NOBLELIFT

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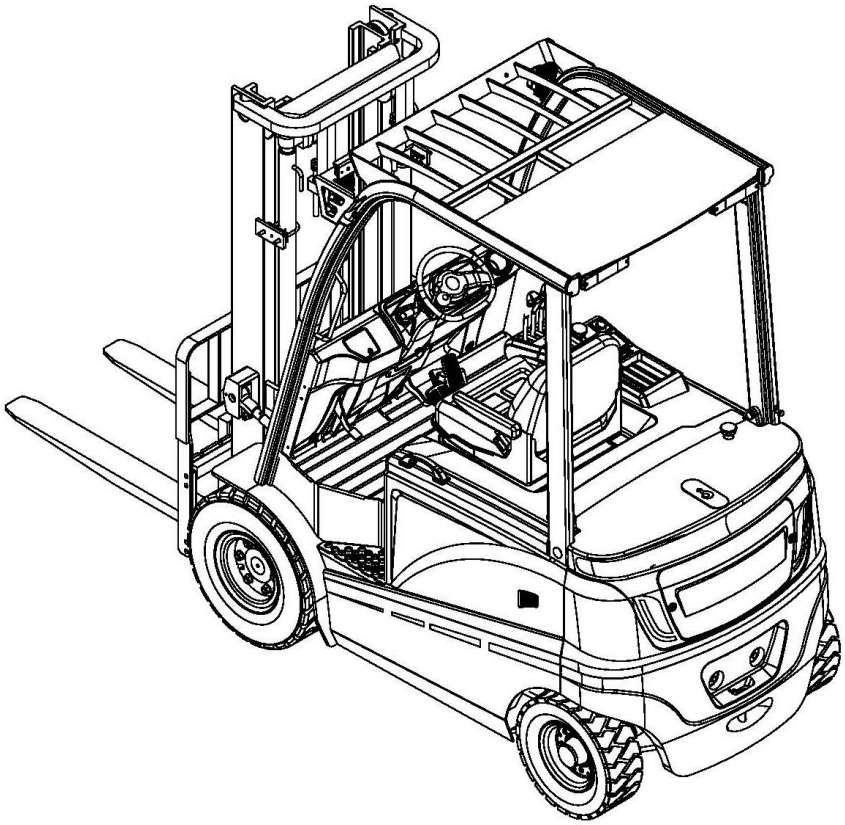


FE4P16-35N-SMS-001 Service Manual

Battery Weight Balanced Forklift

WARNING

Do not use the pallet truck before reading and understanding these operating instructions.

NOTE:

- Please check the designation of your present type at the last page of this document as well as on the ID-plate.
- Keep for future reference.

1.General

2.Electronic System

3.Driving/Braking System

4.Hydraulic System

5.Lift/Tilt/Auxiliary System

9.Battery Charger

1-1 How to use this manual

1-1-1 Composition of this manual

This service manual mainly provides engineers and technicians service information for forklift repair and maintenance, which excludes vehicle operation instructions.

The introduction section of this manual introduces the functions of the vehicle with particular attention to its different components. More detailed specific information are available in the main body of this manual for you, including the schematic diagram of the vehicle components, the principle they work, the check lists, the maintenance procedures as well as the data and information as needed for maintenance and repair

To facilitate a quick and easy access to the services and training information as required by the readers, the sections of this manual are categorized as per different systems of the vehicle (Please refer to the table below).

Section	Headings
1	General
2	Electronic System
3	3 Driving/Braking System
4	Hydraulic System
5	Lift/Tilt/Auxiliary System
6	Steering System
7	Schematic Diagram
8	Miscellaneous
9	Battery Charger

1-1-2 Definitions of Warning Signs

The following three warning signs are applicable to this Manual: "Danger", "Warning" and "Caution". Each label is intended to indicate the severity and nature of the potential hazard, the consequences, as well as preventive measures against hazards. You will find these signs throughout this manual. Please ensure your careful attention to such signs, as they are included for your safety intensively.

⚠ Danger

This signs represents a dangerous situation that could result in death or serious injury if not avoided

⚠ Warning

This signs represents a dangerous situation that could result in death or serious injury if not avoided

⚠ Note

The label indicates a dangerous situation that could result in minor injuries if not avoided

1-2 Glossary

The terms referred in this service manual and their descriptions are as follows.

Item	Descriptions
Accelerator	A device that converts mechanical motion to an analog voltage mode and transmit to a controller to control the speed at which a vehicle is driven
Actuator	A device (e.g. a hydraulic cylinder and motor) that converts hydraulic power into mechanical force and motion.
Ampere (A)	A measurement unit of current. The current of a voltage passing through an ohmic resistor.
Battery	Two or more batteries which are inter-connected with each other to provide current.
Coulomb meter	(Battery Discharge Indicator) an electrically controlled display that shows the operator the current charge of a battery.
Busbar	A re-conducting conductor that wired to other smaller conductors.
Communication Modes	CAN (Controller Area Network) is the standard for communication among microcontrollers and/or devices.

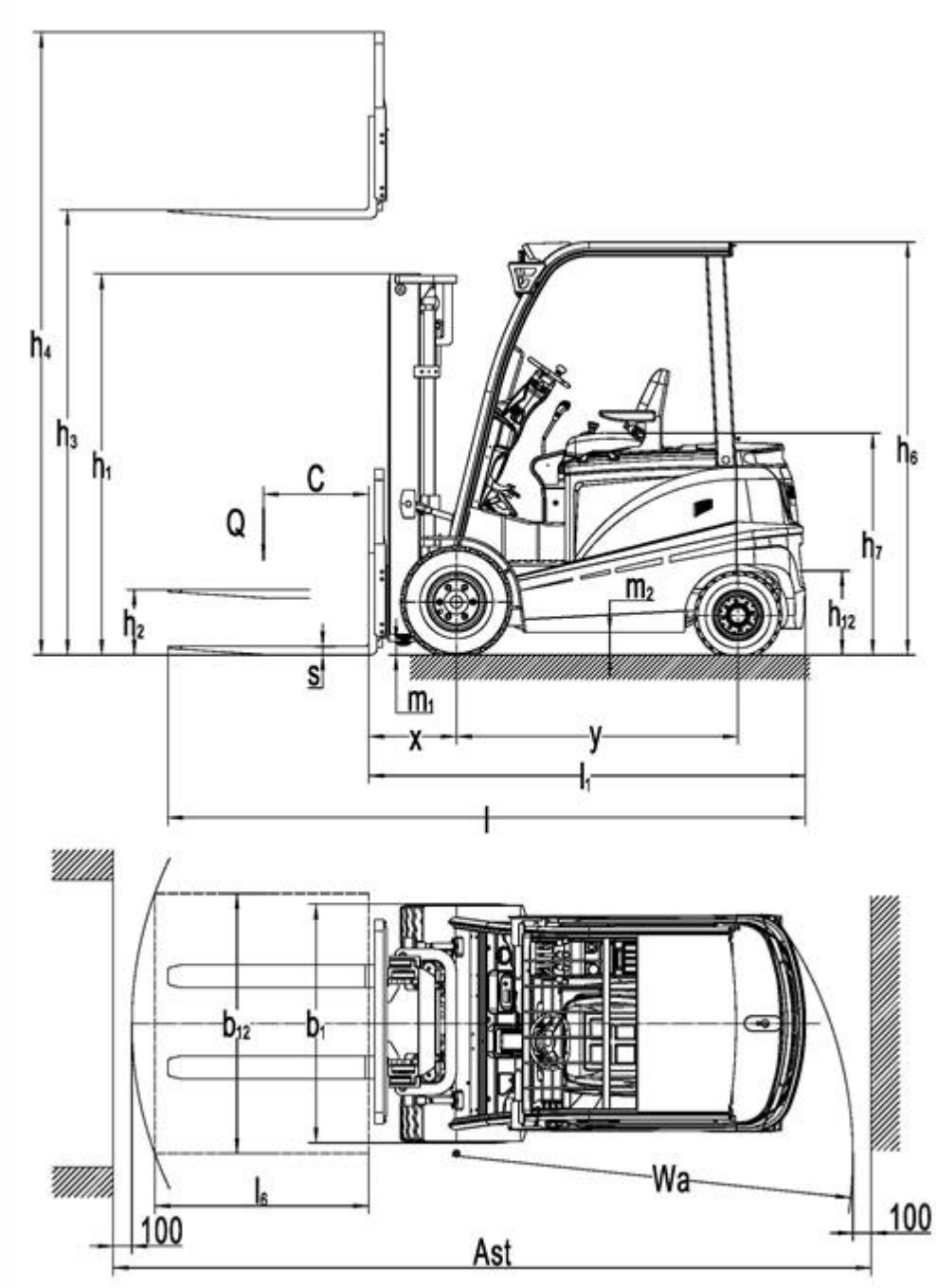
Condenser	A device for short-time electrical energy storage.
Goods Holder	A supporting structure on which a fork is mounted
Check Valve	A valve that allows oil to flow in one direction rather than in the other
Circuit	A path along which The current can travel from the positive (+) side of the source to the negative (-) side. This can be obtained with wires and electrical components.
Connector	A part of a wire assembly or harness wired to another wire assembly or harness to for a easier Disassembly and Assembly operation.
Co-contactor	A switch, relay, or part of a contactor that opens or closes a circuit.
Components of Co-contactor	An electrical element consisting of an electromagnetic coil and a set of heavy contact tips, which controls current flow through the coil, create a magnetic field, and close or open contact tips
Coil of Co-contactor	An electromagnet used to open or close contact tips in a contactor component.
Control Valve	A valve unit includes multiple directional blocks, each of which has a corresponding actuator
Counterweight	The weight mounted on the back of the forklift to ensure a stable status, especially when lifting heavy loads
Current Limiting	The maximum permissible armature current of the stopped drive motor during the pulse.
Oil Cylinder	A container that maintains pressurized oil and converts hydraulic power into rectilinear motion
DC-DC Convertor	A device that converts a high-voltage DC onto a low-voltage DC.
Digital Signal	A signal in which the element can be either of two different values, e.g.high voltage and low voltage.
Diode	A semiconductor device that allows current to flow from the anode to the cathode in one direction
Directional Valve	A valve that directs the flow of oil according to the position of the valve element.
Instrument	An electrical device that converts an voltage input into an visual output.
Drive Axle	A device that receives power from a driving motor
Driving Controller	A control device to drive an electric motor, which includes an inverter and a logic circuit.
Handheld Programmer	A maintenance tool program to calibrate and diagnose CURTIS controllers of trucks.
Parking Brake	A pair of brakes that electromagnetically activate their respective motors upon the stationary of the vehicle.
Encoder	A device that detects the direction and speed of a motor to produce a pulse signal.
Fan	A device that generates an airflow to cool an electric motor and a

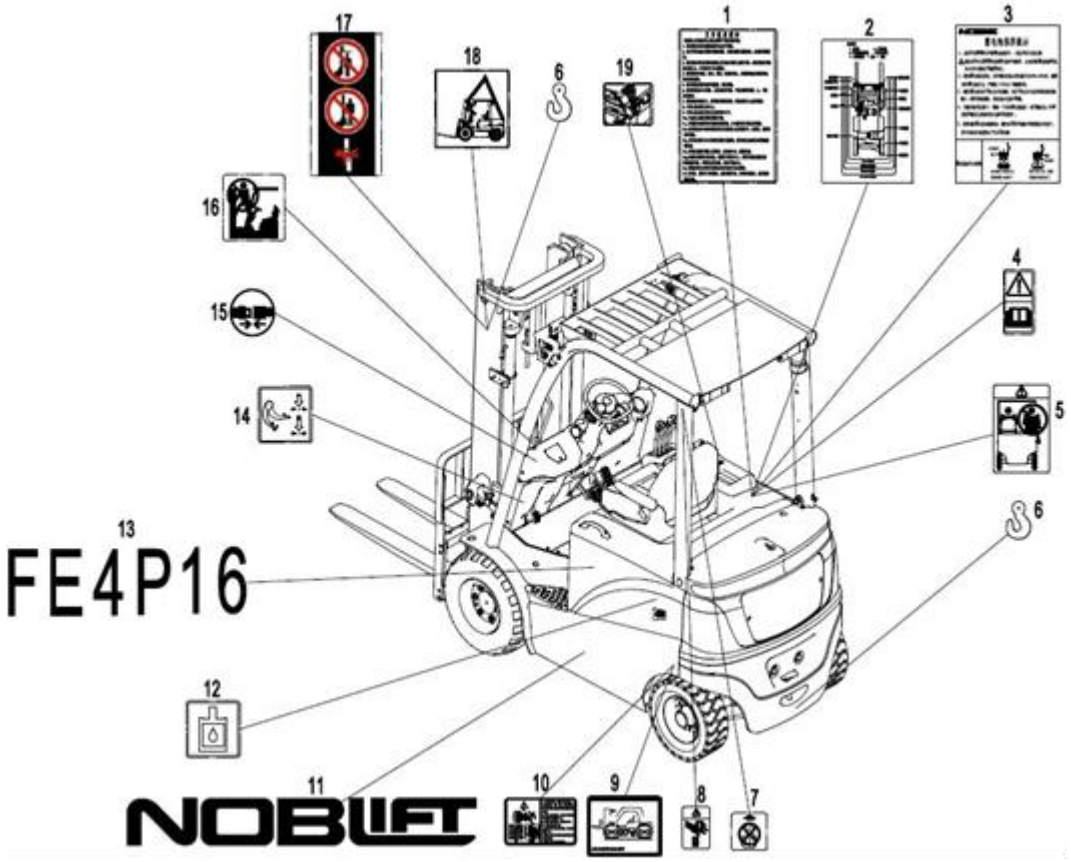
	controller.
Filter	A mechanical device used to accommodate a filter element, or a filter device used to prevent contamination flow through a system
Flow Protector	A valve that prevents the hydraulic oil extraction of the control valve from the lifting cylinder when the hydraulic line breaks unexpectedly, which prevents the backstay from dropping suddenly.
Flow Regulator	A valve that reduces the pressure by limiting the flow of a hydraulic line
Pallet Fork	L shape rod for cargo pickup
Friction Plate	When meshing with helical gears, the friction disc stops the drive shaft movement when it is compressed by the steel plate
Fuse	A component of a circuit that opens upon an overlarged current flowing through a given part of the circuit
Fixture	A fitting o secure an assembly consisting of two or more wires
Radiator	A mounting frame for cooling semiconductors.
Hydraulic System	A hydraulic element circuit to convey oil pressure
Hydraulic Oil Tank	A chamber for the oil storage in a hydraulic system
Mandatory Sign	A symbol indicating the state of a vehicle when it is on or flashing.
Seat Switch	A switch to disable the vehicle movement when the operator leaves the seat.
Main Hydraulic Pump	A gear pump uses mechanical power from an electric motor to pressurize the oil stored in a tank and distribute to various actuators
Portal	The front vertical structure of the forklift extends and retracts to lift and lower the load.
Master Cylinder	The hydraulic cylinder which is responsible for the start-up of the driving brake
Needle Valve	A valve to lower the backstay manually when the lifting lever is not available.
Normal State	A term used with switches or relays. Their "normal state" means that they are not under any control of stress,temperature, pressure or electricity.
Ohm (Ω)	A resistance unit. The resistance will be such that one volt shall push one ampere of current through it only.
Timely	The time it takes for a current to flow through a transistor.
Open Circuit	A connection or component of a circuit without continuity.
Hole	A limited passage in a hydraulic circuit, including a limited flow or pressure generation in a given chamber (e.g. a small bore).
Top Cover	A overhead frame structure which protects the operator from falling objects
Overload	A condition that the existing voltage or current is greater than the capacity of a given circuit or component.
Piston Rod	A part that push oil into the cylinder chamber

Suffocated	The part of an electric brake in which the current generated is directed back to the armature.
Port	An input or output point on a hydraulic element
Power Socket	A connecting socket that installed on the forklift.
Pressure	a fluid force as per unit area
Proximity Detector	A sensor which can detect the presence of objects nearby without any physical contact.
Pump Controller Unit	A control device for a hydraulic motor, which includes an inverter and a logic circuit.
Safety Valve	A valve that limits the pressure of the hydraulic system by releasing excess oil
Resistance	A component made of a material with a specific current impedance.
Return Filter	A filter to collect contaminants in oil returned to a hydraulic tank
Rotor	A part of rotating motor.
Outline	A bar chart of an electrical or electronic component that uses symbols to show the individual components as well as how the wires and connectors work electrically
Serial Port	A port that communicates one-to-one with the controller.
Service Brake	A pair of brakes built into the drive shaft to enable the vehicle when the operator applies the pedal for stationary
Short Circuit	An unwanted electrical connection between two or more components.
Side Shifter	An accessory that moves the fork and its load to the left and right
Socket	The male contact of the connector which slides over the male contact of the other connector (pin).
Magnetic Valve	A directional valve that moves the valve element when the magnetic coil is equipped with a magnetic valve.
Solid State	A term that refers to semiconductor components or circuits that wired without moving parts, e.g. diodes and transistors.
Stator	a fixing part in the motor
Steering Shaft	A column that connects the steering wheel to the steering gear to allow the operator to use steering wheel controller
Jociey Stick	A hydraulic component that deliver oil to the right or left side of the steering cylinder as required by the operator
Steering System	Hydraulic element loop, including steering unit, circuit and actuator
Steering Gear	A axle mounted on the rear wheel of a vehicle
Switch（SW）	The component to control a circuit by opening or closing the circuit.
System	Electrical components, circuits, and connections that provide power for specific tasks.
Thermal Sensor	a sensor activated at a pre-conditioned temperature.
USB	A connecting device providing a power supply of 5V.
Valve	A component that controls the pressure, direction, or velocity of a

	hydraulic system
Voltage	A measurement unit of electrodynamic force. A volt is the force that required for an ampere of current to pass through an ohmic resistor in a circuit.
Watt	A unit of power measurement. The power for one volt to push one ampere of current through an ohmic resistor. The outcomes of amperage (current) multiplied by volts (voltage) is watts (power).
Wire	A path of conductors to provide for current flow in and out of different electrical components.
Wiring Diagram	A visualized figure that represents a component in the way it actually looks. which is used to show the locations of components, and the connections between them.
Zener Diode	A special diode to regulate voltage or protect a system from overvoltage.

1-3 Appearance and Specifications

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NOBLIFT

Model	FE4P16 N	FE4P25 N
Drive Mode	Electromotion	
Operating Mode	Seated	
Rated Capacity of Load Q(kg)	1600	2500
Center Distance of Load C(mm)	500	
Front Overhang x(mm)	381	381
Wheel Base y(mm)	1360	1360
Self weight with battery kg	3120	3120
Bridge load of full load, front/rear kg	3950/770	3950/770
Bridge load of empty load, front/rear kg	1470/1650	1470/1650
Front Wheel Size	6.50-10-10PR	
Rear Wheel Size	5.00-8-10PR	
Front wheel tread b_{10}(mm)	970	
Rear wheel tread b_{11}(mm)	920	
Portal inclination (forward/backwarding)α/β(°	6/10	
Retraction Height of Portal h_1(mm)	2025	
Retraction height of free lifting h_2(mm)	130	
Lifting height h_3(mm)	3000	
Extension height of Portal h_4(mm)	3985	
Height of overhead guard h_6(mm)	2190	
Height of seat h_7(mm)	1100	
Height of traction pin h_{10}(mm)	295	
Total length	2981	

l_1(mm)		
Length of body(to pallet fork end) l_2(mm)	2061	
Total width b_1(mm)	1150	
Size of pallet fork s/e/l(mm)	35/100/920	
Width of fork arm carrier b_3(mm)	970	
Wheelbase centre clearance from ground m_2(mm)	110	
Radius of turning Wa(mm)	1880	
Running speed(full/empty) Km/hr	13/15	
Lifting speed(full/empty) m/s	0.32/0.42	
Lower speed(full/empty) m/s	＜0.6	
Gradeability(full/empty) S_2 5mins %	13/15	
Drive motor S_2 60min kilowatt	6.8	
Lifting motor power S_3 15% kilowatt	8.6	
Battery voltage/capacity K_5 V/Ann	48/400	
Weight of Battery kg	695	
Working pressure of accessory MPa	17.5	
Oil mass of accessory Litres/minute	36	

1-4 Safety Notes

The following safety sections contains the following subsections: general, personal safety, maintenance safety, compressed air hazards, hydraulic oil hazards, mechanical hazards, electrical hazards, and fire & burning hazards. Each heading are attached with the precautions you should take for your safety while working in your vehicle.

Readers are advised with responsibility to read this manual thoroughly, and understand and follow all the following precautions. Please also note that the safety instructions listed below are not only for the safety of the readers, but also for those around them. Therefore,, please be sure to read the following instructions carefully for the purpose of your own personal safety and the safety of those around you:

General

Safety Instructions

Please be familiar with the visible safety instructions on the vehicle, which includes warning signs, stickers, carvings, etc. Make sure to read the them before operating, lubricating, or repairing the vehicles (Please refer to the safety section of the Operations and Maintenance Manual).

Make sure that all safety rules, regulations and instructions are followed when performing maintenance tasks. Special attention is required to the danger warning in this manual, which will detail you the potential dangerous conditions.

Do not assume that you can replace the steps outlined in this manual with your previous maintenance experience of similar models. Weight and specifications vary from different models and care is required to avoid any dangerous condition, injury and/or component damage.

Personal Safety

Do not operate or service a vehicle without authorization or training

Do not operate or service a vehicle after alcohol or drugs taking which will impair your judgement.

If you have any disease or condition that restricts physical activity, please do not operate or service the vehicle.

Working Garment

If you are wearing baggy clothes or have long hair that is not handled safely, please do not operate the vehicle or carry out maintenance. Both can be caught by any moving part and cause serious injuries

Appropriate protective equipment is required when performing maintenance tasks. Protective gear may include a hard helmet, glasses/visor, ear protectors, gloves and protective shoes.

Masks are required when polishing the body

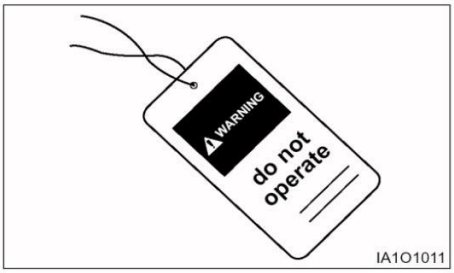
and an air breathing device is advised when painting.

Welder gloves, welding masks/goggles, aprons and other suitable welding clothing are required when welding.

Security of Service

Pre-service

Make sure that the vehicle is kept in a clean, open environment, and is free from any traffic and personnel.



Please ensure that the vehicle is parked safely and will not move suddenly.

Place the wooden props in front and back of the wheels and make sure that the parking brakes will mesh correctly.

Make sure that the vehicle is empty and unoccupied, the cargo forks are lowered, all the hydraulic controls are in neutral position and the key is switched to OFF. Place a "do not operate" or similar warning signs to the start switch or the controller before repairing or servicing the forklift.

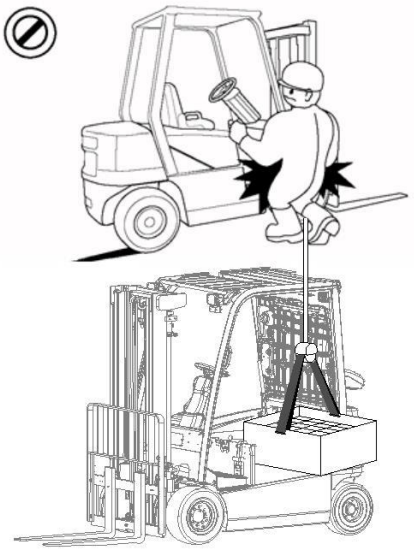
Make sure the tools are in good condition.

Disassembly and Installation

Make sure the working environment is clean, clean and dry before installing the vehicle.

When using steps, ladders or walkways for installation or removal, please face the vehicle.

Please follow these steps and grab the handle to install or remove parts.



When you are unable to follow these steps, please use a ladder, scaffold, or work platform to perform maintenance operations safely.

Work platform is advised to perform maintenance for safe operations.

Lifting

Check the weight of each component before removal. Partial components of the vehicle may so heavy that it may cause serious injuries

When removing any components, please use appropriate lifting procedures

A hoist is required avoid back injuries when lifting parts weighing 23kg (50lbs) or more.

Ensure all chains, hooks, slings and the like are in good condition and in correct capacity. Make sure the hook is positioned correctly. Lifting ring bolts

should not be loaded laterally during lifting operation.

Disassembly/Assembly

Make sure that the assembly/disassembly site is kept clean and dry and that hand tools are kept clean.

When tightening/loosening bolts and nuts, please use a properly sized wrench and always pull towards the body. A wrench with the wrong size or pushing off the body to loosen/tighten the bolt or nut may cause an accident as the handle slips.

If two or more people are working together, signs or signals are required for communication so that the work is done in an agile manner as if it were done by one person.

Be careful when removing the cover. Slowly loosen the last bolt or two opposite direction nuts from the cover plate unit, twist the cover plate to loosen tension or other pressure, and then completely remove the last bolt or two nuts.

Re-install all fasteners with the same numbered part. If any fasteners need to be replaced, please use qualified fasteners and be careful to not use metric system fasteners with British fasteners together.

Hazards of Compressed Air

Please wear protective mask, protective clothing and protective shoes in

cleaning operation。

The maximum air pressure for cleaning must be less than 205 kPa (30 psi).

Hazard of Hydraulic Oil

Please follow the following safety instructions for hydraulic system maintenance carefully.

Oil removal under pressure, even if the pinhole size leaks, can penetrate the body elements and cause serious damage and possibly death.

Please wear gloves, goggles, and make sure that your arms and legs are completely covered.

Release all pressure from the hydraulic system before disconnecting or removing any piping, fittings or related item, and wait for the runner system to cool down.

Do not touch the pressurized hose by hand, or bending or striking.

Do not check pinhole leakage by hand, which is the most common method of oil-related injury! Please use cardboard or other solid surfaces instead.

When removing the filler cover, vent and plug, please place the cloth on the port to prevent pressured liquid spraying or splashing

A container shall be Prepared to capture any hydraulic fluid that may flow from the hose/port.

Make sure that all raised components are properly locked.

When reinstalling lines, make sure tighten them to the correct torque, and

ensure that all heat shields, fixtures and guards are properly installed to avoid overheating, vibration or friction with other components during operation.

Lines must be installed correctly to prevent oil from being sprayed into the shield on the hot exhaust components in case of any pipe or seal failure.

Mechanical Hazards

Keep all the objects away from the fan blades, or they will throw or cut any object or tool that falls or is pushed in.

Do not operate the machine when any rotating parts are damaged and do not touch any other parts during the operation. Please check the balance of any damaged or changed high-speed rotating part before re-use.

The equipment shall be properly supported and the component shall installed when working under the vehicle.

Do not expect the hydraulic cylinder to be always mounted. If the control lever is moved or the hydraulic line breaks, any accessories may fall off.

Debris or other debris will fly away from the object upon impact. Make sure the flying debris doesn't hurt anyone before hitting the object.

Electrical Hazards

Do not damage any wire during disassembly operation. When re-installing wiring, make sure it is installed correctly

Do not wire to any oily cable.

Do not smoke or expose batteries to any spark or flame when checking, charging or repairing the batteries.

The chain and metal tools shall be kept away from the top of the battery.

Electrolyte is an acid that can cause injury if it comes into contact with the skin or eyes.

Fire and Burning Hazards

Attention shall be paid to the hot parts on the machine that has just stopped and to the hot oil in the pipes and compartments to avoid scalding.

All hydraulic oils, many lubricants and some coolant mixtures are flammable. If the pipe is loose or damaged, there may be a fire.

All hydraulic oils and lubricants shall be stored in appropriately marked containers and be away from unauthorized personnel.

All oily rags or other flammable materials shall be stored in a protective container and kept in a safe place.

Do not weld or flame cut pipes or pipe containing easy fuel.

Before welding or flame cutting, please clean them thoroughly with a

nonflammable solvent.

Remove all residual flammable materials from the forklift and then collect, like fuel and oil.

1-5 Maintenance

The following provides the key items and replaceable components to be checked during maintenance intervals.

Note: all maintenance and repair should be carried out by a qualified authorized engineer except for the routine inspection of the vehicle driver.

Note: careless disposal of waste oil is not only harmful to the environment, but also to human health. Waste oil should always be kept in containers and disposed of by authorized personnel at a designated locations.

Necessary Check as Required

Item	Inspection Standard and Method
Instrument Board	Press Enter You can access diagnostic mode by pressing this button while driving
Idler Wheel of Goods Holder	Measure the distance from the bottom of the inner frame to the bottom of the sliding frame bearing to ensure a upright inner frame and then adjust the squeezed roller.
The power module	must be fully discharged before contact with any electrical components.
Fuse Holders	Check the removed components fuses and replace if necessary. 5A：Backup/parking light, relay/power supply, fan, strobe, flash, rear/headlight 10 A：key switch 20 A：DC-DC Convertor and Horn 500 A：main fuse
Operator's Seat	Check that the operator's seat for proper working and gently lubricate the slider track.
Wheel bolting	Make sure that the wheel bolts and nuts are fixed as follows: Tightening torque of rear wheel : 430 Nm Tightening torque of drive wheel：600±75 N·m（442.5±55 lb·ft）
Drive axle gear box	Check gear box for lubricant Refill the lube oil into the plug opening for shell level inspection.

Check every10 service hours or daily

Item	Inspection Standard and Method
Check by walking around	Check for loose parts and fasteners. Check the indicator lights of instrument board for abnormalities. Check if the speakers and other alarms are working properly. Check if the frame and lifting chain are worn and if the pins/rollers are abnormal. Check rack, fork and accessories for damage and abnormality. Check tires, valves and wheels for abnormalities. Check the ceiling for damage and abnormality. Check the hydraulic system for oil leakage and damage. Check the drive axle for oil leakage. After adjusting the driver's seat and placing the control lever in neutral, please open the key switch and check the overall operation of the system.
Portal	Lubricate the beam where the roller is.

Battery	Check the battery box for loose connections, worn cables and limits on properly secured battery limits. Clean the top of the battery. If necessary, clean the top of the battery with a solution of 0.5 kilograms (1 pound) of baking soda and 4 liters (1 gallon) of hot water. Check the density of the battery. If the specific gravity reading is below 1.150, the battery must be charged. Check the electrolyte levels of all cells. Keep the electrolyte level about 13 mm (0.50 in) above the plate. Add water as needed. Use distilled water only. Water should be added to the battery after charging
Indicator lights of instrument board	Check whether the parking brake light is working normally and all the indicator lights
Tyres and wheels	Check tires and wheels for wear, cutting, grooves and contamination.

First check shall be made after 50-100hours or a week later

Item	Inspection Standard and Method
Drive Axle	Replace gear oil

Check every 500 service hours or ever 3 months

Item	Inspection Standard and Method
Tilting cylinder	Lubricate chassis and door frame pivot bolt fittings. Check pins for loose retaining bolts or worn. Measuring and adjusting the extension of cylinder rod (Max. 3.18mm / 0.13in) Standard tightening torque of bolt：95±15 N·m（70±11 lb·ft）
Crosshead roller	Check crosshead roller guard and retainer for damage.
Portal, chain and accessories	Check if the lifting cylinder, tilt cylinder and the attached controller are in normal operation. Check the rack bolts and nuts for looseness and remove contaminants if any. Check the pallet fork and accessories for proper operation. Lubricate all chains with a brush and check for abnormal anchor points.
Steering Shaft	Accessories to lubricate the steering shaft.
Drive Axle	Replace gear oil
Control Panel	Clean control panel. Maximum allowable pressure：205 kPa（29.7 psi）
F / R switch	Check the tightness of the F/R switch mounting bracket and adjust as

	needed. Check for loose wiring and secure it as needed.
Parking Brake	Check the parking brake to ensure that the vehicle is stationary at a 15% gradient and repair or replace if necessary.
Hydraulic Oil	Check the hydraulic oil level and refill if necessary.

Check every 1,000 service hours or every 6 months

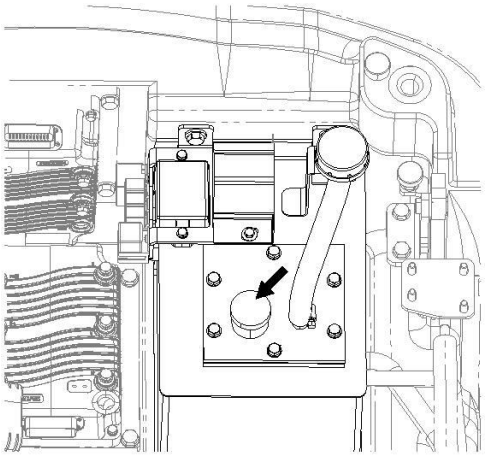
Item	Inspection Standard and Method
Drive and hydraulic pump motor	De-dust and check drive motor and end cover area. Maximum allowable pressure：205 kPa（29.7 psi）
Hydraulic oil return filter	Replace the return oil filter in the hydraulic tank.
Tyres and wheels	Check tires for worn, cuts, grooves, contaminants and the like. Check the wheel components for cracks, wear, damage, corrosion and the like. Standard torque of drive wheels：180 N·m （133 lb·ft）
Lifting chain	Perform the lifting chain wear test by measuring the wear of the link and pin.

Check every2,000 service hours or annularly

Item	Inspection Standard and Method
Hydraulic System	Replace hydraulic tank and filter.
Rear wheel	Remove and assemble the rear wheels to re-assemble the bearings.
Basic maintenance	A regular check-up shall be made at least every 12 months under normal circumstances. If the vehicle are working with long hours or under heavy load, please check the vehicle every 6 months in regularly. If any of the following conditions are found, please replace: the crack healing on the fork, welding, bracket and the like

1-6 Lube

The following is a detailed description of the lubricant as required and the parts to be lubricated.



1-6-1 Lubricating Oil Specification

The following lubricants are recommended for chains and connecting rods:

Item	Specification
1	DIN 51825 Standard Oil and Grease

Hydraulic Oil （HYDO）

Hydraulic oils shall be qualified with anti-wear, anti-foam, anti-rust and anti-oxidation additives

for heavy duty use as described by the oil supplier. ISO viscosity grade 46 is usually preferred.

Note: the correct hydraulic oil should be used to for the maximum service life and performance of hydraulic system components. The above hydraulic oils are recommended for most hydraulic and hydrostatic systems.

If the hydraulic fluid becomes cloudy, it is evidenced that the water or air has

entered the system. Water or air in the system will cause pump failure.

Drain all hydraulic oil, re-tighten all hydraulic suction clamps, and then clean and refill the system.

Gear oil

Failure to comply with recommendations will result in excessive wear of gears leading to shortened service life.

API GL-4 or SAE 80W oil is acceptable

Note: Noblelift does not mix multi-stage oils for transmissions. Multistage oils with high molecular weight polymers as vi improvers lose their viscosity effectiveness due to the permanent and temporary shear of vi improvers and hence are not recommended for use in drives and compartments of drive system

Brake oil

Heavy duty hydraulic brake oil that certified by qualified supplier is required

1-7 Instructions of Disassembly/Assembly

The following parts of Disassembly/Assembly include the following sections: the preparation before disassembly,

the inspection and test before disassembly, the matters to be attended during disassembly, the matters to be attended after disassembly, the matters to be attended during assembly, the handling of common parts and hydraulic piping fittings.

The precautions to be taken for proper disassembly/assembly operations are listed in each heading.

Preparation before disassembly

Remove dust and contaminants from the vehicle before transferring to the maintenance centre. Dust or contaminants that enter the maintenance centre may contaminate parts and enter inside to introduce scratches. The electric forklift are operating on an electrical system.

No water shall be allowed inside the system.

To avoid unnecessary disassembly, please prepare necessary tools and place parts inside boxes with priority to site cleaning

Check and test before disassembly

Be sure to record any problems before starting the disassembly, which can prevents unnecessary disassembly, loss of replacement parts, and repeated failures as caused by the same problem.

To prevent failures, record failures and replace required parts are required.

The following information shall be also checked and recorded:

Vehicle model number, serial number and operation hours

Reasons of the vehicle needs to be dismantled

Check for symptoms, locations and causes of failures (repeat the same failure if needed)

Check any part which is not suitable.

Check the parts for damage or looseness.

If possible, check the maintenance condition of the vehicle.

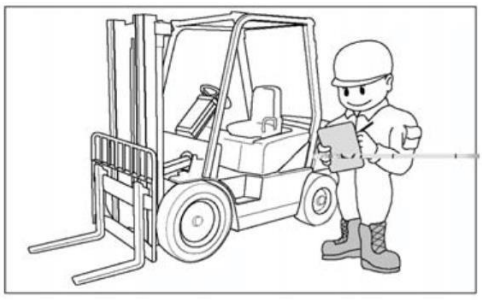


Figure1-17

Notes for disassembly

Disassembly：

Determine the way of parts assembly (front/rear, left/right and up/down) for the sequence of disassembly.

Before starting to disassemble parts, attention shall be paid to the join points of parts with arrow marks to avoid misplacing parts during assembly

Please use the right tools to remove specific parts.

If no part is removed, even when mounting bolts and nuts, do not use excessive force.

Do not overstrain. Check and find the causes

Put the disassembled parts on one side in the order of disassembly, and place signs or marks on similar parts.

Store bolts, nuts and other common parts in an orderly manner.

Check and test in disassembly

The cause of the fault is sometimes found in the process of disassembly.

Therefore, it is important to carefully examine the condition of the friction surfaces and the contact parts.

During disassembly, gaps, deformations, projections and other factors that may cause failures shall be measured and recorded.

Keep the distance

Make sure that the installed spacers and gaskets will produce the required specific clearance.

Remove pressure fittings

Remove any dent or mark that caused by area hammering and polishing.

If any pressing part is released, please identify and eliminate the cause to avoid problems during assembly.

Bearing Disassembly

Do not remove the bearing forcibly, and a bearing puller is advised.

Notes after disassembly

Be clean

Clean disassembled parts and keep them away from contaminants.

Special attention should be paid to removing contaminants from the oiling or component lines.

When cleaning special parts, increase the number of detergent containers and clean several times.

Kerosene or neutral anhydride diesel is suitable for cleaning viscous oils in bearings.

When using dangerous chemical cleaners, be careful to avoid a skin or eye contact.

Used oil should be disposed of in designated containers at designated locations.

Dustproof

A dust cover is advised to keep cleaned parts free of dust and contaminants and to block up the ends of all pipes.

Any part you may store should be rust-proof before re-installing.

Notes for assembly

Parts installation

All parts shall be kept clean before assembly. All surfaces shall be checked for defects and repaired if necessary. Any contaminant shall not be smeared or rubbed on the surface, which may shorten the service life of the parts.

Before starting assembly, a cleaner is required to remove the rust inhibitor from the parts.

Before assembly, the markings that put the parts together shall be identified.

Bearings, bushings, and seals shall be assembled with press tools and specific parts shall be handled with specified tools.

Before pressing parts, the surface shall be lubricated with lube.

Tighten the bolts and nuts

To ensure a uniform torque of bolts and nuts, the tighten order shown in figure 1-19 shall be followed and then the other end of the other side shall be tightened. This method is known as the "template method", which gradually repeats loosening and fastening to ensure even contact.

Fix the bolts, nuts or other important fasteners that cannot be visually inspected with wires, cotter pins, lock washers or other components as shown in figure 1-20.

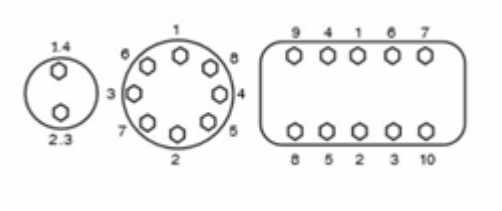


Figure 1-19

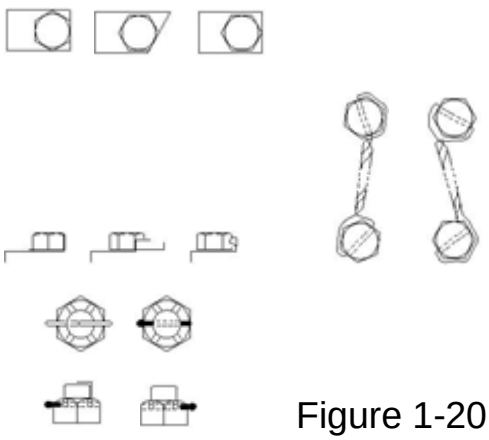


Figure 1-20

Assembly Inspection

At each step of the assembly process, each part's number shall be checked and recorded.

Reassemble the gaskets

Install the gasket and washer in the same position as before, and then check the gap for correctness.

Assembly adjustment

If no adjustments are required, assemble them to the same length as before

Assemble pressed parts

Scratches and dents shall be repaired as needed and be kept clean before insertion.

Please note that press fittings that are not adequately tightened may become loose.

Assemble keys and keyways

Check if the keyway and key are loose and in contact with the key head. If the keyhead touches the keyway, then the rest of the keyhead shall be removed.

Handling the general parts

Handling the packaging

Packing, as well as gaskets &copper packing should be replaced as instructed. After using the adhesive, please assemble the gasket specified in this maintenance manual. The followings shall be noted when applying the adhesive to the gasket:

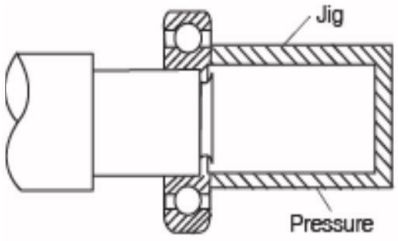
Old adhesive, scratches, dust, paint and grease shall be thoroughly removed from the washer surface.

Apply appropriate sealant evenly to both sides of the washer and wait a few minutes until dry.

Once the sealant is dry enough to touch, it won't stick to your hand.

Assemble the parts

Please soak the leather package in oil before use.

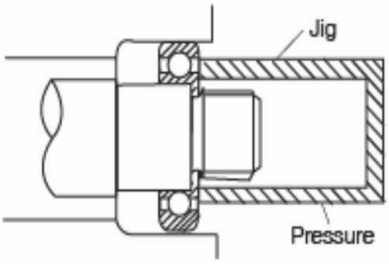


Handling the O-rings

Please remember to check the condition of the O rings.

Hardened O-rings shall not be stored for long.

The O-rings to be used shall be the specified once in



the parts list. For example, the O rings used in engine oil are made of special materials, such as silicone rubber, and are resistant to heat and aging.

Installing different types of O-rings in this situation can cause serious damage to the system and its components.

The O-rings shall be lubricated to avoid surface scratching during installation. Silicone rubber O rings are prone to damage, hence attention is required to avoid overstretch.

Handling the oil seal

Oil seals shall be prevented from dust sedimentation, especially on the lips, and there shall be no rust or scratch.

Lips opposite to the seal shall be lubricated evenly.

The surface of the shaft where the seal is installed shall be checked for contamination, rust, or scratches and grease or lubricant shall be applied so that the seal can be easily installed.

Oil seal installation.

By gently rubbing the wire on the surface, please check the surface of the oil seal lip for scratches.

If there is any scratch, please replace the oil seal.

When inserting the oil seal, please use the guide device and fixture as shown in figure 1-22 to avoid any damage to the oil seal.

After the oil seal is inserted, the inclination shall be checked (tilt tolerance: 0.2 mm /00 mm, diameter 0.008 in. /3.937 in.).When applying adhesive to oil seal, make sure that there is no adhesive in contact with the lip surface. All residual adhesive shall be removed from the guide and fixture before inserting another seal.

Bearing handling

The followings shall be noted to properly assemble bearings and avoid damage to bearings:

The dust and other contaminants that may shorten the service life of the bearing shall be thoroughly removed.

The bearing shall be kept packaged until it is installed.

Do not affect the bearing.

Do not over-turn the bearing to remove the purifier by compressed air.

The oil seal ring shall be installed in the correct direction.

Please note the following when installing the bearing.

Neither hit the outer ring with a hammer for installation, nor hit the inner ring to insert the outer ring. Such hammer strike may damage the bearing track.

When you are insert the inner ring of the bearing with a reasonable tolerance, the fixture shown in figure 1-23 is required with pressure to the inner ring. For

hot insertion, the bearing shall be heated to 120℃（248℉）. However, please note that excessive heating can reduce the hardness of the bearing surface.

When inserting non-split bearings with inner and outer rings with reasonable tolerances, the fixture shown in figure 1-24 shall be applied and both inner and outer rings shall be pressed.

Handle the retainer

When removing or installing the retainer, a pair of right ring tongs is required and attention shall be paid against over-pressure on retainer. After installing the retaining ring, the retaining ring shall be checked for correct insertion.

Hydraulic circuit fittings

1.For metal tube to hose installation, the tube shall be installed and all bolts shall be tightened by hands.

2. Tighten the bolt at the rigid end.

3. Install hose and tighten all bolts by hands

4 .Place all the hose in a position where it will not contact with the machine or other hoses.

5. Tighten the bolts at both joints

6. Start up the engine.

7. Move the control lever to full position.

8.Inspect the hose during tool movement. Make sure that the hoses do not contact any machines or other hose.

9. Shut off the motor

10. If necessary, place the hose in a new position so that it will not touch the position when moving the tool.

Fitting assembly with straight thread and O rings (for different applications)

1.Place the lock nut (3), support washer (4) and o-ring seal (5) as far away from the fitting body (2) as possible.

2. Tie the joints to the part it is using until the support washer (4) just touches the surface of the part.

3. Place the joint assembly in the correct position, and turn the joint body (2) outward to 359°(counter-clockwise) .

4. Tighten the locking nut (3) to the torque as shown in the correct diagram for the used fitting.

5. If the end shape of the fitting body is the same as shown in figure 1-25 (elbow or straight), please place the sleeve over the tube before connecting the tube to the end.

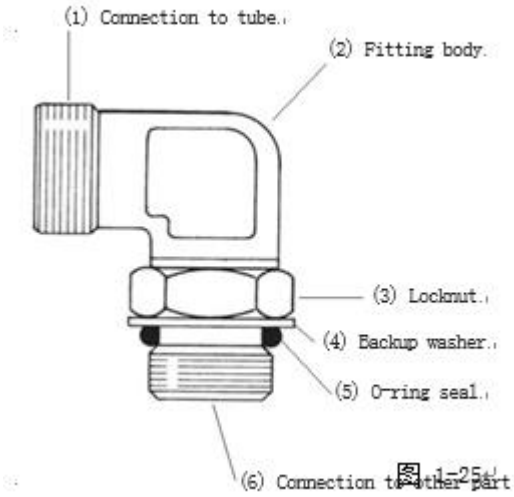


图 1-25

Note: if the joint is a connector (direct connector), then the lock nut on the main body shall be replaced by the hexagon nut. To install this type of joint, the hexagon joint shall be tightened to the surface of the parts into which it enters.

Tighten accessories of other types

Pipe fittings (shear sleeve) of high load: please turn the nut with a wrench until a slight reduction in torque is felt after the pipe passes through the nut and touches the shoulder in the fitting body, which indicates that the sleeve has been removed from the nut

High seal fittings: place the nut and sleeve on the pipes with the short end of the sleeve toward the end of the pipes. Press the pipe end against the counterbore in the body of the fittings and tighten the nut until it is above the last

thread of the body. As soon as the fitting is removed and reinstalled, the remaining space will be available.

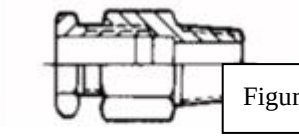


Figure 1-26

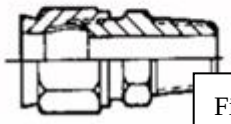


Figure 1-27

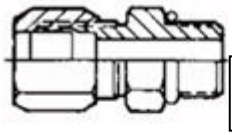


Figure 1-28

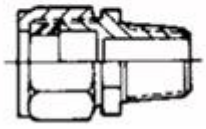


Figure 1-29

Flexible fittings: please place the nuts and sleeves on the pipes and push the pipes as far as possible into the countersunk holes of the fitting bodies. Tighten the nut until it touches the hexagonal part of the body.

1-8 Standard Torque

1-8-1 Standard torque of bolts and nuts

Be careful that the metric and British size fasteners shall not be mixed in used. Mismatched or incorrect fasteners may cause damages or malfunctions to the vehicle or personal injuries.

Exceptions to these torques may be provided in the service manual if required.

Before installing any hardware, make sure that the components are close to a new state. Threads of bolts and nuts shall not be worn or damaged. Hardware shall be free from rust and corrosion.

Hardware shall be cleaned with a non-corrosive cleaner with oil application to threads and bearing surfaces. Oil shall be not applied if thread locks or other compounds are to be used.

The fastener shall be kept in good condition and reused only in fine conditions after loosening.

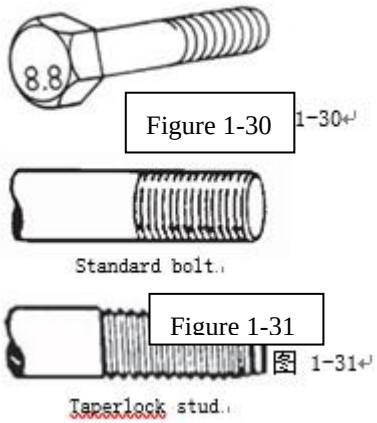


Figure 1-30 1-30

Figure 1-31 图 1-31

Make sure to choose the same size and grade of fasteners for replacement. Generally, you can identify the strength of the bolts based on the numbers

marked on the heads

(e.g. 8.8 or 10.9) as shown in figure 1-30. The following table are listing the standard torques for typical bolts, nuts and the taper bolts as shown in figure 1-31.

For metric fasten .

