

XF series 12t
Internal Combustion Counterbalanced Forklift Truck

SERVICE MANUAL



Original Instruction

HANGCHA GROUP CO., LTD.

09/2023

Foreword

XF series diesel fork truck is a new generation fork truck which adopted the latest concept to design, it has these features: novel appearance, compact structure, advanced function. The manual is the introduction of structure, working principle and maintenance and so on.

For safety and performance of truck, all in charge of operation, maintenance and management must read and comprehend this manual well.

The manual also applies to container fork-lift trucks.

It is forbidden anybody without training and qualification to maintain.

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I .Power system

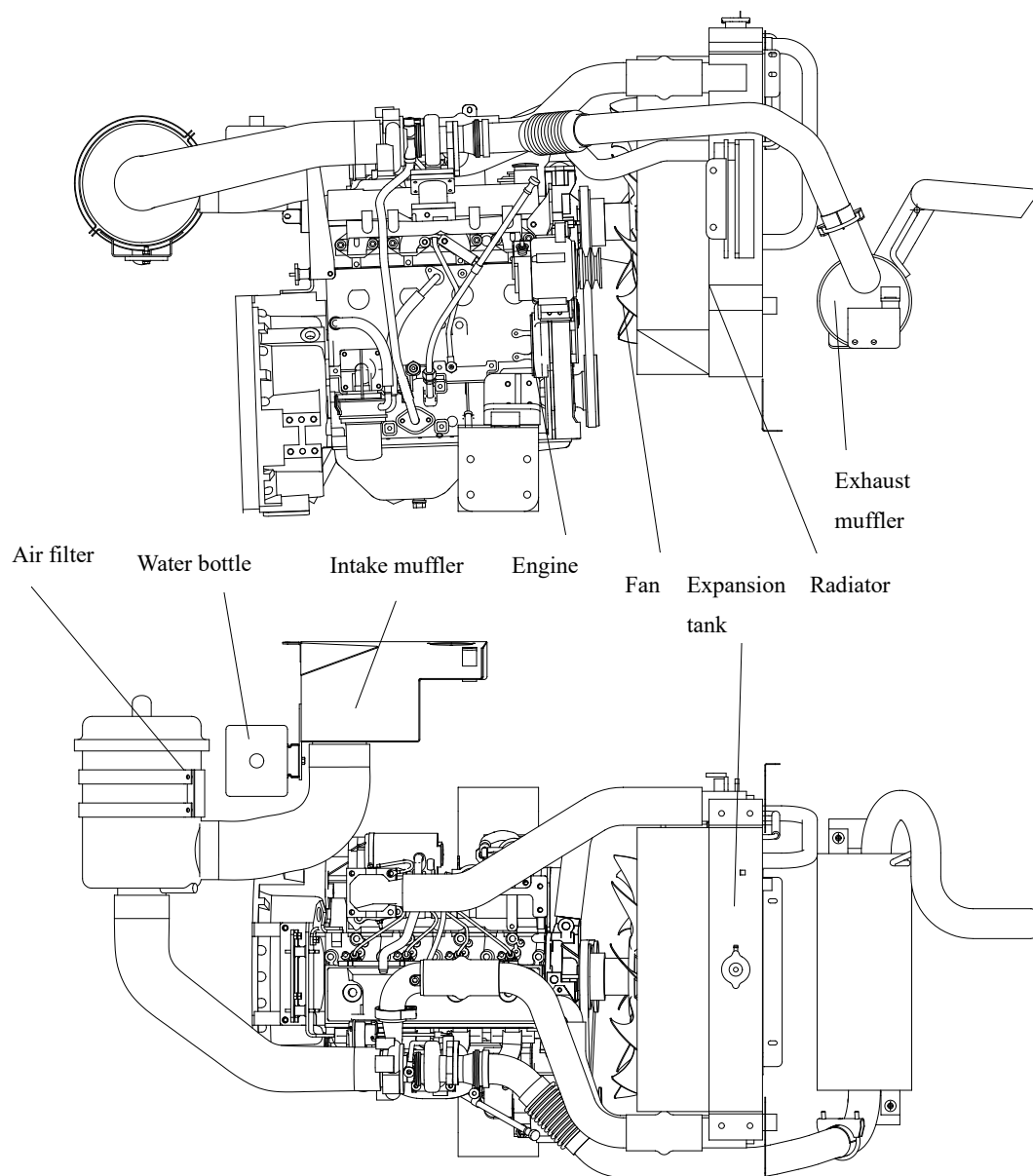


Fig.1-1 Power system drawing

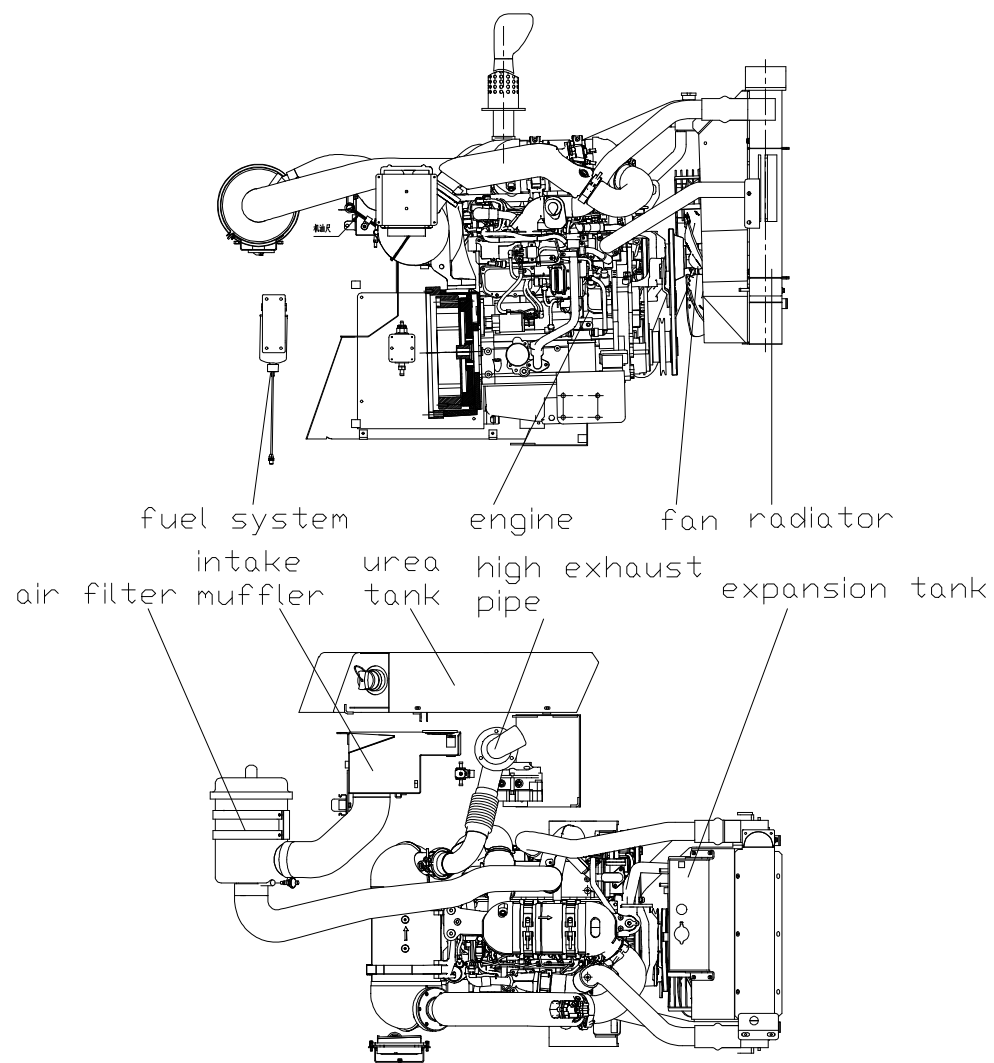


Fig.1-1-2 Power system drawing (W75、W96)

1.Engine

1.1 Power disposition

Model	BB-6BG1TRC-06 (ISUZU)	QSB4.5 110 (Cummins)
Displacement (L)	6.494	4.5
Rated power (kW)	97.7	82
Rated speed (r/min)	2200	2200
Max. torque/rotate speed (N • m/rpm)	490/1400	489/1500
Cylinder stator No. (piece)	6	4
Cylinder diameter × stroke (mm)	105×125	107×124
Engine oil volume (L)	21.5	8~12
Coolant volume (L)	12	8.5
Air inlet way	Supercharge	Supercharge
Dry weight (kg)	484	390

Model	TCD 3.6 L4 f (DEUTZ)	TCD 3.6 L4 (DEUTZ)
Displacement (L)	3.6	3.6
Rated power (kW)	85	85
Rated speed (r/min)	2200	2200
Max. torque/rotate speed (N • m/rpm)	460/1600	460/1600
Quality (kg)	350	350
Type	CPCD120-XXW75	CPCD120-XXW96

1.2 Use and maintenance of Cummins engine

1.2.1 Basic operation requirement

◆ Before starting the engine, you should check the level of machine oil and coolant, and seek:

- Leakage place
- Looseness place and damage article
- Any change of the appearance of the engine

◆ When starting:

- Do not place the hydraulic system operating grip and transmission gear box place in neutral.
- Do not step on the accelerator (Electronic controlled engine).
- Switch the key to the connecting position “ON”, wait for the “WAIT-TO-START” indicator going out, and then re-start the engine (Electronic controlled engine).
- Starting time of the motor should not exceed 30 seconds, and interval between two starting should be 2 minutes.
- If there is current malfunction, you should deal with the problem and re-start the engine (Electronic controlled engine).
- If you are unable to start the truck for 3 times, you should check the electrical control and fuel system.
- If there is still no machine oil pressure for 15 seconds after starting the truck, you should shut down the engine and check the lubricating system.

◆ After starting:

- Reload for idling at least 3-5 minutes to make sure the normal of lubricating oil.
- The engine is not allowed to run under low idling speed condition for overlong time (exceed 10 minutes).
- It is not allowed to keep the engine accelerator open exceeding 30 seconds when it is below motor linear torque rotate speed(refer to linear torque speed on the engine nameplate), otherwise it may shorten engine heavy repair interval and damage the engine badly.
- Engine speed is not allowed to over the max. speed of the engine, or it will cause sever damage to the engine.
- During then engine running, if the temperature of engine coolant continually is over or below the technical specified value given by the maintenance technical regulation.

◆ If the engine has the following condition, you should report it in time, such as fire lack, vibration, abnormal noise, leakage, sudden water temperature or engine oil pressure change, smoking, power coastdown, inability or fuel consumption increase.

◆ After engine run with full load:

- Idling for 3-5 minutes.
- When the engine misses, stay ON position for at least 10 seconds, and then cut the power (Electronic controlled engine).
- Do not wash the engine with water(Electronic controlled engine).

1.2.2 Daily maintenance requirement

Discharge water in oil-water separator daily

◆ Turning off the engine. Turn on the water discharging switch, let out water and deposit in the oil-water separator until the clean oil flows out.

Notice: Water discharge switch should not screw too tightly, or it will make thread invalid.

Check oil level of the machine oil daily

◆ When checking oil level of the machine oil, the engine should be placed in level, and the measurement should carry out in 5 minutes since stop. Taking out oil gauge to check oil level, which should be between “L” and “H” marked on the oil gauge.

Check fluid level of coolant daily

Caution: When the engine is still heat, do not take off the radiator cover! The temperature should be below 50 °C , then you can take off the pressure cover, let out the pressure of the cooling system slowly.

◆ You should check fluid level of coolant daily and get the radiator full of coolant. Coolant cover should work normally. Please apply the recommended Renewal interval to replace the filter.

◆ You should report the following condition of the engine in time: lacking spark, vibration, abnormal noise, leakage, sudden change of water temperature and engine oil pressure, smoking, power coastdown, inability, increase of engine oil and fuel oil consumption.

◆ After full-loaded running of the engine

- Idling 3-5 minutes then stop the truck.

- When the engine shut down, stay the ‘ON’ position for at least 10 seconds, then cut off the power (Electronic controlled engine).

- You are not allowed to clean the engine with water (Electronic controlled engine).

◆ There must be certain DCA4 in the coolant to supply the best anticorrosion ability.

Notice: If adding coolant is needed, you must add the mixed coolant (intensive mixing of 50% water and 50% antifreeze solution).

Check driving belt weekly

◆ Check the longitudinal crack of the belt. Transverse crack is acceptable, while longitudinal crack intersecting with transverse crack is unacceptable. You must change the belt if there is any deformity or damage.

Check cooling fan weekly

◆ Check the crack of the cooling fan. Make sure the cooling fan firmly install and change the damaged one.

Renewal interval of lubricating oil and filter

◆ Only use high-quality lubricating oil and fleetguard filter recognized by Cummins.

◆ Choose lubricating oil that suits local temperature. The max. renewal interval of lubricating oil and filter recommended is 250 hours or 3 months or 10,000 km(based on the first arrival)

Notice: Do not get the dirty into the lubricating system when changing filter and lubricating oil.

Adding fuel oil, the renewal interval of fuel filter

◆ Cummins suggest to use diesel with high quality and proper viscosity and fleetguard filter. Replace fuel filter every 250 hours and 10,000 km, or refer to the

recommended Renewal interval of the manual.

Notice:

- Never get the dirt into the fuel system when changing filter and adding oil to the oil box.
- Clean oil box periodically.
- Never use low-quality and non-Cummins filter, otherwise it may cause severely early wear of fuel pump.

Check air intake system and air filter weekly

◆ Check whether there is crack in the air intake pipe or the looseness in the pipe. When the intake resistance reaching the specified max. intake resistance, you should replace air filter or clean air filter according the manufactures' requirement.

Notice: Even little dirt enter the engine, it will cause severe wear of piston ring and big low exhausting. Make sure the clean and no air leakage of intake system.

Starting motor and battery

◆ Make sure the clean and no looseness of the battery wiring. Interval between two continuous starting should exceed 2 minutes. Per starting time should not exceed 30 seconds. You should charge the battery periodically and pay attention to battery's winter insulation.

Turbocharging and intercooling system

◆ The common turbocharging is waste gas supercharger, using the waste gas exhausted from the engine to drive impeller to compress the fresh air thus increase the air inflow.

◆ Air temperature increased after supercharging, first is air density of the cylinder decreased(the higher temperature, the lower oxygen content) and the output power decreased; second is causing engine detonation. As a result, cooling the air after supercharging is beneficial to improve engine power, reduce fuel consumption, reduce engine thermal load and lessen engine detonation trend. This is realized through the intercooler at the back of the compressor.

◆ After high-speed running for a long time, the engine should not shut down immediately. The reason is that, after sudden stop, engine oil pressure drops to zero rapidly, machine oil supply for lubricating and cooling suspend, meanwhile the rotor is still in inertially high-speed rotation. Thus it cause the "seizure" between the spindle and shaft sleeve of the turbocharger and damage the spindle and shaft sleeve. Moreover, after sudden shutdown of engine, temperature of exhaust manifold is very high, it will boil the machine oil in the turbocharger into carbon deposit. If this carbon deposit is accumulated much, it will lead to the oil lack of shaft sleeve and speed the wear between spindle and shaft sleeve of the turbocharger.

Specification, structure and maintenance, please refer to ENGINE MAINTENATION MANUAL.

You should check the exhaust displacement after the maintenance or servicing, and ensure that the exhaust gas is in accordance with relevant figure.

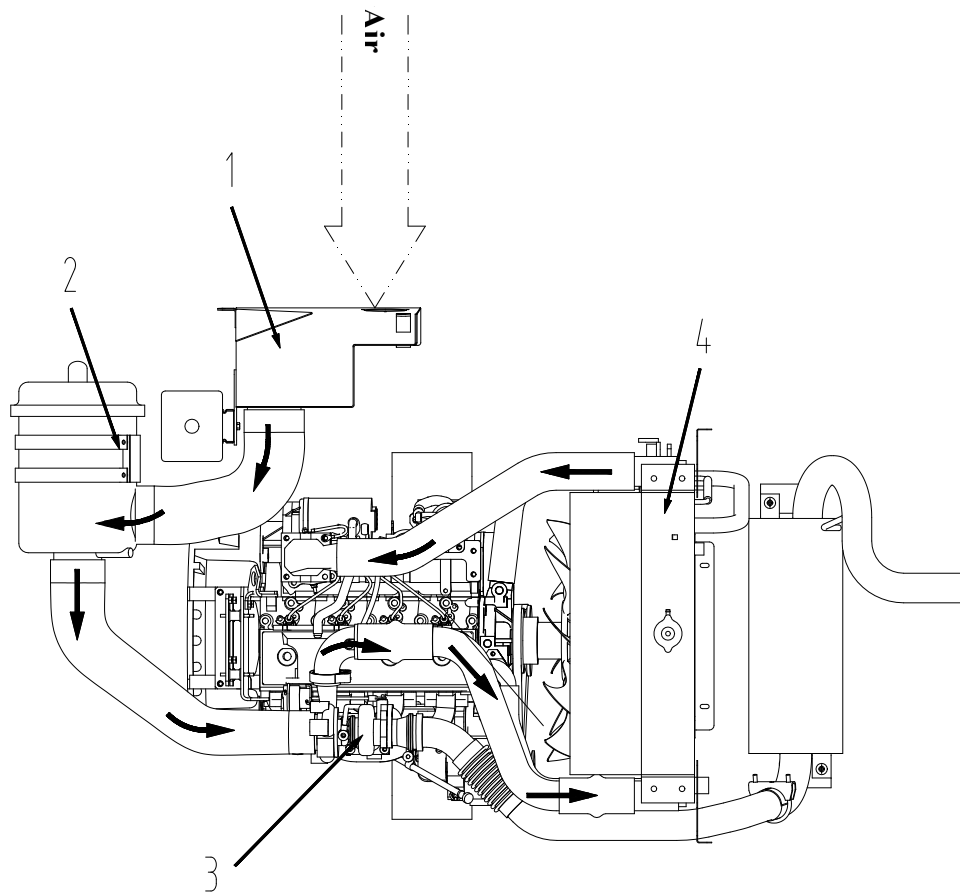
phase III see the following table:

Engine power kW	CO (g/kWh)	HC (g/kWh)	NO _x (g/kWh)	HC+NO _x (g/kWh)	PM (g/kWh)
75 ≤ P < 130	5	-	-	4.0	0.3

Phase IV see the following table:

Engine power kW	CO (g/kWh)	HC (g/kWh)	NO _x (g/kWh)	HC+NO _x (g/kWh)	PM (g/kWh)
75 ≤ P < 130	5	0.19	3.3	-	0.025

2. Air intake system



1. Intake muffler 2. Air filter 3. Turbocharger 4. Empty intercooler

Fig. 1-2 Intake system

Intake pipe maintenance

Before daily work, start the engine, keep in idling speed and check if the intake pipe leaks. If air leaks, make sure the leakage position, shut down the engine and check the air leakage reason. If air leakage caused by the T-type clamp in pipe joint looseness, re-screw down T-type clamp; if it is caused by tube ageing, replace a new rubber tube.

Note: If intake pipe has ageing and delamination problem, replace aged tube as soon as possible no mater leak or not.

Air filter

Air filter maintenance

Maintenance way(outer):

Lightly knock the filter element end cap and shake off the dust.

Blow clean the filter element along the bevel angle direction from inside to outside with dry compressed air whose pressure is no larger than 500kpa.

Replace filter element

1. Outer filter element or maintenance reaches 5 times.
2. There is still maintenance signal after installing the maintained filter element.

Note: Inner filter element does not need maintain and replace when change the outer

filter element.

It is not suggested to clean, please replace it.

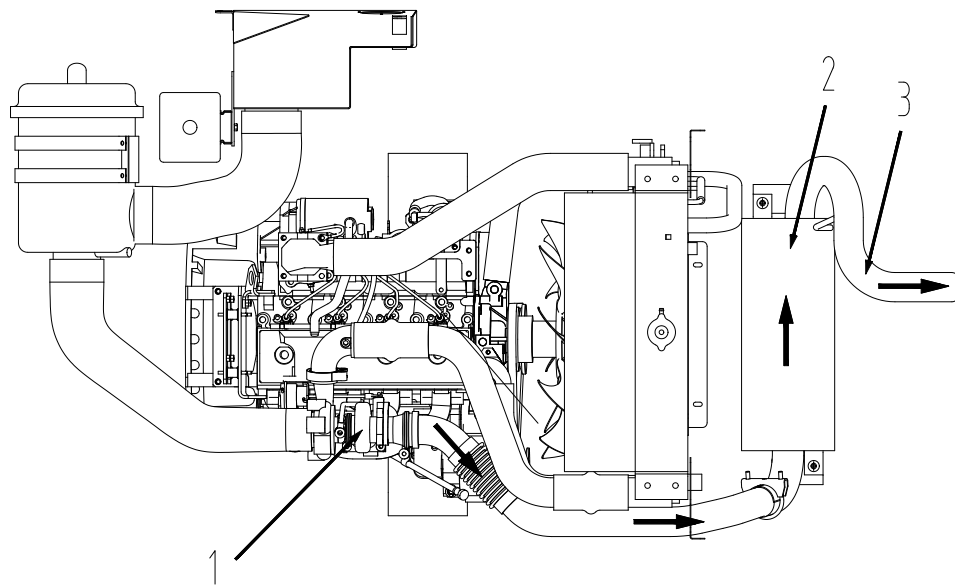
Air filter maintenance, main filter element, safety filter element and filter element model refer to notice on the filter.

Air filter replace and maintain procedure

1. Open the six fasteners with thumb.
2. Hold the fasteners and pull out the cover outward.
3. Lightly wave the main filter element and pull out the main filter element.
4. Safety filter element needs no maintenance, if it needs replacement, wave the filter element to right and left, slowly pull out it.
5. Wipe both sides of the inner shell in order not to influence installation and sealing effect.
6. Check the safety filter element and install into the shell.
7. Check the main filter element and install into the shell.
8. Put the cover and keep the anti-dust bag downward.
9. Lock the fasteners as fig. shown place and installation finish.

Note: Maintenance notice and parts replace, you may contact Hangcha after-sales service.

3.Exhaust system



1. Turbocharger 2. Muffler 3 Exhaust tail pipe

Fig.1-3 Exhaust system flowchart

Exhaust pipe maintenance

Before daily starting the engine, clean the dirt on the muffler sunshade, check if the exhaust pipe or muffler assembly damage, pipeline connected hoop loosen. Replace exhaust pipe or muffler assembly, re-screw down clamp if necessary.

Muffler assembly replacement

- (1) Turn the truck left to the end and shut down the engine;
- (2) After engine exhaust pipe fully cool down, take down muffler sunshade;
- (3) Disassemble hoop in the exhaust pipe entrance and exhaust connection;
- (4) Disassemble fixed bolts between exhaust pipe two ear plates and chassis.
- (5) Take out old exhaust pipe and replace a new one.

Disassembly order is opposite to the installation order.

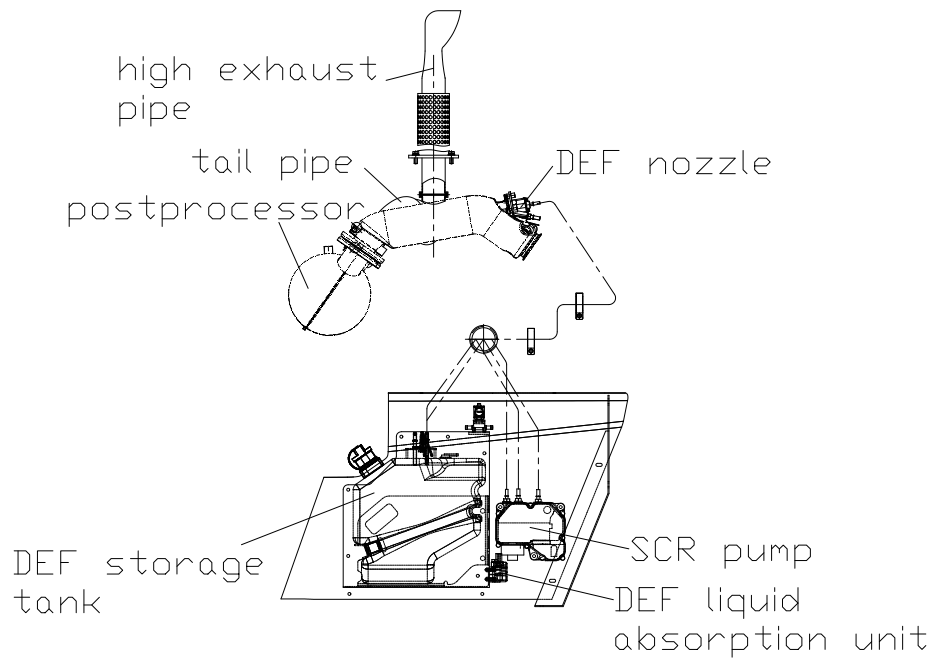


Fig 1-4 exhaust system (W75, W96)

4.Cooling system

Cooling system is composed of fan, composite cooler and each cooling pipeline. According to different cooling material, it divides into water cooling system, air cooling system and hydraulic oil cooling system. All these three cooling systems realize cooling through composite cooler.

Cooling system maintenance:

- (1) Before start the engine, check the expansion water bottle liquid level and add antifreeze solution in necessary.
- (2) Before start the engine, check if the cooling pipe leaks.
- (3) Replace antifreeze solution every two years or after long-time park.

II. Transmission shaft

Transmission shaft(refer to fig.2-1) is composed of flange yoke, universal joint pin, bearing and center fork etc.. Universal joint pin is installed in the earhole of center fork, needle bearing bush in four bearing block, universal joint pin with oil cup, and the oil cup can be filed with lubricating oil and lubricate all bearings through the oil line.

When there is too big clearance in the needle bearing, you should take apart flange yoke, change bearing or universal joint pin according to condition, and the bearing change should be in group. The two universal joint pin should be in the same side.

Transmission shaft needle bearing use MoS_2 lubricating oil, and is prohibited to use thick oil(Such lubricate with butter, cause the butter will stop the needle roller on the universal joint pin rotate and speed the wear). When working with thick dust, you should often fill lubricating.

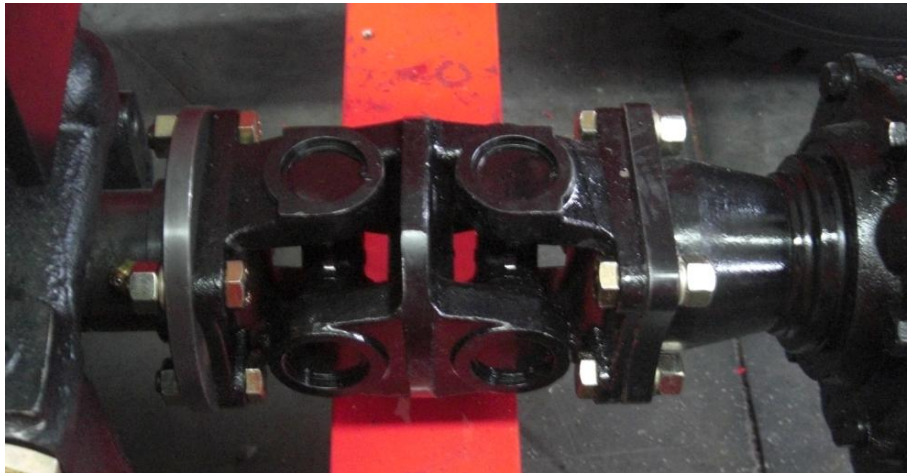


Fig. 2-1 Transmission shaft

Universal joint pin damage and repair

- (1) When universal joint pin surface has nick, dent and journal wear is larger than 0.04mm, it can repair with chroming or steeling. Or grind four journals into the same size and equip with amplified kingpin, when the carbon bed is insufficient after shortening the journal, it needs carburization and heat treatment. Journal circular degree and cylindricity deviation after grinding should not be larger than 0.01mm; error of perpendicularity of two axis should not be larger than 0.1mm.
- (2) During installation, fit clearance between journal and bearing is 0.02-0.09mm, and the max. clearance should not be larger than 0.13mm.
- (3) Universal joint bearing kingpins wear, fracture and groove should replace.

Check and repair of flange yoke and center fork

- (1) If flange yoke or center fork fracture, replace it.
- (2) If kingpin bearing saddle bore wears, it can be repaired with bead weld, and then bore a hole to match the size.
- (3) Bearing cover plate thread should fix, snap ring groove match piston, there should no looseness.

III. Hydraulic transmission gear box

1. Summarize

Hydraulic transmission gear box is composed of stamping torque converter and power gearshift gear-box that owns four gears as forward two gears, reverse 2 gears. Hydraulic torque converter is a combination torque converter with single stage two phase three running wheel.

Hydraulic torque converter is the hydraulic transmission gearbox output automatic hydraulic transmission is adaptive, can with the variation of the external load and the corresponding change its output torque and speed, and can absorb and remove from the engine and external load on the transmission system of the buffer hydraulic transmission gearbox to connection vibration flange output, the shift for power shift and way with buffer valve, simple and convenient operation, start smoothly, considerably reduce the labor intensity of the operator

Hydraulic torque converter make hydraulic transmission gearbox own automatic adaptive to fluid drive output, it can change the output torque and speed as outer load changes, and also can absorb and eliminate buffer vibration to the drive system from engine and outer load. Hydraulic transmission gear box is through connecting flange output, and the adopted shift gear way is power shift and owns cushion valve, which makes operation simple, easy, start stable and ease operator's labor intensity.

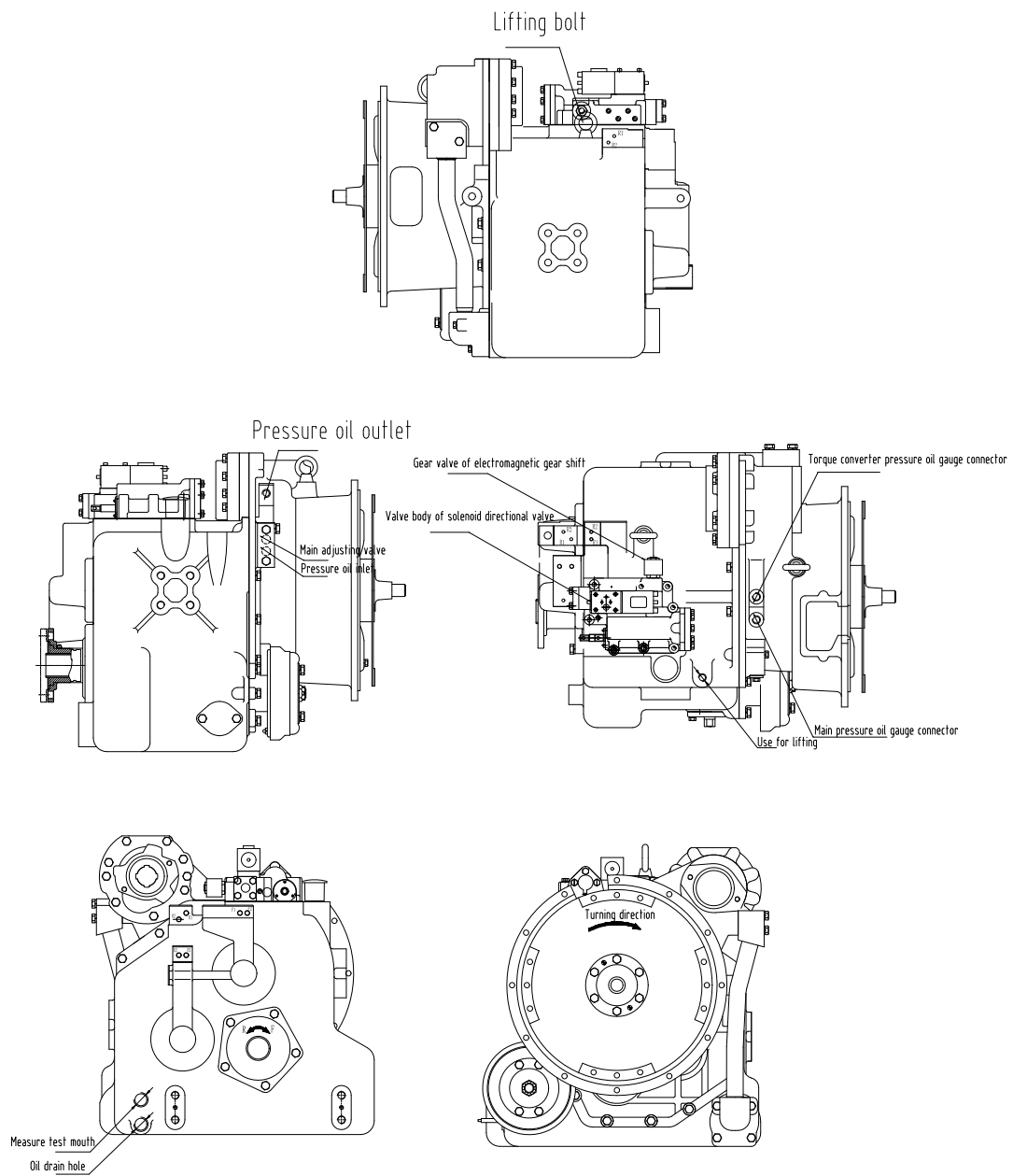


Fig. 3-1 Hydraulic transmission gear box outline drawing

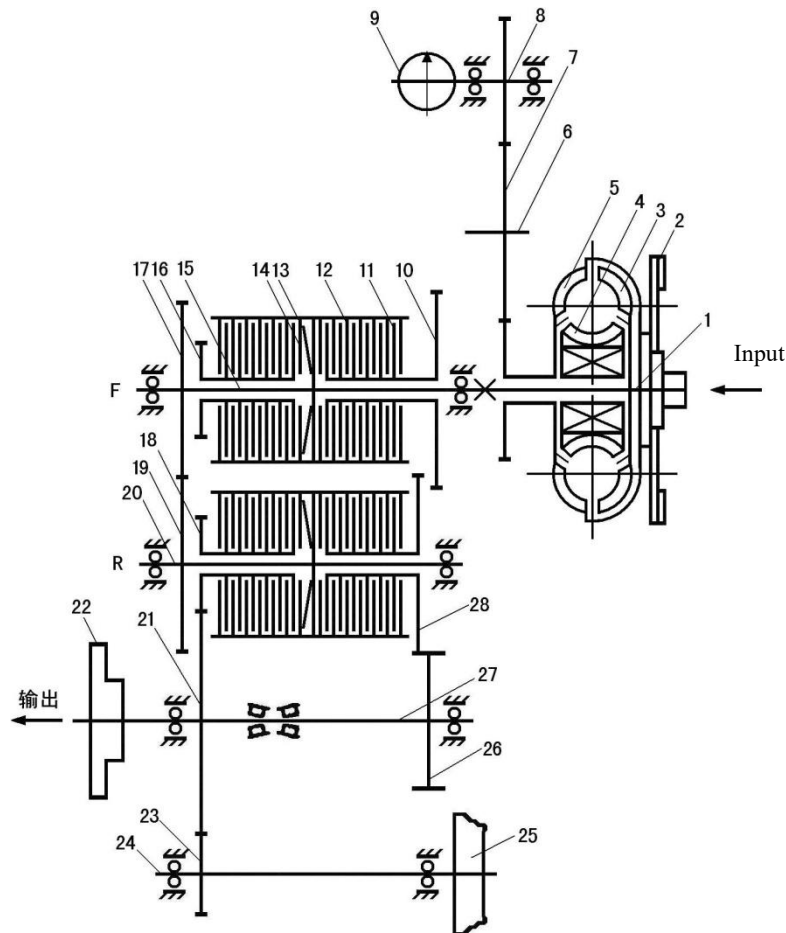
2.Main technical parameter

Item		Main technical parameter
Drive ratio	Forward 1 gear	1.852
	Forward 2 gears	0.642
	Reverse 1 gear	1.852
	Reverse 2 gears	0.642
Main oil pressure MPa		1.2~1.5
Torque converter oil inlet pressure MPa		0.5~0.7
Transmission gear box	Model	YJH315
	Circling round diameter D mm	315
	Zero-speed working condition torque ratio	3.15±0.15
	Peak efficiency	>0.79
	Zero-speed working condition impeller rated torque N.m	71±4
	Peak-efficient working condition impeller rated torque N.m	60±3
Direction of rotation (Face input end))		Clockwise
Work oil		6# hydraulic transmission oil
Work oil temperature℃		70~95
Highest work oil temperature℃		120 (no more than 5min)

3.Working principle

3.1 Drive principle

Hydraulic transmission gear box drive diagram refers to fig. 3-2. Torque converter is driven by engine through flexible coupling plate 2, drives the impeller 5 to rotate, makes the fluid flow into the turbine 3 along the blade in high speed, and pushes turbine rotate. Guide roller 4 makes torque converter generate torque change action, transfer torque to hydraulic transmission gear box F-axle assembly 15 through turbine shaft 1.



1-Turbine shaft	2-Flexible coupling plate	3-Turbine	4-Guide roller	5-Impeller	6-Idler shaft
7-Idler	8-Pump drive gear	9- Oil pump assembly	10- Forward II gear	11- Internal friction lining	12- External friction lining
13-Dish plate	14-Platen	15- F- axle assembly	16- Forward I gear	17-Back gear	18-Reverse I gear
19-Reverse gear	20-R- axle assembly	21- Low speed gear	22-Adapting flange	23-Parking brake gear	24- Parking brake axle
25-Manipulator brake		26-High gear	27-Output shaft	28- Reverse II gear	

Fig 3-2 Hydraulic transmission gear box diagram

When hang to forward I gear, forward 1 gear and clutch works, forward 2 gear, reverse 1 gear, reverse 2 gear clutch idles, and the delivery order is piece 1→ piece 15→piece 16→ piece 21 → piece 27 → piece 22.

When hang to forward II gear, forward 2 gears and clutch works, forward 1 gear, reverse 1 gear, reverse 2 gear and clutch idles, and the delivery order is piece 1→ piece 15→piece 10→ piece 26 → piece 27 → piece 22.

When hang to reverse II gear, reverse 2 gears and clutch works, forward 1 gear, forward 2 gear, reverse 1 gear, and clutch idles, and the delivery order is piece 1→ piece 15→piece 17→ piece 19 → piece 20 → piece 28 → piece 26 → piece 27 → piece 22.

This gear box equips with parking brake.

Oil line of hydraulic transmission gear box schematic refers to fig.3-3. In the fig., F1 shows forward I gear, F2 shows forward II gear, R1 shows reverse I gear, R2 shows reverse II gear, N shows neutral gear.

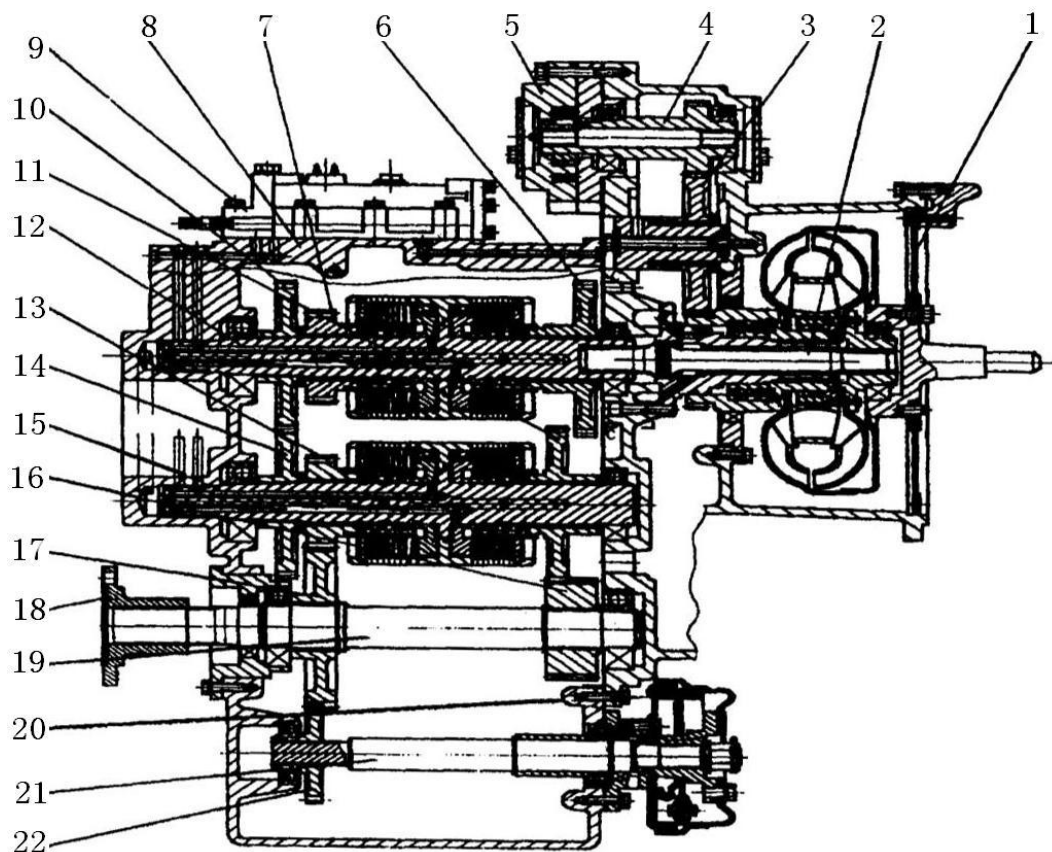


4. Structure introduction

4.1 Hydraulic transmission gear box

4.1.1 Structure introduction

Hydraulic transmission gear box structure diagram refers to fig. 3-4 and its working principle is as previously mentioned. According to truck performance requirement, the gear box is composed of torque converter and gear box. Engine power inputs to gear box forward clutch 12 through torque converter's bending movement of torque converter turboshaft spline joint. Gear box includes forward clutch 12, reverse clutch 15, idler 3, pump drive gear 4, oil pump assembly 5, control valve assembly 9, high gear 16, low gear 17, adapting flange 18, output shaft 19, internal expanding mechanical hand brake 20, park brake shaft 21, parking brake gear 22. Piece 8 is transmission case, and itself works as an oil tank.



