synchronous shift)

Operation

1. Only 2WD function, do not install 2WD/4WD switch, 2WD/4WD relay, 120OR and 313a are shorted, 2WD/4WD valve has been energized, keeping 2WD.
2. There is 2WD/4WD function, 120OR and 313a are cut off, 2WD/4WD switch in the closed position, 2WD/4WD is power off, 4 WD mode.
3. Bilateral brakes, forced 4 WD;
4. When drive in the 4th gear, forced 2WD; in 4th gear, unilateral brake is the same with bilateral brakes, brake is override, 4 WD mode.

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Wiring diagram



Troubleshooting

Prop up the machine, if the 2WD/4WD mode does not match the operation, refer to circuit diagrams, and check wiring corresponding to failure.

3.11.10 Shift handle unloading (synchronization shift)

Parameters

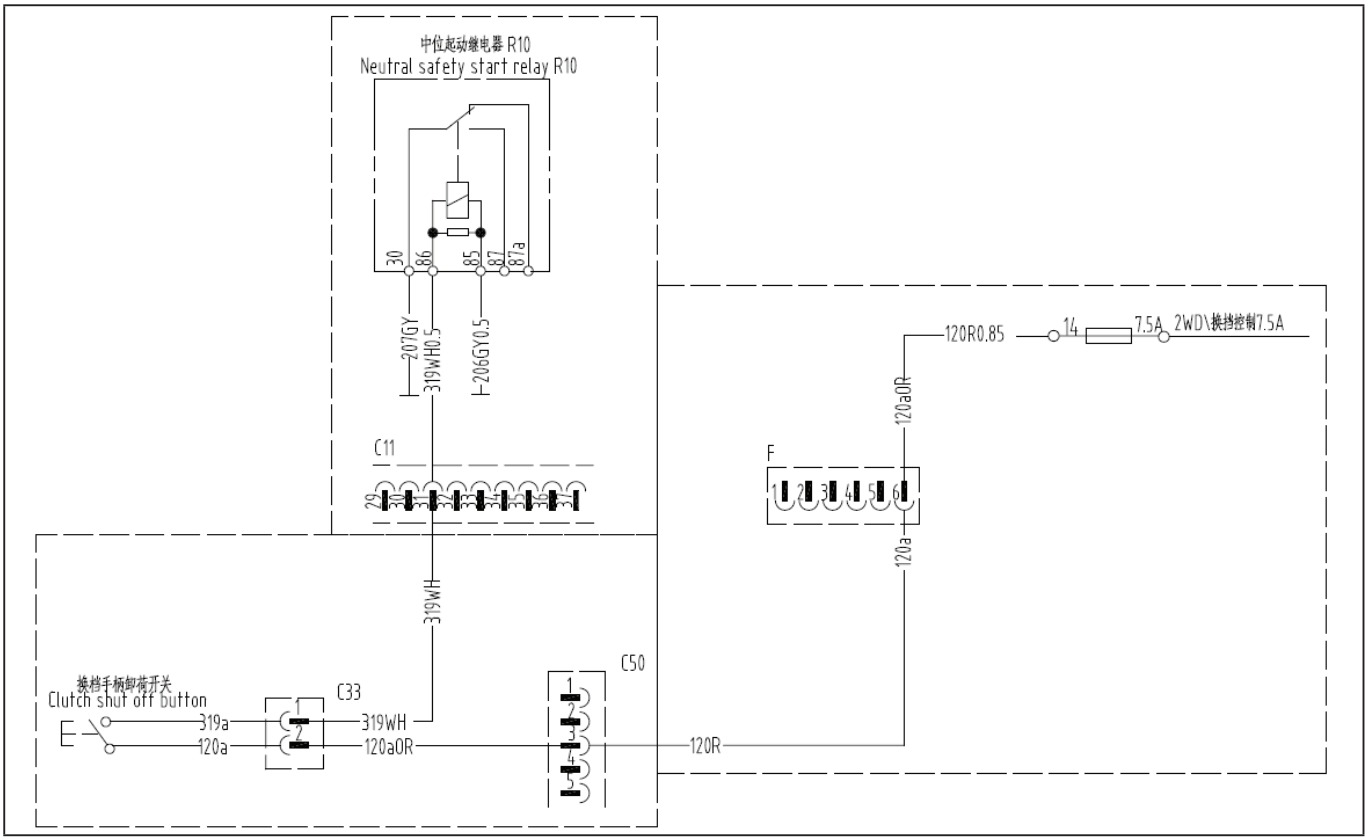
Handle switch: self-reset switch

Operation

1. One of the machine starting conditions, press and hold the shift handle unloading switch, the machine can be started. After the machine starts, then release the switch.
2. When the machine is running, press the shift handle unloading switch, it can cut off the forward and backward driving force.

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Wiring diagram



Troubleshooting

1. If it can not serve as starting conditions, check the switch mechanical structure is normal; use a multimeterto check whether there is open circuit fault in the wiring reference circuit diagram check.
2. If the machine is started and excluding other issues, it still can not move forward/backward, check switch is malfunctioning and can not be reset.

3.11.11 Load/unload excavation handle

Parameters

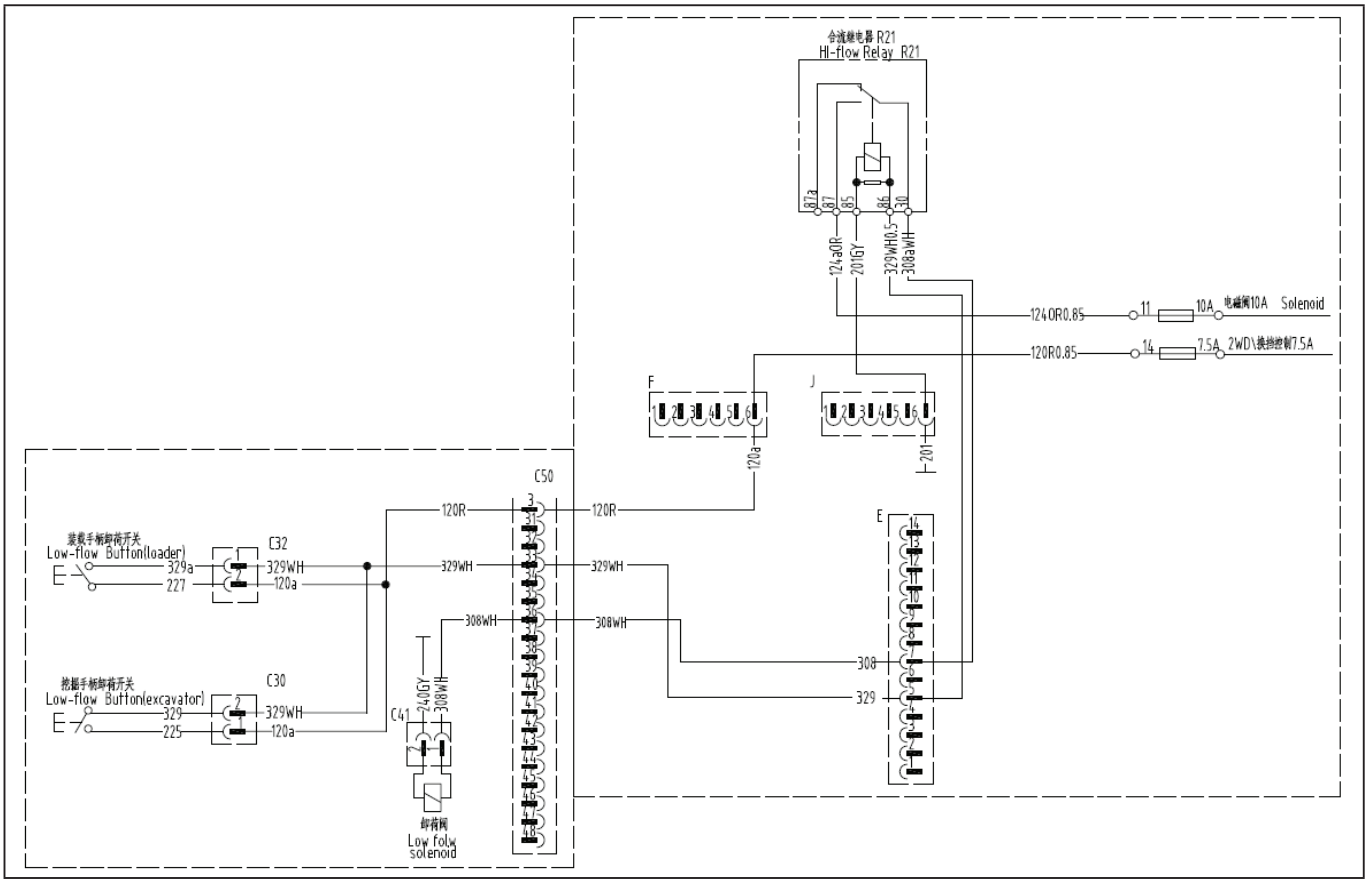
Handle switch: self-reset switch

Operation

1. During loading/excavating work, press the unloading button on the loading/excavating handle, the confluence relay is pulled, power is supplied to the unloading solenoid valve coil via confluence relay contacts, so that unloading solenoid valve is pulled to reduce flow.

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Wiring diagram



Troubleshooting

1. During the loading and excavation operation, press the button but cannot unload, check the fuse failure;
2. Check whether mechanical structure of the switch is normal;
3. Press the switch, use a multimeterto test whether there is 12V on the terminals of the confluence relay coil, if so, the relay is not energized, the relay may be faulty;
4. Use a multimeterto check whether there is disconnection fault in the wiring according to circuit diagrams.

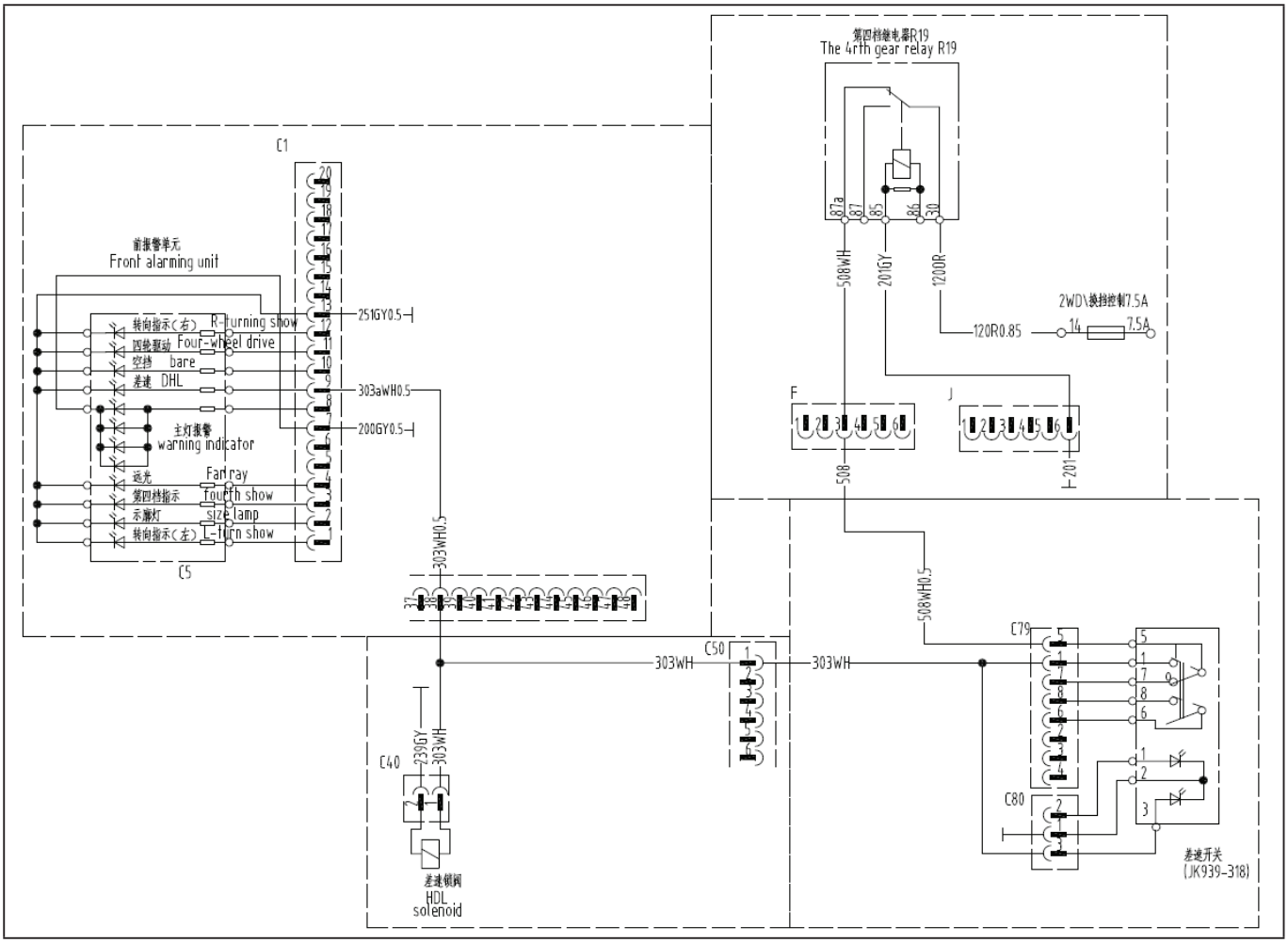
3.11.12 Differential lock (synchronous shift)

Operation

1. Close the differential lock switch, power is supplied to the differential lock alarm indicator of the differential lock valve and front alarm unit, via the fuse 14 to the 4th gear relay contacts then to differential lock switch.
2. When drive and the gear is in 4th gear, the 4th gear relay will be closed, power supply of the differential lock switch is cut off, differential lock function is invalid.

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Wiring diagram



Troubleshooting

1. Differential lock switch is invalid after being closed, check the fuse;
2. Check the 4th relay is pulled, if yes, check partial wiring of the 4th sensor.
3. Use a multimeterto check whether there is disconnection fault in the wiring according to circuit diagrams.

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3.12 Display and alarm malfunction

3.12.1 Engine oil pressure warning (mechanical engine)

Position

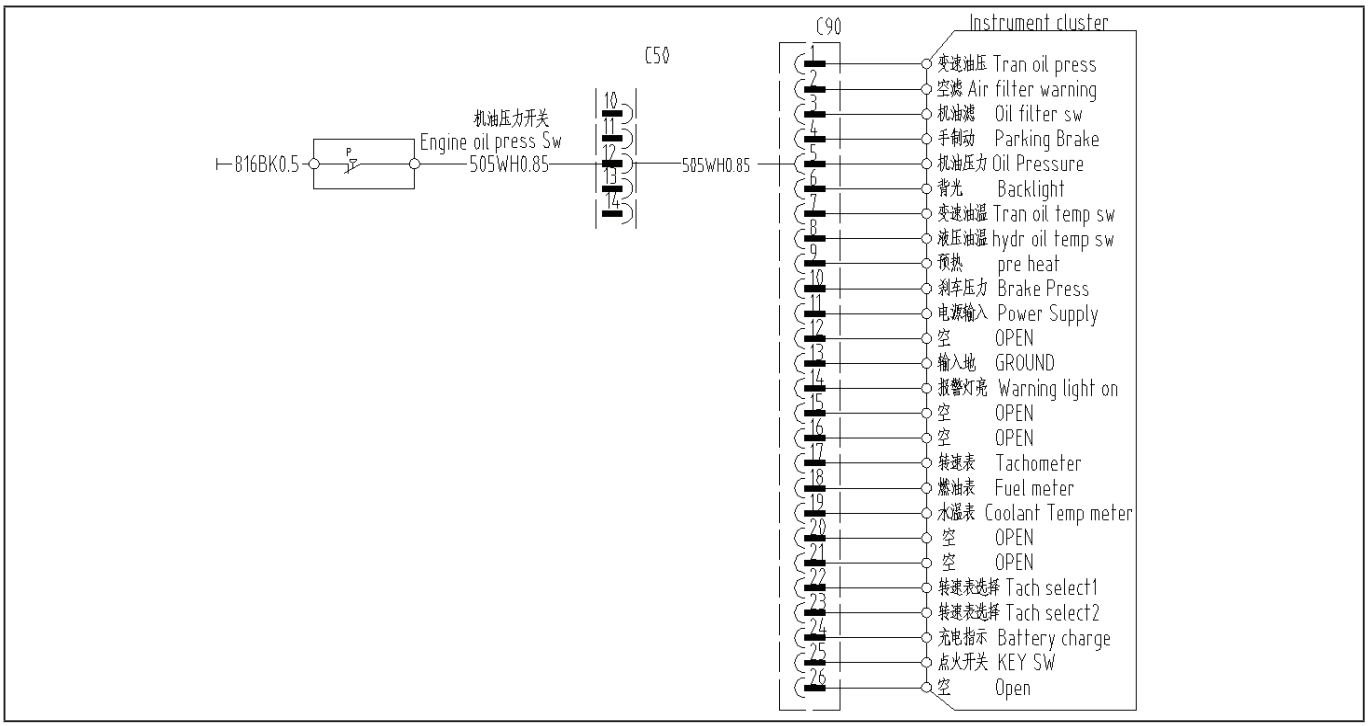
Parameters

	Switch type	Pressure set value	Remarks
Perkins	Constant-off switch	0.88bar	Engine self-contained
Weichai	Constant-off switch	0.88bar	Purchasing

Operation

When the electric lock is switched to ON gear, the instruments are powered. When the engine oil pressure is too low, oil pressure switch is closed, the instrument pin 5 is earthing, and the alarm indicator is lit. If the engine is running, the pin 14 outputs signals, the buzzer gives alarm, and the front alarm unit alarm indicator lights.

Wiring diagram



Troubleshooting

The Jumper connect the oil pressure switch signal terminal and the ground, the instrument oil pressure warning light is lit, oil pressure alarm switch may be faulty; if the light is still not lit, check whether pin 5 of the instrument is earthed, it may be instrument failure if earthing, wiring fault if not earthed.

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3.12.2 Engine water temperature display alarm (mechanical engine)

Parameters

When connecting engines from Weichai, Cummins and YTO, parameters of the engine water temperature sensor are as follows:

Temp (˚C)	Resistance	Tolerance
40	596.5 Ω	±11.5Ω
60	267Ω	±4 Ω
80	127.5 Ω	±1.5 Ω
100	65.5 Ω	±0.5 Ω
105	58 Ω	±1 Ω
120	37.5 Ω	±0.5 Ω

When connecting to Perkins engine, water temp sensor parameters are as follows:

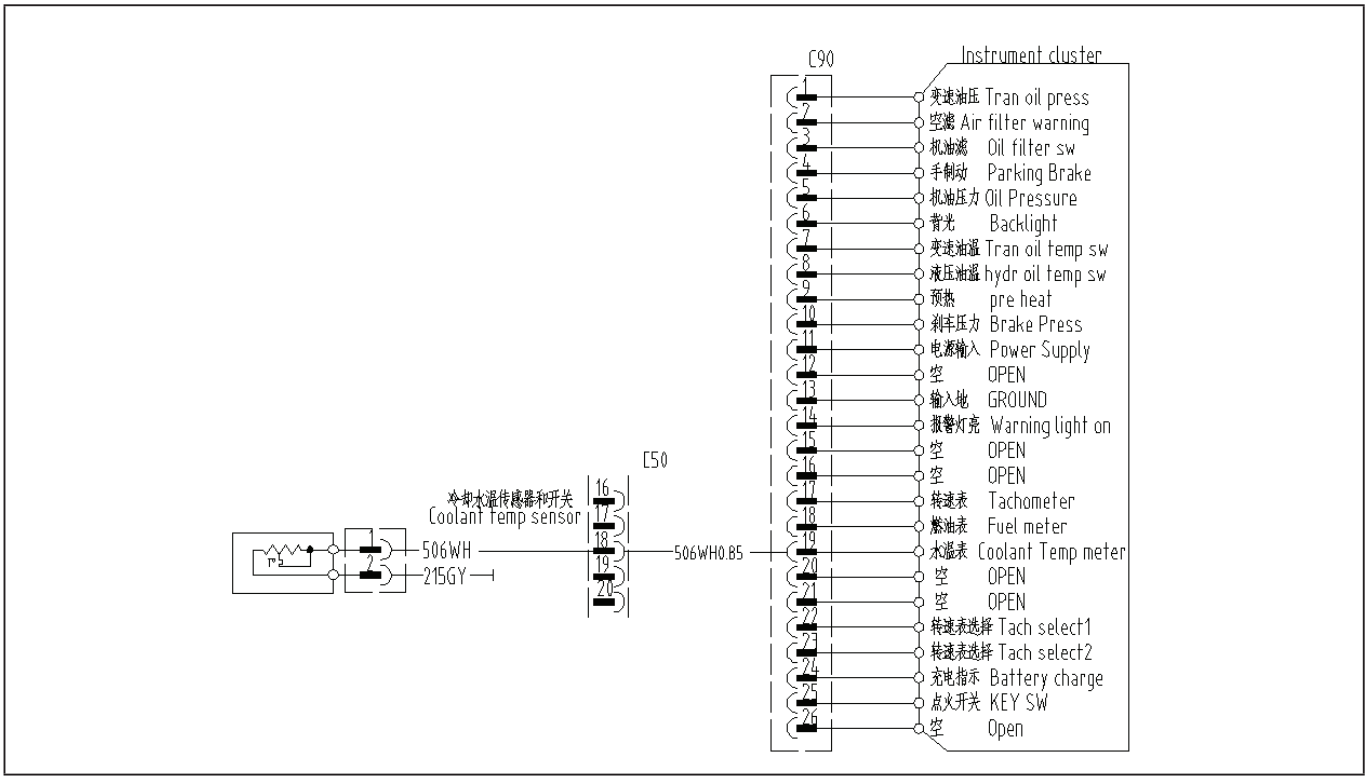
Temp (˚C)	Resistance	Tolerance
40	500Ω	±11.5Ω
60	170Ω	±4 Ω
80	77Ω	±1.5 Ω
100	39Ω	±0.5 Ω
105	33 Ω	±1 Ω
120	23.4Ω	±0.5 Ω

Operation

When the electric lock is switched to ON gear, the instrument is powered; the water temperature gauge reads the current temperature reading. When the water temperature exceeds 105 degrees, the indicator begins to alarm, pin 14 outputs signals, and the buzzer gives alarm, the alarm indicator of the front alarm unit is lit.

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Wiring diagram



Troubleshooting

1. If the combination instrument water temperature reading is not normal, check whether there is open or short circuit faults; check wiring between No.22 and 23 pins of the combination instrument and the harness is correct.
2. If the wiring is troubleshooting, check whether the coolant temperature sensor and switches are faulty. Provide heat, determine whether the relationship between resistance and water temperature conforms to requirements of the factory according to the above table.

3.12.3 Gearbox oil temperature warning (synchronous shift)

Parameters

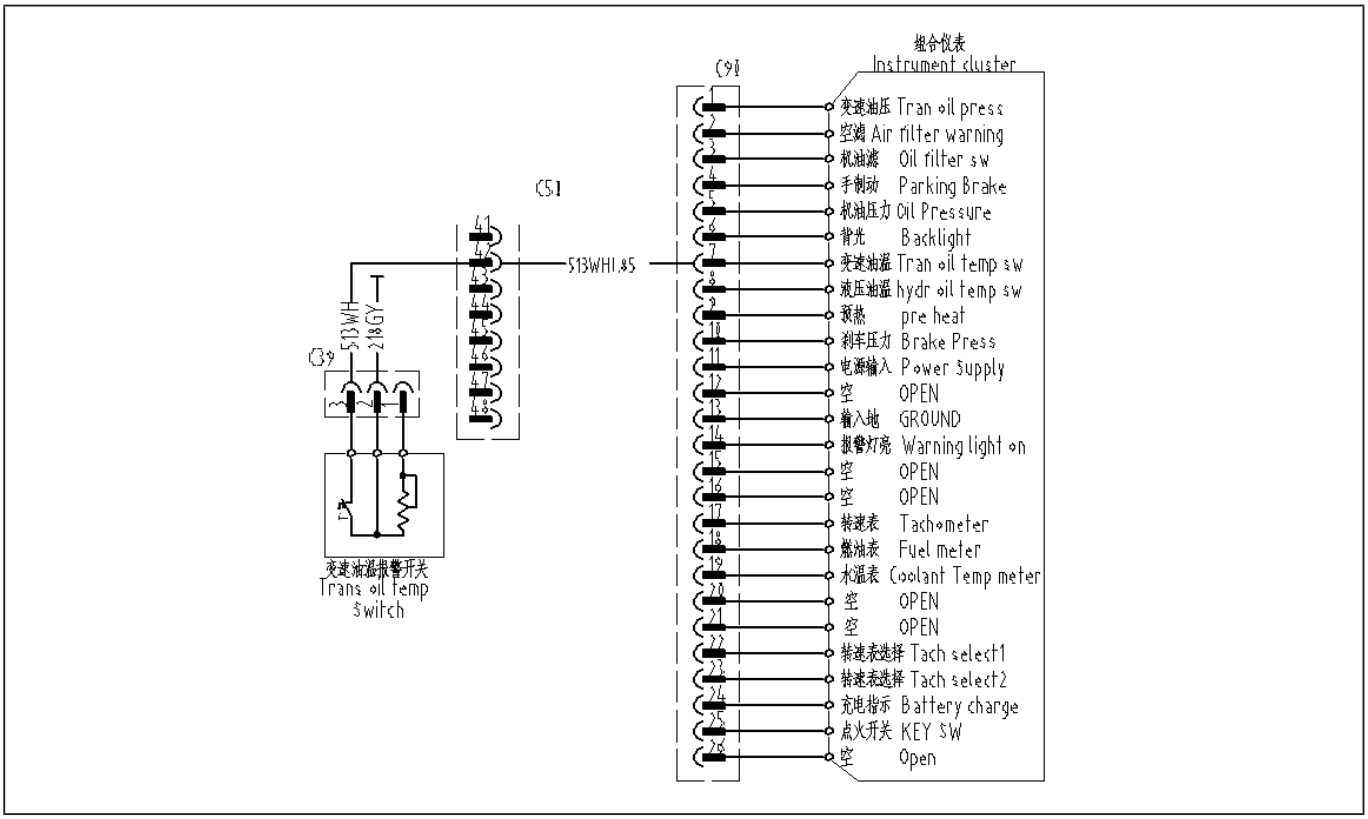
Operation

When the electric lock is switched to ON gear, the instrument is powered, when the gearbox oil temperature exceeds the set temperature, gearbox oil temperature alarm switch is closed, the instrument gearbox oil temperature alarm indicator is lit, and pin 14 outputs signal, the buzzer sends out alarm, alarm indicator of the front alarm unit is lit.

Troubleshooting

1. If the gearbox oil temperature alarm of the combination instrument is abnormal, alarm or not alarm continuously, check for open or short circuit fault;
2. If the wiring is troubleshooting, check the gear oil temperature alarm switch is faulty. Provide heat, test the connection of No.3 and 2 pins of the C39 by the multi instrument under the condition that temperatures is higher than the specified ones, and judge whether the gearbox oil temperature alarm switch is faulty.

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3.12.4 Gearbox oil pressure warning (synchronous shift)

Operation

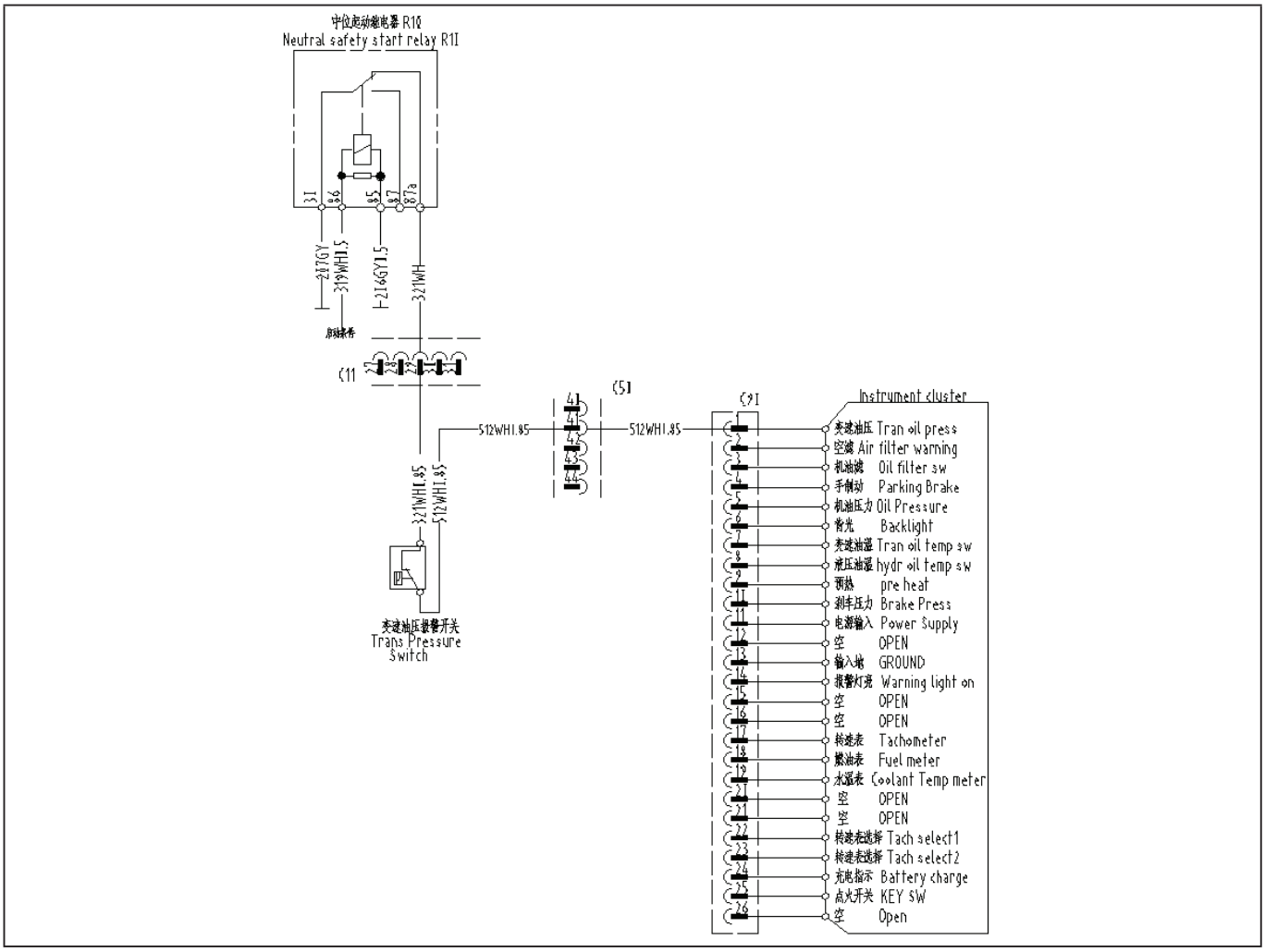
When the electric lock is switched to ON gear, the instrument is powered, when the gearbox oil pressure exceeds the set pressure, gearbox oil temperature alarm switch is closed. If the starting conditions are not satisfied, the neutral starter relay does not pull, making the No.1 pin of the combination instrument to ground, gearbox oil temperature warning indicator is lit. No.14 pin of the combination instrument outputs alarm signals to the buzzer. When the machine is running and the alternator begins to generate electricity, the earthing terminal of the buzzer is effective and starts alarming;

Constant-off switch	9Bar	Synchronous shift
Constant-on switch	9.5Bar	Self-automatic gearbox box

Troubleshooting

1. The jumper shorts the gearbox oil pressure alarm switch to meet starting conditions; if alarm, check whether the neutral starter relay is energized; if starting conditions is not satisfied and not alarm, check the wiring for open circuit fault;
2. If the first step is excluded, it may be gearbox oil pressure alarm switch failure. Use simple hydraulic test stand, and set the pressure to the set value, use a multimeter test two terminals of the pressure switch. If it reaches the set value, constant-on switch is closed, constant-off switch is disconnected, then it indicates that pressure switch is intact. On the contrary, the pressure switch is damaged;

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3.12.5 Speed signal (mechanical engine)

Parameters

Because different engine speed sensors mounting holes have different specifications, different engines are configured with different speed sensors; flywheel teeth are different, signals input from the speed sensor to the instrument are different, wiring is different.

To Weichai engine, No. 1p and 2c of the instrument harness are not connected; to Perkins engine, No. 1p of the instrument harness is grounded; to Cummins engine, No. 2c of the instrument harness is earthed.

Weichai: Voltage: 12V; operating temperature: -30˚C ~ 120˚C ; resistance between two terminals: 1150 ± 100Ω; installation size: M18 × 1.5-6g.

Perkins: 12V; operating temperature: -30˚C ~ 120˚C ; resistance between the two terminals: 1150 ± 100Ω; Installation size: M16 × 1.5-6g.

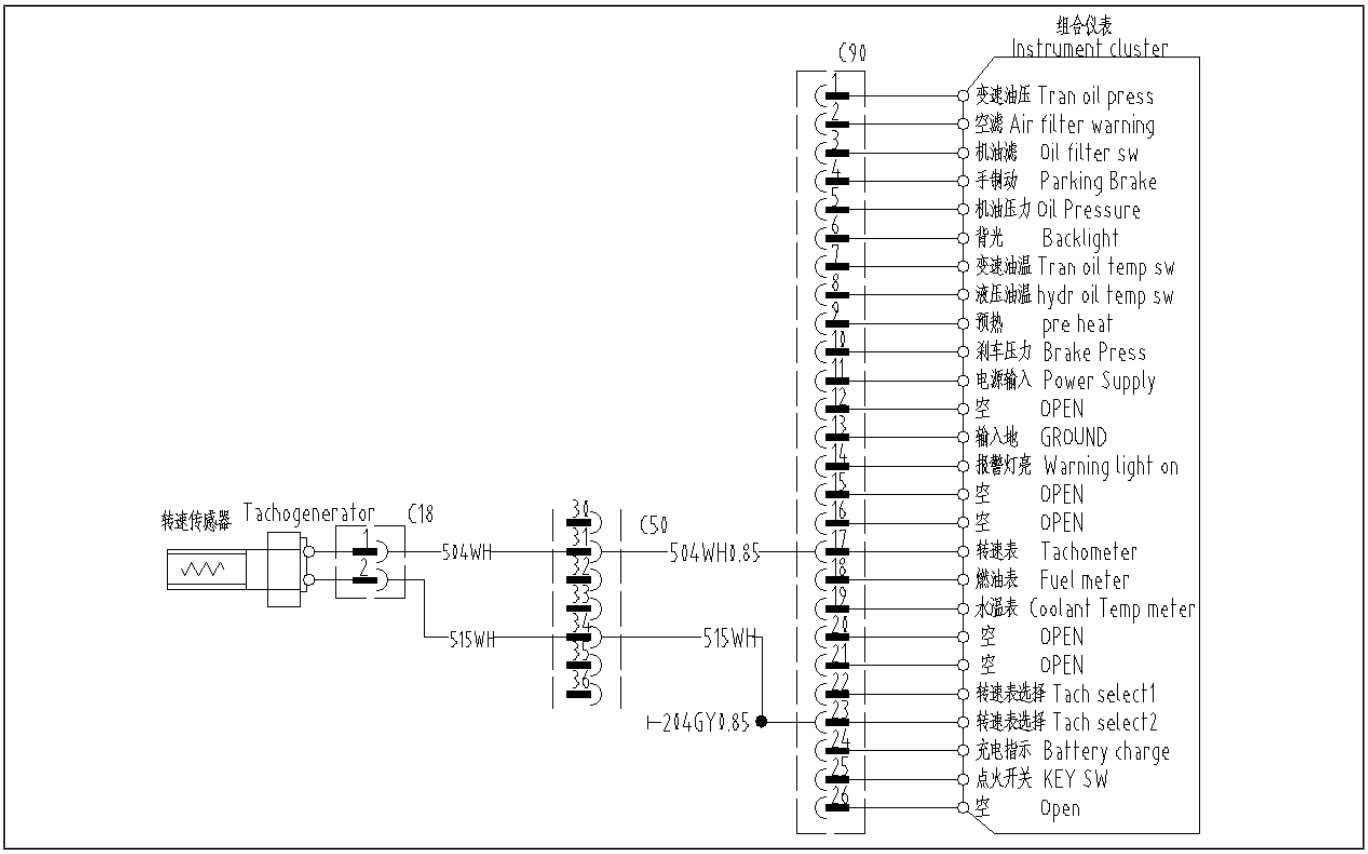
Operation

When install, the sensor end face should be perpendicular to the top surface of the flywheel, its distance is 1 ~ 1.5mm;

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Troubleshooting

1. If the tachometer reading is not normal, use a multimeter to test the resistance between the two terminals of the speed sensor. If the resistance value is tested to be 1150 ± 100Ω, then the tachometer sensor is intact; if the resistance vale is infinite, then the speed sensor is damaged;
2. Well as speed sensor, tachometer normal, but speed is not displayed, it can be tightened to the limit speed sensor position, passed on a ~ 1.5 pitch before testing;
3. If the first two steps have no problems, then the wiring is faulty, which should be excluded.