Thread size(mm)	Metric nuts and bolts		Metric taperlock stud	
	（N·M）	Pounds/feet	（N·M）	Pounds/feet
M6	12±3	9±2	8±3	6±2
M8	28±7	20±5	17±5	13±4
M10	55±10	40±7	35±5	26±4
M12	100±20	75±15	65±10	48±7
M14	160±30	120±22	-	-
M16	240±40	175±30	110±20	80±15
M20	460±60	340±44	170±30	125±22
M24	800±100	600±75	400±60	300±45
M30	1600±200	1200±150	650±80	480±60
M36	2700±300	2000±225	870±100	640±75

For British fasteners

Thread size(inch)	British nuts and bolts		British taperlock stud	
	（N·M）	Pounds/feet	（N·M）	
1/4	12±3	9±2	8±3	6±2
5/16	25±6	18.0±4.5	17±5	13±4
3/8	47±9	35±7	35±5	26±4
7/16	70±15	50±11	45±10	33±7
1/2	105±20	75±15	65±10	48±7
9/16	160±30	120±20	-	-
5/8	215±40	160±30	110±20	80±15
3/4	370±50	275±35	170±30	125±22
7/8	620±80	460±60	260±40	190±30
1	900±100	660±75	400±60	300±45
1 1 / 8	1300±150	950±100	500±70	370±50
1 1 / 4	1800±200	1325±150	650±80	480±60
1 3 / 8	2400±300	1800±225	750±90	550±65
1 1 / 2	3100±350	2300±250	870±100	640±75

1-8-2 Standard torques for fastening fittings

Standard torques for O-ring surface seal fittings

Thread size(inch)	Accessories for straight thread o-ring	
	(N·M)	Pounds/feet
5/16-24	5.0±1.5	45±15
3/8-24	12±2	110±20
2/7-16	20±4	15±3
1/2-20	40±5	30±4
9/16-18	40±5	30±4
3/4-16	100±15	75±10
7/8-14	135±15	100±10
1 1/16-12	200±25	150±20
1 3/16-12	250±25	185±20
1 5/16-12	300±40	225±30
1 5/8-12	300±40	225±30
1 7/16-12	300±40	225±30
2 1/2-12	300±40	225±30

Thread size(inch)	Sealing joint nuts for O-ring face	
	(N·M)	Pounds/feet
9/16-18	16±3	12±2
11/16-16	30±4	22±3
13/16-16	50±7	37±5
1 1/4-14	90±10	65±7
1 3/16-12	120±15	90±10
1 7/16-12	160±20	120±15
1 11/16-12	190±20	140±15
2-12	215±25	160±20

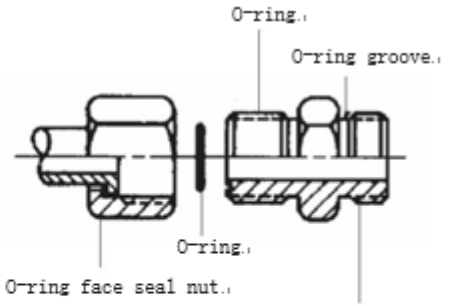


图 1-32

Hose clamp- belt type

Clamp width	New hose torque	Torque for re-tightening
7↵9 mm ↵ (0.312 in) ↵	0↵9±0.2 N·m↵ (8±2 lb·in) ↵	0.7±0.2 N·m (6↵ ±2 lb·in) ↵
13.5 mm ↵ (0.531 in) ↵	4↵5±0.5 N·m↵ (40±5 lb·in) ↵	3.0±0.5 N·m (25↵ ±5 lb·in) ↵
16.9 mm ↵ (0.625 in) ↵	7↵5±0.5 N·m↵ (65±5 lb·in) ↵	4.5±0.5 N·m (40↵ ±5 lb·in) ↵

图 1-33↵

37° bell and straight threaded O - ring accessories

Pic 1-34

图 1-34↵

37℃ bell and straight threaded O - ring accessories（Sealing accessories for O - ring surface are excluded）

Nominal pipe external diameter		Thread diameter（in）	Standard torque	
Metric	Inch	Inch	(N·M)	Ponds/Feet
3↵18↵	0.125↵	5/16↵	5.0±1.5↵	4±1↵
4↵76↵	0.188↵	3/8↵	11.0±1.5↵	8±1↵
6↵35↵	0.250↵	7/16↵	16±2↵	12±1↵
7↵94↵	0.312↵	1/2↵	20±5↵	15±4↵
9↵52↵	0.375↵	9/16↵	25±5↵	18±4↵
9↵52↵	0.375↵	5/8↵	35±5↵	26±4↵
12.70↵	0.500↵	3/4↵	50±7↵	37±5↵
15.88↵	0.625↵	7/8↵	65±7↵	48±5↵
19.05↵	0.750↵	1-1 / 16↵	100±10↵	75±7↵
22.22↵	0.875↵	1-3 / 16↵	120±10↵	90±7↵
25.40↵	1.000↵	1-5 / 16↵	135±15↵	100±11↵
31.75↵	1.250↵	1-5 / 8↵	180±15↵	135±11↵
38.10↵	1.500↵	1-7 / 8↵	225±15↵	165±11↵
50.80↵	2.000↵	2-1 / 2↵	320±30↵	240±22↵

45° bell shape and 45° inverted bell fittings

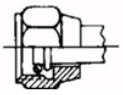

45° inverted bell


45° bell

1-35

45° bell shape and 45° inverted bell fittings				
Nominal pipe external diameter		Thread diameter (in)	Standard torque	
Metric	Inch	Inch	(N·M)	Ponds/Feet
3	0.125	5/16	5.0±1.5	4±1
4	0.188	3/8	8.0±1.5	6±1
6	0.250	7/16	11±2	8±1
7	0.312	1/2	17±3	13±2
9	0.375	5/8	30±3	22±4
11.11	0.438	11/16	30±3	22±2
12.70	0.500	3/4	38±4	28±3
15.88	0.625	7/8	50±5	37±4
19.05	0.750	1-1 / 16	90±8	65±6
22.22	0.875	1-1 / 4	100±10	75±7

Thread fittings for air conditioning and conical pipes


o-rings


45 ° flare

1-36

AC Accessories						
Thread diameter (in.)	Mounting end of O-rings		45° flaring end			
			steel tube		aluminum pipe	
	(N·M)	Ponds/Feet	(N·M)	Ponds/Feet	(N·M)	Ponds/Feet
5/ 8-18	18±4	13±3	30±3	22±2	23±3	17±2
3/ 4-16	37±4	27±3	52±5	38±4	33±4	24±3
7/ 8-14	40±4	30±3	60±7	44±5	38±4	28±3
1-1 / 16-14	45±5	33±4	75±8	55±6	50±5	37±4

Thread fittings for conical pipes				
Thread diameter (in.)	Threads with le2200e sealant		Threads without sealant	
	(N·M)	Ponds/Feet	(N·M)	Ponds/Feet
1/ 16-27	15	11	20	15
1/ 8-27	20	15	25	18
1/8-14	25	18	35	26
3/ 8-18	35	26	45	33
1/ 2-14	45	33	60	45
3/ 4-14	60	45	75	55
1-11 1/2	75	55	90	65
1-1 / 4-11 1/2	95	70	110	80
1-1 / 2-11 1/2	110	80	130	95
2-11 1/2	130	95	160	120

2 Electronic System

2-1 General

This model is equipped with an electrical system with the following components:

1. The battery supplies the power to the electrical system [Section 2-2]

2. The emergency switches may be pressed in emergency to turn off all DC and AC circuits [Section 2-3]

3. Motors, controllers, and associated equipment are providing the necessary drive and pump power to the vehicle based on their interactions with sensors, switches, relays, actuators, as well as various parameter settings. [Section 2-4]

4. When the load is supplied at a current above the limit, the fuse will protect all DC loads from overcurrent by cutting off the load's power supply. [Section 2-5-1]

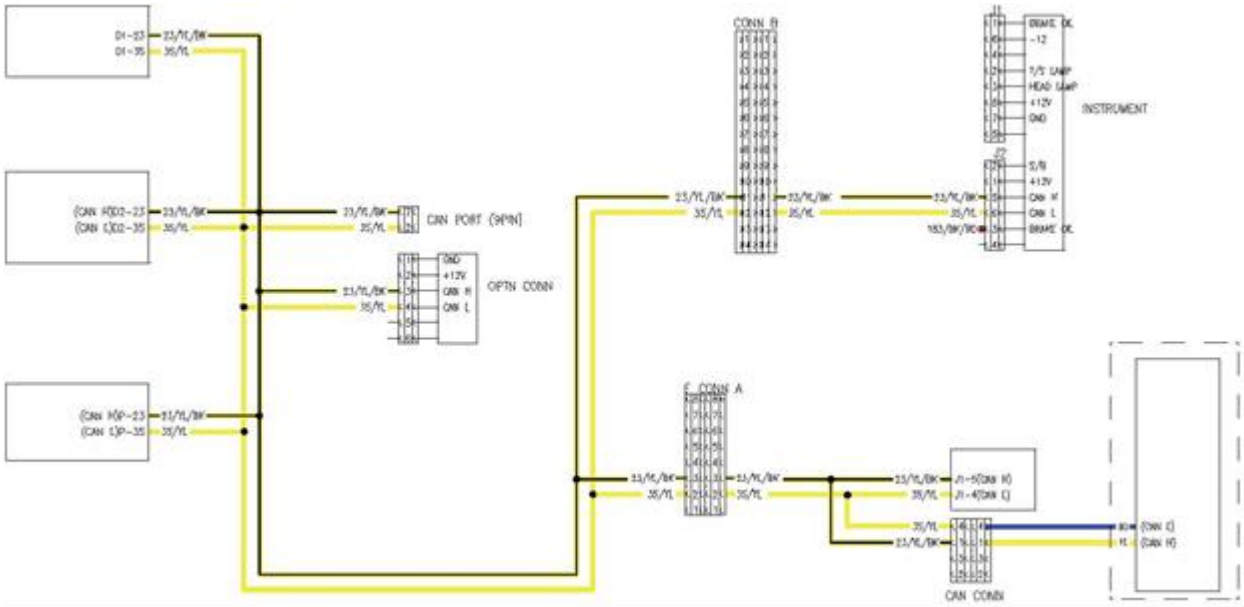
5. The DC-DC converter converts the high voltage of the battery to a low voltage or a low voltage load [section 2-5-2]

6. Other DC loads that activated by the operator's direct requirements will work independently of the controller. First, such DC loads not regulated by controllers and are not the purpose of controllers' signals. However, they may interact with controllers in some configuration. Such loads include light sets and horns.[Section 2-5-3 to 2-5-5]

7. The instrument board monitors the vehicle, informs the user of its condition and provides basic functions for mode setting, diagnosis and calibration [Sections 2-6]

8. The handheld programmer provides the same functions as the instrument board, but are detailed [sections 2-7]

2-1-2 Communication Protocol

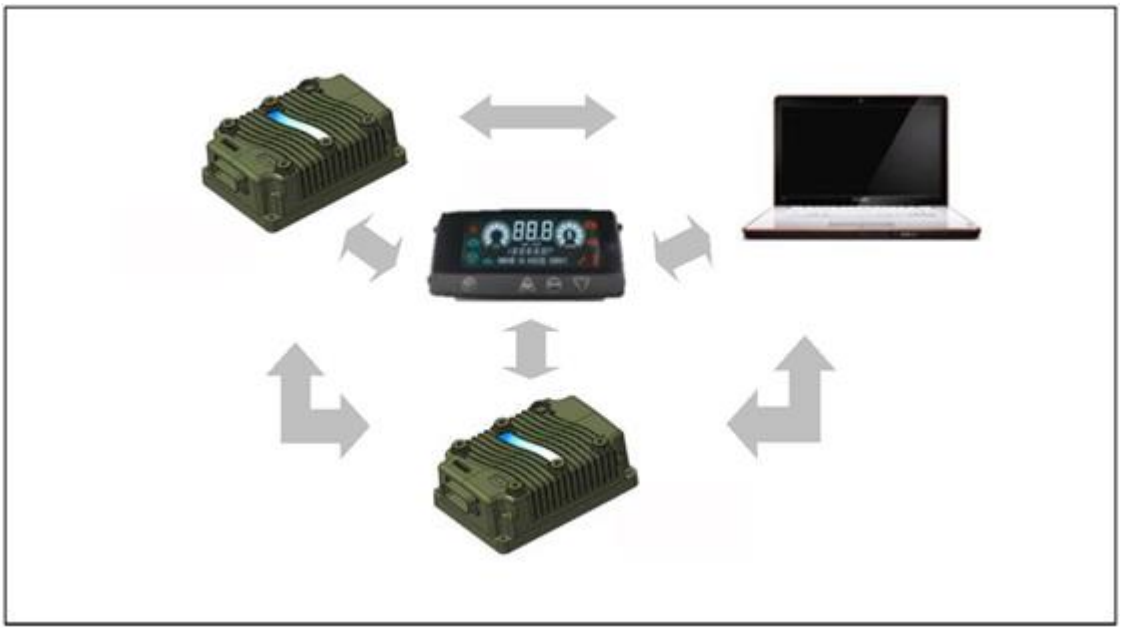


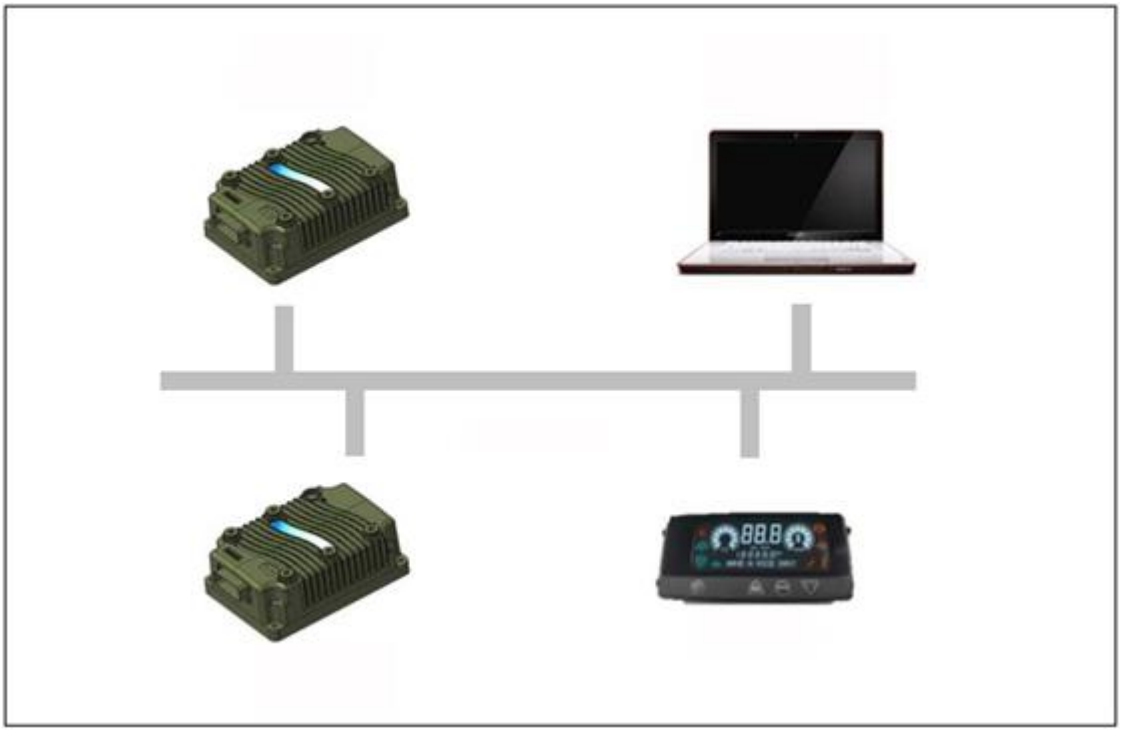
To enable all electrical equipment in the vehicle and provide diagnostic and parameter calibration functions to the user, data shall be shared between these controllers and instrument equipment. For this purpose,the CAN (Controller Area Network) is used as the standard protocol.

The communication between the main electrical equipment with CAN protocol are indicated in the diagram above

Note: information on how to install an application to check vehicle conditions and perform parameter calibration through CAN communications shall be

referred to sections 2-7.





Such CAN communication effectively overcomes the shortcomings of the widely used point-to-point communication based UART

(universal asynchronous receiver/sender) system. The UART systems are limited by the one-to-one communication between individual devices in the number of communication devices, wiring availability and vehicle performance improvement. CAN and UART communication are compared in the figure above.

2-2 Battery (Lead Battery)

2-2-1 Appearance and Specifications

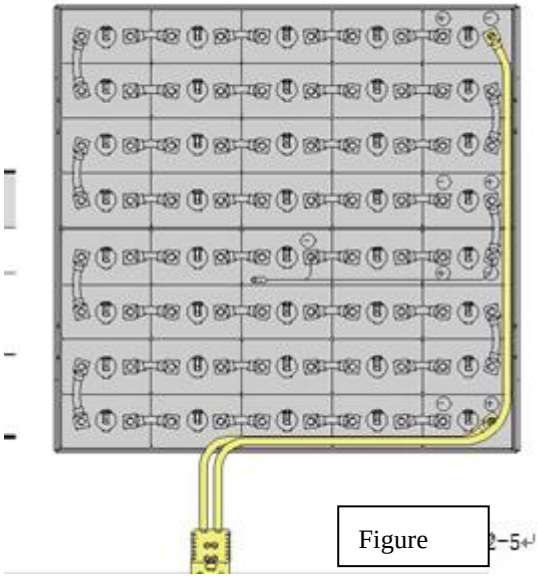


Figure 2-5

Item	Specification
Dimension of battery compartment	980*538*760mm
Total battery weight	1000KG
Battery connector	Socket connector

	REMA95044-01
Battery cable length	B+:1450mm B-:1450mm
Battery cable size	More then 2/0 GA（60 mm 2 ）

Specific gravity depends on temperature

Temperature								Charging Level
-15° C（5 ° F）	-5° C（23° F）	0° C（32° F）	5° C（41° F）	15° C（59° F）	25° C（77° F）	35° C（95° F）	45° C（113° F）	
1.108	1.101	1.098	1.094	1.087	1.08	1.073	1.066	0%
1.118	1.111	1.108	1.104	1.097	1.09	1.083	1.076	5%
1.128	1.121	1.118	1.114	1.107	1.1	1.093	1.086	10%
1.138	1.131	1.128	1.124	1.117	1.11	1.103	1.096	15%
1.148	1.141	1.138	1.134	1.127	1.12	1.113	1.106	20%
1.158	1.151	1.148	1.144	1.137	1.13	1.123	1.116	25%
1.168	1.161	1.158	1.154	1.147	1.14	1.133	1.126	30%
1.178	1.171	1.168	1.164	1.157	1.15	1.143	1.136	35%
1.188	1.181	1.178	1.174	1.167	1.16	1.153	1.146	40%
120%	1.191	1.188	1.184	1.177	1.17	1.163	1.156	45%
121%	1.201	1.198	1.194	1.187	1.18	1.173	1.166	50%
1.218	1.211	1.208	1.204	1.197	1.19	1.183	1.176	55%
1.228	1.221	1.218	1.214	1.207	1.2	1.193	1.186	60%
1.238	1.231	1.228	1.224	1.217	1.21	1.203	1.196	65%
1.248	1.241	1.238	1.234	1.227	1.22	1.213	1.206	70%
1.258	1.251	1.248	1.244	1.237	1.23	1.223	1.216	75%
1.268	1.261	1.258	1.254	1.247	1.24	1.233	1.226	80%
1.278	1.271	1.268	1.264	1.257	1.25	1.243	1.236	85%
1.288	1.281	1.278	1.274	1.267	1.26	1.253	1.246	90%
1.298	1.291	1.288	1.284	1.277	1.27	1.263	1.256	95%
1.308	1.301	1.298	1.294	1.287	1.28	1.273	1.266	100%

2-2-2 Function

A. Characteristics of lead batteries

This model uses a lead battery as a power source for its electrical system. The lead battery is mainly composed of positive plate, negative plate, electrolyte, separator, battery tank, battery cover, electrode, liquid injection cover, etc. The electrode of the exhaust battery is composed of lead and lead oxide, of which the electrolyte is an aqueous solution of sulfuric acid. Main advantages: stable voltage, cheap price; Disadvantages: low energy density (i.e, energy stored per kilogram of battery), short service life and high frequency of daily maintenance. The service life of the old ordinary battery life is generally about 2 years, of which the height of electrolyte shall be checked and the distilled water shall be added. However, With the development of technology, lead-acid batteries have become more durable and easier to maintain.

The plastic covers that can be unscrewed at the top with a vent hole is the most apparent feature of the lead-acid batteries. These caps are designed for distilled water refilling, and electrolytes and gases checking. Theoretically, lead-acid batteries shall be checked for the density of electrolyte and liquid level height during each maintenance, and distilled water should be added if reduced

2-2-3 Test

A. Battery condition check

Weak batteries can cause problems in the controller and power circuit.

The battery shall be ensured with a good condition before troubleshooting other areas.

Preliminary steps

Verify the polarity on the battery connector and control panel for correctness. The positive terminal cable shall be located at the line fuse while the negative terminal shall be located at

the negative terminal of the control panel.

When the vehicle is in operation

Battery load test >

1. Turn the range switch on the multimeter to read the battery voltage.

2. Connect the battery

3. Connect the multimeter leads with B+ (1) and B- (2) of the controller.

4. Please operate the hydraulic system (temporarily keeping the tilting lever at its maximum position) in the safe area while reading the voltage indicated on the multimeter.

5. If the indication is below the limit (46.0v), the battery shall be charged or

repaired before the troubleshooting.

When the vehicle does not work and the battery is suspicious. Battery pressure drop test

1.The voltage of each battery shall be measured when the vehicle is powered on and the pump motor is running.

2. The normal voltage of each battery should be between 1.95V and 2.12V. If the voltage on each battery is below 1.95V, the battery shall be charged or repaired before troubleshooting resumption.

3. The readings between batteries should not exceed 0.05 volts. If so, the battery shall be properly charged or repaired

Hydrometer test >

1. Test each individual cell of the battery with a hydrometer

2. If any specific gravity indicator is below 1.140, the battery shall be charged.

3. If any reading is 1.265 to 1.285, then the battery is fully charged (please refer to section 2-2-1).

4. The readings between monomers should not exceed 1.020. If so, the battery

shall be properly charged or repaired

B. Insulation check of battery case

Any resistance between any point of the wiring in forklift truck and car body should be at least 10000 Ω or higher.

A short circuit in the battery case may cause many faults. Because the battery may have chassis leakage,

A chassis short circuit in the forklift wiring may cause problems. To avoid any problem as caused by the short circuit, the followings shall be attended:

1. Disconnect the battery and discharge the controller.

2. Measure any component connection or wiring that associated with the forklift chassis or wiring connection randomly, and the minimum resistance shall be 10000 Ω.

Any test point with low resistance shall removed from the chassis against any short circuit.

3. The battery shall be always kept clean to minimize the leakage of current into the case.

4. Make sure that all accessories (e.g. horn and lights) are designed to be chassis free (dual wire system)

2-2-4 Maintenance

Battery maintenance and service is essential to maximize the service life of battery and efficient vehicle operation. Regular inspection and maintenance will extend the service life of the battery.

Special attention should be paid to the following rules:

1. The battery shall be always kept clean Being cleaning can prevent corrosion, current leakage and case short circuit. Please tighten all ventilation plugs, clean batteries with water and brush, and then dry with air hose.

2. Distilled water shall be fully refilled to cover the plate before charging, which will ensure a chemical reaction on the entire surface of the plate. After charging, the water shall be added to 12.7mm (0.50in) above the top of the plate. Distilled or mineralfree water is required.

3. Charge properly. The battery should be discharged to 80% of its capacity and then fully charged. Batteries should be charged evenly once a month to ensure that all batteries are fully charged. Correctly battery charging should be identified to prevent low power in the vehicle installation.

4. Low power operation shall be avoided. Low battery power may damage batteries and cause higher-than-normal currents in electrical systems. High current consumption due to low battery power may damage the contactor tip and shorten the service life of the motor brush.

5. The highest temperature of the battery is essential. The electrolyte

temperature shall not exceed

55°C (131°F) during operation or charging. Overcharging of the battery will lead to an overheating of the battery, causing the battery bulge and other adverse phenomena. The battery has the longest service life when the electrolyte temperature is maintained at 25 ° C (77°F). Most charging devices are fully automatic, but should be checked regularly to ensure a normal operation.

6. Maintain accurate battery records. Battery tester or voltmeter should be used to read and record the battery index regularly. The specific gravity and voltage of each cell should be checked at least once a month. This inspection should be carried out after a balanced charge. After adding water, the reading should not be taken directly. Maintenance of all batteries should be recorded to identify batteries that are in deficit or wear.

2-2-5 Disassembly and Installation

Warning

Careless use of the battery may result in an electric shock
The safety precautions given in sections 1-4 shall be followed

Warning

A short circuit may occur during the removal, transportation, and installation of the battery
Make sure that the battery is covered with insulation material (poly) and that no metal material touches the top of the battery before disassembling, transporting, and installing the battery

1. Vehicles Parking

2. Drop the fork and tilt the mast forward until the tip of the fork touches the ground.

3. Close key switch

4. Disconnect the battery connector.

5. Position the operating column vertically and move the seat back completely.

6. Open the door lock of the fixed seat and battery cover.

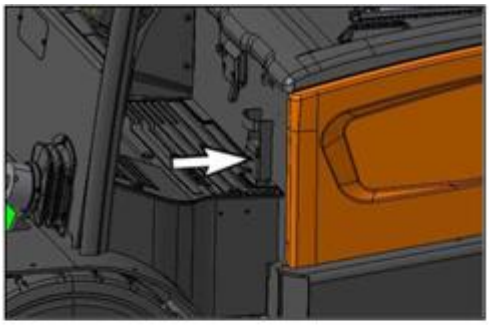
7. Lift the seat and battery cover.

8. Keep the key switch open to discharge the power module. Twice for 30 seconds.

Note: failure to discharge the power module may result in electric shock.

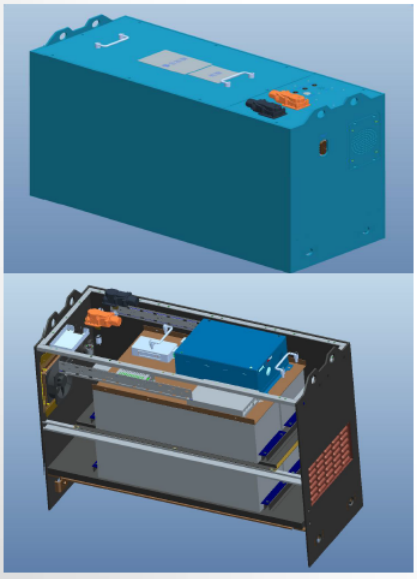
9. Use the hoist to remove the battery.

10 Install the batteries and perform the above steps in reverse order.

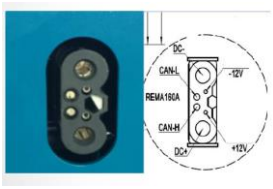


2-2-6 Lithium Battery

1 Technical parameters and description of lithium battery



Battery system parameters		
1	Rated voltage	51.2V
2	Rated capacity	300Ah
3	Total voltage range	43.2V ～58.4V
4	MAX. discharging voltage	58.4V
5	Discharging cutoff voltage	43.2V
6	STD. charging current	0.5C，150A
7	STD. discharging current	0.5C，150A 450A MAX, 30S
8	Cycle life	≧3000cycles
9	Dimension	660*179*154mm
10	Total Weight	250±10Kg
11	Cooling method	Built-in cooling fan
12	Operation temperature	Charge: 0℃～45℃
		Discharge: -20℃～55℃
13	Storage condition	-15℃~60℃,30%-50%SOC，Permanent storage: 0℃~35℃
		Humidity: ≤85%RH

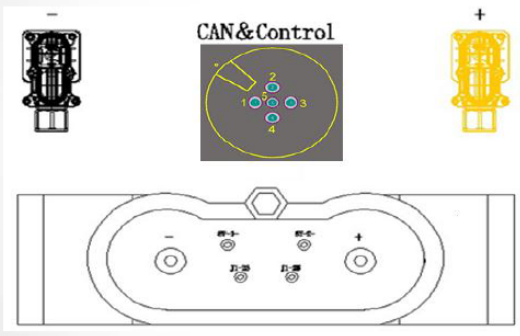


Description of lithium battery charging port

Charging input	DC+	Positive pole of Dc power which connects DC power positive pole and battery positive pole
	DC-	Positive pole of Dc power which connects DC power positive pole and battery positive pole
	CAN-L	CAN-H，Charger and vehicle communication connection
	CAN-L	CAN-L，Charger and vehicle communication connection
	-12V	Charger to the 12V negative pole of BMS power supply
	+12V	Charger to the 12V positive pole of BMS power supply

Description of lithium battery discharging port

User Interface: Discharge Output



Interface Name	No	Definition	Interface Name	No	Definition
Discharge plug			CAN & Control	4-2	key switch
				4-3	key switch
	J1-25	CAN-H1		4-5	CAN-H1
	J1-23	CAN-L1		4-4	CAN-L1
				4-1	CAN-GND
	Red	+	+	Orange	+
	Black	-	-	Black	-

Description of lithium battery debugging port

User Interface: Maintenace and Debug

Interface Name	No	Interface	Definition
Debug1	1	4-2	12V+
	2	4-1	B 485
	3	4-4	A 485
	4	4-3	12V-
Debug2	1	4-2	--
	2	4-1	--
	3	4-4	CAN-L 1
	4	4-3	CAN-H 1

Debug 1 is alway used to connect a maintenance LED panel to monitor the battery informations and connect with the surpervior software for update.

10.1.2 Fault analysis and description of lithium battery

Fault repair list of battery pack system					
No.	Fault type	Preliminary estimate	Test method	Failure confirmation	Countermeasure
1	The battery pack shall have no output after starting, and the switch indicator light shall be on	1. Abnormal communication with forklift; 2.System internal components damaged	1. Check the alarm code on the locomotive display to confirm the specific fault. If it is confirmed as CAN communication problem, the discharge connectors shall be disconnected, and the both ends of the battery pack discharge connectors of CAN communication shall be checked for 120 Ω resistance;	1.If the resistance is measured to be infinite, the the CAN communication wire harness is indicated as disconnected. In this case, the CANH and CAN CAN shall be checked for normal breakover between the discharge connector and the panel communication port, and then the panel communication harness CAN shall be checked	1. Replace damaged wiring harness; 2. Replace damaged BMS

				for breakover. 2.If there is resistance and is far bigger than 120 Ω, damage may be indicated inside the BMS CAN chip.	
			1.Disconnect the discharge plug and start the battery pack separately to check whether the discharge plug has an output.	If there is an output, the locomotive may have an internal circuit error which will result disability of the battery pack output	Check the locomotive communication and power lines
			1. Remove the battery box cover and high pressure box cover, check whether the fuse is normal (in the case of shutdown, select the lead file of the multimeter and use the meter pen to check the two ends of the fuse. If there is a drop of sound, then it is normal. If there is no sound, then the fuse is damaged.)	Broken fuse	Before replacing the fuse, check whether there is a short circuit between the positive and negative discharge of the locomotive and the battery pack. If there is no short circuit, then replace the fuse; if there is a short circuit, first deal with short circuit fault, and then replace the fuse.
2	The battery pack have no output after starting, and the switch indicator light is not on	1.System internal components damaged; 2.Insufficient system voltage	1.Select the DC voltage mode of the multimeter, test the total positive and negative voltages at both ends with the meter pen, and check whether the total voltage of the system is normal;	The system voltage is low, and BMS cannot work normally	Charge the battery pack first
			2.Select the lead mode of the multimeter, and check if the communication harness S1_A and the S1_B of the panel have normal lead	Turn on the light and confirm the fault of BMS to replace BMS preliminarily	Replace panel communication harness
			3. After the voltage harness is connected normally, press the start switch to check if the BMS is on;	After pressing the start switch, the BMS does not turn on the light, and the fault of BMS is preliminarily confirmed	Replace BMS

3	The battery pack cannot be charged. The indicator light of the battery pack is on	1. Abnormal communication with forklift; 2. System internal components damaged	1. Check if the 12V charging socket harness , GND, CANH and CNAL harness is normal	The conduction is abnormal	Replace the cable harness of the charging socket
			2. Connect the charger to check the fault code of the charger display; switch off to see if there's any loose for charging terminals and terminal jump; check the CAN communication if there are 120 Ω resistance on both ends	If no120 Ω resistance is detected, then the CAN chip is damaged	Replace BMS
4	The battery pack cannot be charged. The indicator light of the battery pack is not on	1.The charger has no 12V auxiliary power output; 2. System internal components are damaged	1. Disconnect the charger and battery pack, and check the charger for 12V auxiliary power output separately after starting up;	1.The charger has no 12V auxiliary power output	Replace the battery charger
			2. Check if the 12V charging socket harness , and GND harness are normal	Wire harness is not working properly	Replace the cable harness of the charging socket
			3. Confirm if the 12V auxiliary power output of the charger is normal, and the wiring harness of the charging socket is normal. Keep the charger on and connect to the battery pack, and then check if the BMS is on.	The BMS does not turn on the light, and the fault of BMS is preliminarily confirmed	Replace BMS
5	The battery pack cannot shut down	1. Car key switch get a short circuit, 2. Internal components of battery pack system are damaged	1. Car key switch get a short circuit, 2. Internal components of battery pack system are damaged	The battery pack can switch the machine normally and the locomotive switch harness is short-circuited	Check the wire harness of forklift switch
			2. After disconnect the battery pack from the forklift and pressing the start switch button on the battery pack, the battery pack cannot be shut down normally. After disconnecting the battery box panel and the wire harness on the switch, the battery can be shut down normally	The battery pack can switch the machine normally and the locomotive switch harness is short-circuited	Replace the start-up switch

			3. Disconnect the battery pack from the connection to the forklift and the wiring harness on the switch.	BMS fault	Replace BMS

2-3 Emergency Switch

2-3-1 Appearance and Specifications

Item	Specification
Part Number 1010434024	CE4T-10R-01

2-3-2 Function

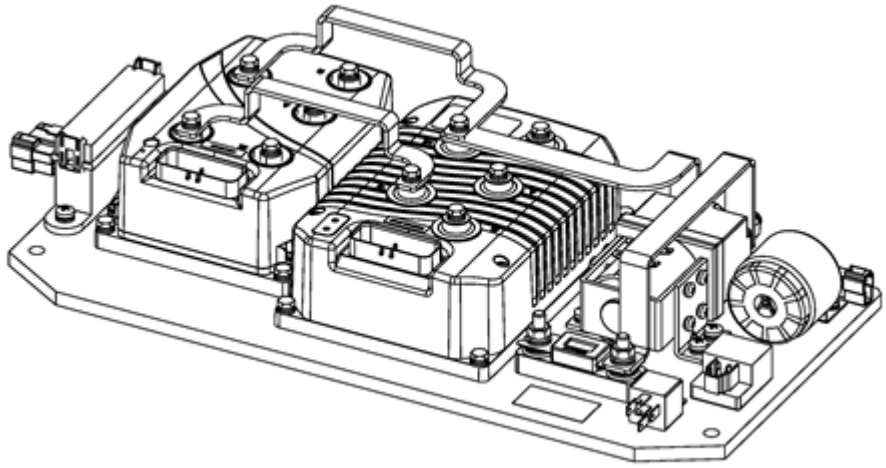
The emergency switch is used to shut off the current in the electrical system in case of emergency,

and thereby stopping the operation of the vehicle. When pressed the key, all DC and AC circuits are open except the speaker circuit.

When the emergency switch is opened, the positive terminal of the battery is disconnected from the key switch, thus cutting off all the load power supplied through the key switch. As a result, all DC loads except the horn will be cut off

2-4 Controller and Related Equipment

2-4-1 Appearance and Specifications

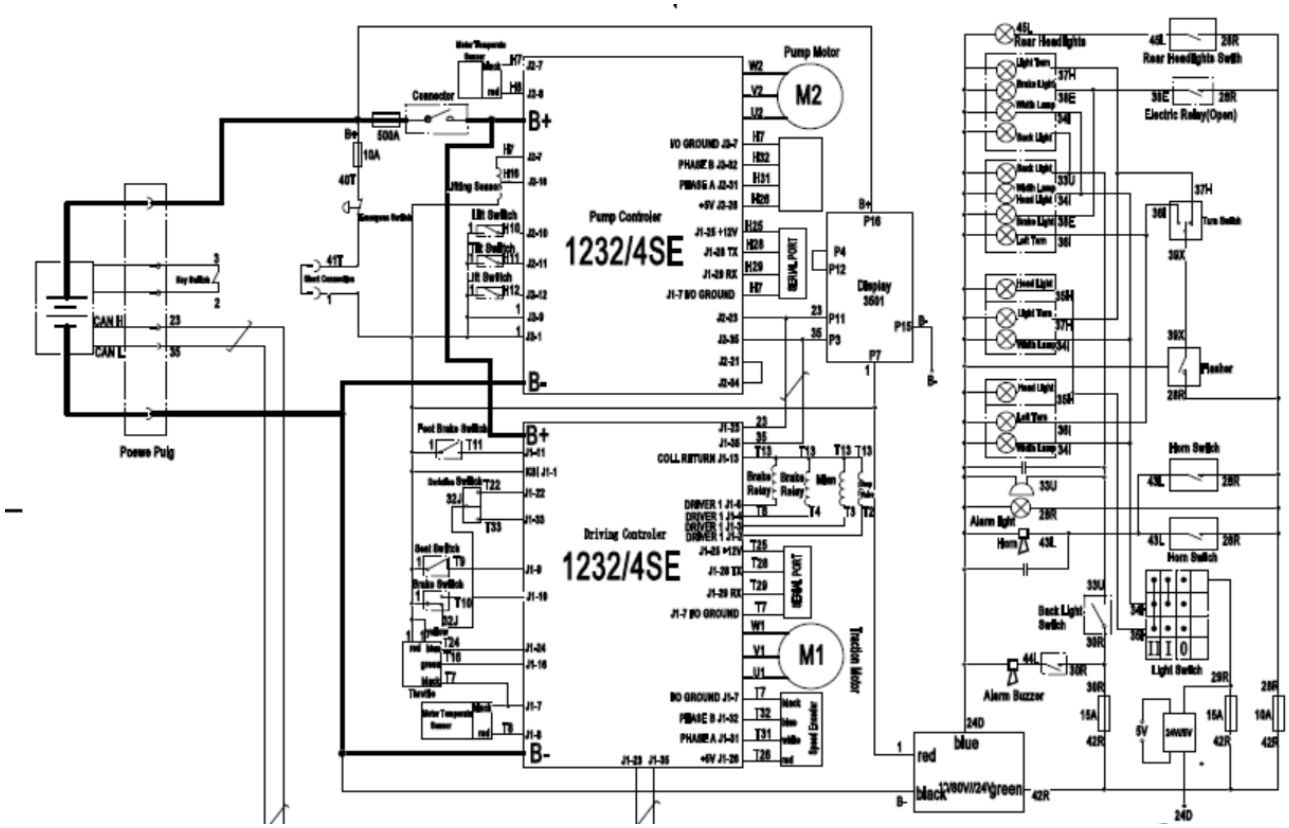


Technical specifications

No.	Description	Specification	Serial Number	Description	Specification
1	PWM Working frequency	10KHZ	8	Accelerator control signal	2 lines of 0-5KΩ/5KΩ-0, 3 lines of potentiometer, 0-5V, current source, electron accelerator
2	Insulation strength with radiator	>500Vac	9	Speed control type	Single end/swing /VCL input
3	Logical port input	If the falling edge > 1.5v,	10	Operating ambient	-40℃ to 50℃

	voltage	then the voltage is high; if the rising edge >4.4V, then the voltage is high		temperature	
4	KSI input current	<1.0A	11	Storage ambient temperature	-40℃ to 50℃
5	Input current of logical end	<10mA	12	Current limit of overtemperature	The current is limited at 85℃ and will cut off at 95℃
6	Maximum output frequency	300Hz	13	Current limit of low temperature	The current will cut off at 40℃
7	Total drive current	<10A	14	Sealing	IP65perIEC529
15	Relevant standards	1) EMC Interference：EN50081-2/08.93；Anti-interference：EN50082-2:1995 2) Safety and Anti-flying：EN1175 3) UL Component Authentication 4) Satisfy the UL583 insulation test			

2-4-2 Circuits and Functions



Critical Power Supply of Controller

This model is equipped with a drive motor and a pump motor, which are controlled by different controllers.

The forklift is powered by the controllers through key switches and then turned on.

Current to the contactor of the line Power supply of controller

Once the controller is energized, a magnetic coil built into the line contactor will receive power from the driven motor controller. The two contact points, which act like switches, will then touch each other and connect the lines between the battery and the two controllers. Therefore, the controller becomes a three-phase and three-wire AC power supply and is transmitted to the motor through each UVW connections. The line contactor is equipped with 500A fuse to prevent

Overcurrent.

The two controllers are connected through the following sensors, switches, relays and actuators.

Key switch

Emergency Switch

Forward/revise units

Accelerator

Seat Switch

Brake pedal switch

Parking brake switch

Hydraulic control switch

Horn relay

These devices provide DC power and interact with controllers that activate or receive data based on a number of parameter settings to control the motor.

The two motor controllers are identical to hardware, but each controller is programmed with different types of firmware to achieve different functions.

The safety & high efficiency performance and complete operation function of electric forklift can be realized by properly setting the motor technical parameters and control technical parameters and function values of the controllers.

1.The crawling speed of electric forklift is adjustable The crawl speed setting

function of the controller enables the a long-time operation of electric forklift at a low speed.

2. The acceleration rate is adjustable. The acceleration rate refers to the "soft and hard" feeling of accelerator pedal when operating electric forklift. By setting the acceleration rate, the forklift can meet the requirements of acceleration operation in different working conditions.

3.Plug braking and regenerative braking. The reverse braking signal will be generated when the direction bar is in opposite position, which controls the traction motor to give a braking torque through the motor driver for the purpose of vehicle deceleration. The power level is controlled by the accelerator pedal. Regenerative braking is generated by the controller under the condition that the speed of the vehicle is relatively higher than the speed of the traction motor, of which the braking energy of the vehicle will be converted into electric energy and fed back to the battery. Especially when the electric forklift is on the downhill slope, the regenerative braking to properly reduce the speed of the vehicle on the downhill slope can be achieved through a proper lifting and releasing accelerator foot plate, which thus extends the driving distance of the battery for any single charge.

4.Slope anti-backward slip function. The electric forklift with AC traction motor has the excellent function of staying non-slip on the slope.

5. The maximum driving speed is adjustable. Reasonable setting on

maximum driving speed of electric forklift can prevent any overloading of traction motor due to high speed.

6.Static reply switch off. In the event that the seat switch or key switch is disconnected, the control will be turned off and the directional control lever shall be pushed back into the neutral position to restart. If the driver leaves the vehicle and returns at any time, the direction control lever shall be pulled back into the neutral position before restarting. This function may help to avoid any unexpected unsafe operation A time delay of several seconds is provided at the input end of the seat switch to allow instantaneous disconnection of the seat switch against turbulence.

7.Safety protection function If the power component of the controller is damaged during operation, the controller will disconnect the main contactor in the shortest time, and the controller will automatically limit the armature current of the motor upon the temperature over rise of the controller . When the battery voltage is too low, the controller will also stop working to ensure safety.

8.Both traction motor controller and oil pump motor controller are functioned with self-diagnosis When the lead controller come across a fault during operation, the fault code will be displayed on the display instrument and the controller will stop working automatically for the safety of the operating system.

9.The amount of battery power and accumulated working hours will be indicated in display instrument.

2-4-3 Diagnosis and Troubleshooting

There is a way to view the current fault code without a instrument board or handheld programmer: a built-in LED light is set on each controller to indicate the entire fault code list.

Each code consists of two digits. The red LED indicator which flashes once indicates that the first number of the code that will follow; The yellow LED then flashes the appropriate number of times to indicate the first number. Red LED which flashes twice indicates the second code that will follow; the yellow LED indicator flashes the appropriate number of times to indicate the second number.

For example, if the current fault code is "23", the LED will display as follows:

The complete list of fault codes is detailed section 2-7. The following table shows a few things apart from the fault code indicated:

Display	Status
All LEDS not on	The controller is not powered on; or running out of battery; or seriously damaged
Yellow LED flashes	Controller works normally
Yellow and Red LEDs is fully on	The controller is in flashing mode
Red LEDs is fully on	hardware failure. To cycle KSI to cleanup, and reload the software or replace the controller if necessary

2-4-4 Test

A. Controller

The diode voltage of AC MOSFET circuit inside the controller shall be tested and checked for any burn out damage. 81

According to the table below, each test item shall be tested repeatedly for more than 3 times.

Item	Multimeter terminals		Range of normal value	
	Red indicating pen	Black indicating pen	Polarity measurement	Resistance measurement
1	B+	U/V/W/B-		1MΩand above
2	B-	U/V/W		1MΩand above
3	U/V/W	B+	0.3-0.6V	
4	B-	U/V/W	0.3-0.6V	

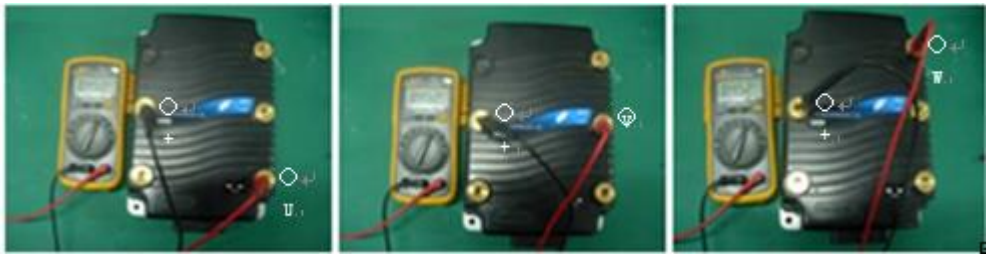
Pull multimeter to Ω mode (resistance) P ull the multimeter to the diode mode (polarity measurement)

1） Remove the cables and wires that connected to the controller, and release all the internal power of capacitor (discharge the B + and B - terminals with 30 Ω resistance / 5 w to).

2） Test the diode voltage (0.3-0.6v) with a multimeter and check if it is normal.

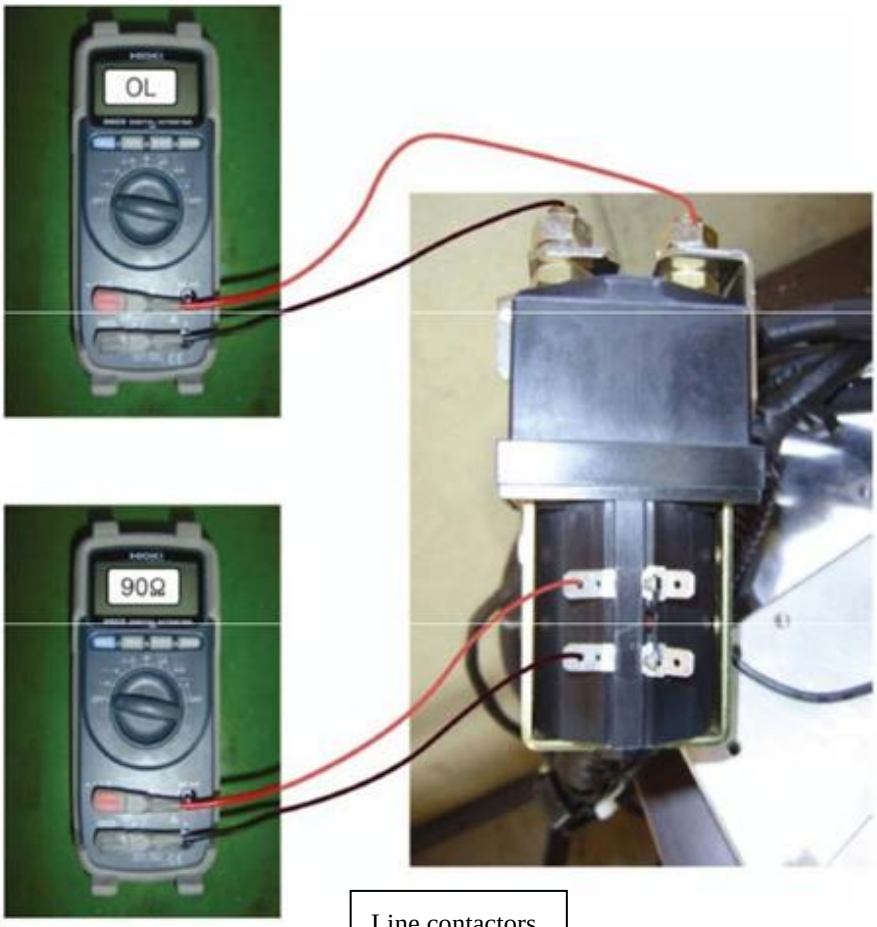
Test1：Read the diode voltage, through which the red wire is B-, the black wires are U, V and W.

Test 2：Read the voltage of the diode to U, V and W, and the black lead to B + with red wires.



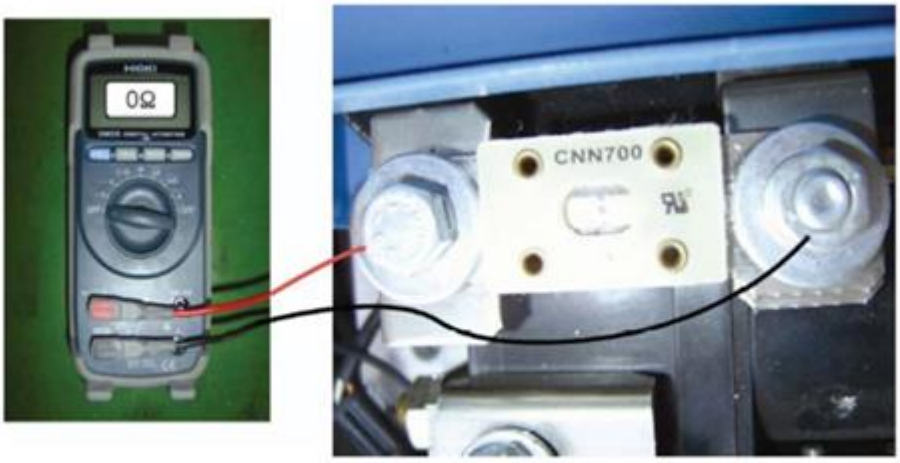
Notes:　The multimeter pointers shall not be inverted in use

B. Line contactor and fuse



Line contactors

Figure 2-22



Line fuse

Figure 2-23

For line contactors and line fuses, an ohmmeter shall be connected at the

point shown in the figure and shall be tested for the specified value.

2-4-5 Disassembly and Installation

Access to control panel

1. Disconnect the battery connector.

2. Keep the key switch open to discharge the power module. Twice for 30 seconds.

3. Close the key switch

4. Remove the top cover（1）to enter the drive motor controller and the pump motor controller.

Note：Please remember that the controller contains ESD (electrostatic discharge) sensitive components.