1- Flexible terminal pad	2- Turbine shaft	3- Idler	4- Pump drive gear	5- Oil pump assembly	6- Forward II gear
7- Forward I gear	8- Transmission case	9- Control valve assembly	10- Reverse gear	11- Reverse II gear	12- Forward clutch
13- Reverse I gear	14- Reverse gear	15- Reverse clutch	16- High gear	17- Low gear	18- Adapting flange
19- Output shaft	20- internal expanding mechanical hand brake	21- parking brake shaft	22- parking brake gear		

Fig. 3-4 YQXD100H type hydraulic transmission gear box structure diagram

4.1.2 Dismantle and assemble order

Dismantle the hydraulic gear box according to the following order

- ① Open drain plug and release oil;

- ② Take out torque converter;
- ③ Take out pin, nut, gasket, bolt that installs internal expanding mechanical hand brake, then take out the internal expanding mechanical hand brake;
- ④ Dismantle oil suction assembly, case cover assembly, oil pump assembly, control valve assembly, clutch F axle and clutch R axle successively;
- ⑤ Dismantle other spare parts.

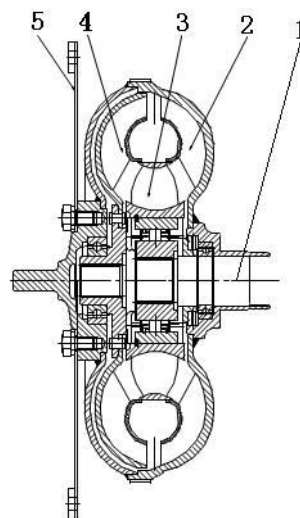
Assemble order is opposite to dismantlement.

4.2 Torque converter

Torque converter structure refers to fig.3-5, and is mainly composed off turbine shaft1, pumper impeller 2, guild roller 3, turbine 4, flexible coupling plate 5.

Pumper impeller 2 is connected to engine flywheel through flexible coupling plate 5. Pumper impeller transfers the engine mechanical energy to working oil kinetic energy, and makes oil flow into turbine 4 along blade in high speed, push turbine rotate, and output from turbine shaft, and transfer the speed and torque to gear box. Oil outflows from turbine enters guildler roller 3. When the torque converter is in heavy load and low turbine speed torque changing stage, guildler roller 3 is wedged not to rotate by one-way clutch, torque from liquid flow worked on guild roller reacts on liquid flow by guild roller, liquid flow increases torque by action of guild roller, torque on the turbine equals the sum of pump impeller and guide roller, thus the output torque is larger than input torque and generates automatic torque change.

Torque converter is weld-type, and undecomposable.

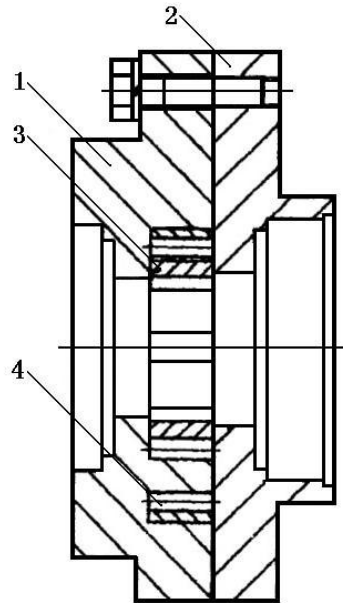


1. Turbine shaft 2.Pump impeller 3.Guide roller 4.Turbine 5.Flexible coupling plate

Fig. 3-5 Torque converter structure

4.3 Oil pump assembly

Oil pump assembly structure refers to fig. 3-6. Oil pump assembly is mainly composed of oil pump body 1, oil pump cover 2, oil pump driving gear 3 and oil pump internal gear 4 etc. Oil pump body 1 is casting, with high pressure chamber and low pressure chamber. Oil pump assembly is installed on torque converter shell, after speed up of gear, idler and pump drive gear on the torque converter, transfers the power to oil pump driving gear 3, drive the oil pump inner gear 4, and forms inner gearing gear pump to offer system oil.

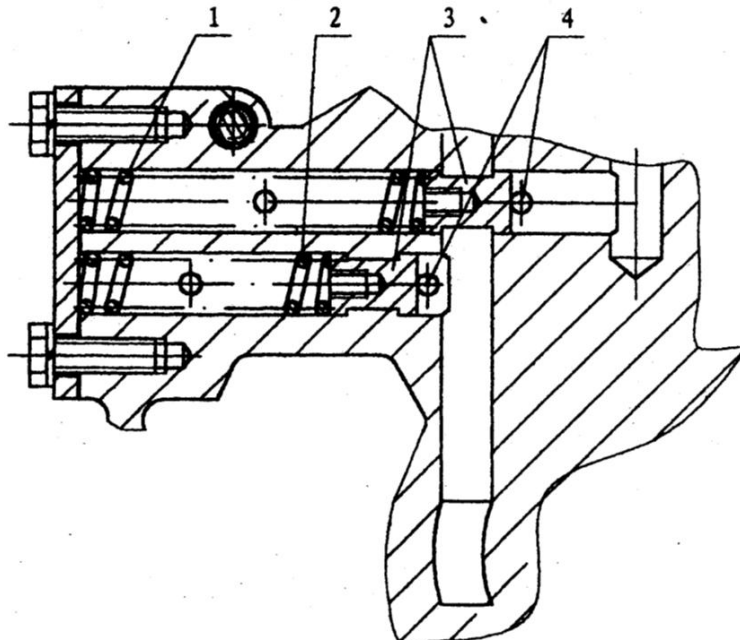


1-Oil pump body 2-Oil pump cover 3-Oil pump driving gear 4-Oil pump inner gear

Fig. 3-6 Oil pump assembly structure

4.4. Main pressure adjusting valve and relief valve

Main pressure adjusting valve and relief valve structure diagram refers to fig.3-7, and is mainly composed of main pressure adjusting spring, over flow spring, valve plug and round pin. Main pressure adjusting valve controls clutch oil pressure between 1.2Mpa and 1.5Mpa, part oil enter control valve though inching valve to realize gear shift, and the other part oil enter relief valve, and adjust oil pressure between 0.5Mpa and 0.7 Mpa, and then work in the torque converter.



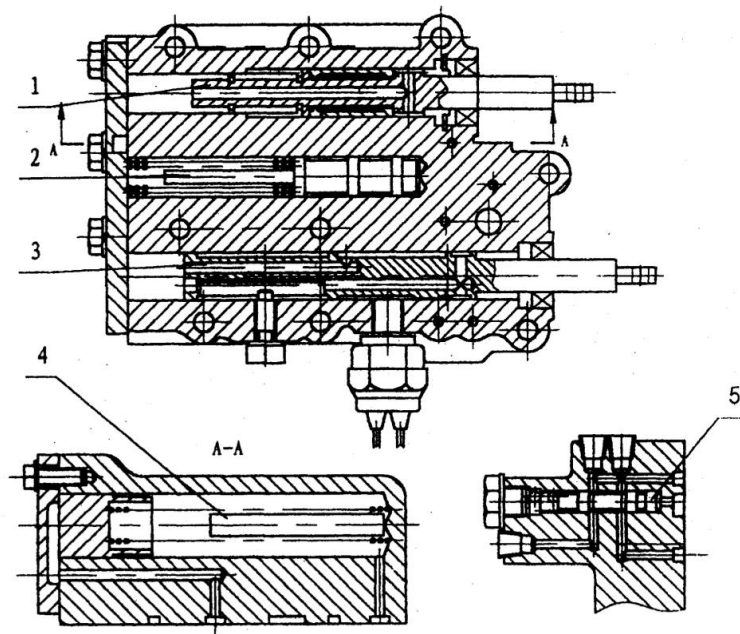
1-Spring 2- Spring 3-Valve plug 4-Round pin

Fig.3-7 Main pressure adjusting valve and relief valve structure diagram

4.5 Control valve assembly

Operating valve assembly structure refers to fig. 3-8, and is mainly composed of

inching valve 1, switch valve 2, operating valve 3, accumulator valve 4 and pressure measure valve 5 etc. Inching valve rod is connected to inching pedal connecting rod, when stepping the inching valve pedal, inching valve rod move inward, when inching valve rod moves inward 4mm, clutch begins to reduce pressure, when the clutch pressure reduces to certain pressure, friction lining slips, make trucks reach inching effect; when inching valve rod move inward 10.5mm, clutch pressure reduces to 0, clutch outer friction lining and inner friction lining cannot combine; when inching valve rod moves inward 30mm, inching valve rod stop travel. Inching valve 2 and accumulator valve 4 combines cushion valve to reduce impact between clutch combine and separate. Pressure measure valve is used to measure vehicle pressure.



1-Inching valve 2-Switch valve 3-Operating valve 4-Energy storage valve 5-Pressure measure valve

Fig. 3-8 Operating valve assembly structure

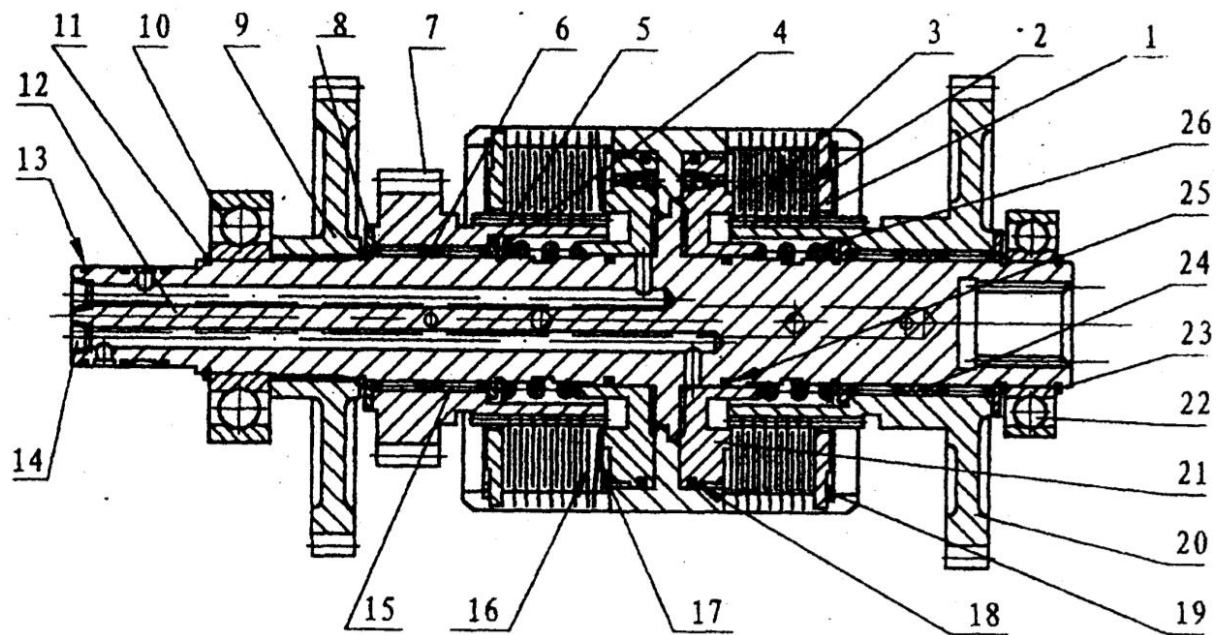
4.6 Clutch

4.6.1 Structure introduction

This hydraulic transmission gear box owns two clutches, clutch I(forward clutch), clutch II(reverse clutch), clutch structure refers to Fig. 3-9.

Clutch is composed of shaft assembly 12, inner friction lining 3, outer friction lining 2, spring 26, shaped plate 17, sealing ring 18 and each gear. Left and right clutch is wet multi-plate hydraulic clutch, the left clutch(low gear) installs seven inner friction lining, six outer friction lining, one compression plate and one shaped plate, and the right clutch installs seven inner friction lining, seven outer friction lining, clutch housing is welded together with input shaft, pressure oil control valve enters into forward 1 gear, forward 2 gear, reverse 1 gear, reverse 2 gear clutch respectively, thus realizes gear shifting. Sealing ring 18 on piston circlip and sealing ring 25 on input shaft guarantee the sealing during clutch working. When in neutral, no pressure oil enter into the clutch, piston return on the force of spring 26, and the inner friction lining is off from outer friction lining. When shifting gears, oil pressure works on the

piston, inner friction lining and outer friction lining combines, and transmits the torque converter power to each gear by friction force.



1-End plate	2-Outer friction lining	3-Inner friction lining	4- Spring base	5-Thrust ring	6-Space ring	7- I Gear
8-Thrust ring	9- Reverse gear	10-Ball bearing	11- Circlip	12-Axle assembly	13-Sealing ring	14-Screw
15-Needle bearing	16-Compression plate	17-Shaped plate	18-Sealing ring	19-Snap ring	20- II gear	21-Piston assembly
22-Ball bearing	23-Circlip	24-Space ring	25-Sealing ring	26-Spring		

Fig.3-9 Clutch structure

4.6.2 Dismantle ad assemble order

Dismantle and disassemble clutch according to series order:

①Take out left and right bearing, gear, circlip for shaft, thrust ring, inner friction lining, outer friction lining, snap ring and end plate.

② Compress ends spring 26 respectively, take out check ring 23, dismantle piston 21 and spring 26.

Assemble is opposite to dismantlement.

5.Installment and use notice

- ① When installing this product, firstly clean sealing oil on the product surface. In order to avoid oil leakage, it is not allowed to dismantle and disassemble the product.
- ② Avoid knocking and collision on each mounting surface and torque converter so that not influence mounting and use precision.
- ③ Check the runout of engine flywheel center mounting hole is no larger than 0.15mm, flywheel end face runout is no larger than 0.1mm; flywheel casing installing end face runout is no larger than 0.2mm.
- ④ Forklift control mechanism should guarantee operating valve rod and inching valve rod travel precise and positioning reliable. Inching valve rod can reset after operator release pedal. Only make sure clutch pressure is larger than 1.2Mpa can proceed gear shift operation.
- ⑤ When hoisting this gear box, try to keep level to avoid torque converter slip off.
- ⑥ It is prohibited to change gear box oil line system. In order to make sure gear box work normal and lubricate well, cycling oil of the gear box should not use for other purpose. Working oil mark should meet the requirement.
- ⑦ Working oil should keep clean, have no other impurity. After first use for 50 hours, use per 1000hours or use after stopping for a long time, it needs change new one.
- ⑧ Fill working oil, drive for 5 minutes in neutral and then check oil level, which should be in the specified scope. Filler cap is also used as vent cap.
- ⑨ After filling new hydraulic oil, it needs 50-hour running-in, and the load should not exceed 70% in the running-in device, pay attention to oil temperature, oil pressure and bolt tightening condition, replace new oil after running-in finishes.

6. Fault reason and corrections

Item	Fault reason	Corrections
Efficiency decline and over high oil temperature	1. Friction lining blind or damage; 2. Insufficient torque converter oil supply; 3. Bearing damage; 4. Check if lubricating oil line blocks; 5. Torque converter one-way wheel blind;	1. Check if friction lining has gluing, uneven contact or warpage; 2. Check if oil pump wear or oil level is in normal position; 3. Replace bearing; 4. Dredge oil line; 5. Replace torque converter
Oil leakage	1. Sealing gasket damage; 2. Rubber parts age or damage; 3. Parts damage;	1. Replace sealing gasket; 2. Replace parts; 3. Replace;
Low clutch pressure or over large swing	1. Low oil level; 2. Rotation sealing ring on clutch shaft and piston wear; 3. Oil pump wear; 4. Oil filter strainer is blocked by impurity ; 5. Inching valve rod not reset;	1. Check oil level and add oil to normal oil level; 2. Replace rotation sealing ring; 3. Replace oil pump; 4. Clean or replace oil filter; 5. Reset the inching valve rod;

Note : Okamura gearbox parameter and use maintain see *Y53500Z gearbox manual*.

IV. Drive axle assembly

1. Drive axle basic structure and its working principle

1. 1 Basic structure and its working principle

Drive axle basic structure is shown as fig., it is mainly composed of axle housing, main reducing gear assembly, half shaft, hub reduction gear and drum brake etc.

Its working principle is shown as fig. 4-1: driving torque inputs into main reducing gear, by means of mutual vertically installed main axle drive bevel pinion and driven bevel pinion, changes power direction, reduces speed, enlarges the transferred torque, and then transmits power to the wheel by differential and half shaft. After further slowing down by hub reduction mechanism, transmit movement and torque to two drive axle.

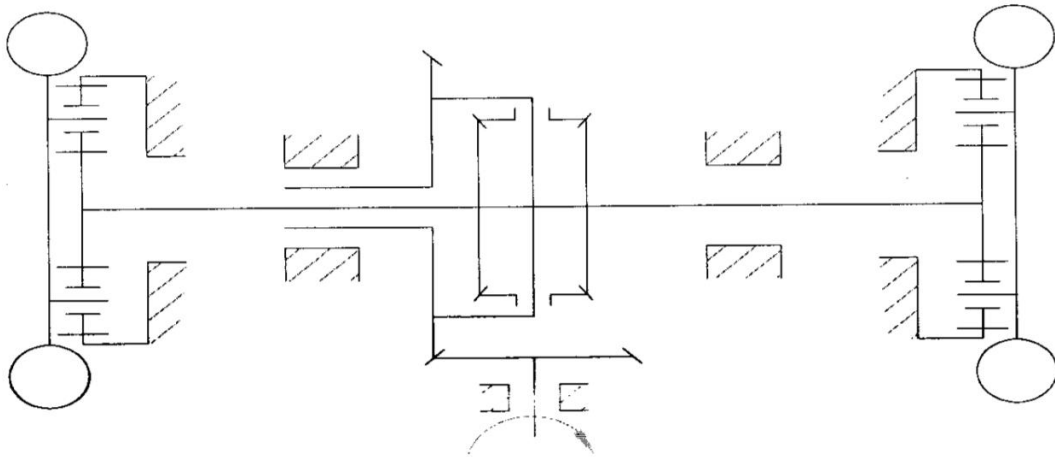


Fig.4-1 Work principle diagram

1.2 Hub reduction gear and axle housing

Hub reduction gear is planetary reducing gear, mainly composed of planet carrier, inner gear, planetary gear and central gear, internal gear is fixed to shaft, planet carrier fix together with hub.

1.3 Main reduction gear assembly structure

Main reduction gear is composed of spiral bevel gear and differential. Differential is a differential planet gear transmission gear, that is composed of two tapered straight tooth half shaft gears, four tapered straight tooth planetary gears, differential carrier and universal joint pin. Refer to fig. 4-4 for details.

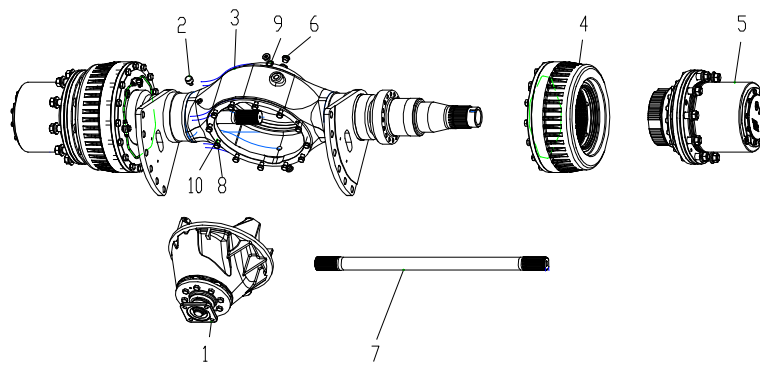
1.4 Wet brake structure

The adopted wet brake braking, mainly composed brake pad, friction plate, piston and brake oil pipe. Refer to brake system.

1.5 Main technical parameter

	12T
Drive axle type	Full floating, axle body and chassis directly install
Total reduction ratio	22.029
Main reduction ratio	6.333
Hub reduction ratio	3.478
Hub reduction gear	Cylinder planetary gear type
Brake	Wet brake

	Item	Standard parameter	Remark
Wheel-end reduction	Spider wheel lining inside diameter	45mm	
	Spider shaft diameter	86mm	
	Pre-load to hub gear	50N•m	Luck nut back off after tight
	Lock bolt fasten torque	50N•m	
	Cover fasten torque	50N•m	
	Rim nut fasten torque	500N•m	
	Wheel-end reduction hull fasten torque	500N•m	
	Wheel-end reduction hull to brake hull fasten torque	100N•m	
Drive and differential carrier	Backlash between the side gear and pinion shaft	(0.19-0.25)mm	limit0.5mm
	Gear set backlash	(0.2-0.35)mm	limit0.5mm
	Ring gear skip	0.15mm	limit0.2mm
	Side gear thrust washer thickness	3mm	limit2.5mm
	Taper roller bearing pre-load	(26-35)N•m	The same degree of tightness
	Ring gear fasten torque	120N•m	Paint Loctite262
	Left and right diff, case fasten torque	100N•m	Paint Loctite262
	Bearing sleeve mounting bolt fasten torque	170N•m	Paint Loctite262
	Carrier to housing mounting bolt fasten torque	45N•m	Paint Loctite262
	Adjusting nut fasten torque	35N•m	Paint Loctite262



- | | | | |
|----------------------------|----------------|----------------------|--------------|
| 1. main reducing gear | 2. relief plug | 3. axle housing assy | 4. wet brake |
| 5. hub reduction gear assy | 6. screw | 7. half shift | 8. washer |
| 9. washer | 10. bolt | | |

Fig. 4-2 Wet drive axle structure

Tightening torque: N•m

Support bush to truck frame fasten torque	550 N•m
Universal joint to flange yoke fasten torque	45 N•m
Brake assembly fasten torque	(189-252) N•m
Rim bolts fasten torque	411 N•m

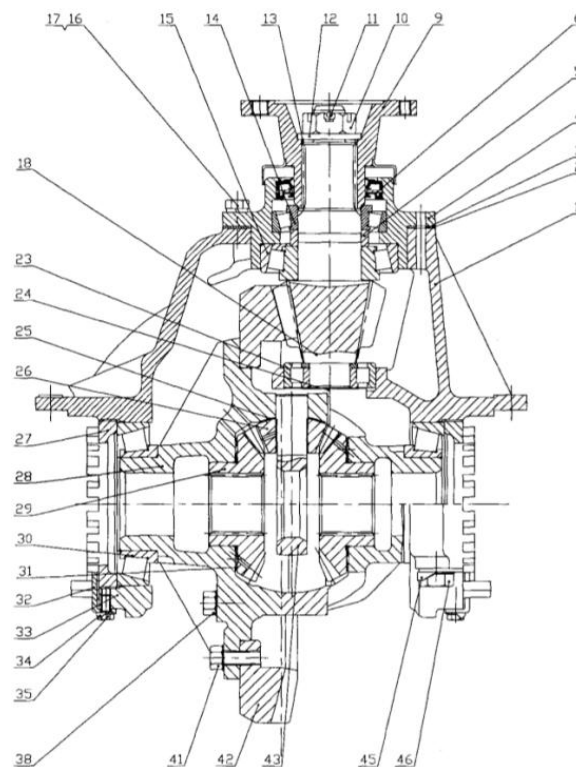


Fig. 4-3 Main reducing gear structure

2.Periodical technical maintenance

2.1 Grade I technical maintenance (about work 50 hours)

①If it is new truck running-in, replace gear oil.

Note: A.When replacing oil, first drive truck warming, release oil, and then wash with carbon oil. After that, add oil to specified position.

B. When discharging oil for main reducing gear, open drain plug and release oil .
When discharging oil for hub reduction gear, place the oil hole at left and right hub reduction gear to lowest place,open drain plug and release oil .

②Check each drive parts move condition, abnormal noise is not allowed.

③Check if hub reduction gear, main driver and brake outer fastener loosen and screw down.

④Check brake pad wear condition.

⑤Check each part oil leak condition and repair in time. All sealing elements are not allowed to reuse once dismantle.

2.2 Grade II technical maintenance (working time about 1200hours)

①Check and adjust bearing and basin tooth clearance.

②Replace gear oil according to season or major repair requirement. When replacing oil, first drive truck warming, release oil, and then wash with carbon oil. After that, add oil to specified position.

③Check and clean greasy dirt, soil and dust, especially breather plug on the axle housing should keep smooth.

④Check and fasten external fastener. If any loosen, apply Letai 242 anti-loose glue and screw down.

3.Drive axle oil adding /drainage way and fuel-injection quantity

When adding oil, place the oil hole at left and right hub reduction gear to highest place(lowest place when discharging oil), open the vent plug, oil level plug and oil plug at left and right hub reduction gear, add lubrication oil to the left, right and middle position, until overflow from the oil level, refer to the following fig.

When adding oil for two hub reduction gear,please rotate hub reduction gear and make the end caps on the arrow "↓" logo vertically downward. Fuel-injection quantity see the following chart.

Note: Specified injection of fuel is approximate, Prevail along the flush to the oil surface and the filling hole.

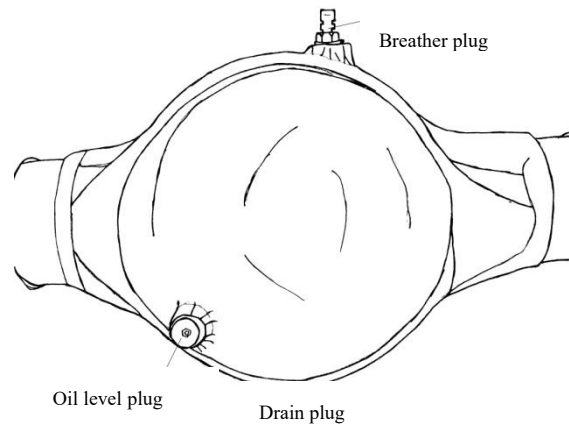


Fig. 4-4

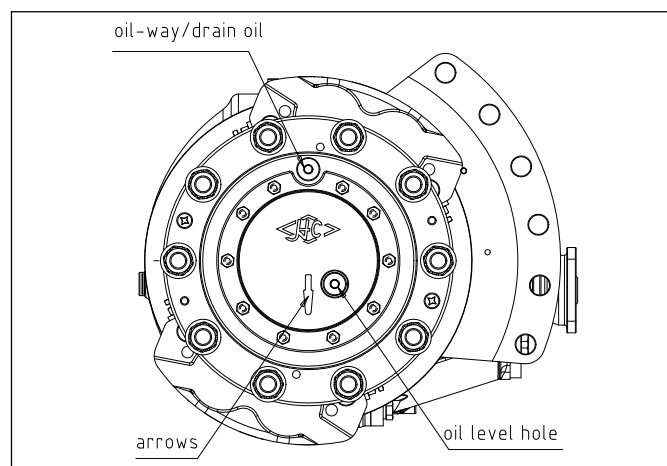


Fig. 4-5

Lubricating part	Lubricating oil type	Oil capacity (L)
Main reducing gear	Mobil 424 hydrodynamic drive oil	≈10
Hub reduction gear	Mobil 424 hydrodynamic drive oil	≈2.5 (One side)
Wet brake	Mobil 424 hydrodynamic drive oil	≈2 (One side)

4. Drive axle hoisting

When hoisting the drive axle, hoist through rope according to the arrow listed place, if shovel needed, shovel according to the arrow listed place. No matter hoist or shovel, collision or obscission is prohibited.

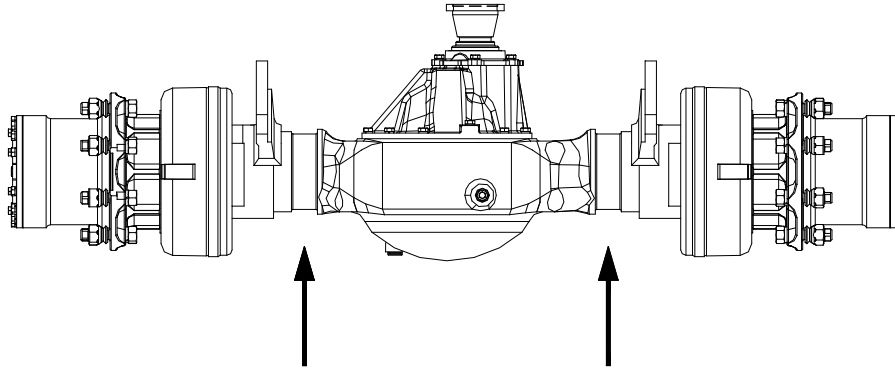
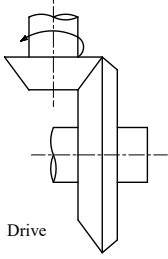
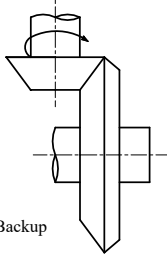
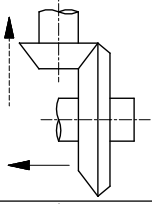
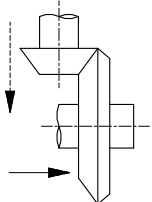
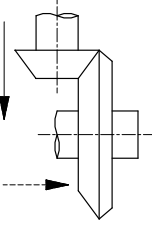
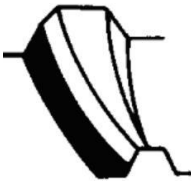
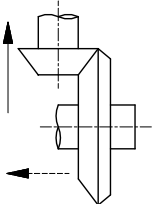


Fig.4-6

5. Driven spiral bevel gear engagement contact condition and adjustment

Ideal engagement contact condition of driven spiral bevel gear			
Driven spiral bevel gear		Driving spiral bevel gear	
 Driving surface	 Driven surface	 Driving surface	 Driven surface
Incorrect imprinting and adjustment way to driven spiral bevel gear			
 Drive	 Backup	Adjustment way	Gear move direction(first adjust active line, then adjust dotted line)
		Get driven gear close driving gear, if the gear clearance is too small, move driving gear outward.	
		Move the driven gear out from driving gear, if the gear clearance is too big, move driving gear inward.	
		Get driving gear close driven gear, if the gear clearance is too small, move driven gear outward.	
		Get driving gear close driven gear, if the gear clearance is too big, move driven gear inward.	

6. Fault diagnosis and corrections

Condition	Possible reason	Corrections
Abnormal noise Before correction, make sure noise is from half axle but not from hub reduction gear or main reducing gear.	·Drive axle supporting cover and chassis connecting bolt loose	Tightening
	·Wheel nut loose	Tightening
	·Other installing parts loose	Tightening
	·Hub bearing damage or wear	Replace
	·Bad gear engagement	Re-adjust assemble
	·Incorrect hub bearing adjustment	Adjust
	·Half shaft spline wear	Replace
	·Insufficient lubrication	Add lubricating oil
Unstable move This diagnosis and corrections is also apply to rear wheel	·Wheel nut loosen	Tightening
	·Wheel deformation	Replace
	·Hub bearing wear or damage	Replace
	·Drive axle supporting cover and chassis connected bolt loosen	Tightening
	·Incorrect hub Bearing adjustment	Adjust
	·Incorrect tyre pressure	Adjust
Oil leakage	·Axle oil sealing wear or damage	Replace
	·Incorrect main drive device installation	Replace paper gasket
	·Fill oil and oil plug loosen	Tightening
	·Bad lubrication	Improve lubrication
	·Over high oil level	Add oil to specified position

7. Dismantle and assemble

7.1 Dismantle and install of drive axle assembly

Dismantle

- (1) Pull the forklift end, and support the carriage with block or safe permanent seat.
- (2) Dismantle mast
- (3) Dismantle front wheel
- (4) Low container of the axle housing will drain the gear oil in rear housing.
- (5) Dismantle brake connecting nut from the left & right brake pump.

Notice:

Plug rubber plug in the brake pipe mouth to avoid brake fluid flowing.

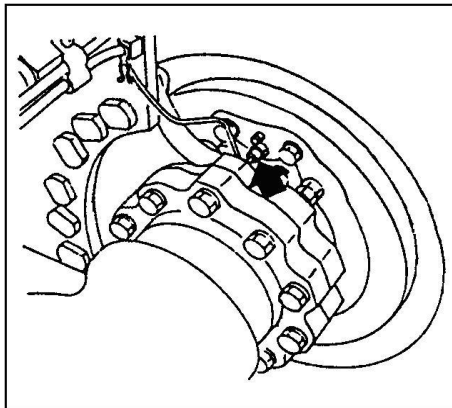


Fig. 4-7

- (6) Dismantle drive axle



Warning:

Be careful to avoid brake oil pipe and other spare parts damage.

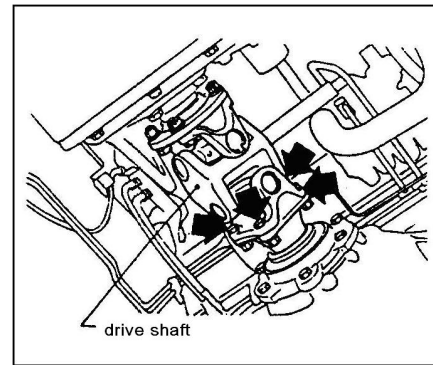


Fig.4-8

- (7) Hoist drive axle with lifting gear and slop.

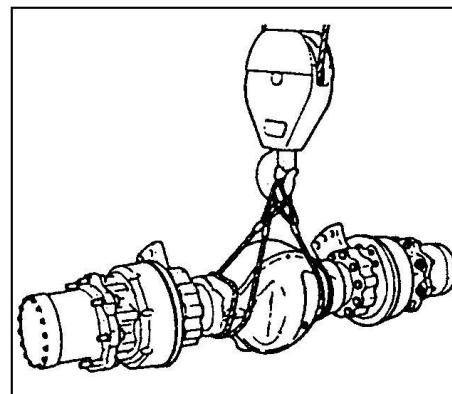


Fig.4-9

- (8) Dismantle supporting cover and frame connected bolt.

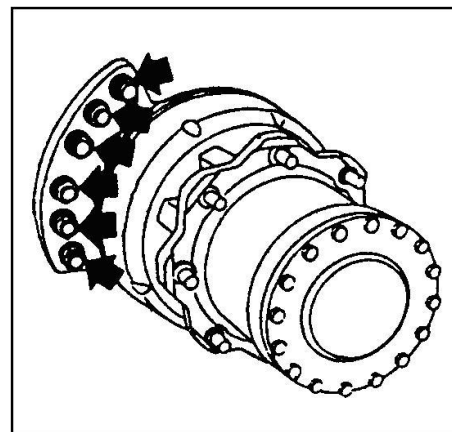


Fig.4-10

- (9) Dismantle drive axle.

Assemble of drive axle assembly is opposite to dismantlement.

7.2 Dismantle and assemble of hub reduction gear

Dismantle

- (1) Dismantle pinion from drive axle hub until discharge gear oil completely.

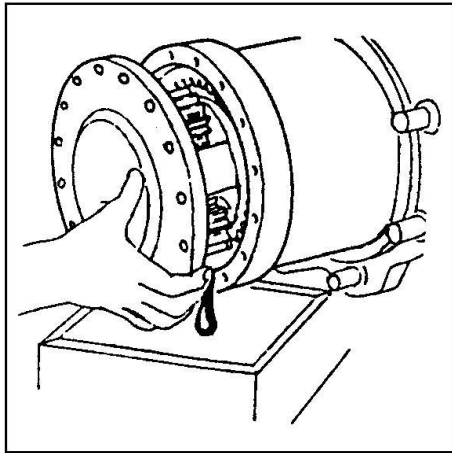


Fig. 4-11

- (2) Pull out half shaft

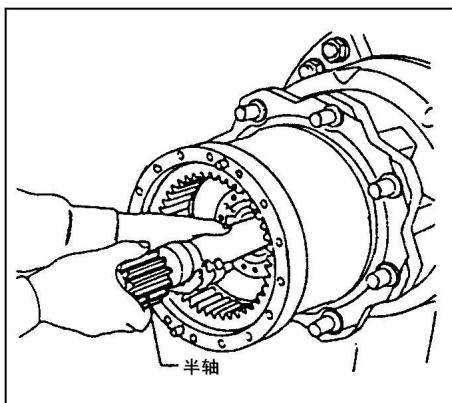


Fig. 4-12

- (3) Dismantle brake
- (4) Dismantle locking ring and locking nut.
- (5) Dismantle wheel gear from hub.
- (6) Connect hub and brake to dismantle.

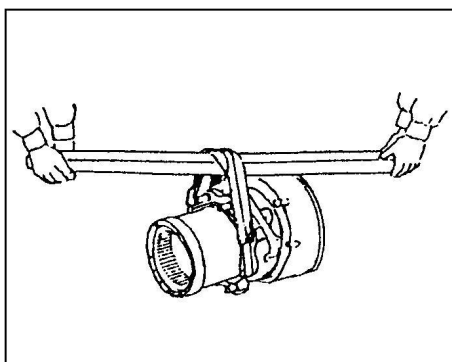


Fig.4-13

- (7) Dismantle drum brake

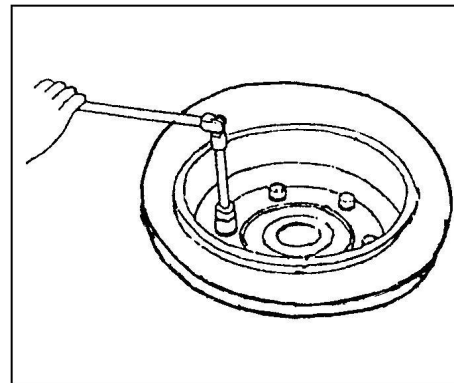


Fig.4-14

- (8) Rap along the bearing by stick matted with soft cloth and dismantle inner bearing.

Assemble

Assemble order is opposite to dismantlement.

·Place hub outer bearing into hub stably.

Check if the deflation mouth of the oil seal faces outside and assemble.

·Bearing adjustment

Adjust bearing according to planet carrier, half shaft and gear ring.

- 1) Apply lubricating grease to the taped roller bearing.
- 2) Screw down hub bearing lock nut until hub can not be turned by one hand.
- 3) Rotate lock nut 60° to opposite direction according to above position.
- 4) Turn hub 2-3 rings to opposite direction to match bearing bracket.
- 5) Fasten lock nut again until hub can not be turned by one hand. Then turn nut 60° to opposite direction

7.3 Main reducing gear dismantle and assemble

Dismantle drive axle and main reducer from the truck.

- (1) Support the rear wheel with wood.
- (2) Rise the front forklift, put a wood at under each supporting cover.

Warning : Be careful and put a wood under counterbalance weight.

- (3) Make sure the bearing cover safely put on the block.
- (4) Dismantle mast and relevant parts.
- (5) Drain oil in the drive axle housing.
- (6) Dismantle half axle(the same as drive axle dismantle).
- (7) Jack up the main drive housing.
- (8) Dismantle drive axle from the main reduction gear.
- (9) Dismantle brake oil pipe.
- (10) Safely dismantle supporting cover connected bolt
- (11) Dismantle drive axle and main reduction gear carefully.

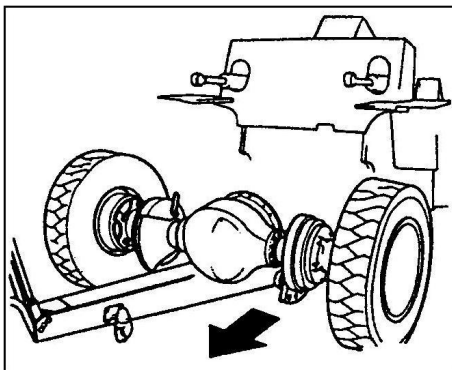


Fig.4-15

- (12) Dismantle main reducing gear mounting bolt, and separate main reducing gear.

Assemble order is opposite to dismantlement.

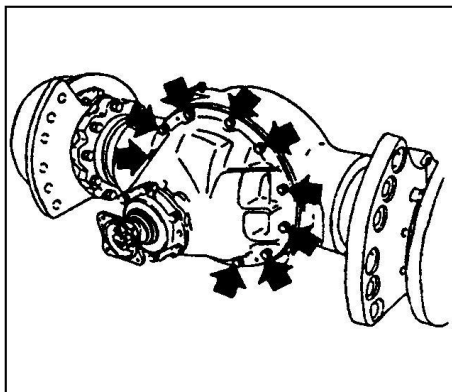


Fig.4-16

Dismantle

Before dismantle, please fully check the flank clearance of drive and driven spiral bevel gear, check engage area among drive gear, driven gear and half axle gear, then diagnose the correct fault

Dismantle differential carrier

- (1) Mark on left & right differential carrier and right&left bearing bracket.
- (2) Dismantle lock nut plate at the two sides of right&left bearing bracket.

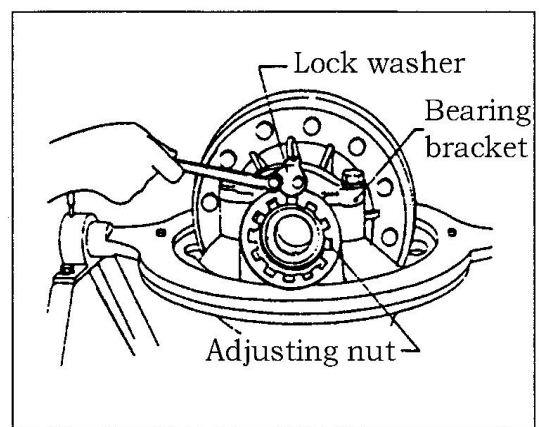


Fig.4-17

- (3) Release bearing bracket mounting bolt slightly, and dismantle adjusting nut.

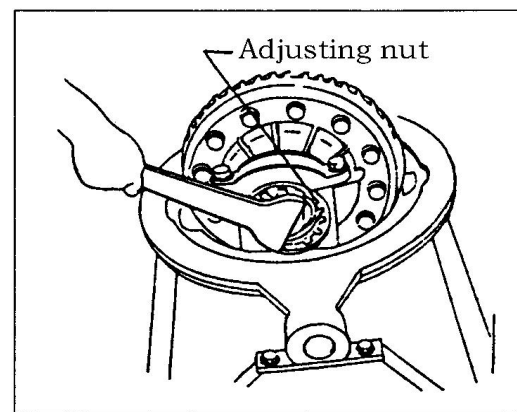


Fig.4-18

- (4) Dismantle bearing bracket mounting bolt and right&left bearing bracket.
- (5) Hoist reducer assembly with calabash or other way, be careful not to damage outside bearing area.