3.12.6 Air filter clogging alarm

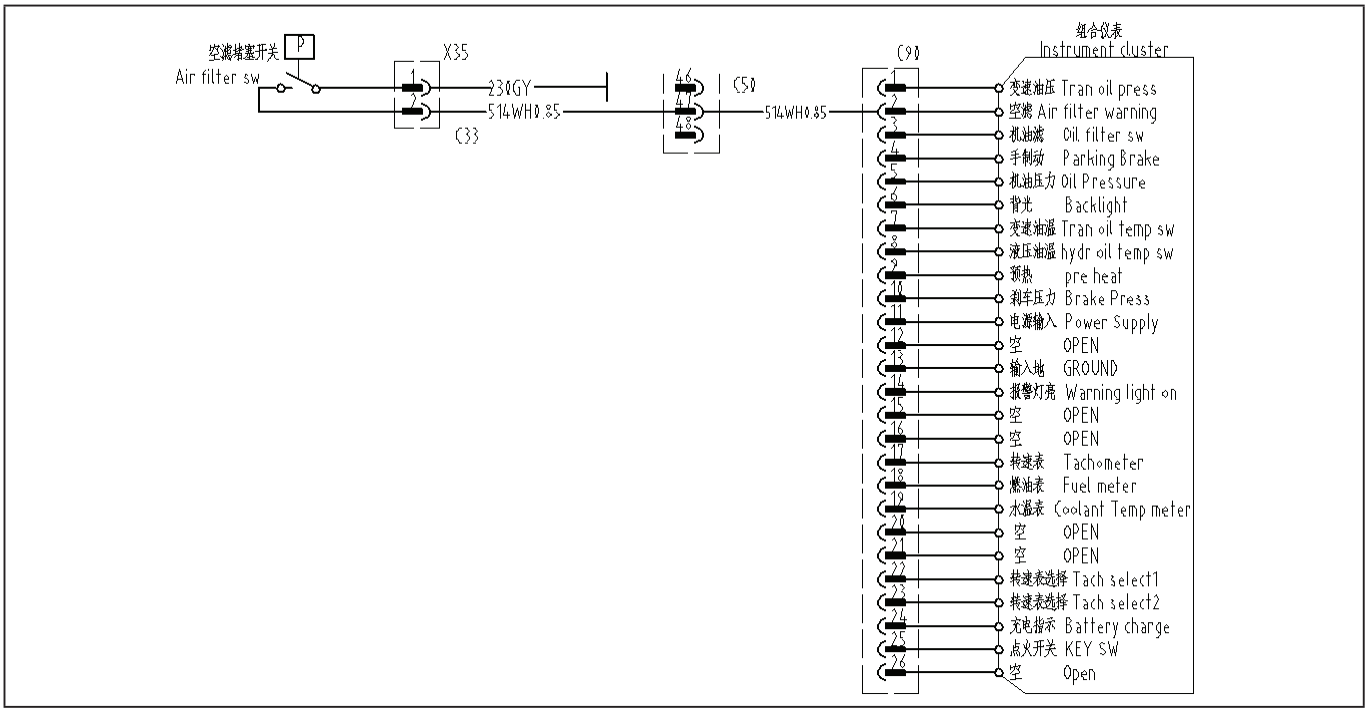
Operation

1. If the air filter is faulty, air filter switch is closed, the combination instrument alarms.

Troubleshooting

1. If the air filter is clogged, the combination instrument does not alarm, check the air filter blockage switch is closed;
2. If the air filter switch works properly, check the wiring is faulty.

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3.12.7 Fuel sensor

Parameters

Fuel level	Basic resistance	Basic tolerance
0	190.2	±5
1/2	88.6	±3
1	43	±2

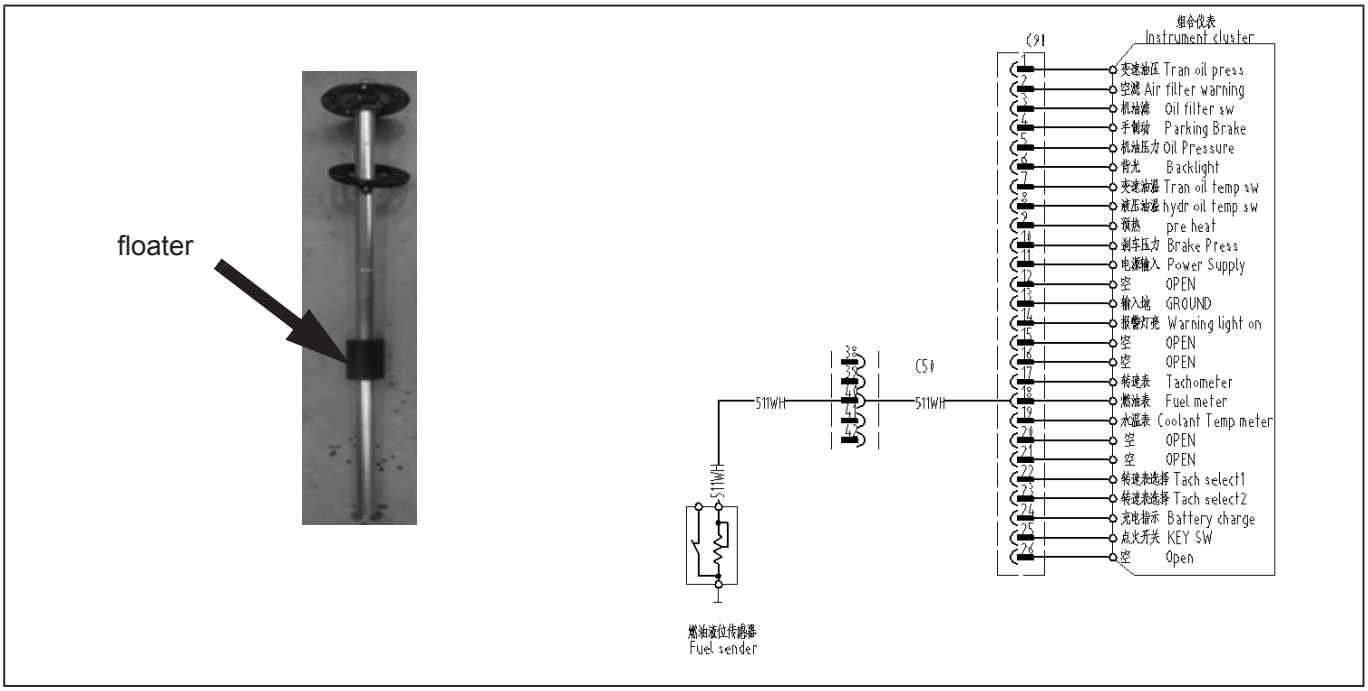
Operation

Slide rheostat pushes the float of the sensor to move through changes of fuel level in the fuel tank, thereby change the resistance value of the sensor. Detect the oil level changes by measuring changes of the resistance value.

Troubleshooting

1. Fuel gauge has been in full range, check the fuel sensor wiring terminals are shorted to the ground;
2. Fuel gauge has been in full range, check the fuel sensor wiring terminals are opened to the ground;
3. Check the fuel sensors if the wiring has no fault:
   (1). Check whether the float is able to changed according to the oil level;
   (2). If the float has no problem, then manually move the float, test resistance value of the sensor to see whether the changes confirm to the above table;

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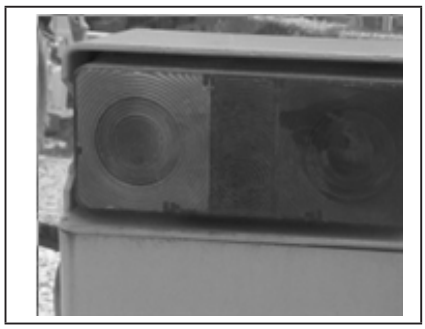
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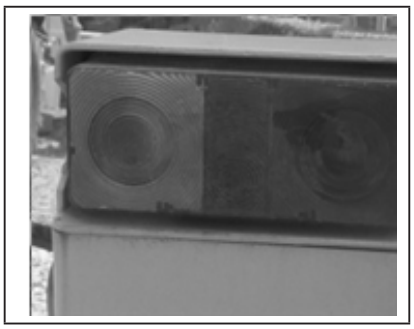
3.13 Lighting fault

3.13.1 Brake light

Position

Hand brake light switch is located below the handbrake, foot brake switch is located on steering column. Brake lights are located at the rear and outriggers of the driving top and in red.





Parameters

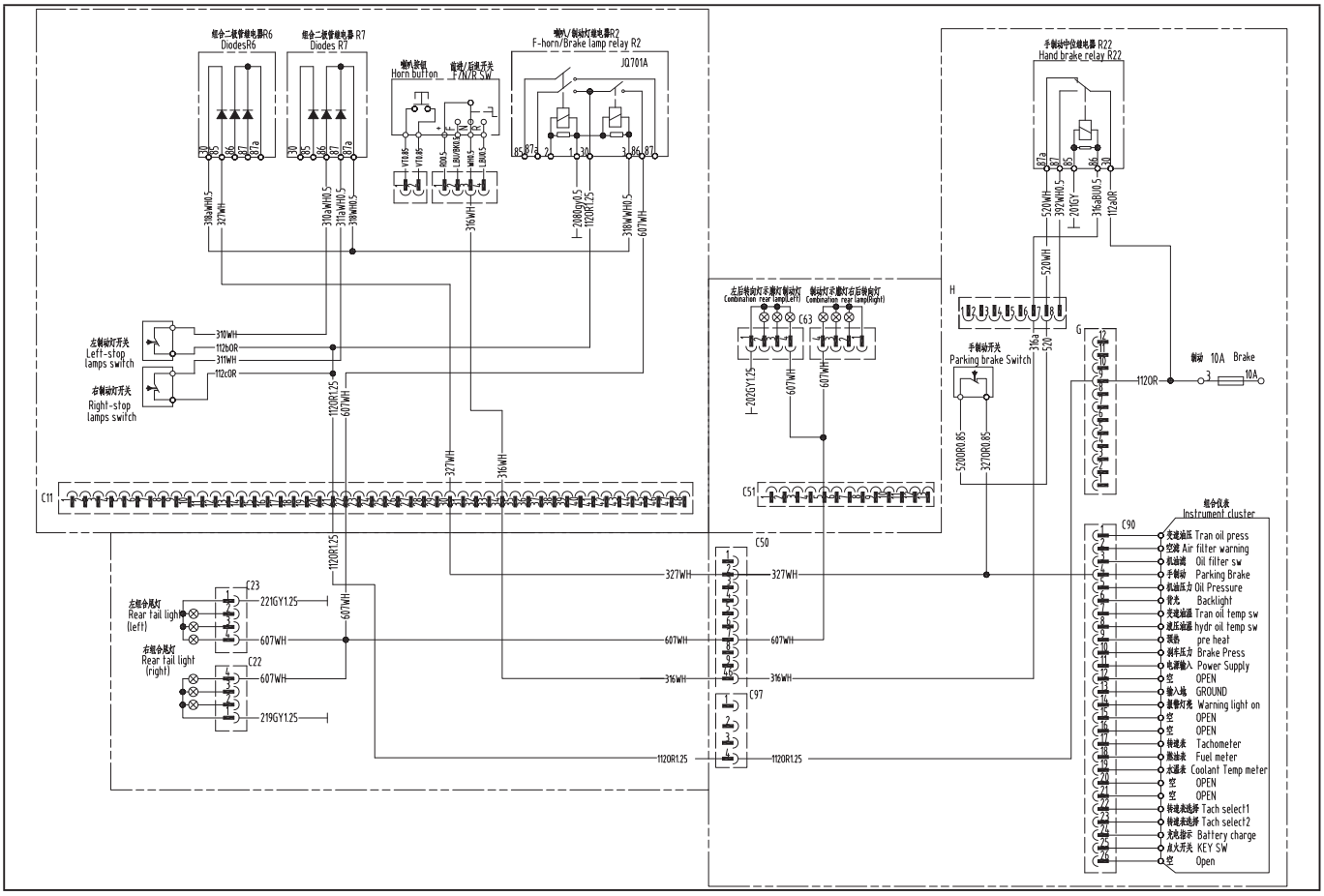
Brake light switch assembly is a mechanical constant-off switch, in the normal state, the extension rod is in the extended state, and the switch is in the closed mode. After the extension rod is compressed 3 ~ 5mm, the switch is in the off mode, the disconnected mode expansion rod stroke has 3 ~ 5mm.

Operation

1. When the electric lock is in ON gear, the forward/backward handle is not in the neutral position, the hand brake neutral relay does not pull; when the handbrake is pulled, the hand brake switch is turned on, the hand brake indicator on the combination instrument is lit, brake light is lit. When forward/backward handle is in the neutral position, the hand brake neutral relay is pulled, power is disconnected, the hand brake lights are invalid;
2. When the electric lock is in ON gear, depress the left/right brake, foot brake switch is turned on, the power supplies the brake light relay coil via the foot brake switch, and the brake light relay is pulled, power is supplied to the brake light via the relay contacts of the brake light, brake light is lit;

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Wiring diagram



Troubleshooting

1. Hand brake light switch fault
    1. Inspect fuses; checking whether fuses have 12V voltage, if no, check the main power wiring and electric locks;
    2. If the electric lock is in ON position, forward/backward handle is not in the neutral position, pull the hand brake, the brake light is not lit, check whether the hand brake pulls the mediate relay in place; if energized, check the combination handle forward/backward gear is faulty; if without pull, then go on the next step;
    3. Check whether the brake lights relay is pulled, if not pull, check the coil terminal voltage and the earthing are valid. If effective, check whether the relay is faulty; on the contrary, check the hand brake switch and diode relay R6 are faulty, wiring from the hand brake neutral relay contact terminal to the relay coil circuit is faulty. If the brake light relay is pulled, proceed to the next step;
    4. Check the voltage at the fault brake light and earthing are valid, if valid, check that the bulb is damaged; if invalid, then check whether the wiring is fault.
2. Foot brake light switch fault
    1. Inspect fuses; checking whether fuses have 12V voltage, if no, check the main power wiring and electric locks;
    2. Electric lock is in ON position, depress the left/right brake, and check whether the brake light relays are energized. If it does not pull, check the coil terminal voltage and the earthing are valid. If effective,

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then check whether the relay is faulty; if invalid, check the left and right foot brake switch and diode relay R7 are faulty. The wiring from the fuse 3 via the foot brake light switch, diode relay R7 to the brake light coil contacts is faulty; if the brake light relay is pulled, proceed to the next step;

3. Check the voltage at the fault brake light and ground are valid, if valid, check that the bulb is damaged; if invalid, check the wiring from the No. 3 fuse via brake light coil contacts to the brake light is faulty;

3.13.2 Turn signal light

Position

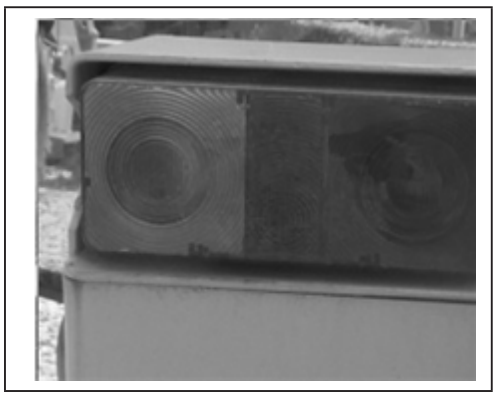
Turn signal light is located on the right handle of the combination switch. Turn signal lights are located at the driving top rear, outriggers, front main lights, and in amber.



Operation

If the electric lock is in ON position, the hazard signal light switch is in 0 gear. After passing the fuse 5, power is supplied to the turn signal light switch of the combination switch, after through the hazard signal light switch to connect with the flash relay, and changed into a pulse signal by the flash relay.

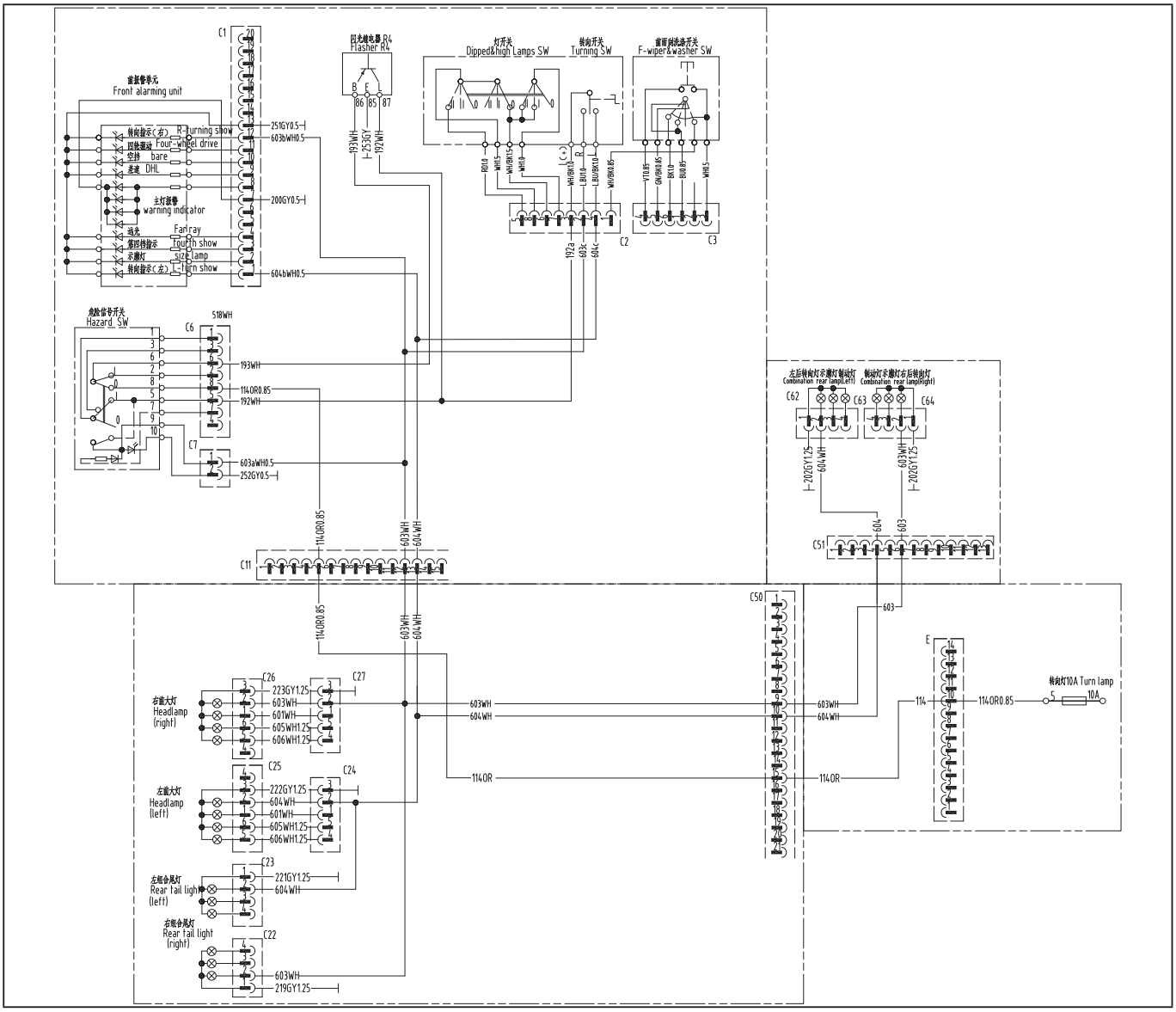
Push the right handle of the combination switch, connect the left turn signal light, the left turn signal light is lit; if dial backwards, connect the right turn signal light, and the right turn signal light is lit.





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Wiring diagram



Troubleshooting

1. Check fuse;
2. Hazard signal light switch is in the 0 gear, open the turn signal light switch, the left and right turn signal lights are off; check whether the fuse has 12V voltage; if no, check the main power wires and electric locks;
3. Check the combination open steering switch meets the factory requirements. Check fault turn signal light power and earthing are valid, check whether the bulb is damaged if effective;
4. Check the hazard signal light switch meets the factory requirements;
5. Check whether flash relay 12V input voltage, if not, check the fuse to flash relay input line; if it has an input, no output, check the flasher relay is faulty.
6. Check the combination open steering switch meets the factory requirements. Check the combination switch to turn signal lights lines.

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3.13.3 Clearance light

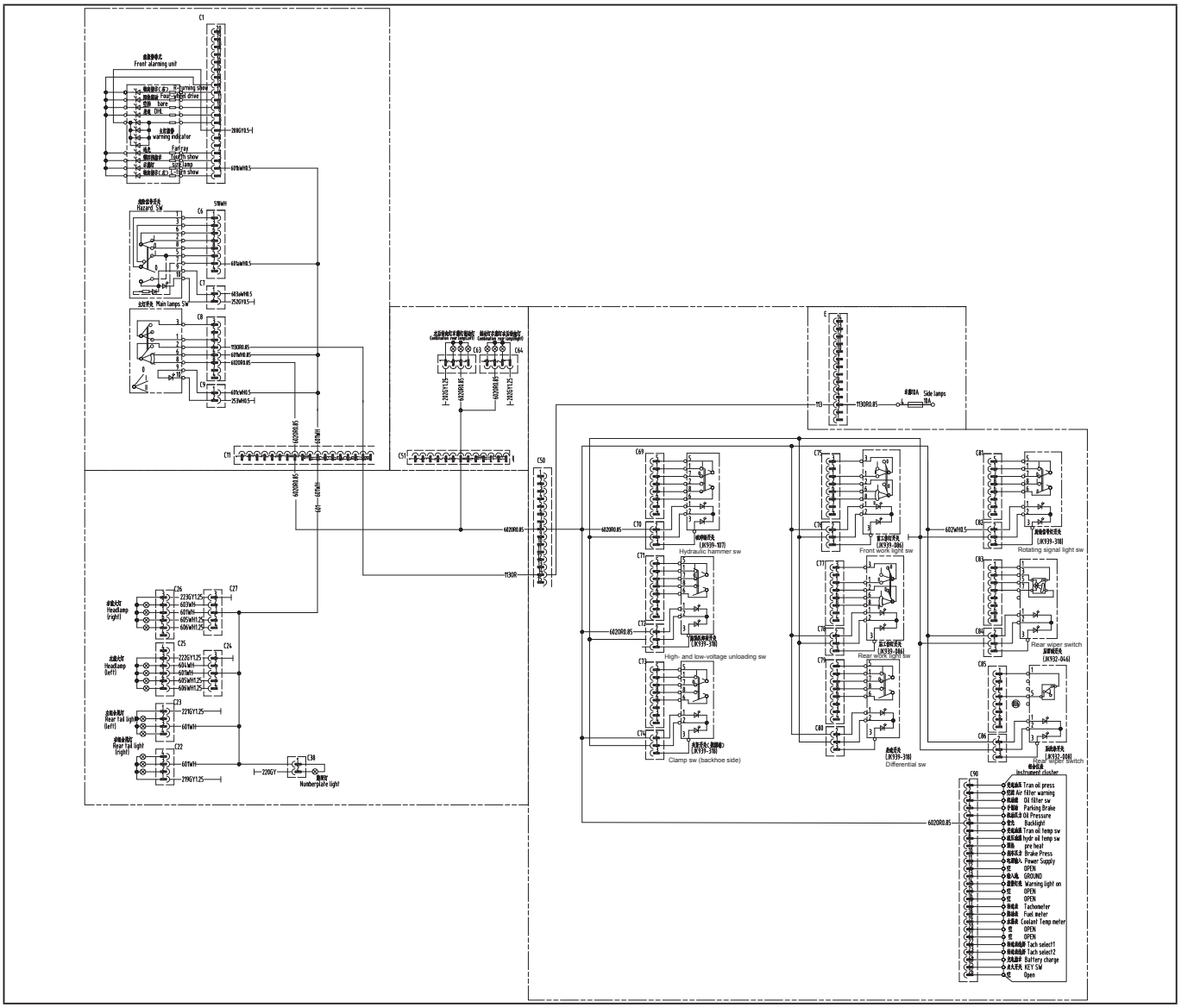
Position

Clearance lights switch realized by the main light switch, main light switch is located on the steering gearbox housing.

Operation

The main light switch to 1 gear, the power is supplied to the front combination light clearance lights, rear combination light clearance light (777A outriggers), rear combination light clearance lights (cab roof 777A/766A), license plate light, the former alarm unit clearance light indicators, combination instrument backlight, switch backlight through the fuse.

Wiring diagram



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Troubleshooting

1. Check fuse;
2. Check whether the fuse at 12V voltage, no, check the main power lines and electric lock;
3. Outline clearance lights and backlight are off, check the main light switch connector pin 2 if there is 12V voltage, if not, then check the fuse to the main light switch circuit; if so, check the main light switch meets the requirements of the factory;
4. Check whether there is fault lights 12V voltage, whether earthing is valid; checking fault light to the main light switch between line is faulty.

3.13.4 Main light switch

Position

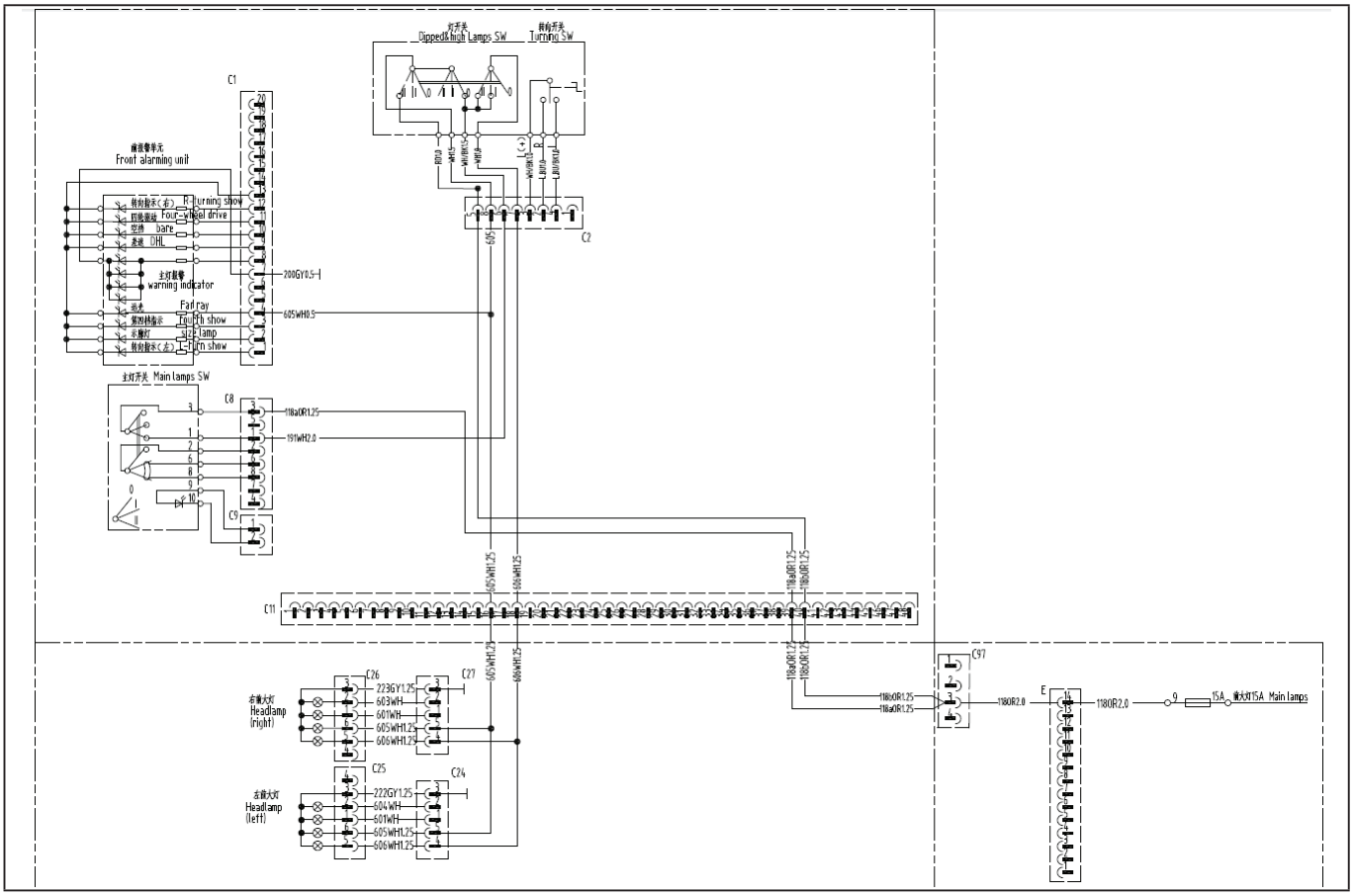
The main light switch is located on the direction of machine housing.

Operation

1. 1st gear is the main light switch backlighting and clearance lights, 2nd gear combination switch provide power to light switch.
2. The main light switch is turned off or 1st gear. Combination switch light switch 0 gear, 1st gear is not valid, playing to 2nd gear, high beam light. 2nd are self-resetting gear from reset to 1st gear.
3. The main light switch is in the 2nd. Combination switch light switch 0 gear, high beam light is on; 1 gear low beam light is on; 2nd gear, high and low beam light illuminate simultaneously.
4. Combination switch light switch 2nd gear as ultra lights while driving use, when overtaking, hit consecutive three under the high beam light.

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Wiring diagram



Troubleshooting

1. Check fuse;
2. The main light switch 0/1st gear combination switch light switch 2nd gear, high beam light does not light, check whether the fuse at 12V voltage, no, check the main power lines and electric locks; Check combination switch light switch meets factory requirements; checking high beam light power and earthing is valid, if valid, check the bulb is damaged; exclude component failure, check whether the fault line.
3. The main light switch 2nd gear, combination switch light switch to 0/1st/2nd gear, the corresponding light is not lit, check whether the fuse has 12V voltage, if no, check the main power lines and electric locks; Check combination switch light switch meets the requirements of the factory; checking power and ground fault lights are valid, if valid, check the bulb is damaged; exclude component failure, check whether the fault line.

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3.13.5 Front/rear work light

Position

On top of the cab, before and after each 4.



Parameters

(outside) (12V/35W)

(inside) (12V/55W)

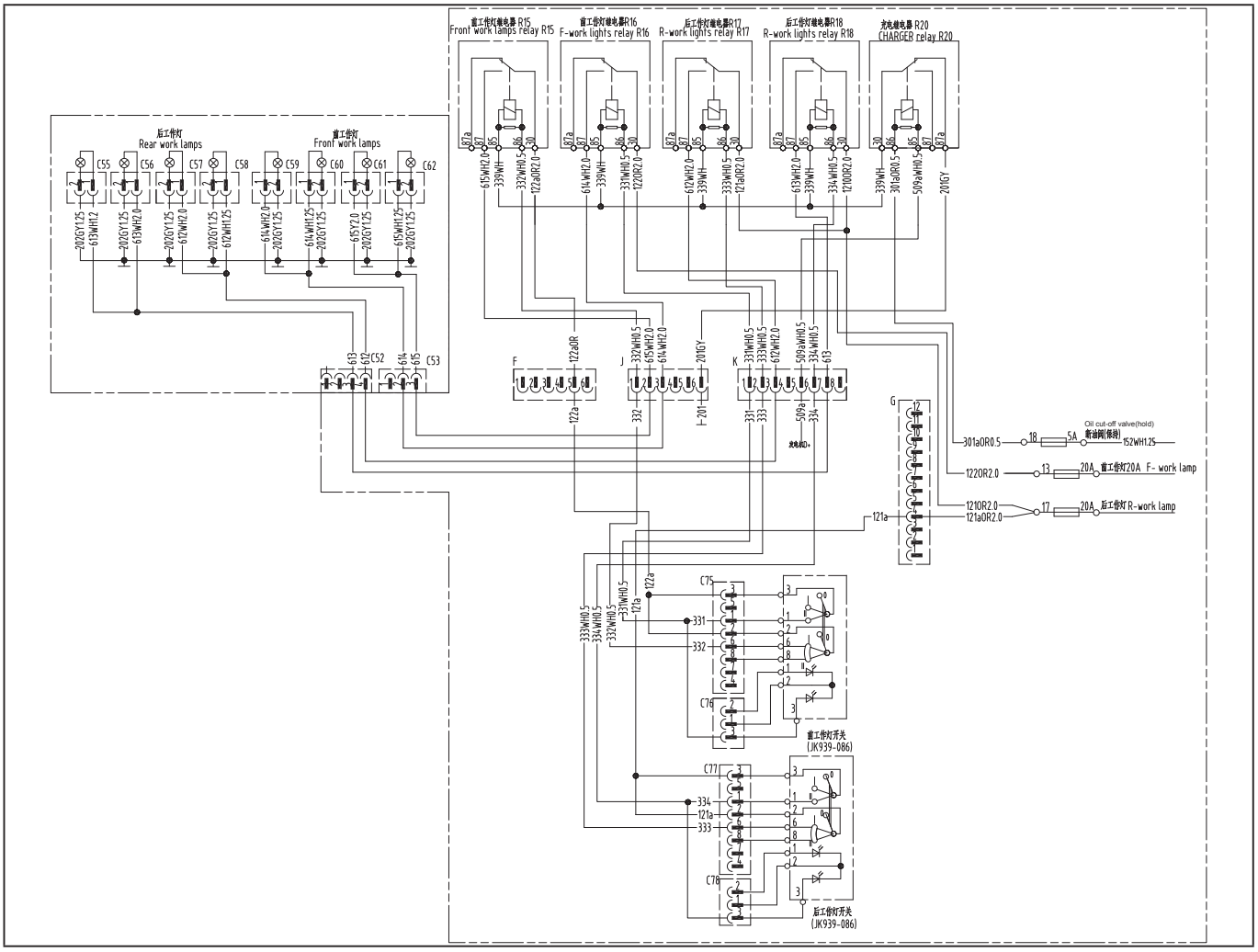
Quantity: backhoe loaders has 8 work lights, 4 in front, 4 in the rear, 2 is a group inside and outside.

Operation

In backhoe loaders, only after the engine is started, work lights before they can work. This control relay controlled by the charger negative control, the engine does not start, the charging relay is closed, control end earthing work light relay is cut off, at this time, work lights do not work; engine is started, the charging relay is off, work lights relay control terminal is earthed connection at this time, work lights by the work light switch control tasks. Work light switch has two gears: frong and rear. 1st gear outside work lights front and rear, 2nd gear, both inside and outside lights go on.

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Wiring diagram



Troubleshooting

1. Check fuse 13 and 17;
2. If the machine is started, all work lights are off, check the charge relay is disconnected, work light relay control terminal is earthed. If the charging relay remains closed, check the alternator is faulty, check the charging relay and alternator D + connection is faulty;
3. Check whether there is trouble work lights 12V voltage, whether earthing is good. If so, then check whether the fault work lights; if not, check whether the light switch meets factory requirements;
4. Excluding electrical component failure, refer to the schematic diagram to check if there's fault line.