Appropriate precautions should be taken when connecting, disconnecting and handling.

Disassemble/install drive motor controllers

Note：Please remember that the controller contains ESD (electrostatic discharge) sensitive components.

Appropriate precautions should be taken when connecting, disconnecting and handling.

1. Disconnect the control harness from the controller connectors
2. Disconnect U, V and W cables. Tightening torque：9.5±1 N·m（7.0±0.7 lb·ft）
3. Remove B+ and B- wires from the drive motor controller
4. Loosen and remove the drive motor controller
5. Perform the above steps in reverse order to install the drive motor controller

Disassemble/install pump motor controller

1. Disconnect the control harness from the controller connectors
2. Disconnect U, V and W cables.

   Tightening torque：9.5±1 N·m（7.0±0.7 lb·ft）
3. Remove B+ and B- wires from the drive motor controller
4. Loosen and remove the drive motor controller
5. Perform the above steps in reverse order to install the drive motor controller

Disassembly/installation of line contactor

1. Disconnect the cable from both terminals.
2. Remove the line B+ from the line contactor.

3. Loosen the bracket screw.
4. Remove the line contactor
5. Perform the above steps in reverse order to install the line contactor

Disassembly/installation of line fuse

1. Remove B+x line from line fuse.
2. Remove the line fuse.
3. Perform the above steps in reverse order to install the line fuse

2-5 Miscellaneous Load

2-5-1 Fuse holder

A. With the function and composition to protect DC load from overcurrent, the fuse box is equipped with the following terminals:

Description	Specification
FU1	15A
FU2	10A
FU3	10A
FU4	10A

B. Disassembly and Installation

Preliminary steps

1. Close the key switch
2. Disconnect the battery connector.
3. Remove the cover.

Steps

1.Disconnect the two harness connections from the fuse box.

2.Remove the bolts and washers, and then remove the fuse holder

3 .Perform the above steps in reverse order to install the fuse holder

Note: when replacing fuses, new fuses of the same type and specification shall be used to avoid any electrical damage. If the fuse blows out frequently, there may be an electrical fault.

2-5-2 DC-DC Convertor

A. Appearance and Specifications

Item	Specification
Maximum power	IN 400W
Input voltage	DC 48V
Output voltage	DC 24V

B Circuits and Functions

The DC-DC converter power supply (48 V) into a 24 V power supply, which is suitable for various loads.

The functions of each terminal are as follows:

1.The INPUT terminal receives power from the battery to activate the DC-DC converter.

2. Collect the OUPUT terminal with green（24V+), which overrides the load supplied from the converter and then passes the fuse box to the load.

The terminal overrides the load supplied from the converter and then passes the fuse box to the load.

2-5-3 Lamp Bank

This model is equipped with a variety of lamps, each of which has a different purpose.

Headlights (L/R) illuminate the path in front of the vehicle

The rear lights illuminate the path behind the vehicle

The reverse lights will turn on during reverse operation

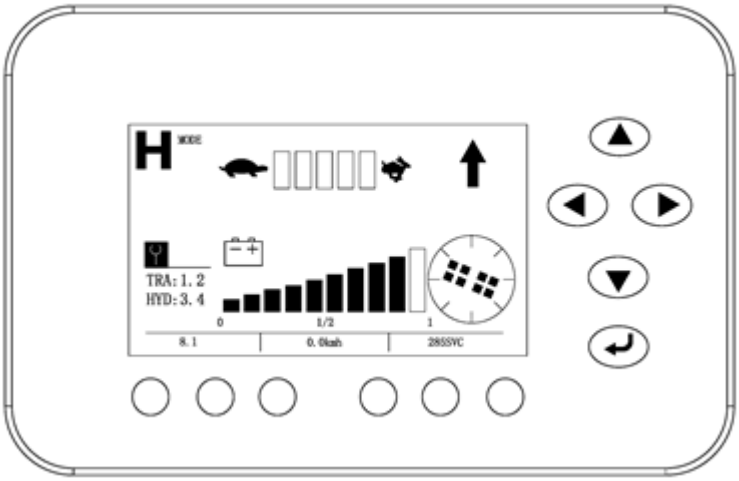
Press the brake pedal and the brake light will turn on

2-5-4 Horn

The horn is powered directly by a battery. It is used to sound an alarm to warn people around.

2-6 Instrument Board

2-6-1 Appearance and Specifications



Item	Specification
Working Voltage	DC 12-80V
Communication protocol	CAN 250kbps

2-6-2 Function

The instrument board displays the various states of the vehicle by receiving input from different switches,

and shares information with the controller through CAN communication, as shown below:

1.Speed mode: "H" high energy mode; "S" conventional performance mode; "E" economic model

2.Direction mode：“↑” Forward; “N” Neutral；“↓” Backward

3.Lithium battery or lead acid mode: switch between "lithium battery" and "lead acid battery" modes

4.TRA fault: traction controller fault

5.HYD fault: pump controller fault

6.Working hours：8.1h

7.Ground speed：13.5km/h

8.Steering angle: show the direction of the tire, and maintain the turning deceleration function (optional function)

9.Mode select key: Switch to "H", "S" and "E" modes

10.Enter the meter interface key: press for 3 seconds to enter the meter selection interface, and switch lithium battery and lead acid modes in the interface

The company has finished the commissioning of the internal parameter adjustment of the instrument before delivery. If any change is needed, please contact the after-sales department of the company for further modification.

2-6-3 Description and Function

The instrument panel is located in the centre of the console cover. The symbols displayed on the panel represent

the basic analog and digital parameter values of the vehicle system.

The name of the indicator and button are as follows:

 : Parking brake

 : Lift lock-up when power is below 10%

 : Fault alarm, and TRA and HYD will display fault code

 : Seat switch signal to display seat switch signal when the vehicle is not moving

 : Electric quantity alarm lamp----when the electric quantity is below 20%, the alarm lamp will prompt

2-7 CURTIS Handheld Programmer

2-7-1 Operation Cautions

The prompt function of the handheld unit is designed for the convenience of

vehicle inspection and maintenance, which not allow the adjustment of the controller parameters without the approval of the vehicle manufacturer, so as to avoid vehicle and personal safety accidents.

After modifying the parameters, the handheld unit will automatically save the parameter settings, and the only thing you need to do is just close the key switch and restart.

The CURTIS handheld unit can be connected when the controller is on or off

2-7-2 Process of Vehicle Fault Reading

Please turn on the key switch after connecting the handheld unit to the controller

Check for the faults based on the CURTIS handheld unit menu list……

When running the vehicle, the flashing line of the handheld cursor will prompt English fault content, which can be interpreted by referring to the fault code list

2-7-3 Vehicle signal Detection

Please turn on the key switch after connecting the handheld unit to the controller

Check for the Monitor based on the CURTIS handheld unit menu list……

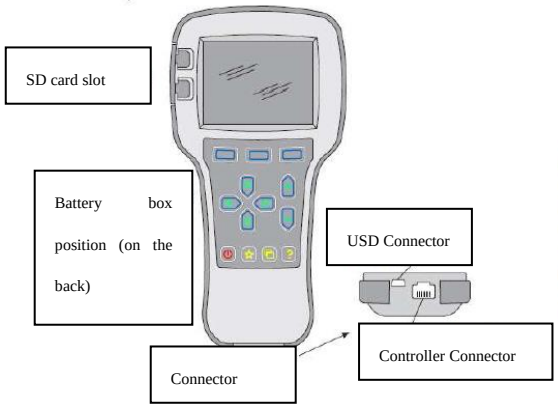
Please open the corresponding detection menu subitem according to the need, run the vehicle, and observe the change of handheld value.

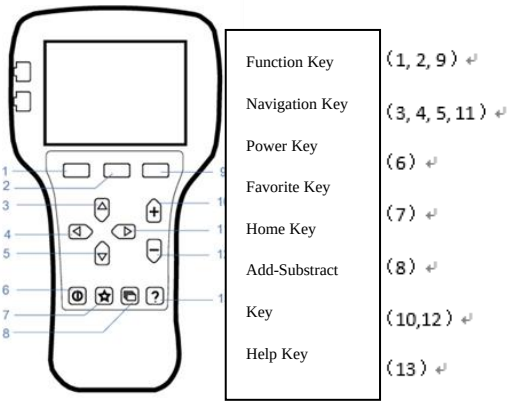
2-7-4 Contents of CURTIS Handheld Unit Menu

The Curtis 1313 handheld programmer is used to configure the Curtis electronic control system. The set parameters, real-time monitoring controller data and fault diagnosis may be adjusted and saved trough this programmer

Warning：The control system will affect the performance of vehicle's acceleration, deceleration, hydraulic system and brakes. Hazardous conditions may occur if the vehicle control system is incorrectly programmed or beyond safety limit. Only the vehicle manufacturer or authorized service agent may program the control system

The programmer has two interfaces with a battery box and a memory card slot, of which one is used to communicate with electric control, and the other is used to communicate with PC.



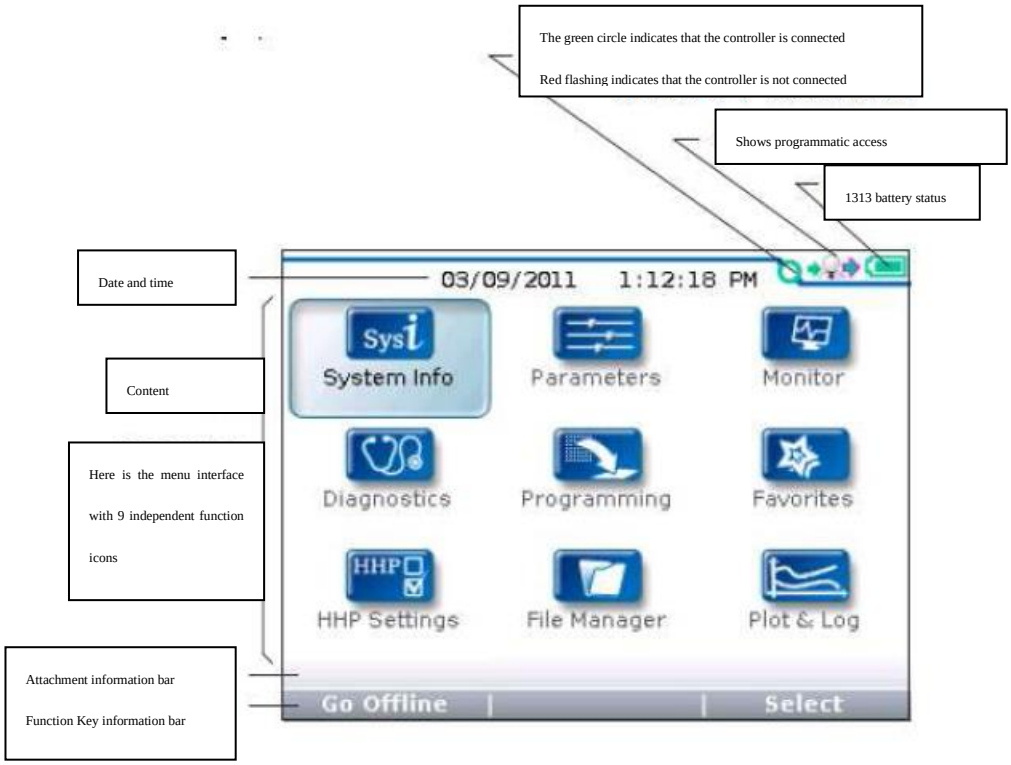


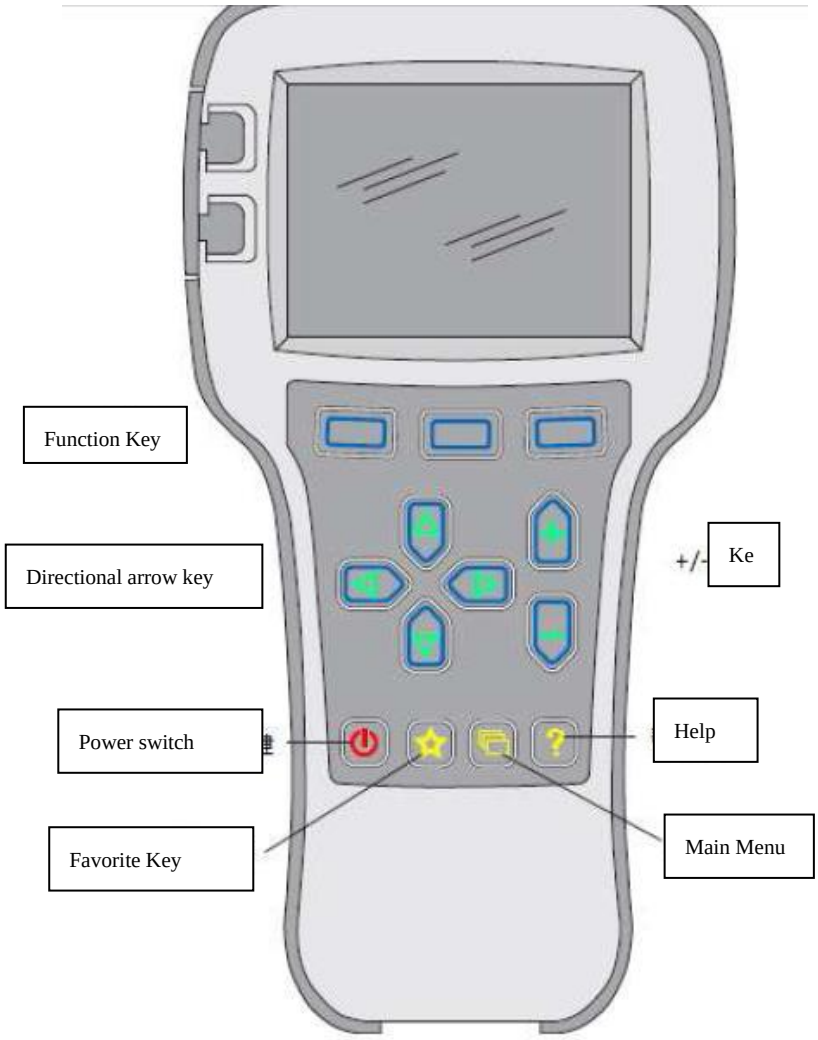
1.Power the programmer

The handheld programmer can be connected to the controller by inserting its connection wire into the programming port of the controller, and will automatically power on and display the control information on the programmer

after connecting to the controller.

When the programmer finishes the loading of the controller information, the main menu will displayed





Function keys

The three keys will be blank because the function of the three keys is based on the specified content. At any given time, the functions of the buttons are displayed on the LCD screen above.

Directional arrow key

The information displayed can be selected by pressing up, down, or left or right through 4 directional keys.

+ / - Button

The parameters can be added or subtracted by the two keys. Meanwhile, "+" refers to "Yes" in the operation system, and "-" refers to "No", which may be used as a scrolling options in some cases

Power switch

When the programmer inserts an already powered controller, it is not necessary for the programmer to be initiated by pressing the power switches, and the programmer will start up automatically. When it is held down for a few seconds, the programmer will prompt turn off confirmation, which shall be answered by selecting "Yes" or "No" of the function keys. When the programmer is turned off, a few seconds of pressing will trigger the restarting of the programmer.

Key of favourite

There are 2 ways to enter the menu of "Favorites" 1. You can enter through the main menu "Favorites"; 2. You can also press this key to enter

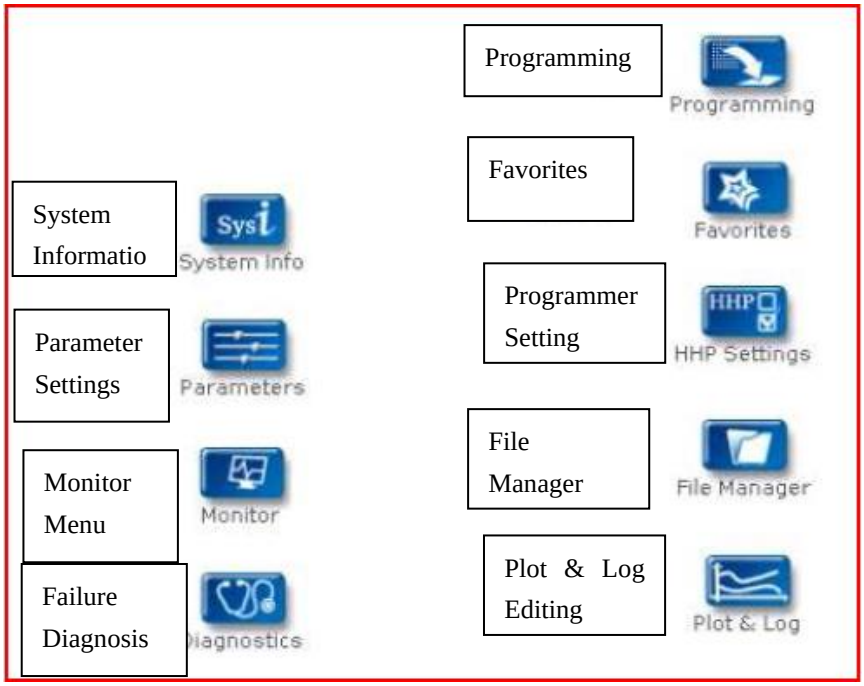
2. Menu structure

The main menu consists of nine submenus, each of which is displayed with a specific icon, and each item of the submenu is arranged in a hierarchy.

Some menus contain one item only, but most menus contain more than one item, and you can access the next level of submenus through each folders. It is possible for your to expand the table through grid options, enter a set of execution commands through dialog options, and return to the next level of menu whichever interface you are in.

All nine submenu names are shown in bold on the main menu and below the icons. When you enter the stepped menu, the name of the submenu or the path you are in are displayed at the top of the screen.

Nine main menus



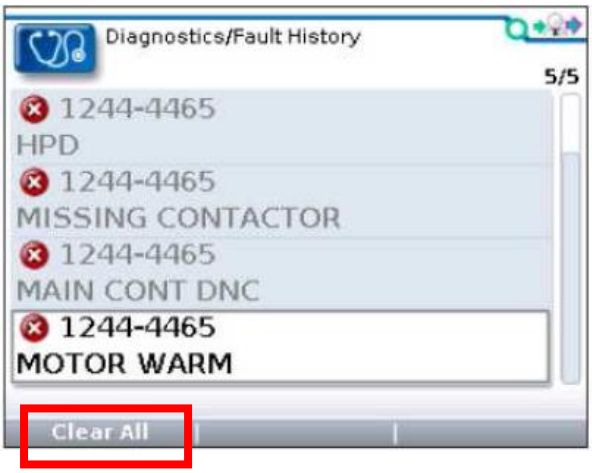
3 Fault diagnosis menu

In the main menu, Select the "Diagnostics" Fault diagnosis icon and press the corresponding function key to enter the Fault diagnosis menu, which includes two folders: "Present Errors" and "Fault History" .

Note: the fault caused by a temporary event captured in the circuit is not a real

system fault in some cases. and you can determine if the fault really exists by restarting the system and observing the automatic fault indication.

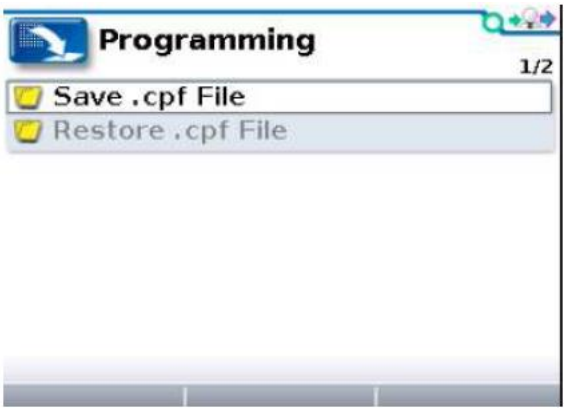
In the history failure folder, the failures listed are all failures encountered after the last history failure was cleared, which can be restarted by clearing the fault content in the entire folder.



"Clear All" is used to Clear the history failure folders. A function key will be highlighted separately if there is a history failure in the history failure folder, and will be grayed out if there is no history failure.

4.Programming edit menu

Select the Programming icon in the main menu, and press the function key corresponding to“Select”to enter the menu. Menus may be programmed to store and restore the setting files of parameter(.cpf files)



Save.cpf Files

The Save. CPF File function in the program menu may be used to backup current setted parameters. You can save as many.cpf files as you want, and each.cpf file shall be named differently.

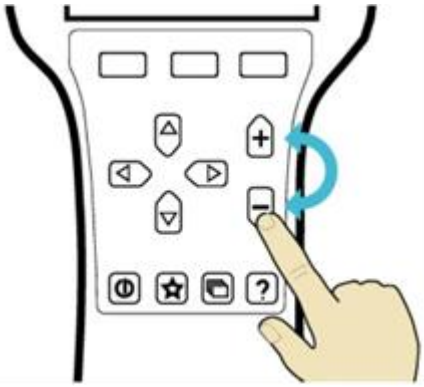
Restore.cpf Files

CPF Files to restored may be selected from the earlier saved. CPF Files instead of the current controller's. CPF Files. When the entire data recovery process is completed, the screen will

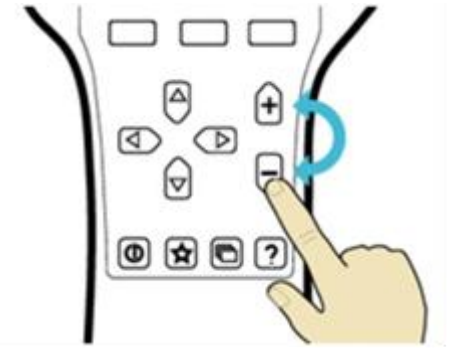
5.Parameter Settings

Select "Parameters" from the main page and press "Select" to enter the parameter setting page, in which you can adjust or modify the parameters of the controller.

Parameters can be adjusted or modified in two ways: one is in the parameter list page as shown in the figure below;



;the other is through the parameter edit page as shown below



2-8 Troubleshooting to Each Fault Code

A. Fault levels

One of the features of the instrument panel is to show the faults occurring in the vehicle.

B Curtis codes

In addition to the instrument panel and handheld programmer, the driver and pump motor

controllers will notify the operator of the current failure with two fault code Leds mounted on each controller and the fingertip extension module, of which the fault indication is called the "Curtis

Codes".

Their advantage over other indicators is that the operator can easily identify which controller is in trouble simply by looking at them and the controller's Leds

will light up only when a fault is detected. The following table shows the controllers to set warnings for each fault code.

Instructions on how to read the Curtis codes are detailed in section 2-4-3.

Countermeasures of failure codes

Display codes of programmer	Display codes of instrument	Failure description	Failure causes
Controller Overcurrent	1.2	Controller got Overcurrent	1.Short circuit of motor external U, V or W connections 2.Unmatched motor parameters 3.Controller failure
Current Sensor Fault	1.3	Current sensor failure	1. Motor U, V and W are in a circuit with the vehicle body resulting in leakage 2. Controller failure
Precharge Failed	1.4	Precharging failed	1.The front end of the capacitor is externally loaded which futher disables the capacitor's normal charge.
Controller Severe Undertemp	1.5	The controller temperature is too high	1.The working conditions of the controller is too harsh
Controller Severe Overtemp	1.6		1. The working conditions of the controller is too harsh 2.Vehicle overloaded 3.Wrong installation of controller
Severe Undervoltage	1.7	The voltage is too low	1. Wrong battery parameter setting 2. A non-controller system is consuming power 3.Excessive battery impedance 4. Battery disconnected 5. The fuse is disconnected, or the main contactor is not connected
Severe Overvoltage	1.8	The voltage is too high	1. Wrong battery parameter setting 2. Excessive battery impedance 3. The battery connection disconnected during regenerative braking

Controller Overtemp Cutback	2.2	Performance degradation resulted by excessive controller temperature	1. The working conditions of the controller is too harsh 2.Vehicle overloaded 3.Wrong installation of controller
Undervoltage Cutback	2.3	Performance reduction as leaded by low voltage	1. Low battery 2. Wrong battery parameter setting 3. The non-controller system has run out of power 4. Excessive battery impedance 5. Battery disconnected 6. The fuse or the main contactor is disconnected
Overvoltage Cutback	2.4	Performance reduction as leaded by high voltage	1.The battery connection disconnected during regenerative braking 2. Wrong battery parameter setting 3. Excessive battery impedance 4. When regenerative braking
+5V Supply Failure	2.5	The controller output 5v power failed	1.External load impedance is too low
Digital Out 6 Failure	2.6	Output overcurrent of drive no.6	1.External load impedance is too low
Digital Out 7 Overcurrent	2.7	Output overcurrent of drive no.7	1.External load impedance is too low
Motor Temp Hot Cutback	2.8	Performance degradation as leaded by motor overheating	1. The motor temperature reaches or exceeds the programmed alarm temperature and results in a drop in current output 2. Wrong motor temperature parameter setting 3. If the motor does not use a temperature sensor, the parameters "Tempcompensation" and "Temp cutback" shall be programmed as “OFF”.
Motor Temp Sensor Fault2.9	2.9	Motor temperature sensor failure	1. Wrong motor temperature sensor connection 2. If the motor does not use a temperature sensor，the parameter "MotorTemp Sensor Enable” shall be programmed as "OFF"
Coil 1 Driver Open/Short	3.1	The output connection coil of drive 1 has opened or gotten a short circuit	1. the connection load has opened or gotten a short circuit 2. Joint pin soiled 3. Wrong wiring
Main Open/Short	3.1	The main contactor coil has opened or gotten a short circuit	1. the connection load has opened or gotten a short circuit 2. Joint pin soiled 3. Wrong wiring
Coil2 Driver Open/Short3.3	3.2	The output connection coil of drive 2 has opened or gotten a short circuit	1. the connection load has opened or gotten a short circuit 2. Joint pin soiled 3. Wrong wiring

EMBrake Open/Short	3.2	The electromagnetic brake coil has opened or gotten a short circuit	1. the connection load has opened or gotten a short circuit 2. Joint pin soiled 3. Wrong wiring
Coil3 Driver Open/Short	3.3	The output connection coil of drive 3 has opened or gotten a short circuit	1. the connection load has opened or gotten a short circuit 2. Joint pin soiled 3. Wrong wiring
Coil4 Driver Open/Short	3.4	The output connection coil of drive 4 has opened or gotten a short circuit	1. the connection load has opened or gotten a short circuit 2. Joint pin soiled 3. Wrong wiring
PD Open/Short	3.5	The ratio driving has opened or gotten a short circuit	1. the connection load has opened or gotten a short circuit 2. Joint pin soiled 3. Wrong wiring
Encoder Fault	3.6	Encoder failure	1. Motor encoder fault 2. Wrong wiring
Motor Open	3.7	Motor circuit has opened	1. Default phase of motor 2. Wrong wiring
Main Contactor Welded	3.8	Main contactor the has been welded together	1.The contact of the main contactor is welded 2. U or V phase of motor is disconnected or has default phase 3.There is a circuit capacitance connected to terminal B+ Charging status
Main Contactor Did Not Close	3.9	The contactor is not closed	1.The main contactor is not closed 2.The contacts of main contactor may oxidize , melt, or be in an unstable connection 3.The capacitor is being charged by an external device 4.The fuse is off
Throttle Wiper High	4.1	The accelerator's output is too high	1.The output voltage of accelerator potentiometer is too high
Throttle Wiper Low	4.2	The accelerator's output is too low	1.The output voltage of accelerator potentiometer is too low
Pot2 Wiper High	4.3	The output of Pot 2 is too high	1.The output voltage of Pot 2 is too high
Pot2 Wiper Low	4.4	The output of Pot 2 is too low	1.The output voltage of Pot 2 is too low
Pot Low Overcurrent	4.5	Low current of port is too high	1.The port impedance is too low
EEPROM Failure	4.6	EEPROM got a failure	1.Failed to write to EEPROM storage. This may be caused by the VCL writing to EEPROM storage, or CAN BUS, or an error in programming parameters programmed into the controller after adjustment.

HPD/Sequencing Fault	4.7	High pedal protection/operation sequence performance failed	1.Incorrect key start, interlock, incorrect orientation, and incorrect accelerator input sequence. 2. Wiring, switch key, interlock, orientation, or accelerator input failure
Emer Rev HPD	4.7	High pedal protection of emergency reverse	1.The emergency reverse operation has finished, but the accelerator, forward and reverse input and interlock have not been retested
Parameter Change Fault	4.9	Parameter change failed/error	1.To ensure the safety of the vehicle, some specific parameter changes shall become effective after the be restarting with the key switch.
OEM Faults	5.1-6.7	OEM failure（customizeed fault	1.Users can define their own faults for some phenomena and express through the codes of VCL
CAN Communications Fault	5.1	BMS connection communication timeout	
BMS PDO Timeout	5.2	BMS connection communication timeout	
BMS First Level Fault	5.3	The BMS got a First Level Fault	There is a serious fault of lithium battery to be repaired
BMS High temp fault	5.4	BMS reports a high temperature alarm failure	
Battery type mismatch	5.7	Battery type error	
Display Config Fault	6.3	The right motor of the drive got a current deviation	
BMS Overvoltage	6.4	BMS reports an overvoltage fault	
BMS Undervoltage	6.5	BMS reports a low voltage fault	
BMS Low AH	6.5	BMS reports a low capacity failure	
eBMS voltage differnc	6.7	The voltage difference of lithium electric monomer is too large	
VCL Run Time Error	6.8	VCL running time error	1.The VCL codes has over-runed
External Supply Out of Range	6.9	The output of the external power supply is beyond the reasonable range	1. External load in 5V and 12V power current is too large or smaller that 2,or got a error in "CheckingMenu" parameter, e.g. "ExtSupply Max", "ExtSupply Min"
OS General	7.1	Operating system failure	1.Internal controller failure

PDO Timeout	7.2	PDO Timeout	1.The CAN PDO information receiving time has exceeded the time limit of PDO
Stall Detected	7.3	Motor stalling	1. Motor stalling 2. Motor encoder failure 3. Wrong wiring 4. Power failure of input motor encoder
Motor Characterization Fault	8.7	Motor matching failure	1. Code references is presented in the motor matching process: 0=normal 1=The controller has received the encoder signal, but the pulse amount is not defined。 Please set the pulse value manually 2=Motor temperature sensor failure 3=Motor high temperature reaction failure 4=Motor overheating reaction failure 5=Motor low temperature reaction failure 6=Low voltage response failure 7=High pressure response failure 8=The controller cannot detect the encoder signal and the channel signal disappears 9=Motor parameters are conditioned beyond the range
Motor Type Fault	8.9	Motor type error	1.The parameter value of motor type is out of range
VLC/OS Mismatch	9.1	VCL/OS cannot be matched	1.The VCL program in the controller does not match the OS program
EM Brake Failed to Set	9.2	The electromagnetic brake setting failed	1.The vehicle still moves after the electromagnetic brake command is conditioned. 2.Electromagnetic braking force is too low
Encoder LOS (Limited Operating Strategy)	9.3	Encoder is restricted by operating state	1. The restricted operating state is activated due to motor stall or encoder failure 2. Wrong wiring 3. The vehicle is stalling
Emer Rev Timeout	9.4	Emergency reverse response timeout	1. Emergency reverse timeout is activated because the EMR timer has expired 2. The emergency reverse switch is always in the position of "On"
Illegal Model Number	9.5	Controller model error	1. Controller model cannot be recognized 2. The hardware and software don't match each other 3. Controller failure

3 Drive / Brake System

3-1 Overview

3-1-1 Assembly

The drive/brake system consists of the followings:

1.The drive motor regulated by the respective controller transmits the rotating force to the left and right drive shafts (electric power/ mechanical power).[Section 3-2]

2.The drive shaft converts the rotating force transmitted from the drive motor into the torque and speed suitable for driving through its gear set, and sends them to the corresponding wheel (mechanical power). They also contain the service brakes, which are actuated by pressing the brake pedal to produce braking force (hydraulic power/friction). [Section 3-3]

3.The accelerator sends an electrical signal to the left drive motor controller to accelerate the motor (analog signal/ digital signal).[Section 3-4]

4.The F/R unit sends an electrical signal to the left drive motor controller to determine the drive direction of the motor (analog signal/digital signal).[Section 3-5]

5.The service brake pedal assembly injects brake fluid into the drive shaft to drive the service brakes (hydraulic power/friction).[Section 3-6]

6.The parking brake, which is built into each drive axle, holds the motor shaft when engaged to ensure that the vehicle is stationary (mechanical power/friction).[Section 3-7]

3-2 Drive motor

3-2-1 Appearance and specification

Project	Specifications
Voltage	50 V
Power	10.0 Kw
Current	150 A.
Speed	2,060 Rpm
Maximum speed	4,500 Rpm
Frequency	70 Hz

Encoder

Project	Specifications
PPR	64 pulses per round
Connector	4 Needle AMP

Thermal sensor

Project	Specifications
Part number	Included in motor
Resistance	603 Ω ± 3% at 25 ° C (77 ° f)
Connector	2 Needle AMP

3-2-2 How to run it

On the electric side, the drive motors turn their respective drive wheels so that the vehicle can move forward / backward.

Control by a controller

Each drive motor is connected to the controller via U, V and W wires. The controller operates the drive motor based on inputs from multiple switches and sensors and internal parameter settings.

The drive motor operates when the following conditions are met:

1. The key switch is off to power the controller,
2. Operator seated (seat switch),
3. Determine the direction of travel (in F / R units),
4. Accelerator pedal pressed (accelerator)

Motor speed detection (encoder operation)

Each drive motor is equipped with an encoder, which is used as the speed sensor of the motor.It contains two hole sensors, and gears are installed on the drive shaft of the motor to interact with the two hole sensors.The gear rotates with the drive shaft at the same time, so that the gear teeth periodically pass through the magnetic field of each hole sensor. When the top platform of the gear passes through the magnetic field, it is close to the hole sensor, so the magnetic flux increases. On the other hand, the distance increases and the

magnetic flux decreases accordingly, when the bottom platform passes through the magnetic field.

The cycle occurs again and the flux has a waveform that produces a voltage pulse. The controller analyzes the amplitude of the pulse to calculate the speed of the motor. The smaller the amplitude, the higher the speed of the motor.

Like other sensors, the encoder generates the main signal (Signal A) and the reference signal (Signal B) through the two hole sensors.The order of the generated signals varies according to the direction of rotation.

Overheat protection (thermal sensor operation)

Each drive motor is equipped with a thermal sensor to prevent overheating.Once the motor is heated to 145 ° C (293°F), an overheat alarm is activated and the operating performance of the motor is limited.

3-2-3 Disassembly/assembly and test of drive motor

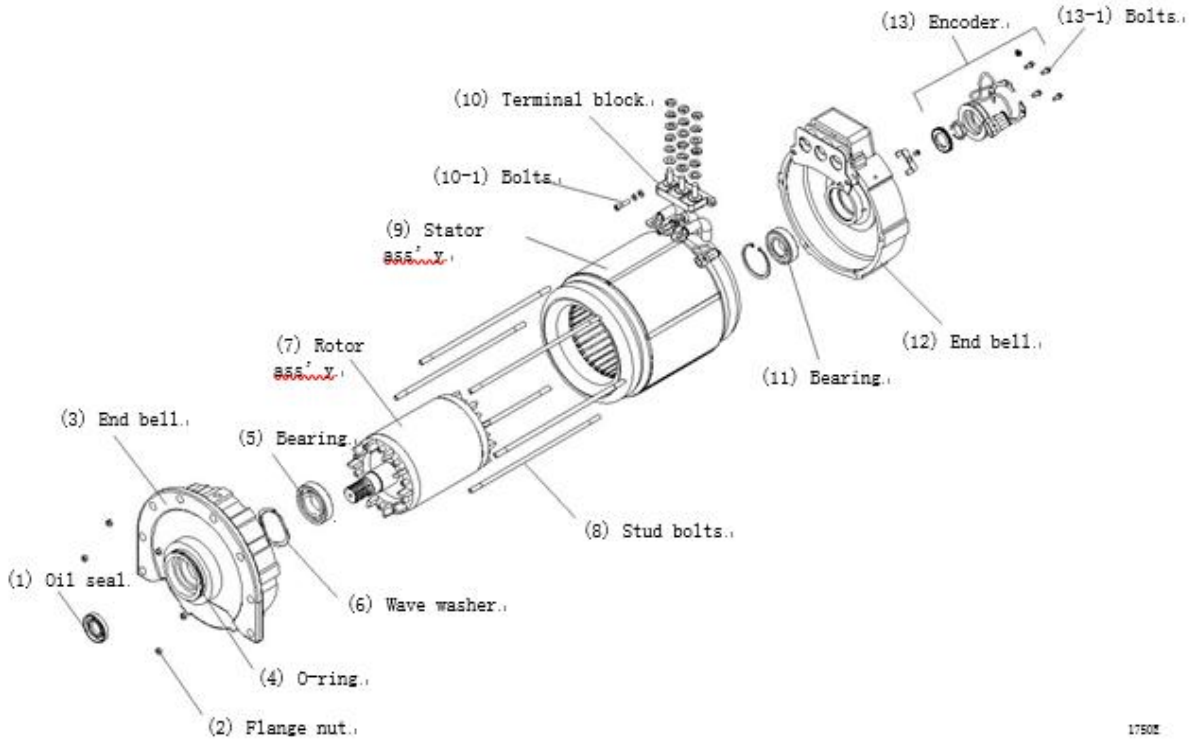


图 3-9

Disassembly/assembly

1.After removing the terminal protector, loosen the screws (10-1) and remove the terminal block (10).

2.Loosen the bolts (13-1) and remove the encoder (13).

3.Remove the O-ring (4) and the oil seal (1).

4.Loosen the back nut (2) and remove the lower cover (3).

5.Remove the stator assembly (9) by hand or using a tool.

6.Remove the wave washer (6) and the bearing (5) from the rotor assembly (5).

7.Remove bearing (11) and rotor assembly (7) from end cap (12).

The bearing puller recommended is as shown in the figure.

8.Perform the above steps in reverse order to assemble the drive motor.

Note: before reassembling the motor, you can test its components as follows.

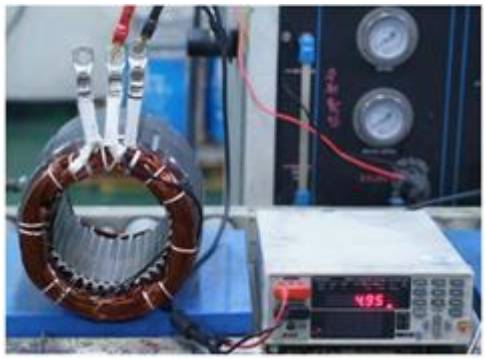
Stator test

1.Carefully wipe the contamination on the stator surface with a clean cloth dipped in alcohol.

Note: contamination in the stator can cause coil damage and therefore damage to the stator itself.

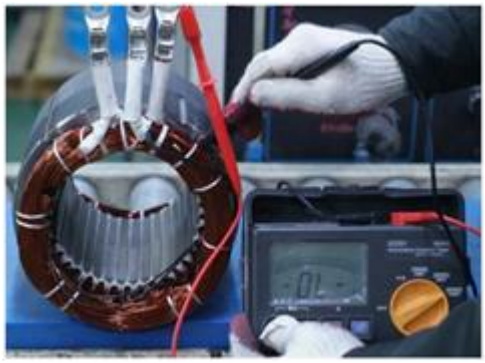
2.Use a milliohmmeter to measure the resistance of each phase (UV, VW, Wu).

Rated resistance: 0.4 Ω



3. Test insulation at 1000 VAC and minUse insulation tester for 10m Ω.

If there is a problem with the insulation, replace the stator with a new one.



3-2-4 Removal / installation of drive wheel

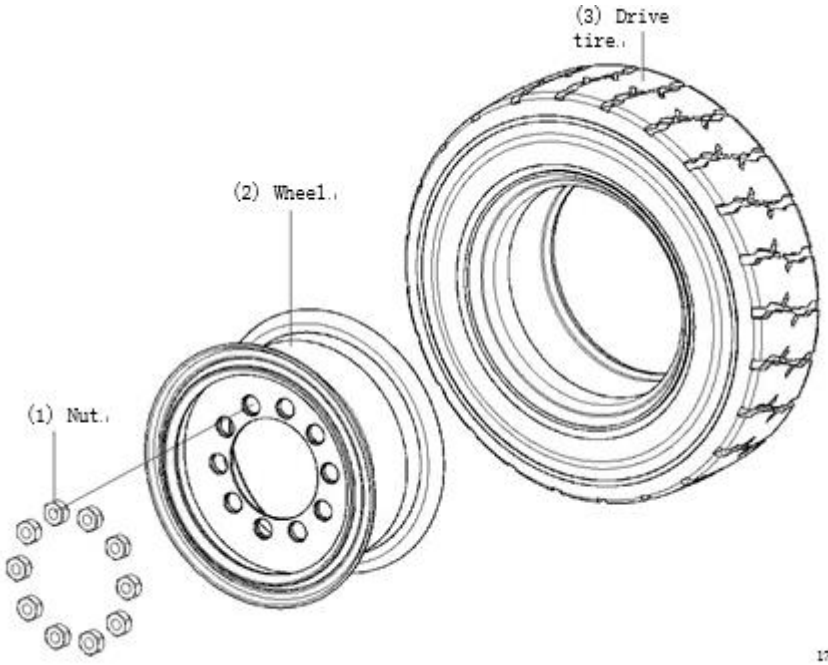


图 3-13

1.Place a jack or block of wood under the forklift to empty the wheel and loosen the nut (1).

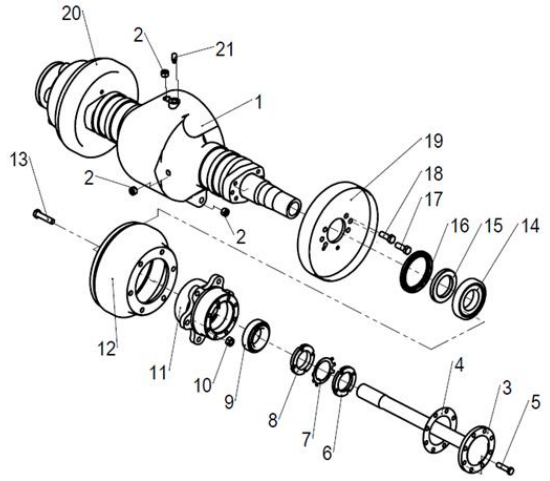
Installation torque: 450 ± 70 n · m (331.9 ± 51.6 LB · ft)

2.Remove the nut (1) and drive the tire (2).

3.Perform the above steps in reverse order to install the drive wheels.

3-3 Drive axle

3-3-1 Appearance and specifications



Serial No.	Description	Amount	Serial No.	Description	Amount
1	Axle housing	1	11	Hub	2
2	Blocking	3	12	Brake drum	2
3	Half shaft	2	13	Hub connecting bolt	12
4	Halfshaft gasket	2	14	Bearing 30213E	2
5	Half shaft bolt	16	15	Bearing retaining ring	2
6	Small round nut	4	16	Oil seal sg100 * 125 * 12	2
7	Lock washer	2	17	Brake hinge bolt	4
8	Spacer sleeve	5	18	Brake bolt M14 * 1.5 * 40	12
9	Bearing oil seal 33012a	2	19	Left brake assembly	1
10	Rim nut M14 * 1.5	12	20	Brake gp-rh	1
			21	Vent assembly	1

3-3-2 How does it work

Driving function

The drive shaft is responsible for transmitting the output of the drive motor to the wheel, reducing the speed and multiplying the torque according to the specific gear ratio generated by its internal gear train.This is to make the motor adapt to driving at high speed and obtain enough force to bear the load of the vehicle and other external conditions.

When the motor shaft rotates, the connected pinion also rotates, and then the helical gear is rotated, and the spline is connected to the pinion.Since the helical gear has several times more teeth than the pinion, the first reduction occurs between the two gears and the torque multiplies accordingly

Braking function

Once the brake pedal is pressed, brake oil is injected into the drive shaft through the master cylinder to push the piston.The pushed piston then compresses the friction discs and the steel discs which are superimposed on each other; there is friction between them.Thus, the friction disc loses its rotating power.When the friction disc loses power, all other rotating parts, including the wheel, decelerate and stop together.After releasing the brake pedal, the brake oil is discharged, and the return spring returns the compression disc to its original position, leaving a gap between the inner disc and the outer

disc, and then turning to release the brake.As a result, all other rotating parts become free to rotate.

3-3-3 Replacement of drive gear oil

Initial steps

1.Park the vehicle on level ground.Check that the parking brake indicator is on, then place the F / R switch in neutral.

Process

1.Lift the Mast and support it with a support block.

2.Turn off the key switch.

3.Unscrew the oil level check plug and remove the drain plug to drain the oil.

4.Clean drain plug and install.

5.Unscrew and fill the oil filler plug.

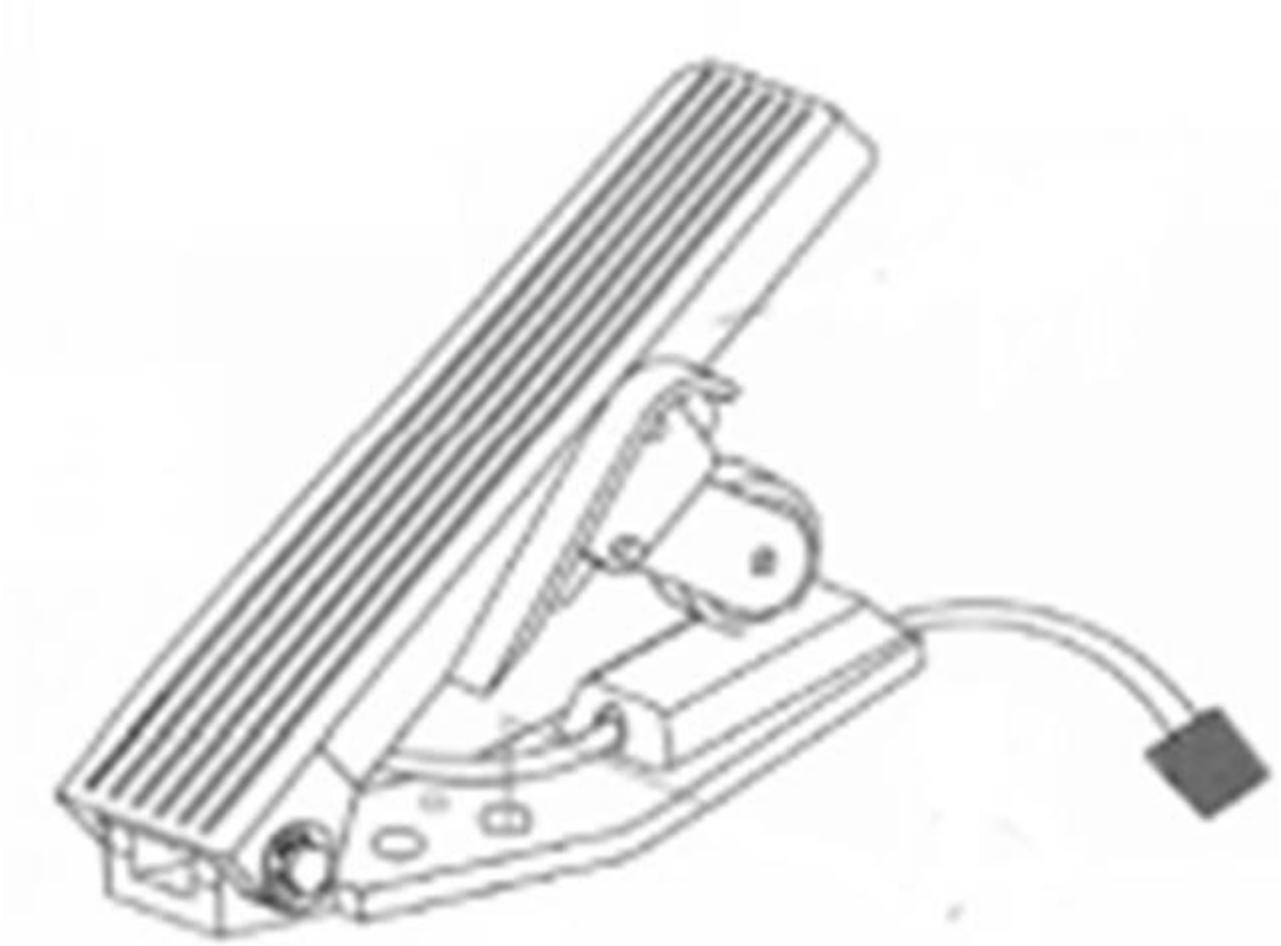
Maintain the proper oil level by checking the dipstick.

6.Install the oil level check plug and tighten the oil make-up plug together.

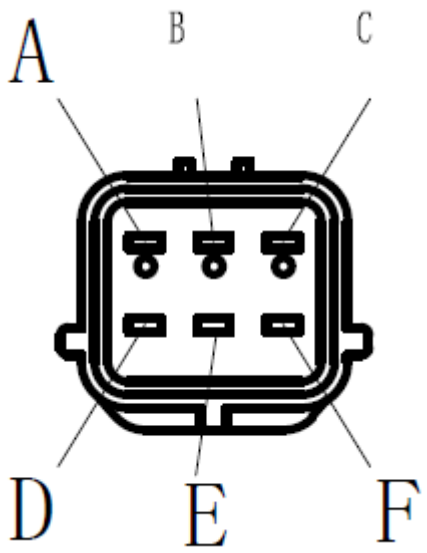
7.Lift the Mast and remove the support block.

3-4 Accelerator

3-4-1 Appearance and specifications



No.	Plug-in definition	Colour
A	Power supply + 12V - + 80V	Red
B	Signal output, 0-10V	Green
C	Ground wire 1	Black
D	CAM (common)	White
E	Idle switch signal	Blue
F	None	N/A



3-4-2 How does it work

Electric vehicle is powered by a drive motor. As a result, the accelerator that determines the vehicle's travel speed is connected to the drive motor controller.

The accelerator is powered by 5 V from the drive motor controller, and generates Signal A in gear F and Signal B in gear R. This output determines that the speed of the vehicle is proportional to the angle at which the accelerator pedal is pressed.

As shown above, Signal A or B sent by the accelerator are communicated to the controller by CAN. In principle, the values of the two signals shall be the same. If they differ by more than the tolerance, it will be identified as a problem

in the electrical system or accelerator and a fault code will appear on the display.

3-4-3 Disassembly and installation

Initial steps

1.Turn off the key switch.