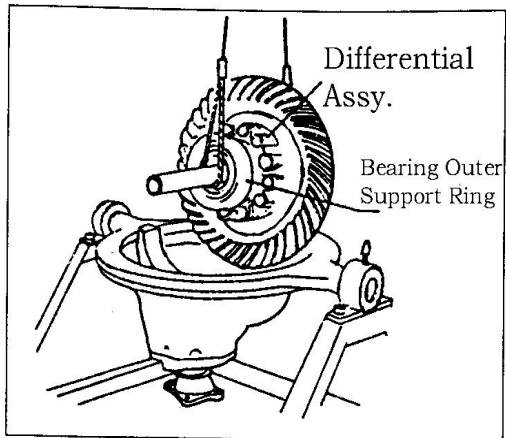


Fig.4-19

- (6) Dismantle the mounting bolt of spiral bevel gear, pre-apply Letai 262 glue to bolt. Dismantle spiral bevel gear.

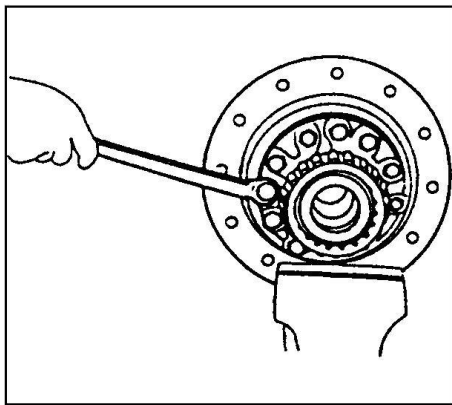


Fig.4-20

- (7) Dismantle differential carrier connecting bolt, disassemble differential carrier. Pre-apply Letai 262 glue to bolt.

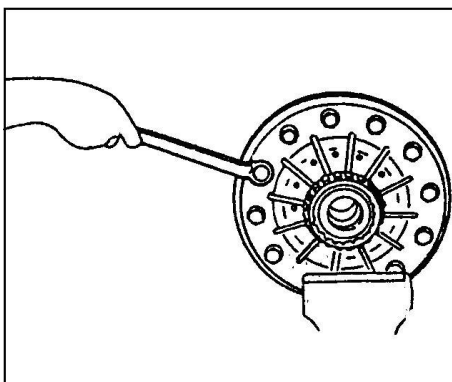


Fig.4-21

- (8) Dismantle planetary gear, thrust washer, planetary gear shaft and thrust washer of half axle gear.

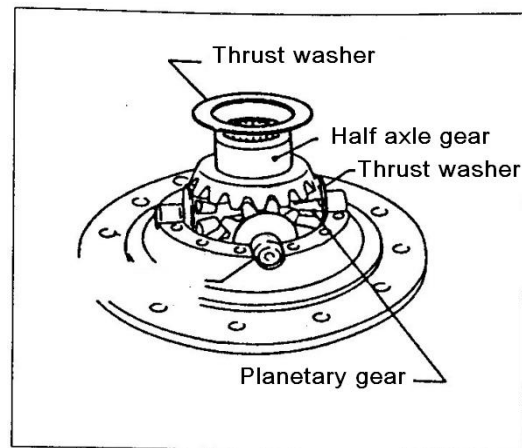


Fig.4-22

- (9) Dismantle bearing from left & right differential carrier with bearing puller.

Dismantle drive spiral bevel gear

- (1) Dismantle snap ring and guiding bear from drive spiral bevel gear with bearing puller.

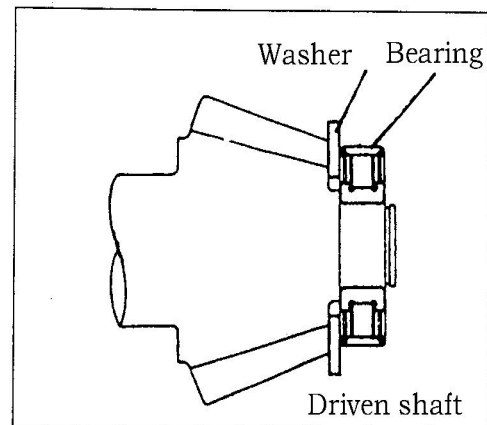


Fig.4-23

- (2) Dismantle bearing bracket and cover connecting bolt.
 (3) Dismantle flange locking round nut, washer, flange, cover, oil seal and spacer bush.
 (4) Press the drive spiral bevel gear and pull out bearing bracket.

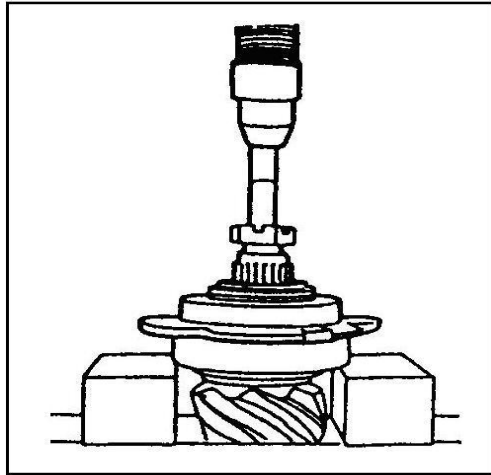


Fig.4-24

(5) Dismantle adjusting washer and washer from drive spiral bevel gear. Pull out conical roller bearing with bearing puller.

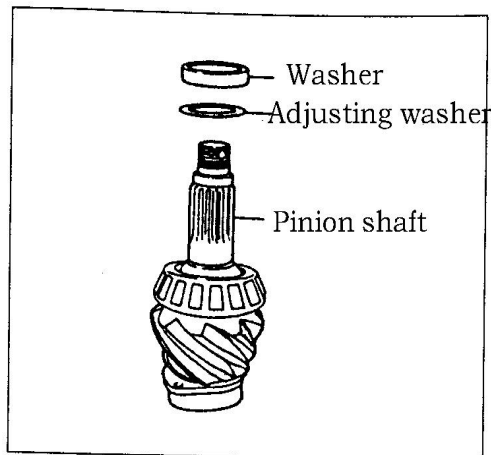


Fig.4-25

(6) Dismantle conical roller bearing from bearing bracket.

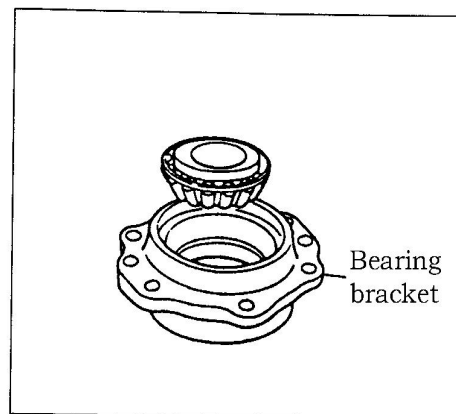


Fig.4-26

Assemble

Tips:

- Use clean gear oil when re-assemble.
- When assembling differential conical roller bearing and adjusting nut, left & right spare parts should not be mistaken.
- Do not forget to assemble oil seal and gasket.
- Confirm that the drive and driven spiral bevel gear is in pair.

Make sure the above tips and do the opposite order to dismantle and do proper adjustment.

Assemble drive spiral bevel gear

- (1) Press the out bearing to bearing bracket.

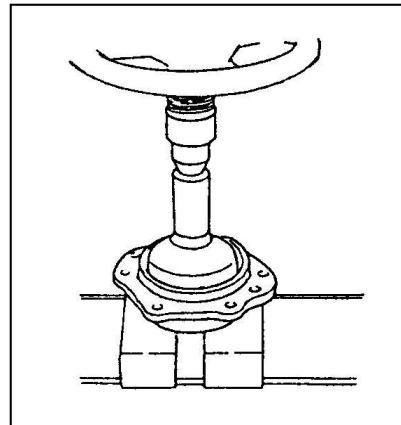


Fig.4-27

- (2) Press in guide bearing to the top of drive spiral bevel gear and install snap ring.
- (3) Press in conical roller bearing.

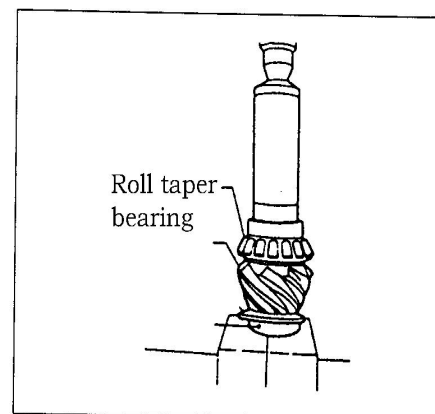


Fig.4-28

(4) Pre-adjust rive spiral bevel gear assembly

① Install any adjusting washer and washer to drive spiral bevel gear

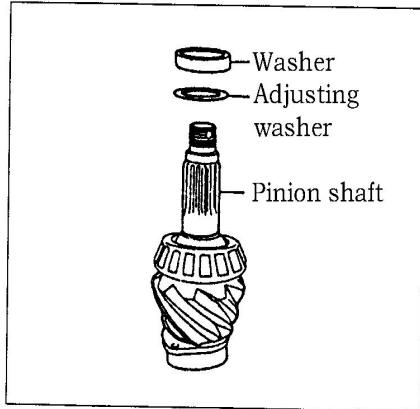


Fig.4-29

Notice:

To avoid over preload, choose some thick adjusting washer firstly and decrease thickness gradually until gain proper preload.

② Install drive spiral bevel gear into bearing bracket.

③ Place the up drive spiral bevel gear axle to spacer bush, oil seal, bearing bracket adjusting washer, cover (hand brake support) and flange.

④ Choose adjusting washer until locking nut arrives defined tightening torque 343-441N.m, starting torque of drive spiral bevel gear is 2.0-3.9N.m.

⑤ After preload, exit flange and cover (brake support).

(5) Place oil seal applied with lubricating grease into cover (brake support).

(6) Install spacer bush and flange.

Install differential carrier

(1) Press the half shaft bearing surface facing the differential carrier

(2) Install half axle gear and matched planetary gear, gear shaft and matched adjusting washer to differential carrier.

(3) Measure the backlash between half axle gear and planetary gear pair,

(Teeth backlash: (0.19-0.25mm) If the backlash is not in this scope, please change planetary gear and half axle gear.)

Notice:

Planetary gear shaft should not move when measuring.

(4) Install half axle gear and thrust washer

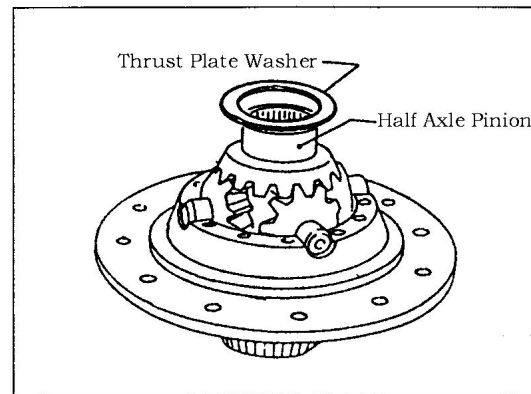


Fig.4-30

(5) Press half axle bearing surface into differential right shell.

(6) Mark on the differential carrier successively.

(7) Assemble differential carrier. Pre-apply Letai glue to connecting bolt and tighten to specified torque 100N.m.

(8) Assemble spiral bevel gear. Pre-apply Letai glue to connecting bolt and tighten to specified torque 120N.m.

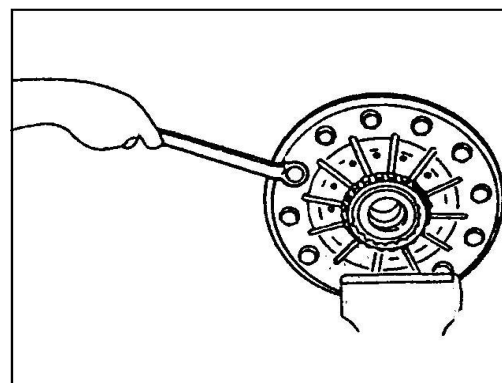


Fig.4-31

Assemble reducer housing

- 1) Install drive spiral bevel gear assembly into reducer housing. Add any adjusting washer, tighten connecting bolt to fixed torque 45N.m.

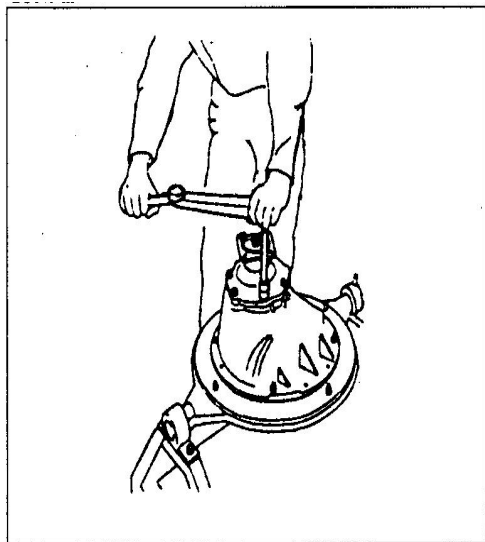


Fig.4-32

·Drive spiral bevel gear needs to place into reducer housing smoothly, if damage the snap ring, please change it.

·When assembling washer, it needs combined type with mono-sheet type.

- (2) Put the roll bearing outer ring to differential assembly and then put into the differential housing.

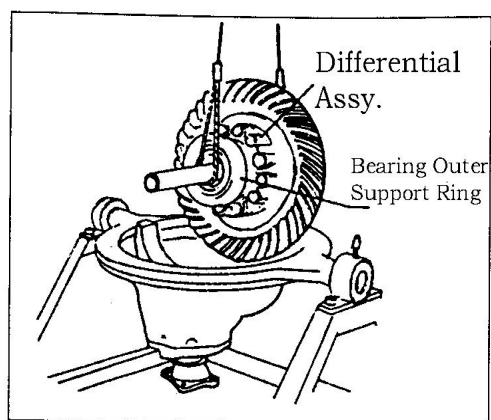


Fig.4-33

- (3) Do measuring mark when observing dismantle, pre-tighten bearing bracket bolt,

and adjust with side lock nut.

- (4) Pre-tighten lock nut and push the bearing to the end.

- (5) Measure teeth backlash of drive and driven spiral bevel gear, adjust the teeth backlash to 0.2-0.35mm by lock nut.

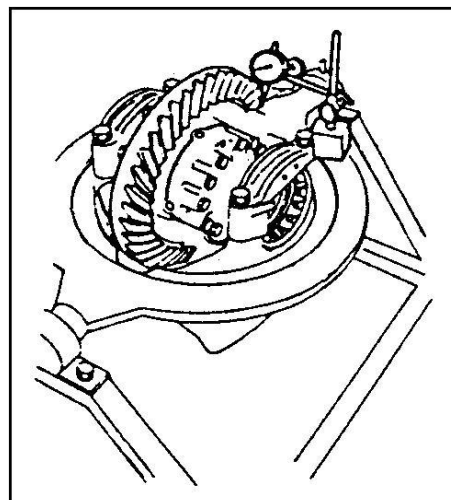


Fig.4-34

- (6) Adjusting the teeth backlash to 0.2-0.35mm by the above way, lock the nut completely and make the bearing pre tightening force as 29-49 N.m.

- (7) Screw down bearing bracket mounting bolt tightening torque 170 N.m.

- (8) Mount locking plate and screw down adjusting bolt 10-15 N.m.

V. Steering system

Steering system is mainly composed of steering device, priority valve, steering oil pipe and steering axle.

Steering device consists of steering wheel, steering column and hydraulic steering gear. Steering wheel and steering column is adjustable, and the adjusting angle is 6° to adapt different drivers' needs. In the engine misfire condition, rotate the steering wheel with 1kg power, after release the hand, the steering wheel can automatic return about 10° .

1. Hydraulic steering gear

1.1 Summarize

This hydraulic steering gear is load sensing type. There is a LS mouth in the steering gear connected to priority valve that makes steering load pressure signal transmit to priority valve through oil pipe, which controls the oil quantity supply to the steering gear.

In the load sensing type steering system, whatever load pressure or steering wheel speed, it can prioritise corresponding flow according to oil line requirement, and guarantees the steering reliable, sensitive and light.

Besides the needed oil pump output flow to the steering system, the rest one is supply to working oil, thus eliminates power loss of over oil supply to steering oil line, and improves system efficiency.

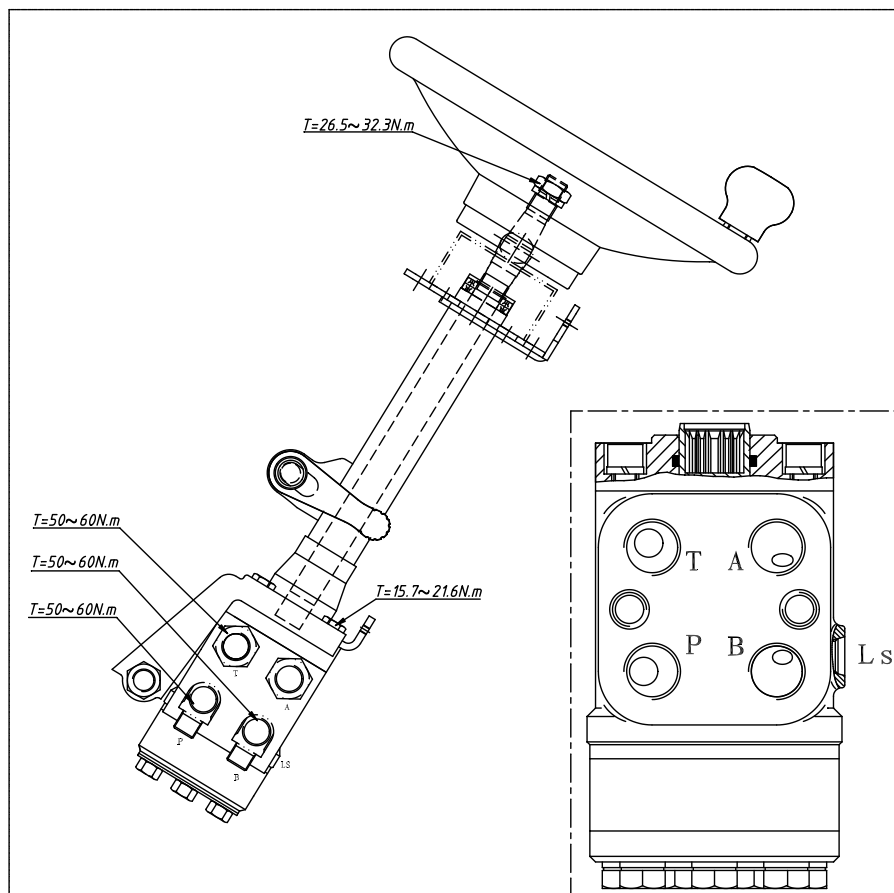


Fig.5-1 Steering device diagram

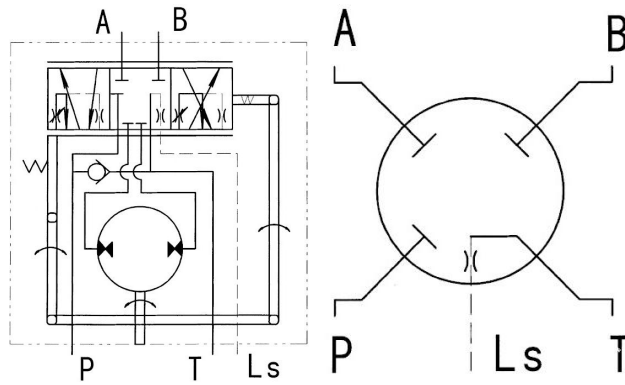


Fig.5-2 Full hydraulic steering gear schematic diagram

1.2 Assemble notice

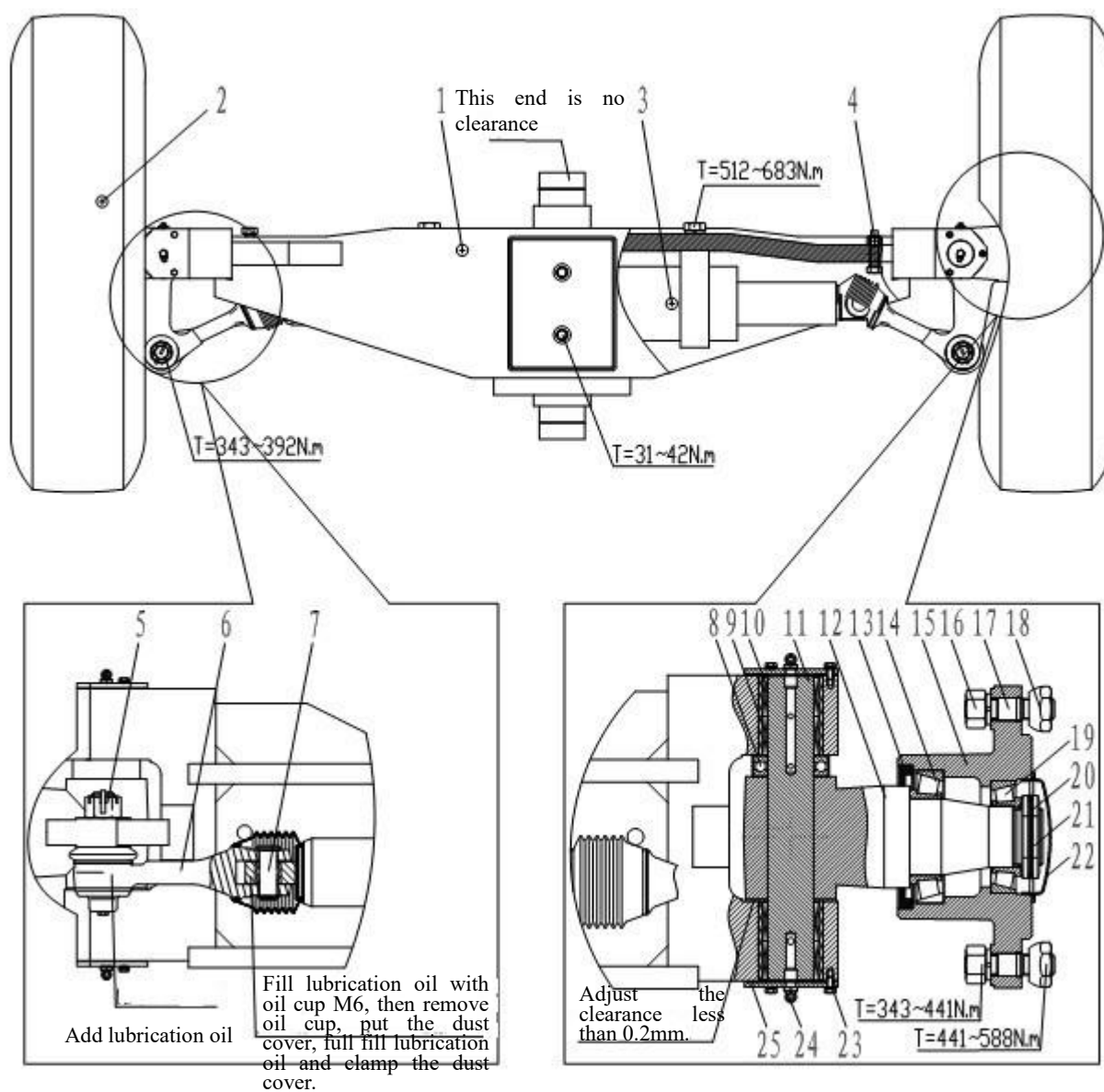
- 1) When assembling the steering gear, make sure in the same axle with steering column, and there should be axial clearance. Check if steering wheel return flexible after assemble. Assemble should follows the following: “P”—connect muti-way valve Ps mouth; “T”—connect hydraulic oil tank; “A”—connect steering cylinder lift chamber; “B”—connect steering cylinder right lift chamber; “Ls”—connect muti-way valve Ls mouth.
- 2) Make sure the oil clean to avoid dirt block steering gear inner part and cause steering malfunction. Thus it needs check filter element of filter and oil work condition, replace when necessary.
- 3) If there occurs to heavy steering or malfunction during steering gear use, find out the reason firstly, it cannot wrench the steering wheel hard, or dismantle the steering gear, otherwise it may damage the parts. It is prohibited to rotate the steering wheel by two persons.

1.3 Diagnosis and corrections

Fault	Probable reason	Phenomenon	Corrective action
Oil leakage	Combined part bolt loosen		Screw down bolt
	Combine face or journal sealing ring damage		Replace sealing ring
	Gasket damage		Replace gasket
Hard steering	Insufficient oil supply to oil pump	Turn steering wheel slowly is light and fast is heavy..	Check if oil pump works normal
	Air in the steering system	Foam in the oil and give out irregular noise, rotate the steering wheel but the cylinder works sometimes and stop for a while.	Eliminate air in the system and check if oil suction pipe leaks
	Oil level is lower than specified position		Add oil to specified height

	Oil viscosity is too big		Use specified oil
	Ball check valve invalid.	Steering wheel is heavy when fast steer or slow steer, and no steering	If steer ball losses, install the ball; if steel ball is blocked by dirt, clean it.
	Steering system pressure is lower than working pressure	No load or light load steering is light, but much load steering is heavy.	Check out the reason, recover or improve system pressure(not exceed 16Mpa)
Steering failure	Spring leaf break off	Steering wheel cannot automatically return in middle	Replace spring leaf
	Dial pin or universal driving shaft open break or deformation	No obvious pressure runout or cannot turn	Replace dial pin or universal driving shaft
	Rotor or universal driving shaft open break or deformation	Steering wheel cannot rotate or move from side to side	Tooth space engagement between compact point teeth on universal driving shaft and on the rotor
No human steering	Overlarge stator radial clearance or axial clearance	Steer after misfire, steering wheel turns but the cylinder keep still.	Replace stator

2.Steering axle



- | | | | | |
|--------------------|-------------------|---------------------|----------------|-------------------|
| 1.Housing | 2.Wheel | 3.Steering cylinder | 4.Stop bolt | 5.Open nut |
| 6. Draw bar device | 7.Axis pin | 8.Bearing | 9. Steel cover | 10.Bearing |
| 11.Main pin | 12. Right knuckle | 13.Oil seal | 14.Bearing | 15.Hub |
| 16.Nut | 17. Tyre bolt | 18.Tyre nut | 19.Bearing | 20. Thrust gasket |
| 21.Lock nut | 22. Hub cover | 23.Bolt | 24.Oil cup | 25.Cover plate |

Fig.5-3 Steering axle

2.1 Technical parameters

King pin inclination angle	0°
king pin caster angle	0°
Steering wheel camber angle	1°
Toe-in	0°
Max. inner wheel turn angle	76°
Max. Outer wheel turn angle	53°

2.2 Steering axle dismantle, disassemble and assemble

Dismantle

- (1) Support the front wheel with block and discharge forklift counterbalance.
- (2) Jack-up the rear chassis, make the rear wheel 1cm off the ground, and support the chassis with block;
- (3) Dismantle steering wheel;
- (4) Dismantle steering pipeline;
- (5) Support the steering axle two ends with stand or jack up, and dismantle bearing support;
- (6) Hoist the steering axle with hang truck.

Disassemble

Hub

- (1) Jack-up the forklift and support with blocks;
- (2) Dismantle tyre;
- (3) Dismantle hub cover, locking nut and thrust gasket;
- (4) Pull out hub assembly;
- (5) Dismantle inner ring of the bearing

Notice: a. do not drop taper bearing
b. Be caution not damage the seal element.

Steering king pin and knuckle

- (1) Dismantle nut in the joint of knuckle and draw bar device, disassemble draw bar device;
- (2) Loose the fixed screw;
- (3) Dismantle oil cup of steering king pin;
- (4) Dismantle steering king pin;

Notice: a. Push steering king pin to avoid drop.
b. Take down the whole set of knuckle (including thrust bearing, dustproof shell, shim).

Steering cylinder

- (1) Dismantle anti-dust cover, axis pin, snap ring and draw bar device that connected the steering cylinder;
- (2) Dismantle steering oil pipe;
- (3) Dismantle steering cylinder and axle connected bolt.
- (4) Take out steering cylinder from the axle.

Installation

Install order is opposite to the dismantling order, please be cautious:

- (1) Install thrust ball bearing;
- (2) End play is less than 0.2mm(End play gained from regulation shim);
- (3) When assembling cylinder, pay attention not to crash the oil pipe connector or wipe the cylinder piston rod;

- (4) After assembling, piece 9 axis pin can rotate freely, cylinder and draw bar move stable;
- (5) Apply lubricating grease to the installed oil cup and hub bearing

2.3 Steering axle check and adjustment

2.3.1 Knuckle check:

- (1) Check if there is flaw with knuckle oil color inspection method or oil immersed hammering method;
- (2) Check fit clearance of knuckle king pin and steering axle main pin hole;
- (3) Check if there is wear in the needle bearing hole;
- (4) Check if there is damage or chap on knuckle arm plate taper hole.

2.3.2 King pin tension check:

Check if there is wear, damage or erosion on king pin and bearing sliding surface. If wear exceeds limit, replace together with its needle bearing.

2.3.3 Check of the king pin and steel jacket clearance

- (1) Adjust the hub bearing pre-tightening to specified scope;
- (2) Hold the wheel and hub, push and pull, if there is obvious looseness, it means there is over large clearance between steering knuckle and steel clearance.

2.3.4 Check and adjustment of end play of knuckle and steering axle

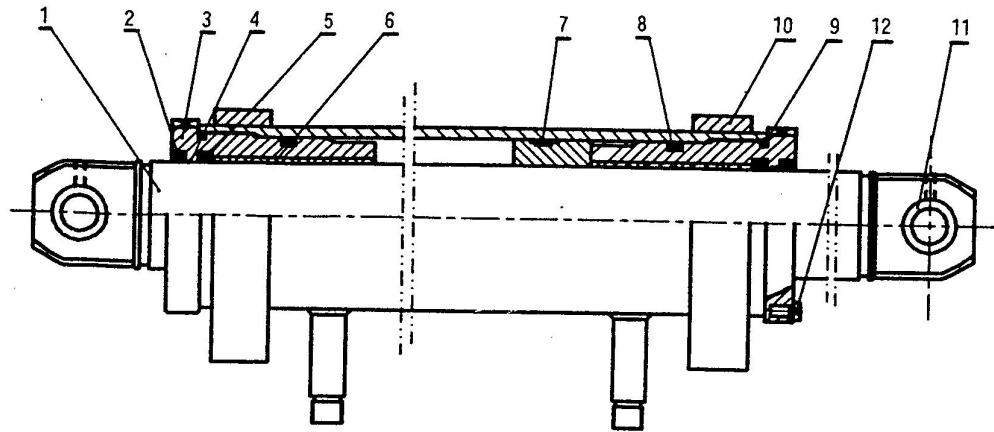
- (1) Check if end play of knuckle and steering axle: hold the knuckle axle, shake up and down, if there is obvious looseness, it means there is over large clearance between them;
- (2) Adjustment of end play of knuckle and steering axle is adjusted through increasing or reducing shim thickness.

2.3.5 Adjustment of hub bearing pretension load

- (1) Apply lubrication grease to the hub and steering nut, and also to the oil seal lip;
- (2) Fix bearing outer ring to the hub, and install the hub to the knuckle;
- (3) Rotate the hub with one hand, and the other hand screw down the nut to the end, and then return 1/6 circle in negative direction;
- (4) Rotate the hub 2-3 circles and rotate the bearing roller in place;
- (5) Repeat ③ action, then put the thrust gasket and locking nut;
- (6) Rotate around 2-3 circles, measure initial torque end play, it need satisfy: end play ≤ 0.08 mm, initial torque $\leq 25.5\text{N}$ (at hub bolt). Otherwise, repeatedly adjust to then requirement.

2.4 Steering cylinder

Steering cylinder is of double-action piston type; each end of piston rod is connected to knuckle and through the connecting rod. Hydraulic oil from hydraulic steering gear makes the piston rod move left and right to steer truck. Refer to fig. 6-3.



- | | | | | | |
|------------------|-------------------|-------------------|------------------|------------|------------------|
| 1-Piston | 2- Dustproof ring | 3- Guiding sleeve | 4-O-ring | 5-Oil seal | 6-Composite bush |
| 7- Combined seal | 8- O-ring | 9- O-ring | 10-Cylinder body | 11-Bush | |

Fig.5-4 Steering cylinder

VI. Brake system

Brake system is composed of service brake system and park brake system. Service brake is front dual tyre hydraulic boosting brake and park brake is mechanical barrows brake.

1.Data

Drive axle brake	Model	Hydraulic supercharge, oil pressure, internal expanding front wheel mechanical brake
	Clearance between friction lining and brake drum mm	0.25-0.5
	Friction lining wear limit （To rivet head） mm	Larger than 0.5
Brake valve	Model	X1000-640008-500
	Type	With accumulator, pedal, central hydraulic brake valve
	Total travel mm	12.5
	Nominal flow rate L/min	25
	Nominal pressure MPa	16
	Brake pressure MPa	8.8±0.2
	Relief valve adjusting pressure MPa	13
	Allowed oil temperature °C	-20~110
	Oil type	L-HM32 anti-brake oil
Accumulator	Model	XR1000-640400-G00
	Alert pressure MPa	5. 7
	Overflow pressure MPa	13
	Nitrogen pressure MPa	5
	Nitrogen volume l	28
	Max. volume ml	422
	Effective volume ml	280
Hand brake	Model	Internal expanding mechanical, work on double change output shaft through parking brake gear.
	Stroke mm	Less than 80（With 147N tensile force, at the hand brake handle.）
Brake pedal	Free stroke mm	5~7.5
	Pedal height mm	145±5
	Stepping height mm	Larger than 60
Inchin g pedal	Free stroke mm	145±5
	Pedal height mm	18

2.Fault diagnosis and corrections

Main brake

Fault	Probable cause	Corrective action
Insufficient brake force	Oil leakage in brake lines. Air in brake lines. Water or oil on linings. Uneven wear or contact of brake linings. Improper functioning of brake valve Clogged oil lines. Leakage of caliper disc brake piston cavity	Correct and replenish. Bleed air. Clean or replace. Grind or replace. Correct or replace. Clean. Replace O-ring
Unequal braking (forklift truck veers to one side)	Uneven tire pressure. Improper relief valve adjustment Water or oil on brake linings. Foreign pieces in brake drum. Deteriorated lining surface. Improper contact of linings. Worn lining Worn, warped, rusted or damaged brake drums. Improper operation of wheel cylinder. Improperly adjusted wheel bearing. Clogged oil lines.	Adjust. Adjust. Clean or replace. Clean. Grind or replace. Grind or correct. Replace. Correct or replace. Correct or replace. Adjust or replace. Clean.
Brake dragging	No free play of brake pedal. Abnormal operate of caliper disc brake Faulty piston cup. Weak or broken return springs. Blockage of hydraulic power brake valve return hole. Clogged oil lines. Hydraulic brake valve out of adjusting.	Adjust. Adjust or replace. Replace. Replace. Clean. Clean. Adjust or replace.
Brake noise	Lining surface harden or foreign pieces on it. Warped back plates or loosed bolts. Brake shoes warped or improper install. Worn linings. Loose wheel bearing.	Repair or replace. Repair or replace. Repair or replace. Replace. Repair.

Hand brake

Fault	Probable cause	Corrective action
Insufficient brake force	Friction lining wear Large travel of control rod Ratchet wear or damage Hand brake dragline lengthen Water or oil on linings Uneven wear or contact of friction linings.	Replace. Adjust. Replace. Replace. Clean or replace. Grind or correct.

3. Pedal height, free stroke

Brake pedal adjustment:

- (1) Adjust brake pedal stop bolt, make the pedal pad point P $145 \text{ mm} \pm 5 \text{ mm}$ from the front base plate and screw down the bolt nut.
- (2) Adjust hydraulic booster manipulator push rod length, and make the idle stroke of the point P to point Q is $1 \text{ mm} \sim 3 \text{ mm}$, and lock the nut;
- (3) When step the brake pedal $10 \text{ mm} \sim 20 \text{ mm}$ little by little, the brake light switch is completely connected, and release the foot to this state, brake light switch should disconnect.

Inching pedal adjustment:

- (1) Adjust R bolt, make the pedal pad point P $145 \text{ mm} \pm 5 \text{ mm}$ from the front base plate and screw down the bolt nut.
- (2) Adjust the brake pedal after adjustment.

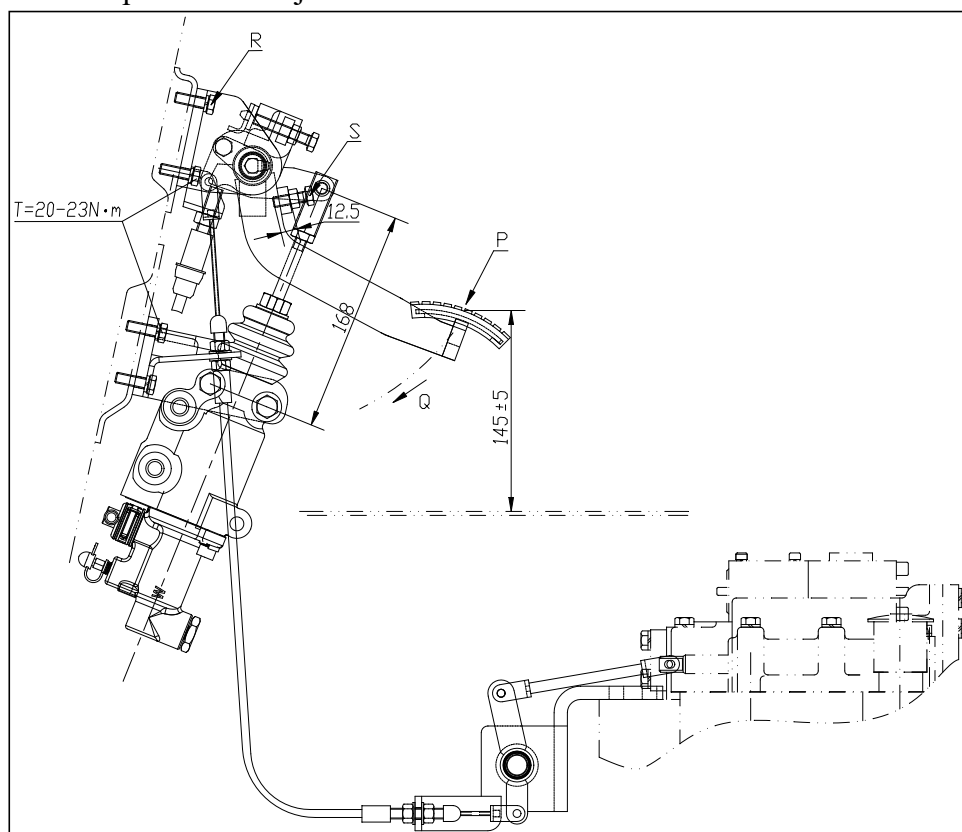


Fig.6-1 Pedal adjustment

4. Brake valve and accumulator

4.1 Brake valve

Brake valve is composed of valve body, closed valve rod, responding piston, slide valve, pushrod valve, check valve and spring. Refer to fig. 6-2.

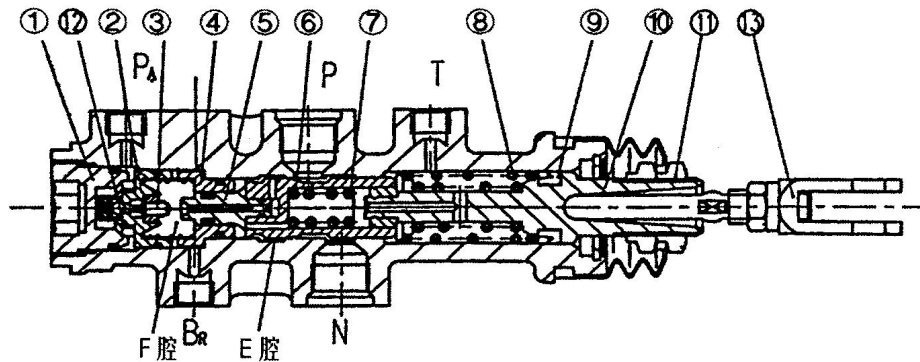


Fig. 6-2 Brake valve

- | | | | | |
|------------------|-----------------|---------------------|-----------------|----------------------|
| 1. Bolt | 2. Valve stand | 3. Closed valve rod | 4. Guide sleeve | 5. Responding piston |
| 6. Return spring | 7. Slide valve | 8. Spring | 9. Cup | 10. Push rod piston |
| 11. Stop nut | 12. check valve | 13. Push rod | | |

It realizes forklift brake through changing oil line direction. In general condition, from reversing multi-way valve oil P mouth to B_R mouth to push caliper disc brake piston generate brake; accumulator oil (P_A mouth) to B_R mouth to push caliper disc brake piston generate brake when parking. N mouth is to hydraulic steering gear oil port, steering oil line and brake oil line can separately work, or united work. No interference when united work.

4.2 Accumulator

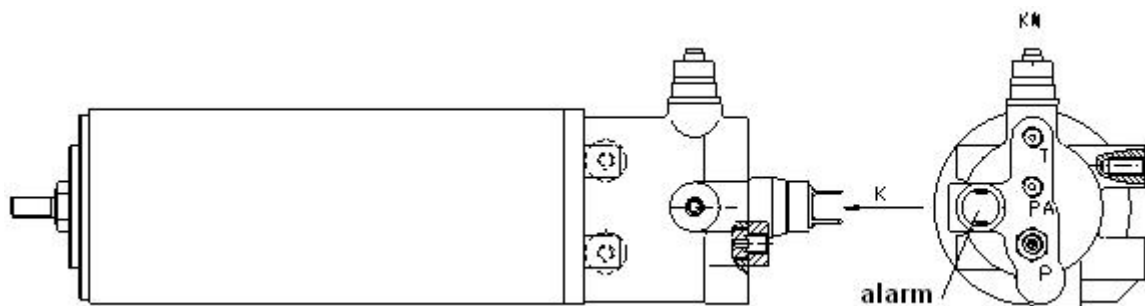


Fig. 6-3 Accumulator

When the engine stop work or the oil pump occurs to fault, accumulator can be used as abnormal energy to satisfy brake need, and the energy storage is spring type.