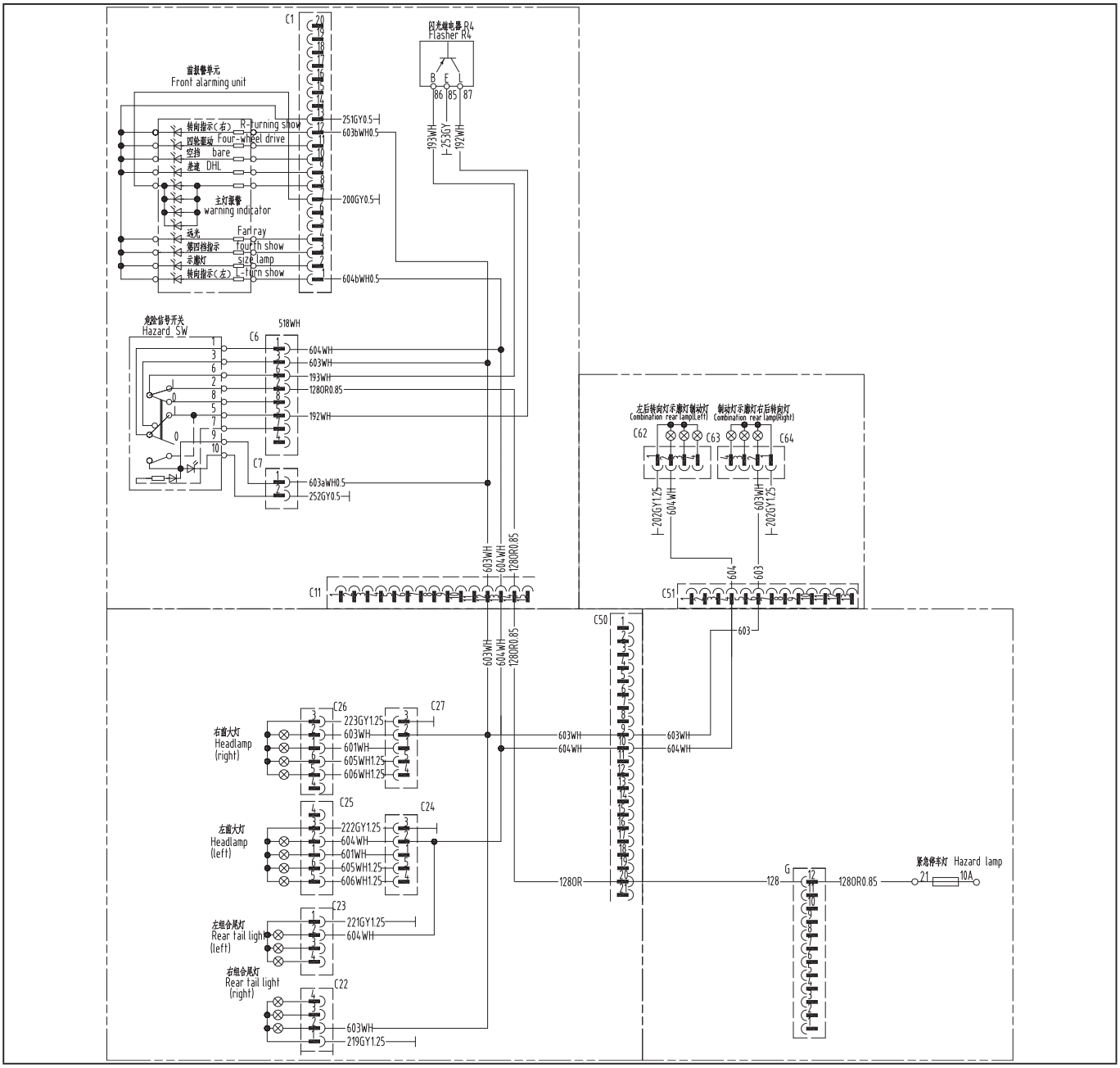
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3.13.6 Hazard signal light

Operation

Disconnect switch is closed, the fuse 21 is energized, hazard signal ights switch is closed, the power supply through the fuse 21, turn flash relay, provides power supply to turn signal lights, left and right turn signal lights are on.

Wiring diagram



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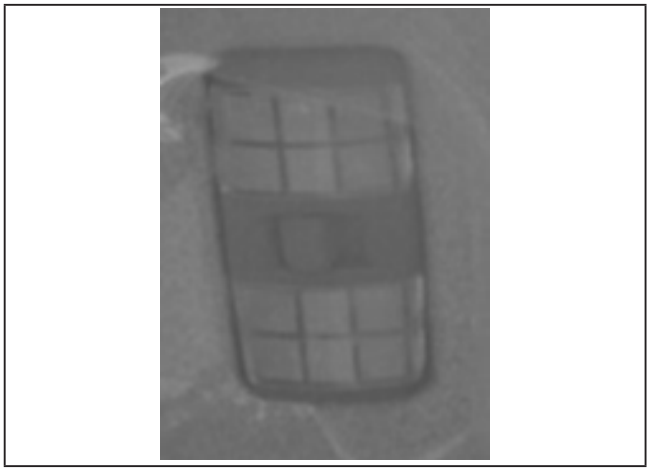
Troubleshooting

1. Disconnect switch is closed, check the fuse is failure, check whether the fuse at 12V voltage, if not, to exclude the fault between disconnect switch the fuse box;
2. Use a multimeterto check the hazard signal light switch off the situation meets the requirements of the factory;
3. Check the turn signal light at the power supply has voltage of 12V, earthing is valid; exclusion, check whether the turn signal light is faulty;
4. Excluding electrical component failure, the reference circuit diagram checking line fault.

3.13.7 Dome light

Position

On the cab roof.



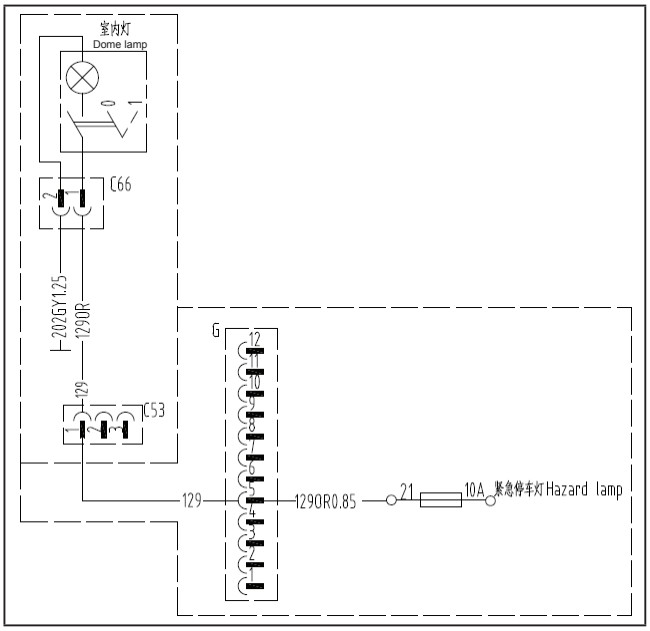
Operation

According to national standards, dome lights without electric lock, take power directly from the battery. After turn off disconnect switch, toggle button on the dome ligth to the closed position, dome light goes on.

Troubleshooting

1. Check fuse;
2. Check whether there is 12V voltage in dome light connector 2 pin and 1st pin earthing is valid; if are intact, check whether the dome light bulb has failure; whether dome light switch structure is invalid;
3. Refer to wiring diagram using a multimeter check whether there is a fault line.

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3.13.8 Rotating beacon (optional)

Position

Rotating beacon is located right in front of the cab at the top, rotating beacon switch is located on the instrument panel measured. Rotating beacon with the rotary beacon switch is optional.



Parameters

Working voltage: 10.8V ~13.8V

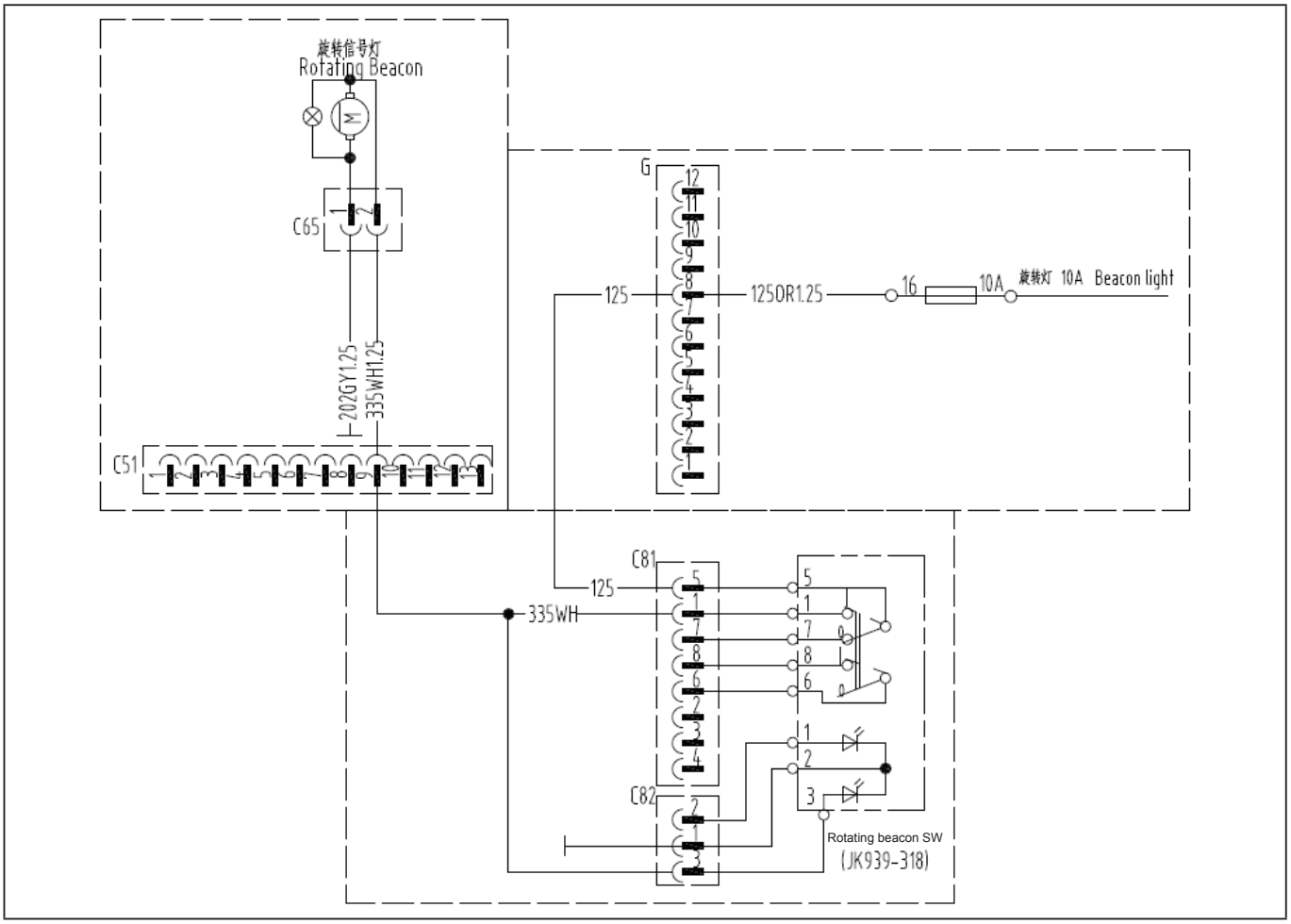
Working conditions: -20˚C ~ 60˚C

Operation

Electric lock is ON, Fuse 16 is energized, closed rotating beacon switch to the ON position. Rotating beacon switch and rotating beacon switch are connected to indicator, powered.

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Wiring diagram



Troubleshooting

1. Check fuse;
2. Rotating beacon is closed, check rotating beacon whether the connector 2 pin 12V voltage, and 1 pin earthing is valid; if they are intact, check the rotating beacon is faulty;
3. Use a multimeter to check rotary beacon switch off the situation meets the requirements of the factory;
4. Refer to wiring diagram using a multimeter check whether there is a fault line.

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3.14 Work system fault

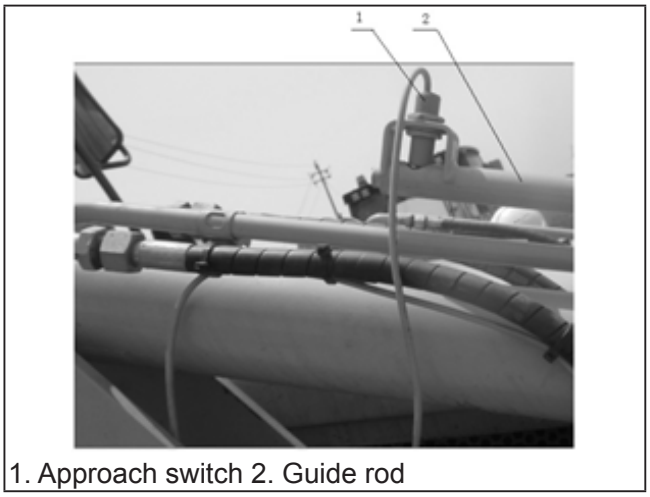
3.14.1 Level the bucket

Parameters

Bucket flat limit switch: constant-off switch

Operation

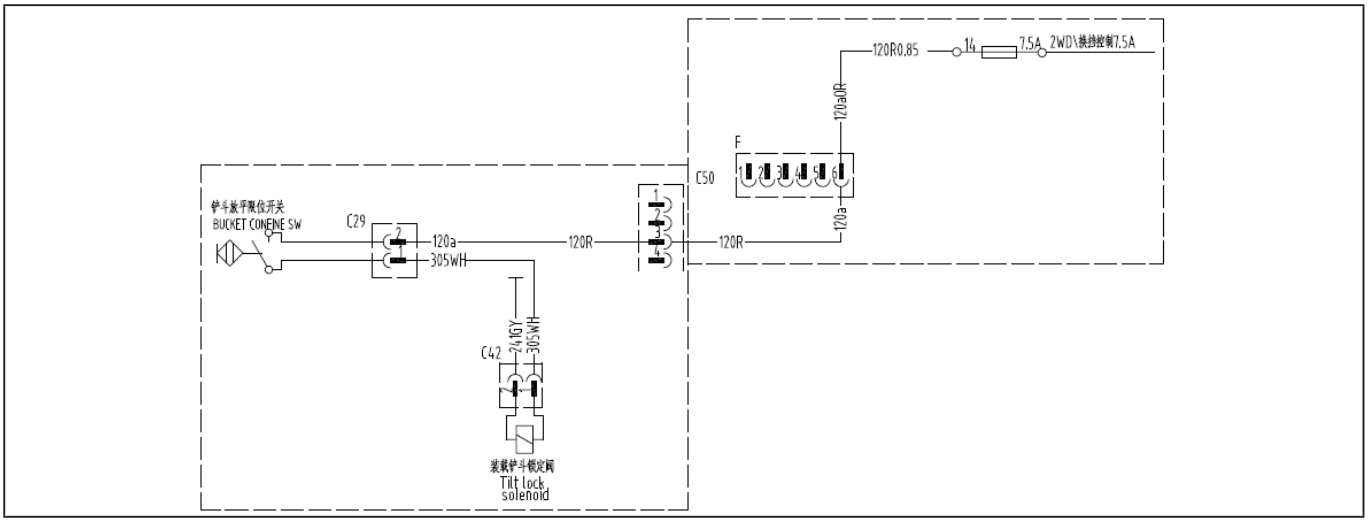
When loading end is working, close fight, it will load the operating handle to play to the limit position, power is supplied by the fuse 14 flat by the bucket flat limit switch to provide power to the bucket lock valve, lock the operating handle will be loaded until the bucket is reset, bucket flat limit switch is disconnected, loader buckets unlock the lock valve, loading the operating handle back into position.



1. Approach switch 2. Guide rod

Troubleshooting

1. Check the fuse, the bucket flat limit switch performance, line;
2. If the first step in checking intact, loader buckets lock valve tremble not reset state power ground are valid, then check out the bucket lock valve failure.



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3.14.2 Unloading

Operation

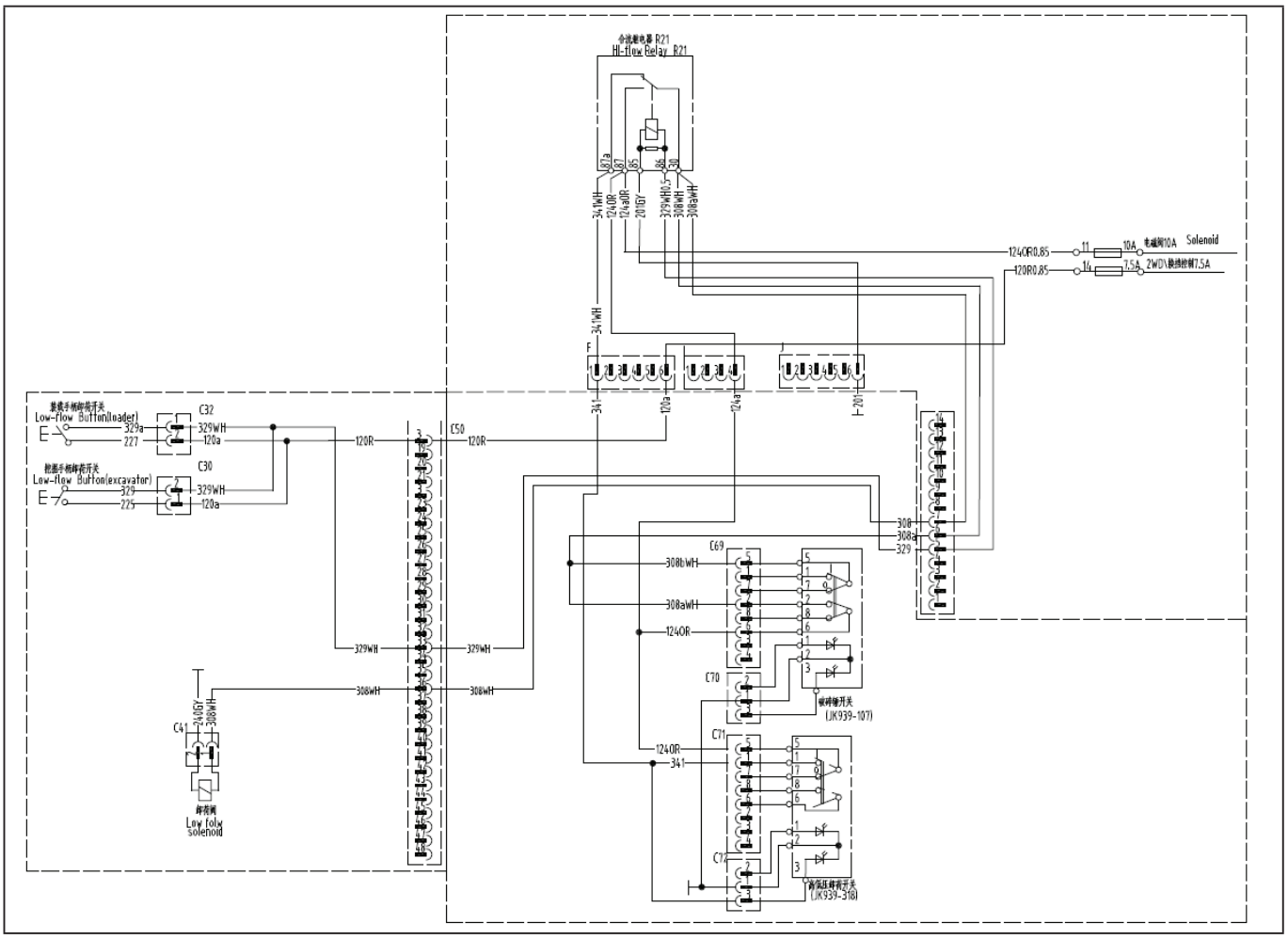
In 777A/766A electrical systems, loading handle unloading switch, backhoe handle unloading switch, high and low pressure unloading switch, hydraulic hammer switch can play unloading functions.

Loading handle unloading/backhoe handle unloading: loading handle unloads/backhoe handle unloading is closed, the confluence relay pulls, power is supplied by the fuse 11 by merging the relay contacts to unloading solenoid valve power supply.

High and low pressure unloading switch: loading handle unloading/backhoe handle unloading is not closed, the confluence relay does not pull, power is supplied by the fuse 11 through high and low pressure unloading switch and confluence relay contacts to the unloading solenoid valve.

Hydraulic hammer switch: hydraulic hammer switch is closed, the power is given by the fuse 11 unloading solenoid valve.

Wiring diagram



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Troubleshooting

1. Check fuse
2. Loading/backhoe handle unloading switch fails, press the loading handle unloading switch, check hydraulic hammer relay power and earthing is valid; if effective, inspect hydraulic hammer solenoid valve failure; if invalid, check the power supply to the fuse 12 via relay contacts to hydraulic hammer solenoid circuit failure.
3. High and low pressure unloading switch fails, press high and low pressure switches.
4. Hydraulic hammer switch fails, press hydraulic hammer switch.

3.14.3 Hydraulic hammer switch

Position

Hydraulic hammer switch is in the side of the instrument cover, hydraulic hammer pedal on the floor of the cab excavation side.

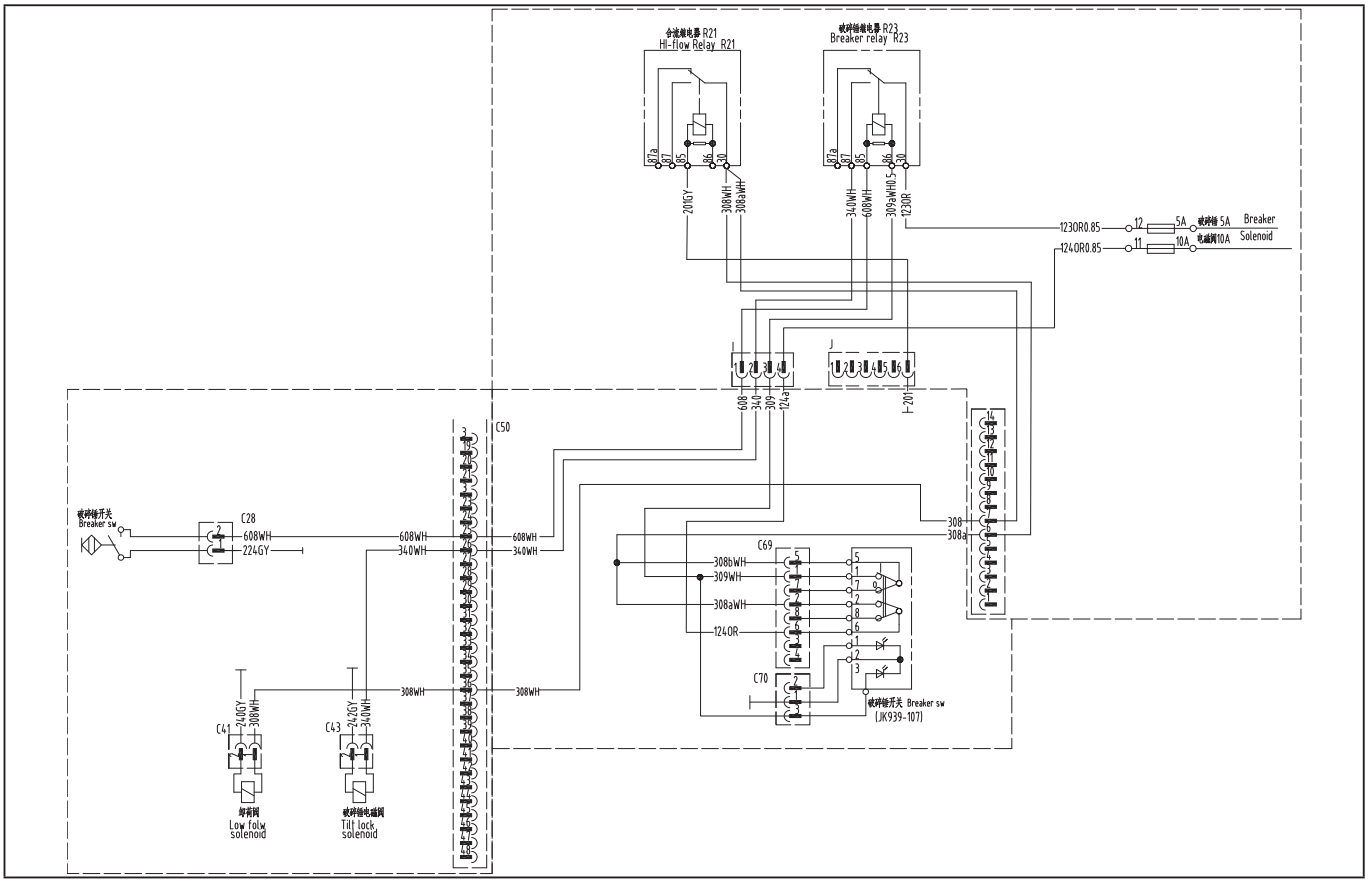


Operation

After starting the machine, press the hydraulic hammer switch, hydraulic hammer relay pulls, unloading valve is energized, the power supply 12 through fuse through contacts to hydraulic hammer valve powered by hydraulic hammer pedal control valve earthing. When hydraulic hammer pedal switch is depressed, the switch is closed, the solenoid valve hydraulic hammer earthing, hydraulic hammer begins to work.

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Wiring diagram



Troubleshooting

1. Check fuse 11# and 12#;
2. Electric lock is ON gear, close hydraulic hammer switch, check whether the unloading valve connector has 12V voltage. If not, check the line; when unloading valve power and earthing are valid, unloading valve does not work, unloading valve may be faulty.
3. Electric lock is ON gear, close hydraulic hammer switch, check the hydraulic hammer switch connectors C69 6,1,2,5 whether there is 12V voltage, if there is voltage 6,1,2,5 not, check the hydraulic hammer switch meets the requirements of the factory; if 6 there is no voltage, check the fuse to the hydraulic hammer switch circuit;
4. Electric lock is ON gear, close hydraulic hammer switch, press hydraulic hammer pedal switch, hydraulic hammer relay does'nt pull, check the hydraulic hammer relay coil power and earthing is valid; if invalid, check the line; if valid, check whether the hydraulic hammer relay has failure;
5. Electric lock is ON gear, close hydraulic hammer switch, press hydraulic hammer pedal switch, hydraulic hammer relay pulls, check the hydraulic hammer relay power and earthing is valid; if valid, check if hydraulic hammer solenoid valve failure; if invalid, check if the power supply to the fuse 12 through hydraulic hammer relay contacts to the solenoid valve circuit of hydraulic hammer has failure.
   If no electrical fault, when the machine operating, there's clamping failure, it may be a hydraulic system failure.

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3.14.4 Clamping valve switch (777A)

Position

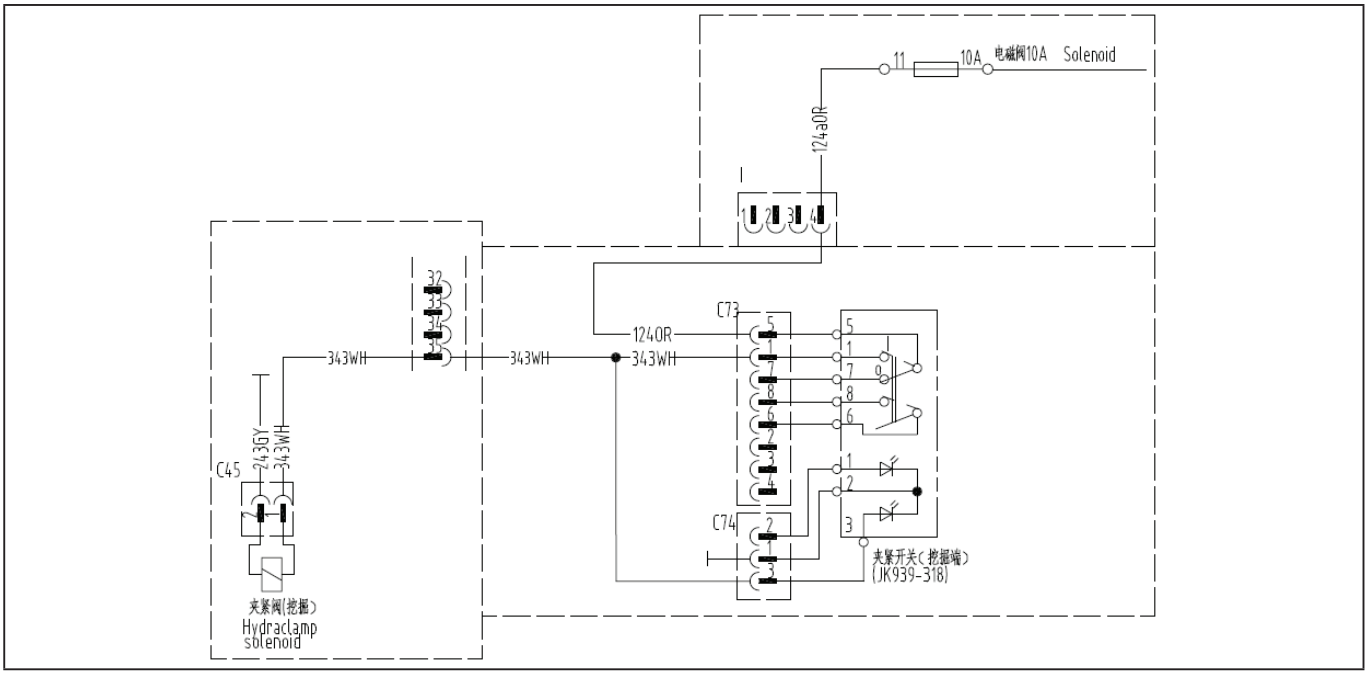
Clamping valve switch is located on measuring instruments cover.

Operation

When machine is operating, adjust the excavation side excavation arm position, press the clamping valve switch, clamping valve is energized, the clamping excavation end support under the action of the clamping cylinder grips.

Troubleshooting

1. Check fuse 11#;
2. Electric lock is ON gear, clamping switch is closed, check the power of clamping valve end and earthign is valid; if valid, then check whether the clamping is faulty;
3. Check the clamping switch meets the requirements of the factory;
4. Electrical components are no failures, check the fuse 11 to clamping valve is faulty;
   If no electrical fault, when the machine operating, the clamping failure, may be a hydraulic system failure.



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3.14.5 Fan (optional convertible)

Position

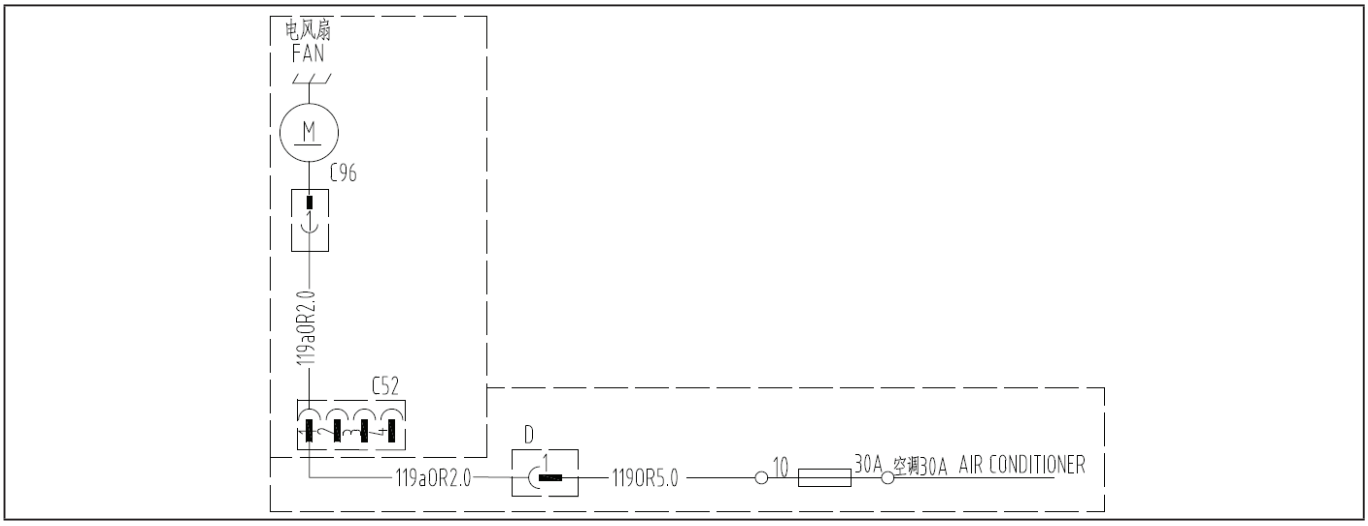
Located in the right side of the cab roof

Operation

Electric lock ON position, toggle switch on the fan, fan works.

Troubleshooting

1. Check fuse 10;
2. Electric lock is ON gear, check whether there is 12V voltage in fan power supply terminal; if no, check the fuse 10 to fan lines;
3. If the fan power supply and earthing are effective, fan may have failure.

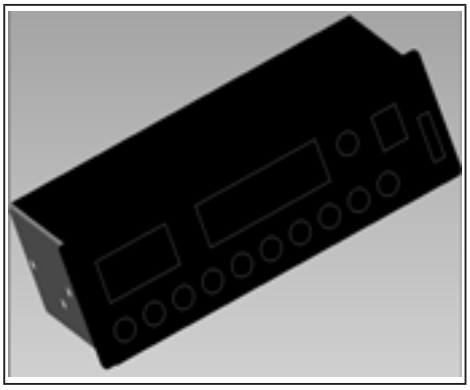


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3.14.6 Radio

Position

Radio is located in side of the instrument hood, roof antenna is located right behind the cab.



Parameters

Working voltage: 10-13.6 V

Working temperature: -20~70℃

Max. output power: 10W+10W

Configuration: two horns, a USB port, an antenna. Hosting control panel designed as a closed structure to ensure waterproof and dustproof.

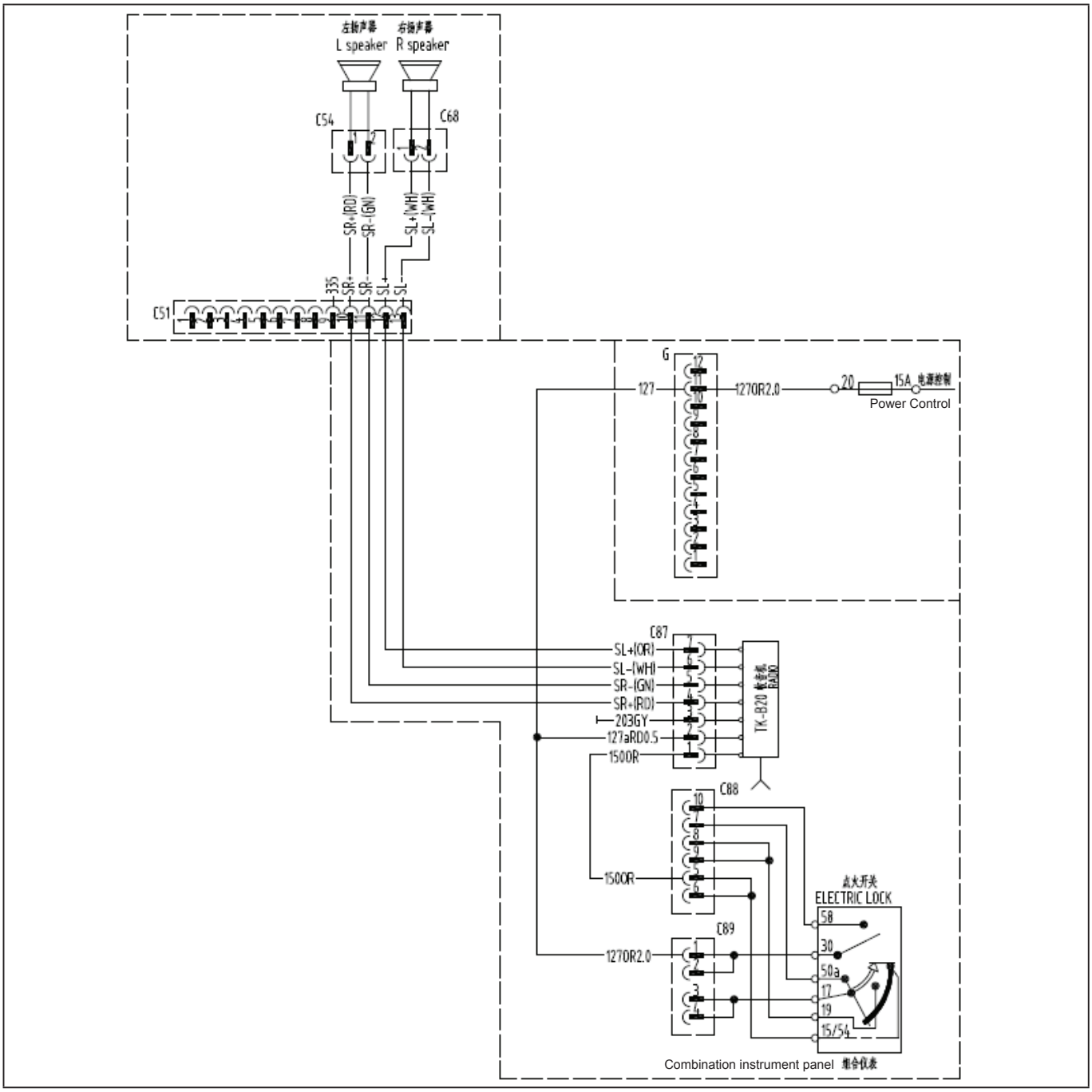
Operation

Operating instructions, see the radio operation manual. Only when the starter switch is not in the OFF position when you can use the radio.

Troubleshooting

1. Check fuse
2. Electric lock is in the OFF gear, check if the voltage of pin 2 of the connectors C87 is 12V, no, check the fuse box to the radio circuit;
3. Electric lock is in the ON gear, check if the voltage of pin 1 of the connectors C87 is 12V, no, check the fuse box to the radio circuit;
4. If the measurement to determine the power supply and earthing are no problem, presumably radio or horn failure.

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3.14.7 Front wiper/ washer

Position

Front wiper is located on the front window glass, the front wiper motor is in the front steering gear box hood. Front wiper, washing switch are in combination switch on the right handle.