2.Remove floor covering mat

Process

1.Lift the base plate slightly and perform the following steps:

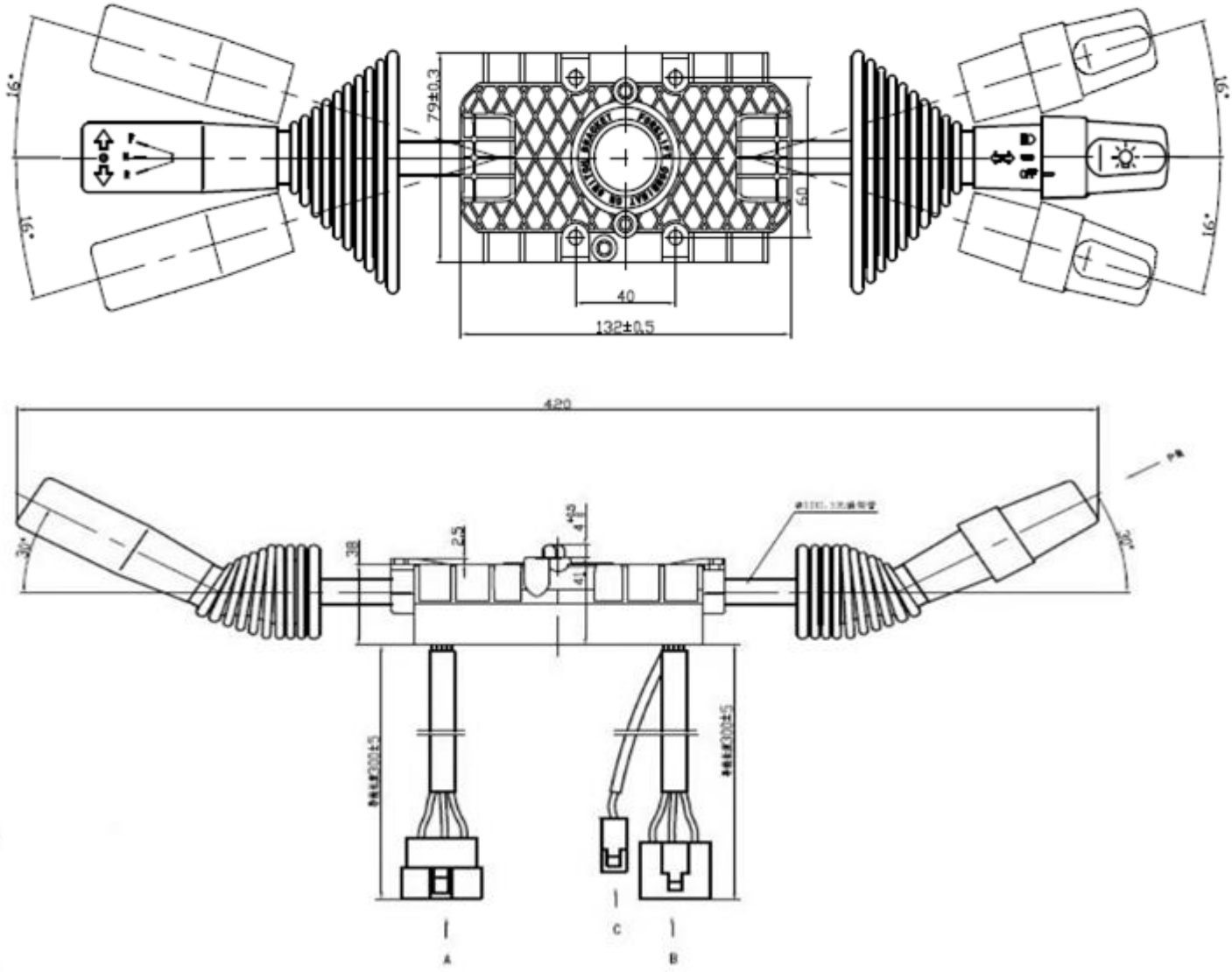
2.Remove the accelerator pedal connector from the main harness.

3.Loosen the three sets of bolts and nuts and remove the accelerator.

4.Perform the above steps in reverse order to reinstall the accelerator pedal.

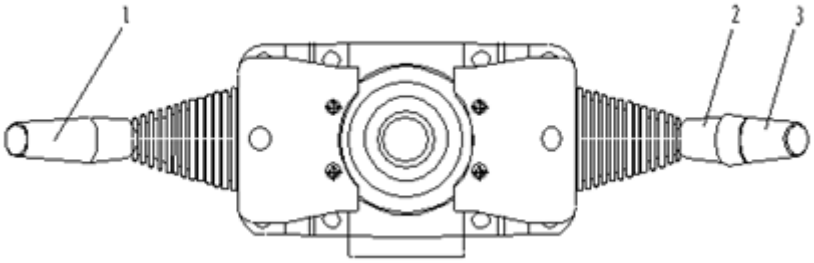
3-5 F/R units

3-5-1 Appearance and specifications



3-5-2 How does it work

The combination switch is a combination of direction switch, turn light switch and large and small light switch.



1-F/R direction switch 2-Turn light switch 3-Large and small light switch

The direction switch controls the driving direction of the vehicle and transmits the signal to the instrument for display. Push the handle forward, pull the handle backward, and set the middle position to neutral.When the handle is set to the backward position, the reversing light and warning light are on and the reversing buzzer sounds.

The steering light switch indicates the turning direction of the forklift. When the switch handle is turned to the steering position, the steering light flashes.

Push forward	Left turn signal flashing
Middle	Median position
Pull back	Right turn signal flashing

The large and small lamp switch controls the on and off of the large and small lamps.This switch has second gear. When it is rotated to the first gear, the small light will be on. When it is rotated to the second gear, the large and small lights will be on.

Gear position / Automative lighting	OFF	Gear I	Gear II
Indicator lamp	×	○	○
Taillight	×	○	○
Headlamp	×	×	○

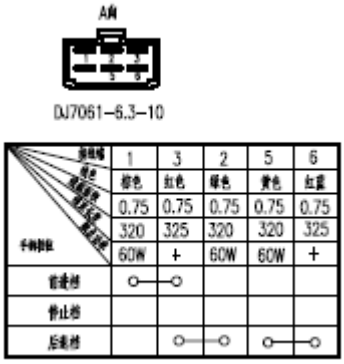
○: Light on ×: Light off

(4) Rear headlamp switch

The rear headlamp switch is a single gear switch, which controls the lighting and extinguishing of the rear headlamp. Pull up and light up the rear headlamp, and push down to extinguish the rear headlamp.

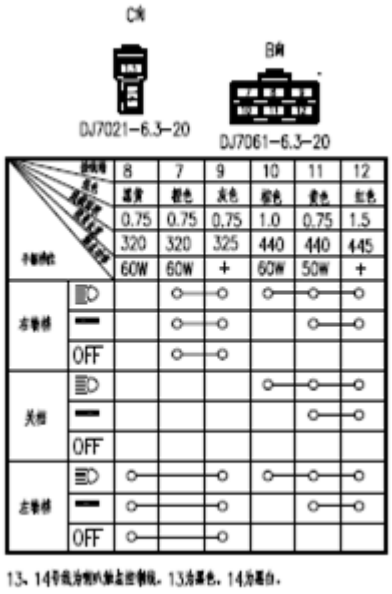
The F / R direction switch (forward / reverse) is used to enable the operator to use the connection to the F / R combination switch to select the driving direction of the vehicle.

The F / R direction switch has one connector (6-pin connector, a-direction), which can be connected with multiple devices interact as follows:



The 6-pin connector pins of the F/R direction switch are all connected with the F/R switch to provide 5V power supply and receive the operator's requirements through forward, reverse or undirected switches.

When the switch is in neutral, it sends voltage signals from the forward and reverse terminals.The B-way and C-way connectors are the vehicle's lamp switch connectors, as shown below.



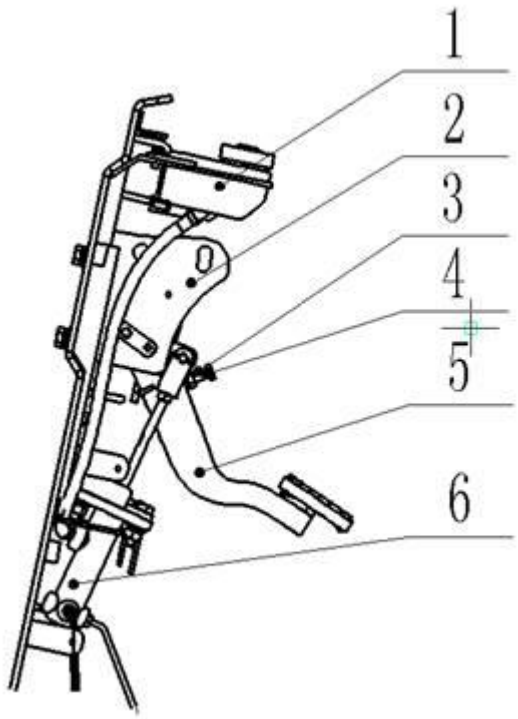
3-6 Brake system

3-6-1 Summary

The brake system is composed of brake pedal, brake master cylinder and wheel brake, which is the internal expansion oil pressure type of the front two wheel braking.

3-6-2 Brake pedal

The structure of the brake pedal is as shown in the figure. The pedal converts the pedal force acting on the pedal into the brake oil pressure through the push rod of the brake master cylinder.



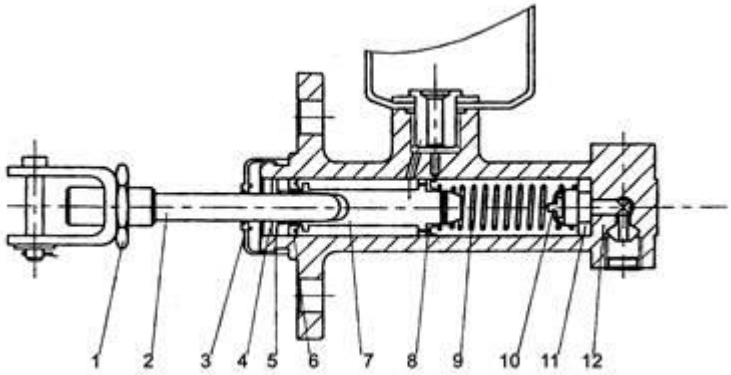
1. Brake oil cup
2. Brake mount
3. Brake sensor
4. stop bolt
5. Brake pedal
6. Brake master cylinder

Figure Brake pedal assembly

3-6-3 Brake master cylinder

The master cylinder includes a seat, a check valve, a return spring, as well as the main seal cup, piston and auxiliary cup.The end is fixed with lock washer and Lock wire, and the outside is protected by rubber dust cover.The master cylinder piston is operated by means of the brake pedal through the push rod. When the brake pedal is depressed, the push rod pushes the piston forward, and the brake fluid in the pump body flows back to the oil storage tank through the oil return port until the main seal cup blocks the oil return port.After the main seal cup is pushed through the oil return port, the brake fluid in the front cavity of the master cylinder is compressed and the check valve is opened, so that it flows to the slave cylinder through the brake pipeline.In this way, the piston of each slave cylinder extends outwards to make the brake shoe friction plate contact with the brake drum, so as to achieve the effect of deceleration or braking.At this time, the rear chamber of the piston is replenished with brake fluid from the return port and the inlet port.When the brake pedal is released, the piston is pressed back by the return spring. At the same time, the brake fluid in each brake cylinder is compressed by the return spring of the brake shoe, so that the brake fluid returns to the master cylinder (piston front chamber) through the check valve. The piston returns to its original position. The brake fluid in the master cylinder flows back to the oil tank through the return port. The pressure of the check valve is adjusted to the residual pressure assembly in the brake

pipeline and the brake cylinderIn a certain proportion, the cup of scoring pump shall be placed correctly to prevent oil leakage and eliminate the possible air resistance during emergency braking.

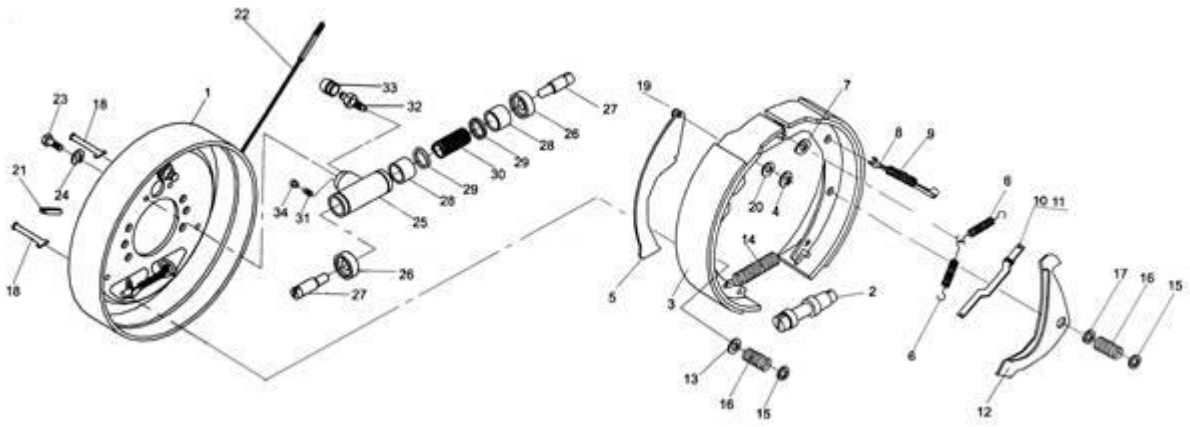


1.Lock nut	2.Push rod	3.Dust cover.	4.Lock wire
5.Lock washer	6.Auxiliary seal cup	7.Piston.	8.Main seal cup
9.Spring.	10.Check valve	11.Seat.	12.Pump body

Figure Brake master cylinder

3-6-4 Brake

The brake is a double shoe brake, which is installed on both sides of the drive axle.The brake consists of two sets of brake shoes, brake cylinder and regulator.One end of the brake shoe is in contact with the fixing pin and the other end is in contact with the adjusting device.Press the parking brake part against the return spring and pressure spring rod.In addition, the brake is also equipped with a parking brake mechanism and an automatic adjusting device.



1.Brake base plate assembly	2.Gap adjuster	3.Friction plate assembly	4.Elastic gasket
5.Hand brake lever	6.Return spring	7.Shim	8.Ejector pin
9.Return spring	10.Hand brake push rod	11.Compression spring	12.Adjustment lever
13.Pressure spring seat	14.Spring	15.Pressure spring cover	16.Spring
17.Pressure spring seat	18.Tension spring rod	19.Support pin	20.Shim
21.Glue plugging	22.Brake cable assembly	23.Bolt M8×16	24.Spring washer 8
25.Wheel cylinder	26.Shield of brake cylinder	27.Piston rod of brake cylinder	28.Piston
29.Pump seal cup	30.Brake cylinder spring	31.Brake cylinder oil plug	32.Bleed screw of brake cylinder
33.Cylinder bleed screw guard	34.Dust cover		

Figure brake

(1) Brake action

The brake wheel cylinder presses the brake drum with the same force as the main brake shoe and the secondary brake shoe until the upper end of the secondary brake shoe is against the fixed pin, and the brake shoe moves towards the rotation direction of the brake drum.After holding the fixed pin, the friction force between the friction plate and the brake drum increases. Because the main brake shoe gives the auxiliary brake shoe a much greater pressure than the brake cylinder pressure, a great brake force is generated.

The brake action in reverse is the opposite of that in forward.

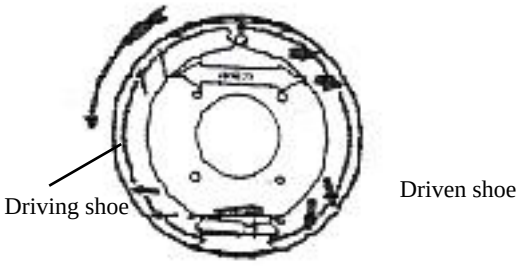


Figure forward action

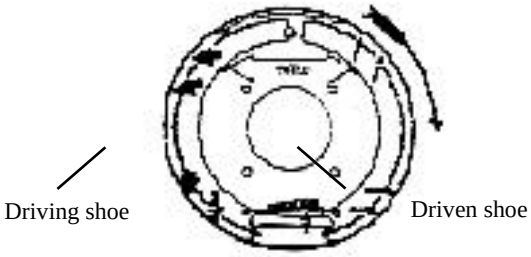


Figure backward action

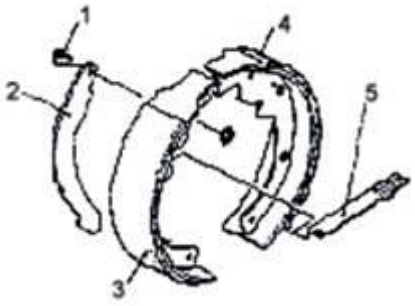
(2) Parking brake

The parking brake device is assembled in the wheel brake and consists of a pull rod and a push rod.The pull rod is installed on the side of the main brake shoe by the pin and pulled

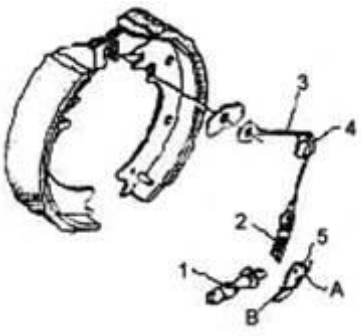
The action of is transmitted to one side of the auxiliary brake shoe through the push rod.

(3) Clearance self-adjusting mechanism

The clearance self-adjusting mechanism can maintain proper clearance between the friction plate and the brake drum.The clearance self-adjusting mechanism only operates when reversing.



1.Pin 2.Pull rod 3.Driving shoe 4.Driven shoe 5.Strut



1.Regulating mechanism 2.Spring 3.Inhaul cable 4.Guide slot 5.Pull rod

(4) Action of clearance automatic adjustment mechanism

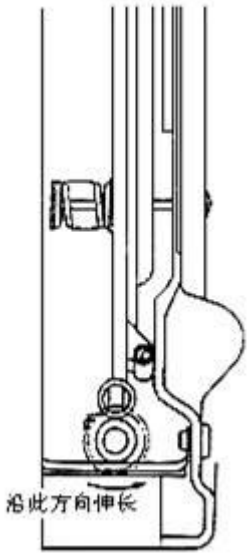
When the forklift is backing up, brake operation is carried out. The auxiliary brake shoe contacts with the main brake shoe and rotates together to make the pull rod turn right around point a, as shown in the figure, point B is raised. After the brake is released, the pull rod turns left under the action of spring force, and point B drops.When the clearance between the friction plate and the brake hub becomes larger, the vertical distance of point B rotation increases, the adjuster is moved by a tooth, the adjusting rod becomes longer, and the clearance decreases accordingly.The clearance adjustment range is 0.40mm-0.45mm.

3-6-5 Parking brake control

The parking brake handle is cam type, and the brake force can be adjusted by the adjuster located at the end of the brake handle.

Adjustment of braking force: turn the adjuster clockwise to increase the braking force; turn the adjuster anticlockwise to reduce the braking force.

Tensile force: 196N ～ 294N.



Elongate in this direction

Figure Clearance self adjusting mechanism

Figure Parking brake pedal

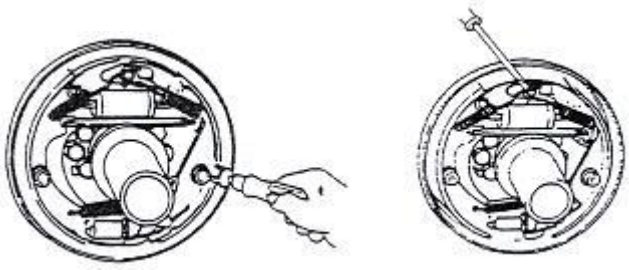
3-6-6 Key points of brake disassembly and adjustment

When the wheel and hub are disassembled, the disassembly, assembly and adjustment of the brake and the adjustment method of the brake pedal.

1.Brake disassembly

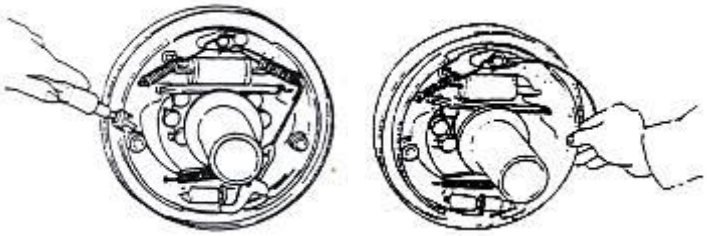
(1) Remove the support pin, adjusting rod, adjusting device and spring on the auxiliary brake shoe.

(2) Remove the shoe return spring.



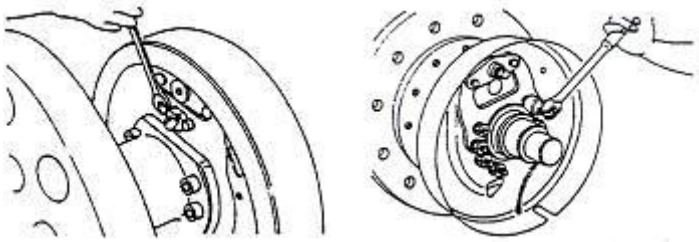
(3) Remove the fixed spring from the main brake shoe.

(4) Remove the main brake shoe and auxiliary brake shoe. Remove the adjuster and adjuster spring at the same time.

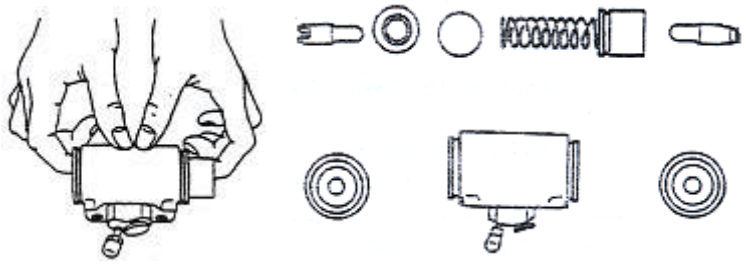


(5) Remove the brake pipe from the brake cylinder.Then remove the mounting bolts of the brake cylinder and remove the brake cylinder from the brake base plate.

(6) Remove the E-ring used to fix the brake cable on the brake base plate.Then:, remove the bolts that install the brake base plate, and remove the brake base plate from the drive axle.



(7) Disassemble the brake cylinder: remove the dust ring.Press one side of the piston to push out the other side of the piston, and then press this side of the piston with your fingers.



2.Brake inspection

Inspection of all parts, repair or replacement of damaged parts.

(1) Check whether there is rust on the inner surface of the cylinder and the outer circumference of the piston; then measure the clearance between the piston and the pump body.

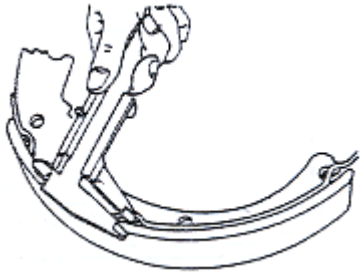
Standard size: 0.03mm-0.10mm; limit size: 0.15mm

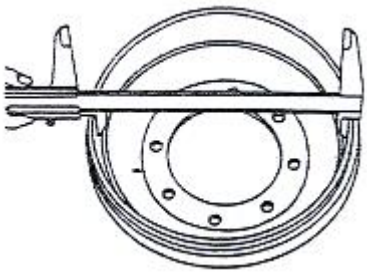
(2) Visually check whether the piston cup is damaged and deformed, and replace it if there is any abnormality.

(3) Measure the free length of the brake cylinder spring, and replace it when it exceeds the reference.

(4) Measure the thickness of the friction plate and replace it when it exceeds the wear limit.Standard value: 8.0mm; limit value: 2.0mm

(5) Visually inspect the inner surface of the brake drum. If there is damage or partial wear, grind it for correction. If it exceeds the correction limit, replace it. Standard value: 314mm; limit value: 316mm.





3.Brake assembly

(1) Apply brake fluid on the cup and piston of the brake cylinder, and assemble the spring, piston cup, piston and anti ring in sequence.

(2) Install the brake cylinder on the brake base plate.

(3) Install the brake base plate on the drive axle.

(4) Apply heat-resistant grease all over as shown in the figure.

Be careful not to apply it to the friction plate.

(a) the contact surface between the base plate and the brake shoe;

(b) fixing pins;

(c) the contact surface between the shoe and the spring seat;

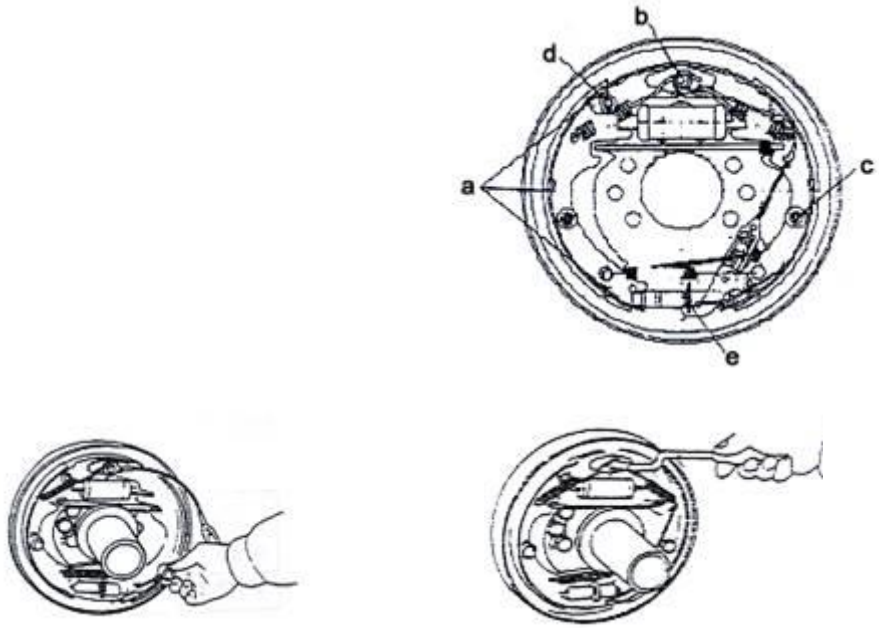
(d) hand brake pull rod support pin;

(e) adjusting mechanism threads and other rotating parts.

(5) The parking brake cable is clamped with E-shaped retaining ring.

(6) Install the brake shoe with the fixed spring.

(7) Install the compression spring onto the hand brake push rod, and then install the push rod onto the brake shoe



(8) Install the brake shoe guide plate onto the support pin, and then install the brake shoe return spring.Install the main shoe first, then the auxiliary shoe.As shown in Figure 2-28

(9) Install the adjuster, adjuster spring, ejector rod and ejector rod return spring. Note the following:

(a) The thread direction of the adjuster and its installation direction;

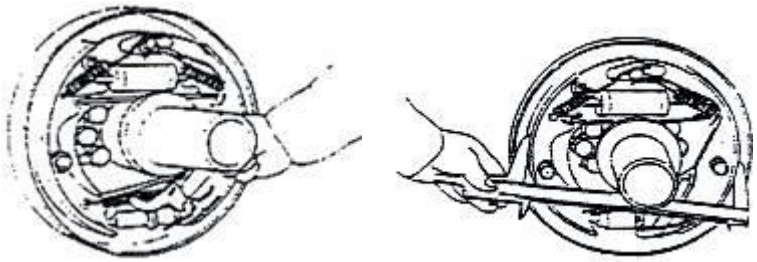
(b) Adjuster spring direction (the adjuster teeth are not allowed to contact with the spring);

(c) The direction of the return spring of the ejector pin (the spring hook at the end of the support pin shall be fixed on the opposite side of the ejector pin);

(d) The lower end of the adjusting lever must be in contact with the tooth part of the adjuster.

(10) Connect the brake oil pipe to the slave cylinder.

(11) Measure the inner diameter of the brake drum, the outer diameter of the brake shoe and adjust the regulator so that the difference between the inner diameter of the brake drum and the outer diameter of the brake shoe friction plate is 0.3mm-0.5mm



4.Operation test of automatic gap adjuster

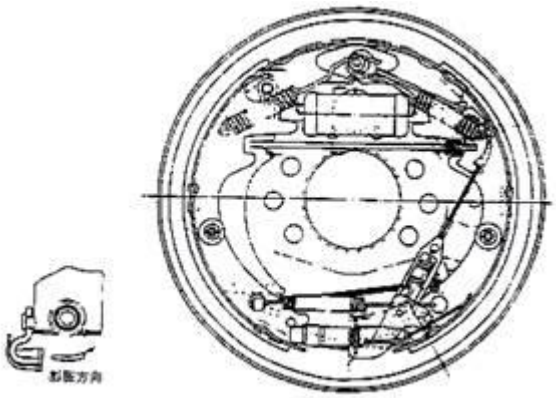
(1) First, make the diameter of the brake shoe close to the specified installation size, and pull the adjusting lever by hand to make the adjuster rotate. When the hand is released, the adjusting lever returns to its original position, while the adjuster gear does not rotate.

Note: the adjuster can work normally even when the hand is released and the adjuster gear returns together with the adjusting lever.

(2) If the adjuster fails to do the above actions when pulling the adjusting lever, the following inspection shall be carried out:

(a) Install the adjustment lever, top bar, top bar spring and compression spring seat firmly;

(b) Check whether the ejector return spring and adjuster spring are damaged, and then check whether the rotation of adjuster gear and its engagement part are excessively worn or damaged.Check whether the lever is in contact with the gear. Replace damaged parts.



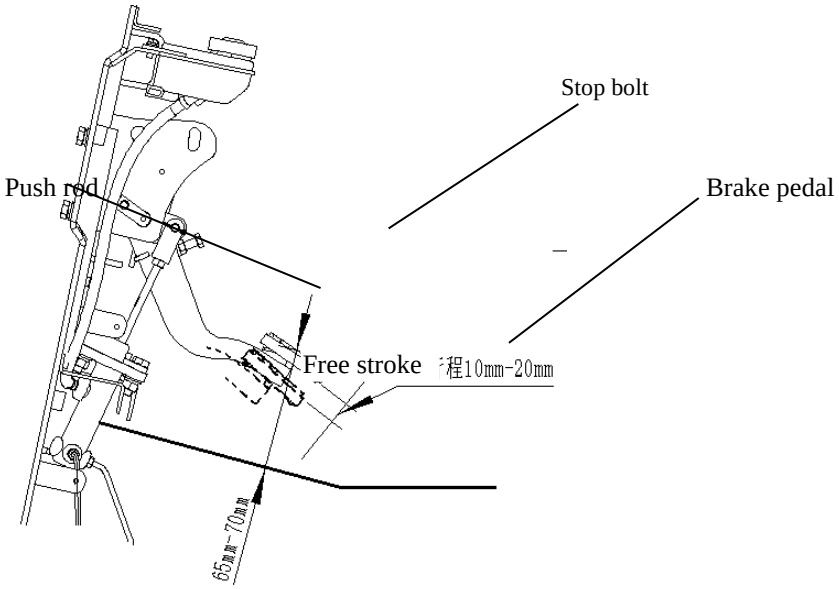
3-6-7 Brake pedal adjustment

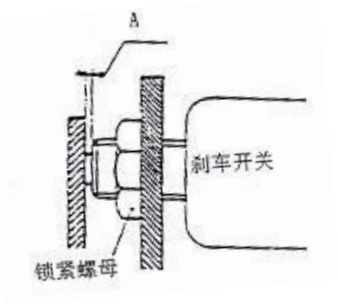
(1) Shorten the push rod;

(2) Adjust the pedal stop bolt and the pedal height;

(3) Lengthen the push rod until the front end of the push rod contacts with the piston of the master cylinder, and then return 1-2 turns to ensure the free stroke of the pedal is between 10 mm and 20 mm;

(4) Lock the push rod nut and pedal stop bolt nut.





(5) Adjustment of brake switch

(a) After the height of the brake pedal is adjusted, loosen the lock nut of the brake switch;

(b) Pull off the plug to separate the wire;

(c) Turn the switch so that the clearance A = 1mm;

(d) Make sure that the brake light is on when the brake pedal is depressed;

(e) Finally lock the nut.

Lock nut
Brake switch

3-6-8 Fault analysis and troubleshooting

Problem	Cause analysis	Exclusion method
Poor braking	1 Brake system oil leakage	repair
	2 Brake shoe clearance not adjusted	Regulator
	3 Brake overheating	Check for slipping
	4 Poor contact between brake drum and friction plate	Resetting
	5 Impurities attached to friction plate	Repair or replace
	6 Impurities mixed into brake fluid	Check brake fluid
	7 Improper adjustment of brake pedal (micro valve)	adjustment
Brake noise	1 The surface of friction plate is hardened or foreign matters adhere to it	Repair or replace
	2 The base plate is deformed or the bolt is loose	Repair or replace
	3 Brake shoe is deformed or installed incorrectly	Repair or replace
	4 Friction plate wear	replace
	5 Loose wheel bearing	Repair or replace
system move No all	1 Oil stain on the friction plate surface	Repair or replace
	2 Brake shoe clearance not adjusted	Regulator
	3 Sub pump failure	Repair or replace
	4 Brake shoe return spring damaged	replace
	5 Brake drum deflection	Repair or replace
system move No Power	1 Brake system oil leakage	Repair or replace
	2 Brake shoe clearance not adjusted	Regulator
	3 Air in the brake system	Deflation
	4 Brake pedal is not adjusted correctly	Resetting

3-6-9 Maintenance and service

① Before running in test, the new drive axle shall be filled with gear oil (the selection of gear oil shall be strictly in accordance with the specification, and the specific model shall refer to table 2-1).Oil shall be injected from the oil filling hole on the upper part of the axle housing until oil overflows from the oil level hole in the middle of the axle housing.

② The thickness of the friction plate on the brake shoe is 8mm.The minimum thickness allowed is 2mm.These two parts are key parts of the brake system, which shall be checked once a month. If excessive wear is found, it shall be replaced in time to avoid accidents.

③ Technical maintenance every 50h:

I. After the new bridge works with the main engine for 50h, the gear oil shall be replaced.When changing oil, clean the bridge and add new oil.

II. Check the fastening of each fastener. If it is loose, fasten it immediately.

III. Check whether there is oil leakage at the connection between the wheel half shaft and the hub. If there is any leakage, reapply the sealant.

④ Monthly technical maintenance:

I. check the wear condition of brake drum to see if there is destructive wear.

II. Check the wear condition of the brake shoe. When the wear has not met the use requirements, replace it immediately.

III. Check whether the oil level of the axle housing meets the requirements. If the oil level drops, make up in time.

⑤ Technical maintenance every half a year: replace the gear oil in the bridge every half a year.

⑥ Annual technical maintenance: the work shall be disassembled and inspected for one year.

⑦ Requirements for inspection and commissioning items during installation:

When reinstalling the drive axle hub, pay attention to adjusting the brake clearance adjuster so that the clearance between the brake drum and the friction plate is between 0.3mm and 0.5mm.The tapered roller bearing on the hub shall be filled with about 100ml of 3 × lithium grease.

Adjustment of wheel hub bearing clearance: tighten the lock inner nut until the wheel hub brake drum can only barely rotate.Then turn the lock inner nut backward by 1 / 8 turn. At this time, the hub brake drum shall be able to rotate freely without jamming, obvious axial clearance and yaw. Then assemble the lock washer, and finally lock it with the lock outer nut.

3-7 Parking brake

3-7-1 Appearance and specifications

3-7-2 How does it work

For this model, the parking brake is built into each drive shaft.Once the operator pulls the lever, the cable assembly pulls the brake lever, which in turn presses the brake piston and the resilient disc.This causes the compression discs to produce friction braking forces in the drive shaft.In this case, all rotating parts in the drive shaft are no longer able to move, thus keeping the drive wheel stationary.And once the lever is pushed back, the cable no longer pulls the lever,

releasing the brake.In addition, the parking brake switch is installed behind the lever.The switch opens when the lever moves to engage the parking brake and closes when the lever moves to release the brake.

3-7-3 Parking brake test

Warning
If the parking brake is not properly adjusted, the vehicle rolls over, resulting in a dangerous situation: If the parking brake fails during this process, be prepared to operate the driving brake.

1. Place rated load capacity on fork

2. Tilt the vehicle up 15%.

3. Stop the forklift with the service brake at the half of the tilt, and the brake will automatically engage as the parking brake.

4. If the parking brake has been adjusted correctly, the vehicle shall remain stationary

If the vehicle descends, refer to Section 3-8-3 parking brake failure exclusion.

Figure 3-64

3-7-4 Park brake switch adjustment

If the instrument panel does not correctly recognize the engagement of the park brake, it must be checked and

Adjust the park brake switch.

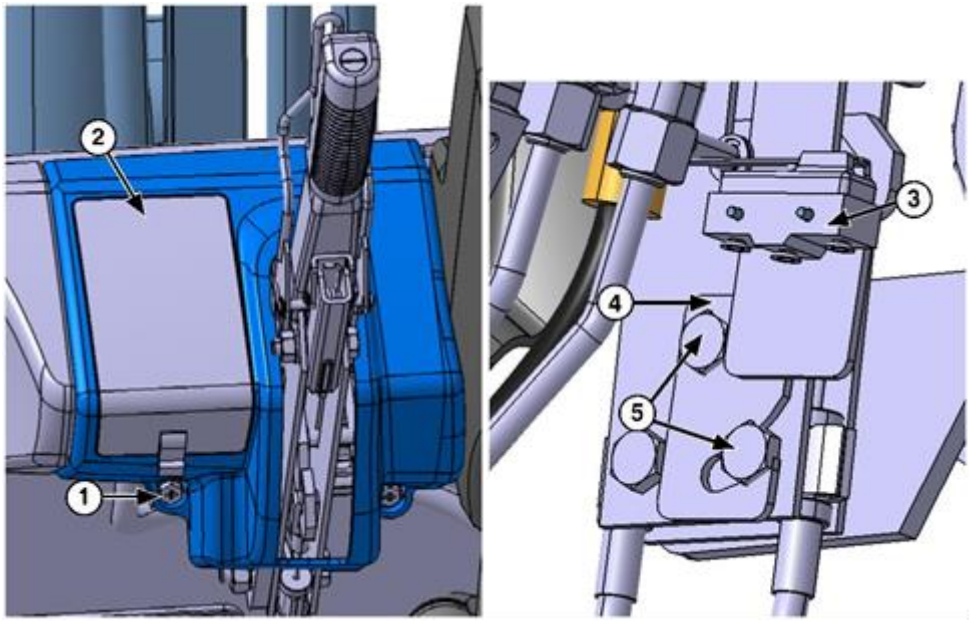
1. Remove the two bolts and washers and remove the left-hand cover.

2. Turn off the seat switch and turn on the key switch.

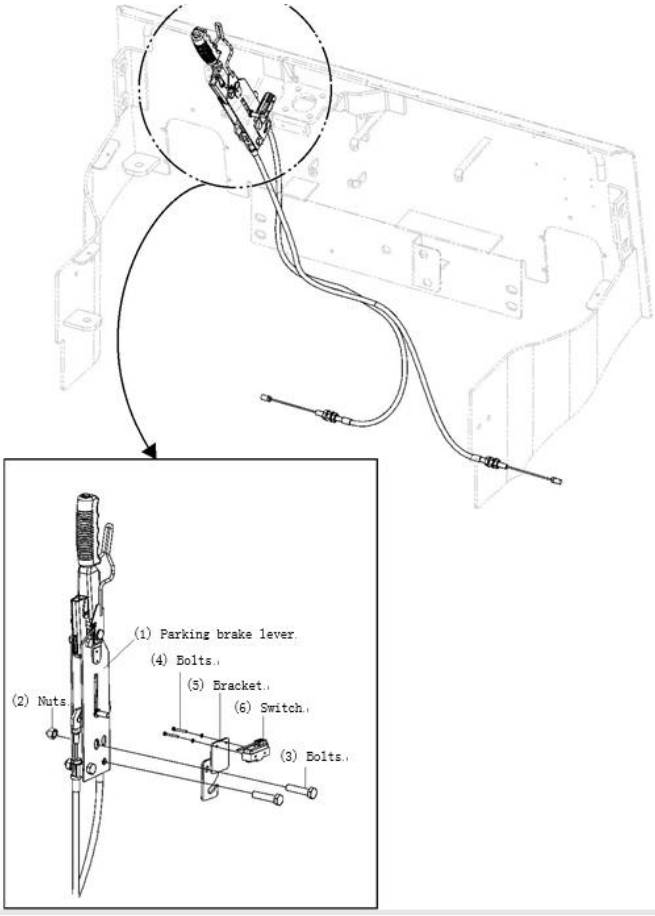
3. Release the parking brake.

4. Reposition the plate so that the switch actuator rests against the bracket.Tighten the bolts.

5. When the parking brake is engaged, the instrument panel shall illuminate the parking brake symbol; when the brake is released, the symbol shall disappear.Repeat this process until the adjustment is correct.



3-7-5 Parking brake lever removal / installation



Initial steps

1. Secure the vehicle with a stop to ensure that it remains stationary even after the parking brake has been removed.

2. Turn off the key switch.

Process

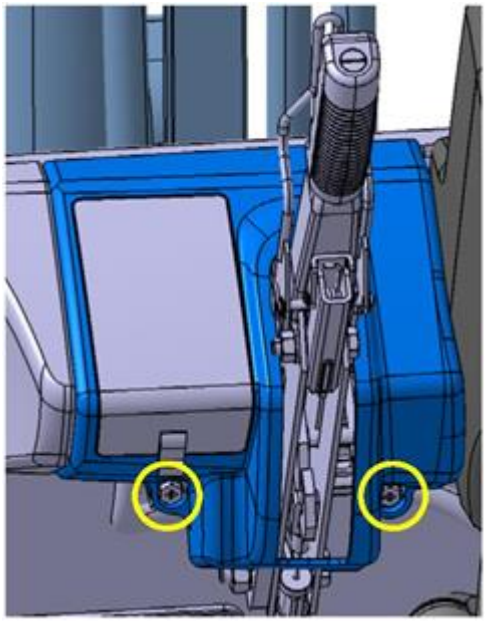
1. After removing the screws and washers shown in figure 3-68, remove the left-hand cover.

2. Disconnect the harness connector from the switch (6).

3. Remove the two nuts (2) and bolts (3) from the parking brake lever (1).

4. If necessary, remove the bolts (4) and washers and remove the switch (6) from the bracket (5).

5. Perform the above steps in reverse order to install the park brake assembly and adjust it (see Section 3-7-4).



3-8 Troubleshooting

3-8-1 Driving motor

Problem	Possible causes
Drive motor does not work	Switch not off (battery connector, key switch, seat switch, f / R switch or parking brake switch): Turn off the switch.If it still fails to operate, use a voltmeter to test the power supply of the control panel and the current of each switch. However, turn on the service brake switch.
	Bad signal.Fuse blown: Check the battery connections.Check the connection of the battery connector.Check fuses, drivers and logic.Replace the fuse if it is blown. Check whether the drive motor and control panel may cause the fuse to blow. Some of the reasons are: Working under excessive load, current limit is too high
	Low battery voltage: Check the battery terminal voltage.If it is too low, charge the battery. Check all cells for one or more defective cells. Check the specific gravity of each cell.The maximum density difference from the highest battery to the lowest battery shall not exceed. 020 SG (specific gravity)
	Incorrect operation of the control panel: Refer to "2-3-5 motor controller test" and "2-7 diagnosis / calibration / troubleshooting".
Drive motor does not work	Encoder failure.
Traction does not operate during normal operation, but hydraulic operation is normal	The brake is defective, resulting in excessive resistance.The increase in heat causes the motor to stop running.Check the brake adjustment.
	There is too much heat in the control panel for the following reasons: Overweight traction load: reduce duty cycle load. Bay thermal sensor failure: refer to "Section 2-7 in instrument panel Handling fault on ".These may cause the drive motor to fail, Control panel faulty or drive fuse open
Traction and hydraulic pressure will not last the whole normal operation period	The lift car is equipped with too small battery:
	Battery not fully charged during battery charging: Check whether the battery is charged Check the battery charger for failure.
	The battery replacement interval is too long or the cooling time of the replacement battery is too short.

	The battery has one or more defective single cells, causing the rated capacity and capacity of the battery to be lower than normal:
	Due to the failure of the drive system, the drive system consumes too much battery power. Check the brake adjustment.Check the wheel bearing, axle and other mechanical parts for correction to eliminate the fault.Change to a tire with less friction
	The hydraulic system consumes too much battery power due to lifting and tilting faults, or the hydraulic conditions of the duty cycle are incorrect: Reduce the setting of the hydraulic relief valve to the capacity used only. Replace with a smaller hydraulic pump. Check the mast for restrictions during operation.
	After a work shift, the forklift's working capacity exceeds its designed capacity without available power:
Battery positive (-) or negative (-) in direct contact with forklift frame (body) or drive motor	The battery is dirty and the electrolyte is on the top of the battery and in contact with the frame.The current flows through the battery box, which applies voltage to the forklift frame: clean the battery with baking soda and water solution.
	Battery or control panel wire connection in contact with forklift frame: Carry out continuity test and move wire contact. Remove the wires in sequence until the fault is cleared. The fault will be disconnected at the end of the wire
	Dirty motors:
	Wet motor:
Forklift does not reach the maximum speed	The battery is not fully charged or poor: Charge the battery.Check the single battery.If necessary, replace the single battery.
	Faults in drive motor, control panel or drive train: Check the forklift speed in both directions.If you need to adjust the control panel, adjust it according to the corresponding section of "Section 2 electrical system". If the drive motor fails, test the motor assembly
Slow acceleration of forklift	Drive control overheating, temperature sensing switch on. Note: if the temperature is 145 ° C (293 ° f), the thermal switch will give a warning.

3-8-2 Drive axle

Problem	Possible causes
Noise or vibration in the transmission	Incorrect oil level: Meet the correct oil level
	Use non-standard oil: Replace the oil with standard oil.
	Gear damaged or dented: Replace the gear.
	Bearing damage: Replace the bearing.
	Loose mounting bolts: Apply thread compound to the threads of the bolts and retighten to the specified torque.
Noise or vibration in the brake disc pack	Use non-standard oil or friction materials: Replace oil or friction materials with standard materials.
	Incorrect oil level: Meet the correct oil level
	Foreign matter (water) introduced into oil: Replace the oil.
	Friction plate wear: Replace the friction plate.
Leakage of installation part	Loose mounting bolts: Apply thread compound to the threads of the bolts and retighten to the specified torque.
	Damaged mounting surface: After removal, readjust or replace the components.
	O-ring damage: Replace the O-ring.
Hub leakage	Damaged oil seal: Oil seal replacement
	O-ring damage: Replace the O-ring.
Input shaft leakage	Damaged oil seal: Replace the oil seal.
	Motor O-ring damaged: Replace the motor O-ring.
	Damaged motor mounting part or housing: Replace the components.
Air respirator leakage	Too much oil: Meet the correct oil level

	Air respirator damaged: Clean or replace vent
	Use non-standard oil: Replace the oil with standard oil.
Brake disc pack leakage	Brake seal damaged: Replace sealing ring
	Brake seal not installed correctly: Reinstall or replace the seal.
	The sliding parts of the brake seal (damaged shaft, bearing seat or piston: Replace damaged components.
	The outer particles are placed on the sliding parts of the seal: Clean sliding parts and master cylinder and replace them if damaged parts are found
	Material or oil passage damage: Replace damaged parts
	Gear damaged or dented: Replace the gear.
	Bearing damage: Replace the bearing.
	Loose mounting bolts: Apply thread compound to the threads of the bolts and retighten to the specified torque.

3-8-3 Service brake

Problem	Possible causes
Pedal resistance is not firm (spongy)	Leakage or low level
	Air in the brake hydraulic system.
	Master cylinder loosening
Too much pressure of pedal when braking	Mechanical resistance on the brake pedal.
	Limit the brake lines.
	Bad master cylinder
Pedal towards the floor	Leakage or low level.
	Bad master cylinder.
Excessive pedal travel	Incorrect pedal adjustment.
	Leakage or low level
	Air in the brake hydraulic system.
	Bad master cylinder.
Brake not applicable	Leakage or low level.

	Air in the brake hydraulic system.
	The linkage is not adjusted correctly or bent.
	There is oil or brake fluid on the brake disc.
	Bad master cylinder.
Uneven braking or roughness (flutter) during braking	There is oil or brake fluid on the brake disc.
	There is poor contact between the steel plate and the friction plate.
	Uneven (uneven) brake discs
	Pressure plate bearing loose
	Broken disc and friction disc assembly

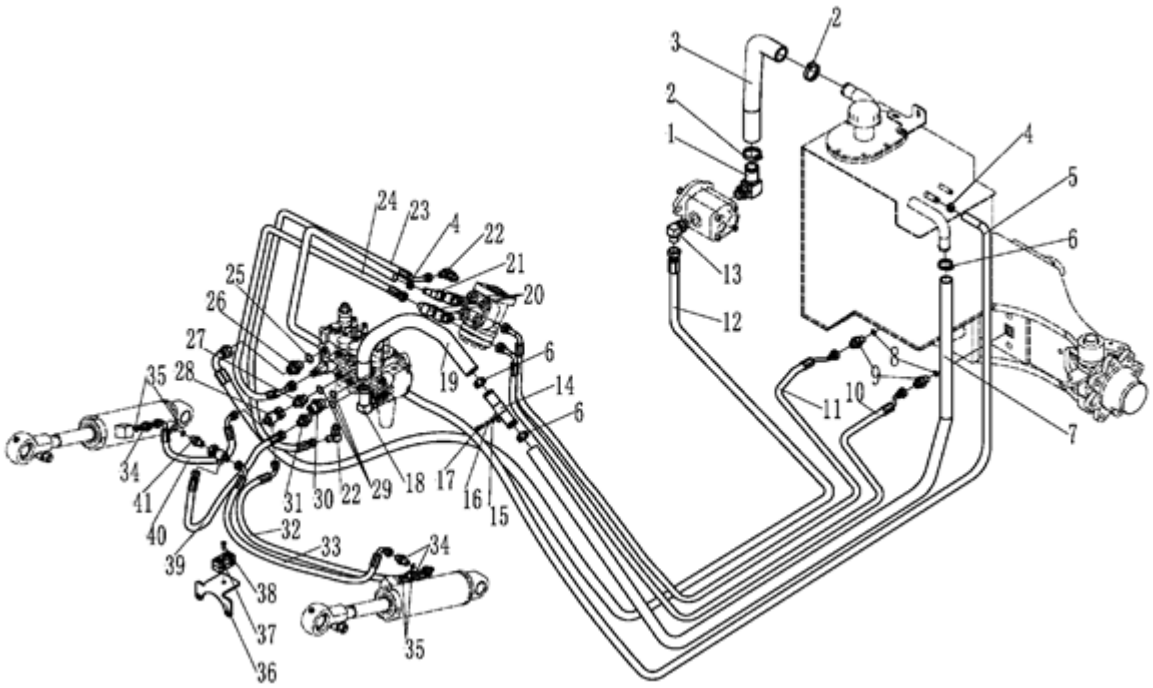
3-4 Parking brake

Problem	Possible causes
Brake not engaged	The parking brake is not adjusted correctly.
	The parking brake cable is not adjusted correctly.
	The brake disc is too worn

4 Hydraulic system

4-1 Overview

4-1-1 Component



The hydraulic system operates multiple brakes with pressurized oil from the main hydraulic pump and draws oil from these actuators.