The figure shows no energy storage state, and the alarm switch is in keep noise state.

When operating brake pedal, the oil pressure reaches above 5Mpa, the check valve open and let oil enter into accumulator, so that push piston move left to compress the combined spring and build up the oil pressure.

Meanwhile piston left shift makes the switch control lever at the alarm switch move left under the spring force, and fall the spring valve spool down the switch control lever groove, then the alarm switch is in no noise state.

With the pump oil pressure increasing, piston left shift stroke is limited by the stop tube in middle of combined spring, at this time, the accumulator has max. energy, oil pressure is 10Mpa, and the value is limited by relief valve opening and closing characteristic.

Brake valve and power accumulator system schematic diagram. Refer to fig. 6-4

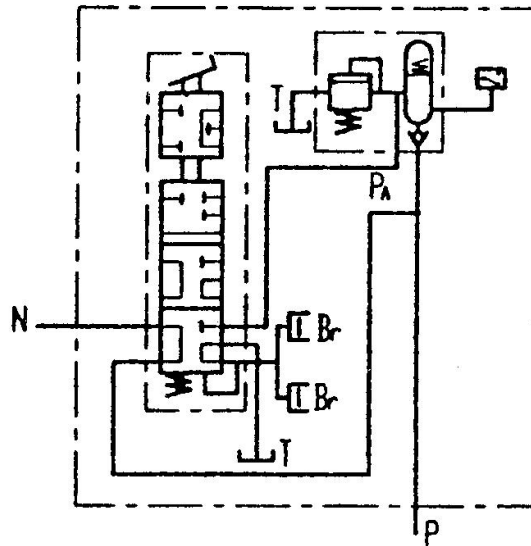


Fig. 6-4 Schematic diagram

Use notice:

- Brake pipeline should install after discharge air in the pipeline.
- Make cleanness of the hydraulic oil.
- Guarantee clearance between push rod and push rod piston is (0.5~1) mm

⚠ Warning

Before repair hydraulic system, shut down the vehicle, step the brake pedal 5 to 10 times continuously to release accumulator energy, otherwise the repairman may have major accidents and endanger personal safety.

Set up the front axle, if the front wheel can be rotated, it mean fully released. Only after fully release the energy can proceed to the next operation.

5. Hand brake

Hand brake is internal expanding mechanical hand brake, its brake base installed to the box, brake drum is fixed to supporting flange, supporting flange is connected to parking brake shaft through spline, parking brake gear on parking brake shaft often engaged with double change output shaft. When truck moves, parking brake gear drives brake drum operate. When pulling tight the brake handle, make brake shoe open through brake flexible shaft, enclasp the brake drum, brake the gear on double change output shaft by the parking brake gear, thus realize truck parking brake.

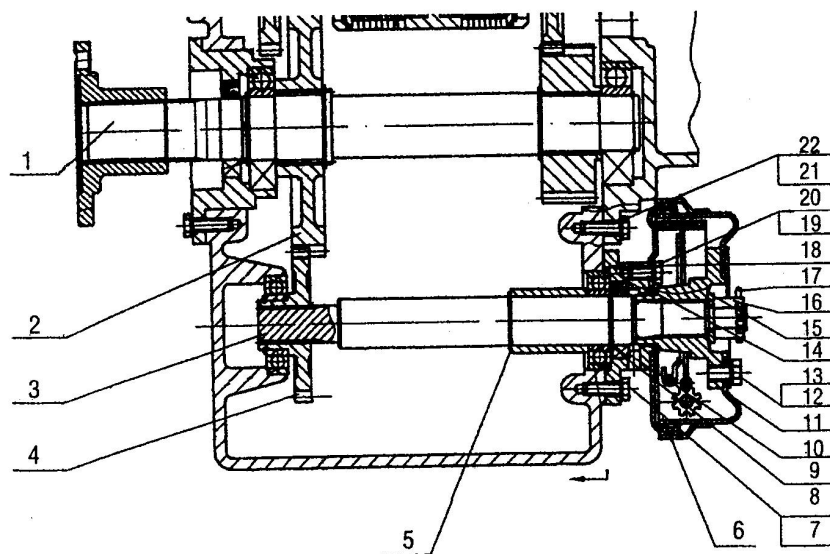
During use and maintenance, if any bad hand brake, check and adjust in time. When the hand

brake idle stroke increases but cannot reach the specified stopping requirement, adjust in time.

Friction plate and brake drum replace

1. Release brake drum clamp nut and release brake drum;
2. Take out parking brake shaft cotter and dismantle supporting flange;
3. Check friction lining, if wear is serious, replace new one in pairs.
4. Check brake drum surface, if rust or scratch, apply 120#-150# abrasive paper and sanding to deal with friction lining contact surface; if abrasion seriously, replace new brake drum;
5. Installing order is to the opposite;
6. Check brake drum and brake shoe correct contact;

Adjust when the free stroke of hand brake handle is over large Firstly release the hand brake control lever to limiting position, adjust handle head screw with screw driver, screw down in clockwise, and unscrew in counterclockwise.



- | | | | | |
|--|-----------------------|------------------------|------------------------|-----------------|
| 1. Output shaft | 2. Gear | 3. Parking brake shaft | 4. Parking brake gear | 5. Spacer bush |
| 6. Internal expanding mechanical brake | 7. Gasket | 8. Bolt | 9. Axis elastic gasket | |
| 10. Sealing ring | 11. Supporting flange | 12. Gasket | 13. Bolt | 14. Brake stand |
| 15. Gasket | 16. Nut | 17. Pin | 18. Paper pad | |
| 19. Gasket | 20. Bolt | 21. Gasket | 22. Bolt | |

Fig. 6-5 Hand brake

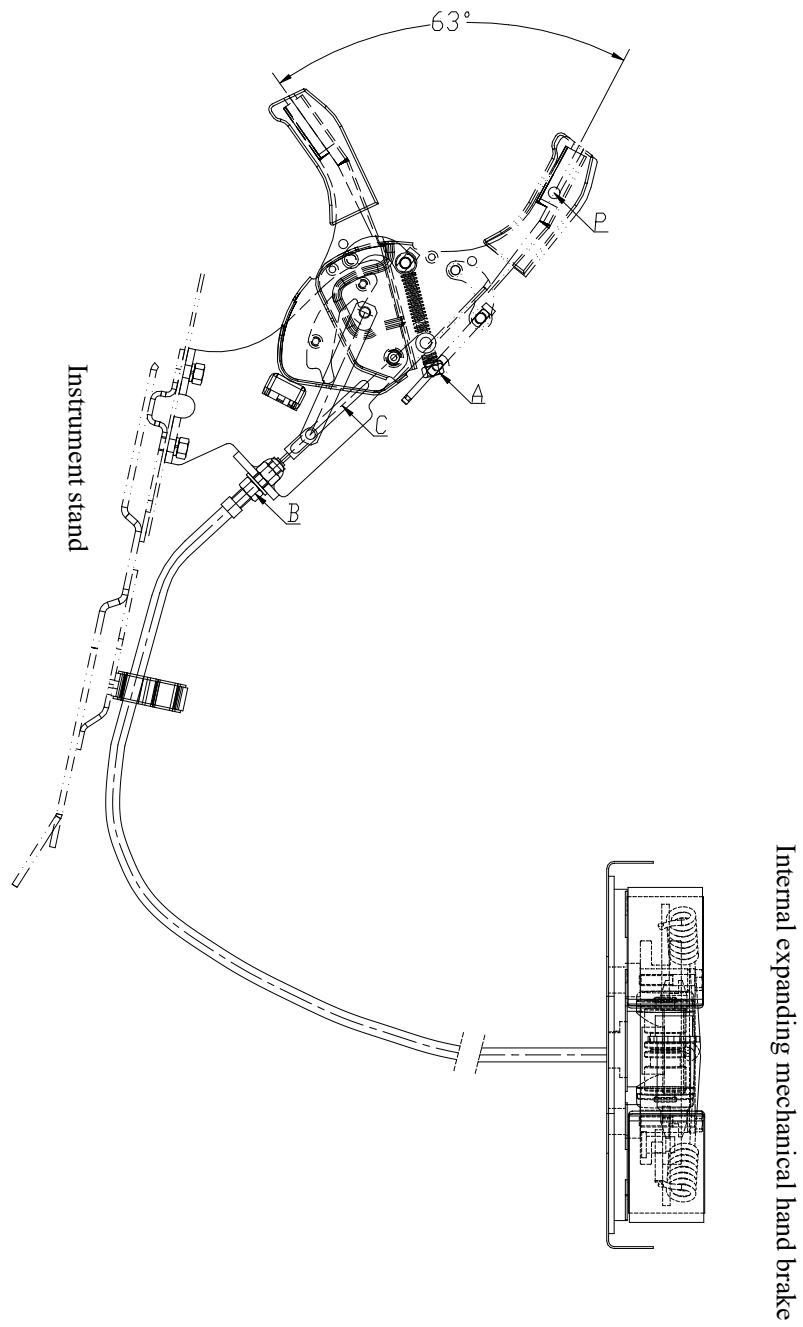


Fig. 6-6. Parking brake system diagram

5.1 Parking brake system fault diagnosis and corrections

Fault	Probable cause	Corrective action
Insufficient brake force	Friction plate wear Large control rod stroke Ratchet wear or damage Hand brake dragline lengthen Oil or water on friction lining Uneven friction lining contact or wear	Replace Adjust Replace Replace Clean or replace Grind or replace

5.2 Hand brake control lever adjustment

Adjust when the free stroke of hand brake handle is over large. Firstly release the hand brake control lever to limiting position, adjust handle head screw with screw driver, screw down in clockwise, and unscrew in counterclockwise.

Adjusting main point: (1) Adjust internal mechanical hand brake before adjust the hand brake control lever; (2) Mount brake dragline, fasten nut B; (3) Adjust nut A until the handle force(point P) is no larger than 15 kg when locking the handle; (4) Apply sufficient lithium base grease to guide rail C.

5.3 Internal expanding mechanical hand brake

Internal expanding mechanical hand brake lies in the bottom right of hydraulic transmission gear box motor, its brake base installed to the box, brake drum is fixed to supporting flange, supporting flange is connected to parking brake shaft through spline, parking brake gears on parking brake shaft often engaged with gears on hydraulic transmission gear box output shaft. When truck moves, parking brake gear drives brake drum operate. When pulling tight the brake handle, make brake shoe open through brake flexible shaft, enclasp the brake drum, brake the gear on double change output shaft by the parking brake gear, thus realize truck parking brake.

During use and maintenance, if any bad hand brake, check and adjust in time. When the hand brake idle stroke increases but cannot reach the specified stopping requirement, adjust in time.

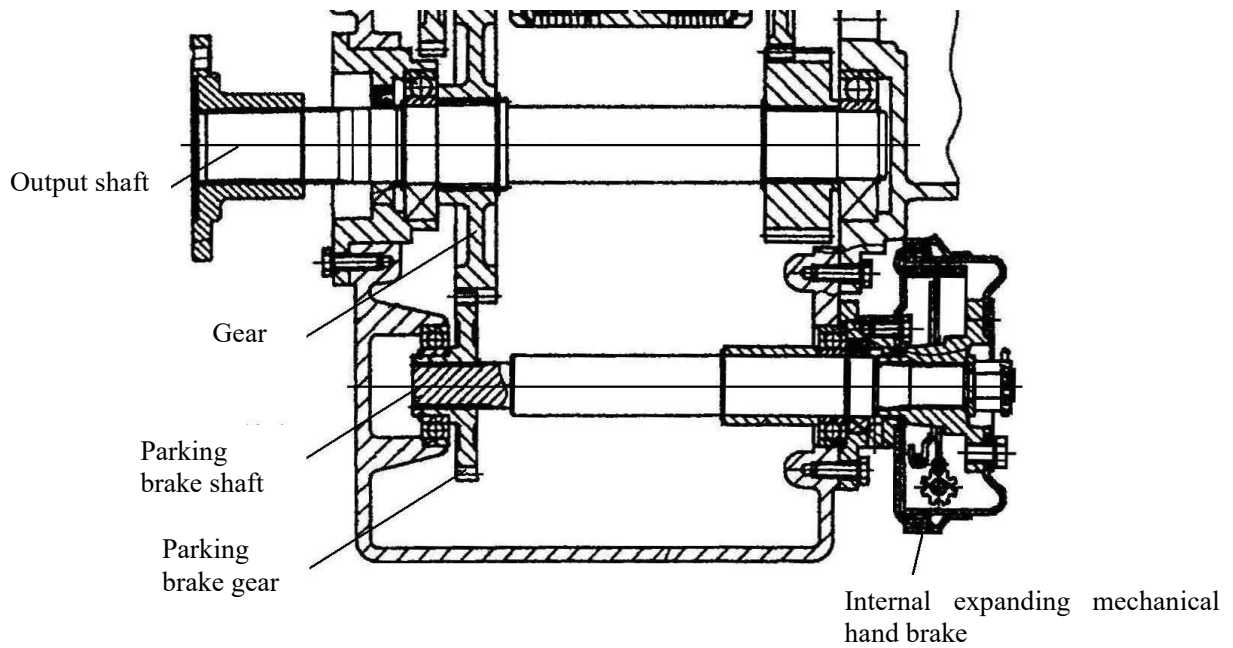


Fig. 6-7

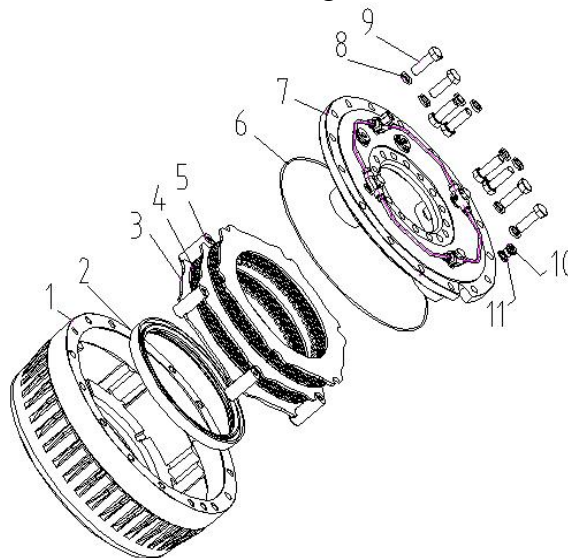
5.4 Friction plate and brake drum replace

- (1) Release brake drum clamp nut and release brake drum;
- (2) Take out parking brake shaft cotter and dismantle supporting flange;
- (3) Check friction lining, if wear is serious, replace new one in pairs.
- (4) Check brake drum surface, if rust or scratch, apply 120#-150# abrasive paper and sanding to deal with friction lining contact surface; if abrasion seriously, replace new brake drum;
- (5) Check brake drum and brake shoe correct contact;

Installing order is to the opposite.

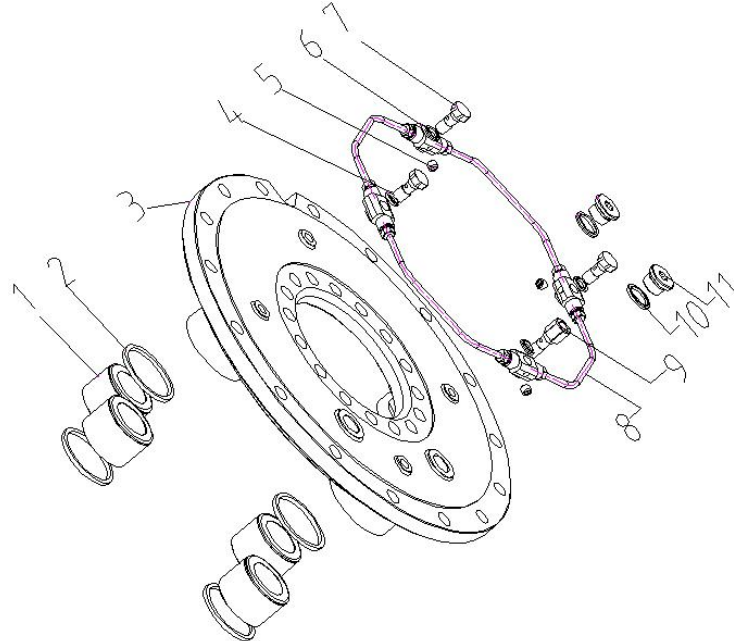
6.Service brake

The truck equipped with wet brakes. Wet brakes include friction plate assembly, brake pads, piston, cylinder, brake housing and other components. When connecting the brake and the drive axle, the oil must be cleaned before connecting.



- | | | | | |
|----------------|-----------------------|------------------|-------------------------|----------------|
| 1. brake shell | 2. oil seal | 3. brake disk | 4. brake lining
assy | 5. pin roll |
| 6. o-ring | 7. cylinder body assy | 8. spring washer | 9. bolt | 10. plug screw |
| 11. washer | | | | |

Fig. 6-8-1 wet brake 1



- | | | | | |
|-----------------------|-----------------------------|-------------|-----------|---------------|
| 1. piston | 2. rectangular sealing ring | 3. cylinder | 4. washer | 5. plug screw |
| 6. tow way joint | 7. bolt | 8. oil tube | 9. bolt | 10. washer |
| 11. plug screw | | | | |
| 16. brake lining assy | 17. brake disk | | | |

Fig. 6-8-2 wet brake 2

Wet brake maintain:

1)Lubricating oil

Brake use Mobil 424 hydraulic transmission lubricants, single brake oil is about 2.5L, regularly check the brake oil (Figure 6-11 oil level port) and change oil (first 500 hours, followed by 1000 hours or one year).

2)Brake temperature

When normal operating the brake temperature not higher than 90℃, if the high strength brake temperature anomalies, (greater than 130 ℃ for half an hour) should inspect the brake disassembly.

3)Oil seal

The brakes have two oil seals, gaskets and rectangular ring combinations need to regularly check the leak: a combination of seals seal brake oil, can observe the outer brake fluid to determine whether there is leakage or not; rectangular ring seals on the high-pressure piston oil leak judgment method: turn off the engine, slam the brake pedal to maintain five minutes to see if there is a low pressure alarm sounded, if so, need to replace the rectangular ring.

4)Change splined hub

Splined hub which in wheel hub, when replacement note spline hub and wheel hub combination flat top coat sealant Loctite 598, connecting bolt paint Loctite 262, bolt tightening torque 90-110 N.m (Figure 6-9).

5) Change friction plate

When the friction plate grooves polished, need to replace them in pairs and dual steel friction plate, friction plates and steel plates spaced alternately fitted into the brake housing, the first piece and the last piece are steel and not installed backwards (Figure 6 -10).

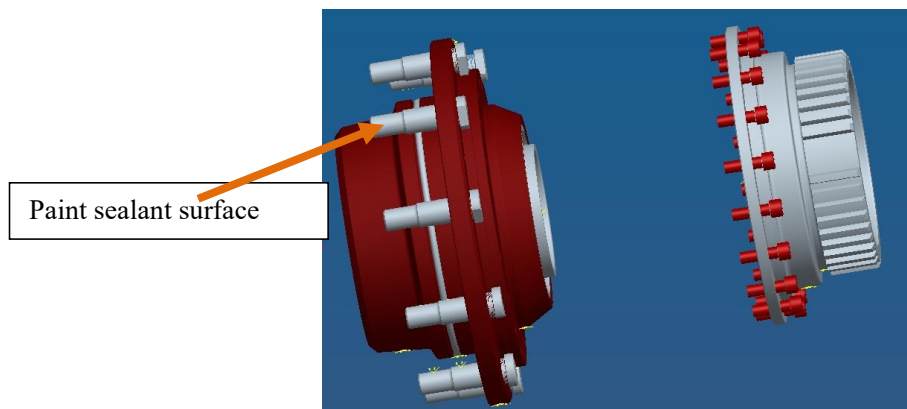


Fig. 6-9

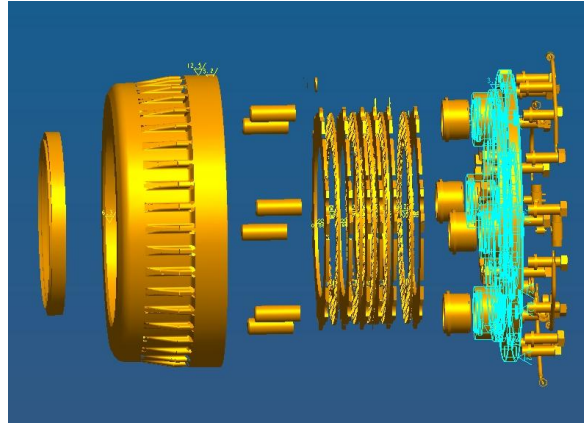


Fig. 6-10

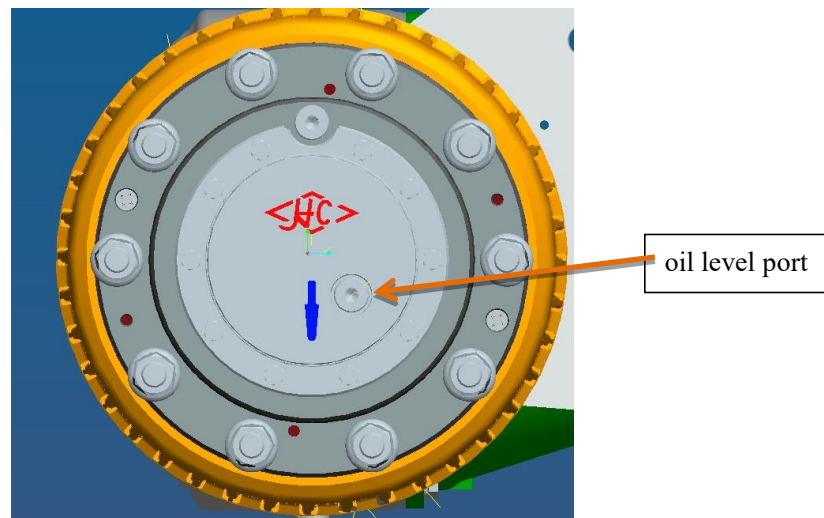


Fig. 6-11

7. Hydraulic brake malfunction diagnosis

In the parking state, step the brake pedal, generate pressure in brake system, continue stress force, if pedal gradually low down, leak on hydraulic system surface, check leakage and oil spots, then you can find out detailed fault position, tighten, repair or replace.

Step the brake pedal, if it can be stepped to the end, it means insufficient brake fluid, overlarge brake clearance, overlarge pedal free stroke or air in the system. Check the reason further and eliminate it.

If continually step the pedal, its working stroke decreases, that is pedal height gradually increases. Otherwise the master pump oil hole blocks and makes the oil in the pump cannot be increased.

8. Exhaust of air in the hydraulic system

Park the truck on flat and solid road surface, shut down and pull up the hand brake. One person continually step the brake pedal and generate enough pressure; another person under the truck, releases bleed screw, exhausts air, and then screws the bleed screw. After repeat this action several times until fully exhausts the air. After that, add enough brake fluid in time.

9.Brake system schematic diagram

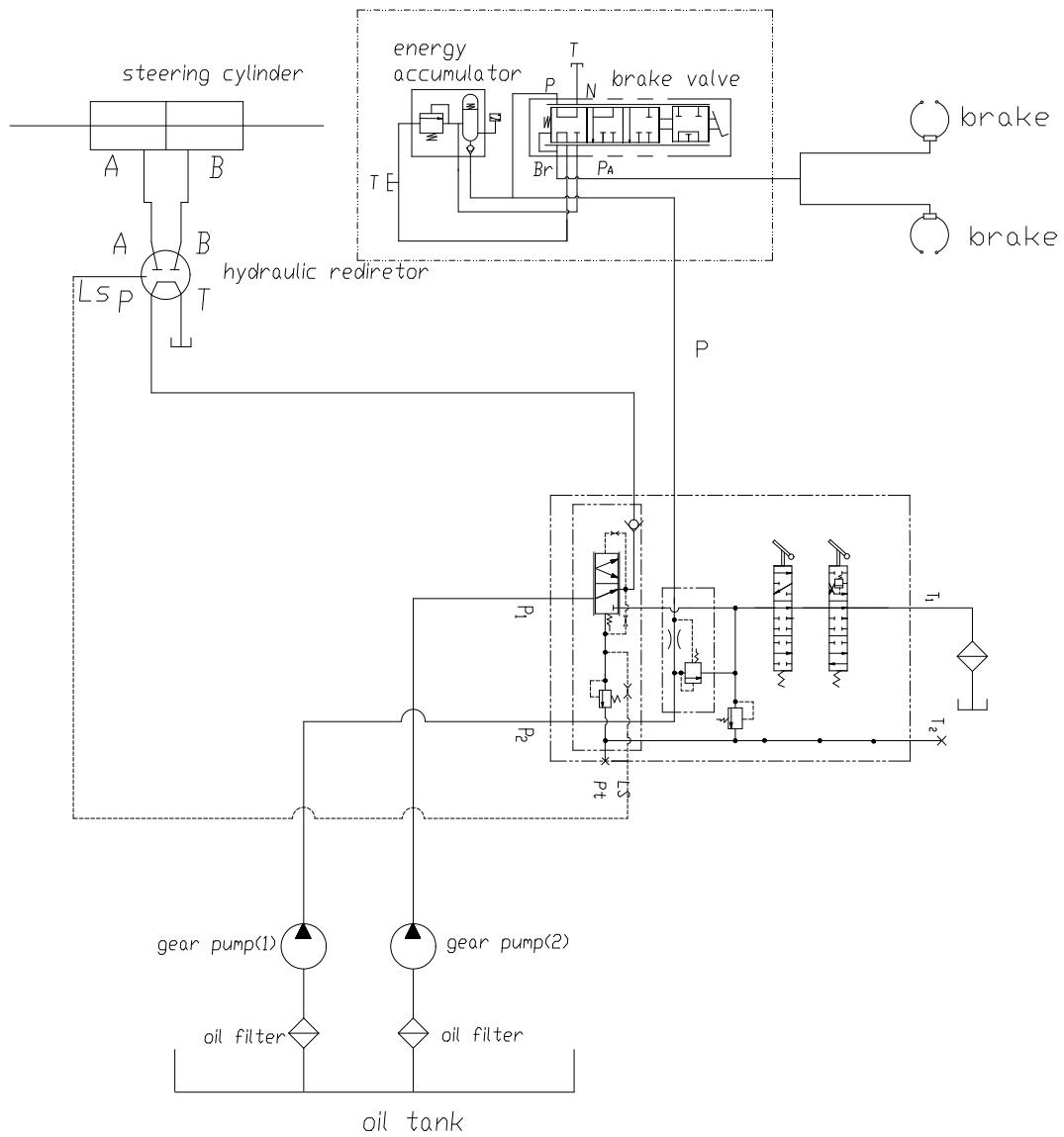


Fig. 6-12 brake system schematic diagram

VII. Hydraulic system

1.Oil pump

As to fig. 7-1, there is one left oil pump and one right oil pump, with the same structure and opposite rotation. Gear pump axial is an external gear pump of balanced outer clearance autocompensation and radial hydraulic. Its gears adopt asymmetric tooth profile special gears, owns little volume and low noise compared with symmetrical tooth profile gears of the same displacement.

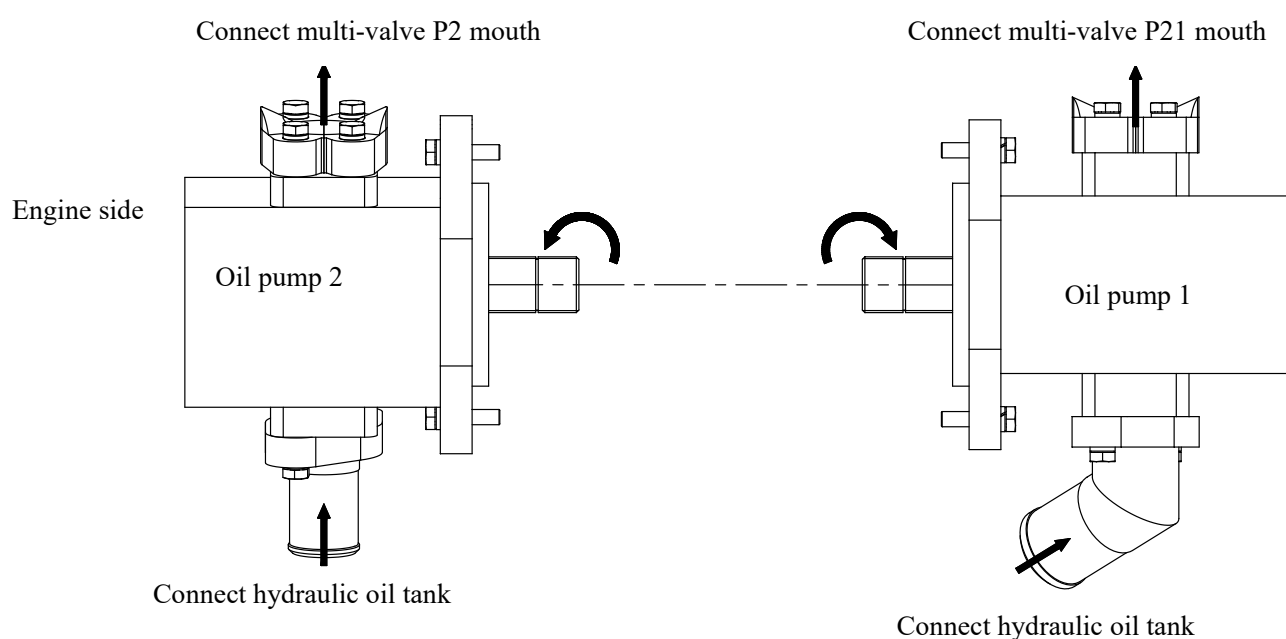


Fig. 7-1 Oil pump schematic diagram

1.1 Performance parameter

Item	Oil pump1	Oil pump 2
Model	CBK-G436-AFΦ	CBK-G430-AFΦL
Rotation direction	Right-handed rotation	Left-handed rotation
Nominal displacement (ml/r)	36	30
Rated pressure (MPa)	25	25
Rated speed (r/min)	2500	2500
Volumetric efficiency[Rated speed] (%)	≥92	≥92

1.2 Common fault and corrections

Fault	Probable cause	Corrective action
No oil from oil pump or insufficient	1. Pump does not rotate or low speed; 2. Incorrect steering; 3. Insufficient oil in oil tank; 4. Oil inlet and outlet reversed; 5. Oil absorption pipeline or filter blockage; 6. Intake duct leakage; 7. Pump cover bolt loosen; 8. Leakage in the system; 9. Over high or low of oil viscosity; 10. Over low or high oil temperature;	1. Make sure if oil pump is normally connected with prime motor; 2. Change prime motor rotation or change to opposite rotated gear pump; 3. Add oil to specified position; 4. Correctly connect according to the nameplate; 5. Check pipeline, clean or replace oil filter; 6. Check intake duct, seal and tighten; 7. Screw down bolt; 8. Check system and repair leakage point; 9. Use recommended oil; 10. Preheat or cool down, use recommended oil;
Low pressure	1. Overflow valve setting pressure too low or not work; 2. Intake oil; 3. Leakage in the system; 4. Bubble in the oil;	1. Check, adjust overflow valve pressure or replace overflow valve; 2. Check inlet line and eliminate suction condition; 3. Check system and repair leak point; 4. Add oil or immerse fuel return port in the oil;
Oil leakage	1. Sealing element ageing 2. Coupling screw or joint loosen;	1. Repair at repair station or factory; 2. Tighten screw or coupling;
Low noise or big vibration	1. Inlet line or filter blockage; 2. Overlarge oil absorption height; 3. Overlarge oil viscosity; 4. Intake oil; 5. Different axle of pump spindle and prime motor; 6. Bubble in the oil; 7. Over high pump speed; 8. Over high pump pressure;	1. Check pipeline, clean or replace oil filter; 2. Reduce oil suction height; 3. Use recommended oil; 4. Check oil suction line, eliminate inspiration condition; 5. Reinstall, make axiality less than 0.05; 6. Replenish oil; 7. Lower down speed; 8. Lower down hydraulic
Severe overheating	1. Over small installing clearance; 2. Over little oil tank volume;	1. Check and repair 2. Enlarge oil tank volume;

2. Multiple directional control valve

2.1 Structure and principle

The multiple directional control valve is fraction model, which is made up of input, output and slide valve.

Main relief valve is used to control the pressure of oil circuit. Main relief valve pressure has also been adjusted in the factory, so please don't adjust it at will.

Steering relief valve is used to control the pressure of oil circuit.

Slide valve is used to control tilt hydro cylinder, lift hydro cylinder, side shift cylinder, platform cylinder and jack. The cylinder control is realized by maneuvering the tilt valve stem, elevating valve stem, fork valve stem. Tilting slide valve owns forward tilting latching valve.

Oil from hydro cylinder returns to oil box from output, and every piece of valve is sealed by maneuver "O-ring. At the same time, there is a check valve in the high pressure oil line.

Note: Main relief valve of this multi-way valve is at the bottom, steering relief valve is on the top, and is different to ordinary multi-way valve.

Note:

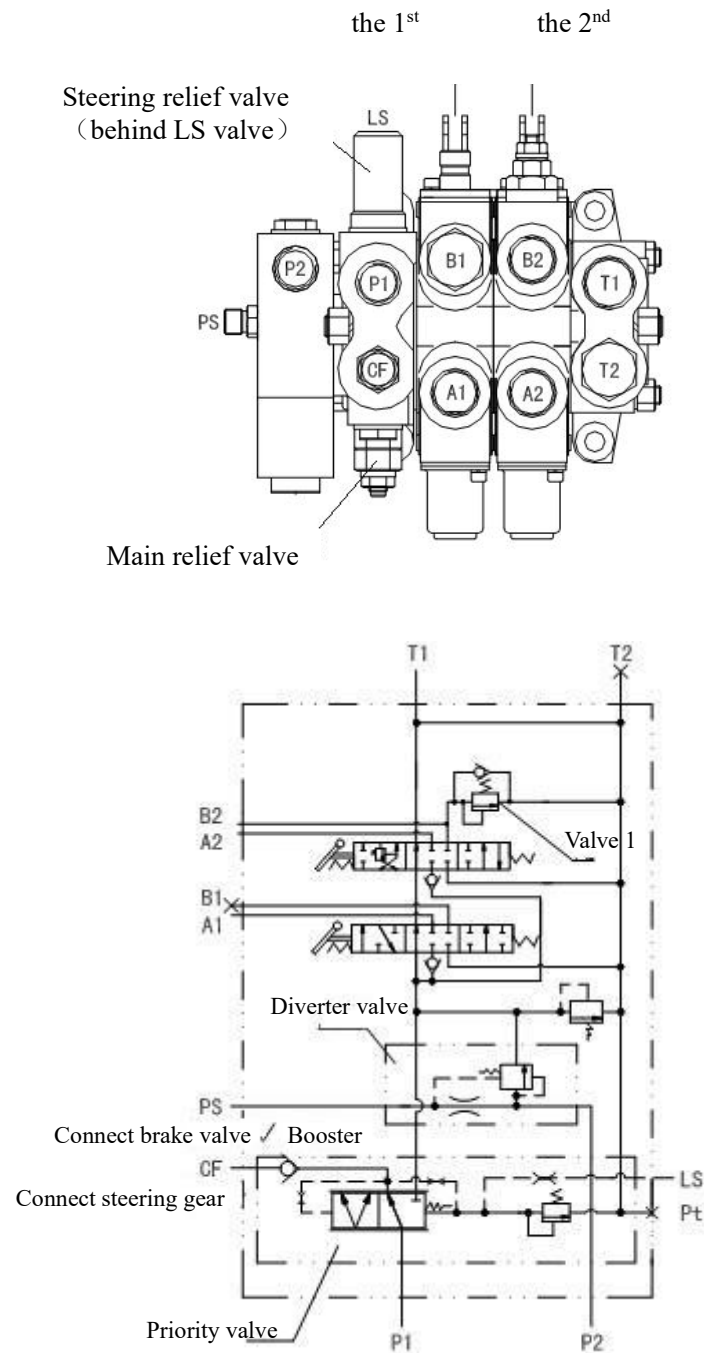
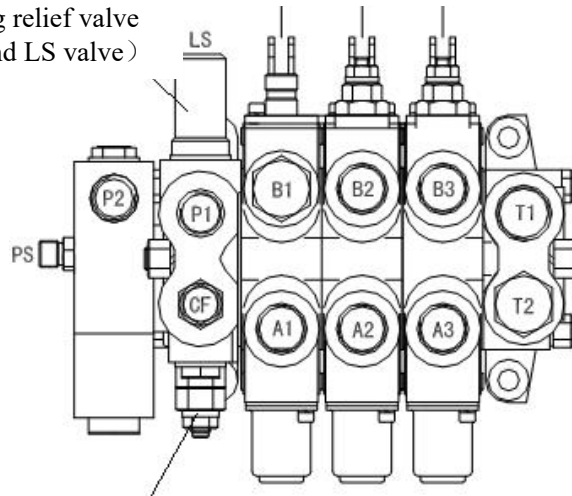


Fig. 7-2 Two through multiple directional control valve structure and oil line schematic diagram

the 1st the 2nd the 3rd

Steering relief valve
(behind LS valve)



Main relief valve

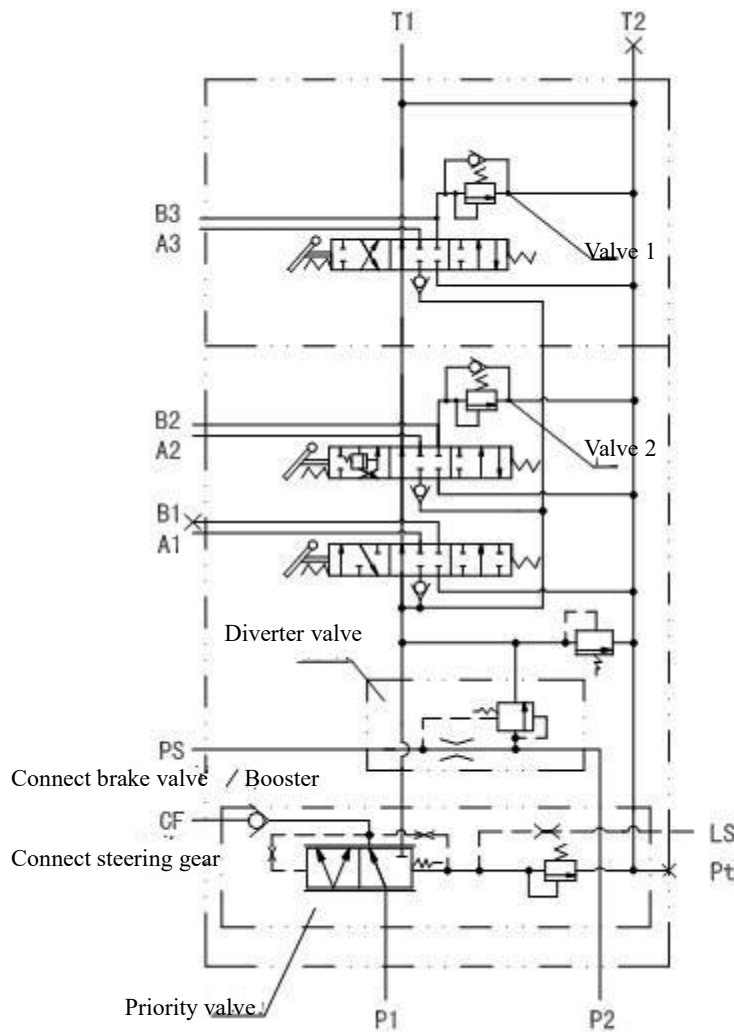


Fig. 7-3 Three-through multiple directional control valve structure and oil line schematic diagram

the 1st the 2nd the 3rd the 4th

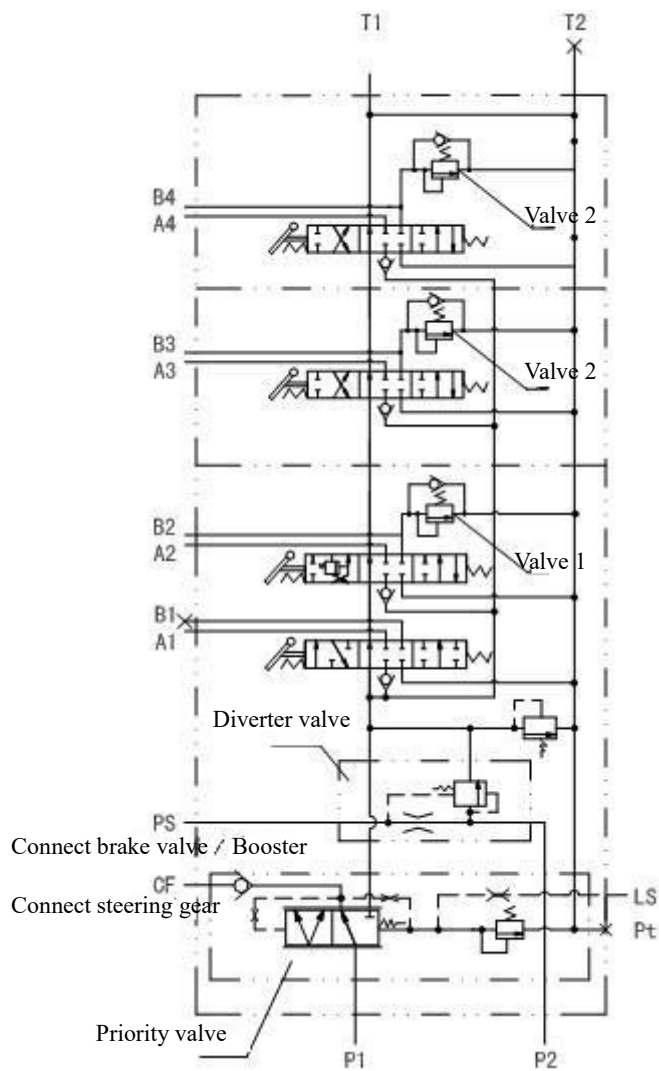
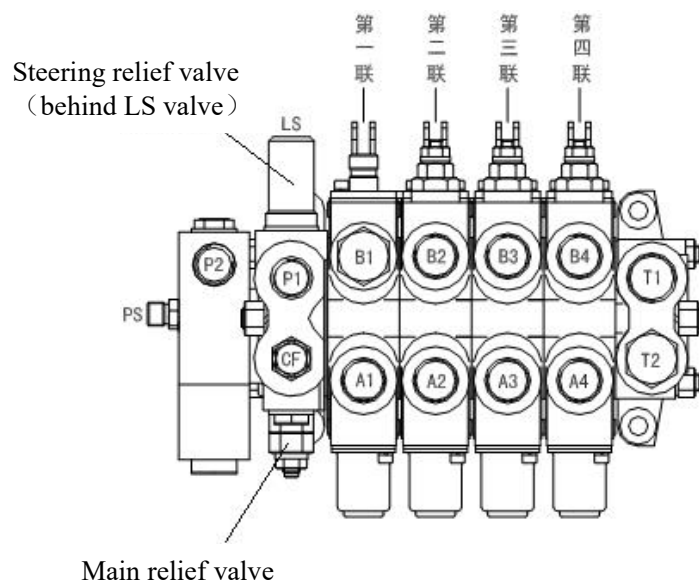