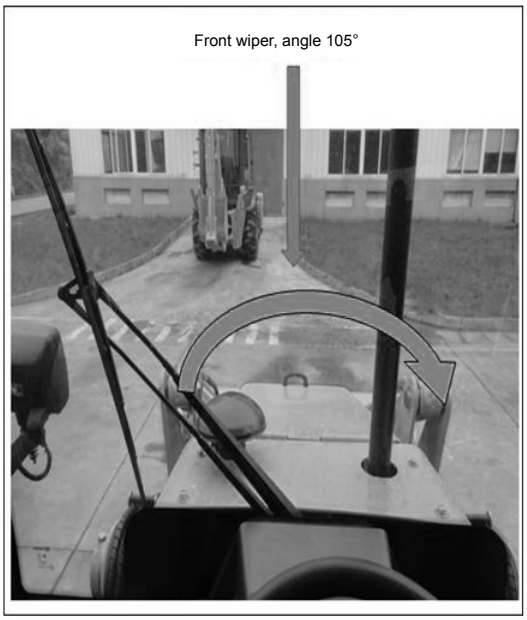
Operation

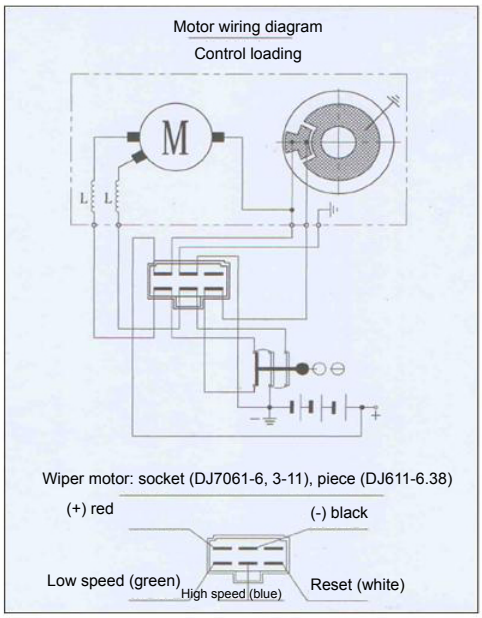
Control:

1. There are 2 gears on wiper:
   II gear rotates from the combination handle to II gear, wipers work intermittently, intermittent time is longer;

   II gear rotates from the combination handle to II gear, wipers work intermittently, intermittent time is shorter;

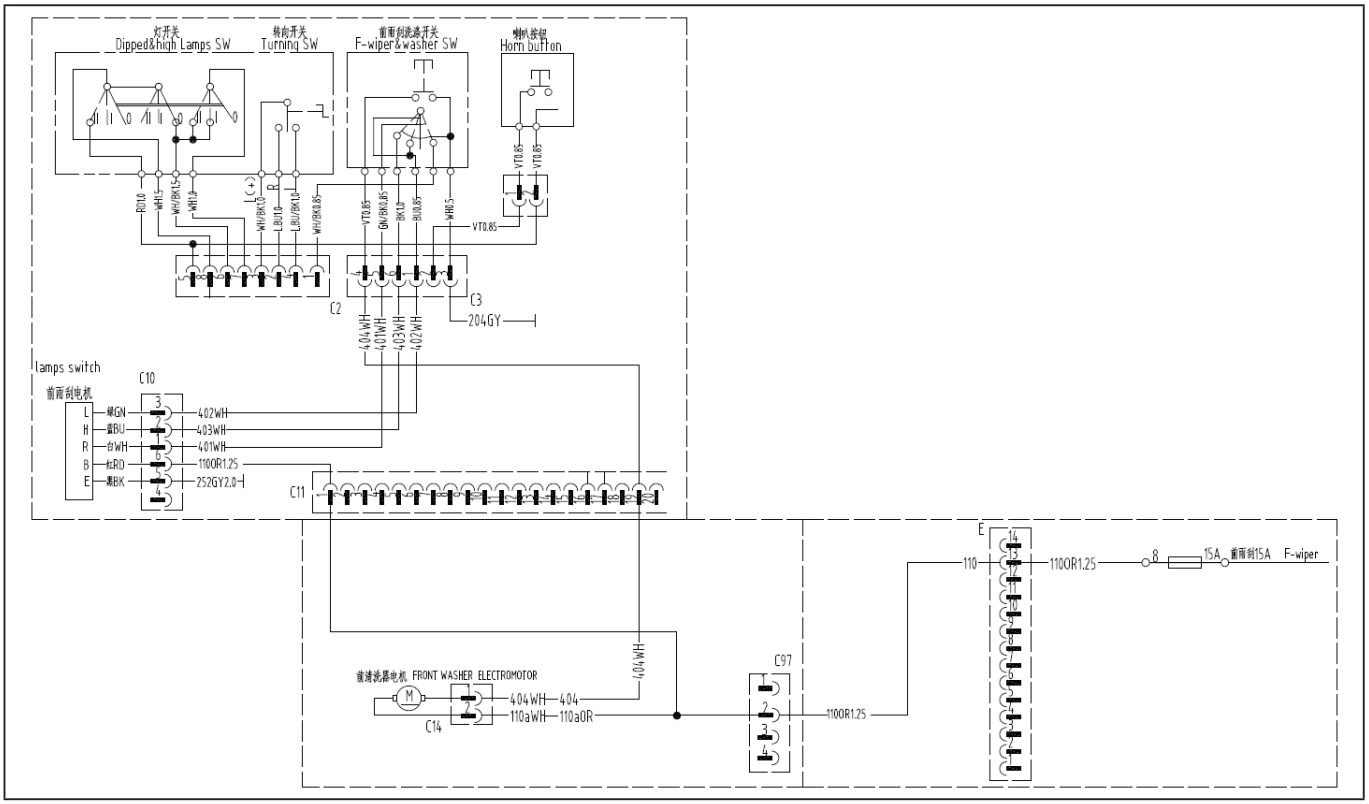
2. Press washer switch, nozzle plays water, wiper continuous scraping action.





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Wiring diagram



Troubleshooting

The first step: wiper motor is generally low level control, when the dysfunction occurs when the wiper motor comes with the red wire to the power B +, black wire to the power B-, another control lines detect the function corresponding to each of the wires according to electrical schematic diagram (B-);

The second step; currently wiper does not work, but after testing the power input, check the wiper brush mounting position is reasonable, swing around scope and tightness of mounting bolts can cause the wiper does not function to work; checking wiper motor drive institutions intact, whether to complete the driving function.

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3.14.8 Rear wiper/washer

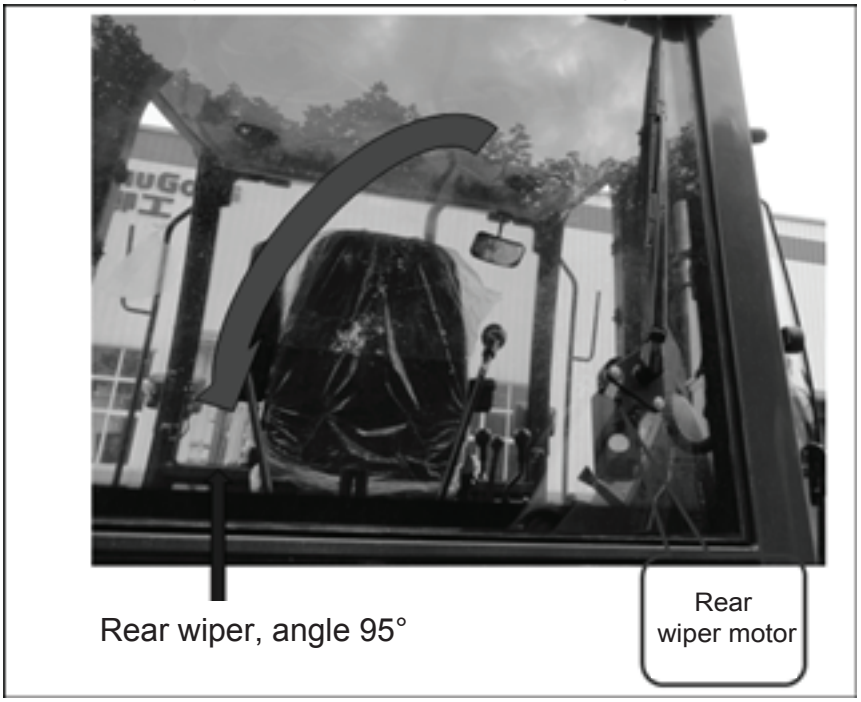
Position

Rear wiper switch is in the side of the instrument panel, the rear wiper controller is located in side instrument hood, installed on the air evaporator. Rear wiper is installed on the rear window.

Operation

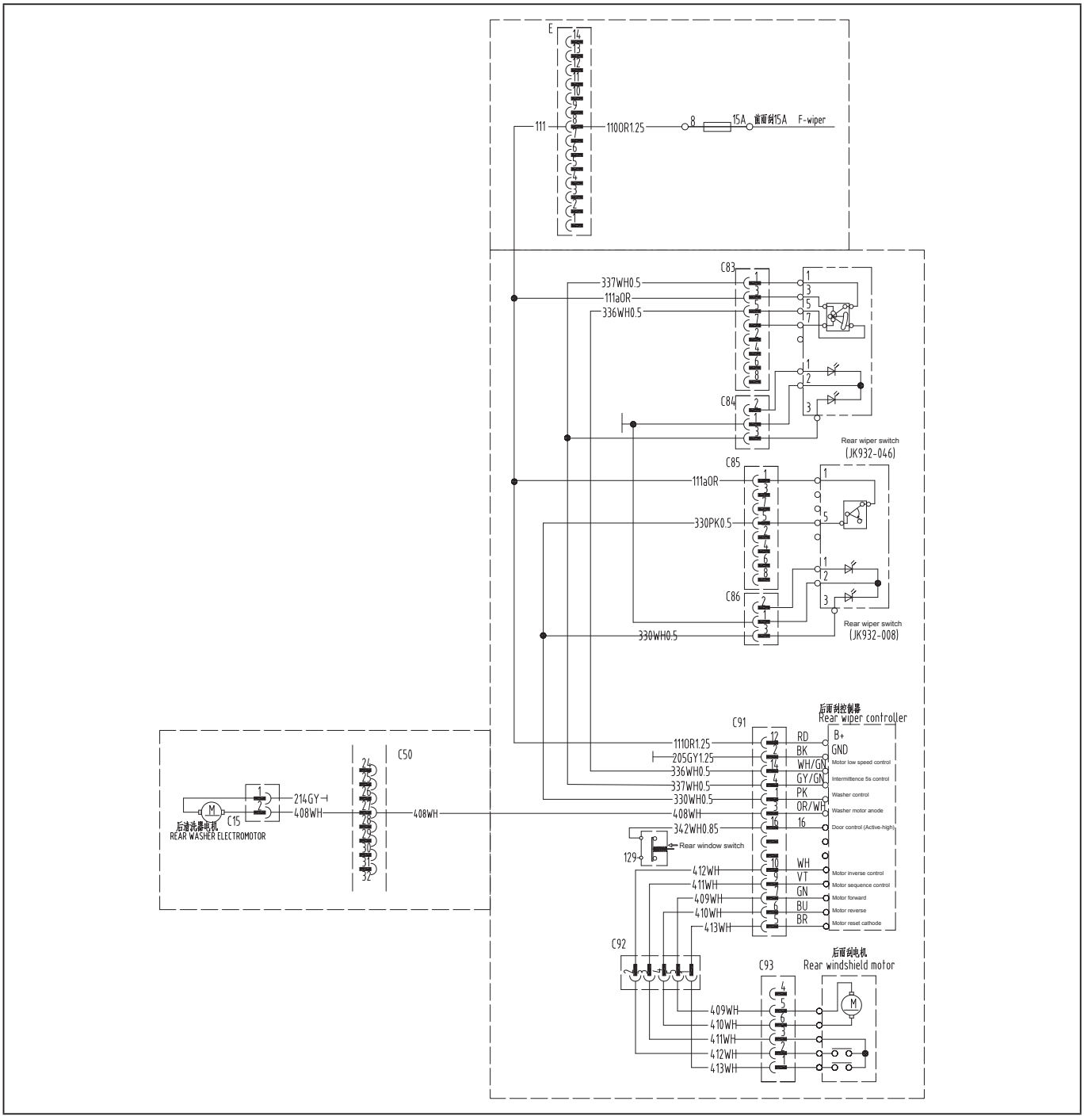
Cab rear wiper switch control rear wiper controller. Rear wiper controller provides power supply by the fuse 8 and continued supply.

1. When the wiper switch is not energized, the wiper motor is always energized for reversing wiper to its stop position. Divided into two gear wiper with wiper switch control: I gear, click the switch, wiper work intermittently, intermittent time is 5s. II gear, and then click the switch, wiper continuous work;
2. Press washer switch, nozzle plays water, wiper continuous scraping action.



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Wiring diagram



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Troubleshooting

1. Open the electric lock and the switch is turned on, turn off the rear window, and then use a multimeter to measure the voltage of the following terminals of the rear wiper controller C91.
   When the wiper is in the stop position, measure terminal 12 and it should be 12 V;

   When the wiper position in the 1st gear, measure terminals 6 and 4, there should be 12 V;

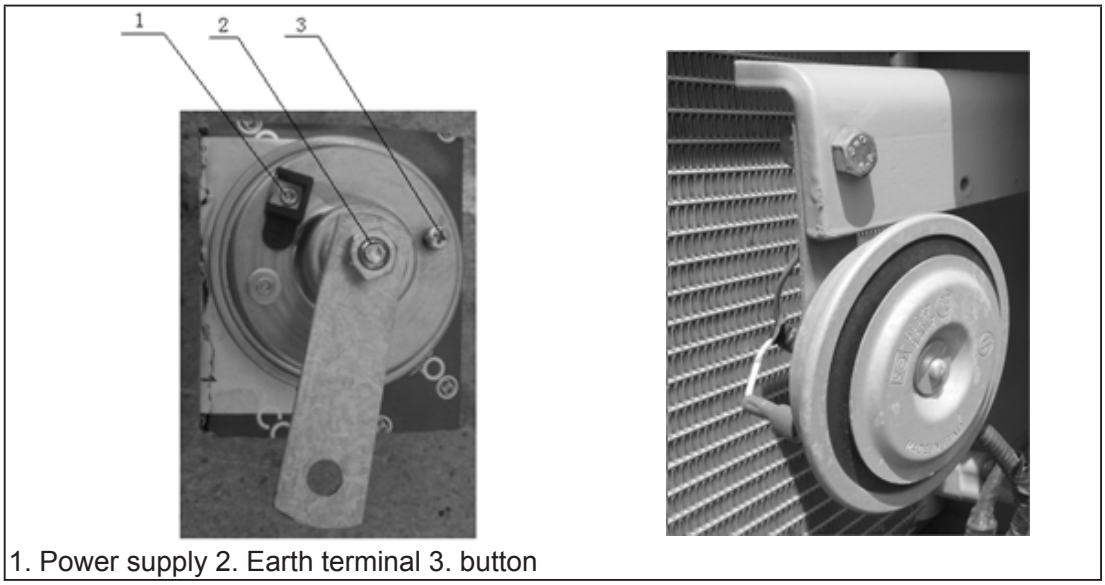
   When the wiper position in 2nd gear, measure terminals 6 and 14, there should be 12 V.

   When washing switch is closed, the measurement terminals 6, 3 and 1 should be 12 V.
2. If the above measurement all have corresponding voltage, and the wiper does not work, replace the wiper motor.

3.14.9 Front horn (synchronization shift)

Position

Front horns are located above the battery, inside the front cover door. Front horn switch is located on the right handle end face of the combination switch.



1. Power supply 2. Earth terminal 3. button

Parameters

Voltage: 12 V;

Current: 4A;

Using temperature: -40˚C ~+85˚C

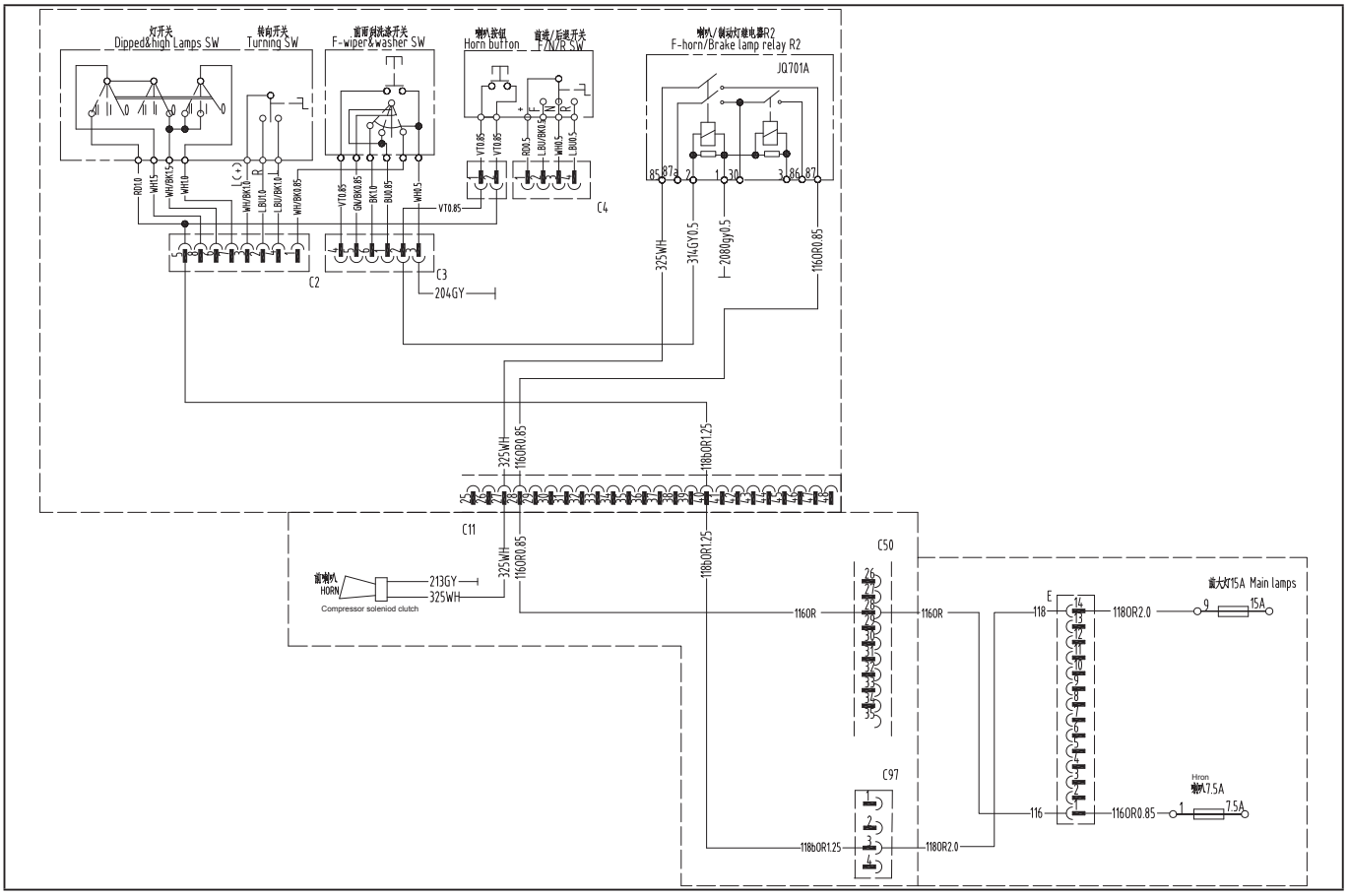
Operation

Press the load-side combination switch located in the cab at the top of the right handle horn button, horn will sound.

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Annex1 (continued)

Wiring diagram



Troubleshooting

1. Check the fuse No.1,9 is normal, if broken, replace it;
2. Press the front horn switch, use a multimeterto check horn voltage and earthing is valid; if valid, then check whether the horn has fault; no voltage, the next step;
3. Press the horn switch, use a multimeter to check the conduction through the horn switch case. If you do not turn, check the combination switch. If there is continuity, check the horn relay is energized, if not pull, check the fuse 9 through front horn switch to the coil circuit is faulty;
4. Check the fuse 1 has failure between horn relay contacts and horn lines.

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3.14.10 Rear horn

Position

Rear horn is located in the rear part of frame. Rear horn switch is located on the excavation side control lever.



Parameters

Voltage: 12 V;

Current: 4 A;

Using temperature: -40℃ ~+85℃

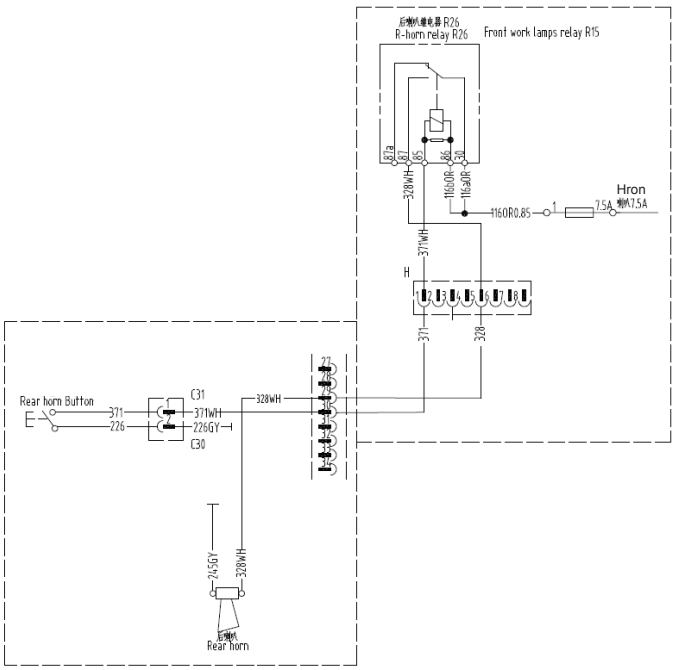
Operation

Press the horn button on the left lever top of the cab excavation end, horn will sound.

Troubleshooting

1. Check the fuse No. 1 is normal, if broken, replace;
2. When pressing the rear horn switch, use a multimeter to check horn voltage and earthing is valid; if valid, then check whether the horn fault; if no voltage, the next step;
3. Press the horn switch, use a multimeter to check the conduction through the horn switch. If there is no conduction, replace switch. If turned on, check if rear horn relay pulls; if it doesn't pull, check the relay coil earthing to the rear horn switch to coil line;
4. Check the fuse 1 has failure between rear horn relay contacts and horn lines.

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3.14.11 Cigarette lighter

Position

Cigarette lighter is located on the side instrument panel AS.



Parameters

Power: 12V/108W; current ≤ 9A

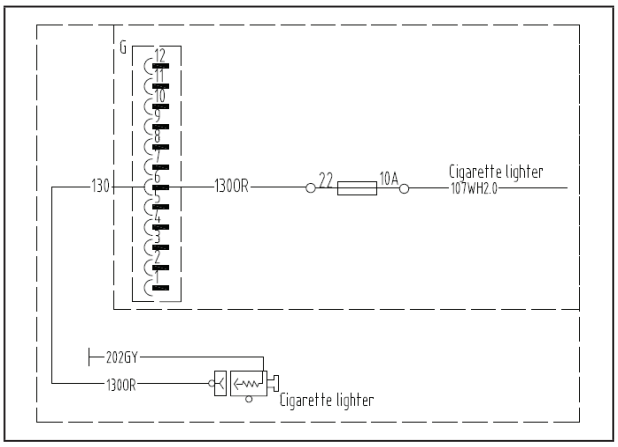
Ambient temperature: -45℃ ~85℃

Operation

Press the cigarette lighter button until it locks into the socket in a few seconds after the lock release button will automatically pop up, remove the cigarette lighter.

Note: The other side coils of the cigarette lighter has been heated, hot coil can cause severe burns.

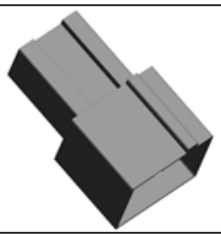
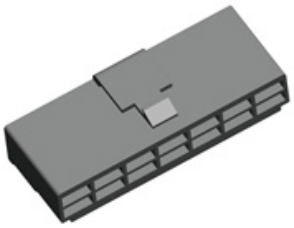
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Troubleshooting

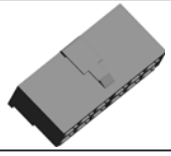
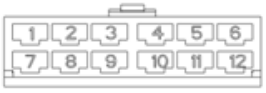
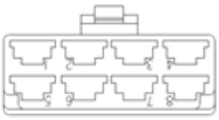
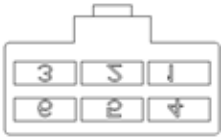
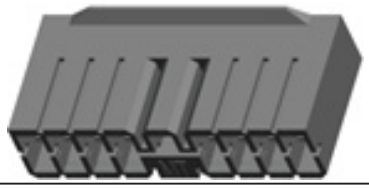
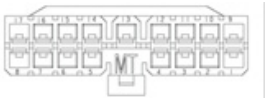
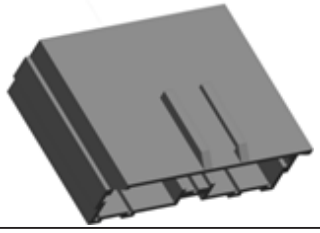
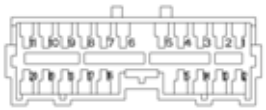
1. Remove from the cigarette lighter button from socket.
2. Use a multimeter to measure the conduction situation between the socket inner wall and machine chassis (earthing).
3. Measure DC voltage through the insulating ends of the socket center and the inner wall, if working properly, the voltage should be +12V.
4. If there is no +12V voltage in the cigarette lighter, check the fuse 22; If the fuse has no problems, it is conferred to be harness failure.
5. If the measurement makes sure the power supply and earthing are correct, the fault lies in the cigarette lighter button, which should be replaced timely.

Annex1

Code	Shape	Terminal	Usage	Remarks
DJ7013-7.8-20C			A	
DJ7022-7.8-20			C	
DJ7013-9.5-20			D	
DJ7141-6.3-20			E	

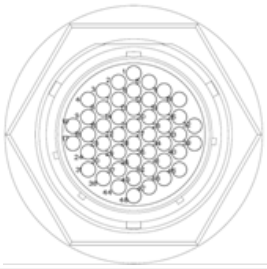
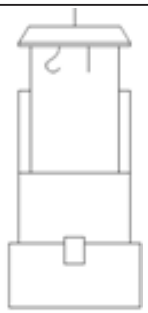
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Annex1 (continued)

Code	Shape	Terminal	Usage	Remarks
DJ7121-6.3-20			G	
DJ7081-6.3-20			H	
DJ7068-6.3-20			J	
DJ7083-6.3-20			K	
DJ7171-3-21			X1	
DJ7201-2-10			C1	
DJ7081B-6.3-10			C2	
DJ70411-6.3-20			C4	
DJ7023-6.3-20			C7/C99/C9	

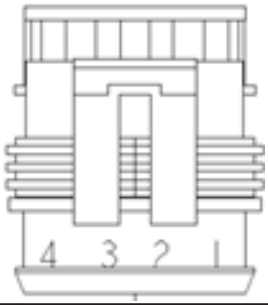
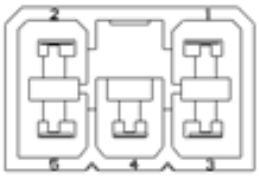
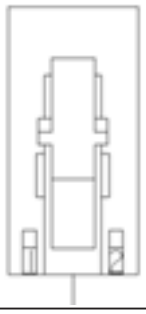
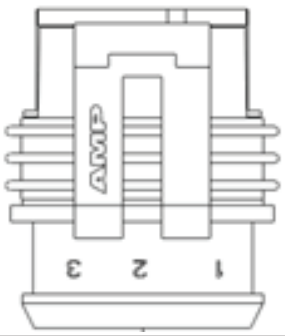
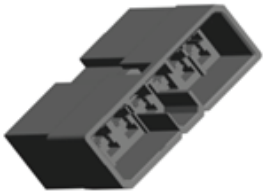
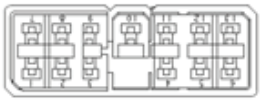
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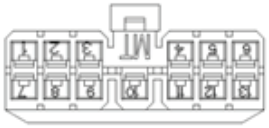
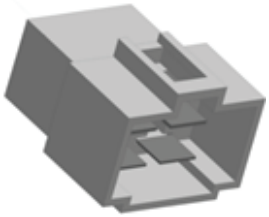
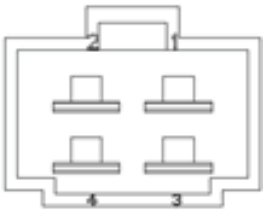
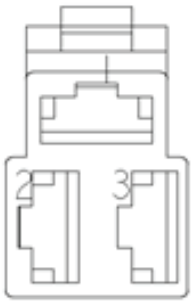
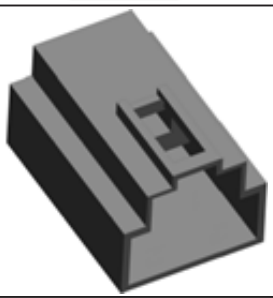
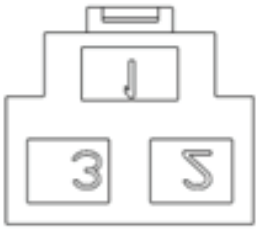
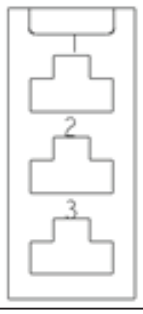
Code	Shape	Terminal	Usage	Remarks
192900-0425			C11/C50	Frame harness
192900-0437			C50/C11	Cab/Steering gear box harness
DJ70116-6.3-20			C12	
DJ7021-1.5-10			C14/C15/C30/C31/ C32/C33	
DJ7021-1.5-20			Manual brake switch/ C18/C28/C46/C47/ C100/C38/C43/C29/ C65	

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Annex1 (continued)

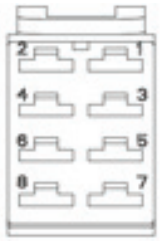
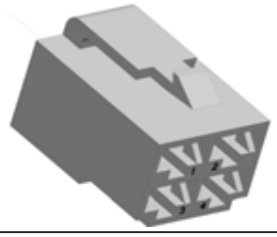
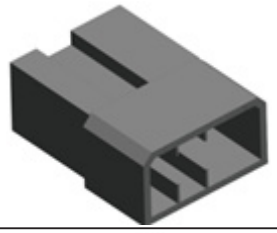
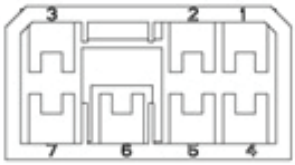
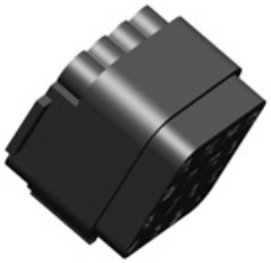
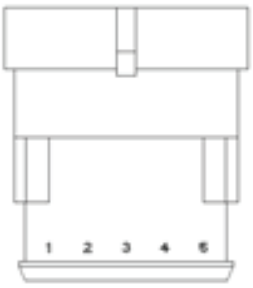
Code	Shape	Terminal	Usage	Remarks
7701996003			C17	
DJ7041-1.5-20			C23/C22	
DJ7051-3-10			C24/C26	
DT06-02S			C45/C44/C42/C41/ C40/WD/CR/CF/4G	
DJ7031-1.5-20			C53/C39	
DJ7131-3-10			C51	Cab harness

Annex1 (continued)

Code	Shape	Terminal	Usage	Remarks
DJ7131-3-20			C51	Work light harness
DJ7041-6.3-10			C52	
DJ7031-6.3-20			C53	Work light harness
DJ7031-6.3-11			C53	Cab harness
DJ7022-6.3-20			C66	
DJ7031-2.8-20			C76/78/80/82/72 /70/74/84/86	

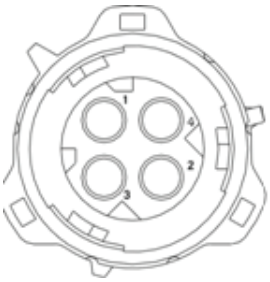
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Annex1 (continued)

Code	Shape	Terminal	Usage	Remarks
DJ7086-6.3-20			C69/85/83/71/81/79/77/75/C5/C6/C98/C8	
DJ7041-6.3-20			I/C95/C52/C63/C64	
DJ7072-3-10			C87	
09706-16120-21			C91	
DJ7051-1.5-10			C92	

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Annex1 (continued)

Code	Shape	Terminal	Usage	Remarks
DJ70116-6.3-10			C94	
121583-0000			C97	Frame harness
121583-0008			C97	Cab harness

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6. A/C System

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A/C System Fault Diagnosis and HFC-134a System Detection

Precautions

Only technical personnel, who have been professionally trained or certified by related institutions, will be allowed to provide services and repairs for the A/C system of engineering vehicles. When service the A/C system of the machine, be sure to reserve the refrigerant in the system for reuse after repair.

Currently refrigerant HFC-R134a, which is used in the A/C system, is quite stable chemically, and does not contain any CFC group with damage effect to atmospheric ozone layer.

In order to protect yourself, you must follow a few items when working in an environment with HFC-134a:

1. When working near the A/C system, you must wear goggles. Because if liquid refrigerant splashed into the eyes, it can cause serious injury. When the refrigerant is splashed into or around your eyes, you should immediately follow these steps:
   A. Rinse eyes with water for about 15 min.
   B. Immediately go to hospital.
2. If liquid refrigerant drops on the skin, it can cause skin frostbite. Therefore, when maintaining the A/C system, you should open the A/C equipment carefully and slowly. If the refrigerant accidentally stained on the skin, it is not necessary to see a doctor.
3. The container holding refrigerant must be placed upright, as well as avoid heat and sunlight. Refrigerant temperature rise will lead to increased pressure within the container.
4. When you need for welding or steam cleaning near the A/C system, you must first recycling A/C system refrigerant.
5. During a test of refrigerant and before recycling refrigerant, first check the temperature and pressure of the A/C system.
6. When the refrigerant contacts with flame, they will react to produce a toxic gas.
7. Experimental results show that mixture of compressed HFC-134a and the air will generate a flammable gas. Therefore, it is not allowed to compress air or smoke when detecting the system leakage.
8. Before removing any component of the A/C system, you should recycle refrigerants.

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Figure1.1 Refrigerant Recollecting, Reuse and Refilling Apparatus (SPX 347112K)

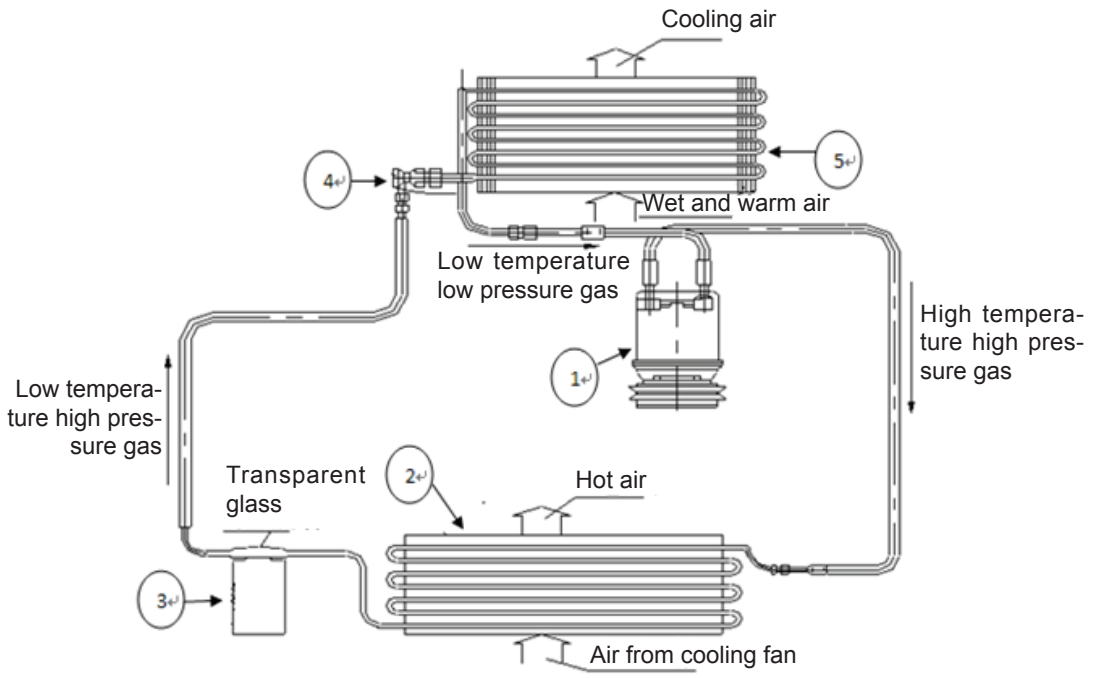
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Operation

A/C system refrigerant circuit consists of five main components : a compressor, a condenser, a refrigerant receiver, an expansion valve and an evaporator. These components are connected by pipelines to form a closed system. The refrigerant used in the A/C system is HFC-134a.

The refrigerant at the inlet of the compressor is gaseous in low pressure, and turns into high pressure gas after compressed by the compressor, then flows into the condenser. After the refrigerant flows through the condenser, most heat will be dissipated. Therefore, the refrigerant will be condensed into high pressure liquid.