1.The main hydraulic pump is driven by the pump motor controlled by the controller.[Section 4-2]

2.The main hydraulic pump uses the rotating force output from the motor to pressurize the oil in the hydraulic tank and send the oil to the priority valve.[Section 4-3]

3.The priority valve determines which device is preferred between the steering and the control valve, and then supplies most of the pump oil to the priority valve.[Section 4-4]

4.The hydraulic tank stores the hydraulic oil that is returned from the actuator.The stored oil is drawn in by the main hydraulic pump for reuse.[Section 4-5]

4-1-2 Oil flow rate

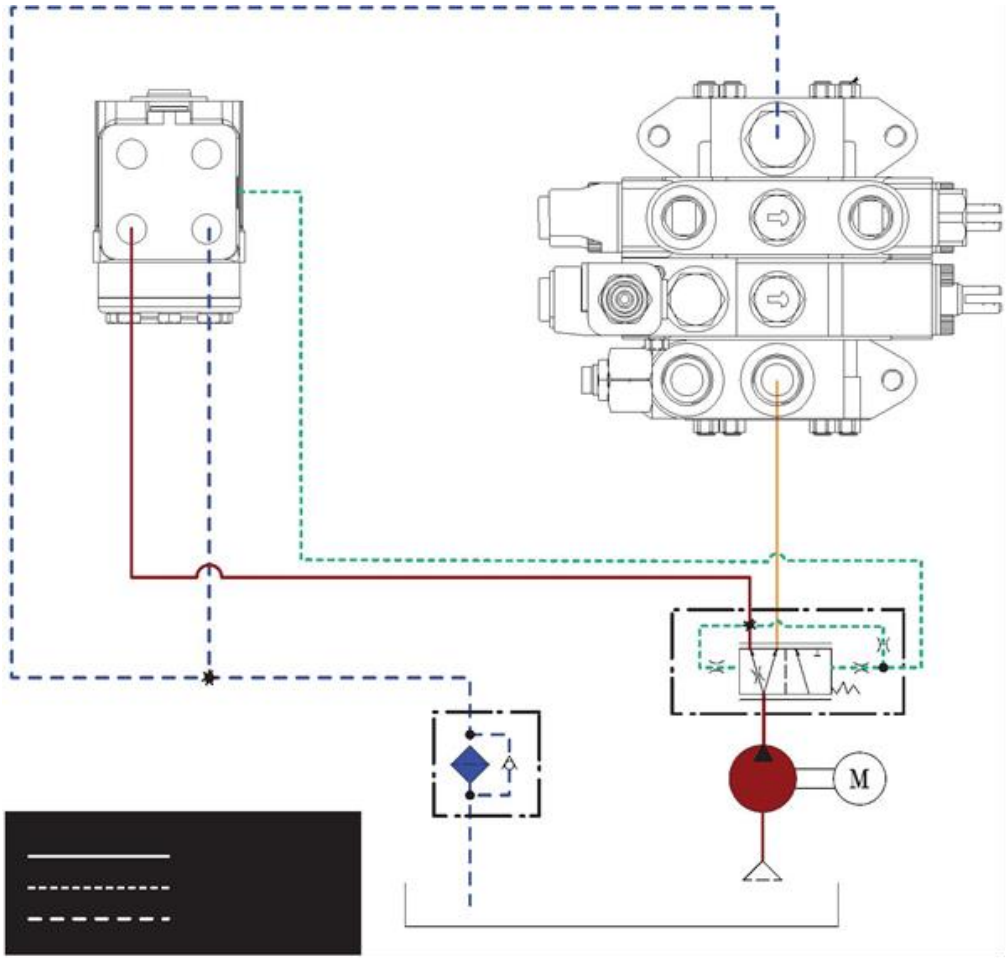


Figure 4-2

Hydraulic oil circulation

The hydraulic oil tank stores the hydraulic oil, which is supplied to the main hydraulic pump through a filter.The main hydraulic pump pressurizes the supplied oil and distributes it through the priority valve to different systems throughout the vehicle.When hydraulic oil is received, these systems perform their functions and then drain the waste oil to the tank through the return filter.

Hydraulic operating system

The following systems are operated by hydraulic oil circulation:

Lifting / auxiliary system: the control valve uses the hydraulic oil supply to control the system.For more information, see Section 5.

Steering system: the steering unit uses hydraulic oil supply to control the system.For more information, see Section 6.

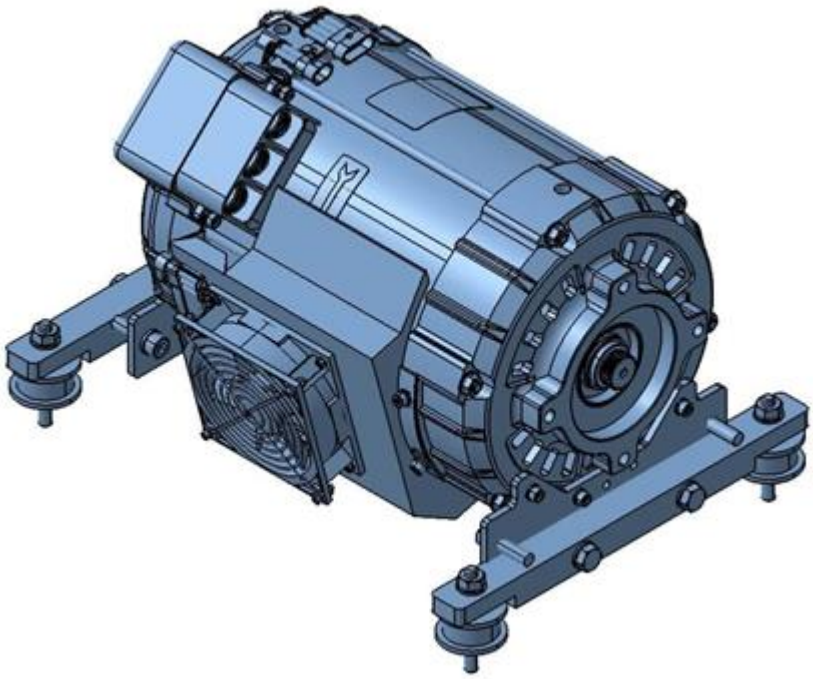
To ensure the efficient and safe use of limited hydraulic pressure, the priority valve determines which of these two systems will be supplied with most of the hydraulic oil.When the steering mechanism is not operated, the steering unit supplies only a small amount of hydraulic oil through the orifice and the control valve is supplied to the rest.

However, once the operator turns the steering wheel, the priority valve receives a pilot signal from the steering unit via a load sensing line, which moves its spool, thus increasing the supply of hydraulic oil to the steering unit.

For more information on the operation of the various components involved in the hydraulic oil circulation, refer to the following sections.

4-2 Pump motor

4-2-1 Appearance and specification



Project	Specifications
Power	8.6KW
Speed	1618rpm
Frequency	55.5hz
Insulation grade	H

Encoder

Project	Specifications
PPR	64 Pulse /revolution.
Connector	4 Needle AMP

Thermal sensor

Project	Specifications
Part number	Included in pump motor
Resistance	603 Ω ± 3% at 25 ° C (77 ° f)
Connector	2 Needle AMP

4-2-2 How does this work

The pump motor electrically transfers power to the main hydraulic pump for pumping hydraulic oil to operate the hydraulic system.

The pump motor is connected to the pump motor controller through u, V and W lines.The controller operates the pump motor based on inputs from multiple switches and sensors and internal parameter settings.

The pump motor operates when the following conditions are met:

The key switch is off.

With the operator seated, turn off the seat switch.

One of the hydraulic control switches, the F / R switch or the accelerator switch signals the controller.Turning the F / R switch to forward or reverse will trigger the pump motor to run at idle for 6 seconds.It then goes into PP mode to stop unless it's in six seconds

The clock signals from the accelerator.To restart the pump motor, the operator shall return the F / R switch to neutral before switching it forward or backward, or move one of the hydraulic levers to turn on the corresponding switch.

Motor speed detection (encoder operation)

The pump motor is equipped with an encoder, which is used as the speed sensor of the motor.The controller analyzes the amplitude of the pulse to calculate the speed of the motor.The smaller the amplitude, the higher the speed of the motor.

Like other sensors, the encoder generates the main signal (signal a) and the reference signal (signal B) through two hole sensors.As shown in Figure 4-6, the sequence of the generated signals varies according to the direction of rotation.

Overheat protection (thermal sensor operation)

The pump motor is equipped with a thermal sensor to prevent overheating.Once the motor is heated to 145 ° C (293 ° f), an overheat alarm is activated and the motor's performance is limited.

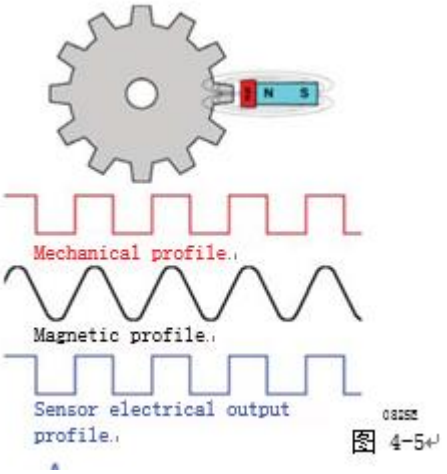


图 4-5

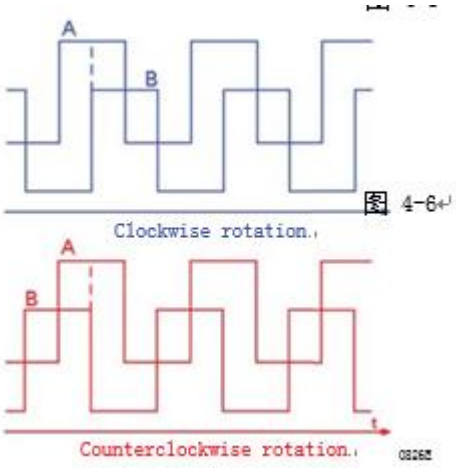
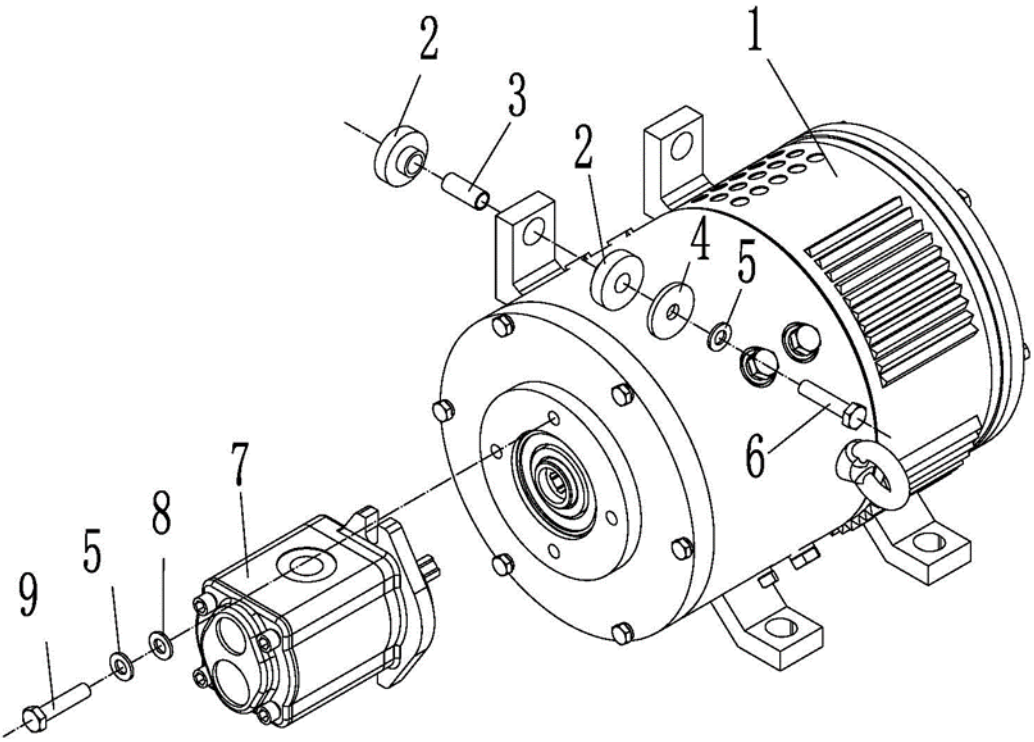


图 4-6

4-2-3 Pump motor and main hydraulic pump removal / installation



Note: do not apply any pressure to the motor or damage the encoder (sensor bearing) cable when assembling and disassembling the hydraulic pump.

Initial steps

1. Remove residual pressure in the hydraulic system by moving the lever back and forth several times by closing the key

2. Remove the pedal so that the pump motor can be seen.

3. Prepare the drain basin.

⚠ Danger

Pressurized hydraulic fluid can cause severe burns and may even result in amputation.
Before performing the following steps, make sure that the pressure has been released from the system.

Process

3. Remove the pedal assembly

4. Disconnect the cable from the UVW terminal.

5. Disconnect the encoder cable and thermal sensor cable from the main Wiring harness connections.

7. Disconnect the hose from the hydraulic pump.

9. Disconnect the suction hose from the hydraulic pump to the priority valve.

10. Support pump motor with belt and remove motor.

11. Remove the bolts, washers and hydraulic pump from the hydraulic motor.

Installation torque: 55 ± 10 N · m (40 ± 7 LB · ft).

12. Perform the above steps in reverse order to install the pump motor.

13. Fill the tank with hydraulic oil according to the specifications given in Section

4-2-4 Pump motor disassembly / assembly and testing

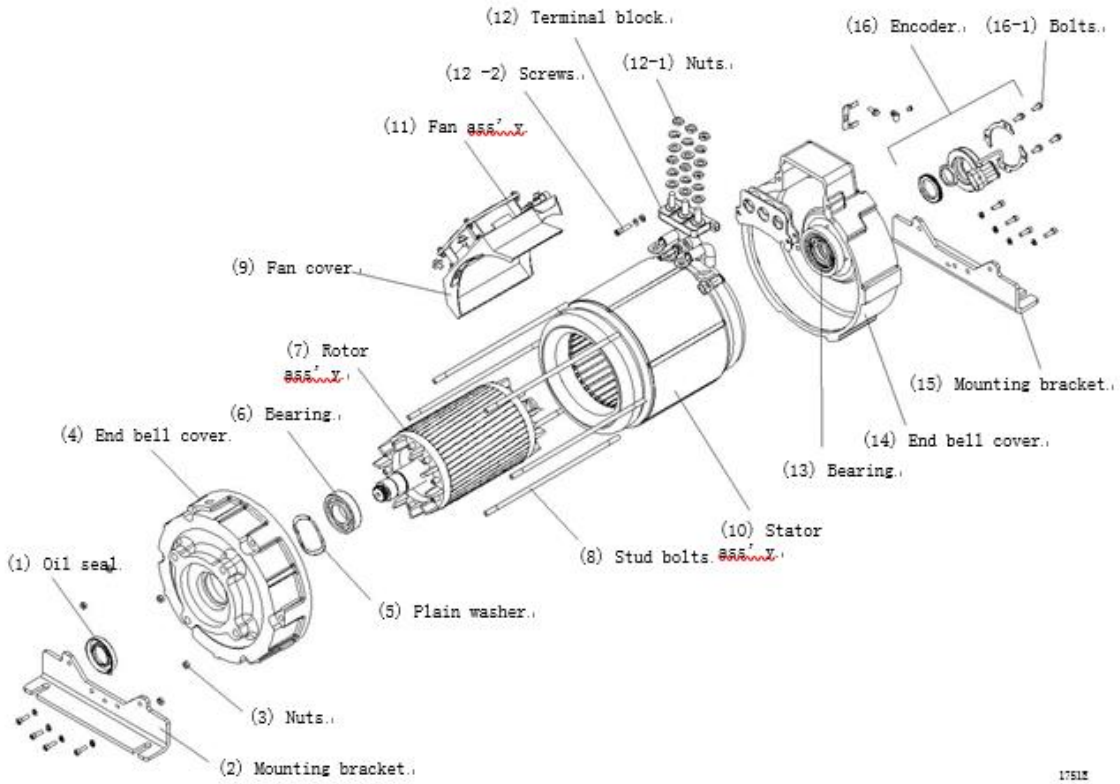


图 4-8

Disassembly / assembly

1. After removing the terminal protector, loosen the nut (12-1) and remove the terminal block (12).

2. Loosen the bolts (16-1) and remove the encoder (16).

3. Loosen the nut (3) and remove the stud (6).

4. Remove the front bell cover (4) and the rear bell cover (14).

5. Remove the stator assembly (10) by hand or using a tool.

6. Remove the flat washer (5), bearing from the rear bell housing (14

(6) and rotor assembly (7).

Manual puller is recommended.

7. Perform the above steps in reverse order to assemble the pump motor.

Note: before reassembling the motor, you can test its components as follows.

Stator test

1. Carefully wipe the contamination on the stator surface with a clean cloth dipped in alcohol.

Note: contamination in the stator can cause coil damage and therefore damage to the stator itself.

2. Use a milliohmmeter to measure the resistance of each phase (UV, VW, Wu).

Rated resistance: 0.4 Ω

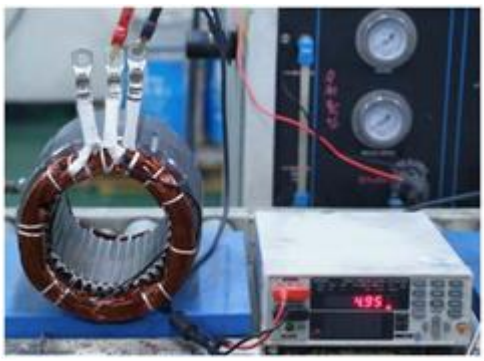


Figure 4-10

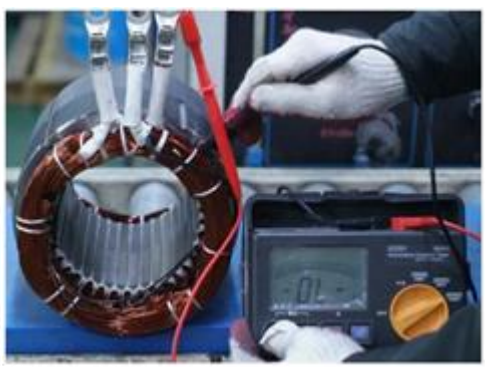
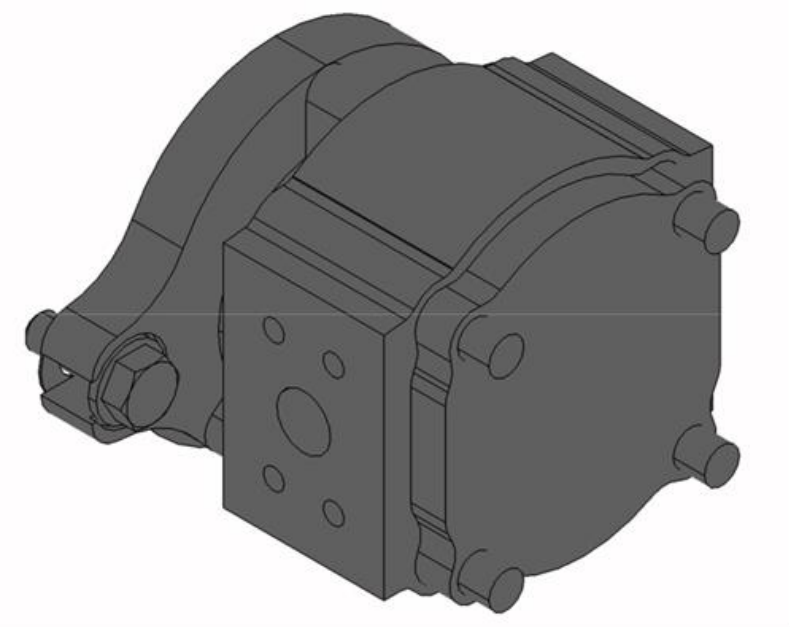


Figure 4-11

4-3 Main hydraulic pump

4-3-1 Appearance and specification



Project	Specifications
Displacement	32.1 Ml / L
Pump rotation	CW

4-3-2 How does this work

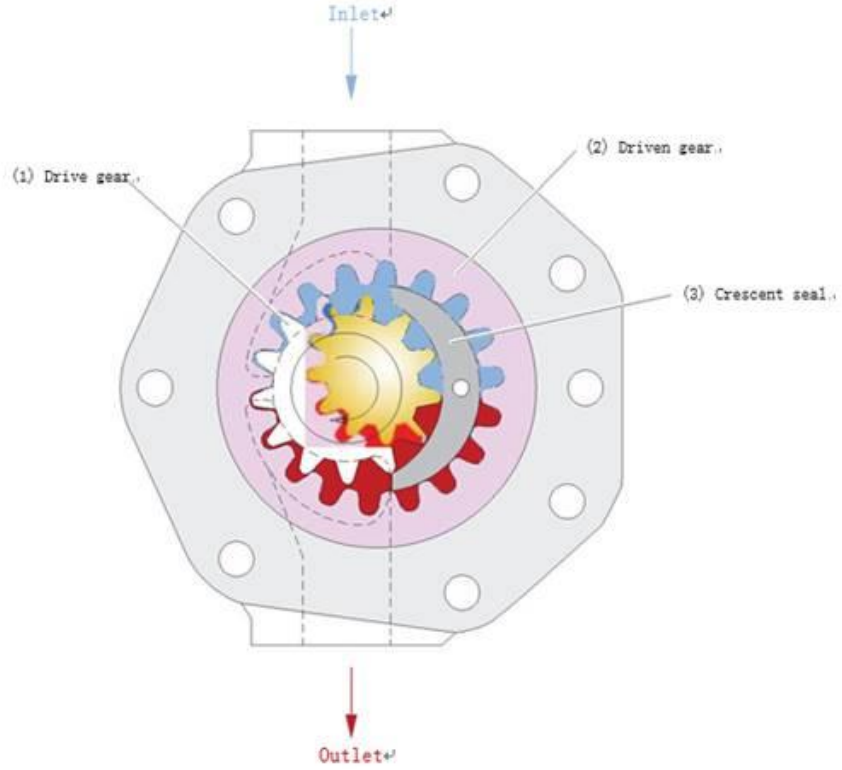


图 4-13

This model uses internal gear pump as its main hydraulic pump.

The internal gear pump includes a driven gear (2) [external gear] and a driving gear (1) [internal gear], as shown in the figure.The volume of the meshing area between the driving gear and the driven gear increases as they rotate and draw oil.The suction cage is then placed between the teeth of the two gears and the crescent seal (3) (the bright area in the figure) and brought to the outlet as the volume of the gear engagement area decreases.The high pressure chamber (discharge) and the low pressure chamber (suction) are sealed by a crescent seal (3).Theoretically, the internal gear pump has less pulsation than the external gear pump.

4-3-3 Disassembly and assembly

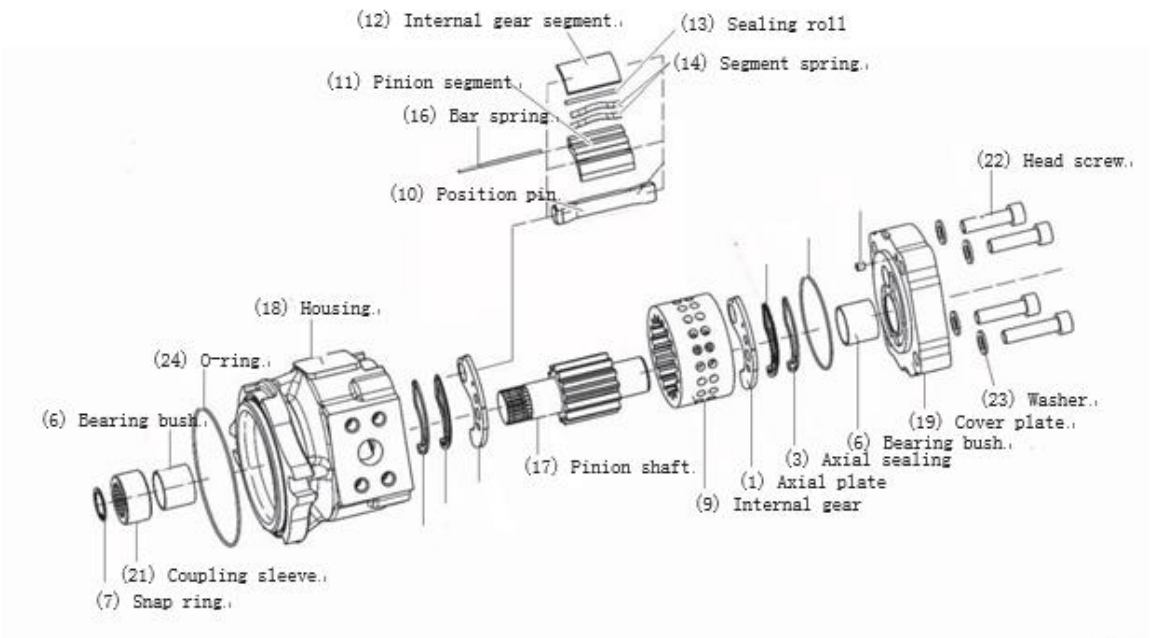


图 4-14

Disassemble

1. Loosen and remove the 4 screws (pos.22) on the cover plate (pos.19).

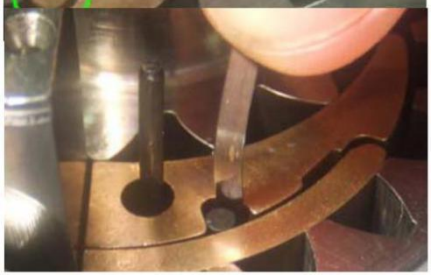
2. Carefully remove the cover plate (pos. 9) from the housing (pos. 18).

3. Remove the shaft plate II (2), pinion shaft (17), rod spring (16), segment (11,12), segment spring (14,15) and sealing roller (13).Note the position of the pinion shaft (17), which may be locked by the locating pin (10), as shown.

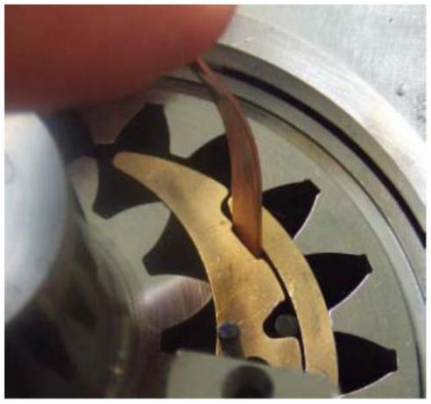
4.Remove the inner gear (9), rotate the locating pin (10) by about 90 °. After that, pull out the locating pin (10).

5. Remove shaft plate I (1)

Below are the backup ring (4) and the axial seal (3).



Parts



(1) Make sure that the axial seal (3) and the left support ring (4) are in good condition in the machined groove.The groove of shaft plate I

(2) must be upward as shown in the figure.

2. Install the dowels (10) first, as shown.Then place the inner gear (9) and turn the locating pin (10) about 90 °

3. Install the pinion shaft (17) and make sure it is not obstructed by the dowels (10), as shown.

4. Install the pinion Section (11) and the internal gear Section (12).Make sure that the side of the inner gear segment (12) with two bevels is shown on top of the pinion segment (11) (green mark).

5. Place the sealing roller (13) and the bar spring (16).The rod spring (16) is fixed in the housing (18) through the shaft plate I (1).

6. Place the section spring II (15) so that the 2 bows are pressed on the sealing roller, as shown in the figure.

7.Install in the same way as the bow against the inner gear segment (12

8. Install shaft plate II (2) close to the housing or damage to the bearing bush (6) hydraulic system in the cover plate (19

9. Check the green O-ring (20) and check the position on the cover plate (19).Install the flexible axial seal (3) first, then the right-hand ring (5).It is helpful to cover the axial seal (3) and the right backup ring (5) with grease, which makes assembly easier.

The straight pins must be located in the cover plate (19) or in the housing (18).

10. Measure the gap between the cover plate (19) and the housing (18).

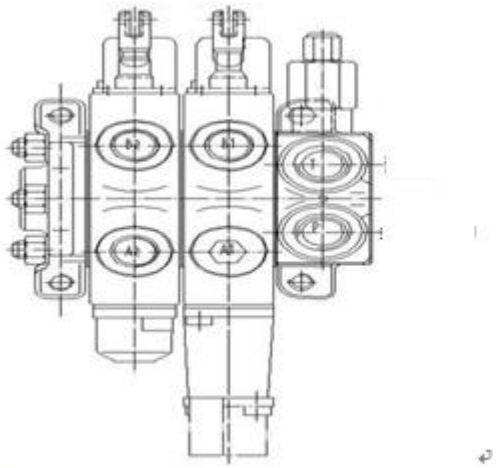
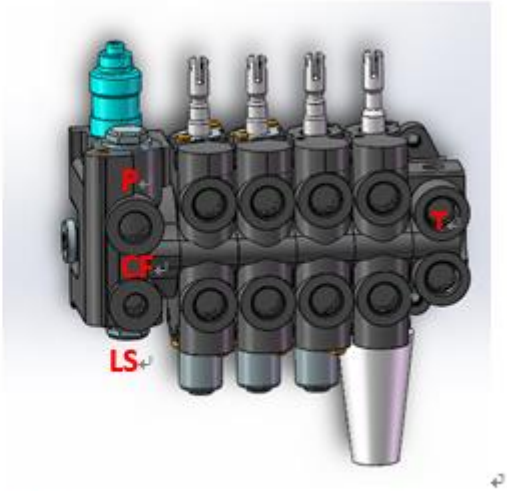
If the gap is greater than 0.6 mm (0.024 in), the axial plate or seal may slide, removing the pump again!

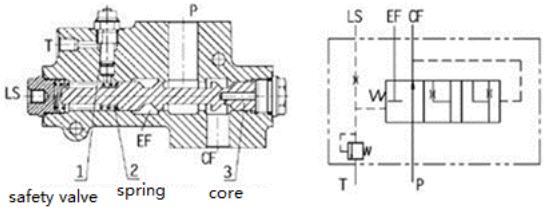
11. Tighten the four screws with 50 N · m (37 LB · ft).

Note: if the pump is assembled correctly, the pinion shaft shall be able to turn by hand.

4-4 Multiway and priority valves

4-4-1 Appearance and specifications

	
None priority	With priority



Priority Valave

Project	Specifications
Maximum.Over flow pressure (EF)	20,600 kPa（2,988 psi）
Control spring pressure	680 kPa（98.6 psi）
Steering system	Internal pilot dynamic signal

4-4-2 How does this work

The multi way valve adopts the two piece four body type. The hydraulic oil from the working oil pump is controlled by the multi way valve stem to distribute the high pressure oil to the lifting oil cylinder or the tilt oil cylinder.There are safety valve and self-locking valve inside the multi way valve.The safety valve is set on the upper side of the oil inlet of the multi way valve to control the system pressure; the self-locking valve is set on the tilt valve plate, which is mainly used to prevent serious consequences caused by misoperation of the control rod in the case of no pressure source of the tilt cylinder.A check valve is installed between the oil inlet and the oil suction port of the lifting valve plate, and between the oil inlet port of the lifting valve plate and the oil inlet port of the tilting valve plate

The pressure of the main safety valve has been adjusted before delivery, and the user is not allowed to adjust and disassemble it at will.

The priority valve measures the hydraulic oil to the control valve and steering unit after receiving the oil from the main hydraulic pump,In order to always give priority to the steering system when steering is required.

Priority valve is mainly composed of steering safety valve, spring, valve core and valve body as shown in the figure.Its working principle is that port P is the oil inlet of the steering pump, port CF is connected with the oil inlet of the steering

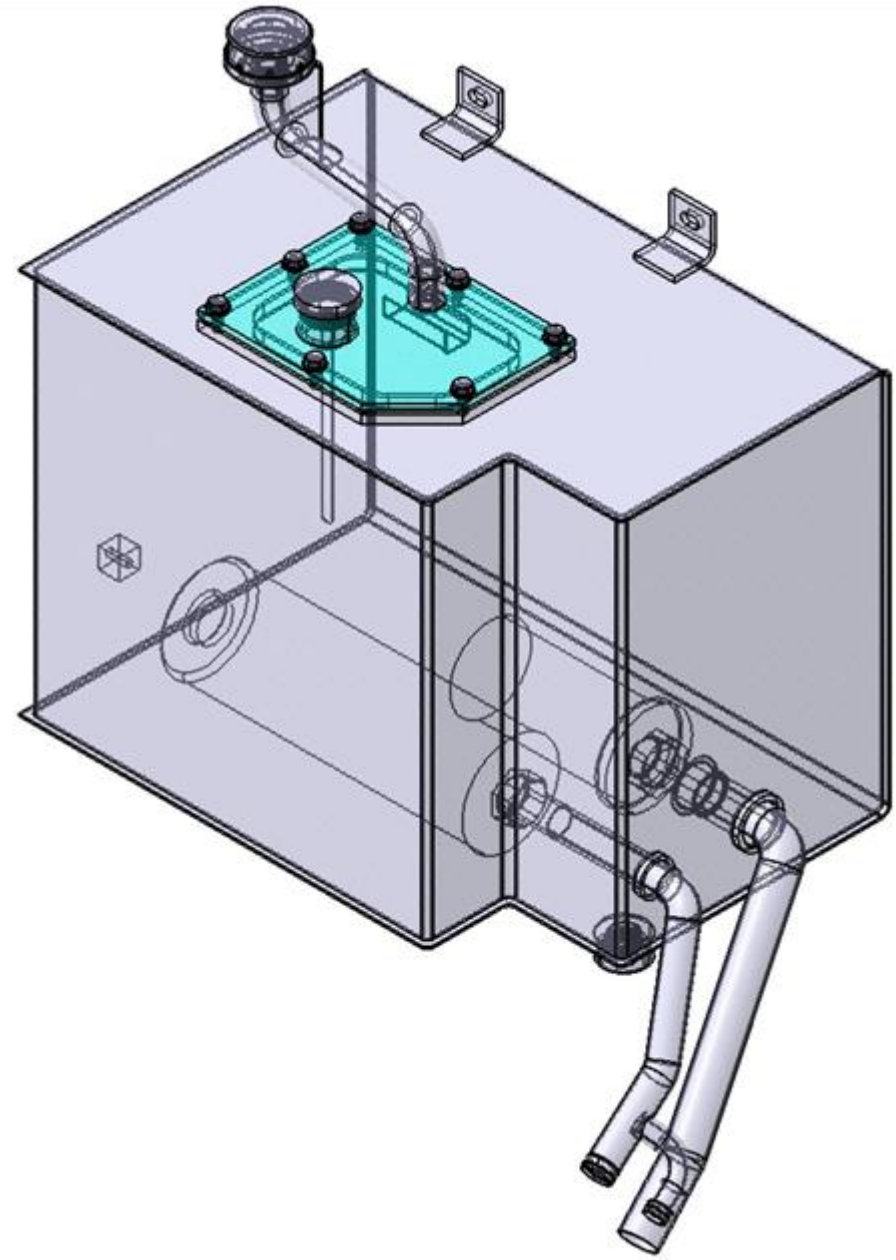
gear, port EF is connected with the oil inlet of the multi way valve of the working system, port LS is connected with the control port of the steering gear, and port t is the oil return port of the safety valve.

When oil is fed into port P, hydraulic oil is preferentially supplied to port CF through valve element 3.When the steering gear is not working, the CF port is in a closed state. At this time, the pressure of the LS port is zero, the right end of the valve core enters the oil, and the hydraulic pressure acts on the right end of the valve core. Overcoming the pre pressure of spring 2, the valve core moves to the left. At this time, the P port is connected with the EF port to realize the functions of lifting, tilting, side shifting, etc.

When the steering gear works, the CF port is connected with the steering cylinder through the steering gear, and the gear pump oil enters the steering cylinder first to realize steering

4-5 Hydraulic tank and filter

4-5-1 Appearance and specifications



4-5-2 How does this work

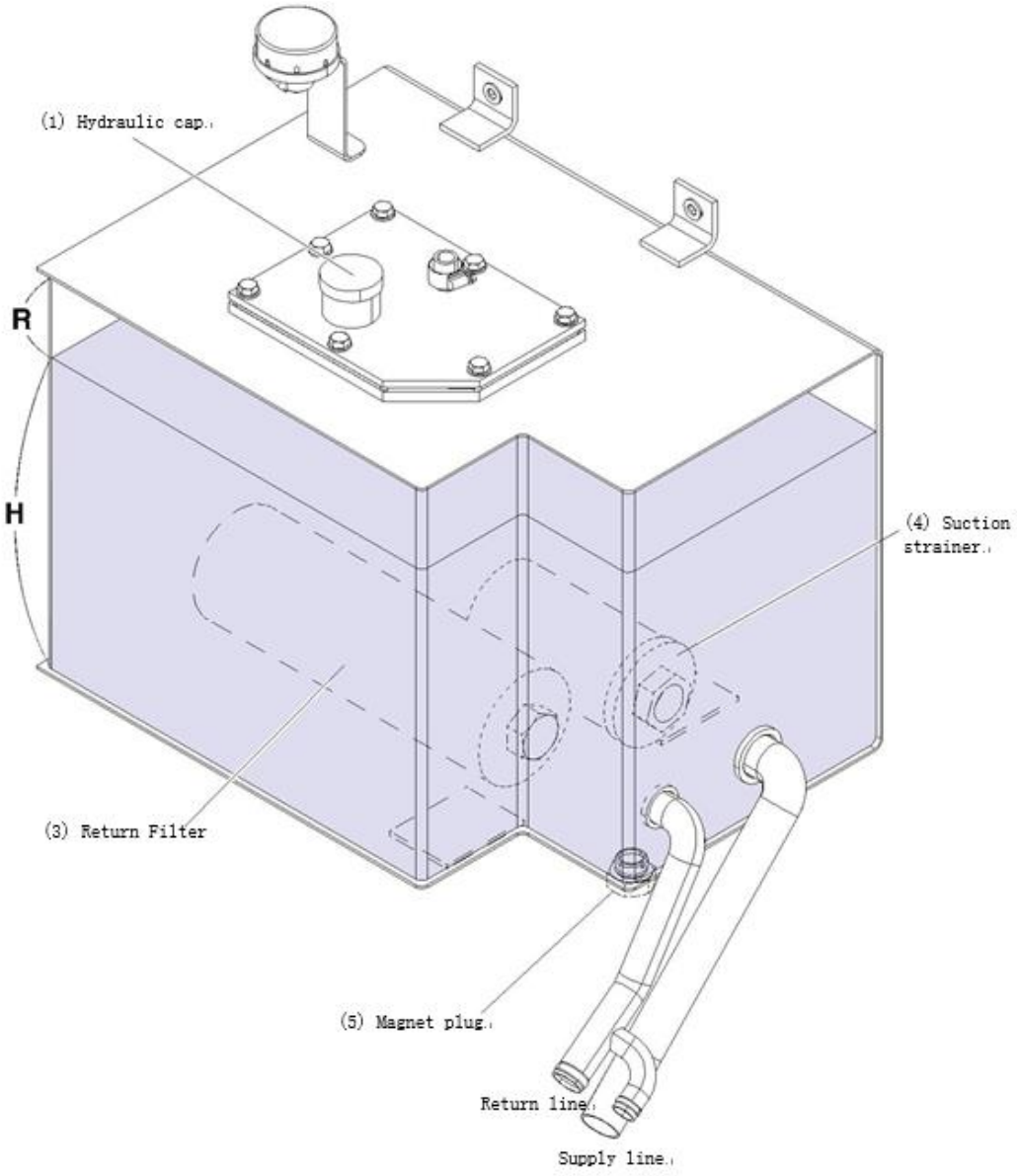


图 4-28

The hydraulic tank and the filter installed in the tank perform the following functions:

Storing hydraulic oil

The hydraulic tank recovers and stores the hydraulic oil drained from different parts of the hydraulic system so that these drains can be reused by the main

hydraulic pump.As shown in Figure 4-28, two pipelines connected to the oil tank are respectively responsible for receiving and supplying hydraulic oil.

The oil height (H) in the tank changes according to the contraction / expansion of various cylinders and the opening / closing of different valves, and the remaining space (R) changes accordingly.An air respirator (2) is installed to allow external air to enter / exit the space, keep the oil in the tank at a constant atmospheric pressure, and filter elements are also installed to prevent dust from entering the system.

You can open the oil cap (1) and refill the tank with hydraulic oil if necessary.

Filter impurities in hydraulic oil

When oil passes through different parts of the hydraulic system, it collects various pollutants, such as moisture and air, which may degrade the performance of the system and cause component failure or failure.For this reason, various devices are installed in the tank to filter these materials and protect the system from failure.

The large solid particles are the first pollutants filtered by the reflux filter (3), while the remaining particles are separated into light oil instead of oil, and the floating oil is on the surface, while the heavier oil is deposited on the bottom.The plug (5) is installed at the bottom of the oil tank to facilitate the precipitation of impurities.

And the suction filter (4) is installed in the discharge pipeline of the pump to filter the oil again before the oil flows back to the hydraulic system.

4-5-3 Hydraulic oil and filter replacement

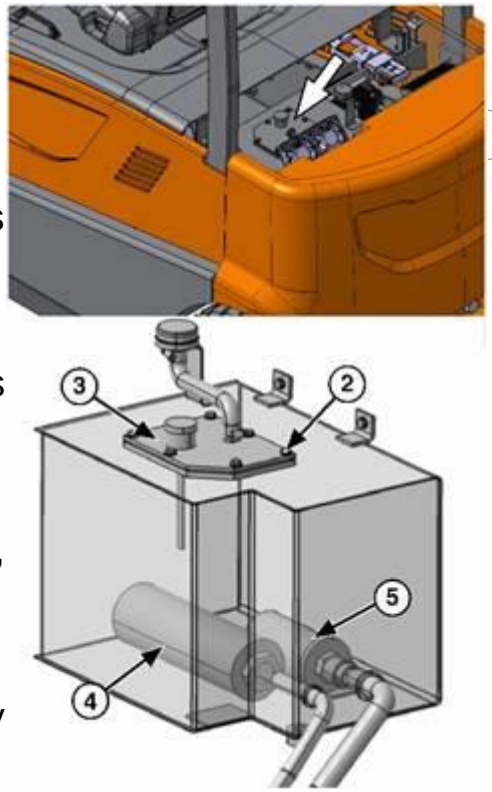
Initial steps

1. Park vehicle level, fork down, park brake engaged, f / R switch in neutral, key switch off.

2.Open the top cover to expose the water tank, as shown in Figure 4-29.

⚠Danger

Hot oil and components can cause personal injury.
Keep hot oil or components out of contact with skin.



Order

1. Unscrew all bolts (2) and remove tank cap (3).

2. Replace the sun screen (5) or return screen (4) as required.

3. Reinstall the tank cap (3) and tighten with the bolts (2).

4. Turn on the key switch with the seat switch off, operating fluid

Pressure controller and steering system, filled by several cycles

5. Turn the key switch off and check the oil level.Maintain the oil level at the full mark on the maceration rod / filler cap assembly.

4-6 Troubleshooting

4-6-1 Pump motor

Fault phenomenon	Possible causes
	Poor connection or blown fuse. Check the battery connections. Check the key fuse. Check whether the hydraulic pump motor may cause the fuse to blow.
	Key switch, seat switch or line contactor not closed. Turn off the seat and key switch.Use a multimeter to check the

	power flow through the seat switch, key switch, line contactor coil and line contactor.The key switch, seat switch and wiring connector must be turned off for the power steering function to operate.
The hydraulic pump motor does not work.	Insufficient voltage. Charge or replace the battery. Check all battery cells for one or more defective battery cells. Check the specific gravity of each battery cell.The maximum density difference from the highest battery to the lowest battery shall not exceed 0.020 SG (specific gravity). Check whether the cable terminal is closely matched with the battery terminal and the control panel connector. Check whether the wire inside the cable is broken.
	Incorrect operation of the lift and drive system.
The battery does not work continuously and completely	The battery installed on the forklift is too small. Study and question the use of forklift trucks in their full working conditions, select and purchase the appropriate battery capacity to understand the working hours.
	During the battery charging operation, the battery is not fully charged. Check whether the battery is evenly charged (charging makes the specific gravity of all batteries the same). Check the battery charger for defects.
	The charging interval of the battery is too long or the cooling time of the charging battery is too short.Reduce battery life. Before charging, please extend the cooling time of the battery before putting it into use.
	The battery has one or more defective battery cells, which may result in below rated capacity and battery capacity. Test and identify defective cells.Replace the defective battery. Battery cells are connected in series, one bad battery causes high power connected in series with other batteries Obstruction.This reduces the speed of the motor as the battery resistance increases.This can happen when other batteries are almost fully charged.
	The hydraulic system consumes too much battery power due to incorrect lift and tilt devices or hydraulic controls for the duty cycle. Reduce the hydraulic relief valve setting to the capacity required for the application. Replace with a smaller hydraulic pump (if any).Check the mast for restrictions during operation. Remove the quick disconnect and install the connection with less oil flow resistance.

	Check the defective hydraulic control valve and pilot relief valve.Remove any restrictions in the hydraulic circuit. Check for restrictions on movable hydraulic attachments.Check sliding parts, bearing wear, hinge binding and proper lubrication on necessary parts.
	Hydraulic pump motor overheated. If the motor temperature reaches 155 ° C (311 ° f) The controller does warn of overheating and reduce performance.
The hydraulic speed of forklift is very slow	Pump motor control circuit overheated. If the temperature of the power unit reaches 100 ° C (212 ° f), the controller will display overheat warning and reduce performance.

4-6-2 Main hydraulic pump

Fault phenomenon	Possible causes
Noise in the pump.	The oil level is low.
	The oil is very thick (viscosity is too high)
	The pump inlet line is limited.
	Wear parts in the pump.
	The oil is dirty.
	Air leaks into the inlet line.
The oil temperature is too high.	The oil level is low.
	There are restrictions on the passage.
	Relief valve set too low.
	The oil is too thin.
	There is air leakage in the system.
	The pump is too worn.
	The system is operating under too high pressure. The relief valve is set too high.Restrictions in flow control valves, check valves and oil circuits.
Leakage at pump shaft seal.	The shaft seal is worn.
	Internal wear of pump body.
	Operation with a low oil level in the tank can cause suction on the seal.
	During installation, the seal is cut at the shaller of the pump or keyway.

	The sealing lip is dry and hardened by heat.
The pump is unable to deliver fluid.	The oil content in the tank is low.
	The pump inlet line is limited.
	There is air leakage in the pump inlet pipeline..Loose bolts. Defect in suction line of bay.
	The viscosity of the oil is wrong.
	The pump is too worn.
	Pump shaft failure
	The bolts for the pump do not have the correct torque.