Fig. 7-4 Four-through multiple directional control valve structure and oil line schematic diagram

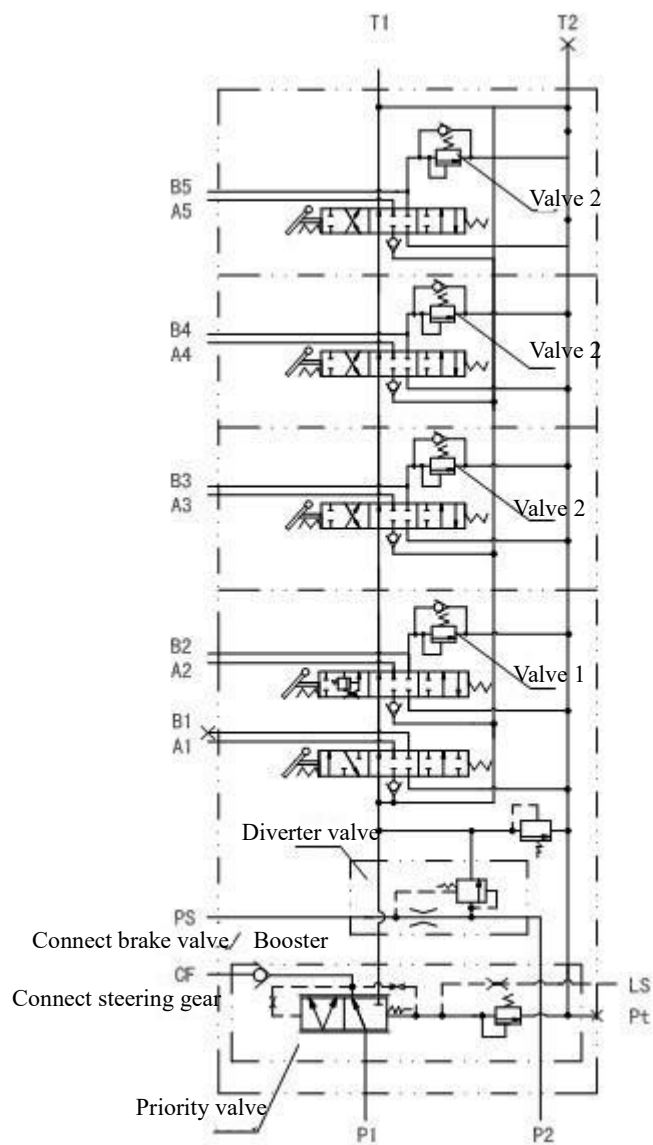
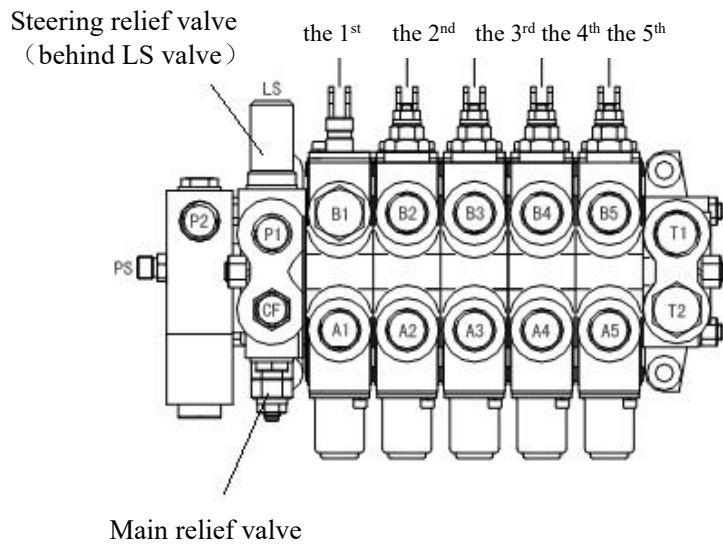


Fig. 7-5 Five-through multiple directional control valve structure and oil line schematic diagram

2.2 Performance parameter

Nominal pressure (MPa)		20
Nominal diameter (mm)		20
Inlet flow (L/min)		180
Allow rate of back pressure (MPa)		1.5
Main relief valve	Setting pressure (MPa)	19±0.25
Steering relief valve	Setting pressure (MPa)	14±0.25
Overload valve pressure adjusted range (MPa)	Valve1	15±0.25
	Valve 2	5±0.25
Priority valve	Control pressure (MPa)	1.1
	Max. inlet pressure (MPa)	25
	Inlet flow (L/min)	140
Forward tilting brake valve	Control pressure (MPa)	≤2
Monostable diverter valve	Shuntvolume (L/min)	7

2.3 Main relief valve pressure adjustment:

Main relief valve pressure has also been adjusted in the factory, so please don't adjust it at will, adjusting way is as follows:

- Unscrew the tube assembly measure hole screw of front pump(truck heading) to multiway valve P1, mount the oil gauge than can measure 20Mpa.
- Step accelerating pedal to the end, lift to the maximum, and measure the pressure when the cylinder travel to the end.
- When the oil pressure is different from the specified value, unscrew overflow valve locking nut, rotate and adjust the screw to the specified value. When in high pressure, rotate to the left; when in low pressure, rotate to the right.
- Relock the locking nut.

⚠ Warn

It is not allowed to adjust pressure without pressure gauge.

2.4 Fault diagnosis and adjustment

Fault	Probable cause	Corrective action
Pressure of relief valve is not steady or cannot be adjusted.	Loose of pressure-adjust screw.	Readjusted and retighten.
	Distorted or damaged pressure-adjust spring.	Replace.
	Worn or blocked relief valve core.	Replace or clean for new assembling.
	Pump malfunction	Examine and repair pump.
Fork tilt forward when control lever is used while engine is off.	Worn or damaged tilt lock valve.	Replace valve core and tilt lock valve as an assembly.
	Broken tilting lock spring.	Replace spring.
	Damaged tilt valve plunger O-ring.	Replace O-ring.
Mast is unstable when tilting	Malfunction tilt relief valve.	Replace tilt relief valve assembly.
Fork carriage descends apparently when the lifting lever is in neutral	Clearance between valve body and valve rod is too large.	Replace valve rod with specified clearance.
	Valve rod is not in centre.	Keep the lever be in the neutral
	Cylinder seal abated.	Examine and repair cylinder.
	Overload valve is worn or blocked by dirt.	Replace or clean taper valve.
Reset failure	Damaged or distorted reposition-spring.	Replace spring.
	Dirt exists between valve body and spool valve.	Clean
	Blocked control device.	Adjust
	Not coaxial parts at reposition	Reinstall, be coaxial
Leakage	Damaged O-ring.	Replace.
	Faulty seal of joint.	Check and retighten. of the relevant part
	Loose seal plate.	Clean seal plate and retighten blots.

	Loose of lock-nut of relief valve and connect-nut between plate and plate.	Tighten.
Heavy steering	Valve element of priority valve sticking	Adjust
	Signal port blockage	Clean

3. Rotary type piping filter

Multiple directional control valve

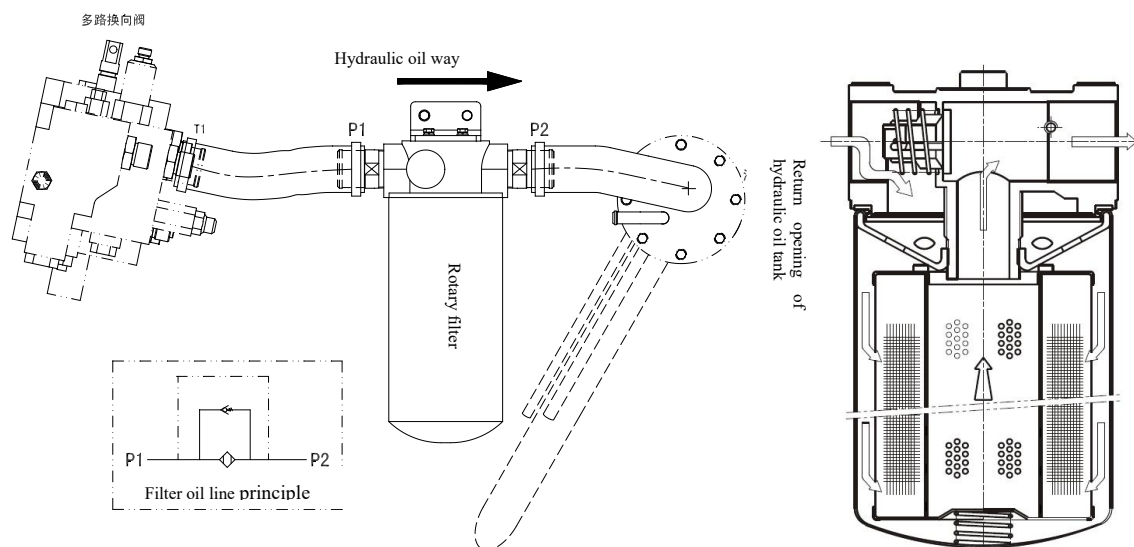


Fig. 7-6 Oil return line of hydraulic filter

3.1 Data

Filter model	SPB-10×10
Filter type model	SPH-10
Filter element model	SPBX-10×10
Max. working pressure	0.7Mpa
Bypass valve opening pressure	0.25Mpa
Burst pressure	2.0Mpa
Max oil return flow	320L/min
Filter precision	10um

3.2 Filter installation

(1) Install with hands, firstly apply oil to the sealing gasket, rotate the thread on the filter head and screw down.

(2) Check if oil leaks.

Notice: Hydraulic filter head must include bypass valve.

3.3 Filter replacement

There installs signal generator on the filter head to check filter use condition, when the

indicator is in the red zone, it means the filter element blockage is severe, bypass valve on the filter head is opened, and the filter does not have filtration, it must unscrew the filter drum and replace new filter element.

Filter dosed not have to wholly replace, replace filter element is enough.

Replace procedure:

(1) During change the filter element, use special spanner to dismantle filter, take out the filter element and replace it.

(2) Apply some lubrication oil along the filter sealing gasket, and then install the filter, after contact the engine body, screw two thirds circles.

4. One-way governor valve

One-way governor valve is installed in the truck up and down return circuit, and lies in the front of the lifting cylinder oil inlet. Actually it is a one-way throttle valve, and its structure refers to fig. 7-7

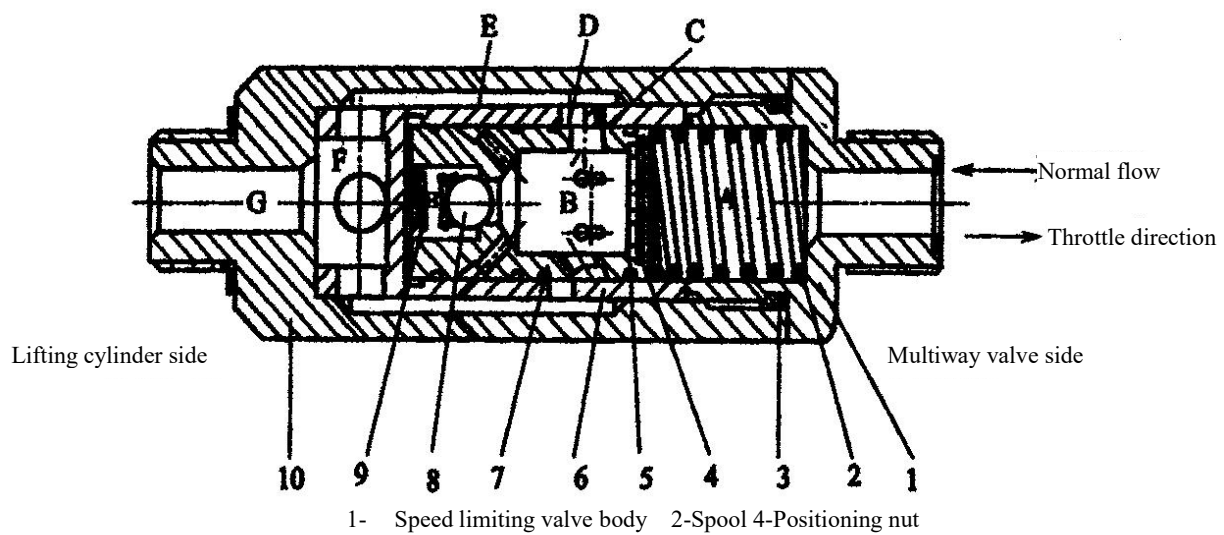


Fig. 7-7 One-way governor valve

When the valve fully open in lifting position, all oil flow into lit; when the valve in descending position, the valve oil hole C,D hides some parts and forms throttling action, oil flow reduces correspondingly, and slow the fork descending speed, that the goods descending speed will not be too fast.

5. Lifting cylinder

Lifting cylinder is single-acting piston structure, composed of cylinder cover, piston rod, cylinder body and piston. Notice to use:

- 1) Keep piston rod from being damaged, and keep good seal ability of the seal ring;
- 2) During daily usage, if there floats leakage oil on the piston rod surface, you should check if there is galling phenomenon on the piston rod surface, and replace o-ring and piston.

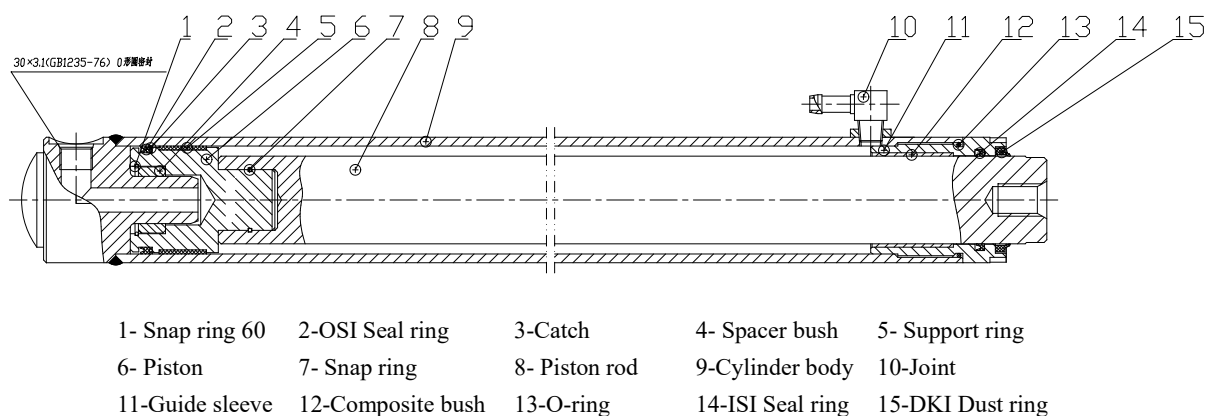


Fig. 7-8 Lifting cylinder (Left)

6. Tilting cylinder

Tilting cylinder is single-acting piston structure. When forward and backward tilting angle do not meet the requirement or the action of two cylinders pistons are out of step, you can adjust the nut on the piston to meet the requirement, and then screw down the nut. Notice is the same to the lifting cylinder.

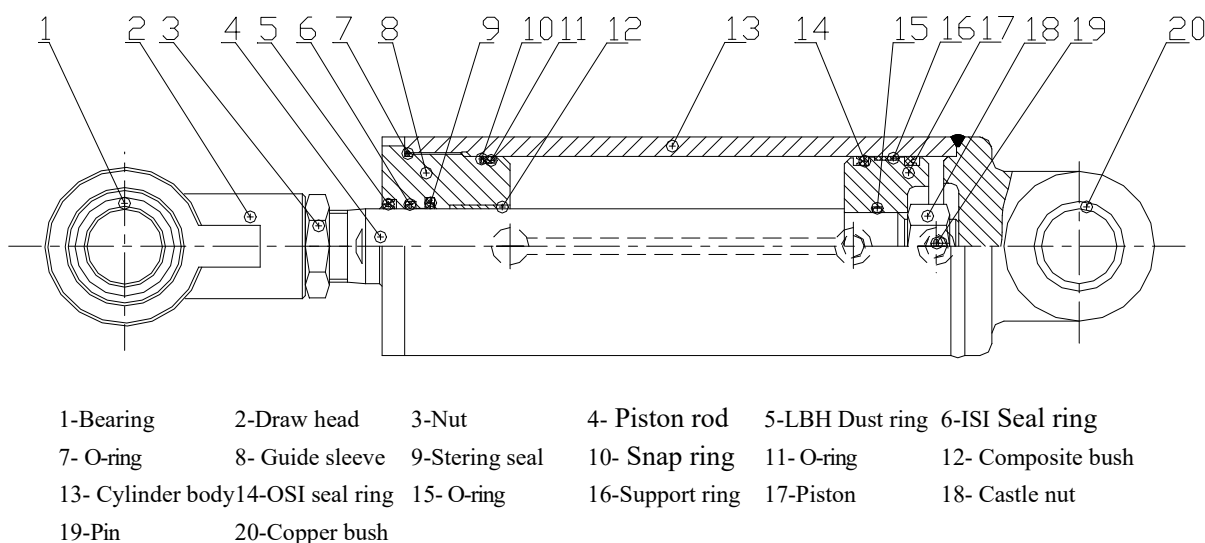


Fig. 7-9 Tilting cylinder

7. Air exhaust in hydraulic system

(1) Add the recommended hydraulic oil to scale specified oil level, lift the lifting cylinder when adding oil.;

(2) Make the truck load reach 1/10~1/8 of rated load, unscrew the bleed screw on the lifting cylinder, lift or fall the fork carriage several times until there is no bubble at the bleed screw, and then screw down the bleed screw;

(3) Tilt the tilting cylinder forward or backward to the maximum for several times, which can exhaust air in it.

8. Hydraulic system fault diagnosis and corrections

Fault	Probable cause	Corrective action
Unable to lift or tilt with no load	Insufficient oil supply	Add oil to oil marking
	Insufficient gear pump displacement or large backlash	Replace oil pump or spare parts
	Multiple directional control valve blockage	Dredge oil line
Lifting cylinder plunger move slow, interruption or impact to lifting frame.	Insufficient oil in the system	Add oil to the oil tank
	Oil leak and oil pipe fracture caused by bad seal or loose oil pipe connecting.	Add seal, screw down joint and replace oil pipe.
	Insufficient oil supply caused by oil pump malfunction	Repair or replace oil pump
	Incorrect relief valve adjustment or damage	Adjust or repair relief valve
	Hydraulic piping filter blockage	Replace hydraulic piping filter element
	Air in the hydraulic system	Exhaust air
Over fast fork carriage descending speed	One-way throttle valve block at opening place or reversely installed.	Disassemble one-way throttle valve and eliminate fault
Over large lifting cylinder gliding	Too much reversing valve rod discharge	Replace valve rod
Too large tilting cylinder angle	Tilting cylinder piston seal ring invalid, inner leakage	Replace real ring
Plunger rod or piston rod with oil	Oil seal damage	Replace oil seal
Noise in hydraulic system or unstable oil cylinder move	Oil absorption fold or blockage	Dredge oil piping
Oil pipe cracking	Filter, relief valve dirty, blockage, increase the oil pressure and make oil piping cracking.	Replace filter element, clean relief valve
Tilting cylinder out of sync		Adjust tilting cylinder piston rod, make end thread cross the ear observation port, make connection firm and adjust piston rod to make two cylinders work in step.
	Air in the system	Exhaust from air bleed hole

	Gear pump bearing wear or grind	Replace bearing
	Gear pump side plate wear	Change side plate R

9. Hydraulic system schematic diagram

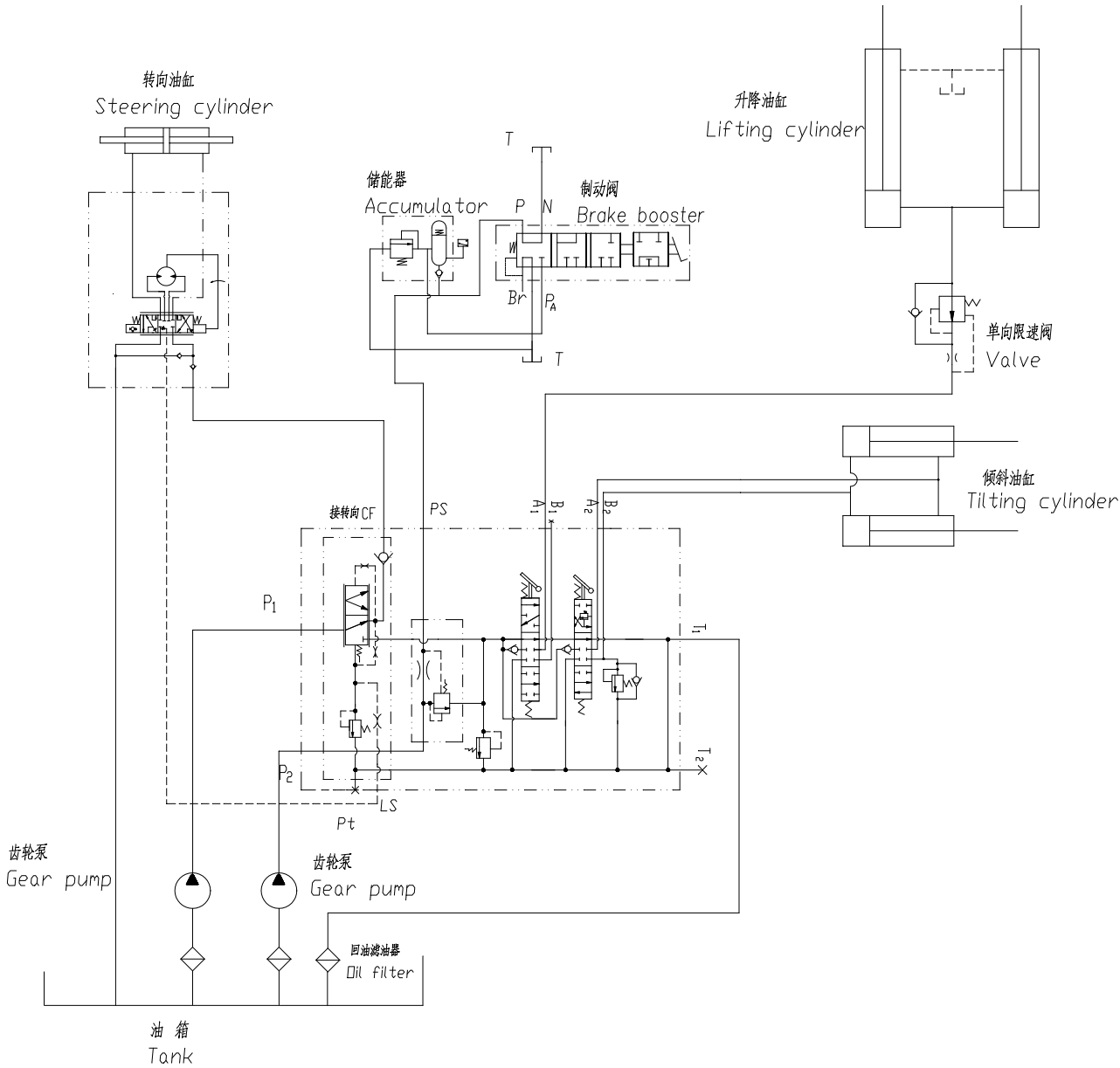
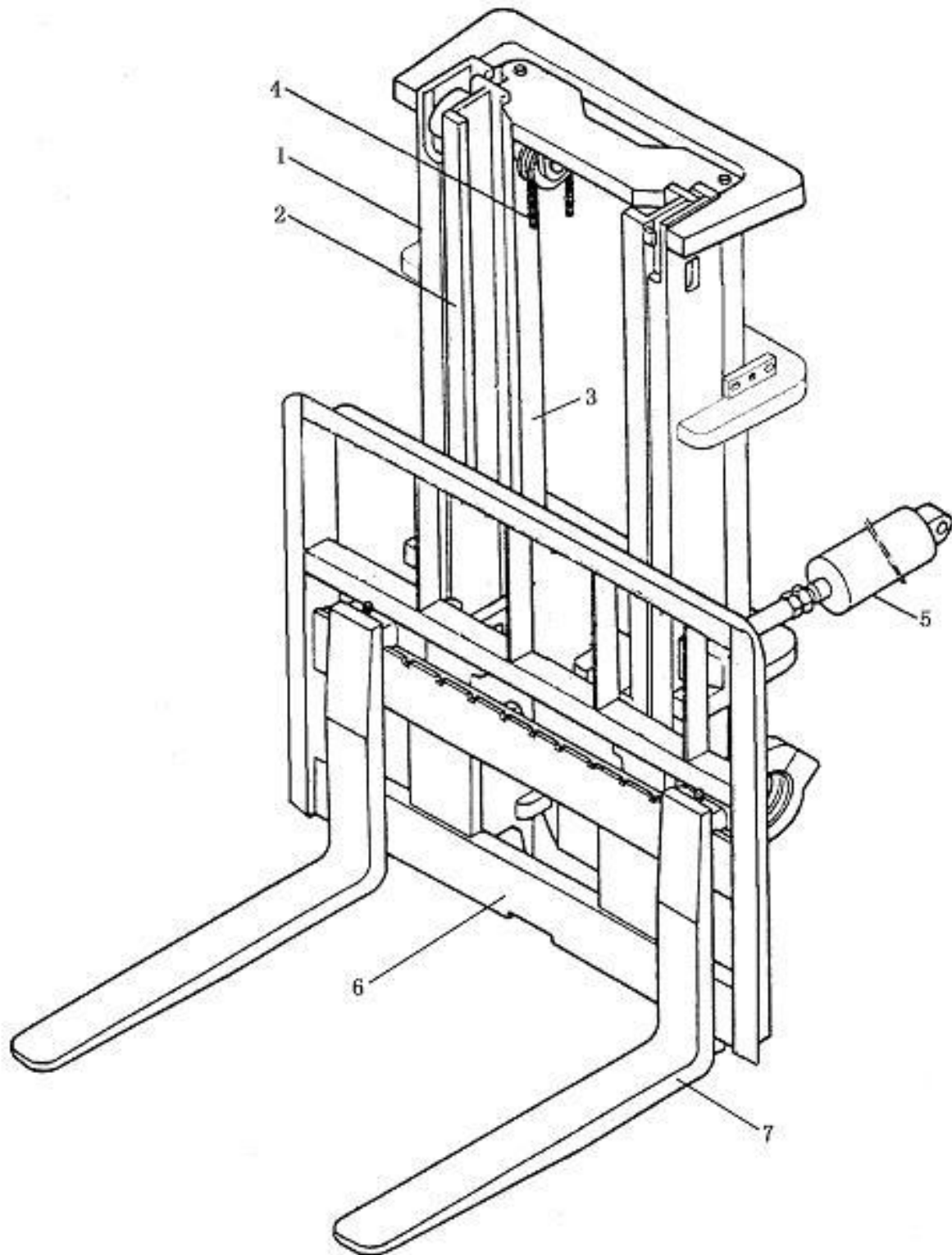


Fig. 7-10 Fig. Hydraulic system schematic diagram

VIII. Lifting system



1. Outer mast 2. Inner mast 3. Lift cylinder 4. Chain 5. Tilt cylinder 6. Fork carriage 7. Fork

Fig. 8-1 Standard lifting assembly

1. Assemble debugging data

Debugging data

Duplex mast and triplex mast

Mast type		Standard type and lifting height of 2.5~4M	Lifting height > 4~5 M	Lifting height > 5~6 M
Mast angle	tilting Forward	6°	6°	3°
	Backward	12°	6°	6°
Fork carriage roller		Adopt longitudinal roller and side roller.		

Inspection and adjustment

Check Place	Assembly clearance (mm)	Repair clearance (mm) (Without
Mast to lift roller	0.3~1.25	0.4~1.4
Mast to bearing guide plate	0.2~1	0.3~1.2
Inner mast to fork carriage	0.3~1.25	0.4~1.4
Lift chain deflection	25~30 mm	

Tightening torque

Place	Unit: N.m
Lift chain lock nut	933-1244 (M27×2)
Tilt cylinder lock nut	245~314 (M20×1.5)
Lift cylinder bolt	638-850 (M24)
Lift cylinder fixing bolt(U type)	45-58(M10)

2. Fault diagnosis and corrections

Condition	Probable cause	Corrective action
Fork carriage or mast tilt automatically	Tilt cylinder and ring abraded excessively	Replace piston ring tilt cylinder.
	The hydraulic control valve spring is inoperative.	Replace it.
The fork arms carrier moves up and down sluggishly.	Caused by piston jamming or piston rod bent.	Replace the faulty parts.
	Too much dirt is accumulated in the cylinder.	Clean
Forks are lifted or lowered unsmooth.	Carriage bracket assembly out of adjustment.	Adjust clearance with thrust metal and carriage side roller.
	Insufficient clearance between rollers and mast channel.	Adjust roller clearance
	Biting foreign materials between moving part.	Remove foreign materials.
	Insufficient lubrication.	Apply grease on contact surfaces of sliding parts. (butter)
	Inner mast deflection or fork carriage bent	Repair or replace.
Forks are lifted unevenly	Lift chains out of adjustable.	Adjust lift chains.
Lift roller does not rotate	Grease stiffened or dirt accumulated on lift roller	Clean and lubricate lift rollers.
	Improperly adjusted lift roller.	Adjust.
Excessive mast noise	Insufficient lubrication.	Lubricate.
	Improperly adjusted lift roller, after extending mast, descend to bump with mast channel	Adjust roller, side roller adjusting shim
Insufficient lift power or no lift movement.	Excessive wear occurs between the oil pump body and gears, causing too much clearance.	Replace the worn parts or the oil pump.
	The lifting jack piston seal ring has worn, resulting in excessive inner leaks.	Replace Y-ring.
	Springs of the multiple control valves and its relief valve are inoperative.	Replace new spring.
	Excessive wear occurs of the hydraulic control valve, resulting in excessive oil leaks.	Replace.
	Oil leaks occur between the hydraulic control valve sections.	Dismantle for regrinding the joint surfaces and reassemble the valve.
	Leakage occurs in the hydraulic pipe.	Tighten the joint nuts and inspect the seal for damage.
	The hydraulic oil temperature is too high. Oil viscosity is too low and the rate is insufficient.	Change the wrong hydraulic oil or stop operation for reducing the oil, find out the reasons for high oil temperature
	The load carried is beyond the designed capacity.	Lift according to requirement.

3. Summarize

3.1 Duplex wide view mast

Duplex mast (Fig.8-1) is composed of outer mast which can't lift and inner mast which can lift. Bottom of lifting cylinder is fixed down the cross beam of outer mast, oriented with pin. Piston rod end is joined with upper cross beam of inner mast; cylinder body is fixed on outer mast fixation board with bolt, and the chain wheel frame on the piston end and connect with leader to realize free lifting. Rollers are laid out at the back of outer mast to realize high visibility.

Fork arm is hung on fork carriage, where installs the tilting cylinder to realize tilting forward and backward, which equips with roller and side roller. The bottom of inner mast also equips with roller and side roller.

Pressure oil from control valve, entering into lifting cylinder through governor valve, force piston and piston rod to rise, thereby force inner mast to rise. At the same time one end of lifting chain on inner mast is fixed on outer mast, the other is joined with fork carriage. Fork carriage and fork are rising with inner mast rising to realize goods lifting.

Treat forklift with 3 m lifting height as basic type. Other lifting height(2.5Mt to 6M) is for special order.

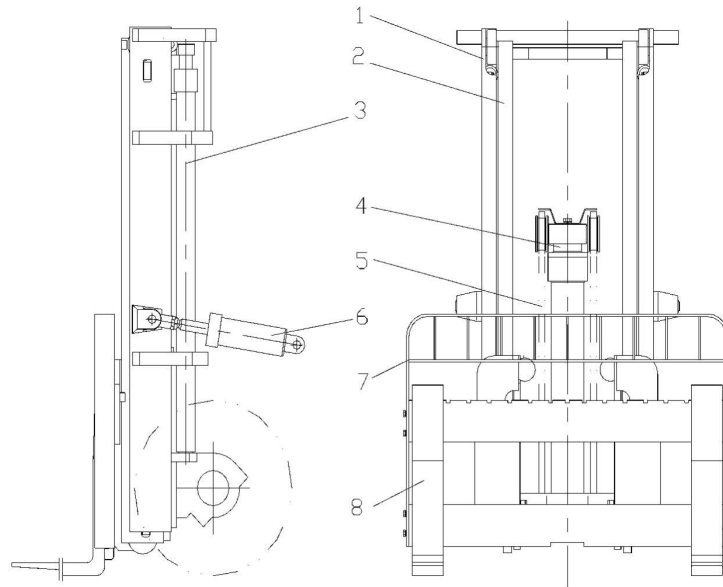
3.2 Duplex full free lift mast (Including railway container forklift mast)

Duplex full free lift mast (Fig8-2) is also composed of inner mast, outer mast, fork arm carrier, and etc, is also belong to high visibility mast. It is different from common standard type mast that two postpose long lifting cylinders are both pole stopper type cylinder. One piston rod is hollow; hole of piston rod is bypassed for hydraulic pressure oil flowing into free lifting jack. End of piston rod in two long lifting jacks is joined with upper branch of inner mast. Besides, short lifting cylinder which is installed middle of inner mast is named as free lifting cylinder. Free lifting cylinder is also pole stopper type cylinder.

As inner mast do not rise when free lifting cylinder rising or falling, and forks can rise in free lifting range.

When lowest height of mast $\leq 22200\text{mm}$, the truck can work inside the container. The truck also can equip with side-shift device. Side shift cylinder of container fork lift truck mast can be side shifting only when goods don't placed appropriate position. In another condition, side cylinder should set center.

Free lifting cylinder equips with chain. Two chains with the same length are in both left and right forklifts.

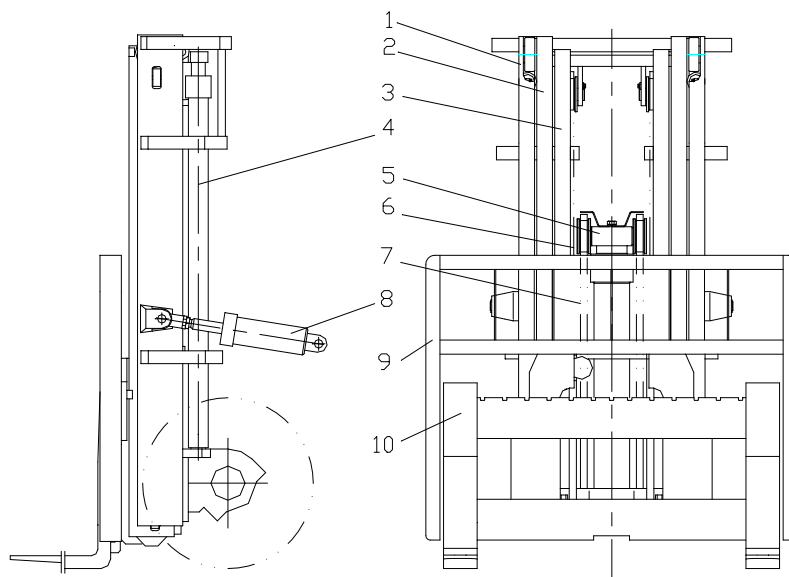


1-Outer mast 2-Inner mast 3-Long lifting cylinder 4-Free lifting cylinder 5-Chain 6-Tilting cylinder
7-Load-backrest 8-Forks

Fig.8-2 Duplex full free lift mast

3.3 Triple full free lift mast

Triple full free lift mast (refer to fig. 8-3) is composed of outer mast, middle mast and inner mast, middle mast and inner mast can flex. There are different specifications in this series of height, 4m, 4.3m, 4.5m, 4.8m, 5m, 5.5m, 6m, 6.5m, 7m, etc. It is different from duplex full free mast that mostly it includes middle mast, and its two postpone long lifting cylinders are both piston type cylinder, and its oil system rather complex than oil system of double full free mast. Its middle is also free lifting cylinder and the structure is similar to the duplex full free lifting mast.



1- Outer mast 2-Middle mast 3-Inner mast 4-Long lifting cylinder 5- Free lifting cylinder
6-Chain 7- Chain 8- Tilting cylinder 9-Load-backrest 10-Fork

Fig. 8-3 Triple full free lift mast

4. Mast dismantle and install adjustment

⚠ Warning

Be careful when removing and installing the forks, carriage and mast as they are heavy.

4.1 Dismantle forks and mast assembly Fork

(1) Dismantle adjusting cylinder and connecting tube;

(2) Dismantle fork shaft stop, pull out fork shaft and dismantle forks.

⚠ Warning

- Be careful! Hands and feet should not approach between forks and fork carriage or the bottom of forks.
- Do not dismantle goods from top forks! To avoid crush from fork falling.

Fork carriage

(1) Attach wire ropes to carriage bracket assembly and lift carriage bracket assembly up with a lifting device.

(2) Remove chain attaching nuts, and detach chains from carriage bracket assembly.

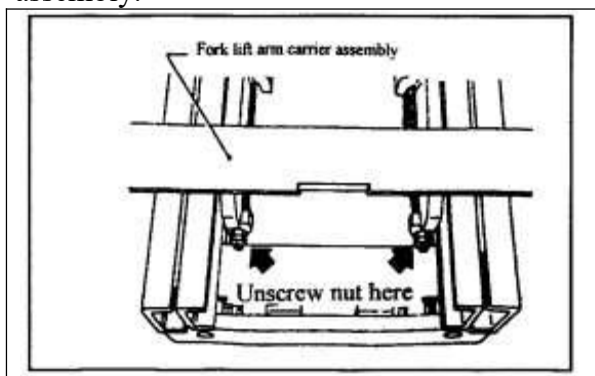


Fig.8-4

(3) Remove carriage bracket assembly from inner mast.

(4) Detach high pressure hose, lift hose and low pressure hose.

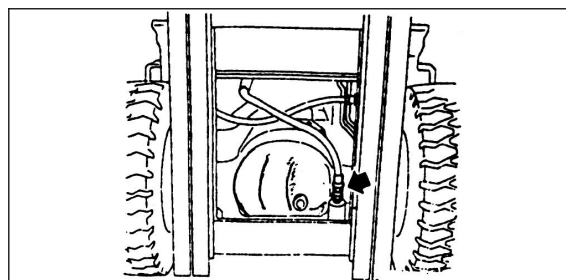


Fig.8-5

(5) Support mast assembly with wire ropes.

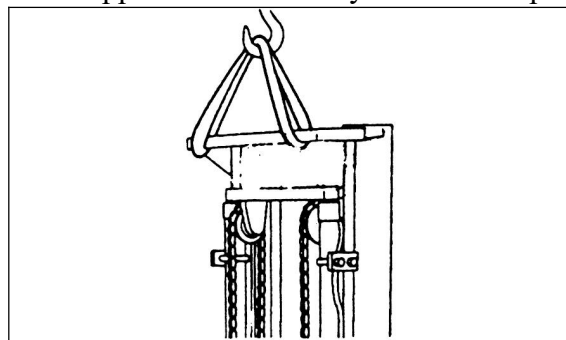


Fig.8-6

(6) Pull out tilt cylinder pivot pin.

(7) Remove mast support caps.

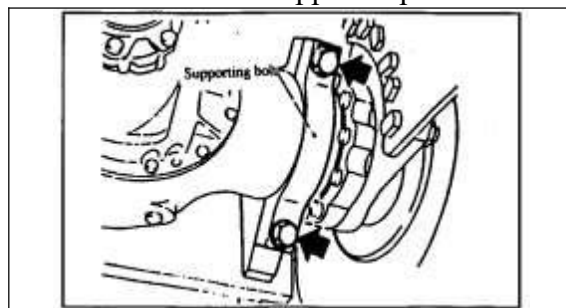


Fig.8-7

(8) Remove mast assembly.

To install mast assembly, reverse order of removal.

4.2 Disassembly

⚠ Warning

Be careful when disassembling the masts as they are heavy.

Remove lifting Cylinder

(1) Place mast flat on ground. Remove lifting cylinder attaching bolts, and U-type screw tighten screw if it is high lifted mast.

(2) Slide inner mast, then remove lifting cylinders.

Remove roller

(1) Slide inner mast out until rollers are exposed and remove little rollers and main roller.

(2) Unclench rollers carefully if no bearing puller or rollers would be smashed.(Up and down, left and right, knock symmetrically.)

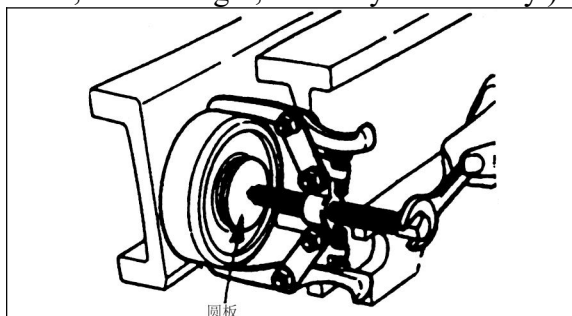


Fig.8-8

Remove inner mast

Attach wire rope to middle of inner mast and slide it out with a lifting device.