The liquid refrigerant in high pressure then flows into the refrigerant receiver after through the condenser. there is absorbent material Inside the refrigerant receiver, which can absorb water in the A/C system, in order to prevent corrosion caused by water to the inside of the A/C system components.



1. Compressor 2. Condenser 3. Reservoir 4. Expansion valve 5. Evaporator

Fig. 1.2

The refrigerant flows to the expansion valve in high pressure liquid after passing through the refrigerant receiver. Expansion valve will release pressure of the refrigerant to drop its pressure, and then flow into the evaporator core. The evaporator controls the expansion valve to release a suitable amount of refrigerant according to its own thermal load.

When the refrigerant flows through the evaporator core, it will absorb heat around the evaporator core and in the air to flow through the evaporator fins. The refrigerant will evaporate into low pressure gas under the combined effect of heat rise and pressure drop, and cool down temperature of the air passing through the

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evaporator fins. Therefore, the cool air will flow from the evaporator into the cab, and make the operator feel comfort.

Electrical components of the A/C system include a control panel, temperature sensors, fan motors, fan resistors, compressor electromagnetic clutches and pressure switches etc.

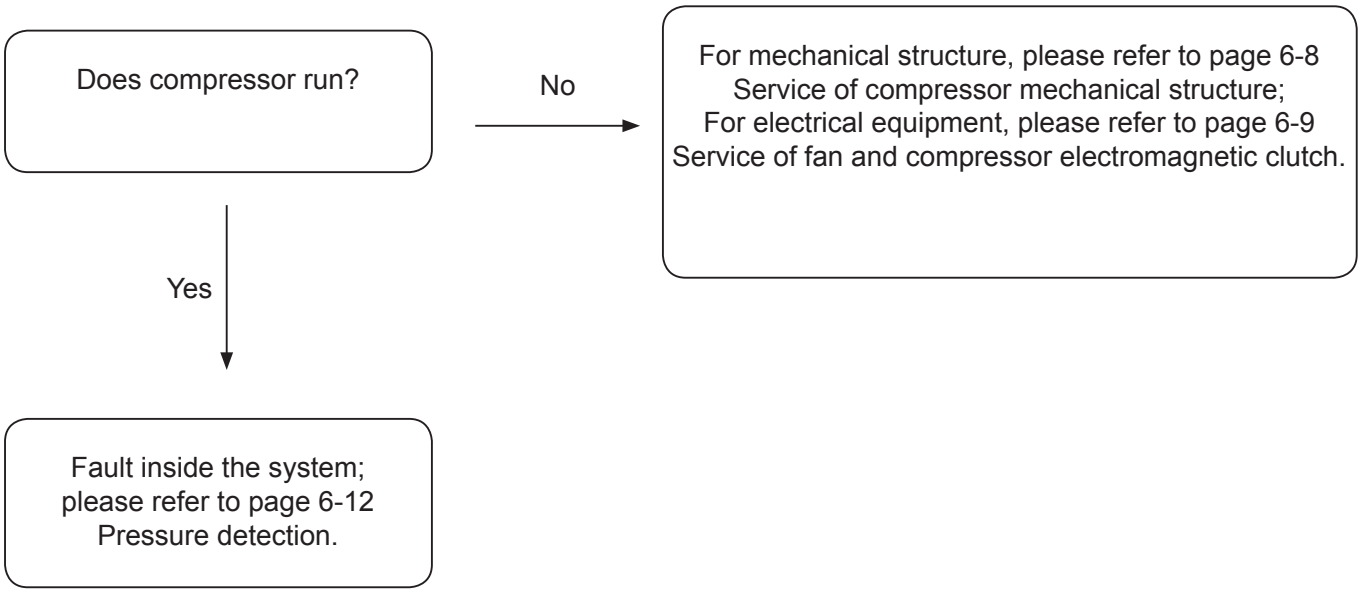
Troubleshooting

First, observe the state of the machine carefully, check as the following and correct if necessary:

1. View previous service records of the machine.
2. Check whether the compressor belt is tensioned.
3. Check whether fins, fan blades, condensers, filters or evaporators have been clogged.
4. Check whether the A/C lines have been excessively bent or knotted.
5. Check whether there are leaks on the components, which have a large accumulation of oil or oily dust.
6. Check whether the air ducts are intact, and seals are in right place.
7. Check whether the condensate drain lines and valves are blocked.

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Fault: no refrigeration



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Fault: insufficient refrigeration

Heater
Confirm the heater control is closed, and also heater water vlave is closed, no coolant flowing through heater core

Seal
Confrim the seal parts are installed correctly

Mechanical structure
Please refer to page 6-8 Service of compressor mechanical structure, and refer to page 6-12 Service of evaporator heater core

Electrical parts
Please refer to page 6-9 Service of fan and compressor electromagnetic clutch

Refrigerant
Please refer to page 6-10 Temperature detection

System inside fault
Please refer to page 6-12 Pressure detection

Fault: intermittent refrigeration

Mechanical structure
Please refer to 6-8 Service of compressor mechanical structure

Electrical parts
Please refer to page 6-9 Service of fan and compressor electromagnetic clutch - service of fan motor, fan switch and compressor electromagnetic clutch

System inside fault
Please refer to page 6-12 Pressure detection

Fault: system has abnormal sound

Please refer to 6-8 Service of compressor mechanical structure and fan motor

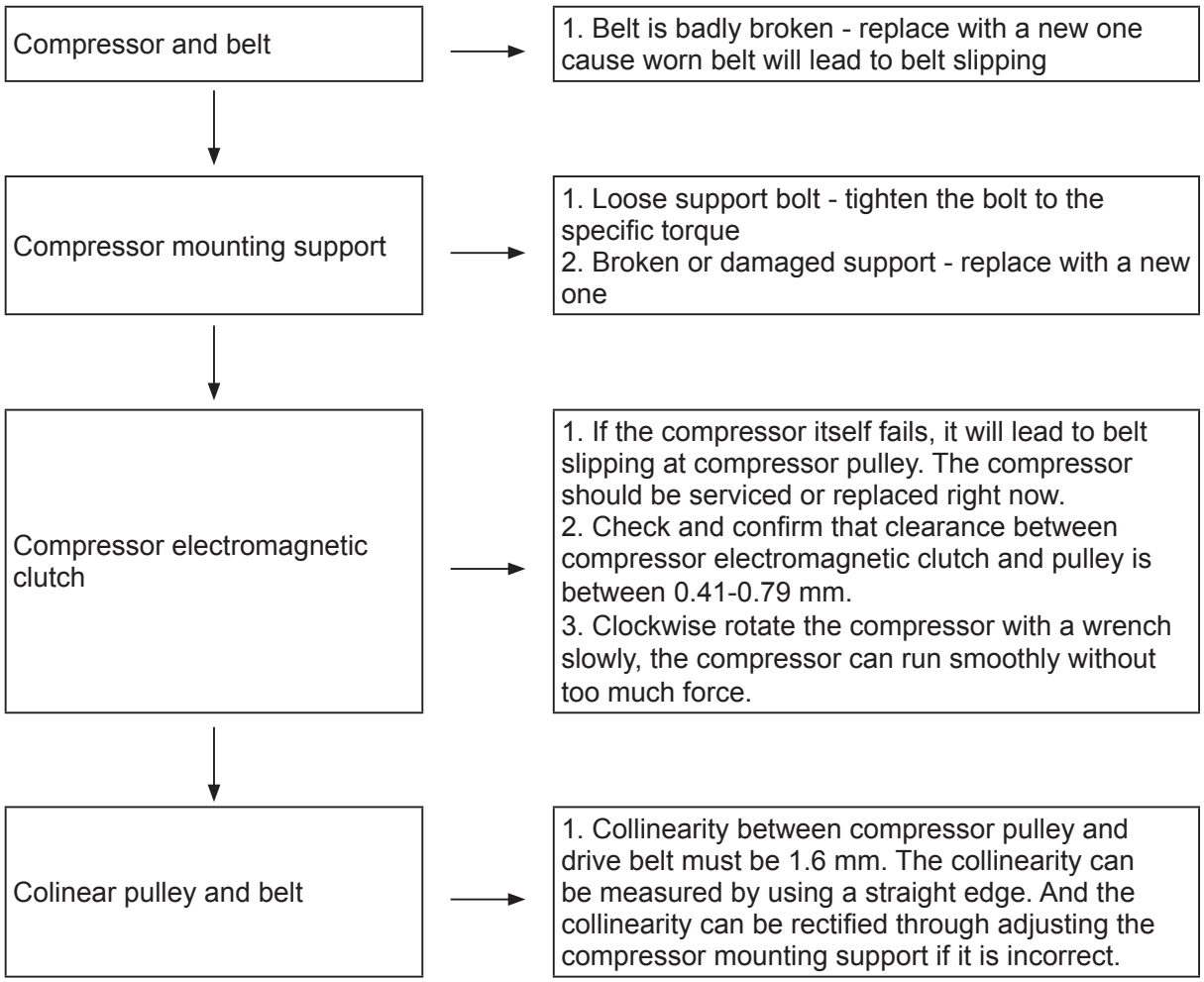
Electrical parts
Please refer to page 6-9 Service of fan and compressor electromagnetic clutch

System inside fault
Please refer to page 6-12 Pressure detection

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System service

Service of compressor mechanical structure



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Service of fan and compressor electromagnetic clutch

Compressor electromagnetic clutch	**Caution:** check the voltage of compressor connectors when in an energized state. If no current passing, the voltage will drop. 1. If no current passing through electromagnetic clutch and excessive voltage drop at the earthing points of electromagnetic clutch is detected, please refer to Section three and replace the compressor.
Pressure sw	1. Please refer to Section three and check if the pressure switch is closed.
A/C system fuse	1. Check if A/C system fuse is blown.
Blower speed sw	1. Check the switch function. The switch should have 4 shifts: Close, Low-speed, Mid-speed, High-speed. 2. Check wiring connectors for looseness and harness for wear. If any, please repair. 3. Check the speed resistor.
Blower motor	1. Check if blower motor harness is correct, if not, please repair or replace. 2. Check motor earthing cable and confirm that it was well contacted with support.
Temp control sw	1. Keep the key sw is power-on and tune the temp sw to the max. refrigeration position. The compressor electromagnetic clutch will act. **Caution:** blower must be in work state as the power supply of temp control sw is controlled by blower sw. 2. Close the blower sw. Cut off the temp controller wiring. Use ohms range to test the continuty of temp sw ends. When in max. refrigeration position, replace the temp sw if it is not conducted.

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Cab temperature detection

Air inlet and outlet	1. In order to experience the A/C effect efficiently, please confirm that the air outlet and air return outlet are fully open. The defrosting air outlet must be closed. 2. Check the blower which must be operating.
Temperature of line	**Caution:** the line may be hot, and please pay attention when feeling the line temperature. Approach slowly with fingers and touch the line several times shortly, and the touching duration can be longer than that of last time. 1. Feel the line temperature. Generally, the temperature of high-pressure line is higher than that of low-pressure line. 2. If the temperatures of both are the same, it indicates that refrigerant is insufficient or the compressor does not work.
Temperature of air duct	1. Put the thermometer at the air duct port, turn on the cooling system for about 5min to keep the temperature stable. Refer to Page 12 for details. 2. If the system is working at the maximum effect, the temperature of air duct port must be lower than 25℃ (72 ℉). **Caution:** the ambient temperature must be between 27℃ and 43℃ (80 ℉ and 110 ℉). 3. If the temperature is higher than 25 ℃ (72 ℉), it indicates that refrigerant is insufficient, clogging occurs in some position, the compressor does not work normally or line sealing is poor.
Detection of temp sensor	1. Stop the engine, keep the machine energized, turn on the blower, and adjust the temperature control switch to the maximum. 2. Remove the temp sensor from the evaporator. Refer to Part III. 3. Put the end of temp sensor into ice water mixture. 4. After the sensor tube into the ice water mixture is cooled down, temperature control switch will cut off the current of compressor, and the compressor will stop. Detect the current at the terminal of control switch as introduced before. If the current is not cut off, it is necessary to replace the control switch.

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Observation and detection of leakage

Connect the compressor pipes	1. Confirm that all pipes are firmly connected and sealed. 2. Check all pipes for bend or damage, and replace them if any.
Leak detection	1. Close the engine. **Warning:** toxic gas may be generated when refrigerant contacts with open fire. DO NOT breathing in the toxic gas. 2. Test all the connectors with electronic leak tester. Refer to the method from instrument manufacture for use. **Caution:** clockwise rotate the electromagnetic clutch when testing the compressor tightness. **Caution:** remove the tie on the expansion valve to test tightness carefully. 3. Repair all leaks, and refill freon into the system, refer to Section two for specific operations.
Condenser	1. Confirm that no sundries blocked on the condenser outer surface, and well sealed. And confirm that condenser runs normally when the temp sw is open.

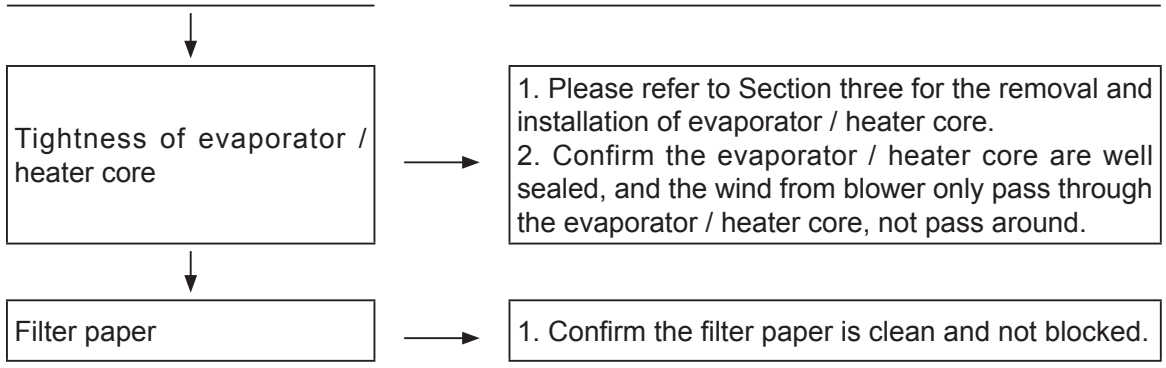
Detection of core of the evaporator / heater.

Confirm that heater water valve is closed already.

Evaporator / heater core

Evaporator / heater core	1. Please refer to Section three for the removal and installation of evaporator / heater core 2. Check the fins of evaporator / heater core. and straighten all bend or broken fins. 3. Test the liquidty of evaporator / heater core. If the core is dry, clear it with compressed air, brush, or vacuum cleaner. If the core is wet or covered with mud, clean it using a water hose without pressure. Make sure water is able to smoothly pass through the evaporator / heater core. **DO NOT use steam.** **Warning:** if the sytem is filled with freon already, DO NOT use steam to clean any A/C parts. The steam heat will improve the refrigerant pressure and may lead to system explosion then.

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Pressure detection

Multifuctional measuring device

NOTE : this measuring device can not optimize the system accurately, which has already charged with HFC-134a. Therefore, this device is better used to measure whether the system is charged with insufficient or excessive refrigerant, and then recycle refrigerant of the system, recharge HFC-134a to the specified amount of refrigerant.

Multifunctional measuring device is the most important tool for service services of the A/C system. As a troubleshooting tool for refrigerant charging, system diagnostics and operational effect, it can be used to measure the system pressure. Multi-functional measuring device can simultaneously read high and low pressure values, so that diagnosis can be made by contrasting high and low pressure.

Low pressure measuring instrument - it has dual functions. Generally the low pressure measuring instrument is used to test exhaust effect of the measuring system. Degree of vacuum can indicate a system failure, therefore an instrument is important which can measure pressure and degree of vacuum.

Generally after the system operates 10-15 min, the Low pressure gage must show a pressure value of 10 to 35 psi (0.7-2.4 bar).

High pressure measuring instrument - it is generally used for measuring pressure on the high pressure side, its minimum range is from 0 to 400 psi (0-27.6 bar).

Generally, in normal system operation, pressure on the high pressure side is from 120 to 310 psi (8.3-21.4 bar). Refer to P13 for pressures- Thermometer

Connection for pressure detection

The multifunctional measuring device is connected to the A/C system as shown in the drawing. Ensure that both valves are closed during the connection.

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Pressure - Temp Table

Ambient Temp ˚F (˚C)	Normal Low-pressure Value psi (bar)	Normal High-pressure Value psi (bar)	Min. Temp at Air Port ˚F (˚C)
80 (27)	9-12 (0.62-0.83)	145-165 (10-11.53)	55 (14)
90 (32)	11-15 (0.76-1.04)	190-210 (13.10-14.48)	61 (18)
95 (35)	16-18 (1.10-1.24)	210-230 (14.48-15.86)	63 (20)
100 (38)	17-19 (1.17-1.31)	235-255 (16.2-17.58)	66 (22)
105 (41)	20-21 (1.38-1.45)	260-280 (17.93-19.31)	68 (23)
110 (43)	22-24 (1.93-2.14)	290-310 (20-21.37)	72 (25)

This Pressure - Temp Table is based on the following conditions:

Note : it will cause the air duct temperature to increases if the air humidity is too high, and pressure on the low pressure side rises. Therefore, adjust data appropriately in the table according to different geographical environment.

1.The engine operates at the speed of 1,500 rpm without any load. Fan speed and temperature are both controlled at maximum setting. A/C switch is turned on, and all the vents are open.

2.Install well and close all fences and doors.

3.Install and clean filters in the cab.

4.Close the heater valve of the engine.

5.Measure after starting 15 min.

Troubleshooting Table

Faults	Low pressure measurement	High pressure measurement	Reference page
No refrigeration	Very low	Very low	14
No refrigeration	High	High	15
Insufficient refrigeration	Same as high-pressure end	Normal	17
Insufficient refrigeration	Low	Low	17
Insufficient refrigeration	High	Low	19
Insufficient refrigeration	High	High	19
Intermittent refrigeration	Normal	Normal	20
Abnormal system noise.	Same as high-pressure end	High	21

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Connections for recollecting and refilling of A/C system

1. Clear stains and moisture on the outer surface of the compressor and conduits, and remove the cap of the charging port.

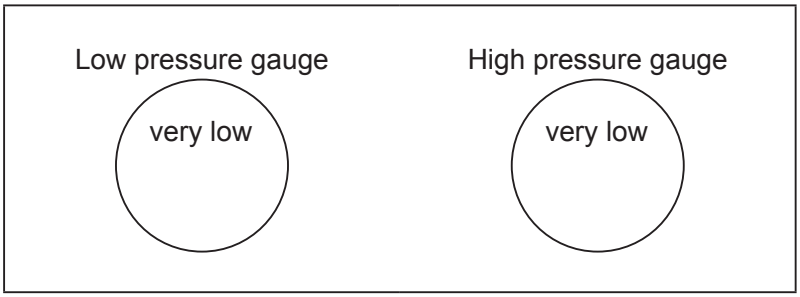
   WARNING: If the system is charged with freon, do not clean any A/C system component with steam. Because heat of the steam will cause pressure of the refrigerant to rise, which may cause the system to explode.

2. Use the red terminal to connect the high pressure charging port of the A/C conduits.
3. Use the blue terminal to connect the low pressure charging port of the A/C conduits.

   WARNING:When there is liquid refrigerant in operation, be sure to wear protective glasses. Because if liquid refrigerant splashes in the eyes, it may cause blindness.

4. Confirm the valve of the multifunctional measuring device is in the closed state.
5. Start the engine and let it run at a maximum speed of 1,500 rpm. Open the cab door, and switch the cooling function of the A/C system to the maximum, let the fan run at the fast speed for 15 min. Observe the measured pressure value and compare it with the table in page 13.

Defect: no refrigeration

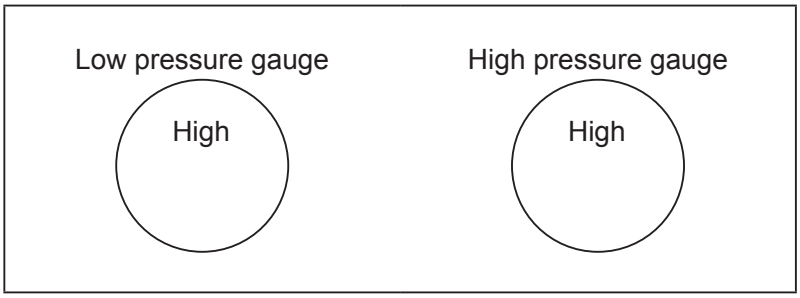


Refer to P13 for Pressure-Temp Table

The symptoms of insufficient freon or no freon

A. Air from evaporator is hot B. Compressor doesn't run, or the cycle frequently shut down after starting. (the green indicator of A/C system in cab goes on)	→	1. Test the system for leaks, refer to Page 6-9. And refer to part 9003, fill more refrigerant. 2. Refer to part 9003, recycle the remaining refrigerant in the system. 3. If any leaks found, repair them refer to the repair steps provided. 4. Check the compressor lubricating oil level - maybe insufficient now. 5. Exhaust the air and moisture from the system. Refer to part 9004 to replace the refrigerant receiver. 6. Refer to part 9003, refill new refrigerant into the system. 7. Keep detection to check for other faults.

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Refer to P13 for Pressure-Temp Table

Features of the system containing large amount of air:

Air from evaporator is hot	Y→	1. Recycle the remaining refrigerant from the system. Refer to Section two. 2. Replace the refrigerant receiver. 3. Exhaust the air and moisture from the system. Refer to Section three to replace the refrigerant receiver. 4. Refer to Section two to refill new refrigerant into the system.

Features of condenser fault

A. Liquid refrigerant pipes are very hot (between evaporator and condenser)	Y→	1. Check the belts of compressor and engine fan for looseness or damage. 2. Check if the condenser is clean and not blocked, and fins are not bend. 3. Check if excessive refrigerant in the system. Recycle and refill refrigerant until the pressure gauge shows normal value. Refer to Section two. 4. Remove the condenser and check if it is blocked or the heat dissipation is getting worse. A. Refer to Section two to recycle the refrigerant. B. Blow the oil stains away from the condenser by compressed air. C. Replace the refrigerant receiver. D. Refer to Section two to vacuum and refill the refrigerant. 5. Keep detection to check for other faults.

Features of expansion valve fault

A. Air from evaporator is hot. B. Too much condensed water on the low-pressure pipes of compressor. C. Too much condensed water at the evaporator outlet.	→	Replace the expansion valve refer to Section three

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Refrigerant contamination

Refrigerant contamination →	Refer to table below, test the stable saturation pressure of refrigerant under a certain temperature to check if it is contaminated. A. Measure its pressure with instrument recovery unit. B. Measure the temperature of refrigerant receiver. If the refrigerant has been recycled to the tank for a while, then measure the ambient temp instead. Value in the table stands for the boiling point. C. The lower limit pressure of refrigerant contaminated is given in the table. **Caution:** do not use refrigerant contaminated or the mixture. Please deal with the refrigerant contaminated on the basis of the local laws and regulations.

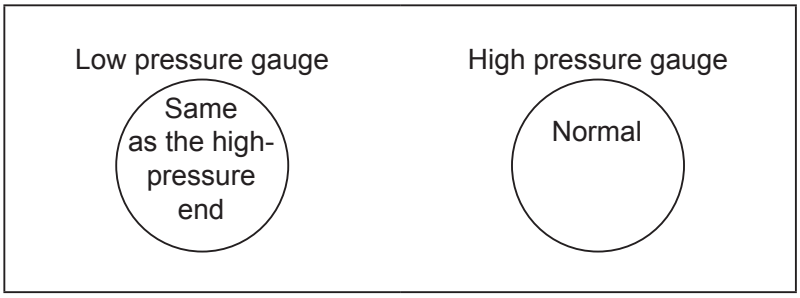
HFC-134a stable saturation pressure - temperature gauge

Temperature °F (°C)	Pressure psi (bar)
50 (10)	45 (3.1)
55 (13)	51 (3.5)
60 (16)	57 (3.9)
65 (18)	64 (4.4)
70 (21)	71 (4.9)
75 (24)	78 (5.4)
80 (27)	88 (6.1)
85 (29)	95 (6.6)
90 (32)	104 (7.2)
95 (35)	114 (7.9)
100 (38)	124 (8.6)
102 (39)	129 (8.9)
104 (40)	133 (9.2)
106 (41)	138 (9.5)
108 (42)	142 (9.8)

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Temperature °F (°C)	Pressure psi (bar)
110 (43)	147 (10.1)
112 (44)	152 (10.5)
114 (46)	157 (10.8)
116 (47)	162 (11.2)
118 (48)	167 (11.5)
120 (49)	172 (11.9)

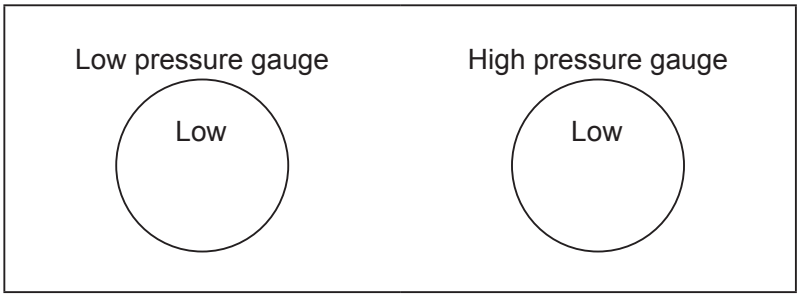
Fault: insufficient refrigeration



Refer to P13 for Pressure-Temp Table

Features of the system containing air

A. The low-pressure pipes is a little hot for hand B. Air exhausted from the evaporator is not cool enough	→ 1. Check the system for leaks. Refer to Page 6-9. Check the tightness of compressor carefully to avoid air in system. 2. Drain refrigerant from the sytem, refer to Section two. 3. If any leaks, repair them. 4. Replace the refrigerant receiver. 5. Check lubricating oil level in the compressor.



Refer to P13 for Pressure-Temp Table

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Features of insufficient refrigerant

Air exhausted from evaporator is not cold enough →	1. Leak test - test for refrigerant leaks. Caution: in normal condition, about 0.5 lounce (14.7-29.5 g) refrigerant leaks from system each quarter. A. If any leaks found, go on the Step 2. B. If no leaks found, turn to Step 6. 2. Drain refrigerant from the sytem, refer to Section two. 3. Repair the leaks. 4. Check lubricating oil level in the compressor. 5. Refer to Section three to vacuum or replace the refrigerant receiver. 6. Refill new refrigerant into the system. Refer to Section two.

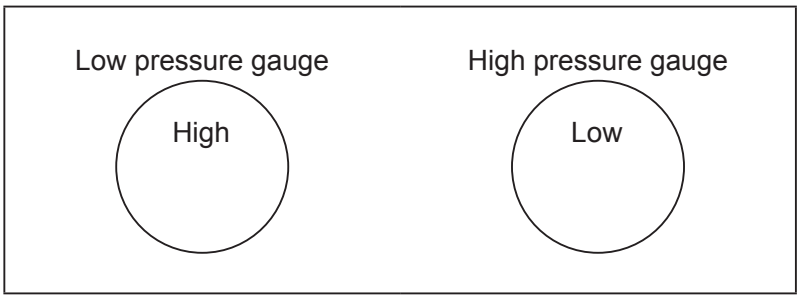
Features of blockage at the high pressure side

A. Air exhausted from the evaporator is not cool enough B. There is condensed water or frost on the receiver C. There is condensed water or frost on the liquid refrigerant pipe to receiver **Caution:** frosting will extend from block points. →	1. Remove the blocked refrigerant in the receiver or liquid refrigerant pipe. 2. Remove and replace the blocked parts. 3. Refer to Section two to vacuum. 4. Refer to Section two to refill new refrigerant into the system.

Features of expansion valve not working

A. Air exhausted from the evaporator is not cold enough B. There is condensed water or frost at the outlet of expansion valve C. The expansion valve inlet end is warm. →	1. The condensed water or frost at the outlet of expansion valve indicates the expansion valve is blocked. Refer to Section two. 2. Warm (not hot) expansion valve inlet end indicates the expansion valve is not fully opened. If the expansion is sticky and blocked, only a little or no refrigerant will pass through the expansion valve. Refer to Section three refer to expansion valve.

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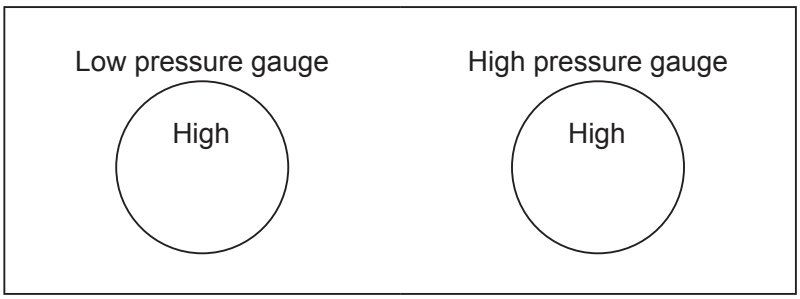
Refer to P13 for Pressure-Temp Table

Features of the compressor turning but not pumping refrigerant

A. Proper refrigerant is filled into the sytem B. Air exhausted from the evaporator is cool	→	1. Refer to Section two to drain refrigerant from the system. 2. Refer to Section three to remove compressor from the machine. 3. Replace the compressor because of leaks inside the compressor. 4. Replace the compressor. 5. Replace the receiver if any conditions below occur: A. System was opened before. B. The receiver has been used for over two years. Replace it refer to Section three. 6. Refer to Section two to refill refrigerant into the system.

Expansion valve stuck after opening

The expansion valve is stuck after opening	→	1. Refer to Section three for repalcement of expansion valve.



Refer to P13 for Pressure-Temp Table

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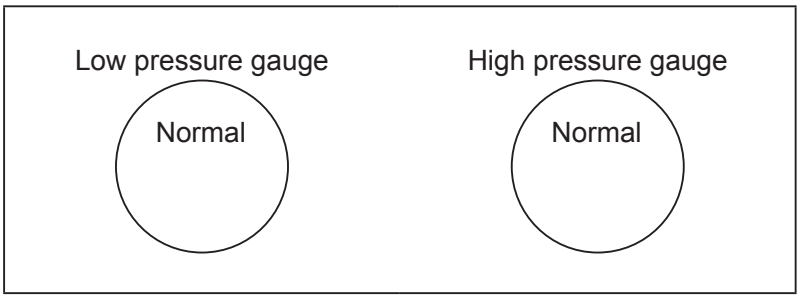
Features of the condenser not working:

A. Liquid refrigerant pipe is very hot B. Air exhausted from evaporator is hot	1. Check the belts of compressor and fan for looseness or damage 2. Check if the condenser is clean or blocked, and fins are not bend. 3. Check if excessive refrigerant in the system. A. Drain refrigerant from the system until the pressure is lower than normal value. Refer to Section two. B. Fill refrigerant until the pressure is the same as normal level. Refer to Section two. C. Go on Step 4 if still any faults. 4. Remove the condenser and check if it is blocked by oil or the heat dissipation is getting worse. A. Recycle the refrigerant. Refer to Section two. B. Blow alway oil stains from the condenser with compressed air. C. Replace the receiver.

Features of the system containing air:

Air from the evaporator is hot	1. Drain refrigerant from the system. Refer to Section two. 2. Replace the receiver. 3. Vacuum the system. Refer to Section two. 4. Refill new refrigerant into the system. Refer to Section two.

Fault: intermittent refrigeration



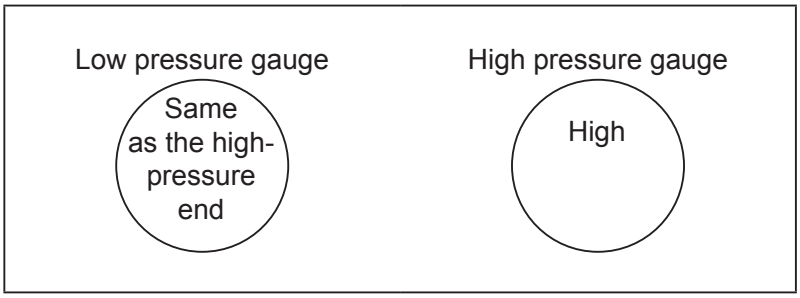
Refer to P13 for Pressure-Temp Table

Features of too much moisture in the system

Intermittent refrigeraion, it's normal during refrigeration	1. Drain refrigerant from the system. If excessive water flows into the small hole, the condenser will be blocked when it's frozen. Refer to Section two. 2. Replace the receiver. The absorbent material in the receiver may be saturated. Refer to Section three. 3. Vacuum to eliminate moisture in the system. Refer to Section two. **Caution:** it generally takes 2 or 3 hours to drain the large amout of water in the system.

Fault: system has abnormal noise

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Refer to P13 for Pressure-Temp Table

Features of excessive refrigerant in the system

A. Air from the evaporator is cool B. the compressor has abnormal sound	→	1. Drain refrigerant from the system until the pressure is lower than normal level. Refer to Section two. 2. Fill new refrigerant until the pressure back to normal level. Refer to Section two.

Table of conduit connection Torque

Hose dimension	3/8inch		1/2inch	5/8inch	
Thread size	M16-1.5	M22	3/4-18 or 3/4-16	7/8-18 or 7/8-14	M24
Copper & aluminum couplings	15-25 Nm	20-25 Nm	24-30 Nm	30-37 Nm	30-34 Nm

Note: when tightening air ducts or duct parts, give a hard tightening action with the given torque value in the table.

Note: when tighten connection devices of the compressor, condenser and evaporator, you must be very careful, because these components are easily deformed and distorted.

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Service of A/C System

Instruction

Refrigerant quantity in A/C system: 1.0 kg

Special tools



Figure2.1 Refrigerant Recollecting, Reuse and Refilling Apparatus - (SPX 347112K)

Recycle of refrigerant in A/C system

The recycled refrigerant will pass through the oil separator and the filter dryer in turn, and finally into the refrigerant tank. When the dried refrigerant flows through the humidity indicator, it will turn green.

If possible, it is better to run the A/C system for about 10 min before recycling the refrigerant. Then shut down the system to start recycling the refrigerant.

1. Connect the power cord of multifunction devices to the 220 V power supply.
2. Turn on the main power switch, and empty the oil recovery tank on the right side of the device.



3. Press the recycle switch.
4. If more than 150lb (68 kg) refrigerant has been recollected since last replacing dry filter, the instrument will display: filtered weight is xxx lb (xx kg). Press the start button.
5. Connect the high and low pressure conduits to the A/C system, and open the connection valves.
6. Rotate both the low and high pressure valves to the Recover / Vacuum location, and then press the Start button to continue.

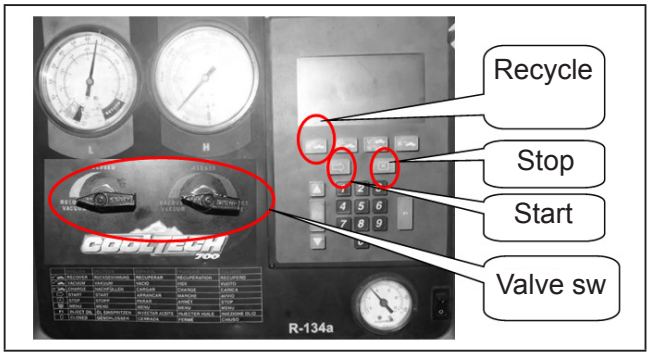


Fig. 2.2

7. If the system pressure is below 25 psi (1.72 bar), the instrument will display : the system pressure is low until the pressure rises or press the Start button. You can press the button to exit.
8. If there is refrigerant in the low pressure conduit

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of the device, the instrument will start cleaning program and display: being cleaned. If you want to skip or stop cleaning program, you can press the Start button again.

9. When the amount of the system recollection reaches 13in.Hg. (0.44 bar), the vacuum compressor will automatically shut down.

10. Next, the instrument will automatically recover lubricant, and the instrument will show: lubricant is being recycled. Oil recovery needs 90s or so.

11. After completion of the recovery of lubricant, check the lubricant recovery tank, and write down amount of the lubricant recovered from the system. The system needs to be charged with more lubricant after being vacuumed.

12. To confirm whether the refrigerant is completely recollected, wait for 5 minutes and observe whether the pressure of the multifunction instrument will rise higher than 0 in.Hg. (0 bar) after the recollection. If the pressure is picked up, you need to press the start button again to repeat the recovery process until the system pressure can be maintained for 2 min, then press the stop button to exit the recovery.

Vacuuming and charging the A/C system with refrigerant

Note: before vacuuming and extracting moisture, replace the refrigerant receiver if one or more of the following conditions are satisfied.