5 Lifting/tilting/auxiliary system

5-1 Overview

5-1-1 Assembly

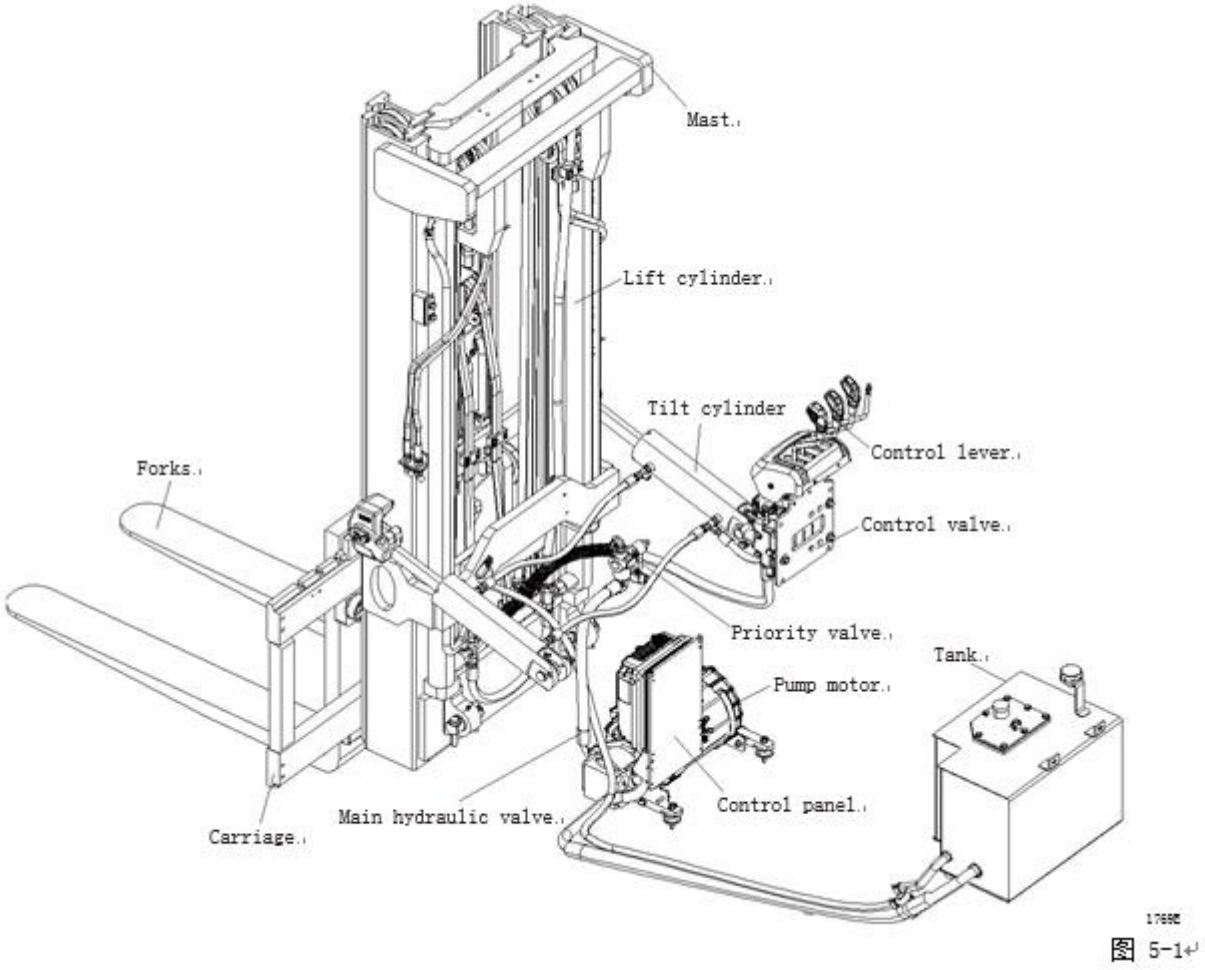


图 5-1

Figure 5-1

The lifting / tilting / auxiliary system is powered by the main hydraulic pump, which consists of the following components:

The control valve that connects the main hydraulic pump and multiple actuator cylinders supplies or returns pump oil to these cylinders.The position of

the valve spool determines whether the cylinder supplies or discharges hydraulic oil; and their positions are moved by corresponding levers.[Section 5-2]

Multi way valve is a set of lifting, side shifting, back and forth tilting, and other operations through the load processing equipment.The assembly is equipped with operator controlled lifting, tilting and auxiliary cylinders.These cylinders are connected to the lift, tilt and AUX sections of the control valve.[Section 5-3]

Fork: two forks to support the load [Section 5-3-3]

Sideshifter: attachment that moves the fork and its cargo to the left and right [Section 5-3-4]

Chains: lifting the components of the bracket and Mast [Section 5-3-5]

Tilt cylinder: double acting cylinder to pull or push the Mast [Section 5-3-6]

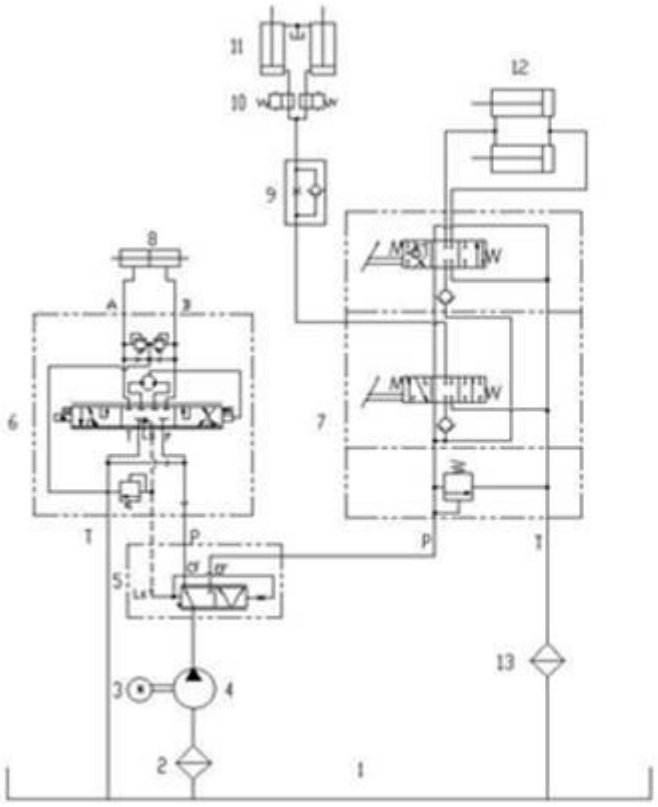
Main lift cylinder: single acting cylinder pull back chain of bracket [Section 5-3-7]

Standard lift cylinders: single acting cylinders for extended inner Mast [Section 5-3-8]

Transportation: support structure for fork installation [Section 5-3-9]

Mast: vertical structure at the front of the forklift, extending and retracting to lift and lower the load [Section 5-3-10]

5-1-2 Oil flow rate



1 Hydraulic tank
2 Oil filter
3 Pump motor
4 Gear pump
5 Priority valve
6 Steering valve
7 Multi-way valve
8 Steering cylinder
9 Speed limit valve
10 Shut-off valve
11 Lift cylinder
12 Tilt cylinder
13 Oil filter

Priority valve operation

The priority valve receives hydraulic oil from the main hydraulic pump and distributes it to the steering unit and control valve. When the steering wheel is not operated, as shown in the circuit diagram, the priority valve moves the valve element, the steering device receives the low-pressure oil through the valve hole, and the control valve receives all the remaining pump high-pressure oil.As a result, masts, brackets, sideshifters, and other accessories have become able to work with the high pressure oil required for their full performance.

Lift/lower

Lift cylinder to lift block of multiway valve, hydraulic line for one of the following operations, depending on the movement of the spool mechanically connected to the lift rod.

1.As cylinders receive hydraulic oil up, and therefore push their rods tight to their mast / fork lift realization.

2.Lowering is achieved by the cylinders discharging oil at their heads to retract the mast / frame fastened to them by gravity.

3.Since the cylinders neither receive nor drain oil, their masts and masts / brackets attached to them can remain in place, thus remaining neutral.

Sudden reductions can reduce productivity and threaten safety.To control this situation, there are many devices including flow protectors and flow regulators.

Tilt forward/backward

Tilt cylinder is connected to tilt block of multiway valve, and hydraulic pipeline is used for one of the following operations, which depends on the movement of valve core mechanically connected to tilt rod.

1.Tilt forward: This is achieved when the cylinder receives hydraulic oil at the head end, which causes oil to drain from the rod end to extend the cylinder rod and thus push the mast fixed to them.

2.When the cylinder receives hydraulic oil at the rod end, it tilts back, which causes the oil to drain from the head end, causing the cylinder rod to retract and therefore pull

Move the mast fixed to them.

3.Since the cylinders neither receive nor drain oil, they remain neutral so that their mast and the mast fixed to them can remain in place.

Accessories

The operation of the Sideshifter and various other accessories is controlled by the auxiliary cylinder, and can be manufactured in two directions according to the position of the valve element, like the tilting cylinder.

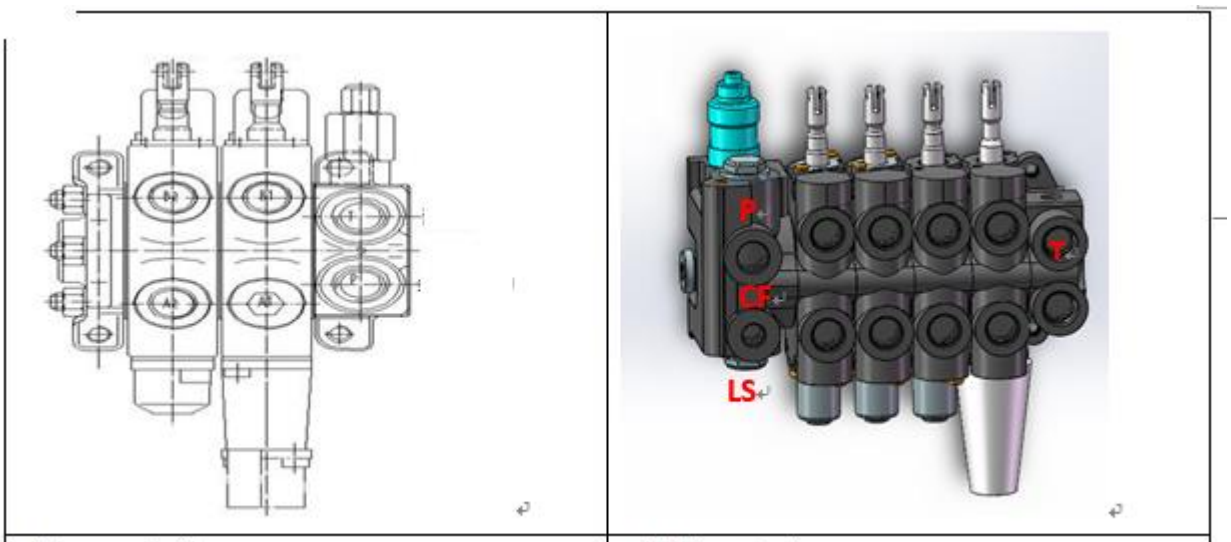
Pressure relief

If the hydraulic pressure to the cylinder exceeds the set limit, the excess oil will be discharged for safety reasons. Overpressure in the lift cylinder is controlled by the main relief valve, while overpressure in the tilt cylinder and the auxiliary cylinder is controlled by the auxiliary lift relief valve.

For a detailed description of the control valve and mast assembly, see Section 5-2-2 and 5-3-2.

5-2 Multiway valve

5-2-1 Appearance and specifications



None priority | With priority

Project	Specifications
Set pressure of relief valve	
Adjustable on TILT and AUX	Tilt flow: 28 ± 2 LPM
Performance of solenoid valve "A"	12VDC active, NC Internal leakage: 0.6l/min, 20594 kPa (2987 psi), difference 32cst
Paint color	Primer and finish - Black
Flow regulator performance	Maximum.Working pressure: 21575 kPa (3129 psi) Flow control: 60 ± 5 LPM Free flow pressure drop: 588 kPa (85 psi) at 50 LPM

5-2-2 How does this work

A. Lifting part

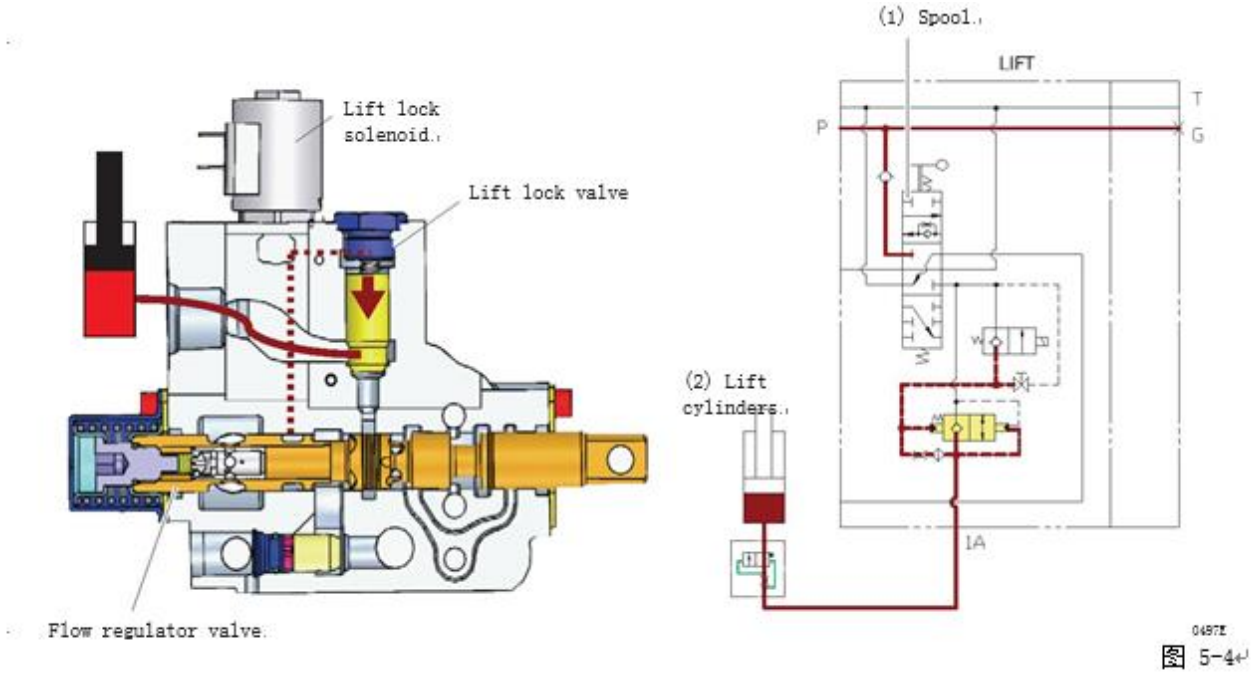


图 5-4

Figure 5-4

When the lift lever is in the neutral position, the oil from the pump cannot pass through the valve element (1) but bypass the tilt part, and the Mast will not rise because the pump oil supply line and the lift cylinder line are disconnected from each other.

The Mast also does not lower because the remaining oil in the lift cylinders (2) is prevented from returning to the tank.

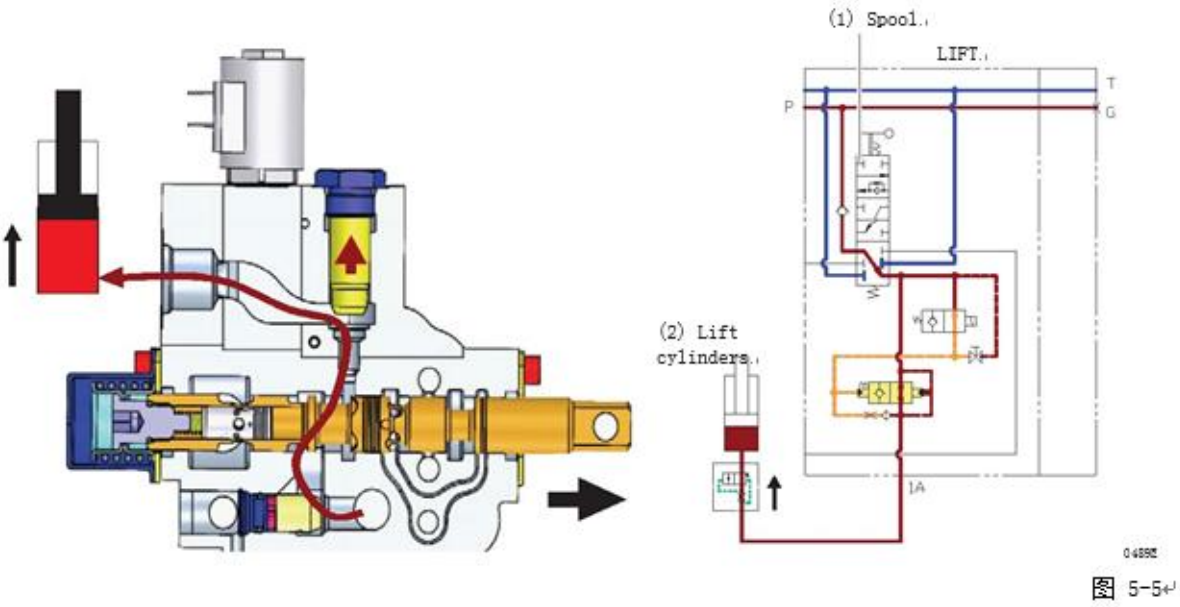


图 5-5

Figure 5-5

Lift

Move the lifting rod to the lifting position to move the valve element (1) so that the oil from the pump reaches the pipeline of the lifting cylinder (2) through the valve element (1), push the piston upward and lift the valve rod.

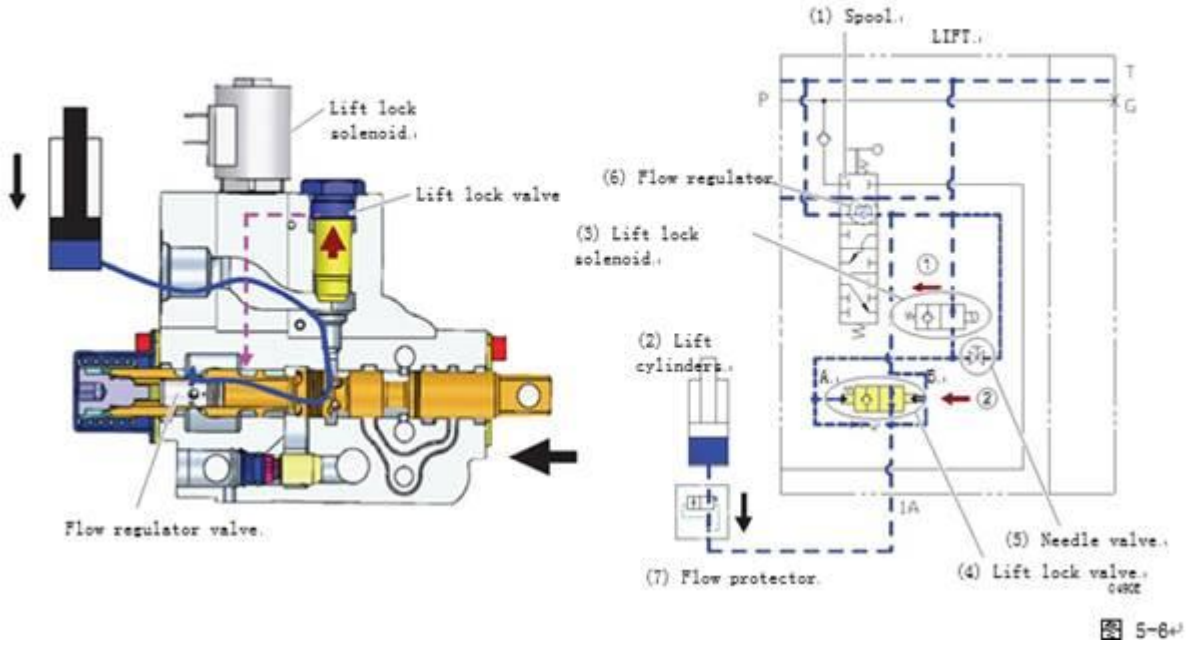


Figure 5-6

Lower

Moving the lift lever to the lower position moves the spool (1) so that oil from the pump passes through the spool (1) to the tilt section.At the same time, the oil in the lifting cylinder (2) is pushed by the piston under the action of gravity, and returns to the control valve, and discharges to the oil tank through the valve core (1).

When the hydraulic oil from the piston that supports the lift cylinder (2) flows out, the Mast lowers.Through its built-in hole, the flow regulator (6) does not allow a large amount of oil to leave the lifting cylinder (2) immediately to prevent the mast from dropping suddenly.

If the line from the multiway valve to the lift cylinder (2) is disconnected, the valve of the protector (7) will move so that the oil in the cylinder passes through its orifice to prevent the Mast from dropping suddenly.

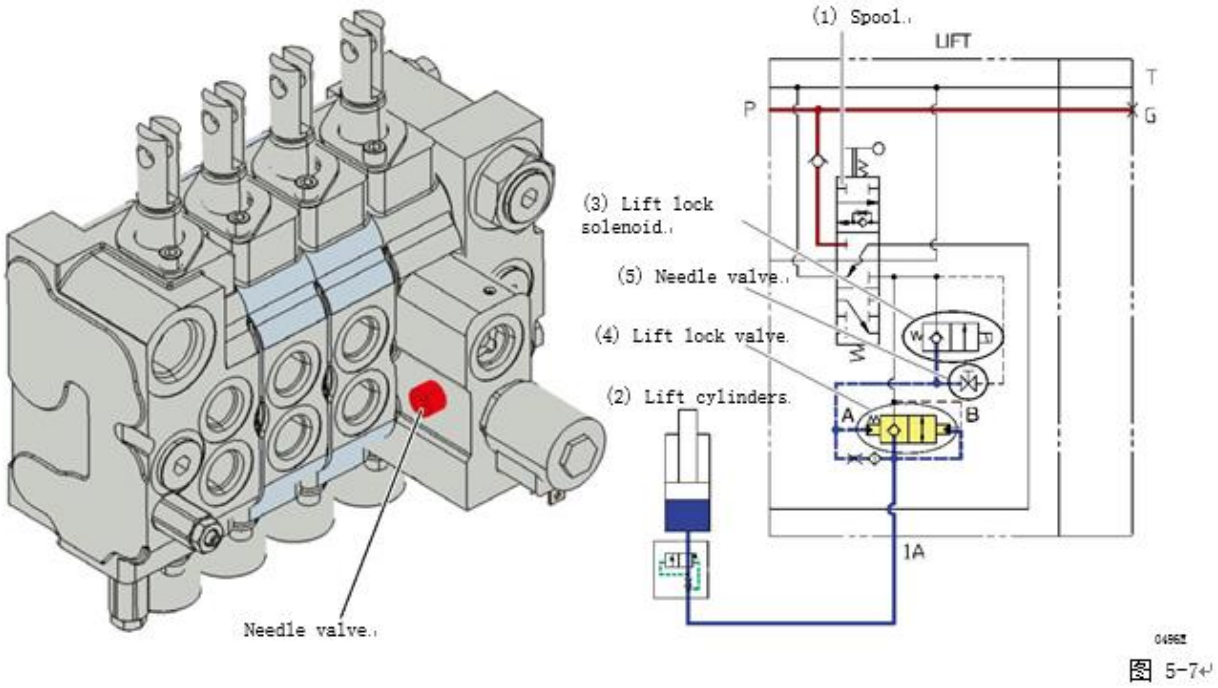


Figure 5-7

B. TILT part

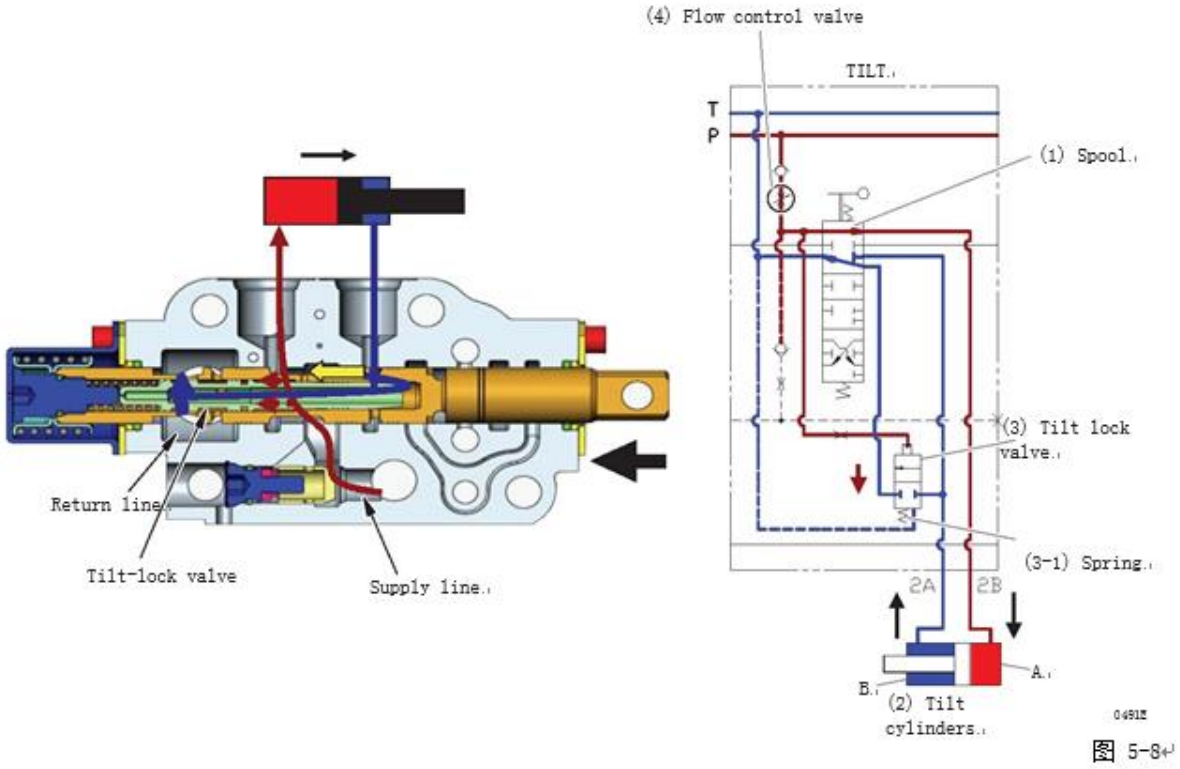


Figure 5-8

Tilt forward

Once the tilt rod is pushed forward, the spool (1) moves, allowing pump oil to flow in the top chamber (A) of the tilt cylinder (2) and allowing the oil in the cylinder rod chamber (B) to drain through the spool (1) to the tank.As a result, the mast is pushed forward.

The tilt spool (1) is equipped with a tilt lock valve (3), so the hydraulic oil in the tilt cylinder (2) does not drain until the pump oil pushes the valve open.Therefore, when the pump oil is not supplied because the operator is not in the seat, the valve remains closed, preventing the return passage of the oil in chamber

B.Therefore, the tilt forward function is not available even when the lever is moved incorrectly or accidentally, thus preventing the load from dropping accidentally.

Install the flow control valve (4) to regulate the amount of pump oil flowing into the cylinder (2) to control the tilt speed.

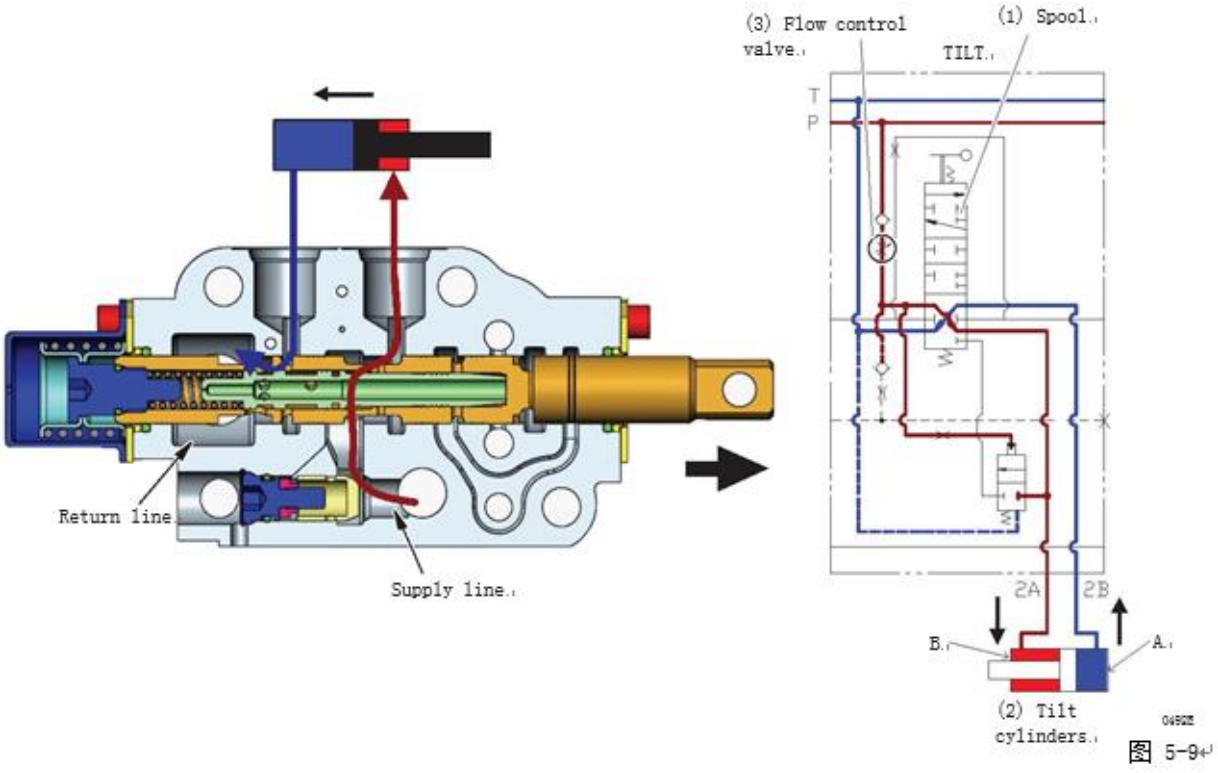


Figure 5-9

Tilt backward

Once the tilt rod is pulled back, the spool (1) moves to allow pump oil to flow in the rod cavity (B) of the tilt cylinder (2) and to allow the head cavity of the cylinder

The oil in (A) is discharged from the oil tank through the valve element (1) and pulled back to the mast.

Install the flow control valve (3) to regulate the amount of pump oil flowing into the cylinder (2) to control the tilt speed.

CAUX Part

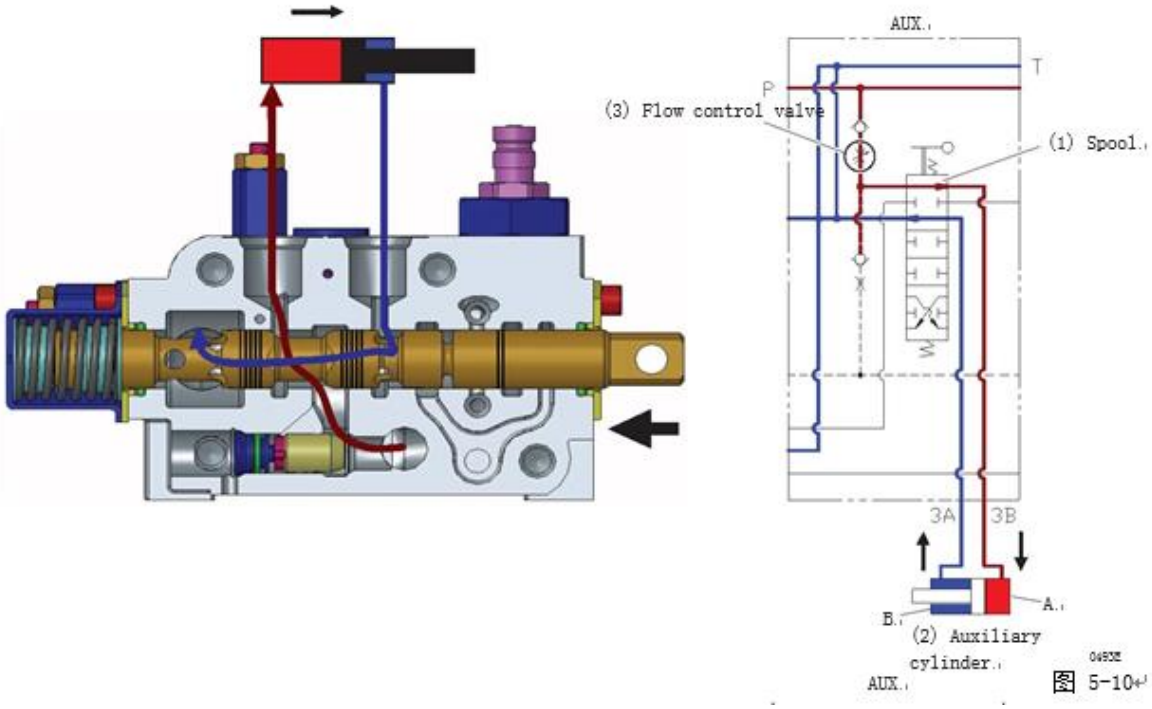
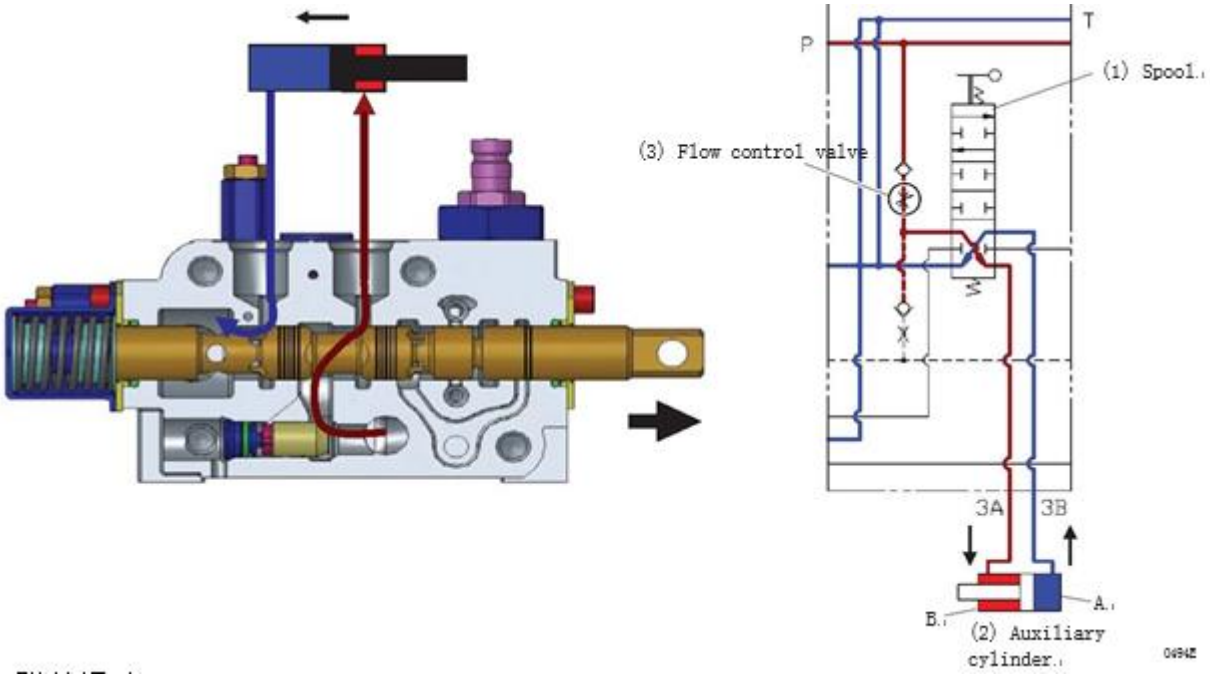


Figure 5-10



Lateral displacement

The movement of the auxiliary cylinder (2) is similar to that of the tilt cylinder.Depending on the position of the spool (1), the chamber to be supplied with hydraulic oil and the chamber to be drained are switched in the cylinder (2).In this way, any accessories fitted to the piston rod will move with it.

Install the flow control valve (3) to regulate the amount of pump oil flowing into the cylinder (2), thus controlling the movement speed of the accessories.

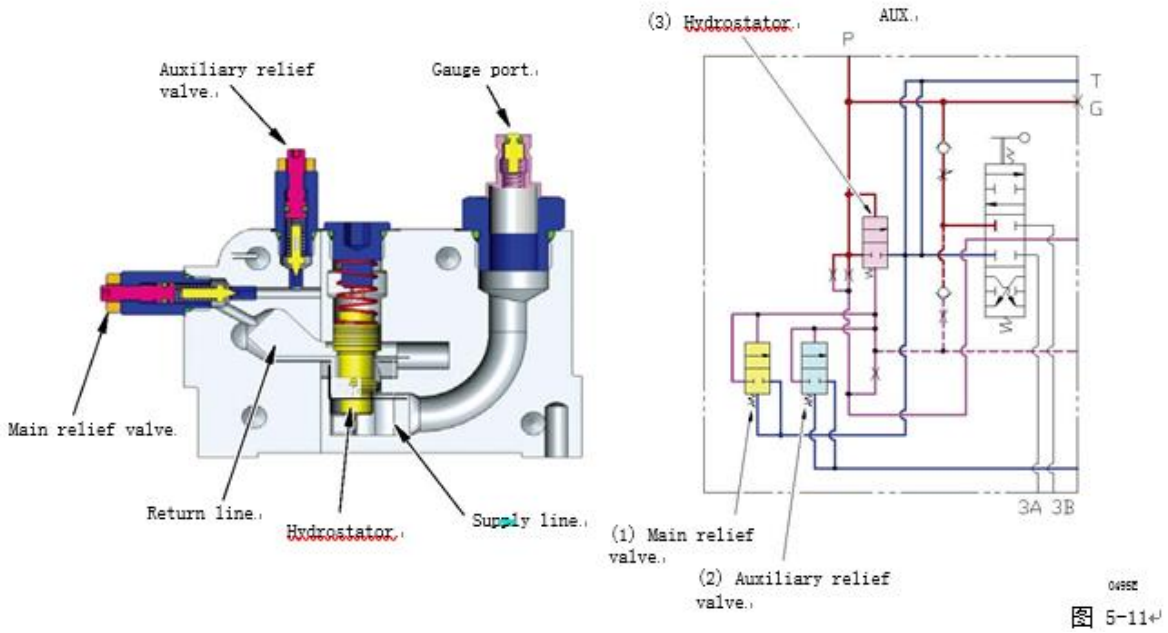


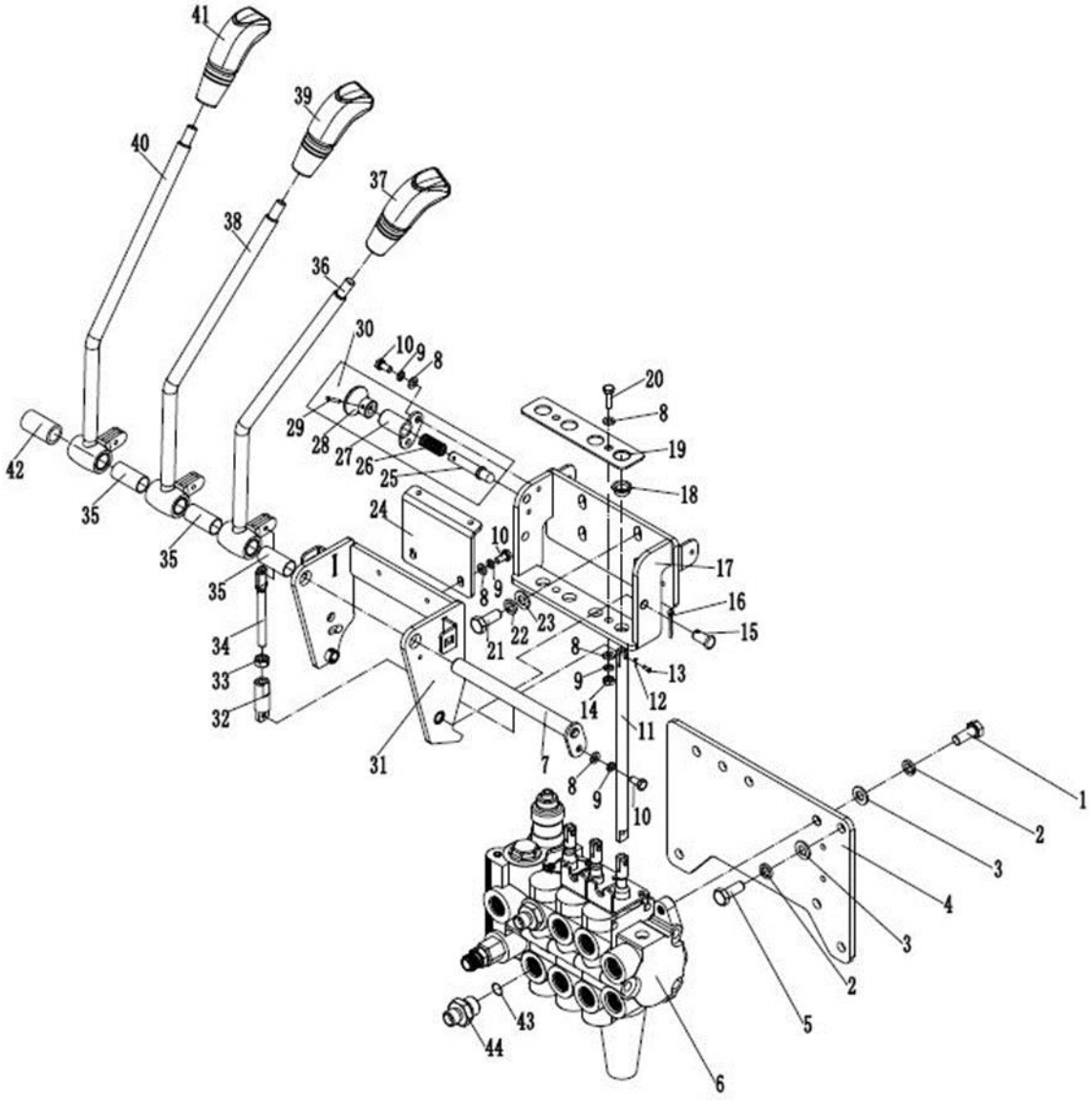
Figure 5-11

Pressure relief

The AUX section block installed at the end of the multiway valve provides the function of relieving excessive pressure.The main relief valve (1) is responsible for the pressure in the lift cylinders and the auxiliary relief valve (2) is used for the pressure in the tilt and auxiliary cylinders.In addition, a hydrostator (3) is built

in to discharge the TILIT and AUX parts of the residual pressure according to the setting of the flow control valve.

5-2-3 Lever and switchpack adjustment / removal / installation



Lift, tilt and sideshift switch adjustment

1. Disconnect the battery connector.

2. Loosen the set screw.

3.The distance (y) between the adjusting screws is 1.0 mm (0.039 in),When the lift lever is fully pulled back.

4.Tighten the set screws.

Lever and switchpack removal / installation

1. Remove the knob assembly from the top of the lever.
2. Disconnect the connector.
3. Loosen the screws and remove the plate assembly.
4. Remove the screws and remove the microswitch assembly
5. Perform the above steps in reverse order to install the lever and switch pack

5-2-4 Removal / installation of multiway valve

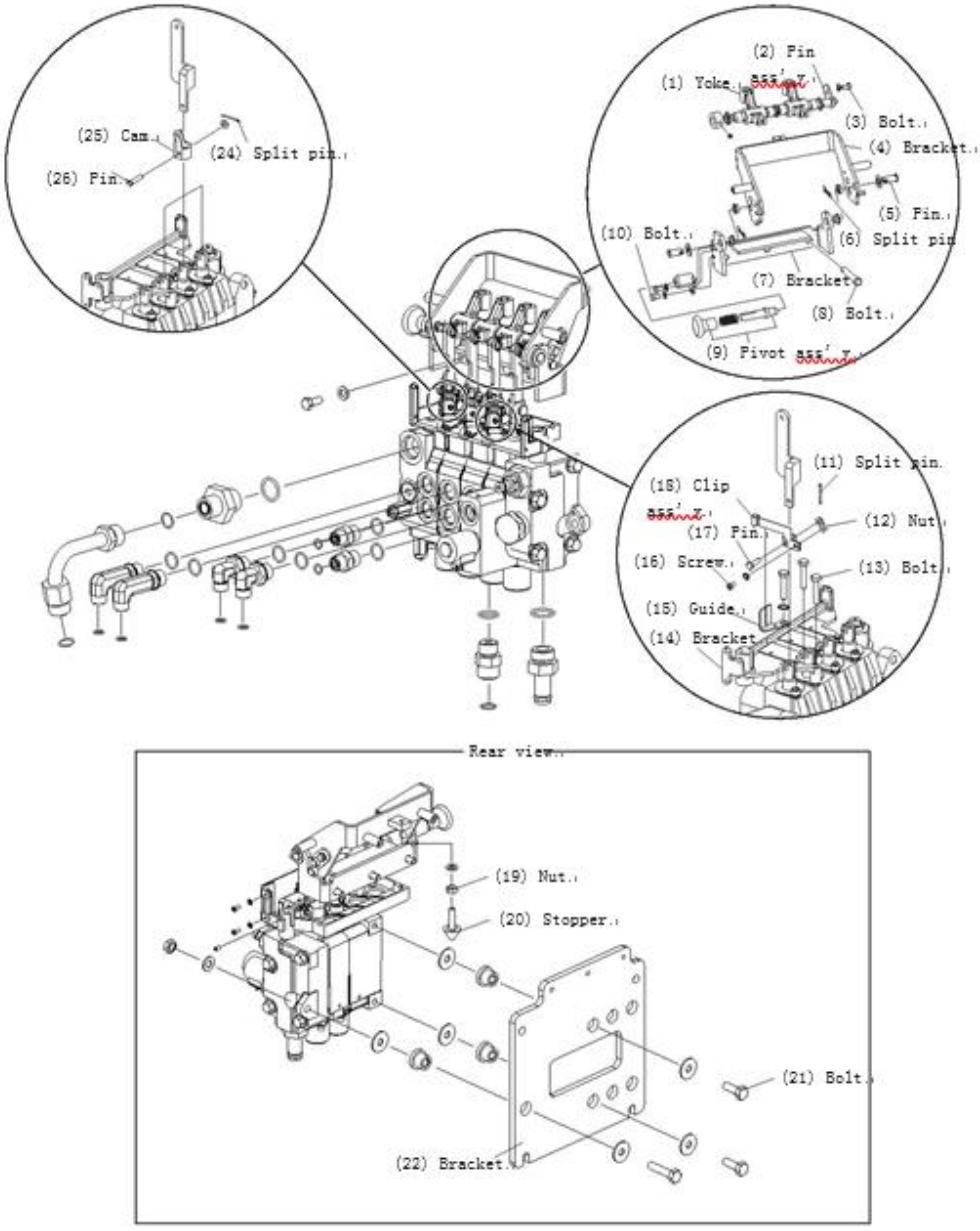


图 5-21

Initial steps

1. Remove residual pressure in the hydraulic system by moving the lever back and forth several times by closing the key

2. Prepare the oil pan.

3. Lift the battery box cover.

Process

1. Give each port and its connection, adapter or insert the corresponding tag As a reference for assembly.

2. Disconnect connections, adapters or plugs, then plug in and cover those connected to the hydraulic hoses.

Prepare the oil pan to catch any oil flowing from the hose and cylinder port.

3. Pull the split pin (24) and pin (26) out of the cams (25) of theAUX1, AUX2, and TILT spools and remove them.

4. Pull out the split pin (11) and pin (17), then loosen the nut (12) from the screw (16) to remove the clip (18).

5. Pull out the split pin (6) and pin (5), remove the stopper (20) and nut (19), and then remove the bracket (4).

6. Loosen the bolt (10) and bolt (3) from the split pin(6).

7. As they slide off the pin (2), carefully remove the pivot assembly (9) while holding the yoke (1).

8. Remove the bolt (8) from the bracket (7) and remove it

9. Remove the bolt (13) from the bracket (14) and remove it with the guide (15)

10. Support the control valve and remove the bolt (21) from the bracket (22).

11. Perform the above steps in reverse order to install the control valve.

12. Fill the tank with hydraulic oil according to the specifications given in Section

5-3 Mast

5-3-1 Appearance and specification

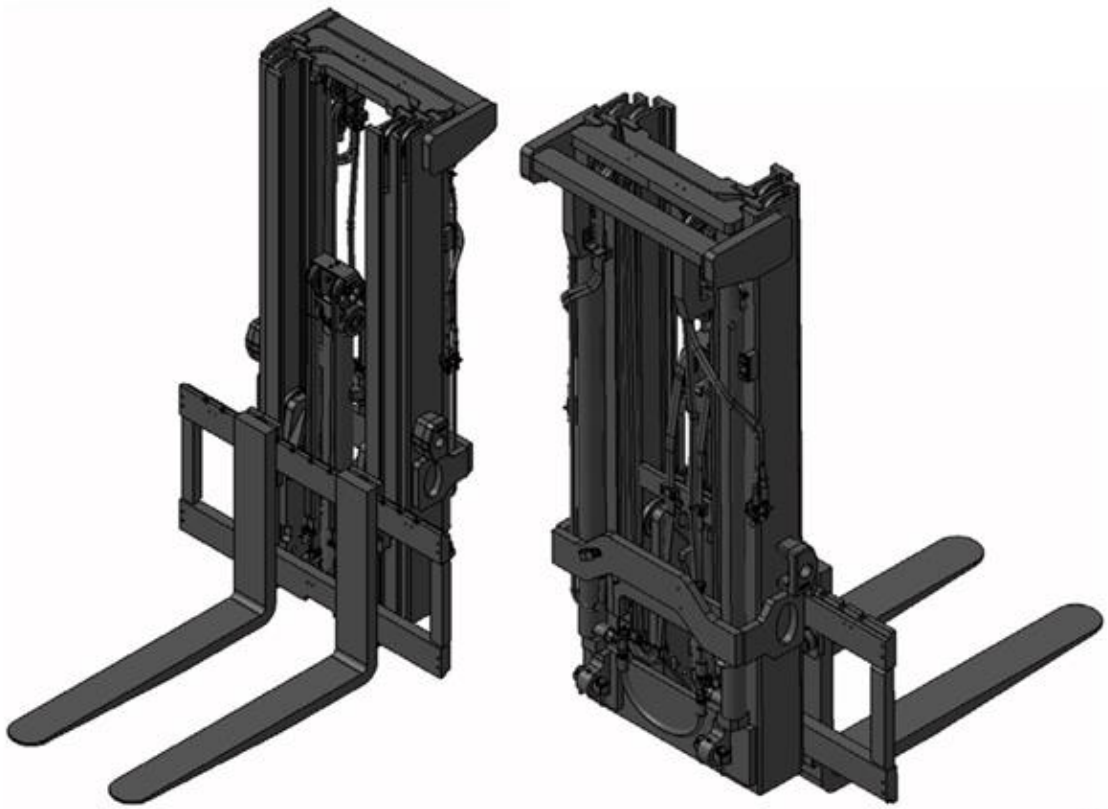
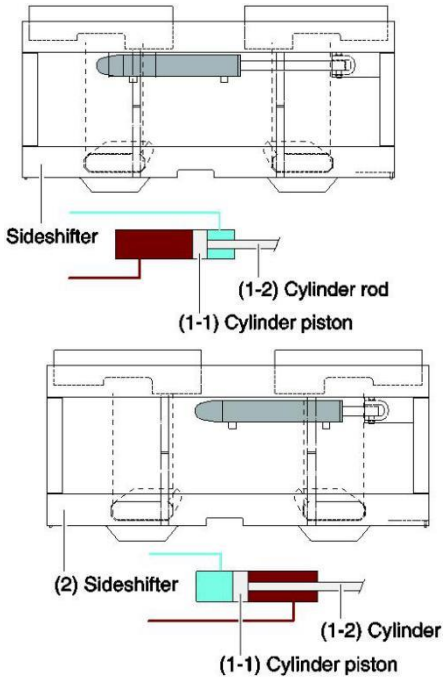


图 5-24



5-3-2 How does this work

A. Mast tilt

Mast tilt operation is performed by two double acting cylinders.In the case of each cylinder, one end is connected to the chassis of the vehicle and the other end to the side of the Mast.

Tilt forward

Push the tilt lever to move the tilt spool of the multiway valve to send the hydraulic oil to the opposite chamber of each cylinder rod and extract the oil from the rod chamber.This causes the piston to push forward, tilting the front door frame mounted on the cylinder rod on the axis connected to the vehicle.