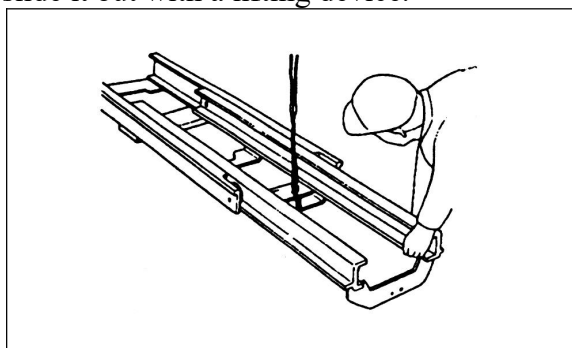


Fig.8-9

Inspection

- (1) Check lift rollers, roller shafts, and associated parts for wear or damage.
- (2) Replace damaged parts as required.

4.3 Assembly and adjustment

⚠ Warning

Be careful when assembling the masts as they are heavy.

Lift roller

Slide inner mast into outer mast and securely attach lift rollers.

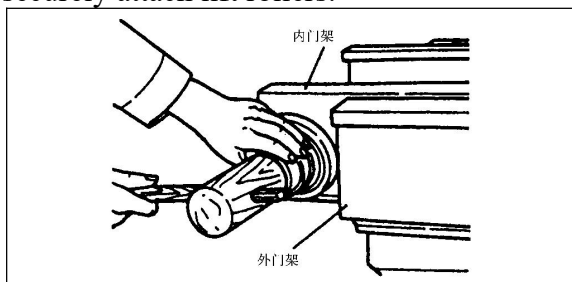


Fig.8-10

Lift roller-to-mast clearance adjustment

- (1) Adjustable left and right “A” with shims, adjust to 0.5mm~1.2mm.

(2) It is suitable that clearance of roller and outer mast is about 0.8mm -1mm. Clearance can't adjustable. Replace it if roller wears too much.

(3) Apply lubrication (butter) to interface of inner mast and outer mast, interface of roller and mast. To prevent sand from entering, it is decided whether to apply lubrication or not in the area where sand blown by wind heavily.

Clearance of back up metal and mast steel

Adjust clearance “B” to 0.2mm ~ 1mm with shims, which may not use. Thickness of shim is 0.2mm.

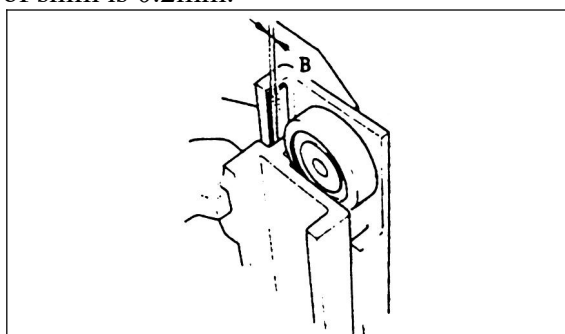


Fig.8-11

Apply a coat of grease to back-up metals. Install mast and lifting cylinder on forklift truck. Connect circle tube and high-pressure tube.

4.4 Left and right cylinder height adjustment.

(1) Install left and right lifting cylinder on mast, pin must be installed into orientation hole of outer mast lower cross beam.

(2) Install upper of piston rod on inner mast. Inner mast lay evenly in the direction of left, right, upper and lower. If it is not even, please adjust by putting washer between hole of cylinder support and upper end of piston rod.

(3) Installs U-bolt onto cylinder, hand-tighten nuts and lock it with two tighten nuts. Screws down tighten bolt and nuts to avoiding losing.

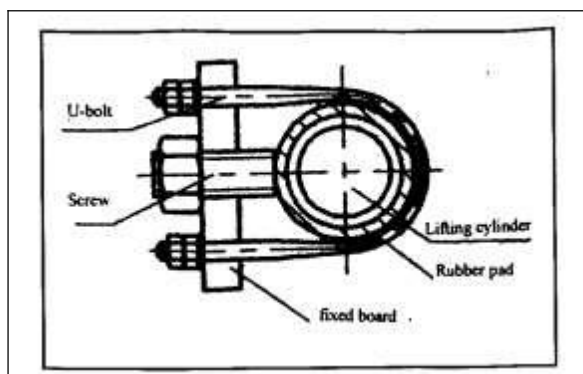


Fig.8-12

4.5 Lifting chain adjustment

Installs fork arm carrier on inner mast, and install lifting chain, then install two nuts on end of every side. With mast set straight up, lower carriage completely. Temporarily adjust clearance of carriage: 160mm.

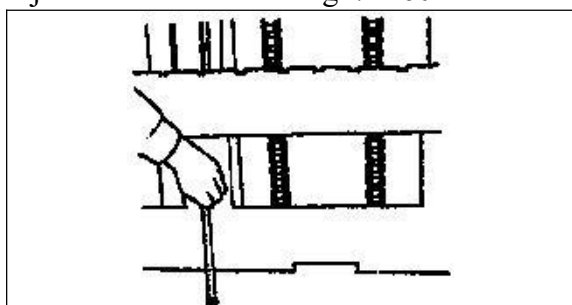


Fig. 8-13

To adjust tension of lift chain, lower lifting cylinder until fork is on the ground, and adjust chain adjusting nut (three every side) so that dimension C will be as listed below when the middle portion of chain is pressed by a finger.

Dimension C: 25 mm ~30 mm

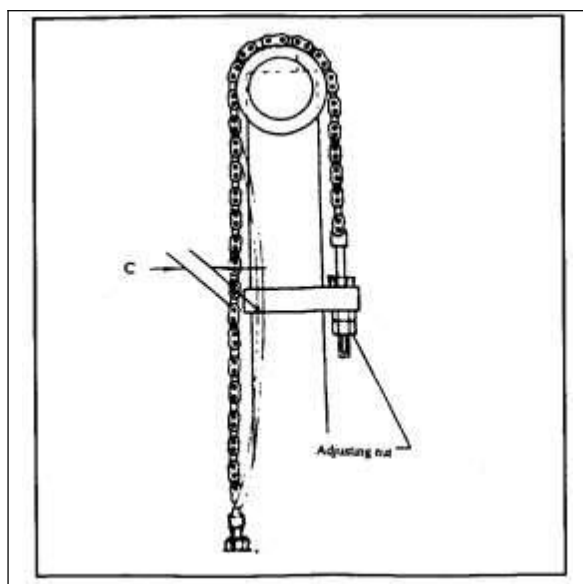


Fig. 8-14

5. Disassembly and installation of lifting cylinder

⚠ Warning

Keep body away from equipment

(1) Turn down the engine, then make lifting cylinder falling into lowest condition that lower of piston rod is touched bottom of cylinder body so as to return oil flowing back tank completely.

(2) Disconnect lifting cylinder oil return pipe, dismantle bottom end governor valve oil inlet high pressure hose and two cylinder connected high pressure hose.

(3) Remove U-bolt of outer mast fixation board and tighten skew of other side.

(4) Unscrew mounting screw on left and right cylinder piston rods and mast cylinder.

(5) Remove chain of outer mast and the bottom cylinder bolt.

(6) Attach wire rope to inner mast and remove left and right lifting cylinder with a lifting device.

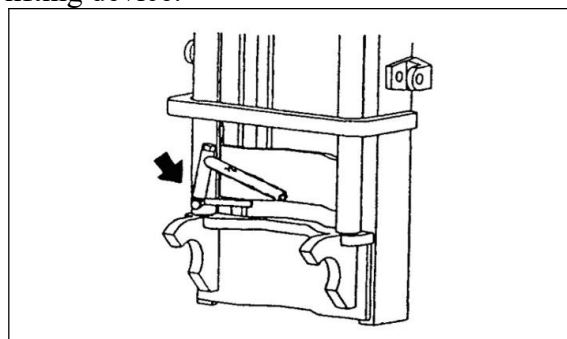


Fig. 8-15

5.1 Disassembly

Removes tighten screw and nylon stopper, then remove cylinder head.

(1) Remove dust gasket ring.

(2) Remove sealing ring with screwdriver.

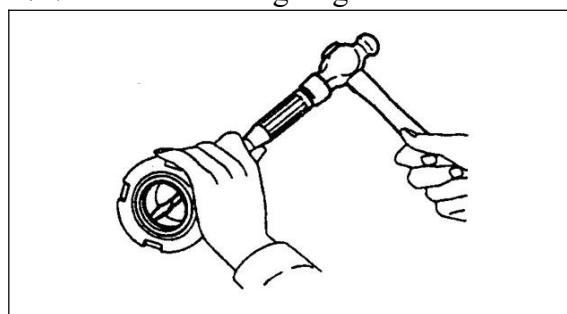


Fig. 8-16

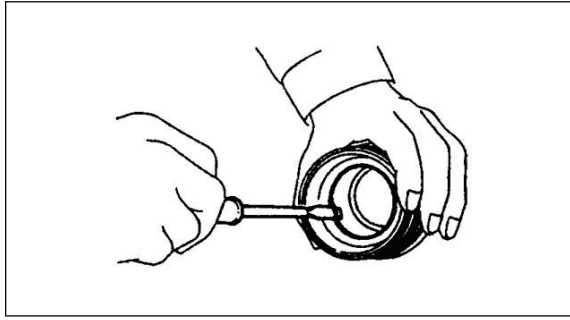


Fig. 8-17

Caution:

Please not use dust gasket ring removed, O-ring, Y-ring again, must replace.

(3) Draw out piston rod, remove sealing ring on end of piston.

5.2 Assemble and replace quick-wear part

(1) Cleanup parts with clean oil before installation.

(2) Then cleanup guiding bush and piston with hydraulic pressure oil the same as oil box trademark.

(3) Dust or dunghill doesn't drop into lifting jack.

(4) The order of installation is reverse the order of disassembly.

(5) Install sealing ring on piston.

(6) Install piston rod assembly into clean cylinder body.(including piston rod, piston, supporting ring and seal ring)

Caution:

If there is burr in the cylinder barrel, you must clean smooth, place into the middle carefully, to avoid Y-seal ring scrape.

(7) Install replacing dust gasket ring and sealing ring in guiding bush and cylinder head.

Notice: Apply hydraulic pressure grease which trademark is the same as tank on guide sleeve installed gasket ring

(8) Rip cylinder head into piston rod, screw down cylinder body.

6.Disassembly and installation of tilting cylinder

⚠ Warning

·Attach wire rope to outer mast, avoiding mast fall down after removing tilting cylinder.

·Keep body away from equipment, no standing under the fork arm carrier.

6.1Disassembly

(1) Lay down the fork carriage completely.

(2) Dismantle oil pipe at the entrance of tilting cylinder.

(3) Remove bolt on the left and right bracket of outer mast, moreover pull axis out.

(4) Remove bolt on the bracket of chassis, and pull pin out, then move tilting cylinder.

The order of installation is reverse the order of disassembly.

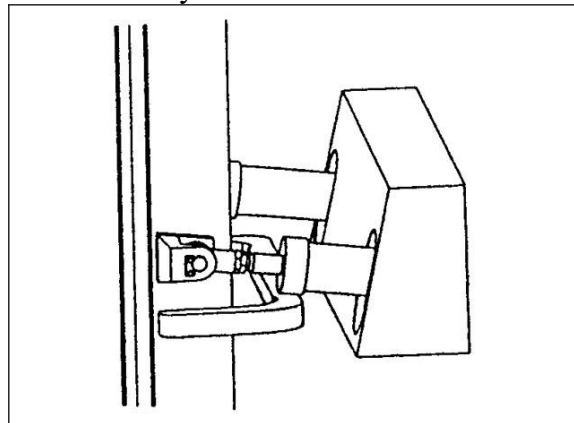


Fig. 8-18

6.2 Disassembly spare parts

(1) Squeeze tilting cylinder with pliers, then pull piston rod come-and-go as opening of inlet and outlet on the tilting cylinder, so remaining oil is discharged tilting cylinder.

(2) Screw earring 21.

(3) Removes tighten screw and nylon stopper.

(4) Remove cylinder head 14 and guiding bush 12.

(5) Draw out piston rod assembly 25 (see Fig.).

(6) Remove all dust gasket rings, O-ring and sealing ring.

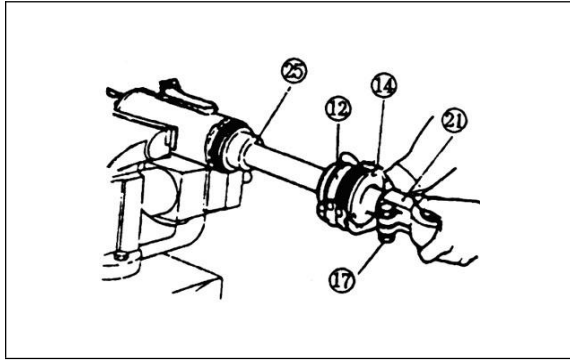


Fig. 8-19

(7) Remove dust gasket ring in the cylinder head. Means is the same as discharging of dust gasket ring in the cylinder head of lifting cylinder (see disassembly and installation of lifting cylinder).

(8) Remove O-ring outside in the guiding bush..



Fig. 8-20

(9) Remove O-ring and sealing ring in the inner hole of guiding bush (see Fig. disassembly and installation of lifting cylinder).

Notice:

No using dust gasket ring and sealing ring removed.

6.3 Assemble after real ring changing

Assemble order is opposite to dismantle order, but you need to pay attention to the following item:

(1) Lubricate each spare parts with clean hydraulic oil.

(2) Prevent dust and oil dirt fall into cylinder.

(3) Prevent burr in the cylinder barrel mouth and entrance.

(4) Centering carefully, push the piston rod to cylinder barrel, especially avoid scraping

the seal ring.

(5) Before placing guild sleeve, apply hydraulic oil the same brand to work oil between O-ring and seal ring.

(6) Do not scrape O-ring of the outer ring.

(7) Remember install nylon stopper and tighten screw after screw cylinder head.

7. Noticing proceeding of debugging

(1) Adjust Forward and Backward of the Mast:

Place fork lift truck on the level ground, operate control lever to realize that mast inclined forward or backward extremely. As assembly debugging data required, adjust combined screw thread length till according with data of Backward. Then lock earring ring close.

(2) Adjust installation position of left and right lifting jack again

Adjust washer in the middle of piston rod and inner mast bracket if one lifting cylinder is not synchronization with the others when rising or falling, and if one lifting cylinder is different height from the others.

Loose two nuts on the U-bolt. Mast is not rise and lower until relative position of U-bolt and lifting jack is suitable. Then screw down nuts and tightening screw on the U-bolt. Thus lifting jack can be used longer and wear of piston rod can be reduced.

Please see foregoing table if you want know tightening force of bolt or screw. Please refer to common bolt tightening torque prescribed in our company if you want know other tightening force of bolt or screw. (refer to OPERATION AND MAINTAIN MANUAL) .

IX. Electrical system

Warn:

Before starting to check any fault of electrical system, take off jewelry ornaments to guard against a short circuit, and disconnect the start switch and dismantle positive cable of storage battery.

Note

To differ from different colorful wire, color is denoted by one or two letter. Identify carefully that the cable of accumulator has been disconnected before repairing the electrical system.

Cable color:

Cable color showed by 1 or 2 letters

B: black, N: brown, G: green,

U: blue, O: orange, R: red,

W: white, Y: yellow, S: gray, P: purple

Main wiring harness use homochromatic wire. Other wire use double color.:

B/W: black and white

G/Y: green and yellow

INSPECT

Inspect all electrical circuit according wiring diagram. You should make short circuit or open circuit test with the test lamp or multimeter. Before inspection ,ensure that:

1. Each electrical component or cable is securely fastened its terminal.
2. Each terminal is firmly in place and free from rust and dirt.
3. No cable covering shows any evidence of cracks, deterioration or other damage.
4. Each terminal keeps a safety distance with adjacent metal parts.
5. Every cable is fastened to its proper connector or terminal.
6. The wiring is kept away from any adjacent parts with sharp edges.
7. The wiring disconnect to each rotating or moving parts.
8. The length of the wire linking the fixed part and unfixed part should be enough to shake.
9. The wiring keeps a safety distance with the high temperature thing such as the vent-pipe.

Electrical plate assembly

Electrical plate assembly is under the truck engine cover and near the left battery. It is mainly composed of electrical plate, control box assembly, starter relay, pre-heat relay, fault detection switch, fault detection up and down select switch etc.

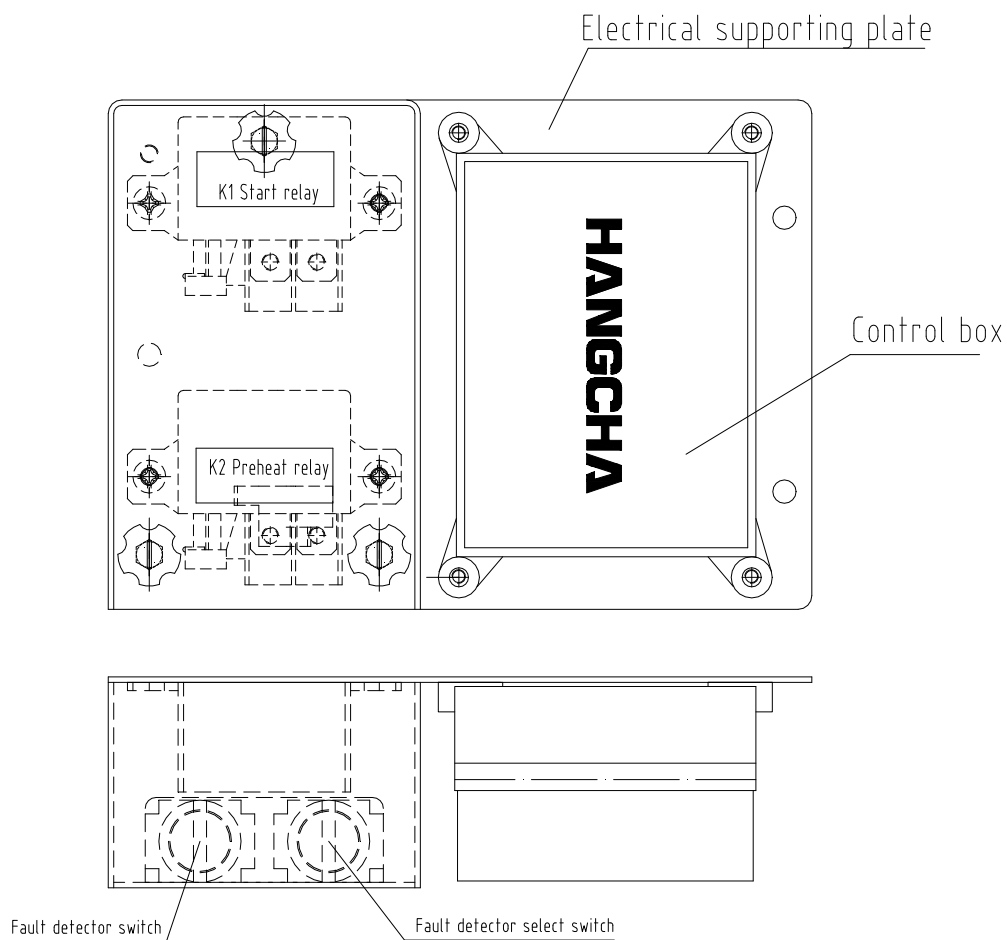
Component dismantle:

- (1) Disconnect emergency disconnect switch and turn to OFF;
- (2) Press down lock catch on the control box cover, and then open the cover or unscrew fixed electrical cover plate screw, take down the electrical cover plate;
- (3) Pull out or dismantle fuse or relay

Explanation: If the fuse or relay is damaged, replace a new one, refer to the following figure;

- ① If a fuse is damaged, please be sure to eliminate cause of problem before replace a new one;
- ② Never use fuse higher than specified rating.

CPCD120-XXW48 electrical panels



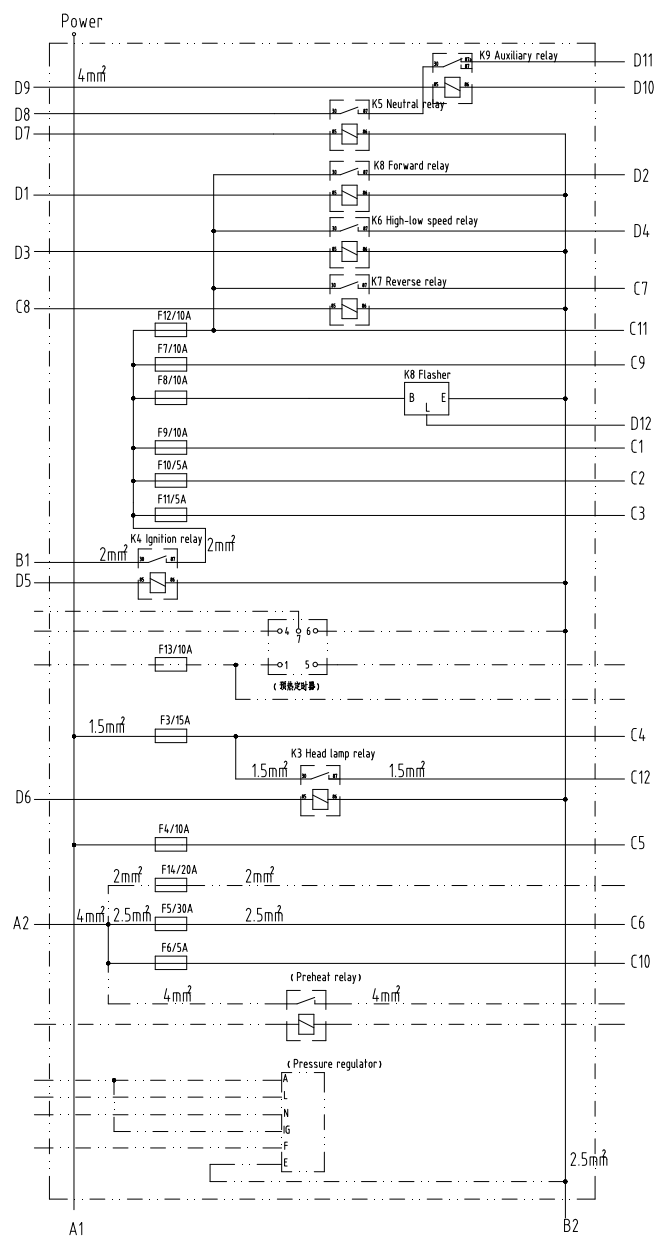
Fuse identification

Location	Capacity	Component
F3	15 A	Headlight, width lamp
F4	10 A	Horn
F5	30 A	Engine ECU4 sheath power
F6	5 A	Engine bus power
F7	10 A	Brake lamp, alarm lamp power
F8	10 A	Steering lights
F9	10 A	Instrument and indicator lamp power
F10	5 A	Switch power
F11	5 A	Pre-heat start indicator light, fault indicator light, major failure indicator light power
F12	15 A	Solenoid valve, reversing light, back-up buzzer, parking brake indicator
F13	10 A	Backup
F14	20A	Backup

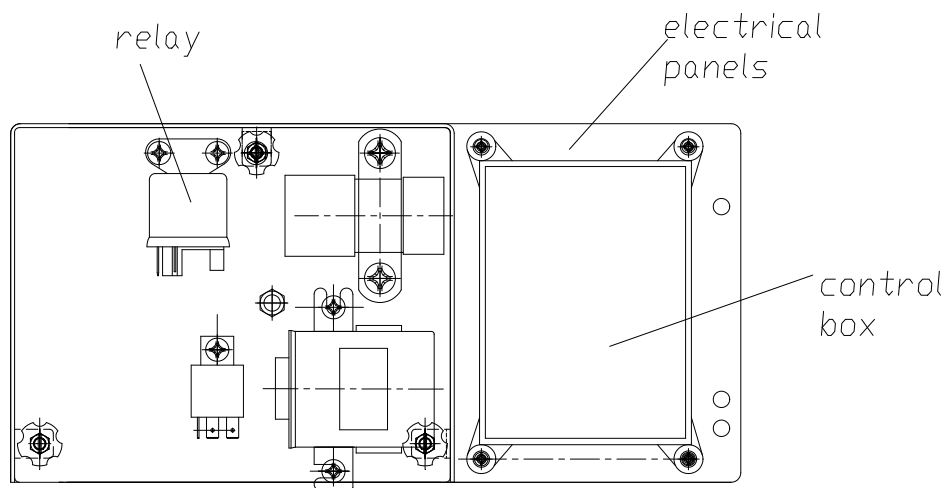
Control box schematic diagram

D12	× 0.85White-green	Flasher L pin
D11	× 0.85White-yellow	Auxiliary relay 87 pin
D10	× 0.85White-black	Auxiliary relay 86 pin
D9	× 0.85White-grew	Auxiliary relay 85 pin
D8	× 0.85Yellow	Neutral relay 30 pin
D7	× 0.85Blue	Neutral relay 85 pin
D6	× 0.85Orange	Headlamp relay 85 pin
D5	× 0.85White-red	Ignition relay 85 pin
D4	× 0.85Brown	High-low speed relay 87 pin
D3	× 0.85Green	High-low speed relay 85 pin
D2	× 0.85Grown-white	Forward relay 87 pin
D1	× 0.85Green-white	Forward relay 85 pin
C12	× 1.5Pink	Headlamp relay 87 pin
C11	× 0.85Blue-orange	Fuse F12
C10	× 0.85Yellow-brown	Fuse F6
C9	× 0.85White-yellow	Fuse F7
C8	× 0.85White	Back relay 85 pin
C7	× 0.85Purple	Back relay 87 pin
C6	× 2.5Red	Fuse F5
C5	× 0.85Blue-red	Fuse F4
C4	× 0.85White-black	Fuse F3
C3	× 0.85Red-purple	Fuse F11
C2	× 0.85Green-white	Fuse F10
C1	× 0.85Red-blue	Fuse F9
B2	× 2.5Black	Ground
B1	× 2.5Red	ACC Power
A2	× 4.0Blue	Pre-heat relay power
A1	× 4.0Red	Control box power
No.	Wire spec.	Function definition

Control box plug pin function list

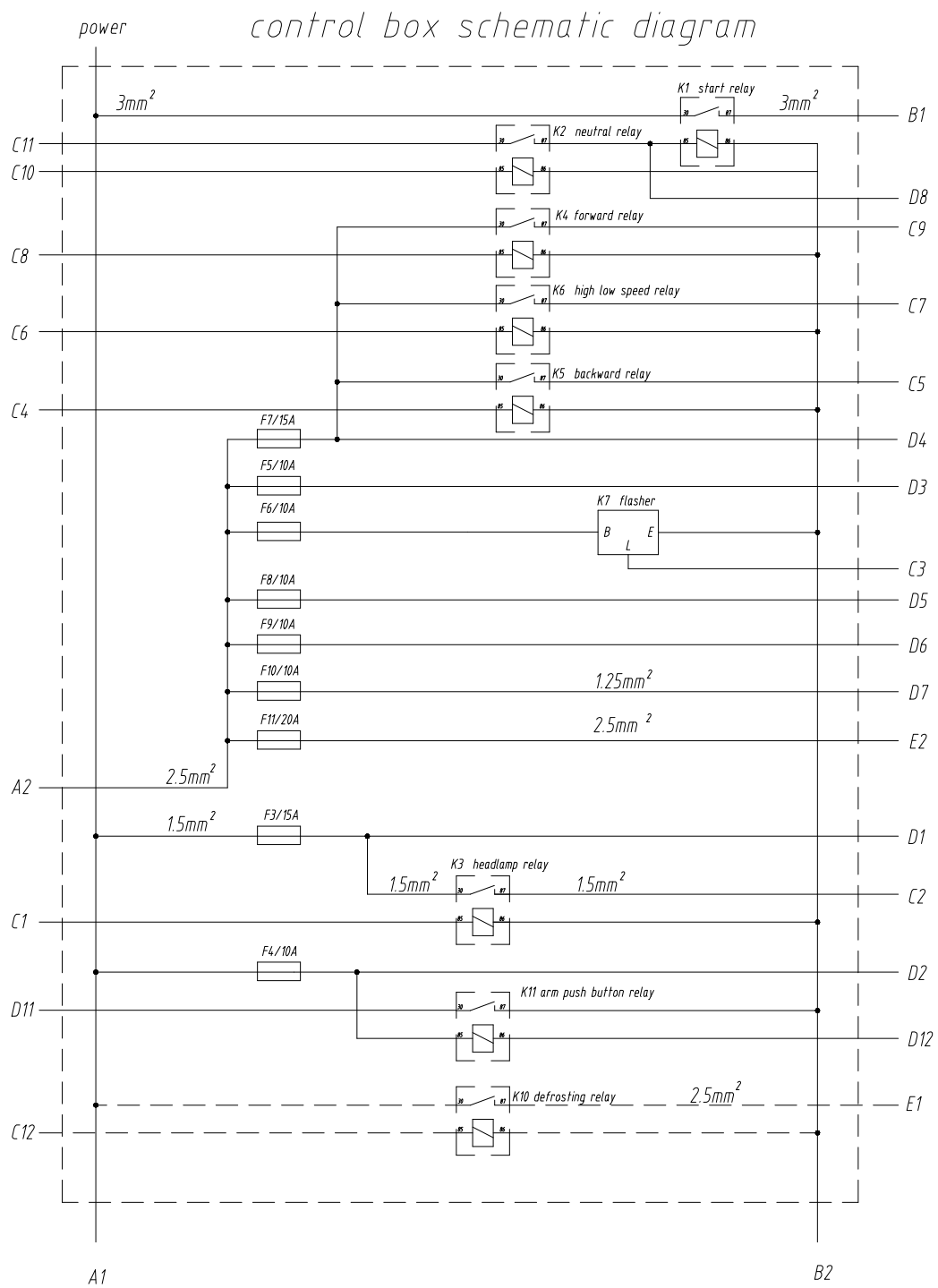


CPCD120-XXW41 electrical panels

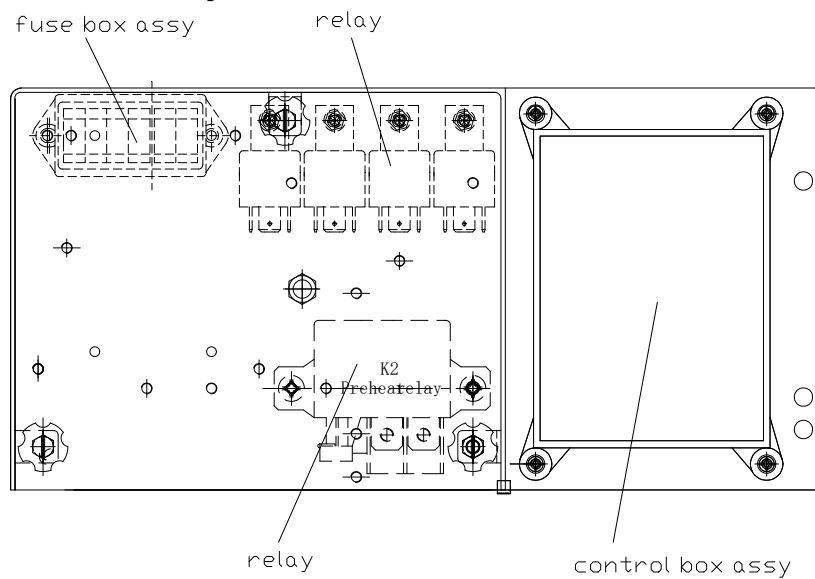


Fuse identification

Location	Capacity	Component
F3	15 A	Headlamp power
F4	10 A	Horn
F5	10 A	Brake lamp
F6	15A	Steering lamp
F7	15 A	Gear power
F8	10 A	Instrument and indicator power
F9	5A	ECU power
-	20 A	Standby application
-	10 A	Standby application



CPCD120-XXW75 electrical panels



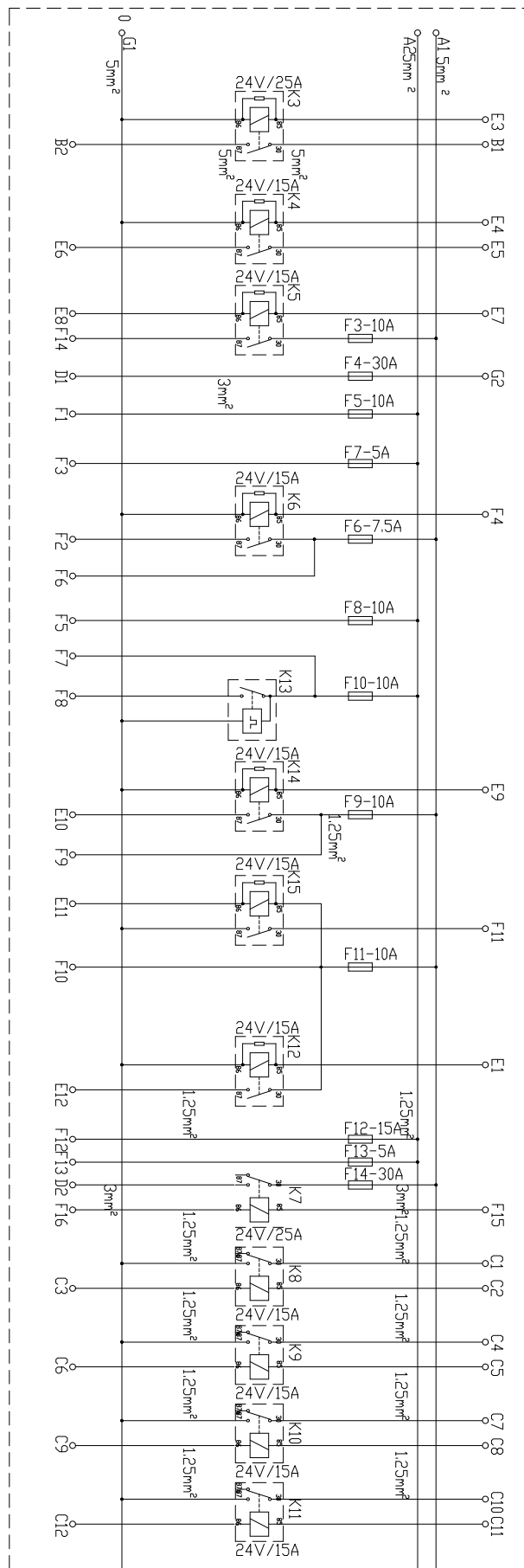
Fuse box assy

Location	Capacity	Component
1	15 A	Front wiper power
2	15 A	Rear wiper power
3	10 A	Standby application
4	10A	Standby application
5	15 A	Standby application
6	10 A	Standby application

Fuse identification

Location	Capacity	Component
F3	10 A	Oil pump power
F4	30 A	ECU power
F5	10 A	ECU diagnose power
F6	7.5A	Reverse power
F7	5 A	TCU power
F8	10 A	Instrument power
F9	10A	Headlamp power
F10	10A	Brake lamp 、 steering lamp power
F11	10A	Horn power
F12	15A	Post-treatment power 1
F13	5A	Post-treatment power 2
F14	30A	Post-treatment power 3

control box schematic diagram

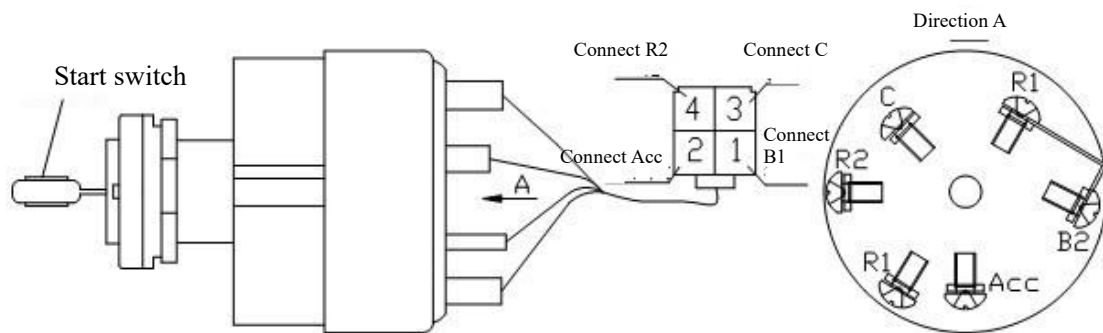


Key switch(start)



- (1) Remove the combination instrument.
- (2) Disconnect the wiring connector.
- (3) Dismantle nut, gasket, space ring and instrument panel.
- (4) To install reverse the order of removal.

During installation, adjust switch projection to proper length.



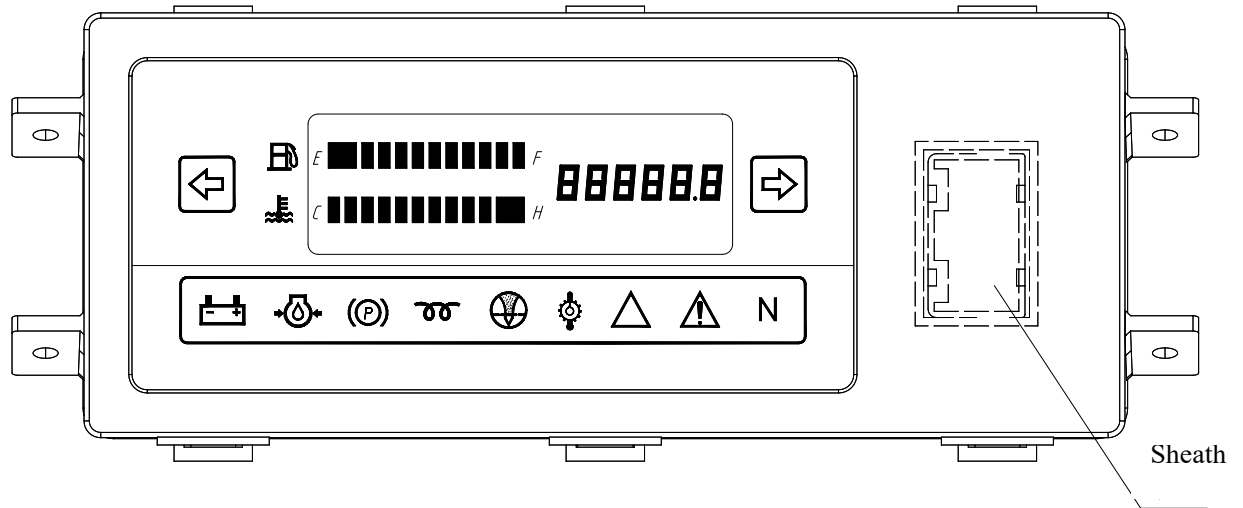
Check

Use multimeter (with ohm) to inspect whether it is on when lighting switch is on each positions.

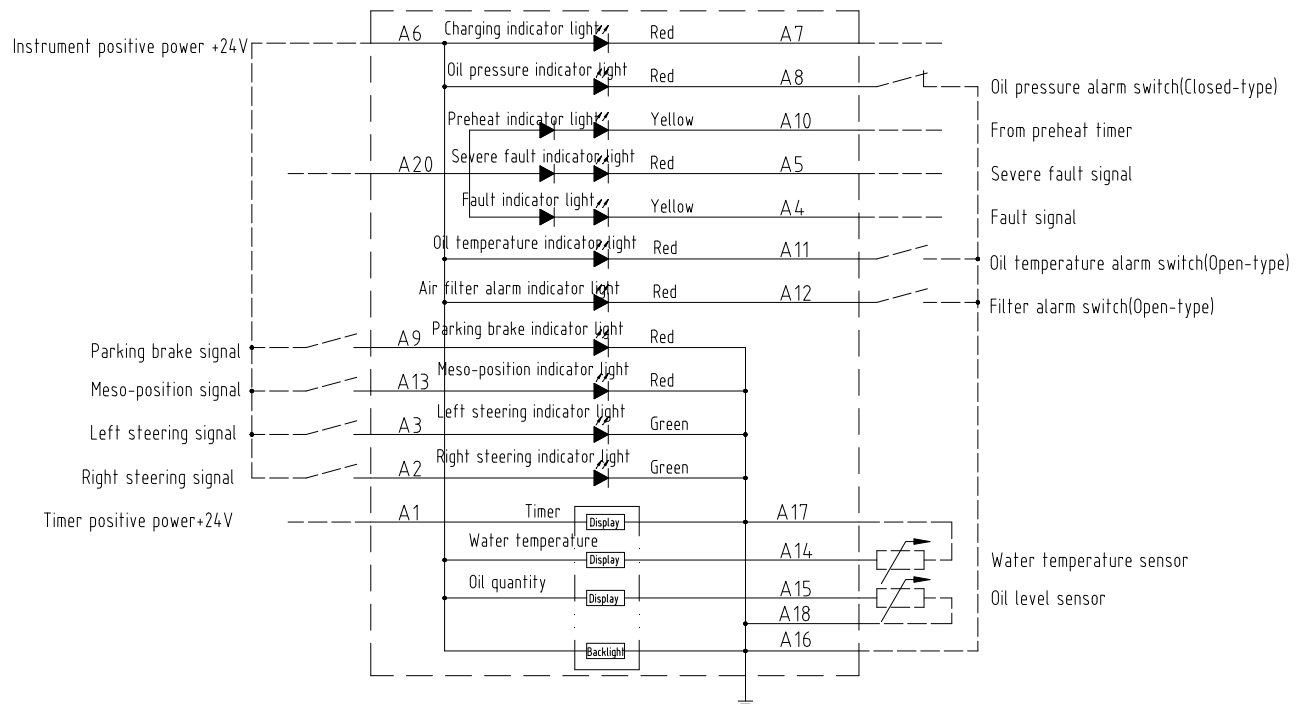
Preheat start switch schematic diagram

Junction	B1	B2	Acc	C	R1	R2	explanation
breaking capacity			240W	480W	1200W	1200W	If the start, pre-heat gear is short-time working, it'll reset automatically.
Position							
Preheat	○	○			○		
Off	○	○					
Run	○	○	○				
Start	○	○	○	○		○	

Combination instrument assembly(W48、 W41)



Instrument schematic diagram



Disassembly and installation:

①Remove 4 fixed bolt from meter crust. Notice that when installing and removing, please make instrument surface tilt an angle to avoid damaging the screw thread of fixed parts on truck.