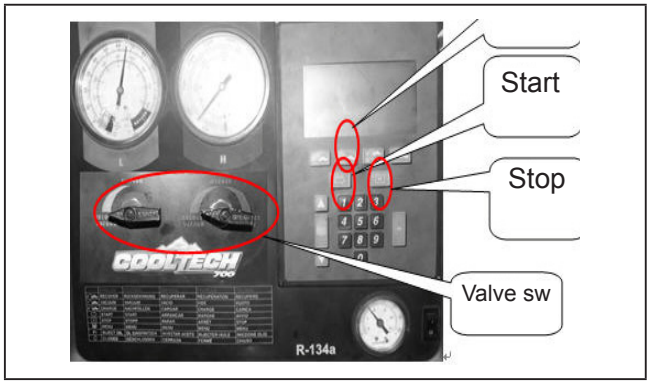
A. The system has been opened for several times.

B. The refrigerant receiver has been used for two or more years.

C. Remove the compressor, and the desiccant material has turned into small particles (golden or brown particles).

D. The system has large amount of leaking. (the conduit is broken).

E. The system contains too much air or moisture.



F. The system is opened as long as up to 5 min when replacing the compressor.

13. Place valves of the multifunctional device in the closed state, and connect the high and low pressure conduits to the A/C system, then open the connection valves.

14. Connect the main power of the multifunction device to 220V power supply, and then turn on the main power switch.

15. Press the vacuum button, and then press the start button.

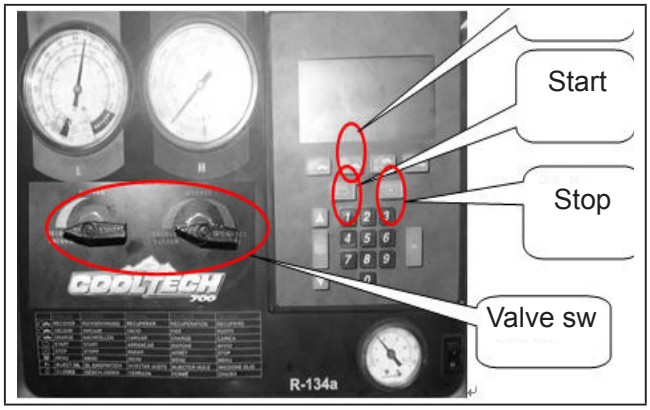


Fig. 2.3

16. Press the start button again to confirm vacuuming for 15 minutes, or change time to vacuum by numeric buttons, and then press the Start button once more.

17. When the set time is up, the vacuuming will automatically stop. Press the stop button to exit the process. Press the start switch to resume continue vacuuming, or exit by pressing the stop button. Now it is ready to charge the system with refrigerant.

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18. Press the Charge button.

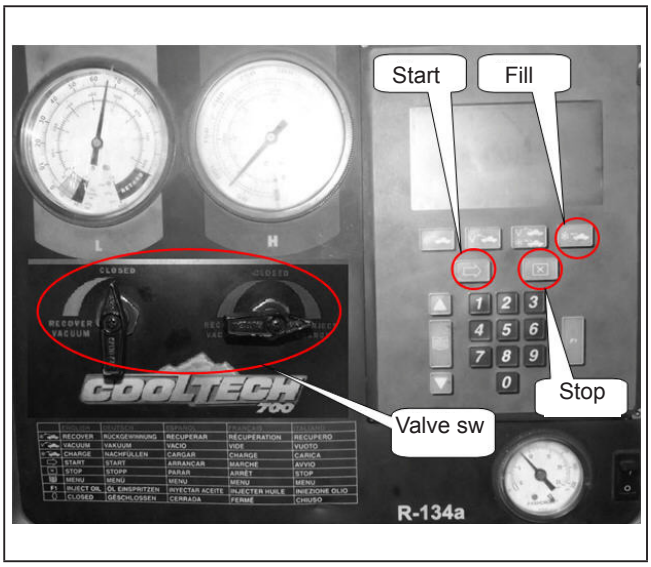


Fig. 2.4

19. Rotate the low pressure valve to the Closed position, and the high pressure valve to the Oil Inject / Charge position. Press the start button.

20. Enter the amount of refrigerant 0.85 kg required to charge by numeric buttons, and then press the Start button again.

21. The instrument will show after filling: charge has completed, the amount of filling is x.xx lb (kg).

22. Close high and low pressure valves, and remove the filling conduits.

    Note: when the remaining refrigerant in the refrigerant storage tank is less than 3 lbs (1.36 kg), it can't charge the system with refrigerant, the refrigerant storage tank should be supplied with refrigerant at this time.

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Removal and Installation of A/C Components

Removal and installation of compressor

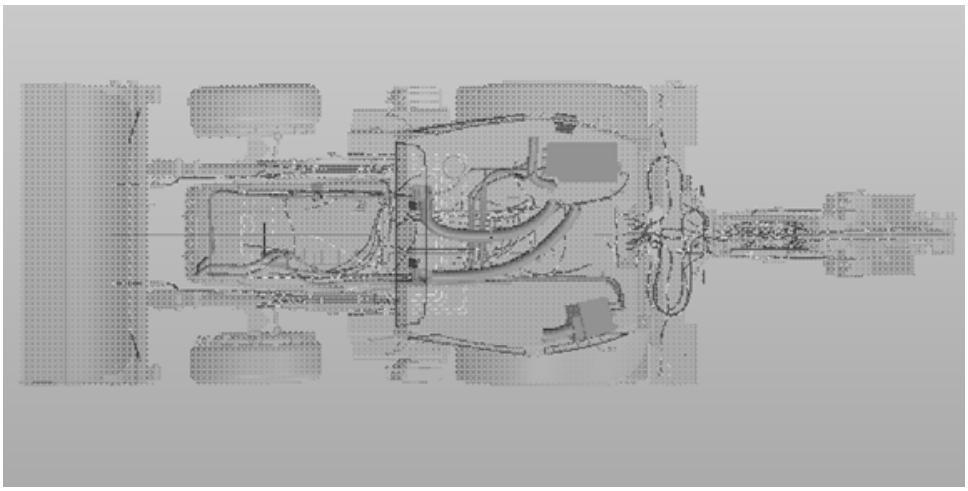


Fig. 3.1

1. Condenser 2. Refrigerant receiver 3.Closable outlet 4.New fan motor as
5.High capacity evaporator 6.Low capacity evaporator 7. Air duct 8. Compressor

Removal of Compressor (Wei Chai Type)

1. Shut down the machine power supply
2. Refer to Section two to recollect refrigerant in the system.
3. Disconnect compressor power plug.
4. Remove the air ducts connected with the compressor and plug the inlet and outlet of the compressor and air duct ports, be sure to protect the o-rings of the duct.
5. Remove compressor control board.
6. Unscrew compressor fixing nut.
7. Rotate compressor outward, take out compressor belt.

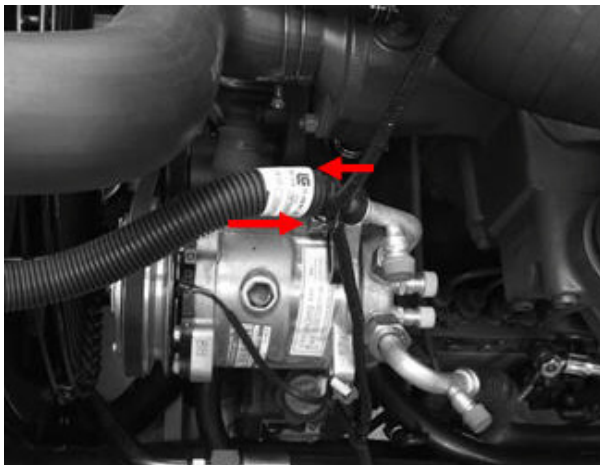


Fig. 3.2

8. Unscrew compressor fixing bolt, take out compressor.

Installation of compressor

9. The installation sequences of the compressor is opposite to the disassembly, for tightening

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torque of each conduct coupler refer to the table of conduct coupler connecting torque

10. Refer to Section two to refill refrigerant to A/C system after the accomplishment of the compressor assembling.

Removal of compressor (Perkins type)

1. Shutdown the machine power supply
2. Refer to Section two to recollect refrigerant in the system.
3. Disconnect compressor power plug.
4. Remove the air ducts connected with the compressor and plug the inlet and outlet of the compressor and air duct ports, be sure to protect the o-rings of the duct.
5. Remove each fixing nut of compressor control rod in turn and remove the control rod (as the arrow shows in the figure)

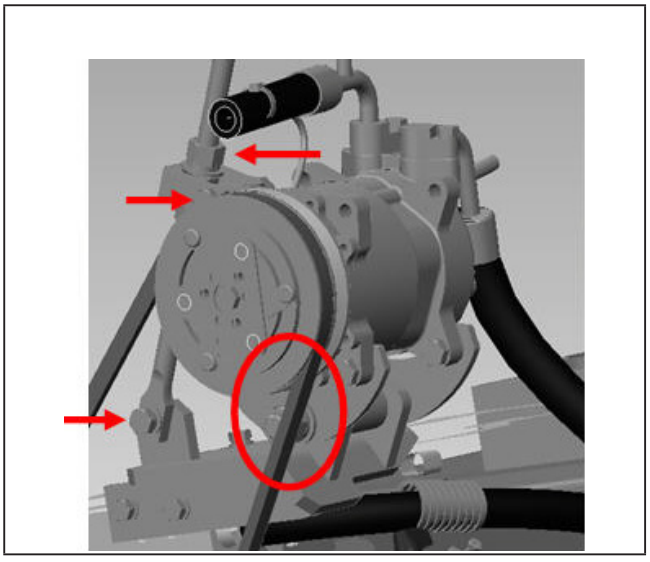


Fig. 3.3

6. Remove compressor fixing bolt (the circled bolt in the Fig.), remove compressor belt and remove the compressor as.
7. Remove the four bolts fixing the compressor, remove the compressor.

Installation of compressor

8. The installation sequences of the compressor is opposite to the removal, for tightening torque of each conduct coupler refer to the table of conduct coupler connecting torque

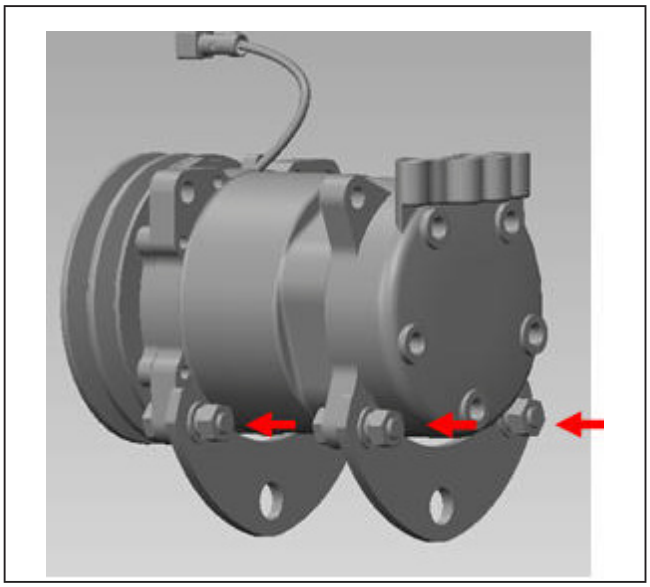


Fig. 3.4

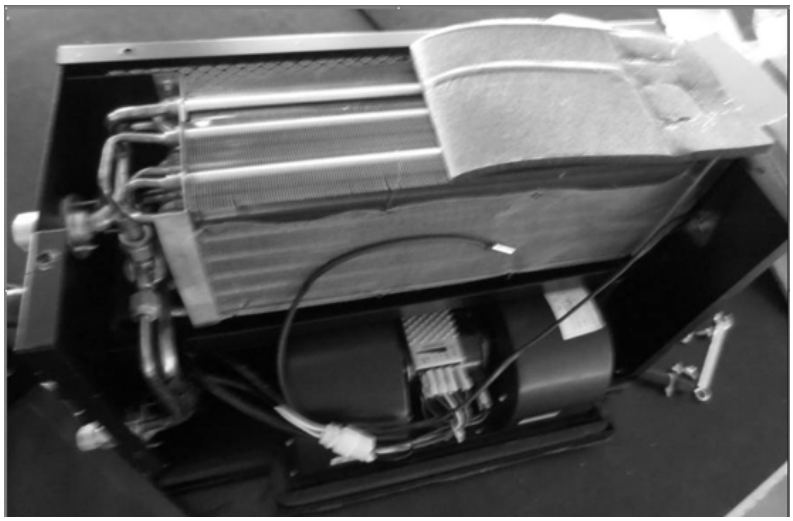
9. Refer to Section two to refill refrigerant to A/C system after the accomplishment of the compressor installation.

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Disassembly of evaporator

View of the inner structure of the evaporator

High cpacity evaporator: Fig. 3.5



Low capacity evaporator: Fig. 3.6



1. Expansion valve
2. Heating core
3. Refrigeration core
4. Sealing sponge
5. Evaporator motor
6. Thermal detector (temperature sensor)
7. Fan speed control re- sistance
8. Evaporator case

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Removal of Evaporator

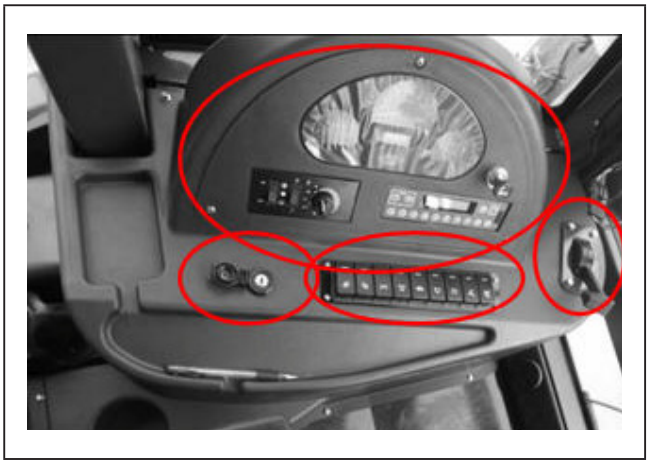


Fig. 3.7

1. Park the vehicle in a relatively flat ground.
2. Shut down the machine power supply
3. Refer to Section two to recollect system refrigerant and close warm air water valve.
4. Remove away all the elements on the right-side instrument cover. (as it circle in the figure).
5. Remove right-side instrument cover, remove the plugs connected with evaporator.

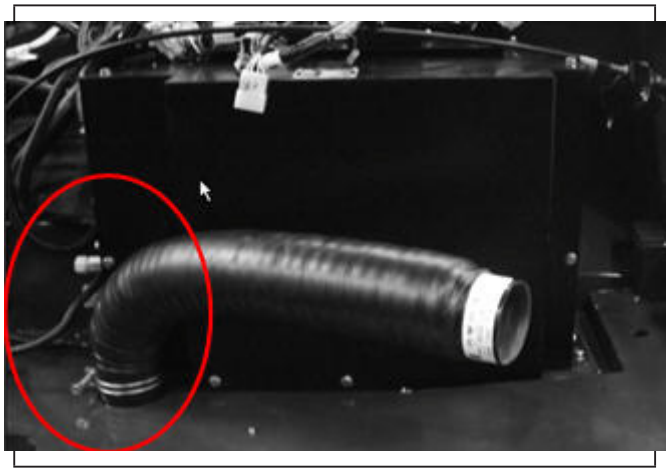


Fig. 3.8

6. Remove the air ducts connected with the evaporator and plug the inlet and outlet of the evaporator and air duct ports, be sure the o-rings of the duct are well protected.
7. Prepare a 30 L container and place it under the water pipe port of the evaporator, remove away the water pipe connected with the evaporator, let the refrigerant flow into the container.
8. Wait until the refrigerant completely drains, remove away the wiper controller on the evaporator.
9. Remove the four bolting fixing the evaporator, remove the high capacity evaporator.

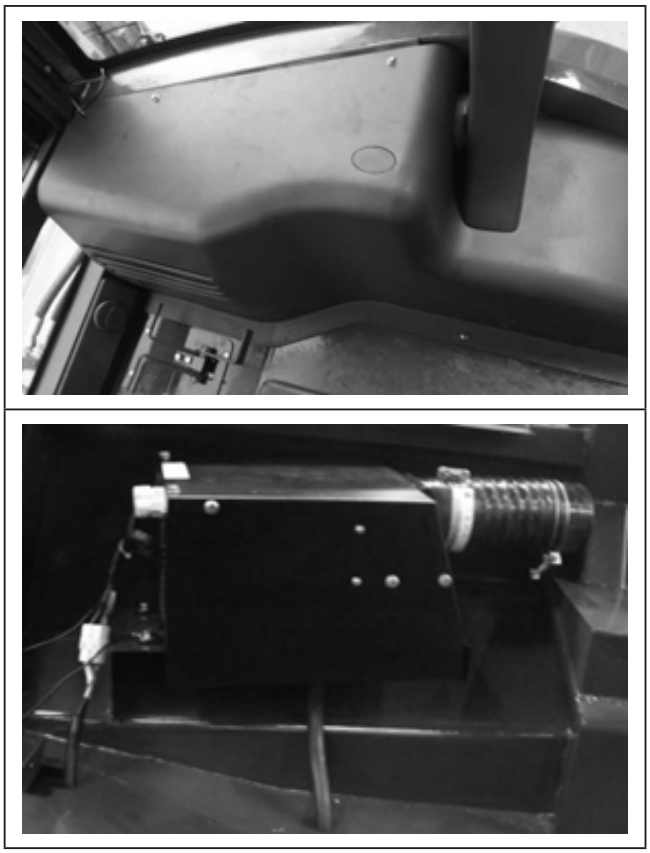


Fig. 3.9

10. Remove left-side instrument cover, remove the plugs connected with evaporator.
11. Remove the air ducts connected with the evaporator and plug the inlet and outlet of the evaporator and air duct ports, be sure the o-rings of the duct are well protected.
12. Remove the air duct connected with the evaporator.
13 .Remove the bolt fixing the evaporator, remove the low capacity evaporator.

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Installation of Evaporator

14. The installation sequences of the high and low capacity evaporators are opposite to the removal, for tightening torque of each conduct coupler refer to the table of conduct coupler connecting torque

15. After the completion of the evaporator installation, refill refrigerant to the system according to Section two.

Removal and installation of the condenser and the refrigerant receiver

Removal of the condenser and the refrigerant receiver

1. Park the vehicle in a relatively flat ground.

2. Turn off the machine power supply

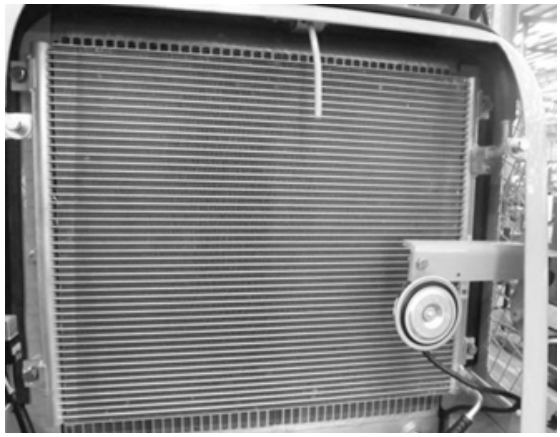


Fig. 3.10

3. Refer to Section two to recollect system refrigerant.

4. Open the machine cover door, remove the air ducts connected with the condenser and plug the inlet and outlet of the evaporator and air duct ports immediately, be sure the o-rings of the duct are well protected.

5. Remove the four condenser fixing bolts, take out the condenser.

6. Remove the electric plug connected with the refrigerant receiver pressure switch.



Fig. 3.11

7. Remove the air ducts connected with the reservoir and plug the inlet and outlet of the evaporator and air duct ports, be sure the o-rings of the ducts are well protected.

8. Remove the two bolts fixing the reservoir as, take out the reservoir as.

9. Loosen the bolt fixing the refrigerant receiver, take out the reservoir as from the duct clamp.

Installation of condenser and refrigerant receiver

10. The installation sequences of the condenser and the reservoir are opposite to the removal, for tightening torque of each conduct coupler refer to the table of conduct coupler connecting torque

11. After the completion of the condenser and refrigerant receiver installation, refill refrigerant to the system according to Section two.

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7. Engine System

Removal and Installation of Engine Attachments and Filter.....2
Air filter removal.....2
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Refer to engine original manual (optional).....24
Refer to the original manual of Perkins engine (optional).....24

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Removal and Installation of Engine Attachments and Filter

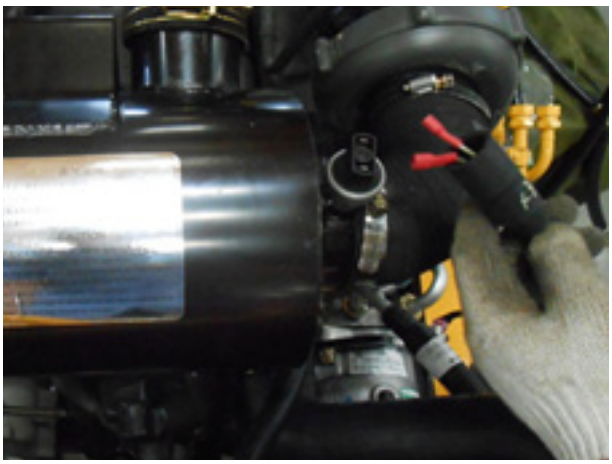
Air filter removal

Air filter

Removal

1. Remove switch wire harness of air filter
   Push aside the protective sleeve of the back-up alarm switch on the air filter and disconnect the harness.



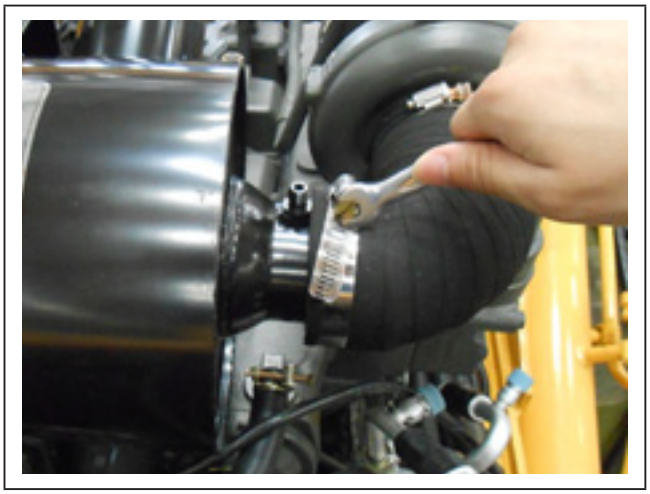


2. Remove the connecting pipeline between air filter and its cap
   Remove the fixing bolt from the clamp of the connecting pipeline between air filter and its cap with the 13# wrench and take down the air filter pipeline, and then place it properly.

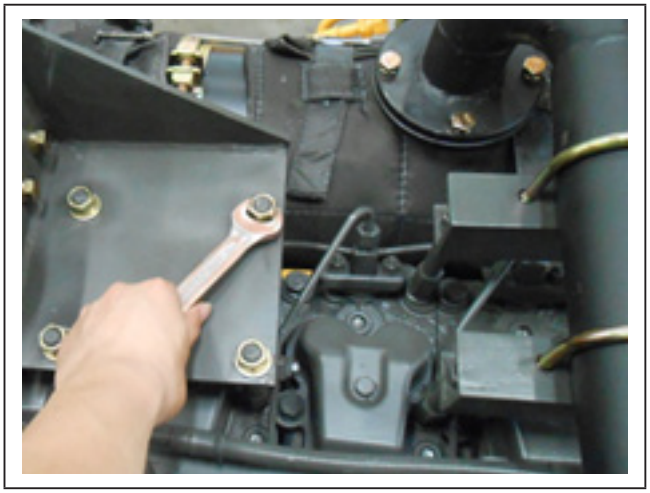


3. Remove the connecting pipeline between air filter and diesel engine
   Remove the two fixing bolts from the connecting pipeline between the air filter and the diesel engine with the 8# wrench and take down the pipeline, and then place it properly.

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4. Remove air filter and bracket asembly
   Remove the four fixing nuts from the supporting seat of the air filter with the 18# wrench and take down the air filter and fixed supporting seat as, and then place it properly.



5. Remove air filter bracket
   Remove the three bolts from the supporting seat of the air filter with the 16# wrench and take down the air filter, and then place it properly.



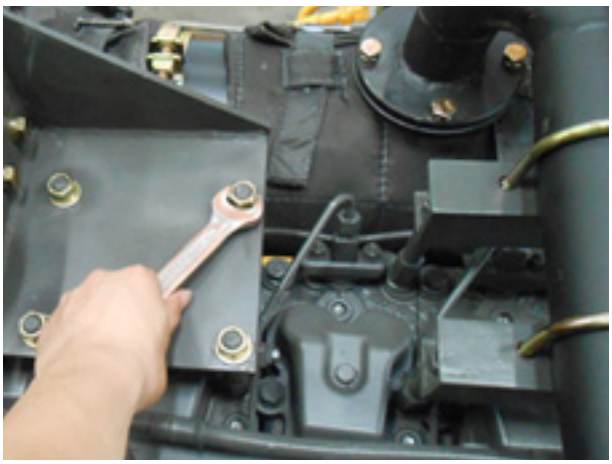
Installation

1. Install air filter bracket
   Align the fixing plate of the air filter to the holes of the air filter and install the three bolts, and then tighten the bolts with 16# wrench.

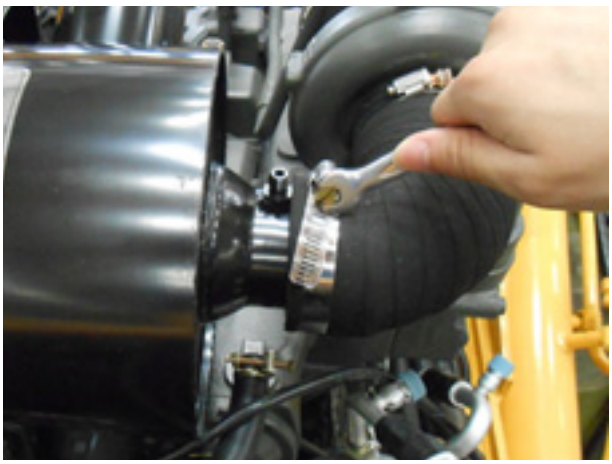


2. Install air filter and bracket as
   Put the supporting seat of the air filter in the mounting position and let it pass through the four studs on the engine, and then install the nuts on the studs and tighten the nuts with the 18# wrench.

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3. Install air filter to diesel engine connection pipeline
   Put the connecting pipeline between the air filter and the engine in the mounting position. Connect one end to the circular hole of the air filter and the other end to the circular hole of the engine. Install the annular clamps on both ends of the pipeline and tighten the bolts with the 8# wrench.



4. Install air filter to air filter cap connection pipeline
   Put the connecting pipeline between the air filter and its cap in the mounting position. Connect one end to the circular hole of the air filter and the other end to the circular hole of the air filter cap. Install the annular clamps on both ends of the pipeline and tighten the bolts with the 13# wrench.





5. Install air filter switch wire harness
   Connect the harness to the back-up alarm switch of the air filter and put the protective sleeve in place.



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Remove and installation of muffler

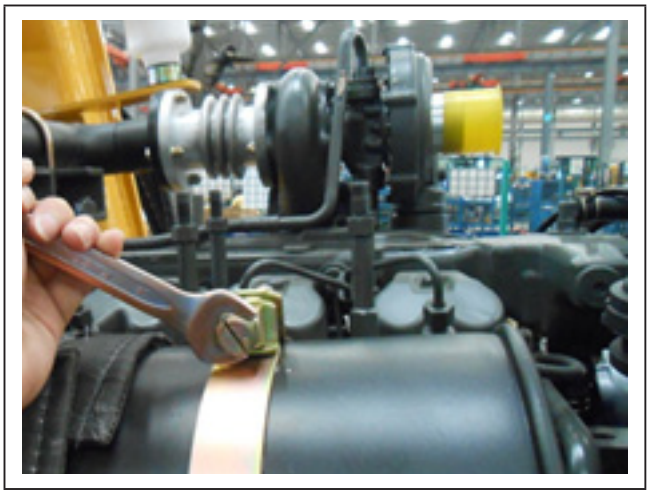
Muffler

Removal

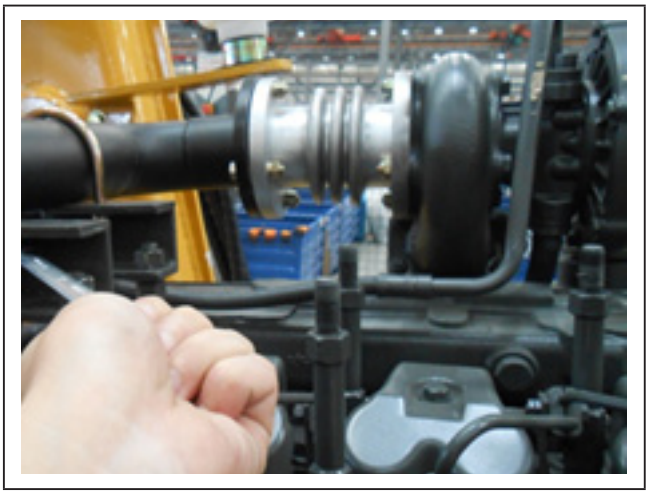
1. Remove sleeve on muffler
   Unscrew the spring on the protective sleeve and remove the protective sleeve, and then place it properly.



2. Remove muffler clamp
   Remove the fastening hoop from the muffler with the 13# wrench.



3. Remove U-shaped fastener of muffler pipeline
   Remove the two fixing bolts on the down side of the U-shaped fastener with the 13# wrench and take down the U-shaped fastener.



4. Remove exhaust pipe
   a Remove the four fixing bolts of the exhaust pipe with the 13# wrench.
   b Remove the four fixing bolts of the exhaust pipe and the braided tube with the# 13 and# 16 wrenches.
   c Remove the mounting plate to fix the exhaust pipe with the# 13 wrench, and then take out the exhaust pipe from the upward side and place it on the ground properly.

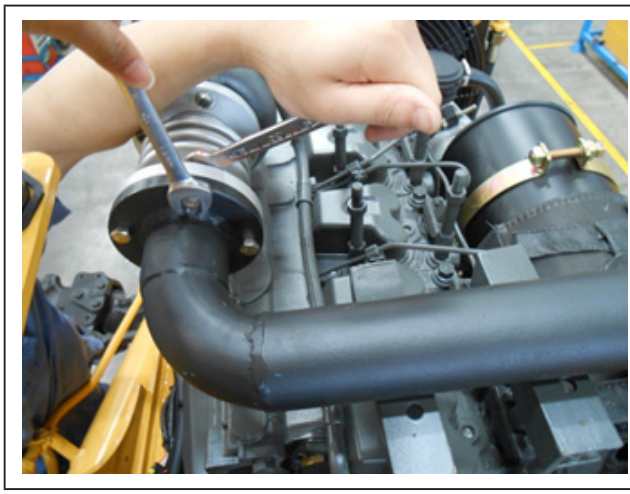


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5. Remove muffler and pipeline as
   Remove the four bolts from the muffler pipeline and the bellows joint with two 13# wrenches. Take down the muffler and pipeline as and place it properly.



6. Remove muffler piping
   Remove the four connecting bolts between the muffler and the pipeline with the 16# wrench. Take down the muffler and place it properly.



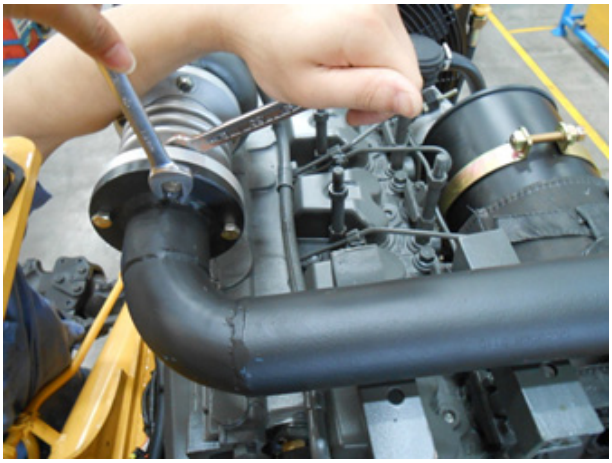
Installation

1. Install muffler piping
   Put the muffler pipeline in the mounting position. Align the holes of the muffler and install the bolts, and then tighten the bolts with the 16# wrench.

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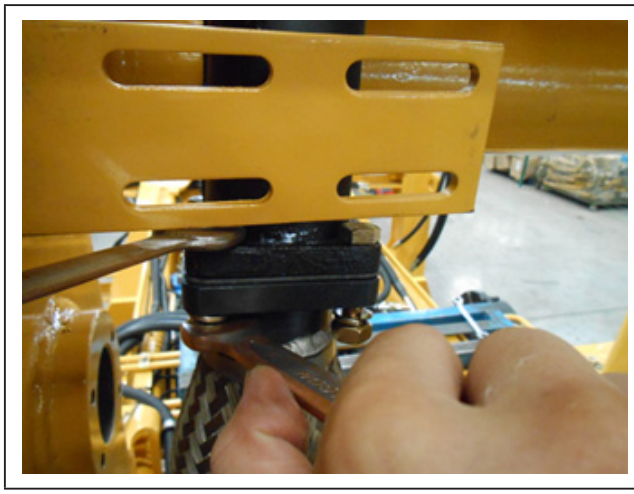


2. Install muffler and pipeline as
   Put the muffler and pipeline as in the mounting position. Align the holes of the muffler pipeline and the bellows and install the bolts, and then tighten the bolts with the 13# wrench.



3. Install exhaust pipe
   Put the mounting plate of the exhaust pipe in the mounting position. Align the holes of the frame and install the bolts, and tighten the bolts with the 13# wrench. Put the exhaust pipe onto the braided tube. Align the holes of the braided tube and install the bolts and nuts, and then tighten the nuts with the 13# and 16# wrenches. Finally, fix the exhaust pipe onto the mounting plate with the U-shaped hoop and tighten the bolts. No deflection or shaking of exhaust pipe is permitted.







4. Install U-fastner to muffler pipeline
   Put the U-shaped fastener of the muffler in the mounting position. Let it pass through the brack-

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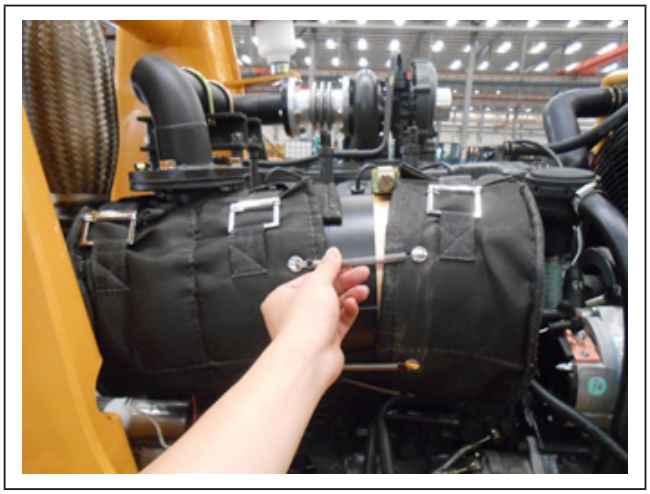
et of the engine and install the nuts on it, and then tighten the nuts with two 13# wrenches.



5. Install muffler clamp
   Put the annular fastening hoop in the mounting position on the muffler and tighten the bolts of the fastening hoop with the 13# wrench.



6. Install sleeve on muffler
   Install the protective sleeve on the muffler and connect the spring.



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Removal and installation of diesel engine body

Diesel engine

Removal

1. Park the complete machine
   Park the machine on level ground. Pull up the parking brake to its extreme position and turn the negative switch to the power-off position.
2. Remove radiator
   Refer to 5.5.1, remove the radiator as and other components, and place them properly.
3. Remove cooling cotton and rear cover
   Tear off the heat-sinking asbestos. Remove the four bolts on the rear cover board with the 13# wrench. Take down the rear cover board and place it properly.





4. Remove air filter
   Refer to 5.5.2, remove the air filter and place it properly.
5. Remove sliencer
   Refer to 5.5.3, remove the muffler and place it properly.
6. Remove rear cover
   Remove the four fixing bolts of the rear hood with the 16# box spanner, and take down the rear hood and put it on level ground. Be careful to protect its surface paint.

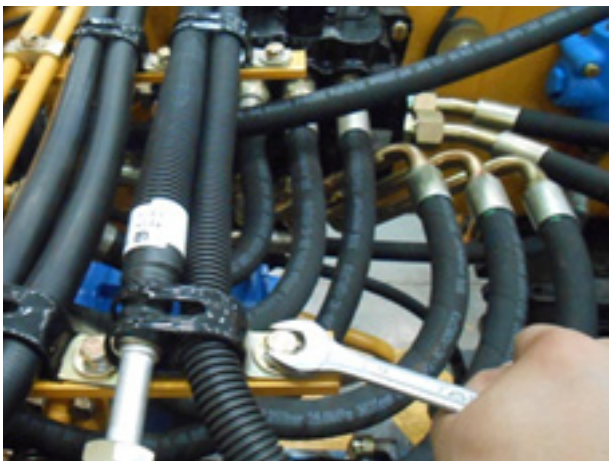


7. Lift the cab
   Refer to 5.3.2, remove the cab as and other components and place them properly.
8. Remove the connecting hose between loading valve and steel tube inside frame
   Refer to 5.4.2, remove the hose between the loading valve and the connecting end of the

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steel tube inside the frame with the appropriate wrench. After removal, wrap the hoses with clean plastic bags and belts to prevent foreign matters from entering.