Tilt backward

Pull the tilt lever to move the tilt spool of the multiway valve to send the hydraulic oil to the chamber of each cylinder rod and extract the oil from the opposite chamber.This causes the piston to be pushed back, tilting the rear mast mounted on the cylinder rod onto the connecting shaft to the vehicle.

B. Standard Mast lifting

The standard (STD) Mast assembly uses two Mast and two single acting cylinder cylinders to lift the load.

Rollers mounted on the inside and outside of the carriage and Mast respectively facilitate these up / down movements.

Cylinder

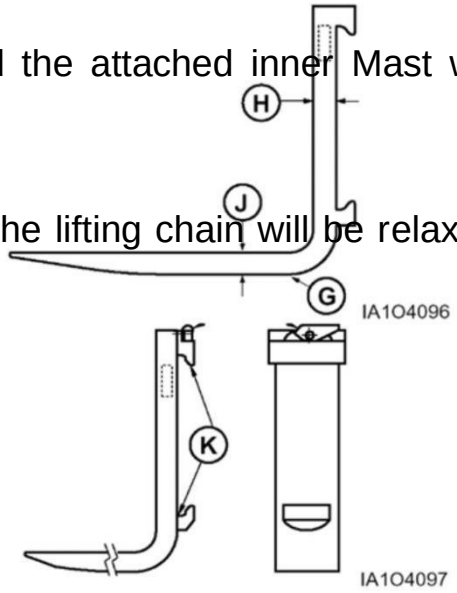
After receiving the hydraulic oil from the lift part of the multi way valve, the rod of the standard oil cylinder stretches out to push the internal Mast upward. At the same time, the bracket is also pulled by the lifting chain, which is connected to the external Mast to lift together with the chain.

Lower

If the operator controls the lever to open the outlet port in the poppet of the multiway valve, the oil output from the standard cylinder will begin to flow out by gravity.

When the oil is drained, the cylinder rod and the attached inner Mast will retract.

When the inner Mast is lowered, the tension of the lifting chain will be relaxed and the bracket will also be lowered.



C Side shifter

Move to the right

Press down the sideshift rod to move the AUX1 valve element of the multiway valve to send the hydraulic oil to the left chamber of the cylinder piston (1-1) and recover the oil in the right chamber.This causes the piston (1-1) to push forward with the Sideshifter (2) mounted on the piston rod (1-2) and also moves the fork attached to it to the right.

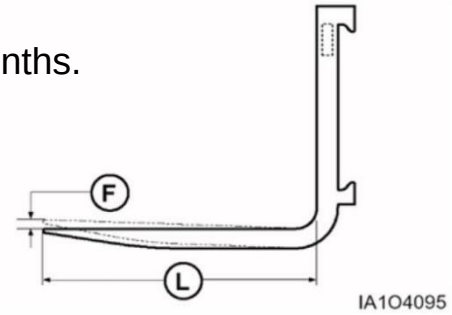
Move to the left

Pull the sideshift lever to move the AUX1 spool of the multiway valve to send hydraulic oil to the right chamber of the cylinder piston (1-1) and recover the oil in the left chamber.This causes the piston (1-1) to push back together with the Sideshifter (2) mounted on the piston rod (1-2) while moving the fork attached to it to the left.

5-3-3 Fork service

A fork inspection

The forks shall be checked at least every 12 months.If the forklift is used in multi shift or heavy work, it shall be checked every six months.



1. Check the fork carefully for cracks.Pay special attention to the heel

(A), all welding areas and mounting brackets (B).Check hanging

The top and bottom of a fork used on a fork on a fork lift truck

A hook.

A cracked fork shall be replaced

2. Check the angle between the upper surface of the fork blade and the front surface of the fork shank.

If the angle (C) exceeds 93 degrees or deviates from 90 degrees

If the original angle is more than 3 degrees, the fork shall be stopped, such as some special

Apply the fork as shown in.

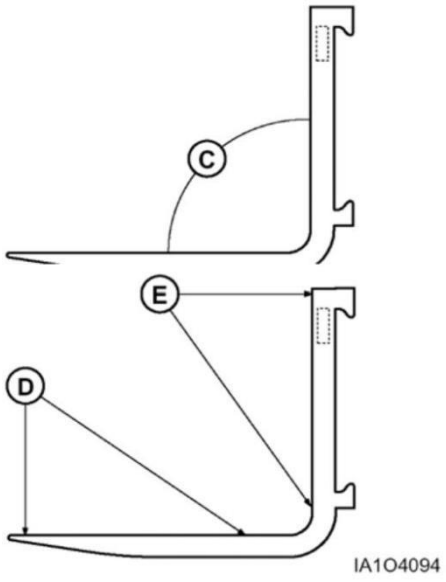
3.Check the upper surface of blade (D) and the front surface of handle (E) with straight edge

The straightness of.

If the deviation of straightness exceeds 0.5% of the blade length and / or the blade

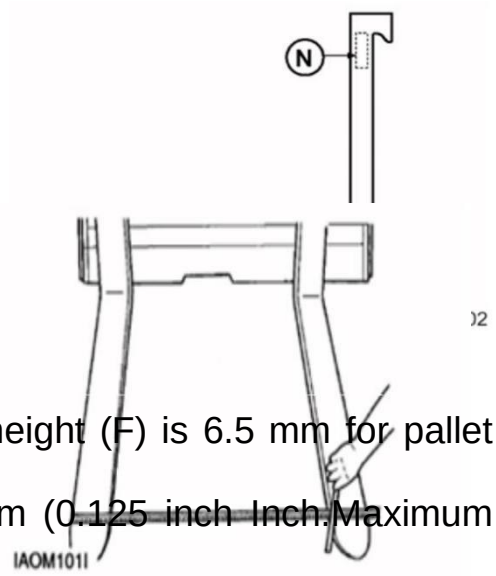
Handle height is 5 mm / 1000 mm (0.18 "/ 3"),

Stop using the front fork.



4. When installing on the fork frame, check the connection between one fork tip and the otherHeight difference.The difference of fork tip height may lead to uneven load

Support and cause problems entering the load.



The maximum recommended difference in fork height (F) is 6.5 mm for pallet fork Meter (0.25 inch) and full tapered fork 3 mm (0.125 inch Inch.Maximum allowable height of fork tip between two or more forks

The allowable difference is 3% of blade length (L).

If the difference of fork tip height exceeds the maximum allowable difference, the Change one or two forks.

5. Check the front fork blade (J) and handle (H) for wear, especially

Pay attention to the heel (G).If the thickness is reduced to 90% of the original thickness Or smaller, replace the front fork.

Fork blade length may also be reduced by wear, especially in the

Tapered fork and pressing plate.If the blade length is no longer as expected

Replace the fork from service.

6. Check the fork frame (K) for wear, extrusion and other local deformation,

This may cause excessive lateral swing of the fork.Cross on hook fork

Large gaps may cause them to fall off the carrier.

The fork showing obvious signs of damage shall be stopped.

7Check the lock and other front fork fixings to ensure they are in place

And work normally.

The hook yoke is engaged using a spring pin (M) located in the top hook

Notch in the top carrier bar to hold the fork in place.

When adjusting the front fork spacing, prevent the fork from sliding out of the carriage through the stop

End.These stops are located at both ends of the carriage and at the bottom yoke

In the path of.In some cases, a load backrest can be used

Extension instead of stop.

The shaft mounting fork can use any collar or gasket on the shaft to the fork

One side.They can also use U-bolts, pins or similar devices,

It engages the fork through the top structure of the bracket.

8. Check that the fork mark (N) is readable.Update tags as needed to

Maintain readability.

9. Lift the Mast and operate the tilt lever until the top surface of the fork is

The ground is parallel.Place two straight bars with the same width as the bracket, horizontally

Cross fork.

10. Measure the distance from the bottom of each of the two rods to the floor.

For fully tapered and polished (FTP) forks, the forks must be parallel

Full length of all other forks within 3 mm (. 12 in.)

Degrees are 6.4 mm (. 25 in).

11. Place a fork (one third of the tip) on one that will not move

Under the fixture.Then operate the tilt control carefully until it is stuck

The back of the car just lifted off the floor.Use the second fork to perform the phase

The same procedure.Repeat step 9.

B fork removal / installation

1. Lower the fork completely.

2. Unlock the latch at area (1).

3. Slide the fork into the center groove (2) and remove it.

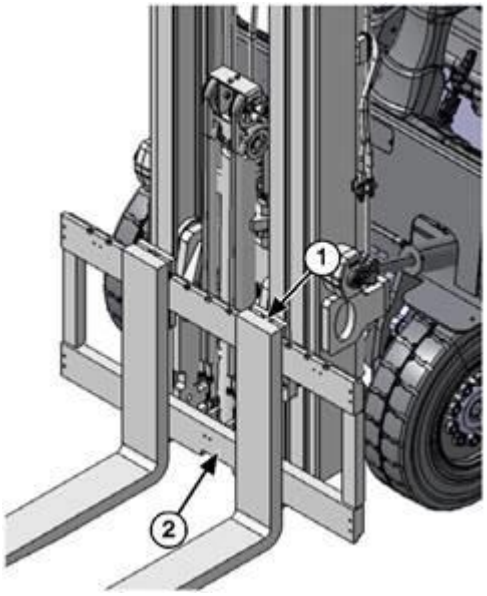
4. Perform the above steps in reverse order to install the front fork.

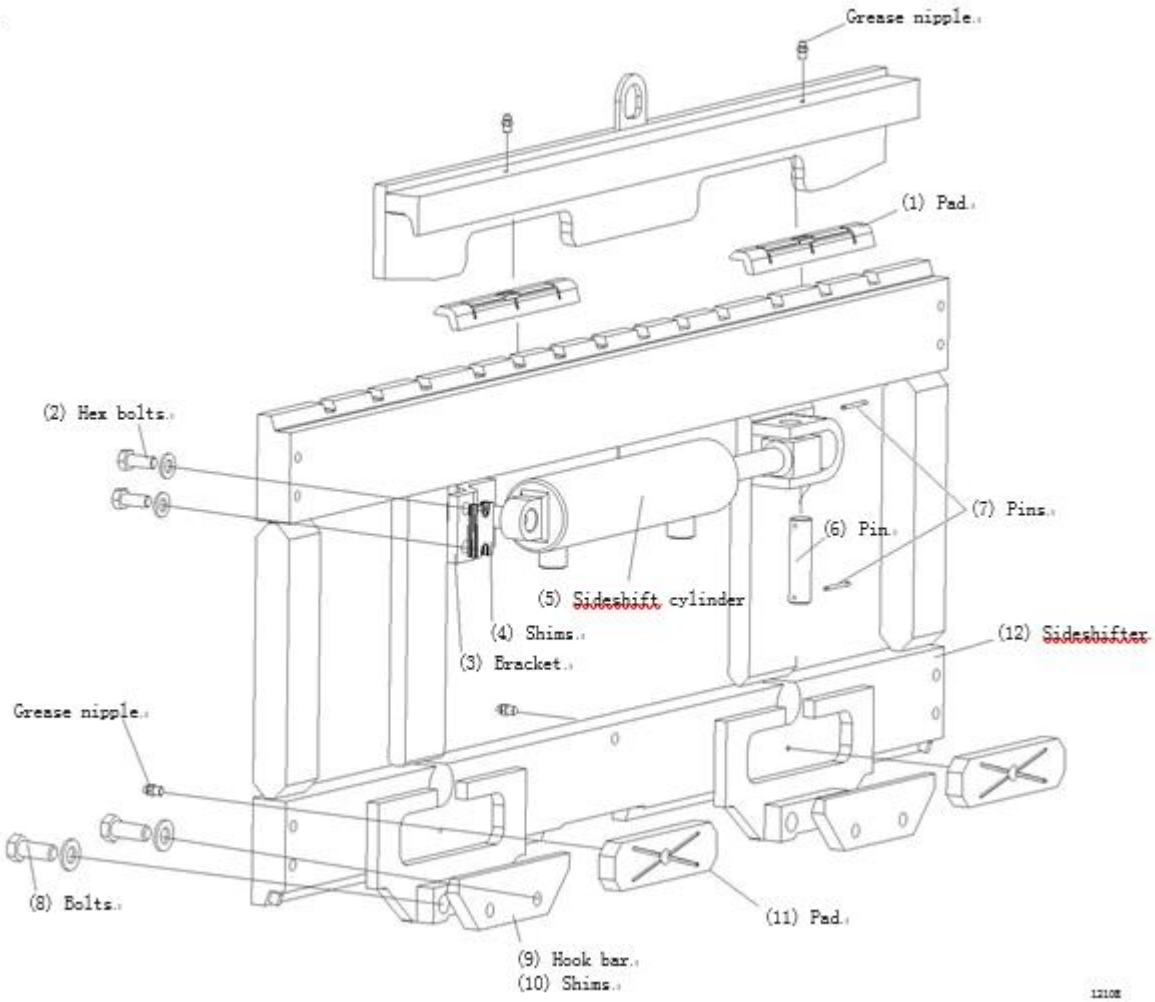
Note: during disassembly, check the fork and fork frame, and replace them for possible damage,

Any part that is cracked or excessively rusted.

5-3-4 Sideshifter service

A Standard sideshifter and cylinder removal / installation

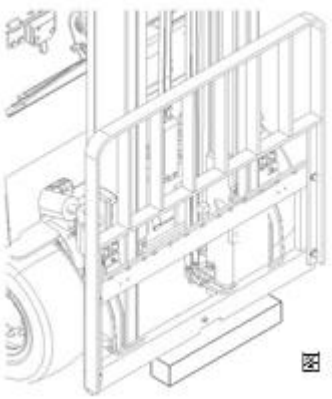




Initial steps

1. Lift the bracket and place a wooden block under it.

2. Lower the bracket onto the wood block and secure the crane to the load backrest.



3. Remove the fork (see Section 5-3-3 b). Figure 5-47

4. Remove residual pressure in the hydraulic system by moving the lever back and forth several times by closing the key

Process

1. Mark the hose and port of the sideshift cylinder as reference for assembly.

2. Disconnect the hose from the sideshift cylinder and plug and cap the hose and port.Prepare the oil pan to catch any oil that is coming out of the hose and the cylinder port.

3. Remove the hexagon bolt and washer, and then remove the gasket.When installing, apply thread sealant on the hexagon bolt.When installing, adjust the thickness of the gasket so that the gap between the bracket and the cylinder is at least 1.5 mm (0.06 in).

4. Slide the side shifter out of the bracket.During installation, check whether the clearance between bracket and side shifter is consistent.If this is not the case, the hook bar must be shimmed on each side.They can be removed by removing the bolts and washers.After installation, lubricate all gaskets with grease through their respective fittings.

5. After removing the pin, pull out the split pin and remove the sideshift cylinder.

6. Perform the above steps in reverse order to install the Sideshifter body and the sideshift cylinder.

B. Disassembly / assembly of sideshift cylinder

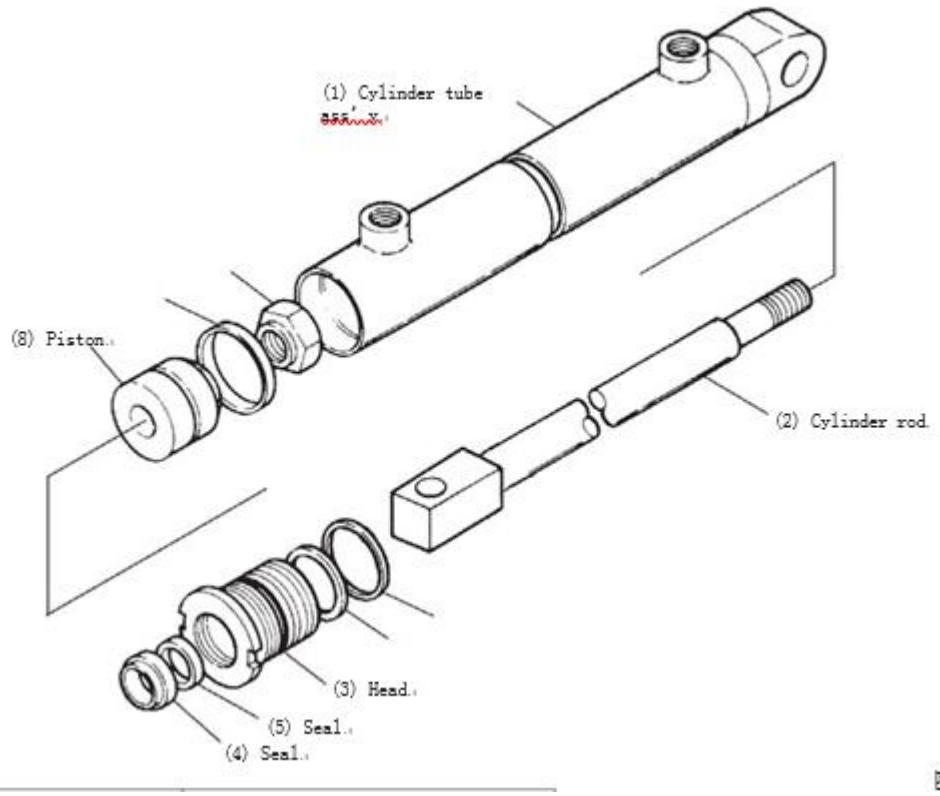


Figure 5-50

Tools needed: claw spanner

Initial steps

1Remove the sideshift cylinder (see Section 5-3-4)

Process

1. Place the cylinder tube assembly (1) in a vise and use a claw wrench to unscrew the head assembly (3).

2. Pull the cylinder rod assembly (2-3) out of the cylinder tube assembly (1).

3. Remove the seals (4,5) from the inside diameter of the head (3).

4. Remove the O-ring (6) and the support ring (7) from the outside diameter of the head (3).

5. Unscrew the self-locking nut (10) from the cylinder rod (2).Installation torque: 253.0 n · m (186.6 LB · ft)

6. Unscrew the piston (8) and remove the O-ring seal (9) from it.

7. Perform the above steps in reverse order to assemble the sideshift cylinder

Note: make sure to reseal the port with the dust cap after the cylinder assembly.

5-3-5 Chain service

A. chain wear inspection

To check for chain wear, the chain spacing must be found first

1. Lifting the bracket is sufficient to apply tension to the lifting chain.

2. Place the stationary pointer of the chain wear gauge on the upper pin of the link.

3. Place the sliding pointer on the lower pin of the link.

4. Make sure that the two pointers are in the same position on both pins to get an accurate reading.

5. Hold the slide pointer in place and read the scale on the gauge to find the chain pitch.

After finding the chain spacing, start the wear check:

1. Place the slide pointer on one of the three boxes at the bottom of the meter scale.Promote

2. Place the window of the pointer in the square containing the chain spacing found above

3. Fix the measuring instrument on the other side of the lifting chain again so that the fixed pointer rests on the upper pin of one of the chain links.

4. Place the entire length of the indicator against the lift chain, move the slide pointer until it aligns with the top pin of the other link, keeping the window of the pointer on the correct square found in step 2.

5. If the chain is excessively worn, replace the lifting chain

B. Chain tension check

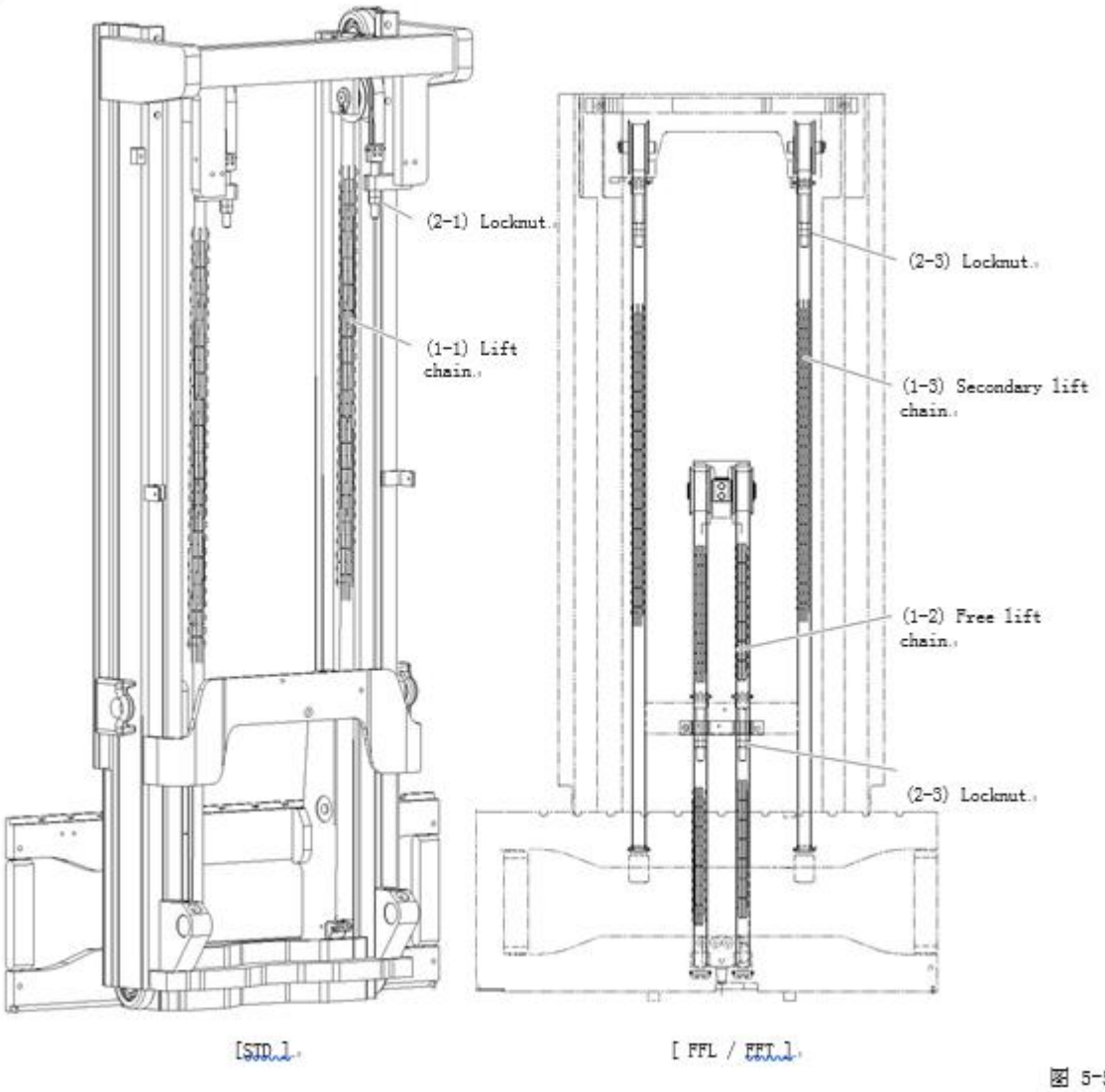


图 5-52 Figure 5-52

For safe operation, the tension of each pair of chains on the Mast shall be the same.

Chain of STD

1. Lift the bracket and place the weight on the fork.

2. Push the two lifting chains gently by hand to check the tension.

If their tensions are unbalanced, follow the adjustment procedure below.

3. As the bracket rises, the block is located below.

4. Lower the bracket onto the block in order to release tension from the chain.

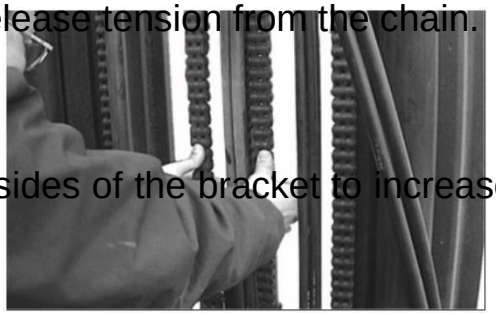


Figure 5-53

5. Tighten or loosen the lock nuts (2-1) on both sides of the bracket to increase or decrease the chain tension as required.

Figure 5-53

6. After the adjustment is completed, place the thread sealant on the thread of the lock nut (2-1).

Chain for FFL/FFT

1. Perform the same operation on the free lifting chain (1-2) and adjust with the lock nut (2-2).

2. After fully lifting the carriage, further lift the Mast to apply tension to the second lifting chain (1-3).

3. Press both auxiliary lifting chains (1-3) lightly by hand to check the tension.If their tensions are unbalanced, follow the adjustment procedure below.

4. As the inner Mast rises, position the block below.

5. Lower the inner Mast onto the block in order to release tension from the chain.

6. Tighten or loosen the lock nuts (2-3) on both sides of the bracket to increase or decrease the chain tension as required.

7. After the adjustment is completed, place the thread sealant on the thread of the lock nut (2-3).

C. Chain removal/installation

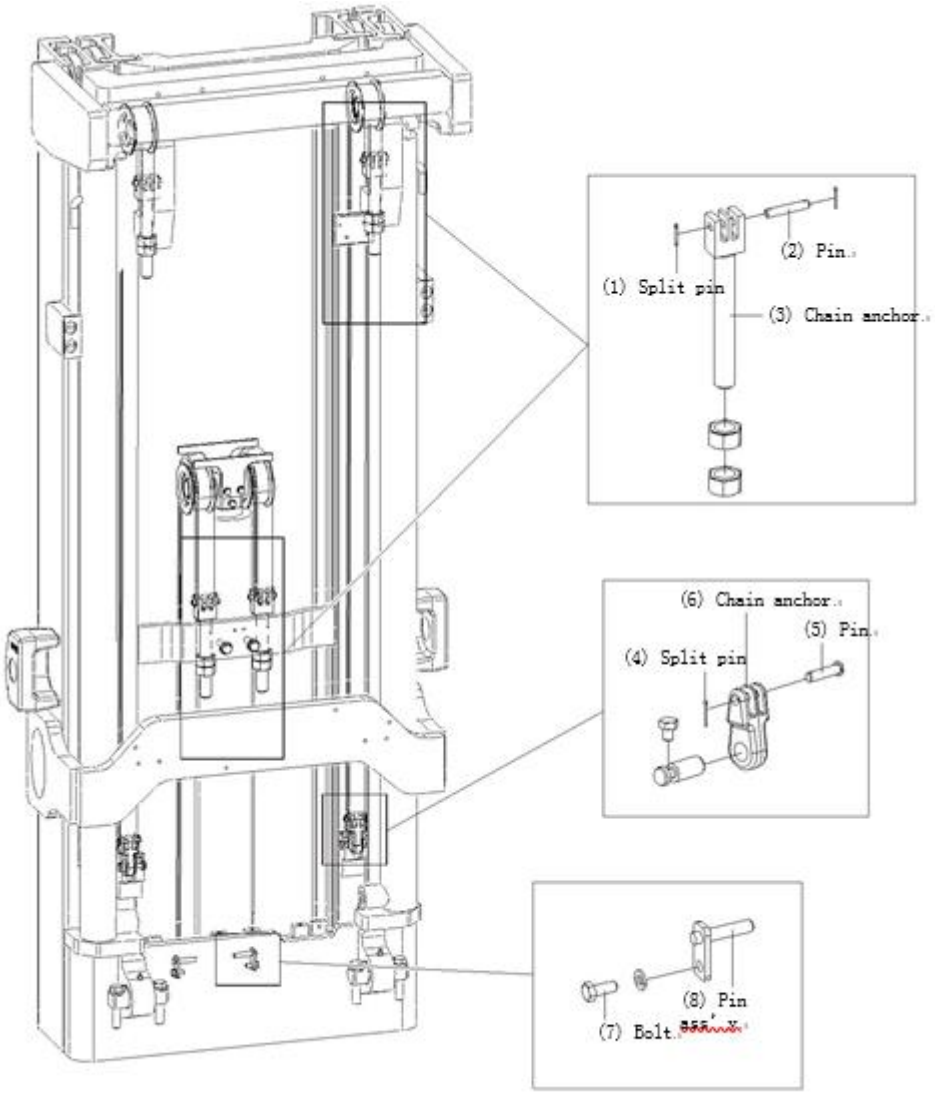


图 5-54 Figure 5-54

Secondary / standard Mast chain removal / installation

1. Lift the carriage and place blocks under it.

2. Lower the bracket onto the block in order to release the tension from the lifting chain.

3. After removing the split pin (1), pull out the split pin (2) and remove the chain from the chain anchor (3).

4. After removing the split pin (4), pull out the split pin (5) and remove the chain from the chain anchor (6).

5. Follow the steps above in reverse order to install the lift chain.

6. Check the chain for proper tension (see Section 5-3-5 b).

Main lifting chain removal / installation (for FFL / FFT)

1. Lift the carriage and place blocks under it.

2. Lower the bracket onto the block in order to release tension from the main hoist chain.

3. After removing the split pin (1), pull out the split pin (2) and remove the chain from the chain anchor (3).

4. Remove the bolt (7) and washer and remove the pin (8).

5. Perform the above steps in reverse order to install the main hoist chain.

6. Check the chain for proper tension (see Section 5-3-5 b).

5-3-6 Tilt cylinder service

A. Tilt column alignment

Warning

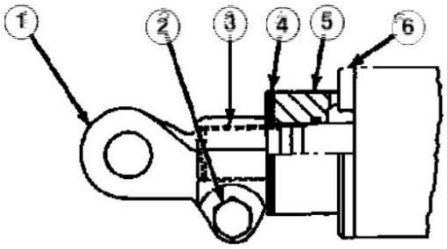
The mast may fall and squash, causing serious injury. After the adjustment is complete, make sure the piston rod is securely mounted in the clevis.

Note: misaligned cylinders will create additional stresses in the area of the Mast assembly and the Mast hinge.To ensure that the tilt cylinders are aligned, follow these steps:

Initial steps

Before starting the adjustment, check whether:

1.The two oil cylinders are evenly stopped at the end of the backward tilt and inclined forward;



2.Two oil cylinders extend and retract evenly;

3.There is no distortion on both sides of the Mast;

4.When fully tilted forward and backward, the tilt angle of the Mast falls within the specifications on the forklift nameplate (measure them with tilt indicator or protractor)

5.When fully extended, the length difference between the cylinder rods is within 3.18 mm (0.125 in).

If any conditions are not met, follow the steps below to adjust the alignment of the tilt cylinder.

Process

1. Tilt the Mast fully forward.

2. Loosen the nut (2) that secures the cylinder rod in the clevis (1).

3. Screw the rod out or into the clevis to achieve the correct length of both cylinders.For tilt cylinders with the tilt after limit group option, you need to move the shim (5) before you can adjust the rod.

4. Install the nut (2) and tighten to a torque of 95 ± 15 N · m (70 ± 10 lb · ft).

Perform the following steps only if the tilt cylinder on the vehicle contains the tilt limit group option.

5. Tilt the Mast fully back.

6. Install the gasket (4) so that there is no gap between the gasket (5) and the head (6).

C. Integral removal / installation of tilt cylinder

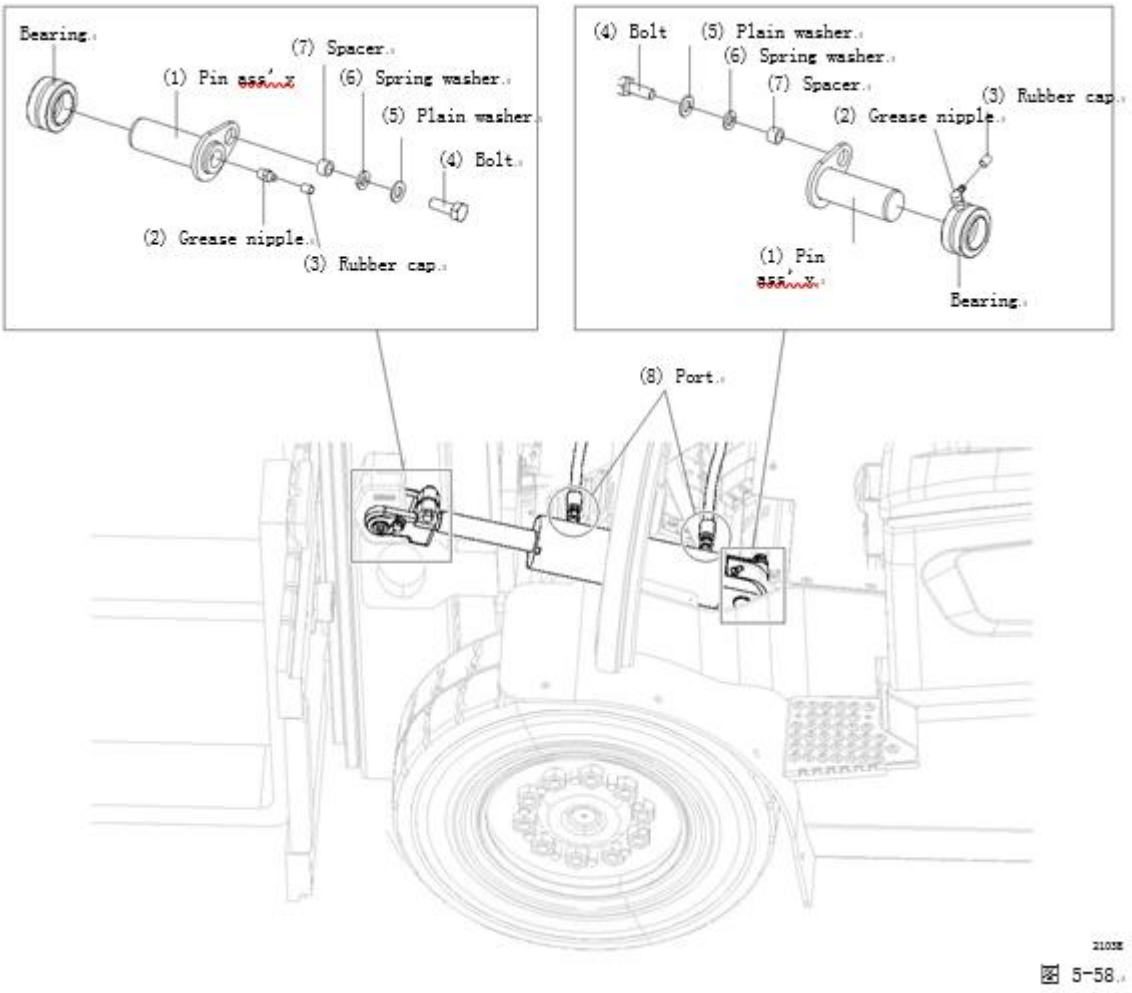


Figure 5-58

Initial steps

1. Prepare a hoist and tie the straps to both sides above the Mast.

2. Remove residual pressure in the hydraulic system by moving the lever back and forth several times by closing the key

3. Prepare the oil pan.

4. Remove the base plate (see Section 7-3).

Process

1. Mark the hose and port (1) as an assembly reference.

2. Disconnect the hoses from the ports and plug them.Prepare the oil pan to catch any oil coming out of the hose and cylinder port.

3. Remove the bolt (4), washers (5, 6), and shim (7) from the Mast end of the cylinder.

4. Pull out the pin (1) from the end of the Mast.

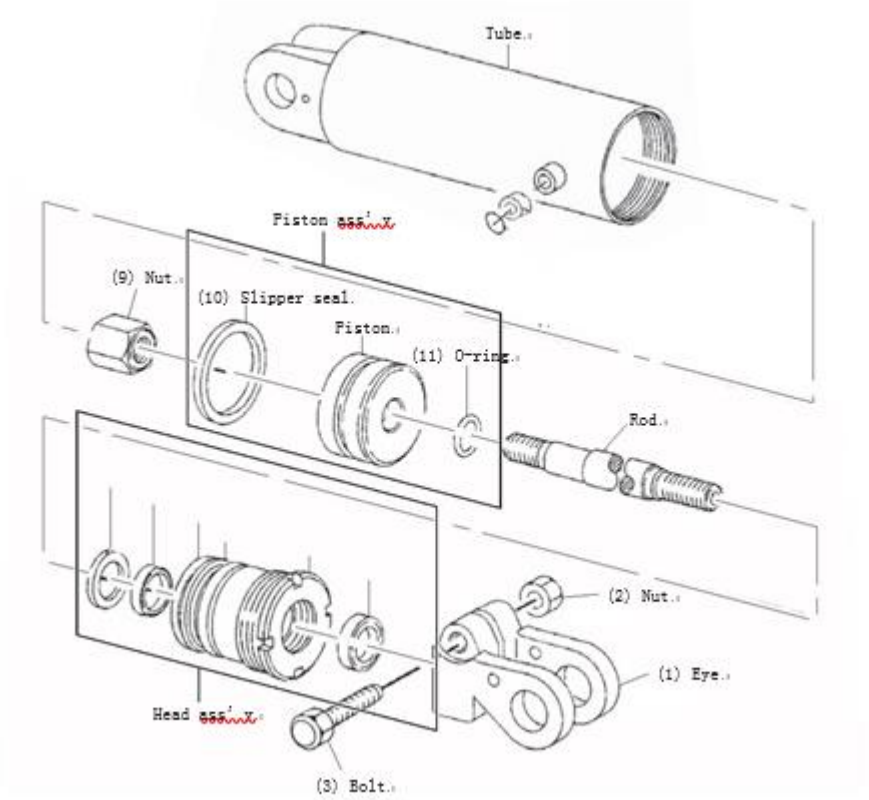
5. Repeat steps 3-4 for the frame end of the cylinder.

6. Remove the tilt cylinder.

7. Perform the above steps in reverse order to install the tilt cylinder.

8. Refill the tank with hydraulic oil according to the specifications given in Section 1-6 and perform the tilt cylinder alignment procedure provided in Section 5-3-6 a.

D. Disassembly / assembly of tilt cylinder



5-60

Tools needed: claw spanner

1. Place the tilt cylinder in a vise and use a dog wrench to remove the rod assembly.

Installation torque: 270 ± 30 n · m (200 ± 22 LB · ft)

2. Loosen the nut (2) and bolt (3) and remove the eye (1).

Installation torque: 95 ± 15 N · m (70 ± 11 LB · ft)

3. Remove the butt from the head.

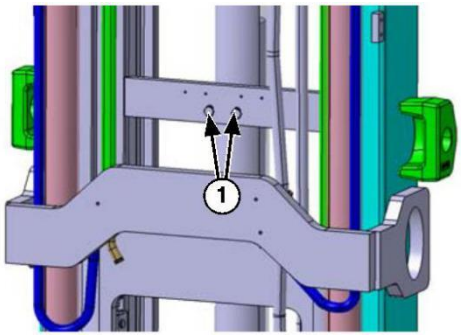
4. Remove the seal ring (4).

The lip shall face the head during installation.

5. Remove the U-cup (5).

6. Remove the O-ring (6).

Install the contact side of the support ring so bent.



7. Remove the backup ring (7).

8. Remove the dust seal (8).

The lip shall face the head during installation.

9. Remove the nut (9).

Installation torque: 402 ± 29 n · m (297 ± 21 LB · ft)

10. Remove the piston assembly.

11. Remove the slipper seal (10).

12. Remove the O-ring (11).

13. Perform the above steps in reverse order in order to assemble the tilt cylinder.

Note: after assembly of the tilt cylinder, make sure that the dust cover and plug are used

New seal port.

5-3-7 Main lift cylinder service

A. overall removal / installation of main lift cylinder

Initial steps

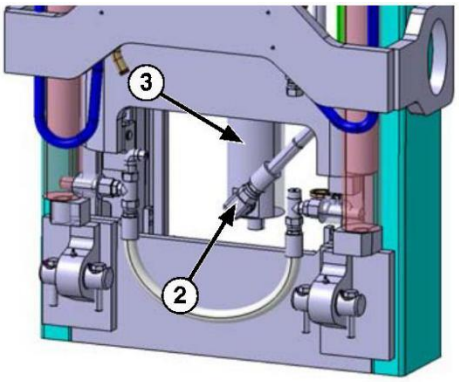
1. Remove the carrier chain (see Section 5-3-5 C).

2. Remove the bracket (see Section 5-3-9 b) and leave all residual pressure fully released.

3. Fix the hoist on the master cylinder.

4. Prepare the oil pan.

Process



1. Remove the bolts (1).
2. Disconnect the hydraulic hose (2)
3. Remove the main lift cylinder (3).
4. Perform the above steps in reverse order to install the tilt cylinder.
5. Fill the tank with hydraulic oil according to the specifications given in Section

B. Disassembly/assembly of main lift cylinder

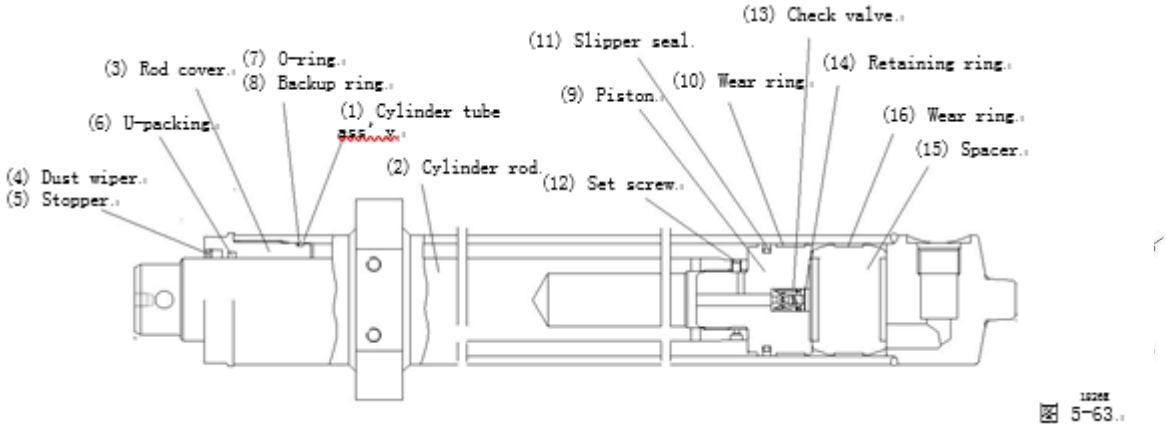


图 5-63

Tools needed: claw spanner

Initial steps

1. Remove the main lift cylinder (see Section 5-3-7).

Process

1. Using a claw wrench, remove the rod cap (10).

2. Remove the O-ring (7) and support ring (8) from the outer diameter of the rod cover (3), the dust wiper (4), the plug (4) and the U-ring seal (6) from the inside.Install the U-gasket (6) with the lip facing outward.Check the condition of the dust wiper (4).

3. Secure the cylinder tube assembly (1) in a vise and remove the cylinder rod (2).

4. Loosen the set screw (12).

5. Unscrew the piston (9)

6. Remove the sliding seal ring (15) and wear ring (10) from the outside diameter of the piston (9), and remove the retaining ring (14) and check valve (13) from the inside.

7. Remove the wear ring (16) and the gasket (15).

8. Check the condition of the seal and replace the damaged or worn seal.

9. Perform the above steps in reverse order to assemble the main lift cylinders.

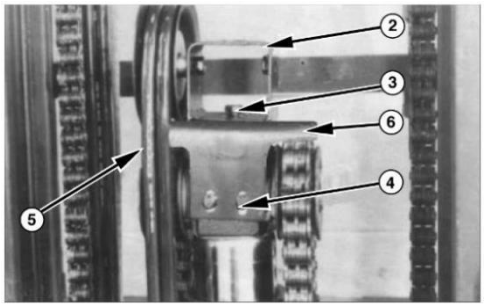
Note: make sure that the port is resealed with a dust cap after the cylinder is assembled.

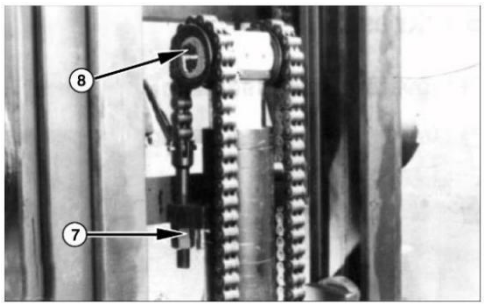
5-3-8 Service of Transportation

A. Height adjustment of bracket and Mast

1. Place the Mast in a vertical position.

2. Lower the bracket completely.





The bottom of the inner Mast of the FFL and FFT lift models must be flush with the bottom of the outer Mast.

3. Measure the distance (A) from the bottom of the inner column to the bottom of the carrier bearing.

If the measurement of (A) does not match the measurement in the table below, adjust the chain (see Section 5-3-5 b) and repeat the process.

B. frame removal / installation

Initial steps

1. Remove residual pressure in the hydraulic system by moving the lever back and forth several times by closing the key

2. Remove the bolts (1) and washers and remove the load backrest.

3. Remove the fork (see Section 5-3-3 b).

4. Lift the bracket and place a wooden block under it.

5. Lower the bracket onto the wood block and secure the crane to the load backrest.

6. Remove the Sideshifter (see Section 5-3-4).

7. Prepare the oil pan.

Process

1. Remove the bolt (3), four bolts (4), and two chain guards (6) from the hose support assembly (2).

2. Disconnect the two hydraulic lines (5), remove the hose clamp and set the hose aside without using the hose support assembly (2).

3. Remove the hose support assembly (2) from the crosshead.

4. Remove the four nuts (7) from the chain anchor.

Installation torque: 500 ± 70 n · m (370 ± 50 lb · ft)

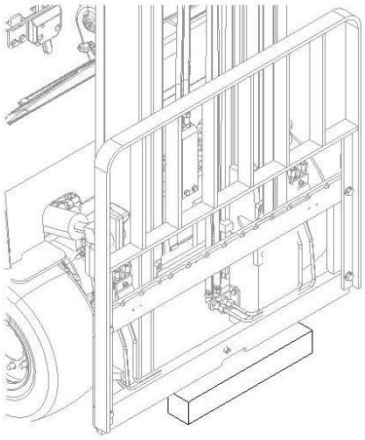
5. Set the chain aside and away from the Mast.

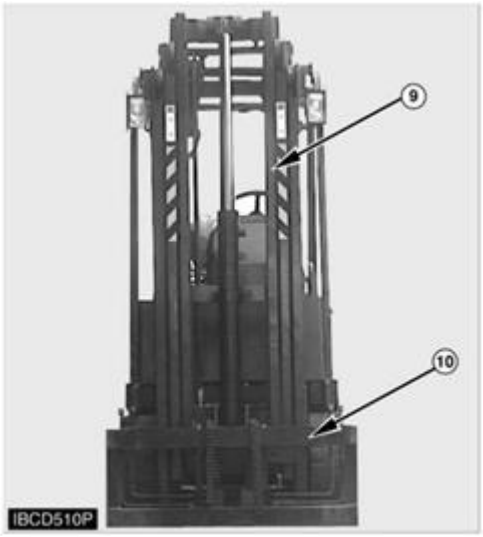
6. Remove crosshead (8) from master cylinder

7. Lift the inner Mast (9) to pull out the bracket, as shown in figure 5-76.

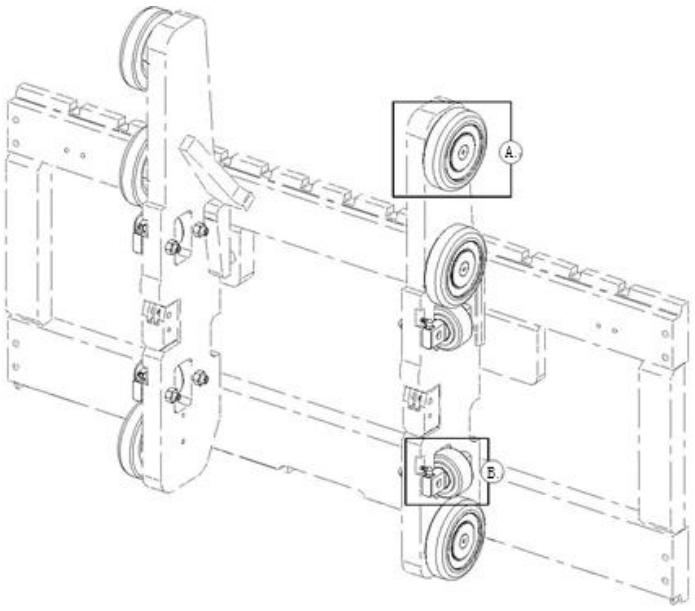
8. Remove the bracket from the bottom of the inner Mast (9).

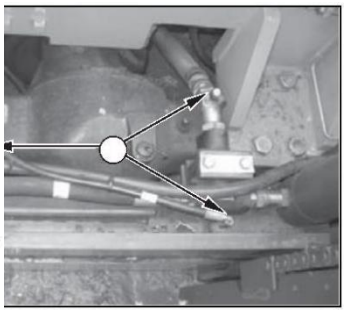
9. Perform the above steps in reverse order to assemble the fork and backrest.

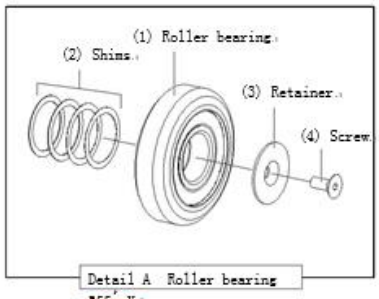




C. Support roller bearing adjustment







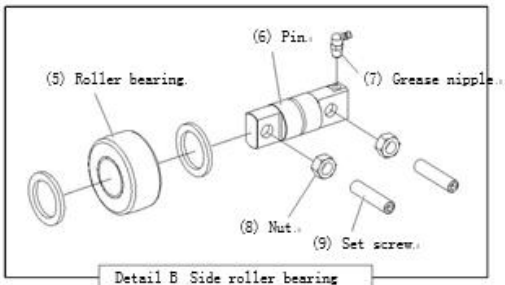


图 5-77

You can adjust the gap between the Mast channel and the carrier roller by adding or removing spacers.All six carrier roller bearings can be adjusted using the same procedure.

Before and during adjustment:

Make sure all parts are clean.

Check all components for wear and replace worn components.

Perform the roller bearing setup procedure one at a time.

Initial steps

Remove the bracket (see Section 5-3-9 b).

Adjustment of upper and lower roller bearings

1. Remove the screws (4).

Installation torque: 30 ± 7 n · m (22 ± 5 lb · ft)

2. Remove the retainer (2).

3. Remove the roller bearing assembly (1).

4. Separate the gasket (2) from the roller bearing (1).

5. If you are installing new roller bearings, please refer to the table below to select those roller bearings (1), which will help to achieve "minimum clearance" between the bearings and the channel legs over the entire length of the Mast; make sure to use the same bearings in all six locations.

6. Measure the width of the inner Mast with a ruler to find the narrowest point.

7. At this point, install the gasket (2) until the upper / lower carriage roller bearing (1) with a clearance of 1.5 ± 0.5mm (0.06 ± 0.02) between the inner Mast and the bearing is behind both sides.