②Take out wiring harness from sleeve, and then instrument can be brought out.

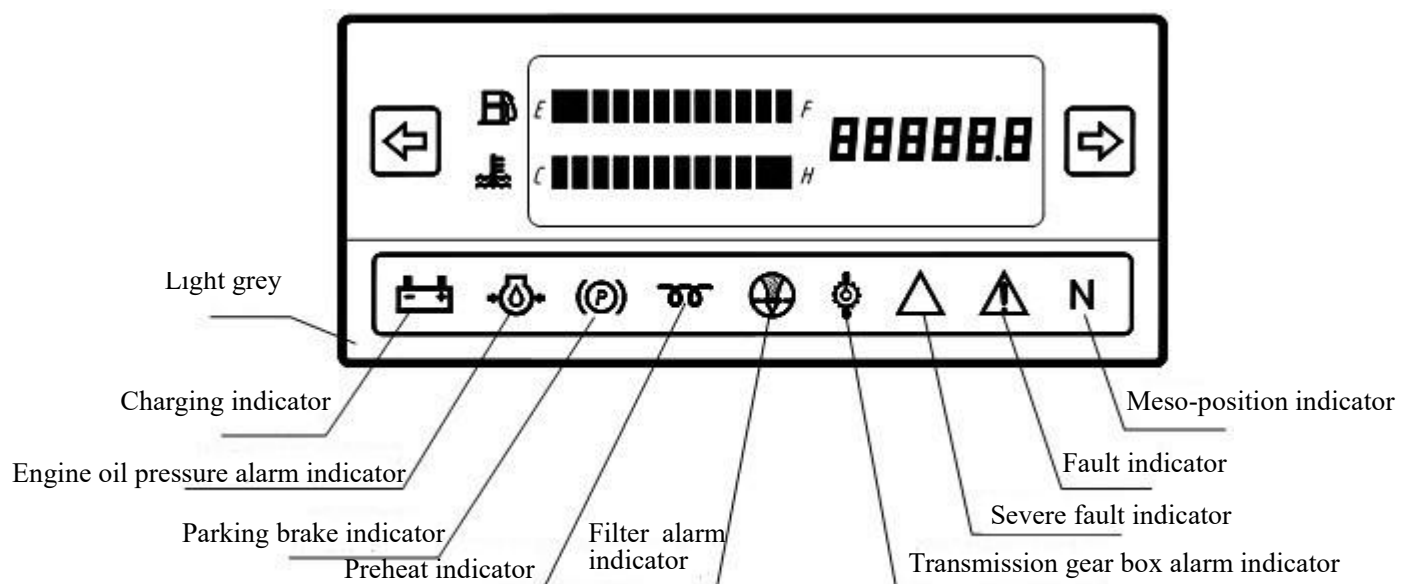
③There is transparent plastic cover to cover, so it can prevent dust and water, and it is fixed by 6 plastic clip buckle, please press down plastic buckles lightly to take out plastic cover when removing.

To install, reverse removal procedures.

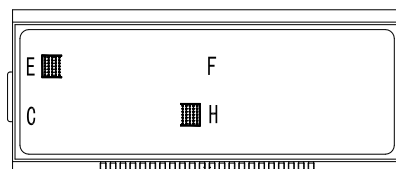
Meter, sensor and relay

Check whether relay circuit is on or not, connect to ring with appropriate voltage(supply by battery) or disconnect, then uses multimeter (Ω) to check whether contact loop is on or not.

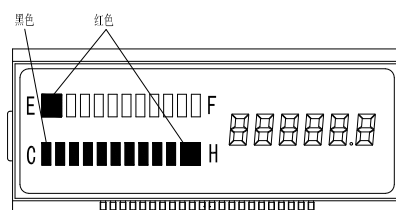
Instrument schematic diagram



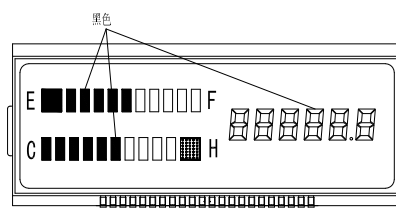
Display map of each condition at instrument



Display at non-working condition

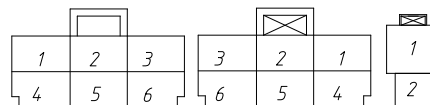
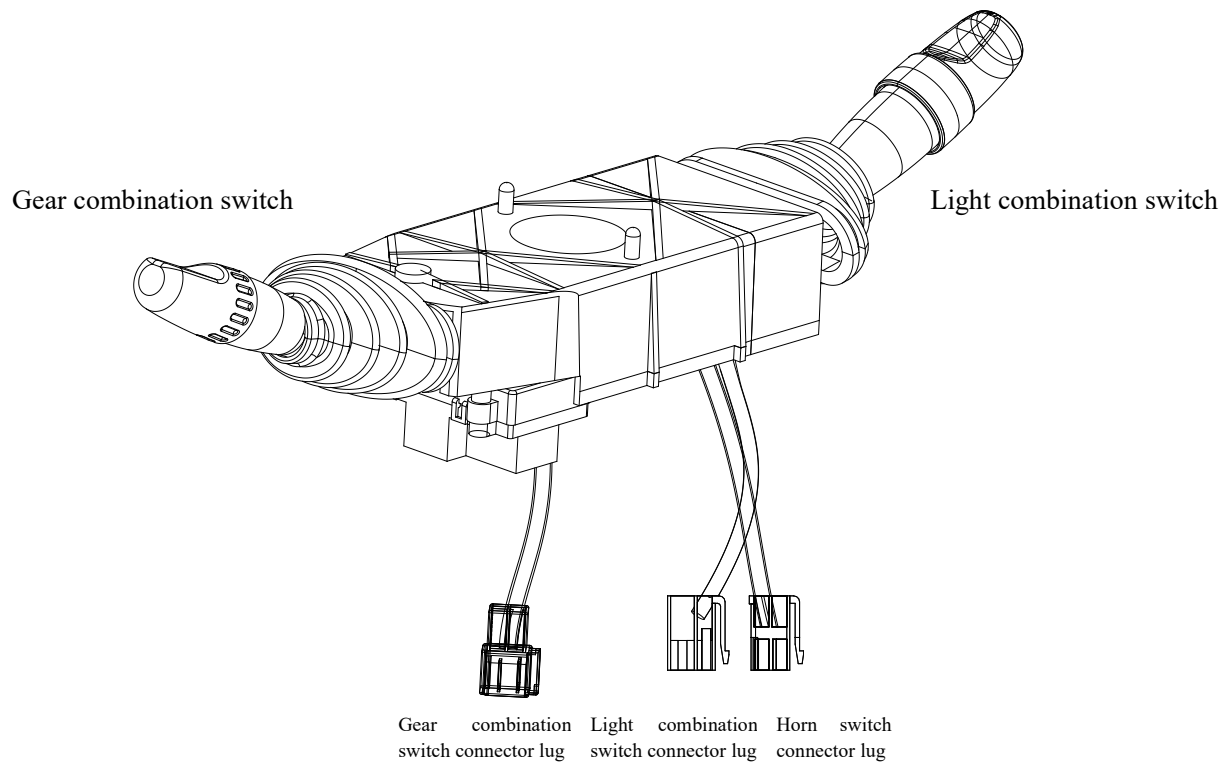


Display when it is at working condition
which water temperature is
too high, oil level is too low



Display at normal working condition

Combination switch assembly



Gear combination switch

Disassemble

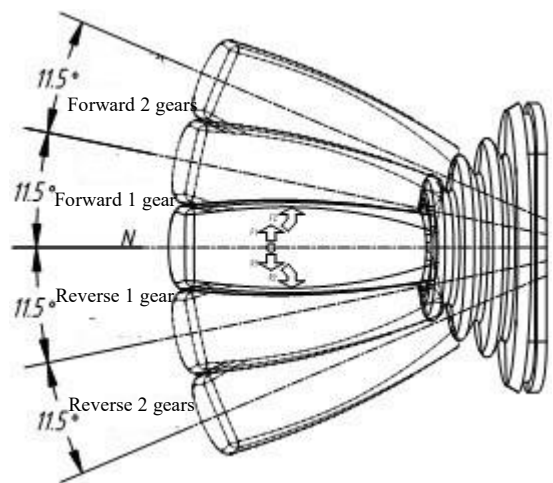
- (1) Remove the combination instrument and steering wheel.
- (2) Unscrew the screws, and disconnect the wiring connector
- (3) To install reverse the order of removal.

Gear switch check

Disconnect switch connect clip, and check if each point is connected.

Use multimeter (with ohm) to inspect whether each gear switch is connected.

Gear combination switch

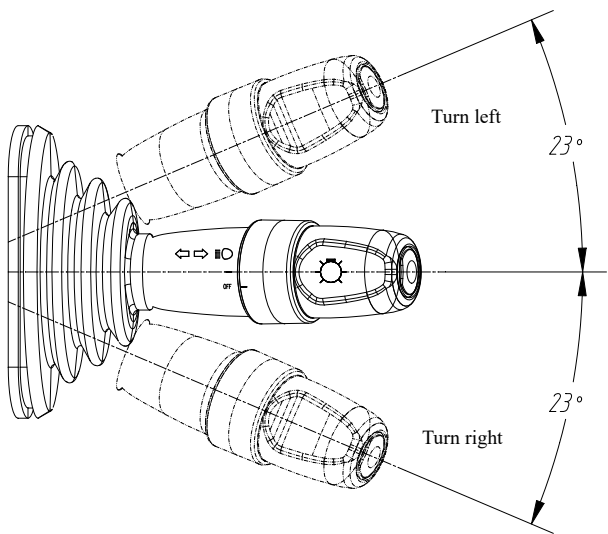


Gear circuit diagram (“O” means connected)

Hole	1	2	3	4	5	6
Color	Green yellow	Red white	White brown	Pink	Brown	Blue
Power Handle position	60W	60W	60W	60W	60W	60W
F2			O			O
F1		O				O
N	O					O
R1				O		O
R2					O	O

Light combination switch

Light combination switch

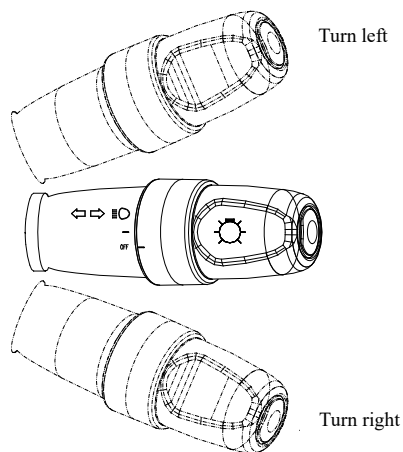


Gear circuit diagram (“O” means connected)

Hole	1	2	3	4	5
Color	Green white	Blue	white	Black white	Green
Power Handle position	60W	60W	60W	60W	60W
Turn left	O	O			
In neutral	O				
Turn right	O		O		
OFF				O	
—				O	O
☹				O	O

Black blue

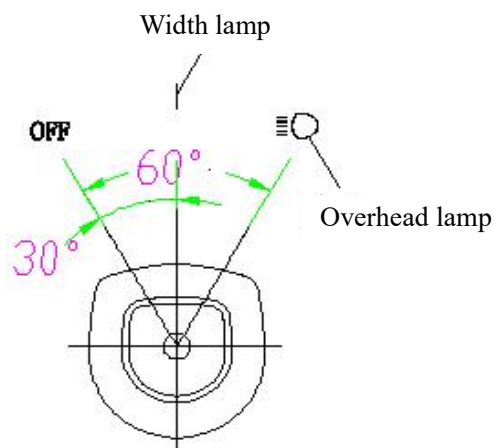
Turn light check



Use multimeter(with ohm) to inspect whether it is on when lighting switch is on these position: left turn, N, right turn

Switch position	Connection point
Left turn	1-2
N	OFF
Right left	1-3

Light switch check



Disconnect switch connector, and check whether each connection point is on.

Use multimeter (with ohm) to inspect whether it is on when lighting switch is on these positions: headlight, width lamp, OFF

Switch position	Connection point
Headlight	4-6
Width lamp	4-5
OFF	OFF

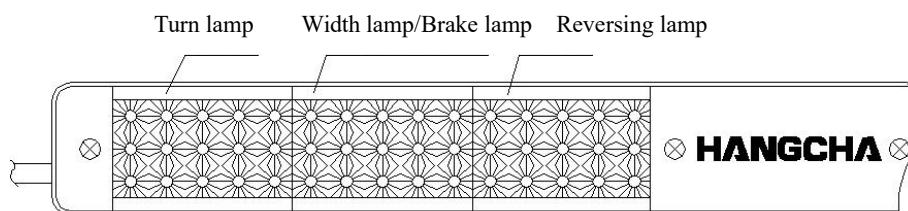
Headlamp assembly



Disassemble and installment:

- ① Dismantle decorating frame;
- ② Unscrew 4 bolts at the back of lamp housing, and then open it;
- ③ Disconnect headlamp lead, release lock catch, dismantle headlamp and replace new bulb and install it;
- ④ Unscrew two fixed bolts of LED width lamp, take out the width lamp, and check if it is damaged, if damage, cut the outgoing line welding spot, replace new panel, re-weld to the original place and install it;
- ⑤ Rotate according to the arrows in the back of steering light, take out steering light, replace new bulb and install it;
- ⑥ Close light housing, screw bolt and fasten the decorating frame

Rear combination light



Disassemble and installment:

- ① Dismantle rear combination light from overhead guard and be careful;
- ② Take the rear combination light to the service station, take out the lamp house, unscrew the mounting screw at the back of lamp housing;
- ③ Take out LED panel, unscrew fixed connector bolt, disconnect connector, and replace new LED panel.

To install reverse the order of removal.

Bulb specification

Lamp	Specification
Front combination lamp Headlamp Turn light Width lamp	24V-35W 24V-21W 24V-5W
Rear combination lamp (LED) Turn light Brake lamp, width lamp Reversing lamp	$(3.2V-20mA) \times 15$ $(3.2V-20mA) \times 15$ $(3.2V-20mA) \times 15$

Starter and generator repair

Starter			
Phenomenon		Reason	Correction
Starter does not rotate		Insufficient accumulator capacity	Replace battery or charge
		Starter circuit disconnection	Repair or replace wire, starter relay
		Magnetic switch damaged	Replace or repair magnetic switch
		Bad pinion and wire-wound gear engagement	Replace or repair
		Bad brush contact	Adjust brush position and clean the surface.
		Brush wear	Replace
		Armature coil disconnection	Replace armature coil
Starter rotate but does not drive the engine		Bad pinion	Replace
		Bad wire-wound gear shaft	Repair
Generator			
Phenomenon		Reason	Correction
Charging indicator light is on	Unable to charge	Regulator damage	Replace regulator
		Magnetic field wiring damage	Replace
		Diode damage	Replace
		Reed wire disconnection or bad contact	Repair or replace
		Fuse damage	Repair
	Little charge current	Exciting coil damage	Replace
		Diode damage	Replace
		Bad reed contact	Repair or replace
		Large electrical load	Reduce load
		Bad belt tension	Adjust
	Large charge current	Regulator damage	Replace
		Fastener looseness of current output return circuit	Repair
	Battery liquid level drops	Battery damage	Replace and add liquid

Others	Abnormal generator noise	Regulator damage	Replace
		Bad internal contact(bearing, brush)	Repair or replace
		Bad driving belt tension	Adjust

Engine fault detection

1. Engine detection port is under the overhead guard left beam(above the left truck body);gear II is fault diagnosis switch, gear III is fault detection up and down diagnosis switch.

2. Turn the fault detection switch to “OFF ”disconnect position, turn the diagnosis switch to “ON” position, and also turn the key switch to “ON” position, if it does not record current fault code, alarm indicator light and stop indicator light keep lighting state; if it records current fault code, alarm indicator light and stop indicator light are on, and flashes the recorded fault code.

Fault code flashes according to the following sequence:

Triangle with exclamation mark alarm indicator light is on for a while, and pause for 1-2 seconds.

Another triangle stop indicator light flashes the fault code, and pause 1-2 seconds between each two figures.

After the triangle stop indicator light flashes the fault code, triangle with exclamation mark alarm indicator light flashes again, and then triangle stop indicator light repeatedly flashes fault code.

If you want to check the next fault code, pull the (+) position of fault diagnosis up and down selection switch. If you want to check the previous fault code, pull the (-) position of fault diagnosis up and down selection switch. If it only records one current fault code, whether you pull to (+) position or (-) position, the fault indicator light will show the same fault code.

Once you do not use the diagnosis system, disconnect the diagnosis switch; if diagnosis switch does not disconnect, ECM will not record some fault code.

Note: After flameout power off switch can be switched off until 30s and flameout cannot use power off switch,if not may detect fault code 1117. Remove this fault code needs to normal operation(ignite-flameout-after 30s-switch off power off switch) once.

CUMMINS stage III B Diagnostic Trouble Codes and Cummins Fault Codes

FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
111	629 {12}	Red	Controller #1	Engine Control Module Critical Internal Failure-Bad Intelligent Device or Component.
115	612 {2}	Red	System Diagnostic Code # 2	Engine Magnetic Crankshaft Speed/Position lost both of two signals –Data Erratic, Intermittent, or Incorrect.
122	102 {3}	Amber	Boost Pressure	Intake Manifold 1 Pressure Sensor Circuit –Voltage Above Normal, or Shorted to High source.
123	102 {4}	Amber	Boost Pressure	Intake Manifold 1 Pressure Sensor Circuit —Voltage Below Normal, or Shorted to Low source.
131	091 {3}	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor 1 Circuit —Voltage Above Normal, or Shorted to High source.
132	091 {4}	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor 1 Circuit —Voltage Below Normal, or Shorted to Low source.
133	974 {3}	Red	Remote Accelerator	Remote Accelerator Pedal or Lever Position Sensor Circuit —Voltage Above Normal, or Shorted to High source.
134	974 {4}	Red	Remote Accelerator	Remote Accelerator Pedal or Lever Position Sensor Circuit — Voltage Below Normal, or Shorted to Low source.
135	100 {3}	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure 1 Sensor Circuit —Voltage Above Normal, or Shorted to High source.
141	100 {4}	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure 1 Sensor Circuit —Voltage Below Normal, or Shorted to Low source.
143	100 {18}	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure —Data Valid but Below Normal Operational Range-Moderate severe level.
144	110 {3}	Amber	Engine Coolant Temperature	Engine Coolant Temperature 1 Sensor Circuit — Voltage Above Normal, or Shorted to High Source.
145	110 {4}	Amber	Engine Coolant Temperature	Engine Coolant Temperature 1 Sensor Circuit — Voltage Below Normal, or Shorted to Low Source.
146	110 {16}	Amber	Engine Coolant Temperature	Engine Coolant Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level

FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
147	091 {1}	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position 1 Sensor Circuit Frequency — Data Valid but Below Normal Operational Range — Most Severe Level.
148	091 {0}	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor 1 — Data Valid but Above Normal Operational Range — Most Severe Level.
151	110 {0}	Red	Engine Coolant Temperature	Engine Coolant Temperature — Data Valid but Above Normal Operational Range — Most Severe Level.
153	105 {3}	Amber	Intake Manifold #1 Temp	Intake Manifold 1 Temperature Sensor Circuit — Voltage Above Normal, or Shorted to High Source.
154	105 {4}	Amber	Intake Manifold #1 Temp	Intake Manifold 1 Temperature Sensor Circuit — Voltage Below Normal, or Shorted to Low Source. Low Signal voltage detected at intake manifold air temperature circuit.
155	105 {0}	Red	Intake Manifold #1 Temp	Intake Manifold 1 Temperature — Data Valid but Above Normal Operational Range — Most Severe Level.
187	3510 {4}	Amber	5 Volts DC Supply	Sensor Supply 2 circuit — Voltage Below Normal, or Shorted to Low Source.
195	111 {3}	Amber	Coolant Level	Coolant Level Sensor 1 Circuit — Voltage Above Normal, or Shorted to High Source.
196	111 {4}	Amber	Coolant Level	Coolant Level Sensor 1 Circuit — Voltage Below Normal, or Shorted to Low Source.
197	111 {18}	Amber	Coolant Level	Coolant Level — Data Valid but Below Normal Operational Range — Moderately Severe Level.
221	108 {3}	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit — Voltage Above Normal, or Shorted to High Source.
222	108 {4}	Amber	Barometric Pressure	Barometric Pressure Sensor Circuit — Voltage Below Normal, or Shorted to Low Source.

FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
227	3510 {3}	Amber	5 Volts DC Supply	Sensor Supply 2 circuit — Voltage Above Normal, or Shorted to High Source.
234	190 {0}	Red	Engine Speed	Engine Crankshaft Speed/Position — Data Valid but Above Normal Operational Range — Most Severe Level.
235	111 {1}	Red	Coolant Level	Coolant Level — Data Valid but Below Normal Operational Range — Most Severe Level.
237	644 {2}	Amber	External Speed Input	External Speed Command Input(Multiple Unit Synchronization)— Data Erratic, Intermittent, or Incorrect.
238	3511 {4}	Amber	System Diagnostic code # 1	Sensor Supply 3 Circuit — Voltage Below Normal, or Shorted to Low Source.
239	3511 {3}	Amber	System Diagnostic code # 2	Sensor Supply 3 Circuit — Voltage Above Normal, or Shorted to High Source.
241	084 {2}	Amber	Wheel-based Vehicle Speed	Wheel-Based Vehicle Speed — Data Erratic, Intermittent, or Incorrect.
245	647 {4}	Amber	Fan Clutch Output Device Driver	Fan Control Circuit — Voltage Below Normal, or Shorted to Low Source.
271	1347 {4}	Amber	Fuel Pump Pressurizing Assembly #1	Engine Fuel Pump Pressurizing Assembly 1 Circuit — Voltage Below Normal, or Shorted to Low Source.
272	1347 {3}	Amber	Fuel Pump Pressurizing Assembly #1	Fuel Pump Pressurizing Assembly 1 Circuit — Voltage Above Normal, or Shorted to High Source.
281	1347 {7}	Amber	Fuel Pump Pressurizing Assembly #1	Fuel Pump Pressurizing Assembly 1 — Mechanical System Not Responding Properly or Out of Adjustment.
285	639 {9}	Amber	SAE J1939 Datalink	SAE J1939 Multiplexing PGN Timeout Error — Abnormal Update Rate.
286	639 {13}	Amber	SAE J1939 Datalink	SAE J1939 Multiplexing Configuration Error — Out of Calibration.
288	974 {19}	Red	Remote Accelerator	SAE J1939 Multiplexing Accelerator Pedal or Lever Position Sensor Circuit — Received detected a Network Data in Error.

FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
292	441 {14}	Red	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 — Special instructions.
293	441 {3}	Amber	OEM Temperature	Auxiliary Temperature Sensor Input #1 Circuit— Voltage Above Normal, or Shorted to High Source.
294	441 {4}	Amber	OEM Temperature	Auxiliary Temperature Sensor Input #1 Circuit— Voltage Below Normal, or Shorted to Low Source.
295	108 {2}	Amber	Barometric Pressure	Barometric Pressure - Data erratic, intermittent or incorrect
296	1388 {14}	Red	Auxiliary Pressure	Auxiliary Pressure Sensor Input 1 — Special instructions.
297	1388 {3}	Amber	Auxiliary Pressure	Auxiliary Pressure Sensor Input 1 Circuit— Voltage Above Normal, or Shorted to High Source.
298	1388 {4}	Amber	Auxiliary Pressure	Auxiliary Pressure Sensor Input 1 circuit — Voltage Below Normal, or Shorted to Low Source.
322	651 {5}	Amber	Injector Cylinder #01	Injector Solenoid Driver Cylinder 1 Circuit — Current Below Normal, or Open Circuit.
324	653 {5}	Amber	Injector Cylinder #03	Injector Solenoid Driver Cylinder 3circuit — Current Below Normal, or Open Circuit.
331	652 {5}	Amber	Injector Cylinder #02	Injector Solenoid Driver Cylinder 2 Circuit — Current Below Normal, or Open Circuit.
332	654 {5}	Amber	Injector Cylinder #04	Injector Solenoid Driver Cylinder 4 Circuit — Current Below Normal, or Open Circuit.
343	629 {12}	Amber	Controller #1	Engine Control Module Warning Internal Hardware Failure — Bad Intelligent Device or Component.
349	191 {16}	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed – Data Valid but Above Normal Operational Range - Moderately Severe Level
351	627 {12}	Amber	Controller #1	Injector Power Supply — Bad intelligent Device or Component.

FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
352	3509 {4}	Amber	5 Volts DC Supply	Sensor Supply 1 Circuit — Voltage Below Normal, or Shorted to Low Source.
356	132 {3}	Amber	High signal voltage has been detected in the mass air flow 1 sensor circuit.	Engine Intake Air Mass Flow Sensor Circuit - Voltage Above Normal or Shorted to High Source
357	132 {4}	Amber	Low signal voltage has been detected in the mass air flow 1 sensor circuit.	Engine Intake Air Mass Flow Circuit - Voltage Below Normal or Shorted to Low Source
358	132 {2}	Amber	The mass air flow measured is irrational.	Engine Intake Air Mass Flow - Data Erratic, Intermittent, or Incorrect
386	3509 {3}	Amber	5 Volts DC Supply	Sensor Supply 1 Circuit — Voltage Above Normal, or Shorted to High Source.
415	100 {1}	Red	Engine Oil Pressure	Engine Oil Rifle Pressure — Data Valid but Below Normal Operational Range — Most Severe Level.
418	097 {15}	Amber /Blinking	Water in Fuel Indicator	Water in Fuel Indicator — Data Valid but Above Normal Operational Range — Most Severe Level.
428	097 {3}	Amber	Water in Fuel Indicator	Water in Fuel Indicator Circuit — Voltage Above Normal, or Shorted to High Source.
429	097 {4}	Amber	Water in Fuel Indicator	Water in Fuel Indicator Circuit — Voltage Below Normal, or Shorted to Low Source.
431	558 {2}	Amber	Accelerator Pedal Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch — Data Erratic, Intermittent, or Incorrect.
432	558 {13}	Red	Accelerator Pedal Low Idle Switch	Accelerator Pedal or Lever Idle Validation Circuit — Out of Calibration.
435	100 {2}	Amber	Engine Oil Pressure	Engine Oil Rifle Pressure — Data Erratic, Intermittent, or Incorrect.
441	168 {18}	Amber	Electrical Potential(Voltage)	Battery 1 Voltage — Data Valid but Below Normal Operational Range — Moderately Severe Level.
442	168 {16}	Amber	Electrical Potential(Voltage)	Battery 1 Voltage — Data Valid but Above Normal Operational Range — Moderately Severe Level.

FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
449	157 {0}	Red	Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure — Data Valid but Above Normal Operational Range — Most Severe Level.
451	157 {3}	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage above normal, or shorted to high source
452	157 {4}	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure Sensor Circuit - Voltage below normal, or shorted to low source
488	105 {16}	Amber	Intake Manifold	Intake Manifold 1 Temperature — Data Valid but Above Normal Operational Range — Moderately Severe Level.
489	191 {18}	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed – Data Valid but Below Normal Operational Range - Moderately Severe Level
497	1377 {2}	Amber	Switch Circuit	Multiple Unit Synchronization Switch — Data Erratic, Intermittent, or Incorrect.
515	3514 {3}	Amber	Sensor supply voltage 6	Sensor Supply 6 Circuit - Voltage above normal, or shorted to high source
516	3514 {4}	Amber	Sensor supply voltage 6	Sensor Supply 6 Circuit - Voltage below normal, or shorted to low source
523	611 {2}	Amber	System Diagnostic code # 1	Auxiliary Intermediate (PTO) Speed Switch Validation — Data Erratic, Intermittent, or Incorrect.
527	702 {3}	Amber	Circuit - Voltage	Auxiliary Input/output 2 Circuit — Voltage Above Normal, or Shorted to High Source.
528	093 {2}	Amber	Switch - Data	Auxiliary Alternate Torque Validation Switch — Data Erratic, Intermittent, or Incorrect.
529	703 {3}	Amber	Circuit - Voltage	Auxiliary Input/output 3 Circuit — Voltage Above Normal, or Shorted to High Source.
553	157 {16}	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure— Data Valid but Above Normal Operational Range — Moderately Severe Level.
555	101 {16}	Amber	Engine Crankcase Pressure	Crankcase Pressure-Data Valid But Above Normal Operating Range - Moderately Severe Level

FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
556	101 {0}	Red	Engine Crankcase Pressure	Crankcase Pressure - Data valid but above normal operational range - Most Severe Level
559	157 {18}	Amber	Injector Metering Rail 1 Pressure	Injector Metering Rail 1 Pressure— Data Valid but Above Normal Operational Range — Moderately Severe Level.
584	677 {3}	Amber	Starter Solenoid Lockout Relay Driver Circuit	Starter Relay Driver Circuit — Voltage Above Normal, or Shorted to High Source.
585	677 {4}	Amber	Engine Starter Motor Relay	Starter Relay Driver Circuit — Voltage Below Normal, or Shorted to Low Source.
595	103 {16}	Amber	Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Above Normal Operating Range - Moderately Severe Level
599	640 {14}	Red	Engine External Protection Input	Auxiliary Commanded Dual Output Shutdown — Special instructions.
649	1378 {31}	Amber /Blinking	Engine Oil Change Interval	Change Lubricating Oil and Filter – Condition Exists
687	103 {18}	Amber	Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Below Normal Operating Range - Moderately Severe Level
689	190 {2}	Amber	Engine Speed	Engine Crankshaft Speed/Position — Data Erratic, Intermittent, or Incorrect.
691	1172 {3}	Amber	Turbocharger #1 Compressor Inlet Temperature	Turbocharger 1 Compressor Inlet Temperature Circuit — Voltage Above Normal, or Shorted to High Source.
692	1172 {4}	Amber	Engine Turbocharger 1 Compressor Inlet Temperature	Turbocharger 1 Compressor Inlet Temperature Circuit — Voltage Below Normal, or Shorted to Low Source.
731	723 {7}	Amber	Engine Speed Sensor #2	Engine Speed/Position Camshaft and Crankshaft Misalignment — Mechanical System Not Responding Properly or Out of Adjustment.
778	723 {2}	Amber	Engine Speed Sensor #2	Engine Camshaft Speed/Position Sensor — Data Erratic, Intermittent, or Incorrect.
1117	627 {2}	None	Power Supply	Power Supply Lost With Ignition On - Data erratic, intermittent or incorrect

FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
1239	2623 {3}	Amber	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage above normal, or shorted to high source
1241	2623 {4}	Amber	Accelerator Pedal #1 Channel 2	Accelerator Pedal or Lever Position Sensor 2 Circuit - Voltage below normal, or shorted to low source
1242	91 {2}	Red	Accelerator Pedal Position	Accelerator Pedal or Lever Position Sensor 1 - Data erratic, intermittent or incorrect
1515	91 {19}	Red	Accelerator Pedal Position 1	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Received Network Data In Error
1539	1387 {3}	Amber	Auxiliary Pressure #1	Auxiliary Pressure Sensor Input 1 Circuit-Voltage Above Normal, or Shorted to High Source
1621	1387 {4}	Amber	Auxiliary Pressure #1	Auxiliary Pressure Sensor Input 1 Circuit-Voltage Below Normal, or Shorted to Low Source
1695	3513 {3}	Amber	Sensor supply voltage 5	Sensor Supply 5 - Voltage above normal, or shorted to high source
1696	3513 {4}	Amber	Sensor supply voltage 5	Sensor Supply 5 - Voltage below normal, or shorted to low source
1843	101 {3}	Amber	Engine Crankcase Pressure	Crankcase Pressure Circuit - Voltage above normal, or shorted to high source
1844	101 {4}	Amber	Engine Crankcase Pressure	Crankcase Pressure Circuit - Voltage below normal, or shorted to low source
1896	2791 {13}	Amber	Engine Exhaust Gas Recirculation (EGR) Valve Control	EGR Valve Controller - Out of Calibration
1898	641 {13}	Amber	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Controller-Out of Calibration
1911	157 {0}	Amber	Injector Metering Rail	Injector Metering Rail 1 Pressure - Data valid but above normal operational range - Most Severe Level
1938	3597 {18}	Amber	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Data Valid But Below Normal Operating Range - Moderately Severe Level
1942	101 {2}	Amber	Engine Crankcase Pressure	Crankcase Pressure - Data erratic, intermittent or incorrect

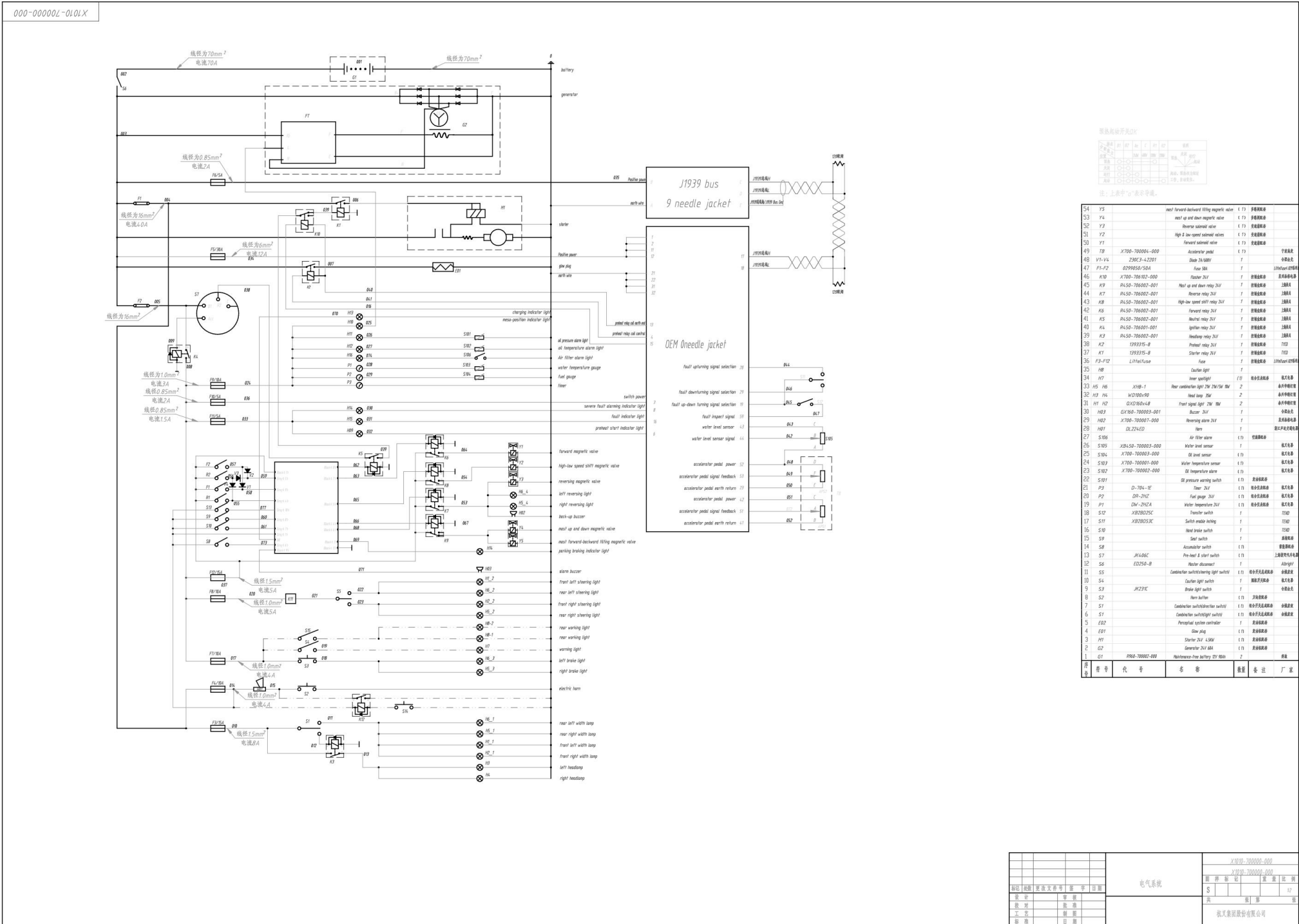
FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
1961	2791 {15}	Amber	Engine Exhaust Gas Recirculation (EGR) Valve Control	EGR Valve Control Circuit Over Temperature - Data Valid But Above Normal Operating Range - Least Severe Level
1974	101 {15}	Amber /Blinking	Engine Crankcase Pressure	Crankcase Pressure - Data Valid But Above Normal Operating Range - Least Severe Level
2182	1072 {3}	Amber	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit-Voltage Above Normal, or Shorted to High Source
2183	1072 {4}	Amber	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit-Voltage Below Normal, or Shorted to Low Source
2185	3512 {3}	Amber	Sensor supply voltage 4	Sensor Supply 4 Circuit — Voltage Above Normal, or Shorted to High Source.
2186	3512 {4}	Amber	System Diagnostic code # 1	Sensor Supply 4 Circuit — Voltage Below Normal, or Shorted to Low Source.
2195	703 {14}	Red	Auxiliary I/O #03	Auxiliary Equipment Sensor Input 3 Engine Protection Critical - Special Instructions
2272	27 {4}	Amber	Engine Exhaust Gas Recirculation Valve Position	EGR Valve Position Circuit - Voltage below normal, or shorted to low source
2288	103 {15}	None	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Above Normal Operating Range - Least Severe Level
2311	633 {31}	Amber	Fuel Control Valve #1	Electronic Fuel Injection Control Valve Circuit - Condition Exists
2321	190 {2}	None	Engine Speed	Engine Crankshaft Speed/Position Sensor — Data Erratic, Intermittent, or Incorrect.
2322	723 {2}	None	Engine Speed Sensor #2	Engine Camshaft Speed/Position Sensor — Data Erratic, Intermittent, or Incorrect.
2349	2791 {5}	Amber	Engine Exhaust Gas Recirculation (EGR) Valve Control	EGR Valve Control Circuit - Current below normal or open circuit

FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
2353	2791 {6}	Amber	Engine Exhaust Gas Recirculation (EGR) Valve Control	EGR Valve Control Circuit - Current above normal or grounded circuit
2357	2791 {7}	Amber	Engine Exhaust Gas Recirculation (EGR) Valve Control	EGR Valve Control Circuit - Mechanical system not responding or out of adjustment
2363	1073 {4}	Amber	Engine Compression Brake Output # 2	Engine Brake Actuator Driver Output 2 Circuit-Voltage Above Normal, or Shorted to Low Source
2367	1073 {3}	Amber	Engine Compression Brake Output # 2	Engine Brake Actuator Driver Output 2 Circuit-Voltage Above Normal, or Shorted to High Source
2372	95 {16}	Amber	Engine Fuel Filter Differential Pressure	Fuel Filter Differential Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
2373	1209 {3}	Amber	Exhaust Gas Pressure	Exhaust Gas Pressure Sensor Circuit - Voltage above normal, or shorted to high source
2374	1209 {4}	Amber	Exhaust Gas Pressure	Exhaust Gas Pressure Sensor Circuit - Voltage below normal, or shorted to low source
2375	412 {3}	Amber	Exhaust Gas Recirculation (EGR) Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage above normal, or shorted to high source
2376	412 {4}	Amber	Exhaust Gas Recirculation (EGR) Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit - Voltage below normal, or shorted to low source
2377	647 {31}	Amber	Fan Clutch Output Device Driver	Fan Control Circuit - Voltage Above Normal, or Shorted to High Source
2448	111 {17}	Amber /Blinking	Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Least Severe Level
2554	1209 {2}	Amber	Engine Exhaust Gas Pressure	Exhaust Gas Pressure - Data erratic, intermittent or incorrect
2555	729 {3}	Amber	Inlet Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage above normal, or shorted to high source
2556	729 {4}	Amber	Inlet Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage below normal, or shorted to low source