9. Install vehicle frame inside steel pipe and hose
   Remove the six small clamps for fixing the air-conditioning pipeline with the 13# wrench and move the air-conditioning pipeline away.



Remove the four hoses on the outside of the hydraulic loading pipeline with the 27# wrench. After removal, wrap the hoses with clean plastic bags and belts to prevent foreign matters from entering.



Remove the hose on the side close to the frame in the hydraulic loading pipeline with the 30# wrench. After removal, wrap the hoses with clean plastic bags and belts to prevent foreign matters from entering.



Remove the six large clamps for fixing the steel tube with the 16# wrench and move the steel tube away.

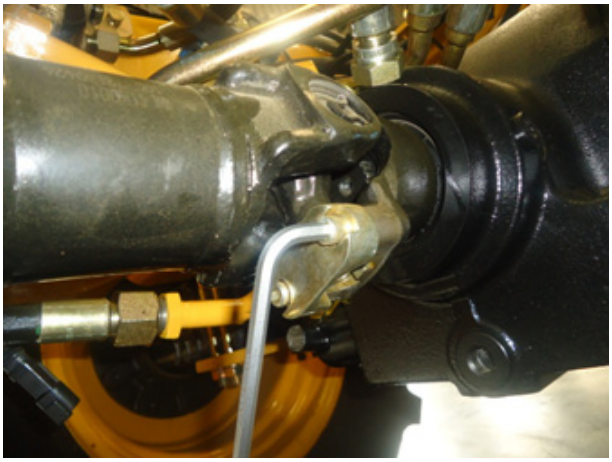


10. Remove oil cup
    Remove the oil cup on the left inside of the frame with the 13# wrench. Take down the oil cup and place it properly.

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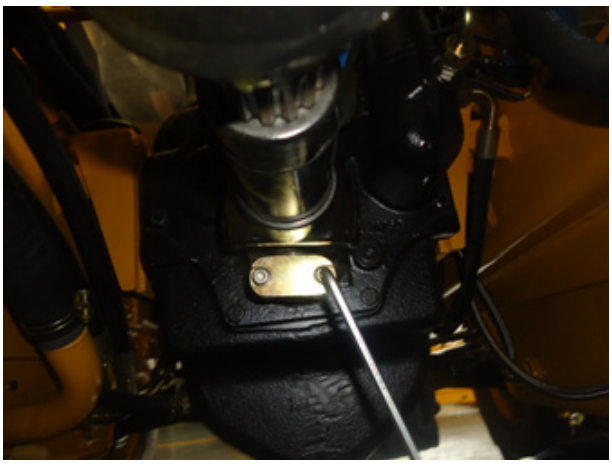


11. Remove rear gearbox shaft
    Remove the connecting bolts between the rear drive shaft and the gearbox as well as between the rear drive shaft and the rear axle, respectively, with the 6# inch hex wrench. Remove the rear drive shaft and place it properly.



12. Remove front gearbox shaft
    Remove the connecting bolts between the front drive shaft and the gearbox with the 6# inch hex wrench. Take down the connecting spline between the front drive shaft and the front axle and place it properly.





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13. Remove diesel engine wiring harness
Disconnect the harness of the gearbox oil temperature sensor.



Disconnect the harness of the 2WD/4WD selector switch.

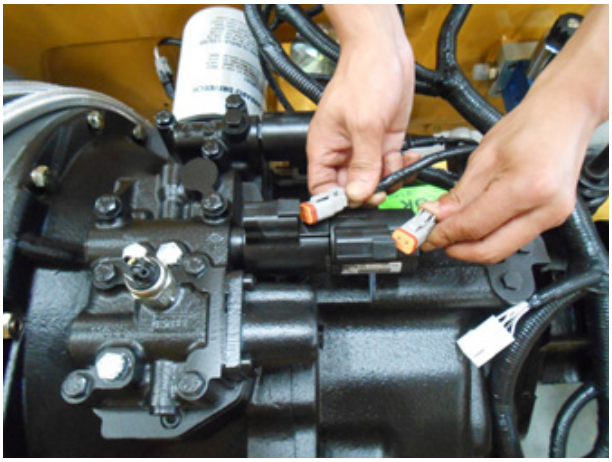


Disconnect the harness of the 4th gear sensor.

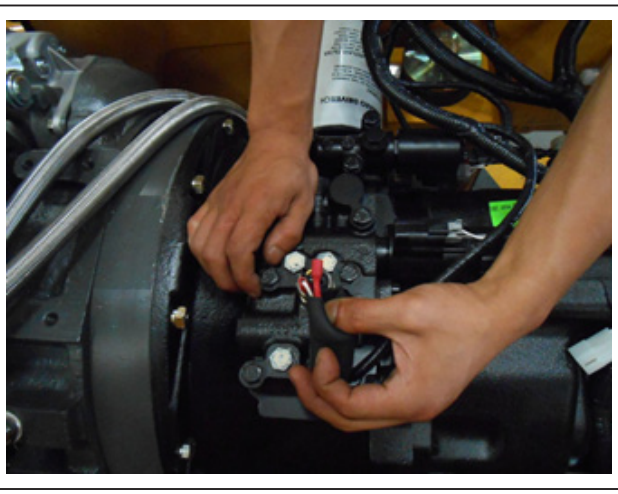


Disconnect the harness of the forward and back-up gears.

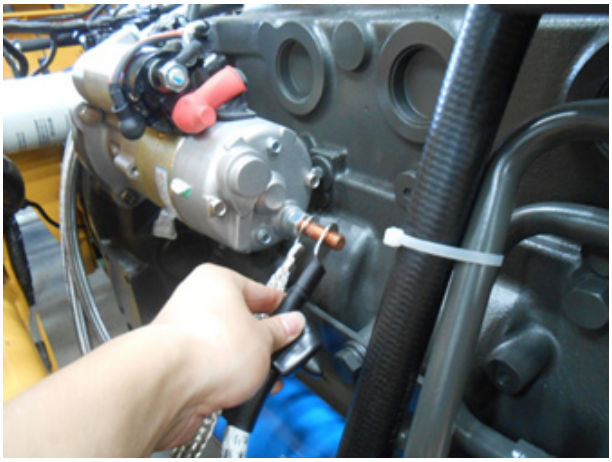
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Push aside the protective sleeve of the gearbox oil temperature sensor cable and remove the harness.



Push aside the protective sleeve of the connecting cable between the frame and the start motor. Remove the fixing bolts of the harness connector with the 19# wrench and take down the harness.



Push aside the protective sleeve of the connecting cable between the frame and the magnetic packageon the start motor. Remove the fixing bolts of the harness connector with the 16# wrench and take down the harness.



Push aside the protective sleeve of the connecting cable between the frame and the starting relay on the start motor. Remove the fixing bolts of the harness connector with the 7# wrench and take down the harness.

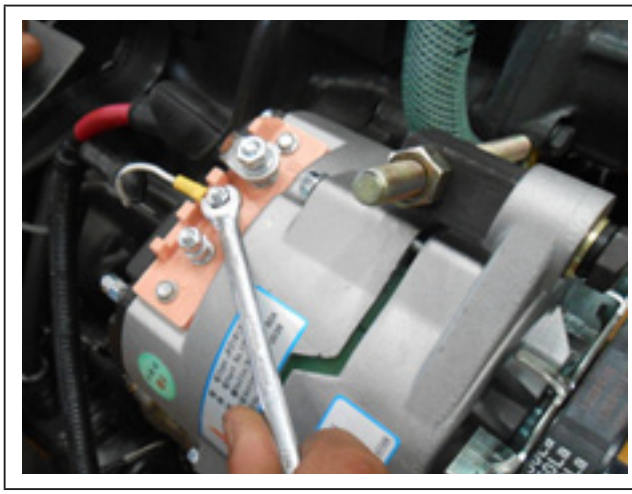
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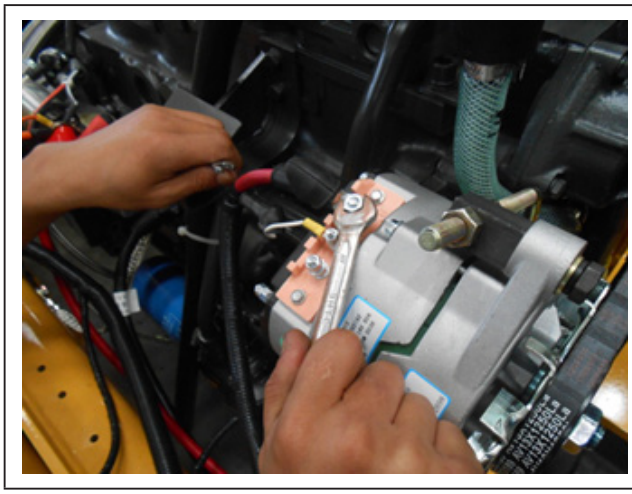


Push aside the protective sleeve of the oil pressure sensor cable and disconnect the harness of the oil pressure switch.



Push aside the protective sleeve of the cable on the alternator. Remove the fixing bolts of the harness connector with the 7# wrench and 10# wrench, respectively, and take down the harness.



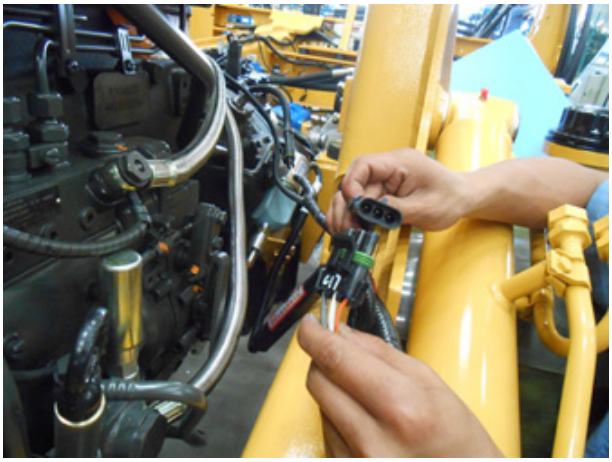


Disconnect the harness between the speed sensor on the left side of the engine and the frame.



Disconnect the harness between the frame and the misfire electromagnet.

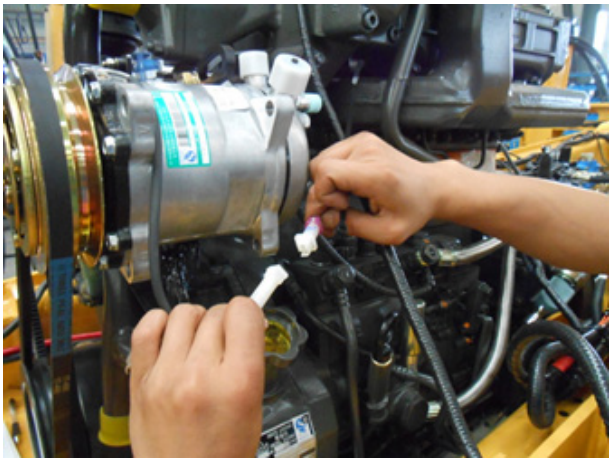
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Disconnect the connecting harness between the water temperature sensor and the frame.



Disconnect the connecting harness between the compressor and the frame.



Cut off a series of belts used for connecting the engine and frame harness with the diagonal pliers.

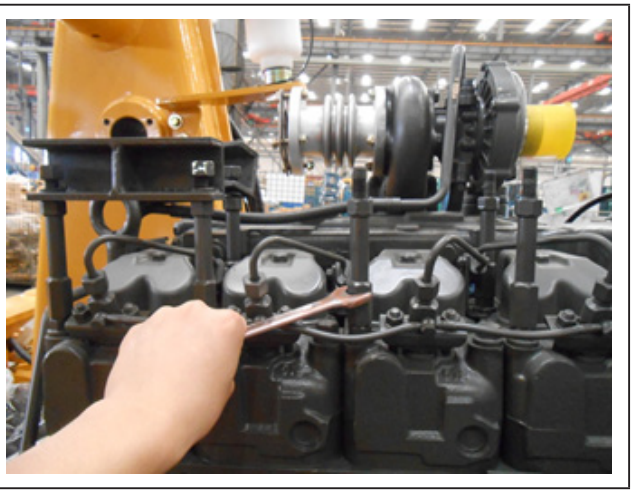


14. Removal of pumps
    Refer to 5.4.3, remove the pump and place it properly.
15. Removal of fixing bolts of engine and gearbox as
    Remove the four fixing bolts from the engine and gearbox as with the 30# socket, extension rod and ratchet wrench (or special wrench) , and take down the bolts and shock pads.

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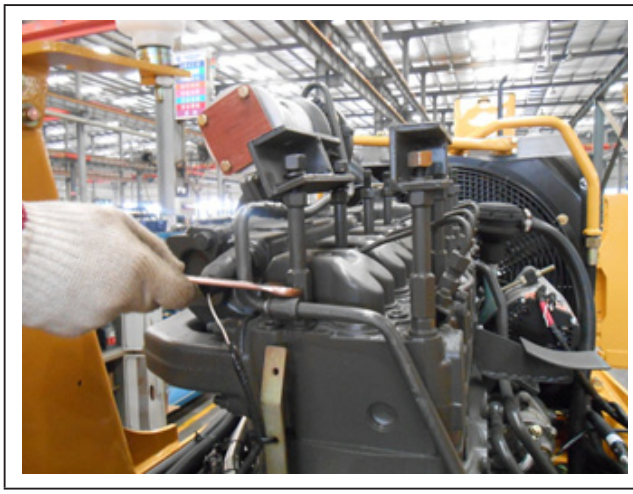


16. Install diesel engine gearbox as hoisting ring
As shown in the figure, remove one bracket on the right side of the engine with the 18# wrench. After removing the bracket, screw the eye ring firmly in the bracket position.





As shown in the figure, remove one bracket on the rear side of the engine with the 18# wrench. After removing the bracket, screw the eye ring firmly in the bracket position as well.



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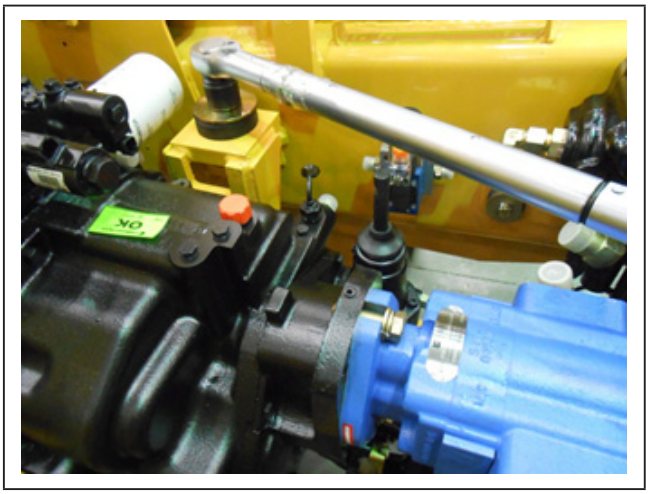


17. Hoist diesel engine gearbox as
    Hook the two eye rings on the engine with the lifting hook. Lift the engine and gearbox as slowly with the travelling crane until it is slightly higher than the frame. Shift out the engine and gearbox as slowly from the front of the frame, and then lift it to the special tooling and place it properly. During lifting and installation, be careful to prevent the engine and gearbox as from crashing both sides of the frame or the crossbeam.



Installation

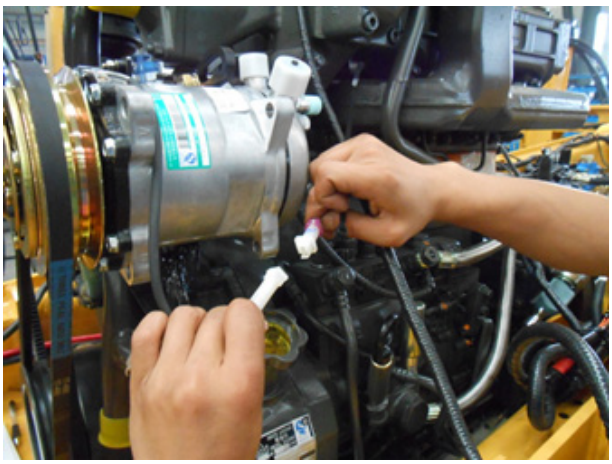
1. Install engine and gearbox as
   Hook the eye rings on the engine with the lifting hook. Lift the engine and gearbox as slowly with the traveling crane above the frame and move it toward the rear of the frame. Align the mounting holes of the diesel engine and the frame and insert the bolts and shock pads, and tighten the bolts. Measure the tightening torque with the fixed torque wrench (200-680N•m) . Make sure that the tightening torque should be 610 N•m. During lifting and installation, be careful to prevent the engine and gearbox as from crashing both sides of the frame or the crossbeam.



2. Install pump
   Refer to 5.4.3 Pump Installation, install the pump in the gearbox.

3. Connect wire harness
   Connect the connector on the compressor with the corresponding connector of the frame harness.

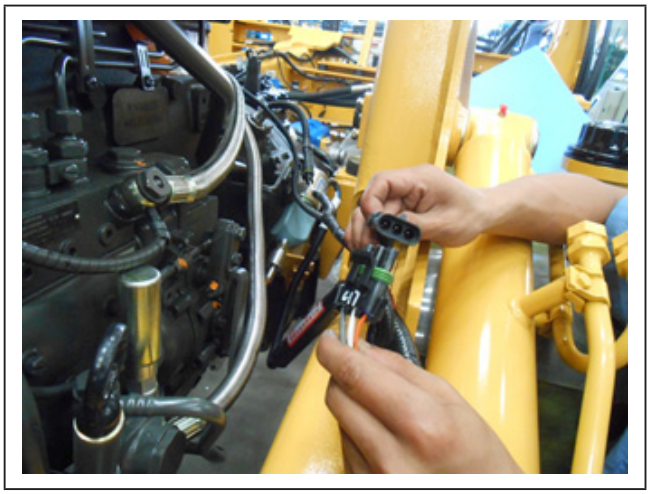
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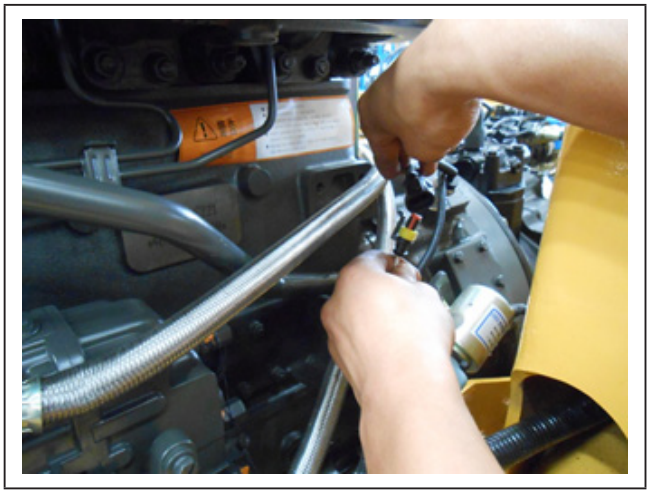
Connect the water temperature sensor harness to the water temperature sensor and put the protective sleeve in place.



Connect the misfire electromagnet harness with the connection of the misfire electromagnet.

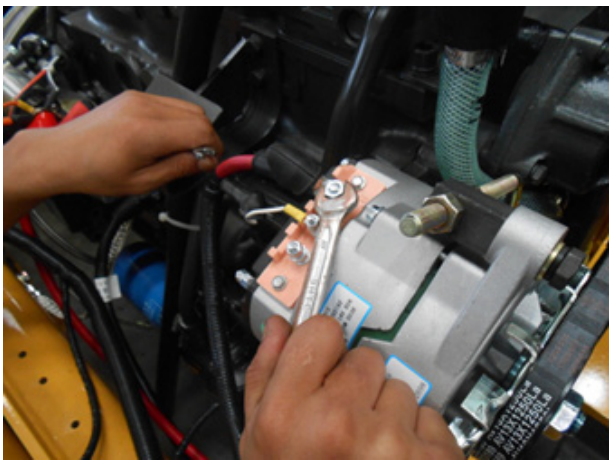


Connect the speed sensor harness with the connection of the speed sensor.



Install the alternator harness in the corresponding connector of the alternator with the 7# wrench and10# wrench, respectively, and then tighten the nuts and put the protective sleeve in place.

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Connect the gearbox oil pressure sensor harness to the sensor and cover the harness connector well.



Install the starting relay harness on the start motor in the corresponding connector of the starting relay with the 7# wrench, and then tighten the nuts and put the protective sleeve in place.

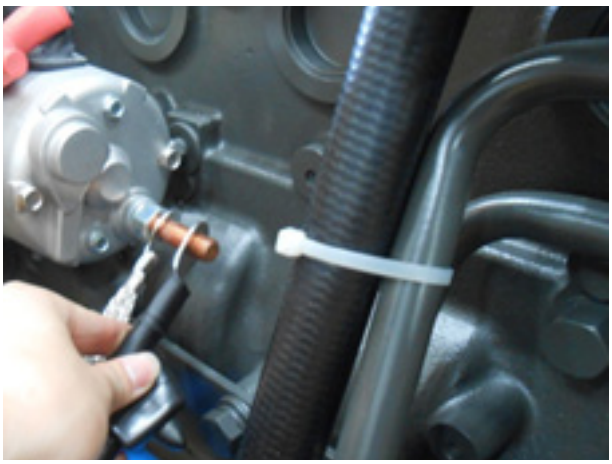


Install the harness of the magnetic package on the start motor in the corresponding connector of the magnetic package with the 16# wrench, and then tighten the nuts and put the protective sleeve in place.

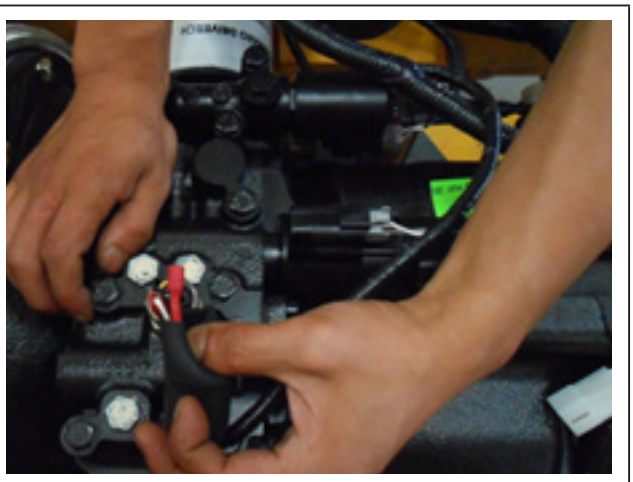


Install the start motor harness in the corresponding connector of the start motor with the 19# wrench, and then tighten the nuts and put the protective sleeve in place.

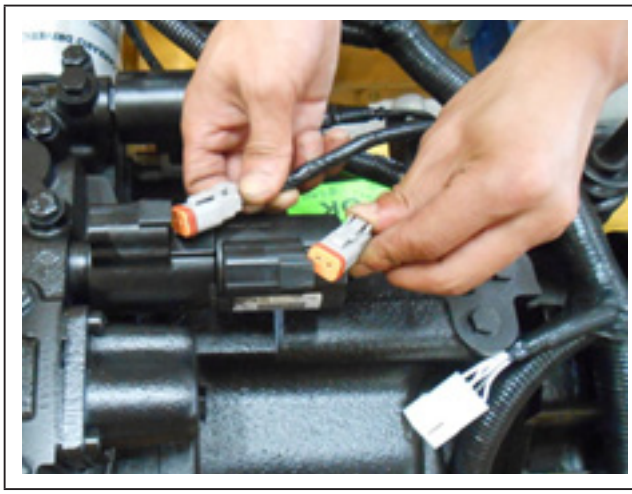
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Connect the gearbox oil pressure sensor harness with the corresponding connector of the oil pressure sensor.



Connect the forward and back-up gear harness with the corresponding interface.



Connect the 4th gear sensor harness with the corresponding interface.



Connect the 2WD/4WD harness with the corresponding interface.

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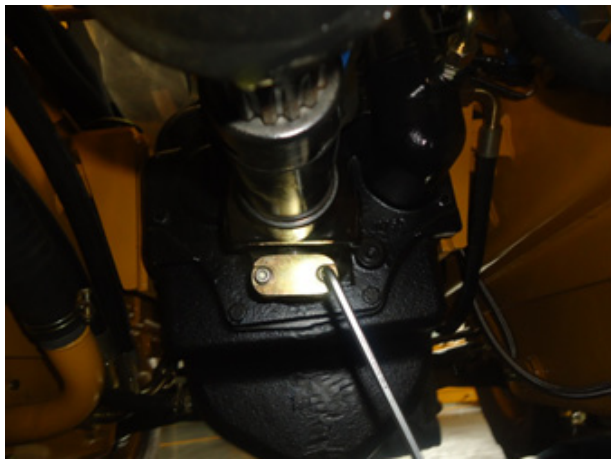


Connect the gearbox oil temperature sensor harness with the corresponding interface.



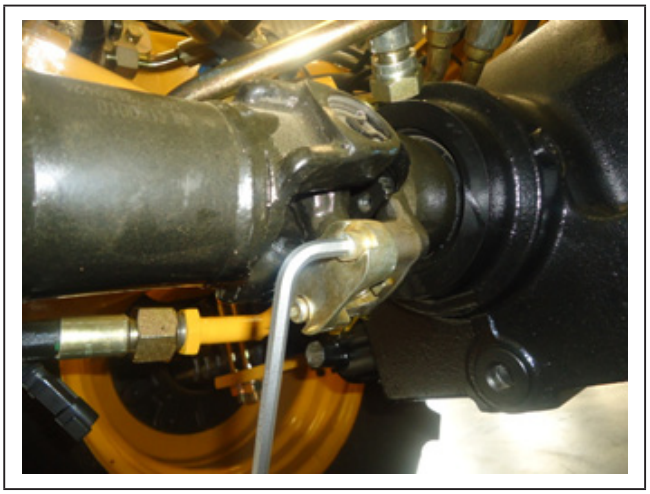
4. Install front axle gearbox shaft
   Insert the spline end of the front drive shaft into the front axle, and install the other end in the gearbox. Tighten the connecting bolts to 26±4N•m with the 6# inch hex wrench.

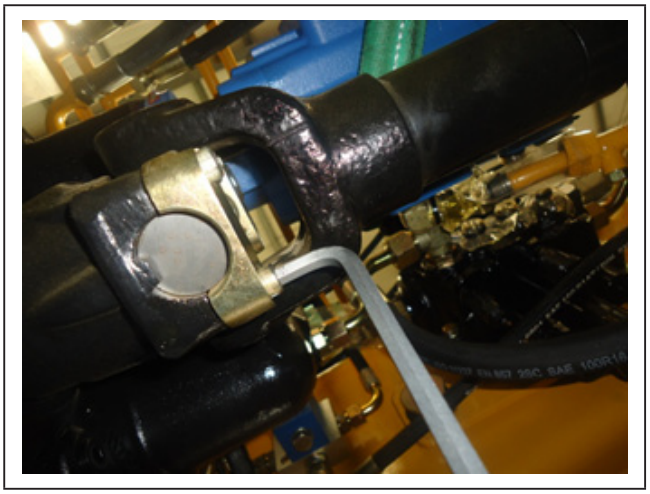




5. Install rear drive shaft
   Install the end (with a larger diameter) of the rear drive shaft in the rear axle, and install the other end in the gearbox. Tighten the connecting bolts to 26±4N•m with the 6# inch hex wrench.

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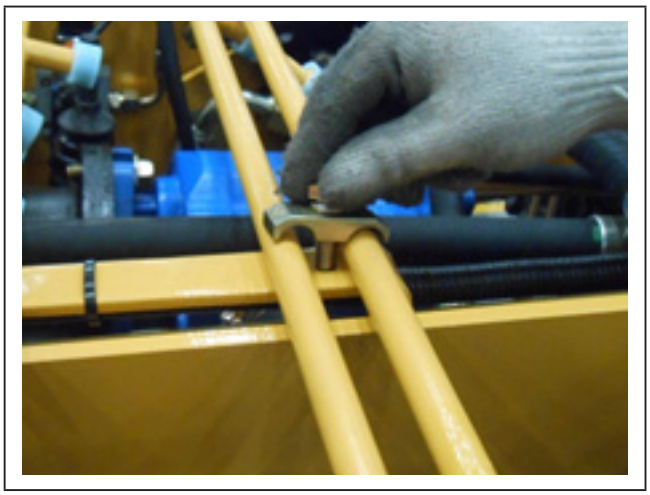




6. Install oil cup
   Align the mounting holes of the oil cup fixing plate and the frame and install the bolts, and then tighten the bolts with the 13# wrench.



7. Install vehicle frame inside steel pipe and hose
   Remove the protection from the steel tube. Put the steel tube in the mounting position. Clamp the steel tube with the large clamps and align the mounting holes, and then install the bolts. Tighten the bolts with the 16# wrench. No deflection of the steel tube trend is permitted.



   Remove the protection from the hoses and the steel tubes. Connect the hose with the innermost steel tube of the frame. Tighten the connection with the 30# wrench. No twist or interference of any hose is permitted.

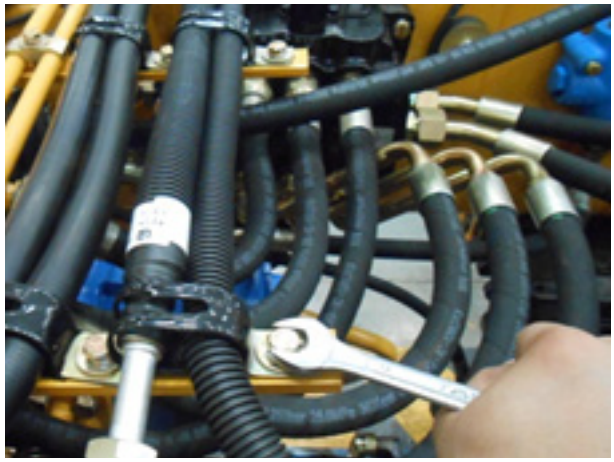
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Remove the protection from the hoses and the steel tubes. Connect the hoses with the four outside steel tubes of the frame. Tighten the connections with the 27# wrench. No twist or interference of any hose is permitted.

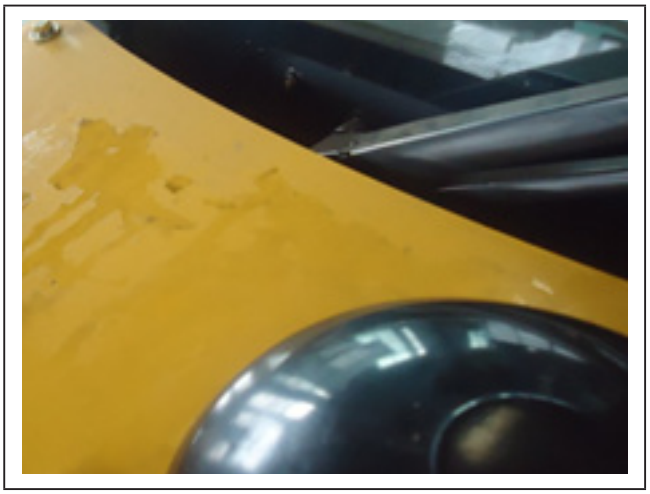


Put the air-conditioning pipeline in the mounting position. Clamp the hoses with the small clamps and align the mounting holes and install the bolts. And then, tighten the bolts with the 13# wrench. No twist or interference of any hose is permitted.



8. Install loading valve and vehicle frame inside steel pipe connecting hose
   Remove the protection from the hose. Refer to 5.4.2 Removal and Installation of Loading Valve Hose, connect the hose of the loading valve with the connecting end of the inner steel tube of the frame and tighten it with the appropriate wrench. No twist or interference of any hose is permitted.
9. Install cab
   Refer to 5.3.2, lift and install the cab as and other components in the machine and connect various connections and pipelines well.
10. Install rear cover
    Put the rear hood in the mounting position of the frame. Align the holes of the frame and install the bolts and nuts. Adjust the position of the rear hood from side to side to make sure the difference between the distances which both sides of the rear hood exceed the frame should be<2mm. And then, tighten the four mounting bolts of the rear hood with the 16# box spanner.

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11. Install muffler
    Refer to 5.5.3, install the muffler as and other components in the corresponding positions of the front end of the engine.
12. Install air filter
    Refer to 5.5.2, install the air filter as and other components in the corresponding positions of the front end of the engine.
13. Install rear cover panel and cooling cotton
    Put the rear cover board in the mounting position. Align the holes of the frame and install the bolts. Tighten the four bolts on the rear cover board with the 13# wrench. After completion of installation of the rear cover board, stick the heat-sinking asbestos in the position shown in the figure.





14. Install radiator
    Refer to 5.5.1, install the radiator as and other components in place, and connect various steel tubes and hoses well and smooth the hoses. No twist or interference of any hose is permitted.

Engine Service

Refer to engine original manual (optional)

Refer to the original manual of Perkins engine (optional)

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8. Power Train System

Front and Rear Axles 2
Removal and installation of front and rear axles.....2
Service of front drive axle (refer to the original manual of CARRARO front drive axle)
Service of rear drive axle (refer to the original manual of CARRARO rear drive axle)
Service of front non-drive axle (refer to the original manual of CARRARO front non-drive axle)
Gearbox & Torque Converter As 10
Removal and installation of Gearbox & torque converter as 10
Removal and Installation of Tyre and Tyre rim.....14

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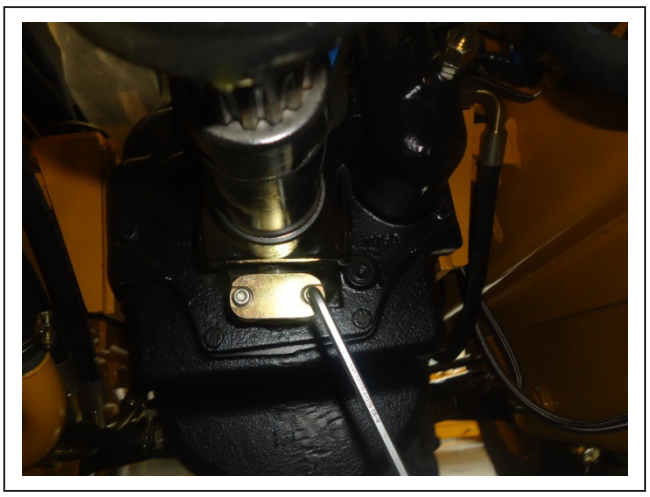
Front and Rear Axles

Removal and installation of front and rear axles

Front and rear axles

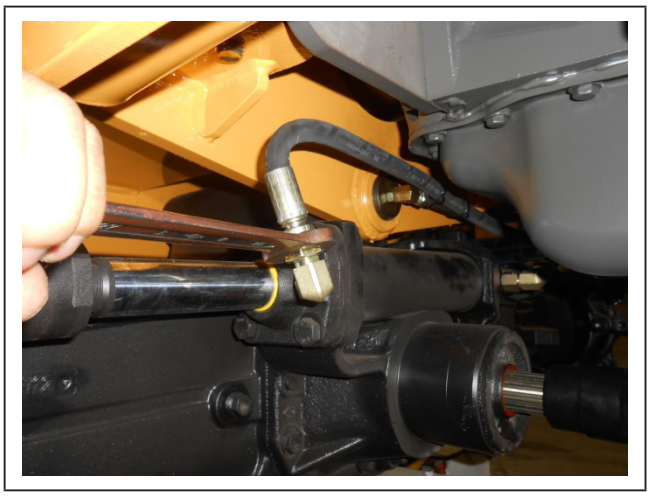
Removal (front axle)

1. Remove the front tyre
   Refer to 5.6.3 Removal of Front Tires in Tires and Rims, remove the front tires and place them properly.
2. Remove front gearbox shaft
   Remove the connecting bolts between the front drive shaft and the gearbox with the 6# inch hex wrench. Take down the connecting spline between the front drive shaft and the front axle and place it properly.





3. Remove front axle steering hose
   Remove the two hoses on the front axle to the metering pump with the 24# wrench. After removal, wrap the hoses with clean plastic bags and belts to prevent foreign matters from entering.



4. Removal of grease pipeline connector of front axle
   Remove the connector on the front axle end of the grease pipeline (between the front axle and the frame) with the 17# wrench. After removal, wrap the grease pipeline with clean plastic bags and belts to prevent foreign matters from entering.