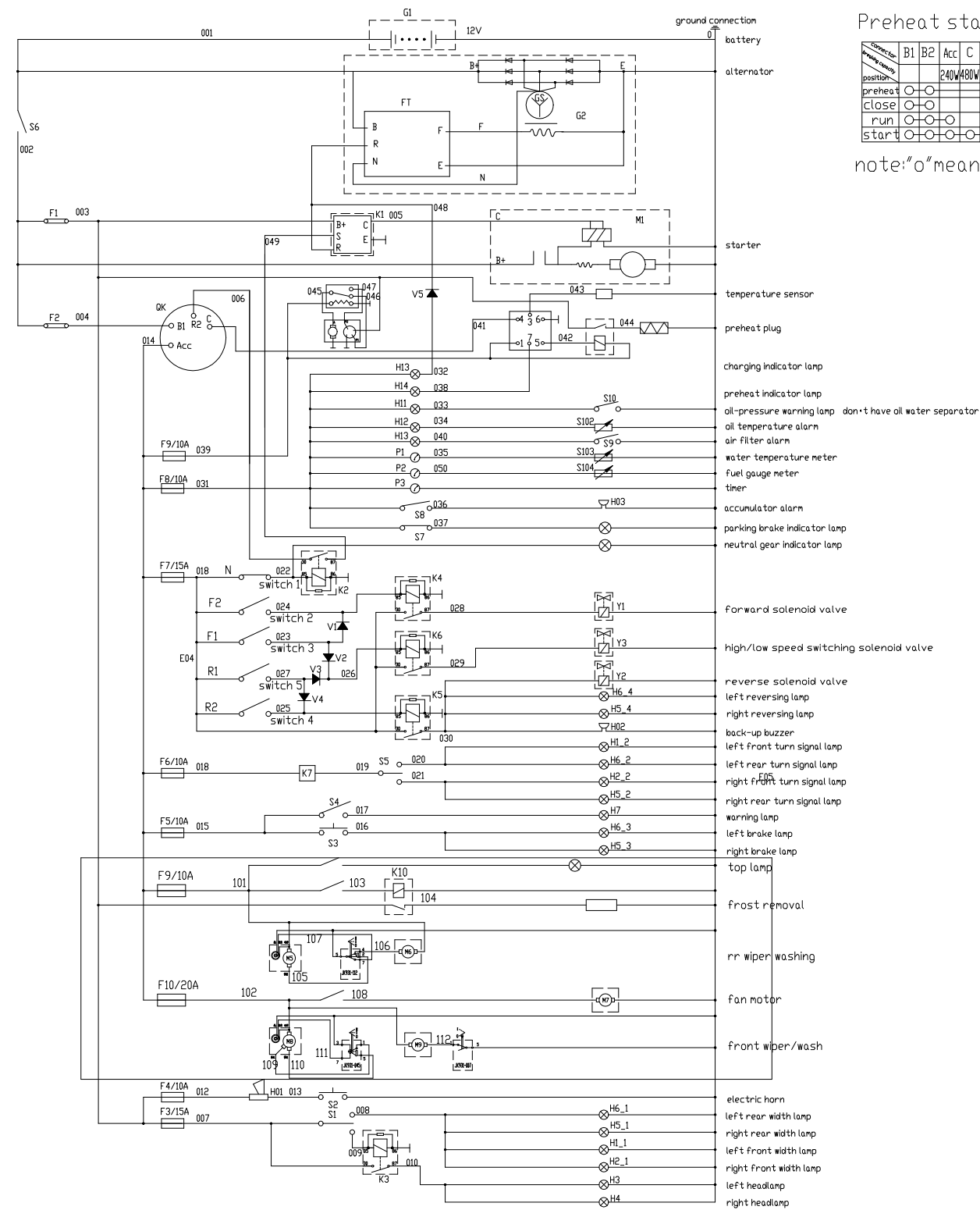
FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
2557	697 {3}	Amber	Auxiliary PWM Driver #1	Auxiliary PWM Driver #1 - Voltage Above Normal, or Shorted to High Source
2558	697 {4}	Amber	Auxiliary PWM Driver #1	Auxiliary PWM Driver #1 - Voltage Below Normal, or Shorted to Low Source
2646	110 {31}	Amber	Engine Coolant Temperature	Engine Coolant Temperature - Condition Exists
2765	2797 {13}	None	Engine Injector Group 1	Engine Injector Bank 1 Barcodes - Out of Calibration
2961	412 {15}	None	Engine Intake Valve Actuator #12	Exhaust Gas Recirculation Temperature - Data Valid But Above Normal Operating Range - Least Severe Level
2973	102 {2}	Amber	Boost Pressure	Intake Manifold 1 Pressure - Data erratic, intermittent or incorrect
3186	1623 {9}	Amber	Tachograph output shaft speed	Tachograph Output Shaft Speed-Abnormal update rate
3213	1623 {19}	Amber	Tachograph output shaft speed	Tachograph Output Shaft Speed-Received Network Data in Error
3326	91 {9}	Red	Accelerator Pedal Position 1	SAE J1939 Multiplexed Accelerator Pedal or Lever Sensor System - Abnormal update rate
3328	191 {9}	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Abnormal update rate
3418	191 {19}	Amber	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Received Network Data In Error
3525	84 {19}	Amber	Wheel-Based Vehicle Speed	Wheel-Based Vehicle Speed - Received Network Data In Error
3526	84 {9}	Amber	Wheel-Based Vehicle Speed	Wheel-Based Vehicle Speed - Abnormal update rate
3527	558 {19}	Red	Accelerator Pedal 1 Low Idle Switch	[C2ST] Accelerator Pedal or Lever Idle Validation Switch - Received Network Data In Error
3528	558 {9}	Red	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch - Abnormal update rate
3616	2633 {7}	None	Engine VGT Nozzle Position	[C2ST] Engine VGT Nozzle Position - Mechanical system not responding or out of adjustment

FAULT CODE {LAMP}	J1939 SPN (S) {FMI}	LAMP COLOR	J1939 SPN DESCRIPTION	CUMMINS DESCRIPTION
3697	630 {12}	Red	Engine Control Module Calibration Memory	[C2ST] Engine Control Module Calibration Memory - Bad intelligent device or component
3724	168 {17}	Amber	Battery Potential / Power Input 1	[C2ST] Battery 1 Voltage - Data Valid But Below Normal Operating Range - Least Severe Level
3727	5571 {7}	None	High Pressure Common Rail Fuel Pressure Relief Valve	[C2ST] High Pressure Common Rail Fuel Pressure Relief Valve - Mechanical system not responding or out of adjustment
3737	1675 {31}	None	Engine Starter Mode	[C2ST] Engine Starter Mode Overcrank Protection - Condition Exists
3741	5571 {0}	Amber	High Pressure Common Rail Fuel Pressure Relief Valve	[C2ST] High Pressure Common Rail Fuel Pressure Relief Valve - Data valid but above normal operational range - Most Severe Level
3765	442 {3}	Amber	[J1939 - 71] Auxiliary Temperature 2	[C2ST] Auxiliary Temperature Sensor Input 2 Circuit - Voltage above normal, or shorted to high source
3766	442 {4}	Amber	[J1939 - 71] Auxiliary Temperature 2	[C2ST] Auxiliary Temperature Sensor Input 2 Circuit - Voltage below normal, or shorted to low source

Electrical system diagram



CPCD1200-XXW48/XXW48B Electrical system diagram (CE)

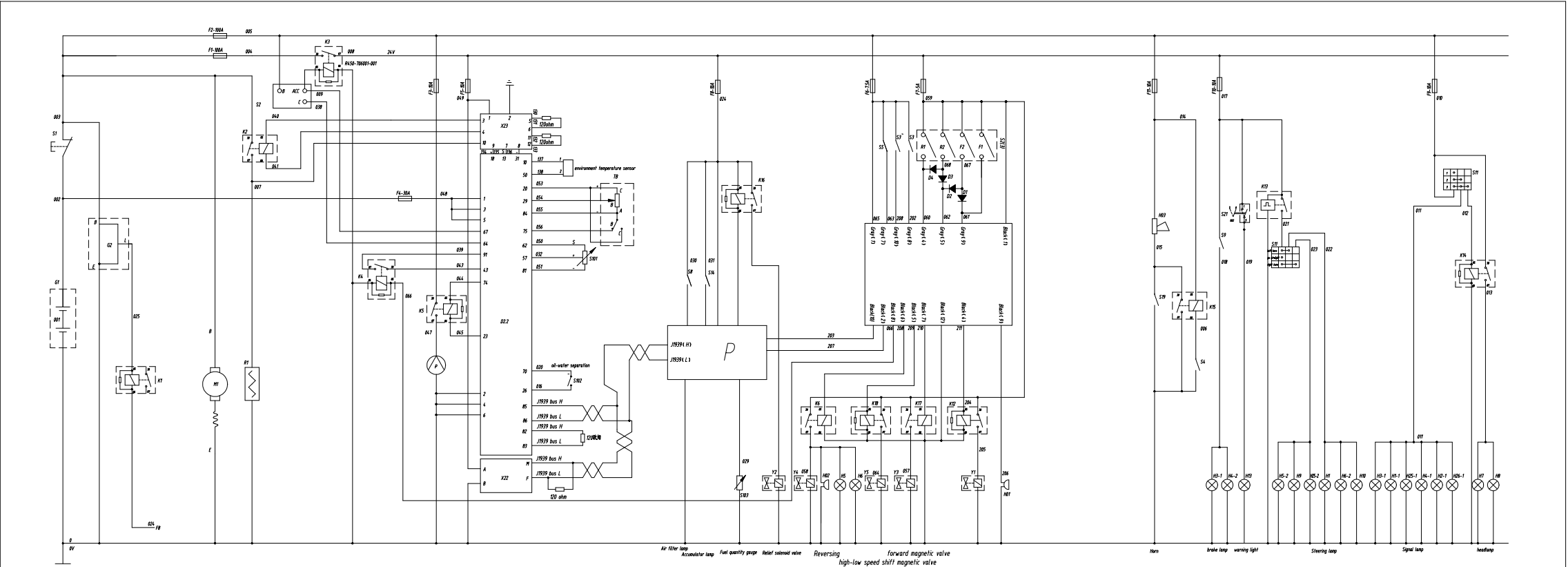


Preheat start switch QK

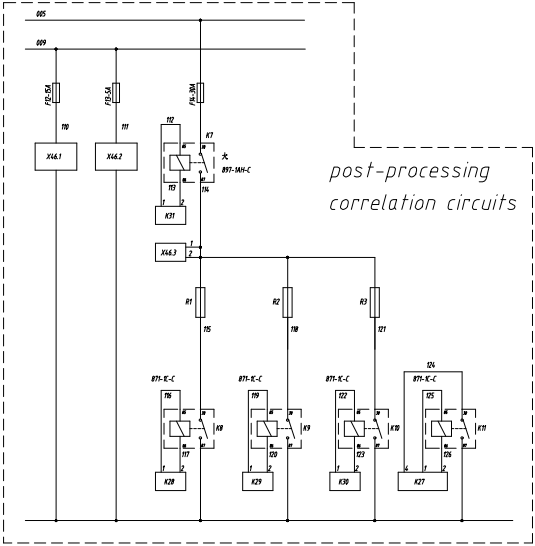
connector	B1	B2	Acc	C	R1	R2	explain
preheat							preheat
close							close
run							run
start							start

note:"o" means $\square$ N.

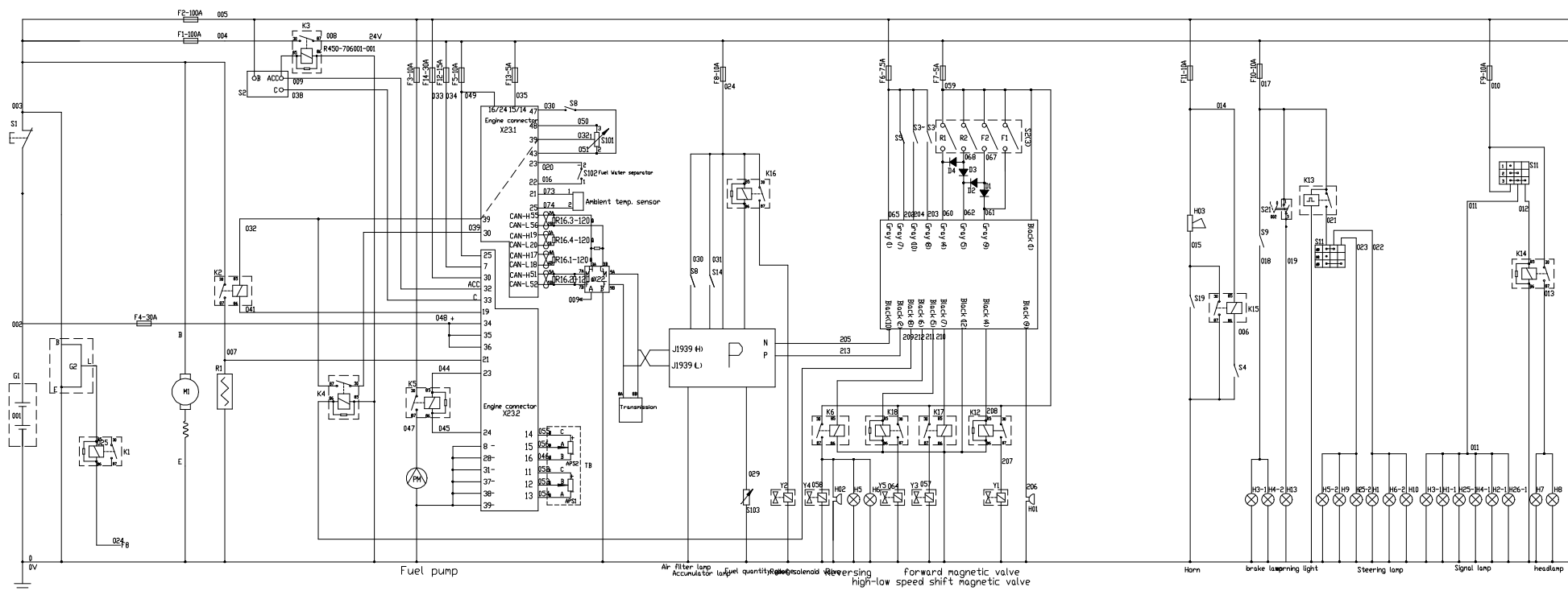
CPCD1200-XXW41 Electrical system diagram



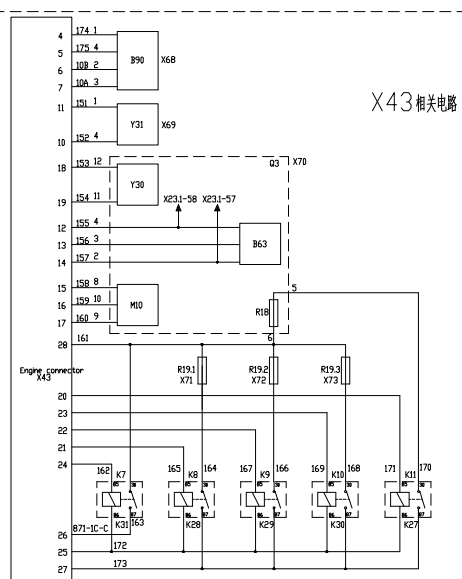
62	Y5	高低速电磁阀/high-low speed shift valve	gearbox mating						
61	Y4	后通电磁阀/Reverse valve							
60	Y3	前通电磁阀/forward valve							
59	K18	X1040-706402-000 高低速继电器/high-low speed shift relay	engine mating	30	K4	X1040-706402-000 空档继电器/Neutral relay			
58	K17	X1040-706402-000 前通继电器/forward relay		29	K3	X1040-706401-000 点火继电器/ignition relay			
57	R1R2R3			28	K2	139335-8/24V 预热继电器/Preheat relay			
56	X46.1\X46.2\X46.3	发动机线束配套号	保险丝 Fuse	27	K1	GR502-700010-820 励磁继电器/Excite relay			
55	K27\K28\K29\K30\K31			26	H5	SC601-700600-001 喇叭/Warning lamp			
54	0257030/30A			25	H4	X740-740000-000 仪表工作指示灯/Working indicator lamp	combination instrument mating		
53	0257020/20A		继电器 Relay	24	H3	X700-770000-000 组合尾灯/Tail lamp			
52	F3-F14	0257015/15A		23	H1 H2	X700-760100-000 前大灯/Head lamp			
51	0257010/10A			22	S103	X700-700003-000 油质传感器/Oil quality sensor			
50	0257005/5A		油水分液器/Water level sensor	21	S102	油水分离器开关/Water in fuel alarm switch	oil-water separator mating		
49	F1 F2	0299050/50A		20	S101	水位传感器/Water level sensor	engine mating		
48	E01	通知系统控制箱/ CONTROLLER		19	S14	蓄能器报警开关/Accumulator alarm switch	energy accumulator mating		
47	Y2	泄压电磁阀/ solenoid vavle	valve body mating	18	S13	后扶手喇叭按钮/Rear armrest horn button			
46	Y1	喇叭电磁阀/Horn solenoid vavle	valve body mating	17	S12	喇叭按钮/Horn button	steering wheel mating		
45	H03	R450-700200-000/24V 3A 电喇叭/Horn		16	S11	GX161-703000-000 灯光组合开关/Light switch	combination switch mating		
44	H02	X700-700007-000/24V 0.05A 倒车蜂鸣器/Reverse warner		15	S10	G250-740015-000 雾灯继电器开关/Warning lamp switch			
43	H01	GX160-700003-001/24V 报警器/Buzzer		14	S9	NC9717-700600-000 制动灯开关/Break lamp switch			
42	P	X1040-740000-000 燃油仪表/CAN Display		13	S8	空滤器开关/Air filter switch	air filter mating		
41	K16	GR502-700010-820 泄压继电器/solenoid vavle relay		12					
40	K15	X1040-706402-000 后扶手喇叭继电器/Rear armrest horn relay		11	S5	TM-1703/250V 15A 驻车制动开关/Switch feedback parking brake			
39	K14	X1040-706402-000 大灯继电器/Headlamp relay		10	S4	扶手座椅开关/Armrest seat switch	armrest mating		
38	K13	X700-706102-000/24V 闪光器/Flasher		9	S3	安全带开关/Belt switch	seat mating		
37	K12	X1040-706402-000 喇叭继电器/Horn relay		8	S3	座椅开关/Seat switch	seat mating		
36	K11	X1040-706402-000 加热模式继电器/Heat model relay		7	S2	R450-740200-000 预热启动开关/Pre-heat & start switch	combination instrument mating		
35	K10	X1040-706402-000 R3加热继电器/R3 heating relay		6	S1	ED2508-1-G00/250A 紧急断电开关/Master disconnect			
34	K9	X1040-706402-000 R2加热继电器/R2 heating relay		5	TB	X700-700004-000 油门踏板/Electronic throttle pedal			
33	K8	X1040-706402-000 R1加热继电器/R1 heating relay		4	R1	预热泵/Preheat	DEUTZ engine mating		
32	K7	X1040-706401-000 加热电源继电器/Heater supply relay		3	M1	TC03.6 BS0674 起动机24V/4KW/Starter			
31	K6	X1040-706402-000 后通继电器/Reverse relay		2	G2	TC03.6 BS1379 发电机24V/55A/Alternator			
30	K5	X1040-706402-000 油压继电器/Fuel relay		1	G1	R960-700002-000/12V 蓄电池/Battery			
N0	symbol	code	name	remark	N0	symbol	code	name	remark

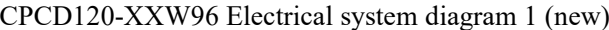


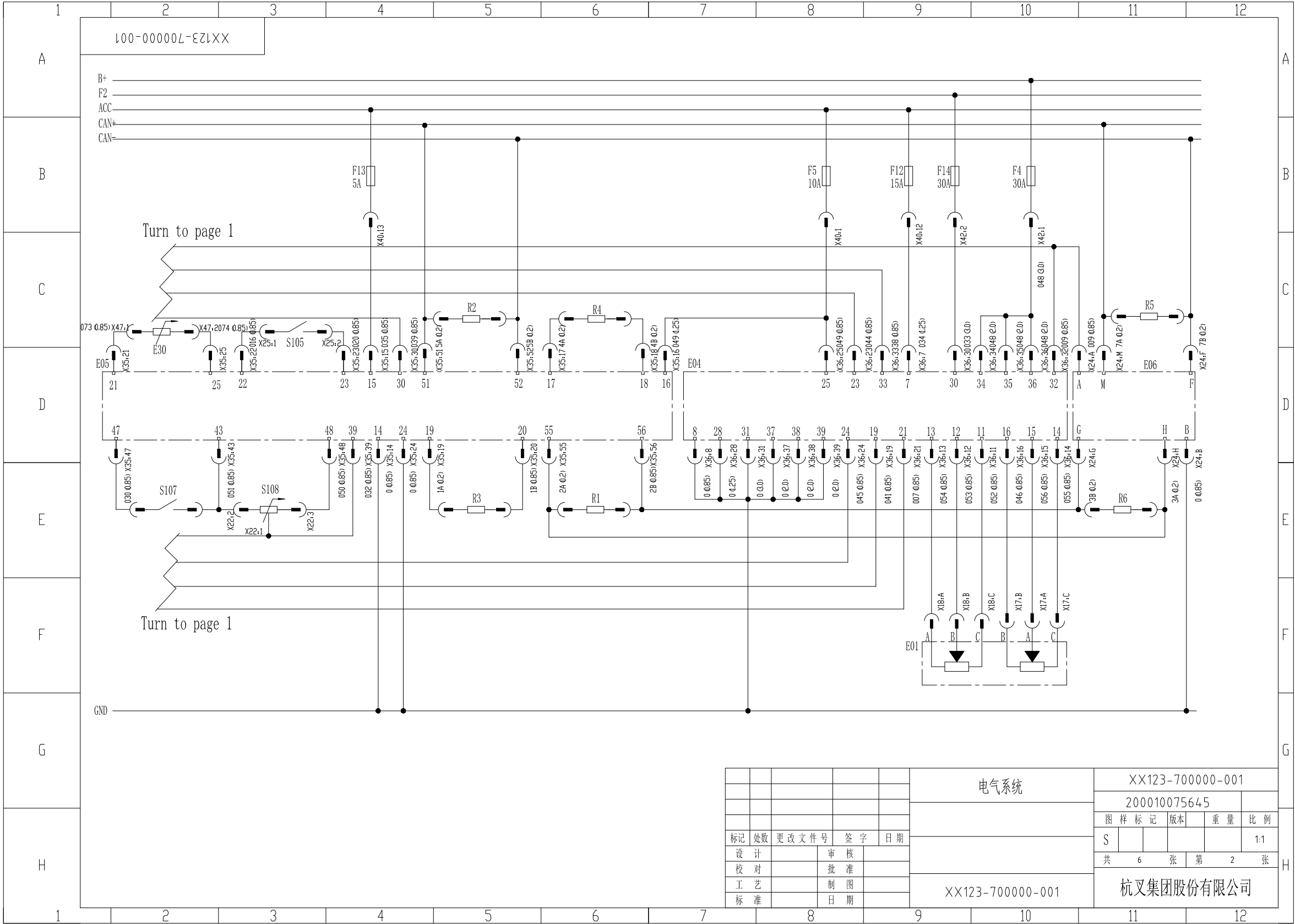
CPCD120-XXW75 Electrical system diagram



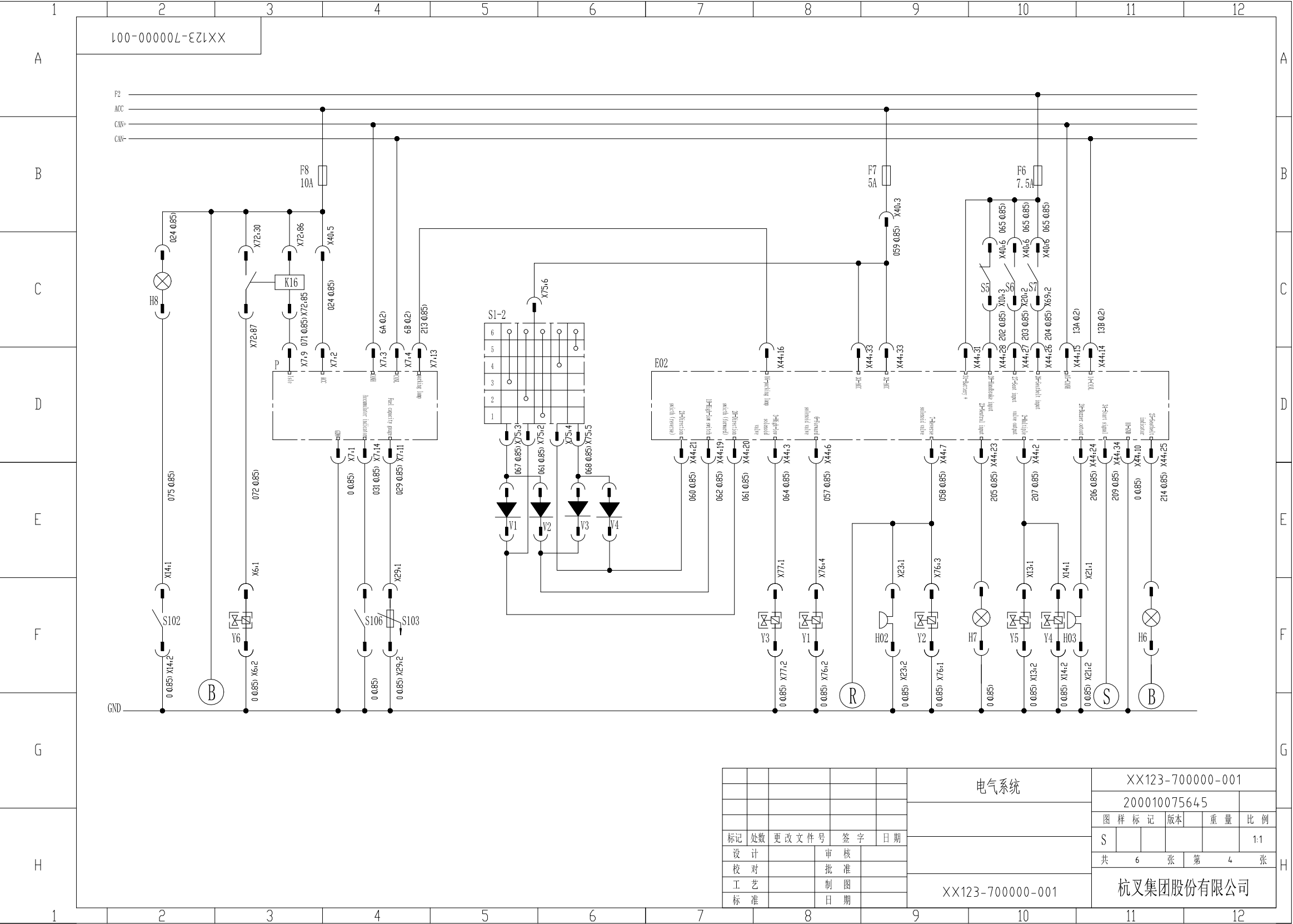
62	Y5	高低速电磁阀/High-low speed shift valve	上海快川	继电器	30	K4X1040-706402-000	空档锁止继电器/Neutral relay	上海快川	继电器
61	Y4	倒车电磁阀/Reverse valve	上海快川	继电器	29	K3X1040-706401-000	点火继电器/Ignition relay	上海快川	继电器
60	Y3	前进电磁阀/Forward valve	上海快川	继电器	28	K2 1393315-8/24V	预热器继电器/Preheat relay	上海快川	继电器
59	K18	040-706402-000高低速电磁阀/High-low speed shift valve	上海快川	继电器	27	K1G5002-700010-820	励磁继电器/Excite relay	TYCO	继电器
58	K17	040-706402-000前进电磁阀/Forward relay	上海快川	继电器	26	H5SC601-700600-001	喇叭/Warning lamp	上海快川	继电器
57		R1R2R3	上海快川	继电器	25	H4 X740-740000-000	熄火继电器/Warning indicator lamp	上海快川	继电器
56	X46	X46.2X46.3	上海快川	继电器	24	H3 X700-770000-000	燃油泵/Tail lamp	上海快川	继电器
55	X47	X47.2X47.3	上海快川	继电器	23	H2 X700-760100-000	大灯/Head lamp	上海快川	继电器
54	X48	X48.2X48.3	上海快川	继电器	22	S103X700-700003-000	油质传感器/Oil quality sensor	上海快川	继电器
53	X49	X49.2X49.3	上海快川	继电器	21	S102	油水分离器/Water in fuel alarm switch	上海快川	继电器
52	X50	X50.2X50.3	上海快川	继电器	20	S101	水温传感器/Water level sensor	上海快川	继电器
51	X51	X51.2X51.3	上海快川	继电器	19	S100	报警继电器/Alarm switch	上海快川	继电器
50	X52	X52.2X52.3	上海快川	继电器	18	S100	报警继电器/Alarm switch	上海快川	继电器
49	X53	X53.2X53.3	上海快川	继电器	17	S100	报警继电器/Alarm switch	上海快川	继电器
48	E01	发动机控制单元/ CONTROLLER	电气公司	继电器	16	S100	报警继电器/Alarm switch	上海快川	继电器
47	Y2	倒车电磁阀/ solenoid valve	上海快川	继电器	15	S100	报警继电器/Alarm switch	上海快川	继电器
46	Y1	前进电磁阀/ Tool solenoid valve	上海快川	继电器	14	S100	报警继电器/Alarm switch	上海快川	继电器
45	R8R9	700200-000/24V 3A	上海快川	继电器	13	S100	报警继电器/Alarm switch	上海快川	继电器
44	H0Z0	700007-000/24V 0.5A	上海快川	继电器	12	S100	报警继电器/Alarm switch	上海快川	继电器
43	H0X16	7000003-001/24V	上海快川	继电器	11	S100	报警继电器/Alarm switch	上海快川	继电器
42	P X1040-740000-000	报警灯/ CAN Display	上海快川	继电器	10	S100	报警继电器/Alarm switch	上海快川	继电器
41	K1G5	700010-820	上海快川	继电器	9	S100	报警继电器/Alarm switch	上海快川	继电器
40	K15	700010-820	上海快川	继电器	8	S100	报警继电器/Alarm switch	上海快川	继电器
39	K14	040-706402-000	上海快川	继电器	7	S100	报警继电器/Alarm switch	上海快川	继电器
38	K7B9	706102-000/24V	上海快川	继电器	6	S100	报警继电器/Alarm switch	上海快川	继电器
37	K12	040-706402-000	上海快川	继电器	5	S100	报警继电器/Alarm switch	上海快川	继电器
36	K11X	040-706402-000	上海快川	继电器	4	S100	报警继电器/Alarm switch	上海快川	继电器
35	K10X	040-706402-000	上海快川	继电器	3	S100	报警继电器/Alarm switch	上海快川	继电器
34	K9X	040-706402-000	上海快川	继电器	2	S100	报警继电器/Alarm switch	上海快川	继电器
33	K8X	040-706402-000	上海快川	继电器	1	S100	报警继电器/Alarm switch	上海快川	继电器
32	K7X	040-706401-000	上海快川	继电器	0	S100	报警继电器/Alarm switch	上海快川	继电器
31	K6X	040-706402-000	上海快川	继电器	-1	S100	报警继电器/Alarm switch	上海快川	继电器
30	K5X	040-706402-000	上海快川	继电器	-2	S100	报警继电器/Alarm switch	上海快川	继电器







CPCD120-XXW96 Electrical system diagram 2 (new)



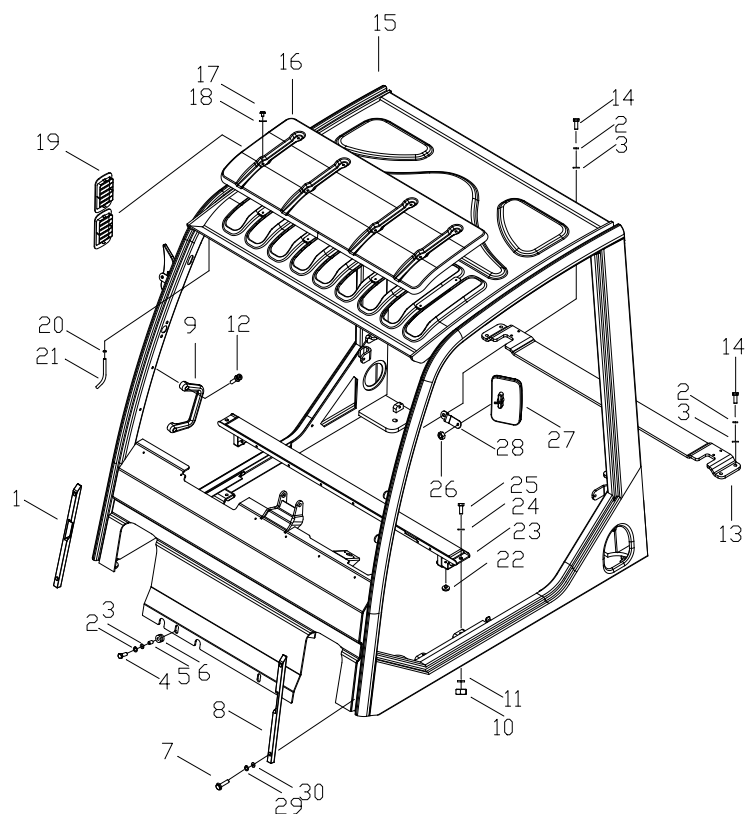
CPCD120-XXW96 Electrical system diagram 4 (new)

1	2	3	4	5	6	7	8	9	10	11	12
A	100-00000L-EXLXX										
	85	V4	230C2-42201-G00	二极管	diode	1	3A\600V	E6			
	84	V3	230C2-42201-G00	二极管	diode	1	3A\600V	E6			
B	83	V2	230C2-42201-G00	二极管	diode	1	3A\600V	E5			
	82	V1	230C2-42201-G00	二极管	diode	1	3A\600V	E5			
	81	M2		油泵	pump	1	engine assort	F8			
C	80	R6	XB1011-710001-000	120欧姆电阻	120 ohm resistance	1	0.25W	E11			
	79	R5	XB1011-710001-000	120欧姆电阻	120 ohm resistance	1	0.25W	C11			
	78	R4	XB1011-710001-000	120欧姆电阻	120 ohm resistance	1	0.25W	C6			
D	77	R3	XB1011-710001-000	120欧姆电阻	120 ohm resistance	1	0.25W	E5			
	76	R2	XB1011-710001-000	120欧姆电阻	120 ohm resistance	1	0.25W	C5			
	75	R1	XB1011-710001-000	120欧姆电阻	120 ohm resistance	1	0.25W	E6			
E	74	K17									
	73	K16	GR502-700010-820	泄压继电器	pressure relief relay	1	24V\15-20A	C3-C4			
	72	K15	X1040-706402-000	扶手按钮继电器	horn button relay	1	24V	E2			
F	71	K14	X1040-706402-000	大灯继电器	headlamp relay	1	24V	D5			
	70	K11	X1040-706402-000	加热模式继电器	heating mode relay	1	24V	F7-G7			
	69	K10	X1040-706402-000	R3加热继电器	R3 heating relay	1	24V	F6-G6			
G	68	K9	X1040-706402-000	R2加热继电器	R2 heating relay	1	24V	F5-G5			
	67	K8	X1040-706402-000	R1加热继电器	R1 heating relay	1	24V	F4-G5			
	66	K7	1393315-8-G00	加热主电源继电器	heating main power relay	1	24V	F3-G4			
H	65	K6									
	64	K5	X1040-706402-000	油泵继电器	pump relay	1	24V	C8-D9			
	63	K4	X1040-706402-000	中间继电器	middle relay	1	24V	C10			
I	62	K3	X1040-706401-000	钥匙开关继电器	Key switch relay	1	24V	B6			
	61	K2	1393315-8-G00	预热继电器	preheat relay	1	24V	E7			
	60	K1	GR502-700010-820	励磁继电器	excitation relay	1	24V\15-20A	F4-F5			
J	59	F3-F14		保险丝	Fuse	12	5\7.5\10\15\30A	B4-B11			
	58	F1/F2	XB1011-700100-000	易熔线	fusible link	1	50A	A4			
	57	HF	X700-706102-000	闪光器	Flasher	1	24V	B10-C10			
K	56	H03	GX160-700003-001	报警器	alarm	1	24V	F11			
	55	H02	X700-700007-000	倒车蜂鸣器	Buzzer	1	24V	F9			
	54	H01	R450-700200-000	电喇叭	electric horn	1	24V	D3			
L	53	V6		防熄火电磁阀	put off solenoid valve	1	hydraulic assort	F3			
	52	V5		门架2电磁阀	mast 2 solenoid valve	1	hydraulic assort	F10			
	51	V4		门架1电磁阀	mast 1 solenoid valve	1	hydraulic assort	F10			
M	50	Y3		高低速电磁阀	High-low solenoid valve	1	gearbox assort	F8			
	49	Y2		后退电磁阀	Reverse solenoid valve	1	gearbox assort	F9			
	48	Y1		前进电磁阀	Forward solenoid valve	1	gearbox assort	F8			
N	47	H8	XX125-700601-000	油温指示	oil temperature indicator	1	24V	C2			
	46	H7	XX125-700601-000	中位指示	neutral indicator	1	24V	F10			
	45	H6	GX161-700710-830	安全带指示	seat belt indicator	1	24V	F11			
O	44	H5	X700-700020-810	工作灯	working lamp	1	24V	E12			
	43	H4	SC601-700600-001	警灯	warning lamp	1	12-36V	E11			
	42	H3	X700-770100-000	后组合灯	Rear combination lamp	1	9-32V	E7-F9			
P	41	H1-R	MBX4510-760200-000	右前大灯	right hgeadlight	1	12V\24V	E6-F7			
	40	H1-L	MBX4510-760100-000	左前大灯	left hgeadlight	1	12V\24V	E5-F6			
	39	S108		水位传感器	liquid level sensor	1	engine assort	E3			
Q	38	S107		空滤开关	air filter	1	filter assort	E2			
	37	S106		蓄能器开关	accumulator	1	hydraulic assort	F4			
	36	S105		油水分离开关	oil-water separation	1	engine assort	C3			
R	35	S104									
	34	S103	X1000-700003-000	油量传感器	oil mass	1	24V	F4			
	33	S102	X700-700002-000	油温报警器	oil temperature	1	24V	F2			
S	32	S101									
	31	S11	ED250B-1-G00	断电开关	ausschalter	1	12V\24V	B2-C2			
	30	S10	XF250-700700-820	扶手喇叭按钮	armrest horn button	1	2A\36VDC	F2			
T	29	S9	MB250-700503-W00	工作灯开关	working lamp switch	1	12V\24V	D12			
	28	S8	MB250-700502-W00	警灯开关	alarm lamp switch	1	12V\24V	D11			
	27	S7		安全带开关	safety belt switch	1	seats assort	C10			
U	26	S6		座椅开关	seat switch	1	seats assort	C10			
	25	S5	X700-707000-000	手制动开关	hand braking switch	1	250VAC\15A	C10			
	24	S4	A2A300-700100-000	钥匙开关	Key switch	1	24V	B4-B5			
V	23	S3	XC9717-700600-000	制动灯开关	Brake light switch	1	3A\24V	D11			
	22	S2		喇叭按钮	horn button	1	24V	E3			
	21	S1-1\2	M700-705000-000	组合开关	combination switch	1	12V\24V	C3-C4\C5-D6			
W	20	P	X2B300-700200-000	仪表	Instrument	1	6-36V	D3-D4			
	19	E30		环境温度传感器	environmental temperature sensor	1	engine assort	C2			
	18	E14		B90	B90	1	engine assort	E10-E11			
X	17	E13		Y31	Y31	1	engine assort	E10			
	16	E12		Q3	Q3	1	engine assort	E7-E10			
	15	E11		R19.3	R19.3	1	engine assort	E6			
Y	14	E10		R19.2	R19.2	1	engine assort	E5			
	13	E09		R19.1	R19.1	1	engine assort	E4			
	12	E08		发动机接口	engine interface	1	engine assort	D2-D11			
Z	11	E07-2									
	10	E07-1									
	9	E06		总线通讯接口	diagnose interface	1	engine assort	D11-D12			
AA	8	E05		ECU2	ECU2	1	engine assort	D2-D7			
	7	E04		ECU1	ECU1	1	engine assort	D7-D10			
	6	E03		预热塞	glow plug	1	engine assort	F7			
AB	5	E02	X2B300-700200-000	OPS控制器	perceptive controller	1	9-36V	D7-D11			
	4	E01	X2B300-700002-000	油门踏板	accelerator pedal	1	5V	F9-F10			
	3	G		发电机	alternator	1	engine assort	E3-E4			
AC	2	M1		起动机	starter	1	engine assort	D4-D5			
	1	GG	NC9321-700002-000	蓄电池	Storage battery	2	12V/90Ah	D2			
	序号	项目代号	图号	中文名称	英文名称	数量	技术参数	序号位置			
AD											
AE	标记	处数	更改文件号	签字	日期						
	设计			审核							
	校对			批准							
AF	工艺			制图							
	标准			日期							
1	2	3	4	5	6	7	8	9	10	11	12

CPCD120-XXW96 Electrical system diagram 6 (new)

X. Overhead guard disassembly and installation

Overhead guard disassembly way:



1. Right gasket	2. Washer 8 (10piece)	3. Washer 8 (10piece)	4. Bolt M8×35 (2)	5. Sleeve
6. Cushion collar	7. Bolt M6×25 (4piece)	8. Left gasket	9. Handle	10. Nut M10
11. Washer10	12. Bolt M6×35 (4 piece)	13. Beam assembly	14. Bolt M8×25 (6 piece)	15. Instrument stand and overhead guard
16. Cover plate	17. Bolt M6×12 (8 piece)	18. Washer6 (8 piece)	19. Inlet vent	20. Pipe clamp
21. Hose	22. Thrust ring	23. Bottom beam assembly	24. Washer10	25. Bolt M10×25
26. Nut M8	27. Rearview mirror assembly	28. Mounting plate	29. Washer6 (4 piece)	30. Washer6 (4 piece)

Fig.10-1 Overhead guard

Dismantle way:

1. Park the truck on flat repair station, place the gear in neutral, pull up the hand brake and the engine shut down.
2. Dismantle instrument stand connected left shield, right shield and rear shield.
(Note: push inward when the button is released)

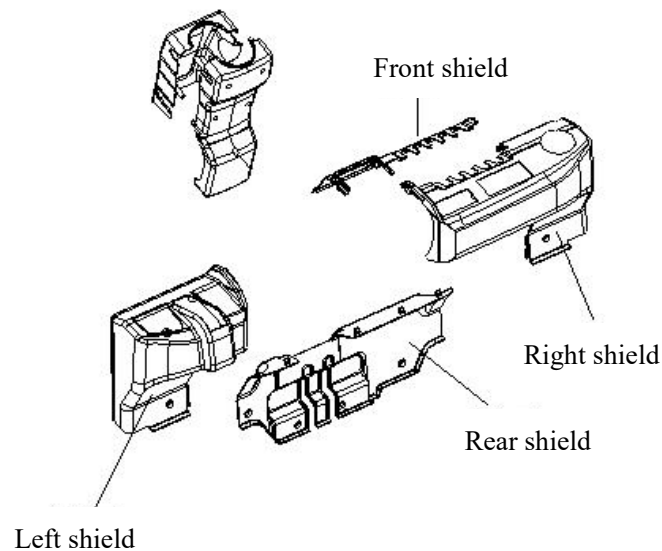


Fig.10-2

3. Dismantle pedal pad, rear base plate and front base plate.
4. Disconnect right shield connected fan, alarm light(optional) switch wire.
5. Dismantle 2 bolts of inner side of left and right landing leg.
6. Open the engine cover
7. Dismantle 2 bolts of inner side of left and right landing leg.(manual wrench)
8. Dismantle auxiliary water tank of rear right leg, and dismantle 2 fixed tightening bolts.
9. Hoist the overhead guard lightly, and dismantle 4 landing leg wires.
10. Hoist lightly

Installation is opposite to dismantlement, tightening torque of 8 bolts in place 4 is $T=137\text{ N} \cdot \text{m} \sim 167\text{ N} \cdot \text{m}$.

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