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5. Remove battery
   Refer to 5.7.1 Removal of Battery of Electrical System, remove the battery and place it properly.
6. Remove counterweight retaining ring
   Remove the circular retaining ring on the counterweight with the 13# wrench.



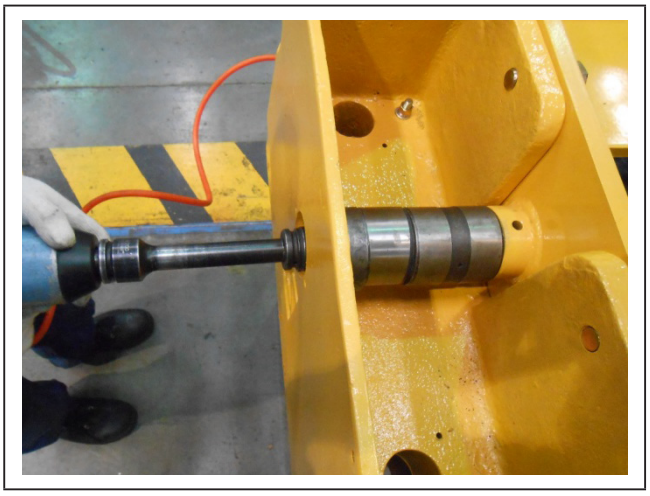
7. Remove the bolt on axis pin
   Remove the bolts from the axis pin of the front axle with two 16# wrenches.



8. Remove front axle pin
   Lift and hold the front axle with travelling crane and sling. Let the M20X220 bolt (about 220mm long) pass through the cylinder jacket and screw it in the threaded hole of the pin. Tighten the bolt with the pneumatic impact wrench (with a 30# socket) continuously to drag out the pin of the front axle. Lift the front axle away for repair or replacement.

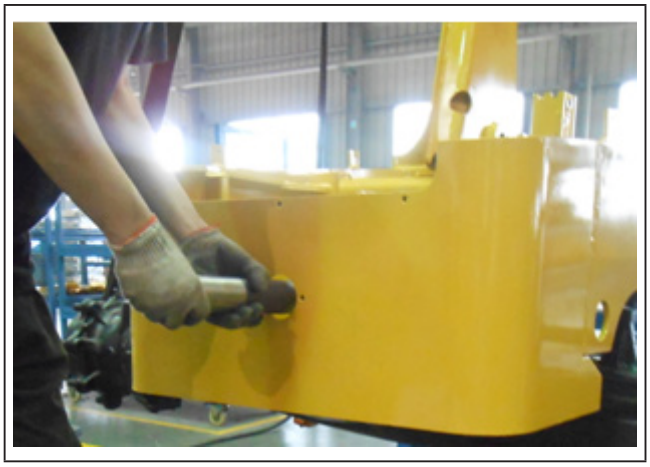


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Installation (front axle)

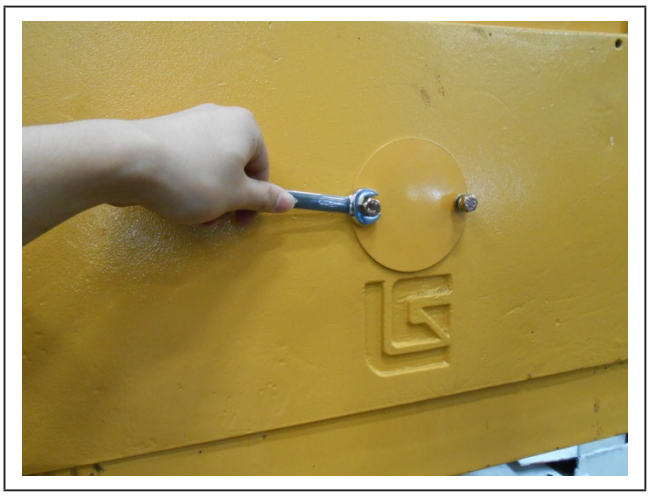
1. Install front axle pin
   Hold on to both ends of the front axle with the sling. Lift the front axle to the mounting position with the travelling crane. Align the pin hole and let the pin pass through the hole. Add the pads to adjust the clearance.After the pin entering into the hole, adjust the positions of the holes of the pin and the frame, and then install the bolts. Tighten the double nuts with two 16# wrenches. Make sure that the front axle is provided with a displacement of 2-5mm after completion of installation of the mounting bolts.



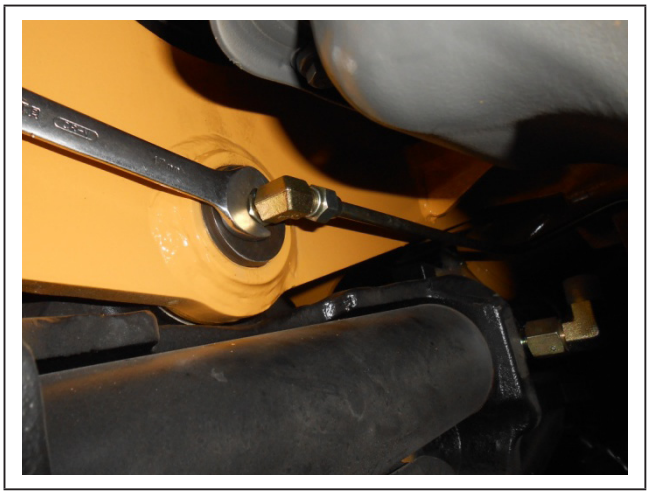


2. Install counterweight retaining ring
   Put the retaining ring of the counterweight in the mounting position. Align the threaded holes of the counterweight and install the bolts. And then tighten the bolts with the 13# wrench.

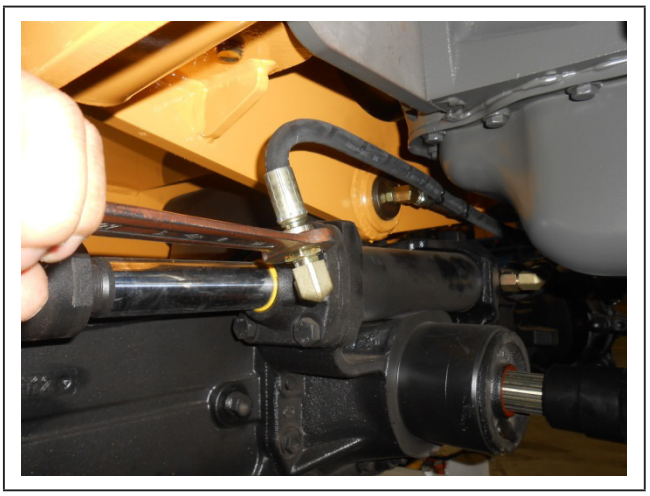
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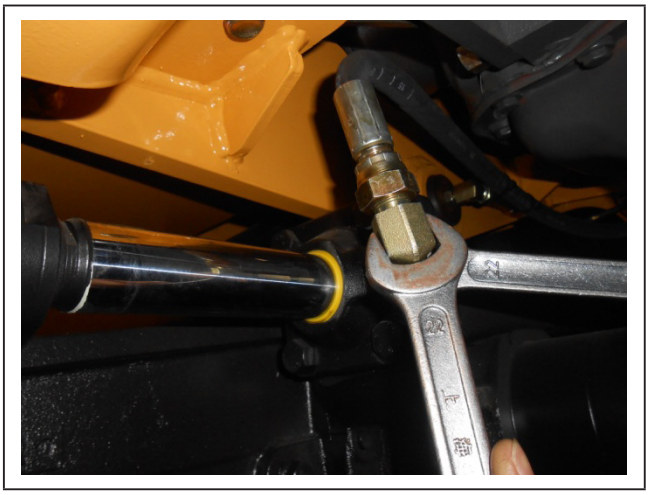


3. Install battery
   Refer to 5.7.3 Installation of Battery of Electrical System, install the battery in place.
4. Installation of grease pipeline connector of front axle
   Remove the protection from the grease pipeline connector. Screw the connector in the threaded hole of the pin of the front axle, and then tighten it with the 16# wrench.



5. Install front axle steering hose
   Remove the protection from the hose. Install the hose onto the connector of the front axle with the 24# wrench. After completion of tightening, adjust the position of the connector with two 22# wrenches. Make sure that the connector will not interfere with the engine base.

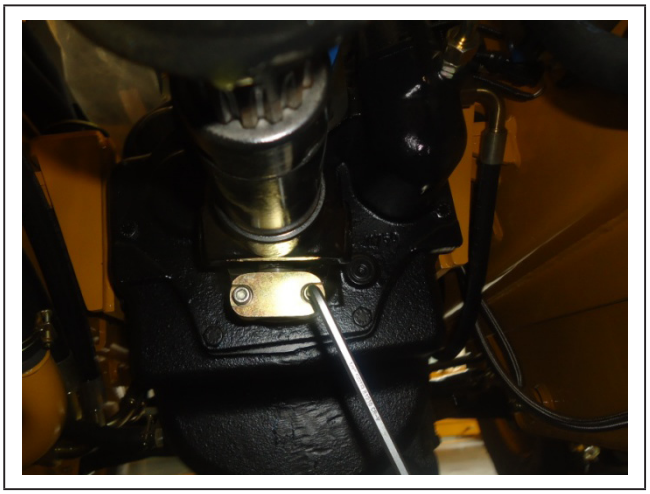




6. Install front axle gearbox shaft
   Let the spline of the front drive shaft enter into the front axle end. Put the other end of the front drive shaft in the mounting position of the gear-box. Tighten the four fastening bolts with the 6# inch hex wrench to 26±4N•m.

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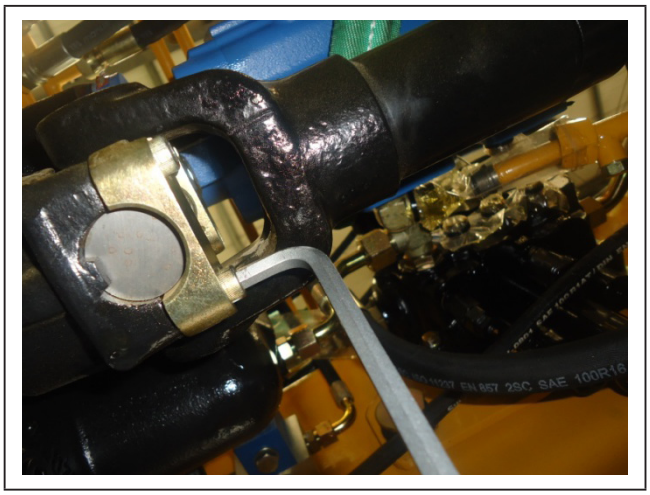


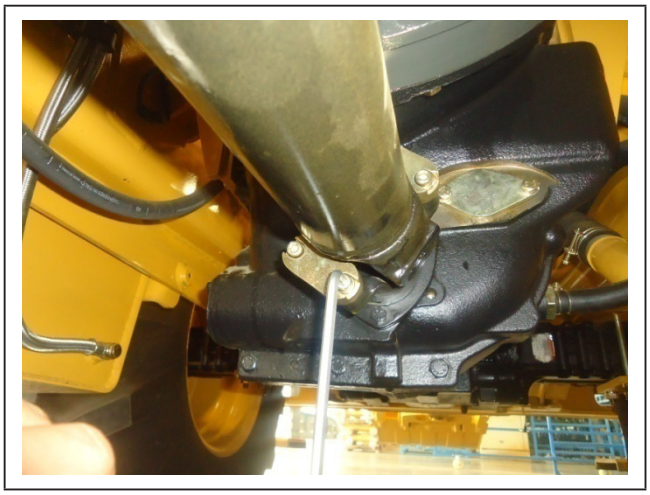


7. Install front axle tyre
   Refer to 5.6.3 Installation of Front Tires of Tires and Rims, install the tires onto the front axle.

Removal (rear axle)

1. Remove rear tyre
   Refer to 5.6.3 Removal of Rear Tires of Tires and Rims, remove the rear tires and place them properly.
2. Remove rear gearbox shaft
   Remove the connecting bolts between the rear drive shaft and the gearbox as well as between the rear drive shaft and the rear axle, respectively, with the 6# inch hex wrench.Remove the rear axle and place it properly.





3. Removal of pipeline between assistor and rear axle
   Remove the hose connecting the assistor with the rear axle with the 17# wrench. After removal, wrap the hose with clean plastic bags and belts to prevent foreign matters from entering.

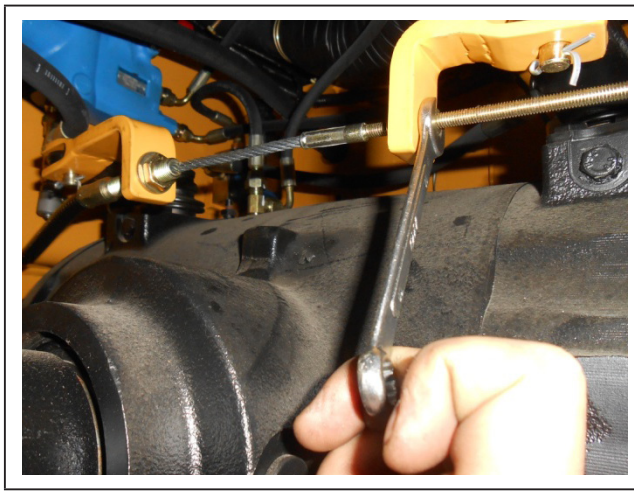
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4. Removal of pipeline between brake balance valve and rear axle
   Remove the hose connecting the brake balance valve with the rear axle with the 17# wrench. After removal, wrap the hose with clean plastic bags and belts to prevent foreign matters from entering.



5. Removal of brake flexible shaft on side of rear axle
   Remove the fastening bolts on the right end of the parking brake flexible shaft on the rear axle with the 10# wrench. Remove the fastening bolts on its left end with two 18# wrenches.

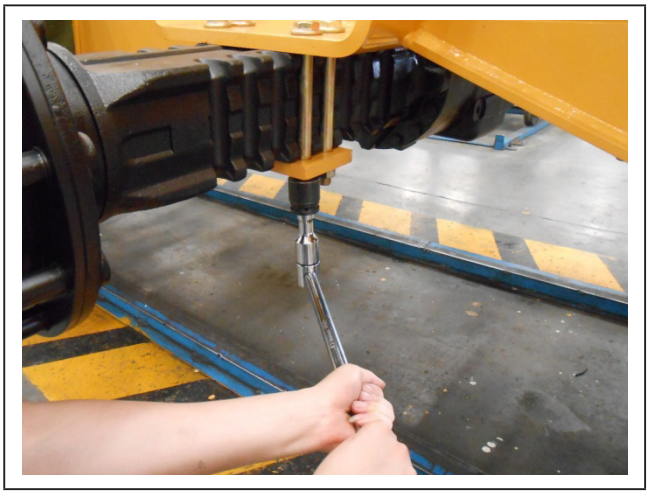




6. Remove rear axle fixing bolt
   Lift and hold both ends of the rear axle with the travelling crane and sling. Remove the fastening bolts from the rear axle with the 30# socket, extension rod and ratchet wrench (or special wrench) . Remove the rear axle and place it properly.

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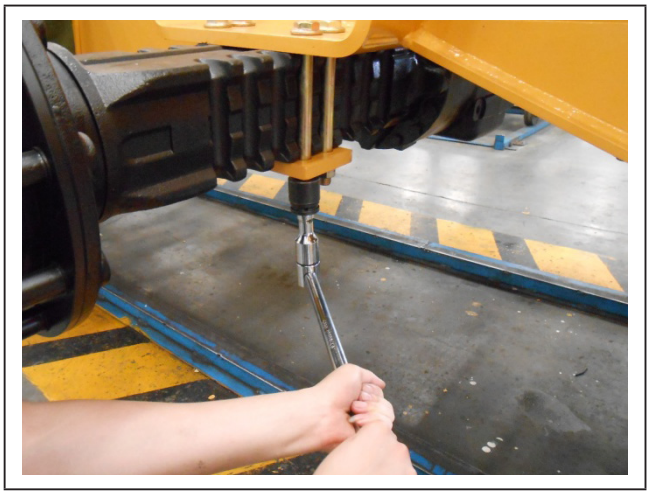




Installation (rear axle)

1. Install rear axle fixing bolt
   Lift and hold both ends of the rear axle with the traveling crane and sling. Lift the rear axle to the mounting position. Let the bolt pass through the hole of the frame and the groove of the rear axle. Compress the rear axle with the pressure plates and then screw in the nut. Tighten the bolt to 400-480N•m with the 30# socket, extension rod and ratchet wrench (or special wrench)
   .



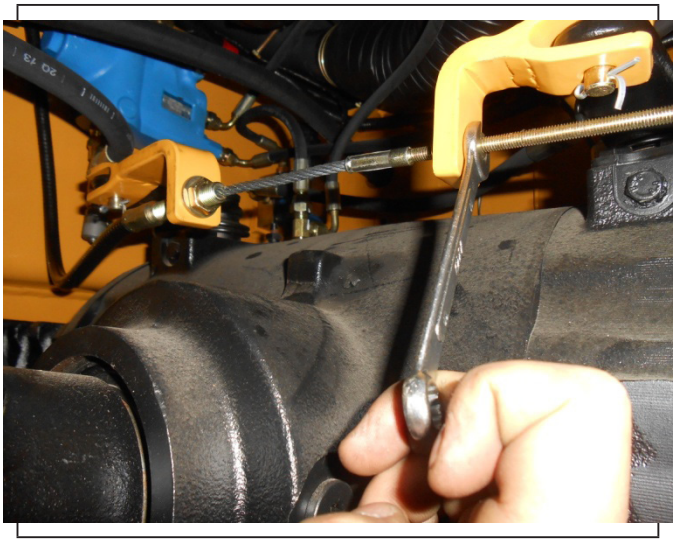


2. Install hand brake flexible shaft
   Let the parking brake flexible shaft pass through the two eye plates on the rear axle and put it in the mounting position. Install the bolt and strain the flexible shaft. Tighten the fastening bolt on the right end of the flexible shaft with the 10#

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wrench. And then, tighten the fastening bolt on the left end of the flexible shaft with two 18# wrenches.





3. Install braking balance valve to rear axle piping
   Remove the protection from the hose. Screw the hose onto the rear axle with the 17# wrench.

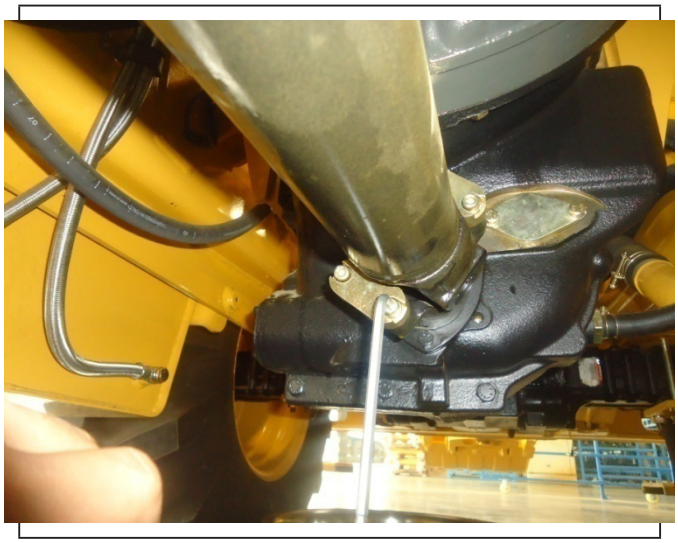


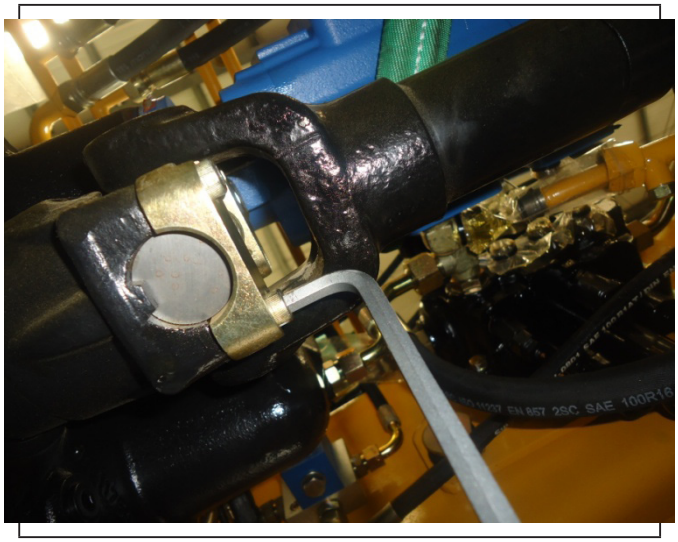
4. Install booster to rear axle end piping
   Remove the protection from the hose. Screw the hose onto the rear axle with the 17# wrench.



5. Install rear drive shaft
   Put the larger end of the rear drive shaft in the mounting position of the rear axle. Tighten the four connecting bolts with the 6# inch hex wrench. And then, put the other end of the rear drive shaft in the mounting position of the gearbox. Tighten the four connecting bolts to 26±4N•m with the 6# inch hex wrench.

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6. Install the rear tyre
   Refer to 5.6.3 Installation of Rear Tires of Tires and Rims, install the rear tires onto the rear axle.

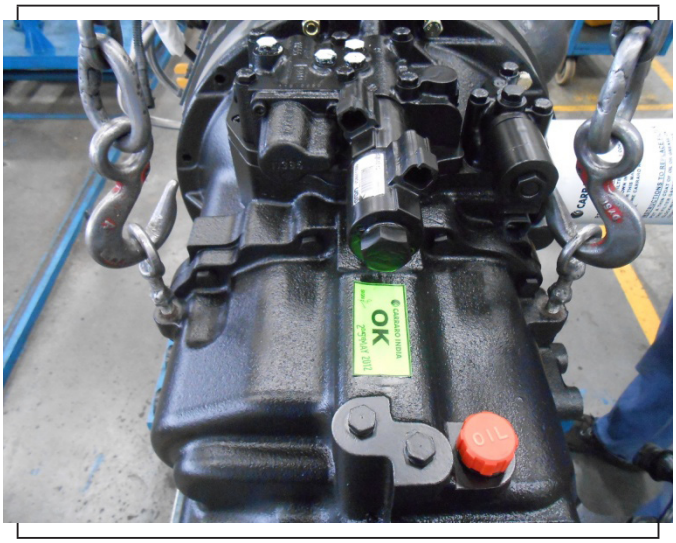
Gearbox & Torque Converter As

Removal and installation of Gearbox & torque converter as

Gearbox & torque converter as

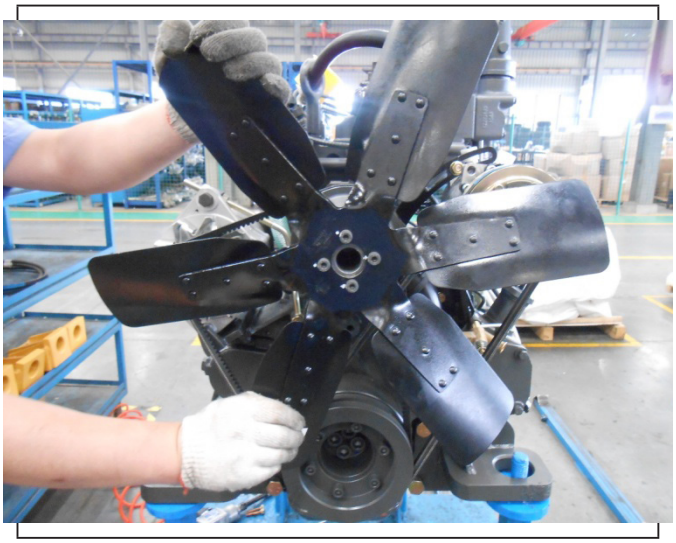
Removal

1. Refer to 5.5.2 Diesel Engine, lift the gearbox as
2. Preparations for diesel engine and gearbox removal
   Install the two eye rings (with a nominal thread diameter of M14) into the two holes on both sides of the gearbox. Screw the eye rings in place and hook the eye rings with the lifting hook. Start the travelling crane and strain the lifting hook to apply a slight force to the gearbox.



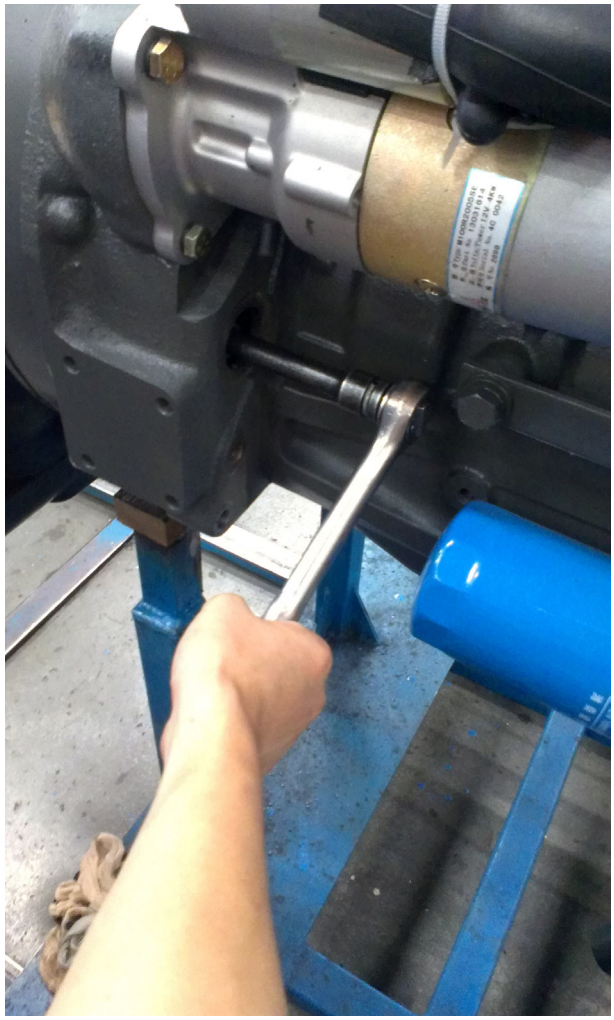
3. Remove diesel engine and gearbox inside connection bolts
   Push aside the protective sleeve of the circular hole on the down side of the start motor. Turn the diesel engine fan blades to a proper position until you can see the bolt in the hole as viewed from the outside to inside.

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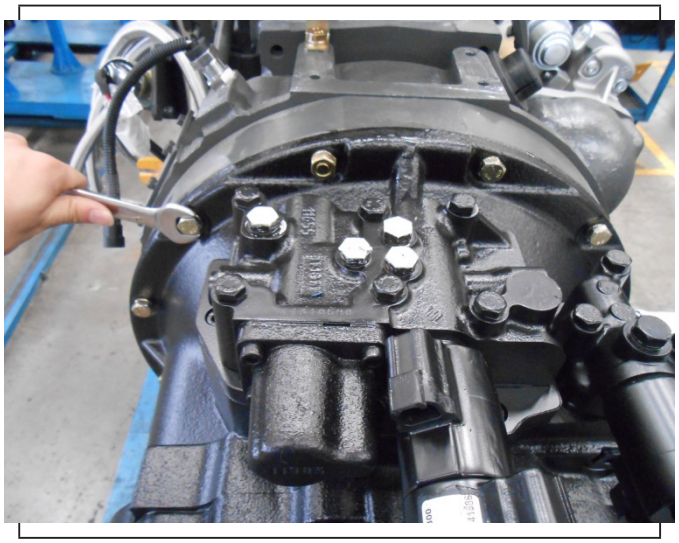
Remove the bolt inside the hole with the 16# socket, extension rod and ratchet wrench or special wrench.And then, turn the fan blades continuously until you have removed the remaining bolts. There are four bolts in total.





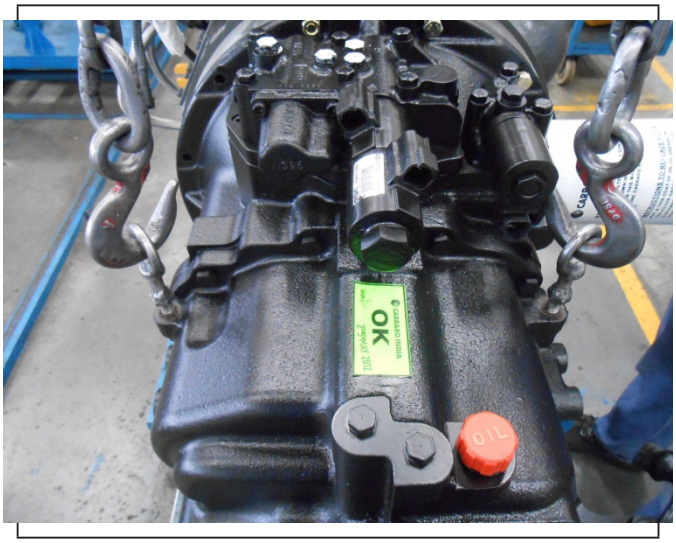
4. Removal of connecting bolts outside diesel engine and gearbox
   Remove the connecting bolts outside the diesel engine and gearbox with the 16# wrench. Lift the gearbox away and place it properly.

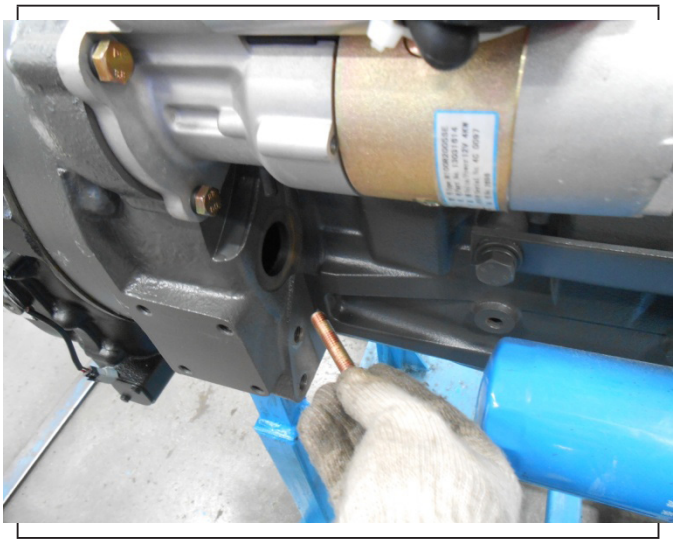
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Installation

1. Install diesel engine and gearbox inside connection bolts
   Install the two eye rings (with a nominal thread diameter of M14) into the two holes on both sides of the gearbox. Screw the eye rings in place and hook the eye rings with the lifting hook.Lift the gearbox to the mounting position with the travelling crane. Align the mounting holes of the gearbox and the engine and install the bolts, and then tighten the bolts with the 16# wrench.

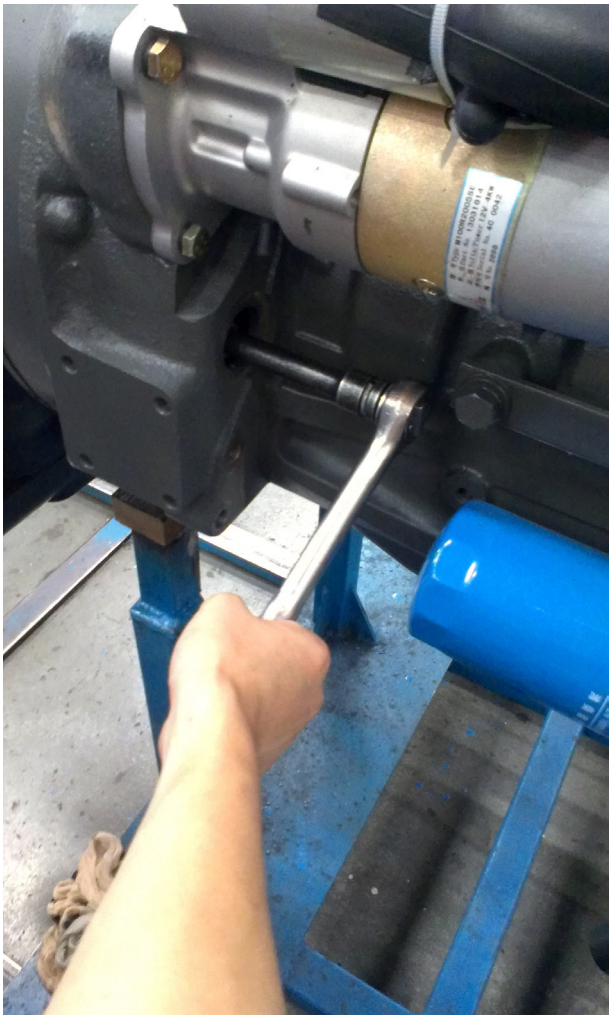


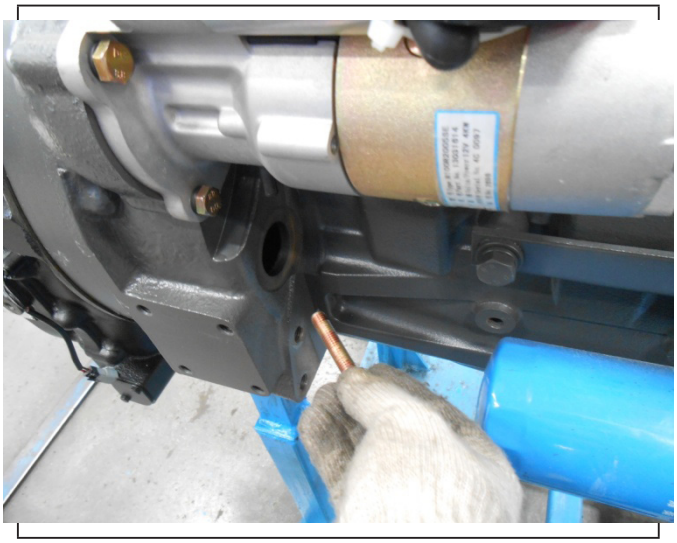


2. Install diesel engine, gearbox inside connection bolt
   Turn the engine fan blades to a proper position

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until the upper hole of the engine is in alignment with the threaded hole inside the gearbox. Coat the bolt with the 1277adhesive and install the bolt. Tighten the bolt with the 16# socket, extension rod and ratchet wrench or special wrench. And then, turn the fan blades continuously until you have removed the remaining bolts. There are four bolts in total.Finally, remove the eye rings and lifting hook.





3. Installation of engine and gearbox as
   Refer to 5.5.2 Lifting and Installation of Engine and Gearbox As, install the engine and gearbox as onto the machine.

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Removal and Installation of Tyre and Tyre rim

Tyre and tyre rim

Removal (front tyre)

1. Park the machine and hold up the bucket and outriggers.
   Park the machine on level ground. Start the engine and operate the handle of the control lever on the loading end and lower the bucket until the front end of the machine has been held up and the front tires has been off the ground.



2. Removal of wheel rim nuts
   Unscrew the nuts with the 27# socket, extension rod and ratchet wrench or special wrench and remove some wheel rim nuts.



3. Remove tyre
   Lift and hold the tire with the travelling crane and sling and unscrew the remaining nuts. Lift the tire away and put it on level ground for repair.



Installation (front tyre)

1. Install the front tyre
   Lift and hold the tire with the travelling crane and sling. Lift the tire to the front axle to align the mounting holes of the wheel rim to the wheel rim bolts on the axle, and then install the tire onto the axle.



2. Installation of wheel rim nuts
   Install the wheel rim nuts and tighten them with the 27# socket, extension rod and ratchet wrench or special wrench. Be sure to tighten the nuts alternatively to 265N~355N•m.

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3. Lay down the complete machine
   Start the machine and operate the handle of the control lever on the loading end and lower the bucket until the front tires have been laid down onto the ground steadily.



Removal (rear tyre)

1. Park the machine and hold up the bucket and outriggers.
   Park the machine on level ground. Start the engine and operate the outrigger handle on the excavation side and raise the outriggers until the rear end of the machine has been held up and the rear tires has been off the ground.



2. Remove fender
   Remove the fixing bolts of the fenders with the 13# wrench and take down the fenders, and then put the fenders properly.



3. Removal of wheel rim nuts
   Unscrew the nuts with the 32# socket, extension rod and ratchet wrench or special wrench and remove some wheel rim nuts.

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4. Remove tyre
   Lift and hold the tire with the travelling crane and sling and unscrew the remaining nuts. Lift the tire away and put it on level ground for repair.



Installation (rear tyre)

1. Install the rear tyre
   Lift and hold the tire with the travelling crane and sling. Lift the tire to the rear axle to align the mounting holes of the wheel rim to the wheel rim bolts on the axle, and then install the tire onto the axle.



2. Installation of wheel rim nuts
   Install the wheel rim nuts and tighten them with the 32# socket, extension rod and ratchet wrench or special wrench. Be sure to tighten the nuts alternatively to 450N~550N•m.



3. Installation of fenders
   Put the fender in the mounting position. After aligning the mounting holes, install the bolts and tighten the bolts with 13# wrench.

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4. Lay down the complete machine
   Start the machine and operate the handle of the outrigger control lever and retract the outriggers until the rear tires have been laid down onto the ground steadily.