Make sure that the same number of gaskets are installed for each corresponding side.

Side roller bearing adjustment

1. Unscrew the nut (8) from the set screw (9) and remove the side roller bearing assembly (5-9).

2. Measure the width of the inner Mast with a ruler to find the narrowest point, as shown in Figure 5-80.

3. At this time, adjust the nuts (8) on the two fixing screws (9) until there is "minimum clearance" (clearance C) between the inner Mast and the side roller bearing (5).

4. Reinstall the side roller bearing.

Keep the angle of the nozzle 45 ° ± 1 °.

5. Install the roller (5) with bushing and washer, washer (6), adjustment pin (7) and nuts on both sides of the carriage.

6. Turn the adjustment pin (7) until it contacts the widest area of the inner Mast.Tighten the nut to a torque of 135 ± 14 n · m (100 ± 10 lb · ft) to hold the drum in place.Adjust the other drum in the same way.

7. Install the gasket (9) and the pin (10), the roller (11) and the washer (12) on each side of the carriage.

8. Adjust the roller (11) with the gasket (9) until it contacts the narrowest area of the inner Mast.Tighten the bolt (13) to secure the pin.

5-3-9 Mast service

A. Mast removal / installation

Initial steps

1. Remove residual pressure in the hydraulic system by moving the lever back and forth several times by closing the key

2. Remove bracket.

3. Fix the hoist on the Mast as shown in figure 5-83Figure 5-83

Process

1. Disconnect the hoses and plug the hoses and ports.Place identification marks on all hydraulics and hoses to ensure proper installation.

2. Remove the bolts, two washers and washers on each side of the tilt cylinder and remove the pin

3.Remove the bolt and its washer.

Installation torque: 220 ± 30 n · m (162 ± 22 LB · ft)

4. On each side, pull out the pin.

5. Use a hoist to remove the mast assembly from the frame.

6. Install the mast in reverse order.

7. Fill the tank with hydraulic oil according to the specifications given in Section 1-6.

B. Mast disassembly/assembly and roller bearing adjustment

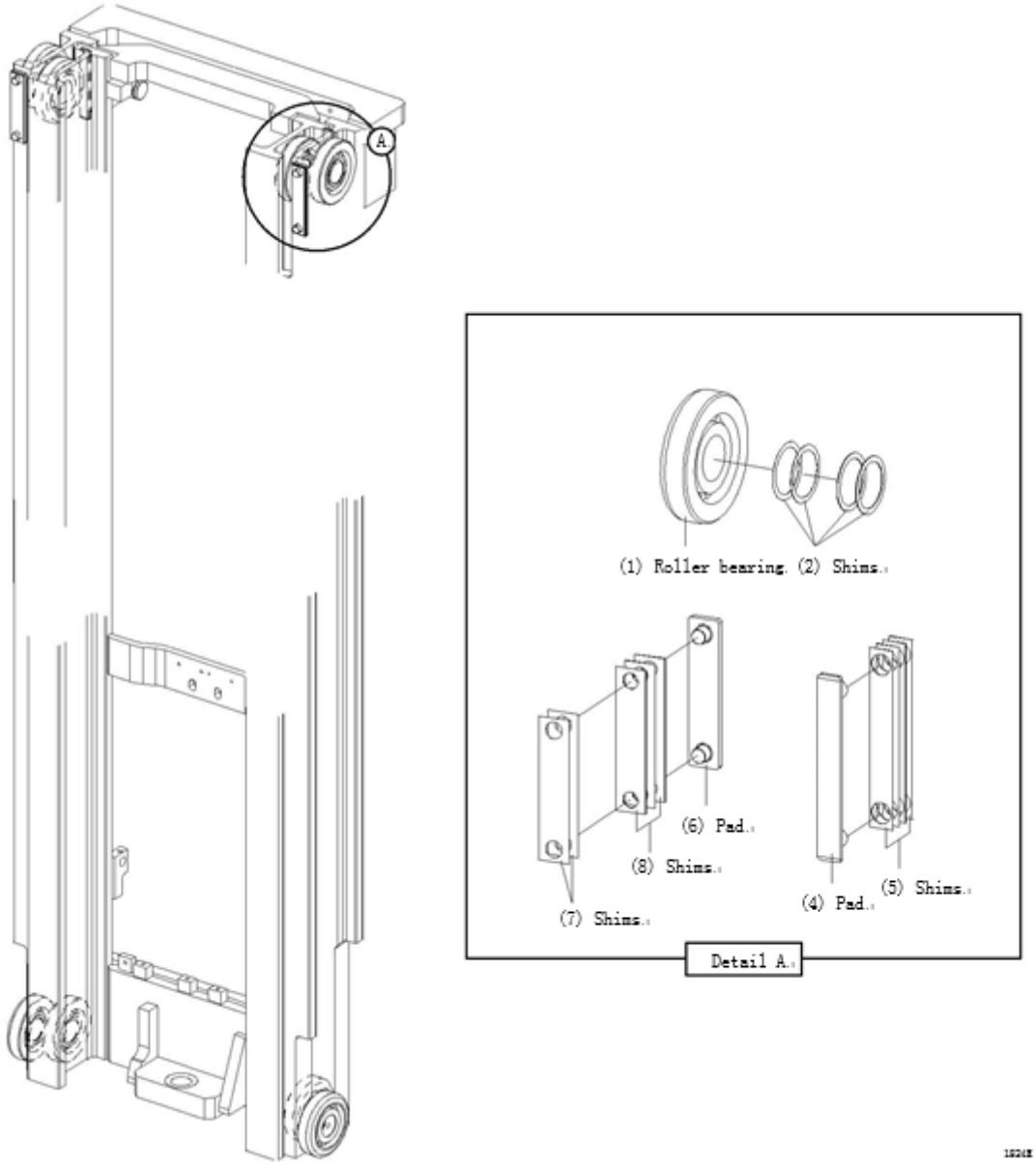


图 5-88.

Initial steps

1. Remove the Mast assembly (see Section 5-3-10 a).

2. Remove the main and secondary (standard) lift cylinders and their hydraulic hoses (see Section 5-3-7 A and 5-3-8 C).

Disassemble

1. Separate the Mast so that all roller bearings can be seen.

2. Remove all pads (4,6) and shims (5,7,8) and mark them as assembly references.

3. Give each Mast roller bearing a mark corresponding to its position on the Mast.

4. Remove the Mast roller bearing (1) and its shims (2).

Remove the Mast roller bearing and check the condition of the mast roller bearing (1), replacing any wear or damage as described in the assembly procedure.For bearings in good condition, clean the parts, reassemble them, and then set them aside until they are installed.

5. Separate the shim (2) and mark it as a reference for assembly.

6. Use a hoist to separate the Mast from each other.

5-4 Troubleshooting

Fault	Possible causes
The hydraulic system will not raise the load.	Air leaks into the hydraulic system on the inlet side of the hydraulic pump
	The relief valve opens at low oil pressure.
	Too much wear of hydraulic pump
	Incorrect load (too heavy).
	The Mast is not aligned with other lifting parts and cannot move freely.
	The moving Mast section does not have enough lubricant.
	The bracket or Mast roller (bearing) is worn, do not move (jam)
The lift cylinder extends too slowly.	Insufficient oil supply to the lift cylinders.
	Poor sealing of lift cylinder
	The Mast is not aligned with other lifting parts and cannot move freely.
	The moving Mast section does not have enough lubricant.

	Bracket or Mast roller (bearing) worn and stuck
Mast does not move smoothly	Air in the hydraulic system.
	Safety valve stem or defective.
	There is not enough lubricant in the moving Mast part
	The loading roller (bearing) is defective or not adjusted correctly.
The Mast will not be lowered completely or at all.	Damage and contamination of lifting valve element (lifting lock)
	The lift cylinder is damaged or bent.
	The load drum is defective (bearing) or not adjusted correctly.
	There is not enough lubricant at the moving Mast.
Mast does not tilt properly or moves too slowly.	There is a leak that allows air to enter the hydraulic system on the inlet side of the hydraulic pump.
	The relief valve opens at low oil pressure.
	The hydraulic pump is worn too much.
	The internal valve of the tilt spool is stuck.
	Control valve tilt spool Limited
	The piston rod is damaged or fails on the tilt cylinder.
Fork not lowered properly.	The lifting valve element in multi way valve has the limitation caused by foreign matters and can not operate freely Do.
	The lift cylinder flow control valve has a restriction.
	There is a restriction on the redundant flow protectors of the lift cylinders.
	Air in the hydraulic system.
	The Mast is not aligned with other lifting parts and cannot move freely.
	The transport chain needs to be adjusted.
	The moving Mast section does not have enough lubricant.
	The fork or Mast roller (bearing) is worn, do not move (jam).
The lift or tilt cylinder does not hold the valve control lever in the center position.	The valve element cannot maintain its position because the spring of the valve element is weak or damaged.
	Leakage of control valve caused by wear of valve element.
	The check valve or flow control valve in the control valve is poor.
	Leakage of cylinder line or piston sealing ring.
	There is foreign material in the control valve.

6 Steering system

6-1 Overview

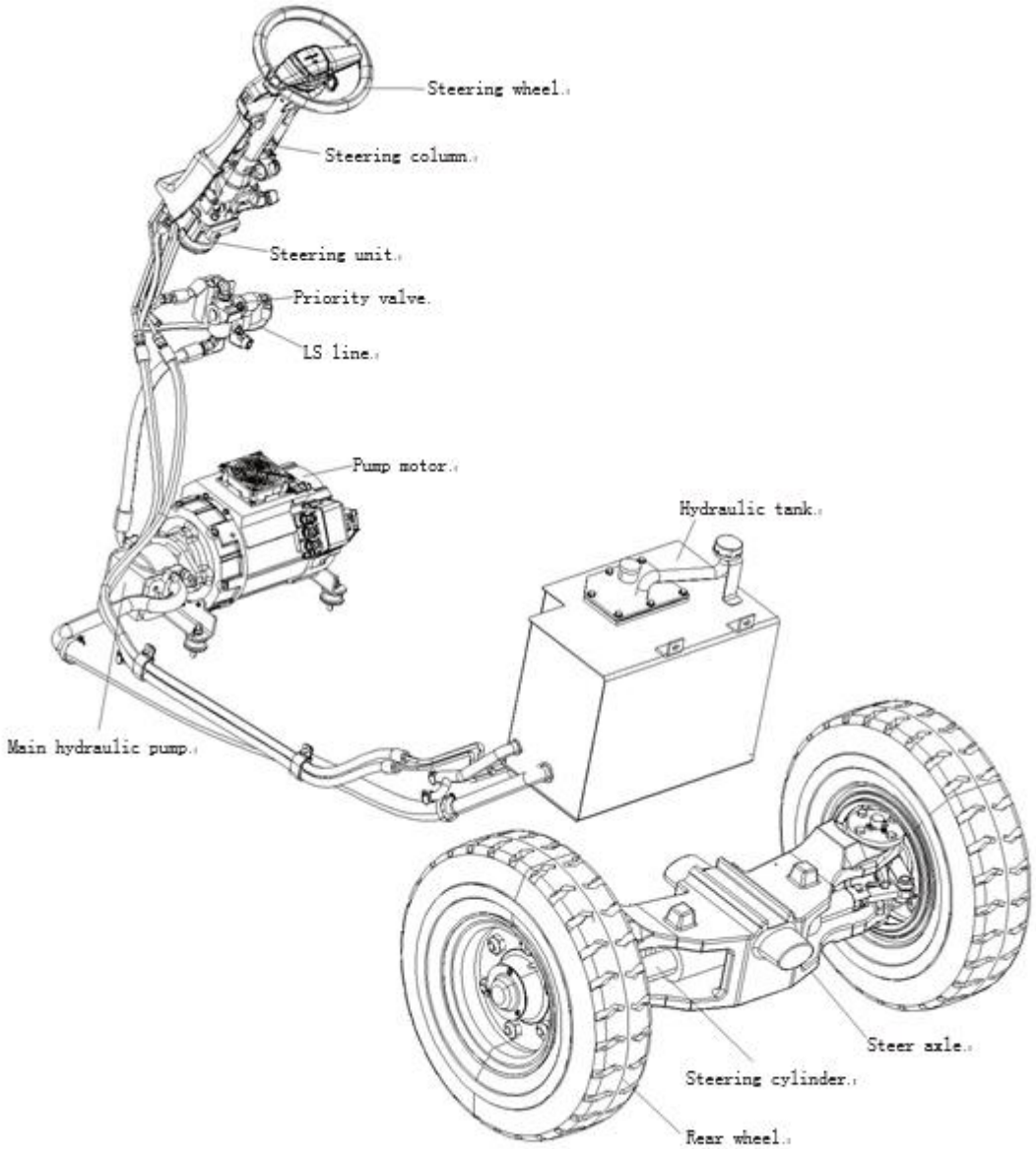


图 6-1

The steering system is a set of devices that turn the vehicle left or right.In this model, the steering system is hydraulically operated and consists of a control group and an actuator group:

1. The control group determines the speed and direction of steering and supplies hydraulic oil to the operation group accordingly.This group includes steering wheel and steering device.[Section 6-2]

2. The operation group converts the hydraulic power transmitted from the control part into mechanical power through the hydraulic oil to make the rear wheel turn.This group includes the steering cylinder, steer axle and two rear wheel assemblies.[Section 6-3]

Unlike cars, forklifts use the rear wheels as steering wheels, because their priority is not to drive at speed, but to ensure a wider steering angle in a narrow area.

6-1-2 Oil flow rate

The main hydraulic pump sends oil to the steering unit through the priority valve, which is proportional to the speed of the steering wheel rotation.By default, the valve supplies oil to the steering first and then controls the valve.

The steering unit is splined to the built-in valve element of the steering wheel to adjust the oil in the unit according to the movement of the steering wheel.

Neutral position

When the steering wheel is in the neutral position, the steering unit sends a small pressure through the load sensing line, and the valve element of the priority valve moves to the neutral position, allowing a large number of oil main pumps from the first section to travel to the control valve.

Turning

When the steering wheel is in the right or left position, the increased load sensing pressure moves the spool of the priority valve to send oil to the steering unit.

During a right turn, the steering unit sends the supplied oil to the left side of the steering cylinder.Once the oil reaches the cylinder, it acts on the cylinder and moves its piston to the right.The return oil from this cylinder is drained back to the hydraulic tank through the steering.

During a left turn, the same process occurs, with oil acting only on the right side of the steering cylinder and not the left side.

Pressure relief

The steering release valve opens above the steering pressure rise setting.

6-2 Steering control group

6-2-1 Appearance and specifications

图 6-3.

Project	Specifications
Maximum pressure	20,600 kPa（2,987 psi）
Rated discharge	32 Litre / minute
Displacement	160 Ml / L
Input torque	1.08n · m (0.80lb · ft) at 60rpm
Pressure relief valve	13,200-13,700 kPa（1,920-1,991 psi）
Steering system type	Dynamic load sensing, no load response

6-2-2 How does this work

A. Steering control mechanism

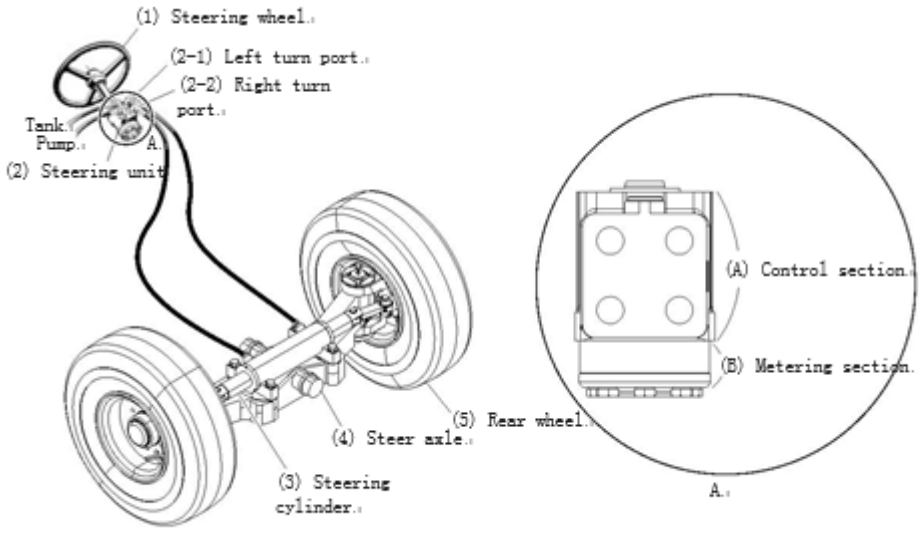


图 6-4

Once the steering wheel (1) is turned, the valve elements in the steering unit (2) are also turned by the steering column splined between them.Turn the valve element to the steering device and adjust the amount of oil discharged to the steering cylinder by:

1.The control section (A), which determines which side of the steering chamber distributes the oil to and then delivers the oil supplied from the hydraulic pump to the metering section (B), depends on the direction of steering wheel rotation.Once through the metering section (B), the oil returns to the control section (A) to leave through the left turn port (2-1) or the right turn port(2-2) depending on the direction of rotation of the steering wheel.

2.The metering part (B) is used as a small pump to control the amount of oil sent to the steering cylinder.The steering angle of the vehicle increases proportionally to the amount of oil sent to the steering cylinders, which is determined by the speed of the steering wheel.

The oil discharged from the left turn port (2-1) flows to the right side of the steering cylinder (3), pushes the cylinder to the left and turns the rear wheel (5) to the left.The oil drained from the right turn port (2-2) flows in reverse and causes the rear wheel (5) to turn to the right. For more information on the different operation of the cylinders and wheels, refer to Section 6-3-2.

B. Neutral position

When the steering wheel is in neutral, the oil groove of the valve element and the oil hole of the sleeve are not aligned with each other, so the oil reaching the sleeve cannot enter the valve element, or the steering cylinder cannot.Therefore,

since the rear wheels can neither turn left nor right, the vehicle goes straight.Since all the pump oil along the LS line is discharged when the valve element is in neutral, it is difficult for the priority valve to be pushed by the LS pressure on its spring side, so it is opened by the pump oil pressure.As a result, most of the pump oil is sent to the control valve, while the steering only supplies some low pressure oil.This small supply causes the check valve to be less pushed in the inlet, so only a small amount of oil is pumped through the valve to the steering unit.This quantity fills the inside of the steering unit so that it can respond quickly to the requirements of the steering wheel.

C. Left turn

When the spool is splined to the steering wheel, turn the steering wheel so that the spool, its engagement pin, and the driver also rotate.The sleeve is also engaged with the pin, but the diameter of the pin hole in the sleeve is larger than the diameter of the pin itself; therefore, the valve core starts to rotate

After a period of time, the sleeve will not rotate,.Therefore, the oil holes and oil grooves that are not aligned with each other at the neutral point now, and the oil sleeve outside the pump flows into the valve core, bringing two changes.

First of all, when the valve element becomes full, it will no longer discharge the LS (load sensing) line into it, so the pressure of the whole LS line increases, and

the priority valve is closed.Here, most of the pump oil is directed to the steering unit because its passage to the control valve is blocked.This high pressure oil then overcomes the resistance of the check valve spring in the inlet and enters the steering.

Second, the increased pressure oil entering the valve core flows through the channel to enter the metering part.Driven by splines, the gear rotor in the metering section rotates with the steering wheel to pump oil into.The pumped oil is discharged to the left turning port through the oil circuit and then to the right chamber of the steering cylinder.The oil entering the right chamber pushes the piston to the left, turning the vehicle to the left.The steering speed increases in proportion to the amount of oil drained and the pumping speed, which is determined by the speed of the steering wheel.As soon as the steering wheel is turned, pressure oil from the pump flows through this passage, increasing the steering angle until the steering cylinder reaches the limit.

When the steering wheel is stationary

Once the operator stops turning the steering wheel, the spool, pin, driver and stator also stop turning, the centering spring will turn the spool

And the sleeve returns to its original position.Then, the pilot signal to the priority valve via the load sensing line stops, supplying only a small amount of

pressurized oil.Even if this small amount can not enter the valve core, the oil in the valve core can not enter the metering part through the channel.The oil in the metering section is also not pumped out to the left turn port because the steering wheel is no longer turning.As a result, all oil flow stops and the steering angle of the wheels remains constant.

D. Right turn

When the steering wheel turns

When the spool is splined to the steering wheel, turn the steering wheel so that the spool, its engagement pin, and the driver also rotate.Sleeve
It is also engaged with the pin, but the diameter of the pin hole in the sleeve is larger than the diameter of the pin itself; therefore, the sleeve will not rotate after the spool has started to rotate for some time.Therefore, the oil holes and oil grooves that are not aligned with each other at the neutral point now, and the oil sleeve outside the pump flows into the valve core, bringing two changes.
First of all, when the valve element becomes full, it will no longer discharge the LS (load sensing) line into it, so the pressure of the whole LS line increases, and the priority valve is closed.Here, most of the pump oil is directed to the steering unit because its passage to the control valve is blocked.This high pressure oil

then overcomes the resistance of the check valve spring in the inlet and enters the steering.

Second, the increased pressure oil entering the valve core flows through the channel to enter the metering part.Driven by splines, the gear rotor in the metering section rotates with the steering wheel to pump oil into.The pumped oil then drains through the oil passage to the right turn port and then to the left chamber of the steering cylinder.The oil entering the left chamber pushes the piston to the right, turning the vehicle to the right.The steering speed increases in proportion to the amount of oil drained and the pumping speed, which is determined by the speed of the steering wheel.As soon as the steering wheel is turned, pressure oil from the pump flows through this passage, increasing the steering angle until the steering cylinder reaches the limit.

When the steering wheel is stationary

Once the operator stops turning the steering wheel, the spool, pin, driver and stator also stop turning, the centering spring returns the spool and sleeve to their original position.Then, the pilot signal to the priority valve via the load sensing line stops, supplying only a small amount of pressurized oil.Even if this small amount can not enter the valve core, the oil in the valve core can not enter the metering part through the channel.The oil in the metering section is not

pumped to the right turn portbecause the steering wheel is no longer turning.As a result, all oil flow stops and the steering angle of the wheels remains constant.

E. Pressure relief

Once the hydraulic oil sent to the steering cylinder reaches the set pressure, the release function is triggered to reduce the pressure to ensure safety.When the oil pressure pumped exceeds the force of the spring, the valve element is pushed against the spring to allow pressurized oil to flow from the steering unit outlet to the hydraulic tank until its pressure is lower than the spring pressure setting.

6-2-3 Air Removal of Steering system

If you have recently replaced a steering component or if any part of the steering system has been opened, you may need to evacuate the system.

Initial steps

1. Turn off the engine and wait for the vehicle to cool down.
2. Place the rated load capacity on the fork and transfer the weight on the steer axle to the front of the vehicle.
3. Lock the steering wheel fully to the left.

4. Top up the hydraulic tank to the full mark with suitable oil (refer to Section 1-6 for details).

5. Check hose connections, hose and seal fittings for air in system openings and replace faulty components.

Process

1. When you slowly turn the steering wheel from locked to locked, ask your partner to pay close attention to the oil level in the tank.

Note: do not turn the steering wheel too fast as it will overflow the tank.

2. When you turn the steering wheel, have your partner replenish the hydraulic tank when the fluid level drops.

Note: do not allow the oil level in the hydraulic tank to fall below the pump outlet. If the level does not drop immediately, this may mean that there are a large number of bubbles in the system; the oil will not pass until the bubbles pass.

3. Repeat the previous step 15-20 times until the oil level is consistent and the oil is clear (i.e. not muddy) and free of bubbles.

If you perform the above steps and still see bubbles, repeat the process.

6-2-4 Steering system pressure check

If the steering system does not function properly, check the hydraulic tank for the correct oil level and for leaks in the hoses and connectionsIf all of these items are correct, use a pressure gauge to check the steering hydraulic system and its relief setting.

Initial steps

1. Check the hydraulic tank for full scale.

2. Check that the hose connections, hoses and sealing fittings are open.

3. Turn off the motor and the circuit breaker.

Process

1. Remove the plug from the port (1) and connect a 28000 kPa (4000 psi) pressure gauge as shown in Figure 6-16.

2. Turn the key switch to the on position and activate the hydraulic controller until the oil temperature reaches normal operation.

3. Turn the rear wheel back or right against the stop and record the indication on the pressure gauge.

The indication on the pressure gauge is the opening pressure of the safety valve of the priority valve -- 1

12,000 + 500 kPa（1,960 + 70 psi）。

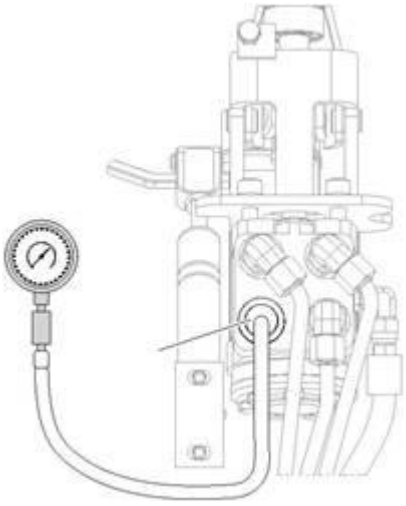
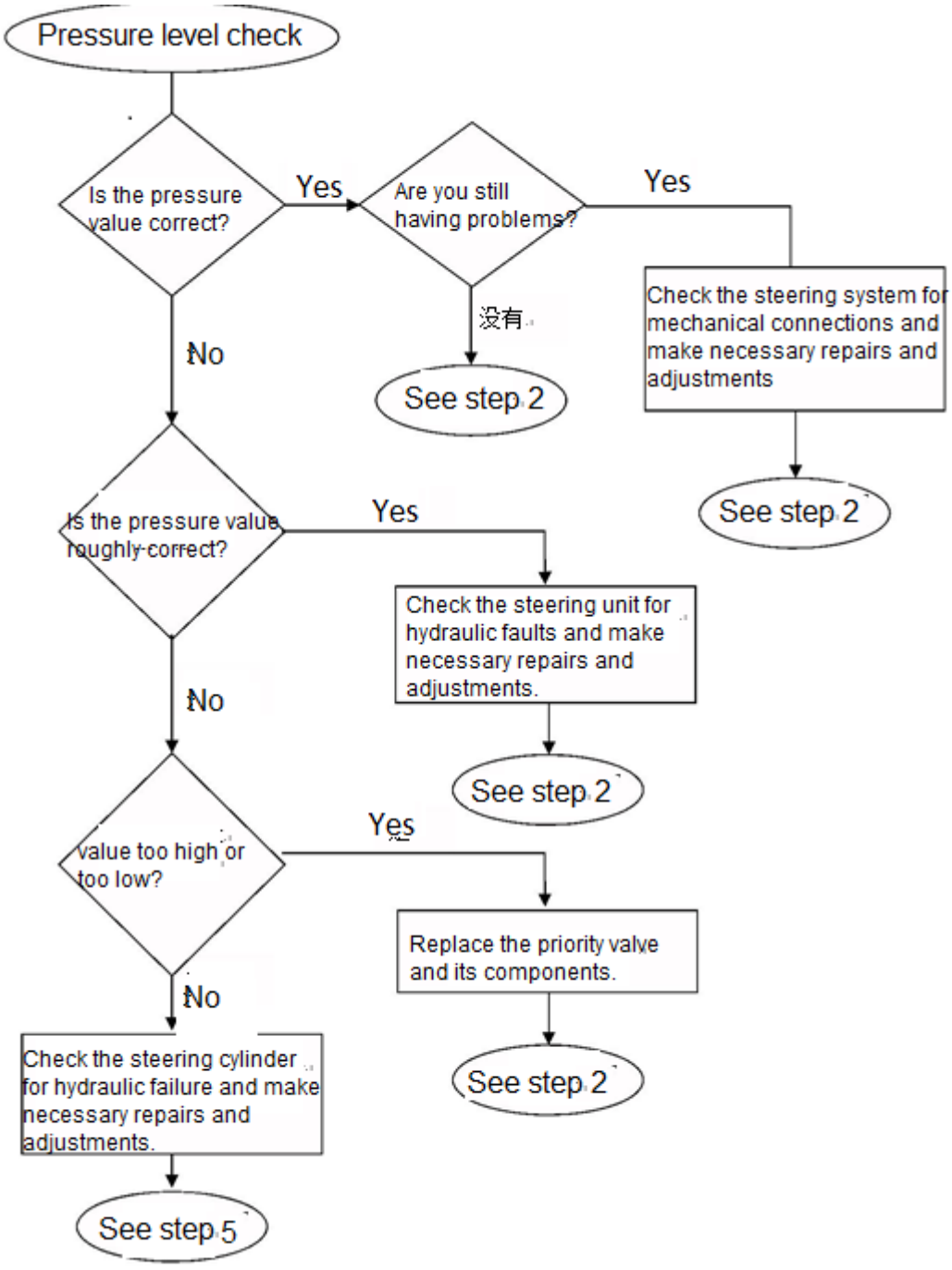


Figure 6-16

4. Use the flow chart below to find out what to do with the pressure reading.

5. After making the necessary adjustments, repairs or replacements, repeat steps 1-6 again to ensure that you have the correct pressure reading.


Pressure level check
Is the pressure value correct?
Yes
Are you still having problems?
Yes
Check the steering system for mechanical connections and make necessary repairs and adjustments
See step 2
没有
See step 2
No
Is the pressure value roughly correct?
Yes
Check the steering unit for hydraulic faults and make necessary repairs and adjustments.
See step 2
No
value too high or too low?
Yes
Replace the priority valve and its components.
See step 2
No
Check the steering cylinder for hydraulic failure and make necessary repairs and adjustments.
See step 5

6-2-5 Steering wheel cover removal / installation

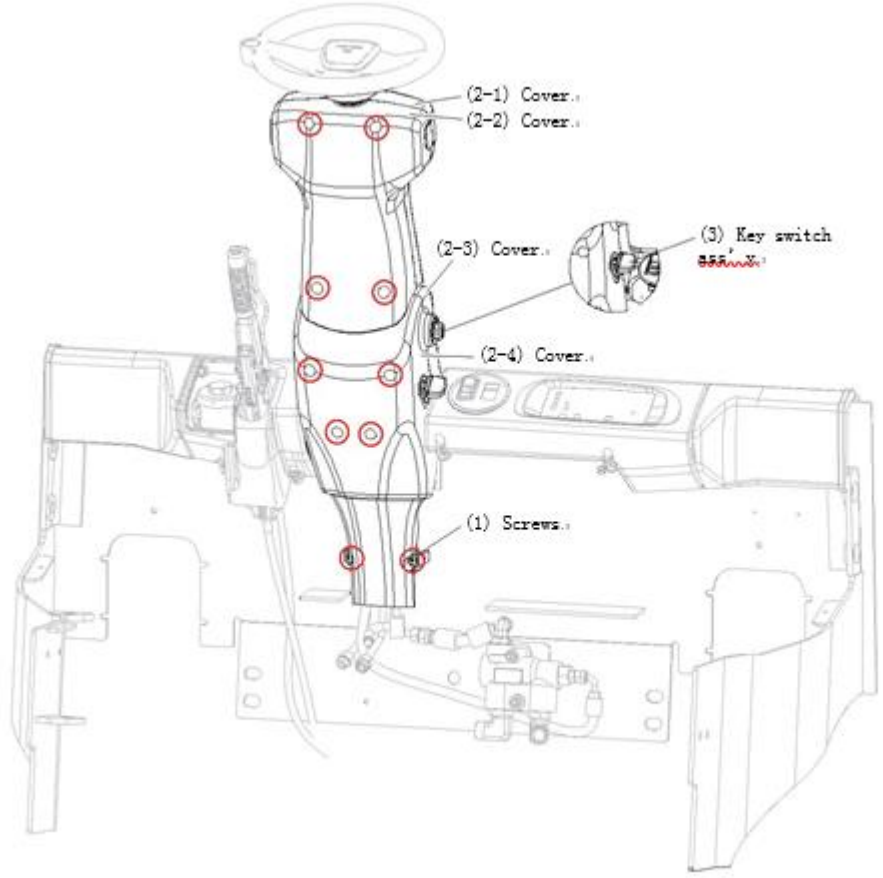


Figure 6-17

1. Loosen 10 screws (1) and remove washers, covers (2-1 to 2 -) and key switch (3).

2. Perform the above steps in reverse order to install the cover.

6-2-6 Steering wheel removal / installation

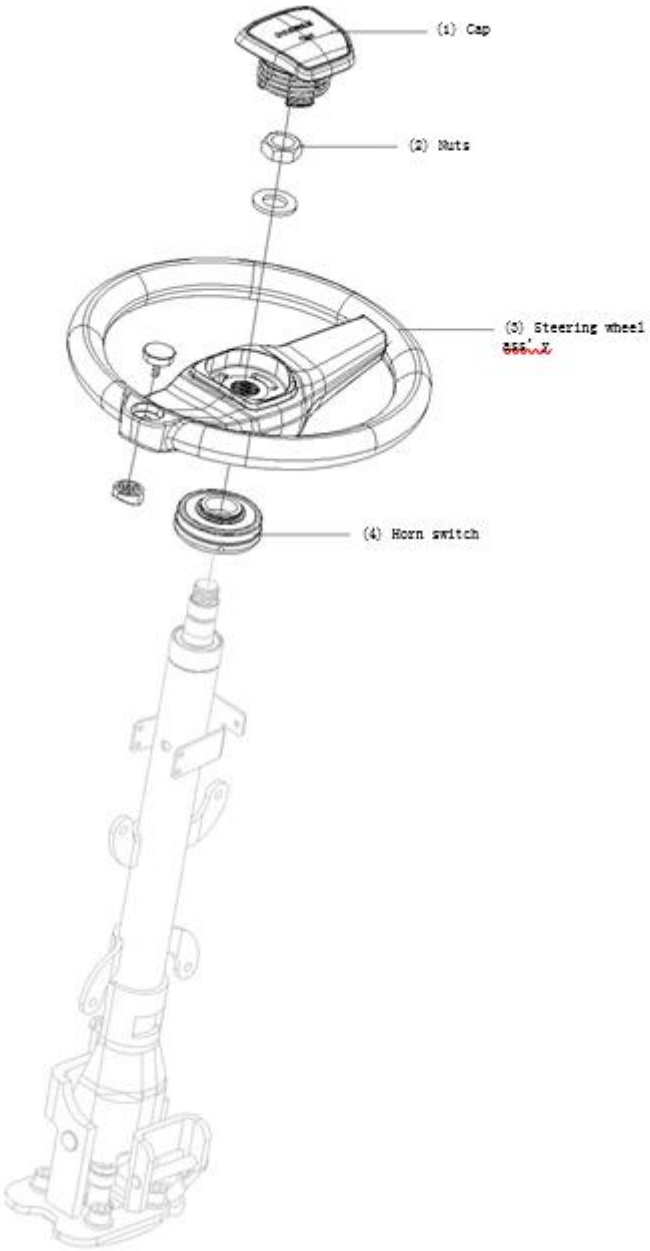


Figure 6-18

1. Remove the cap (1) from the steering wheel.
2. Remove the nuts (2) and the washer from the steering wheel.
3. Remove the steering wheel assembly (3).
4. Remove the horn switch (4).

5. Perform the above steps in reverse order to install the steering wheel cover.

6-2-7 Disassembly / Installation of Steering Wheel Column

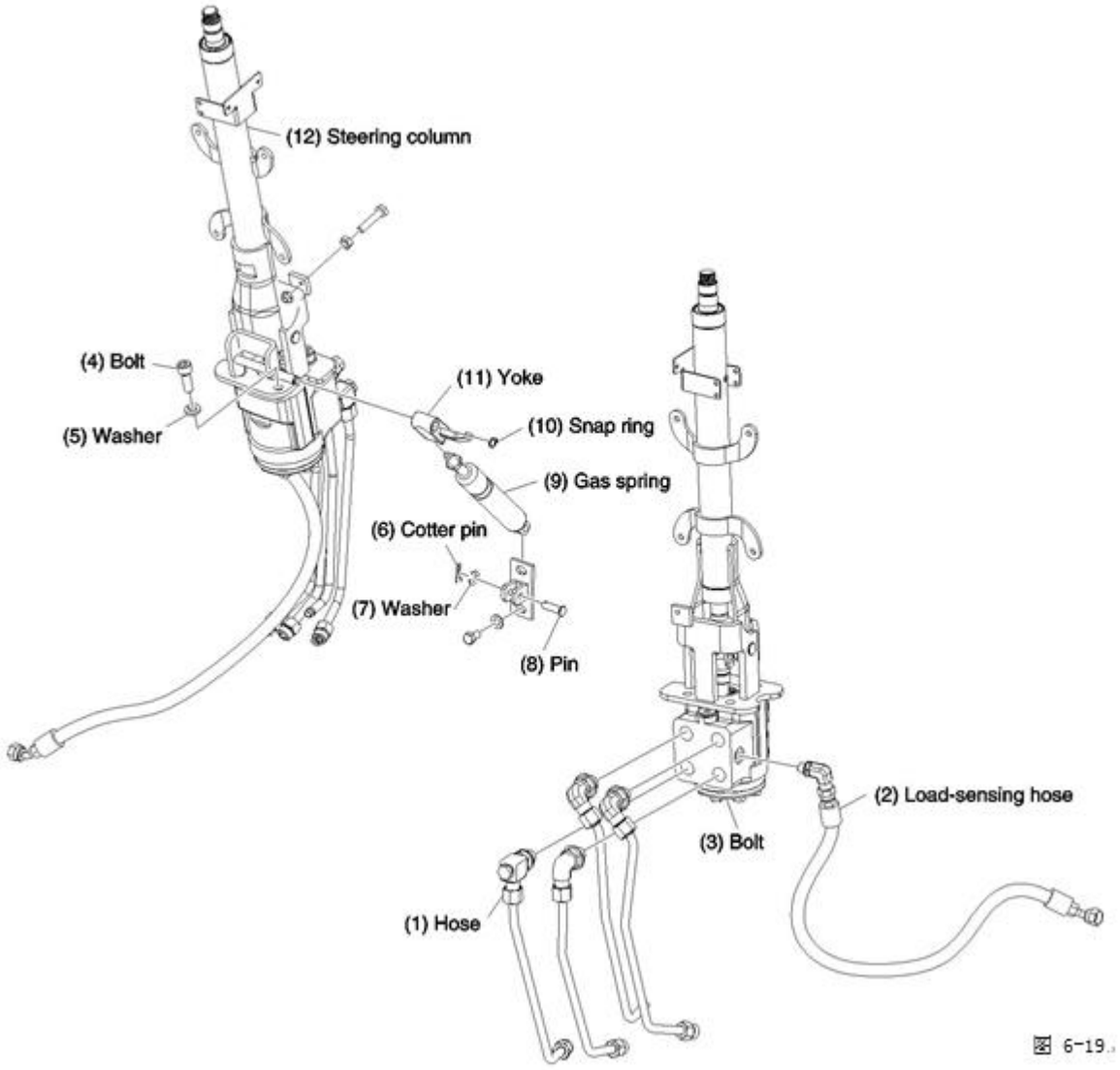


Figure 6-19

Initial steps

1. Remove residual pressure in the hydraulic system by moving the lever back and forth several times by closing the key

Process

1. Remove the four hoses (1) and the load-sensing wire (2) from the steering (8).

Note: as a reference mark for the assembly mark, then plug and cap each port to prevent debris and foreign material from entering the hydraulic system.

2. Loosen the four bolts (4) and four washers (5) from the steering column assembly and remove the steering unit (8).

Note: if the steering gear is not held when loosening the bolt (4), the steering unit (8) may fall to the floor and be damaged.

3. Pull out the split pin (6) and remove the steering column assembly (9-2) while removing the pin (8).

4. Remove the snap ring (10) and remove the bracket (11) and gas spring (9).

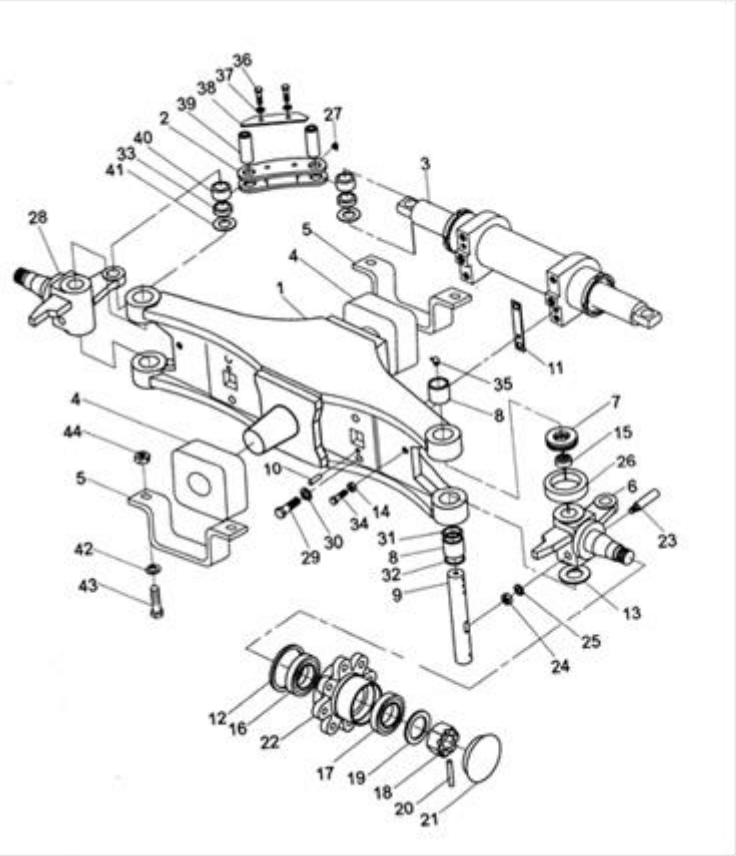
5. Perform the above steps in reverse order to install the steering column.

6. Fill the tank with hydraulic oil according to the specifications given in Section

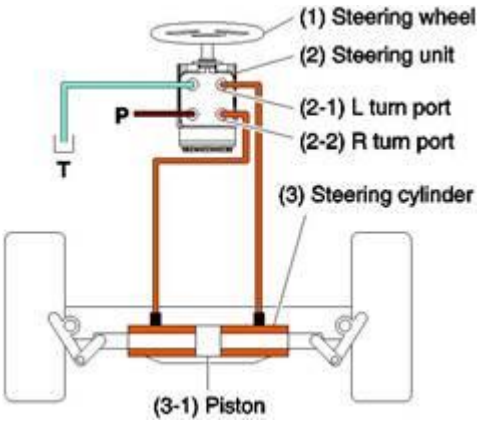
6-3 Steering axle

The steering axle is a welded structure with box cross section (as shown in the figure below), which is composed of steering axle body, steering cylinder, connecting rod, steering knuckle, steering wheel and other parts.The steering trapezoid adopts the crank slider mechanism, and the piston rod of the oil cylinder pushes the steering knuckle through the connecting rod to shift the steering wheel, so as to realize the steering.The steering axle is fixed to the tailstock at the rear of the frame by the front and rear pins through the fixing plate, i.e. the damping pad. The axle can swing around the pin shaft. There is a knuckle on the left and right of the steering axle respectively. The rear wheel hub is installed on the knuckle shaft by two tapered roller bearings. The wheel is fixed to the wheel hub by the rim. The inner side of the bearing is equipped with an oil seal to keep the grease in the hub and knuckle cavity

6-3-1 Appearance and specifications



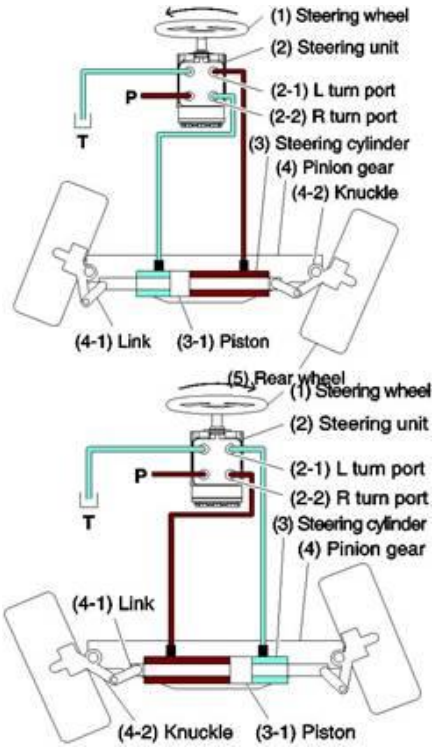
1.Steering axle body assembly	2.Connecting rod	3.Steering cylinder	4.Shock absorbing pad
5.Steering axle fixing plate	6.Right knuckle assembly	7.Thrust bearing 51208	8.Needle roller bearing 943 / 32
9.Steering knuckle King pin	10.Cylindrical pin 10 × 20	11.Adjusting pad	12.Rubber oil seal
13.Knuckle adjusting pad	14.Nut M12	15.Dust cover	16.Bearing
17.Bearing	18.Nut M30 * 2	19.Plain washer 30	20.Cylindrical pin 6.3 × 55
21.Hub cover	22.Hub	23.Fastening pin	24.Nut M10 × 1.25
25.Washer 10	26.Bushing	27.Oil cup M6	28.Left knuckle assembly
29.Bolt M14 × 45	30.Spring washer 14	31.O-ring	32.Oil seal
33.Bushing	34.Bolt M12 × 35	35.Oil cup ZG1/8	36.Bolt M8 * 18
37.Spring washer 8	38.baffle	39.Connecting rod pin	40.Radial spherical plain bearing
41.Adjusting pad	42.Spring washer 16	43.Bolt M16 × 45	44.Nut M16



6-3-2 How does this work

Neutral position

When the steering wheel (1) is in neutral, the steering unit (2) does not drain oil from either the left turn port (2-1) or the right turn port(2-2).As a result, the piston (3-1) is held in the center position to keep the wheels flat.



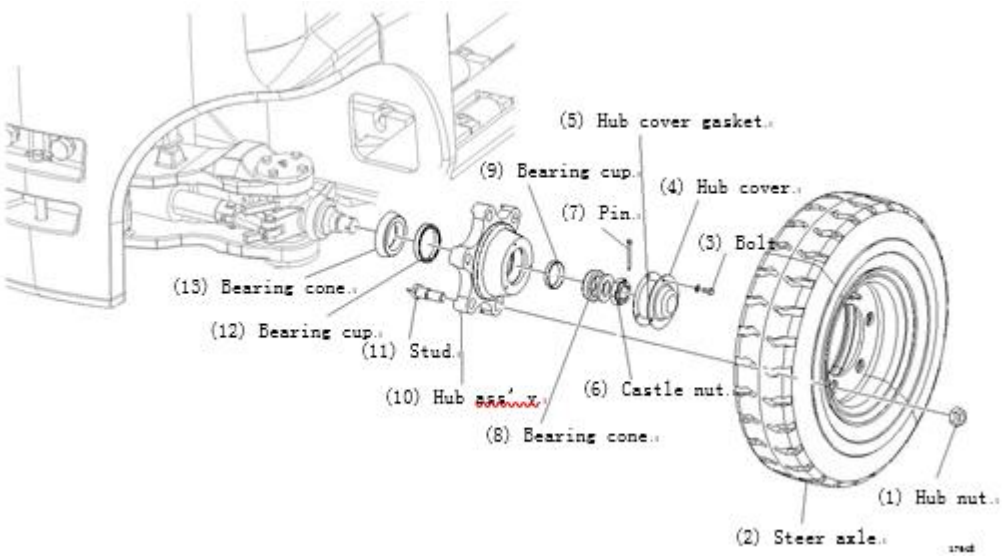
Left turn

When turning the steering wheel (1) to the left, the steering unit (2) drains oil through the left steering port (2-1).Therefore, when the oil fills the right chamber of the steering cylinder (3), the oil in the left chamber is discharged to the steering unit (2), so that both sides of the piston (3-1) and the rod are discharged; the link (4-1) is connected to these rods; and the knuckle (4-2) is pushed to the left.As a result, the knuckle (4-2) and the rear wheel (5) turn to the axis at both ends of the steer axle (4), as shown in Figure 6-26, turning the vehicle to the left.

Right turn

When you turn the steering wheel (1) to the right, the steering unit (2) drains oil through the right turn port(2-2).Therefore, when the oil fills the left chamber of the steering cylinder (3), the oil in the left chamber is discharged to the steering unit (2), so that both sides of the piston (3-1) and the rod are discharged; the link (4-1) is connected to these rods; and the knuckle (4-2) is pushed to the right.As a result, the steering knuckle (4-2) and the rear wheel (5) turn the axis at both ends of the steer axle (4), as shown in Figure 6-27, turning the vehicle to the right

6-3-3 Disassembly/Installation/Adjustment of Rear Wheels and Wheel Hub



Tools needed: floor jack and torque wrench

Initial steps

1. Use a floor jack to raise the rear of the vehicle and support with wooden blocks.

Rear wheel removal / installation

1. Loosen the six hub nuts (1).

2. Remove the rear wheels (2).

3. Perform the above steps in reverse order to install the wheels.

Rear hub removal / installation

1. Remove the three bolts (3) and then the hub cover (4) and the hub cover gasket (5).

2. Remove the pin (7) and then the castle nut (6) and washer.

During installation, slowly tighten castle nut (6) to 200 ± 10N · m (148 ± 7lb · ft) when turning the wheel.Loosen castle nut (4) completely and tighten again to a torque of 45-55n · m (33-41 LB · ft).

3. Remove the bearing cone (8).

4. Delete hub assembly (10).

5. Remove the bearing cups (9, 12) from both sides of the hub assembly (10).When installing, lubricate the contact surface of the cup with multipurpose grease.

6. Clean the hub assembly (10) and make sure it is free of grease.Fully lubricate the inside of hub assembly (10) during installation.

7. Remove the bearing cone (13) from the knuckle.

8. Perform the above steps in reverse order to install the hub.

6-3-4 Disassembly/Installation of Steering Shaft

Tools needed: floor jack

Initial steps

1. Raise the rear of the vehicle and support it with wooden blocks.Make sure that the stop is under the frame, not under the axle, so that the vehicle may remain raised even after the floor jack.

2. Remove both rear wheels (refer to 6-3-3).

Process

1. Disconnect the hydraulic hoses from both tanks.

2. Remove the four bolts and the washers.

Installation torque: 240 ± 40 n · m (177 ± 30 lb · ft)

3. Using a floor jack, pull out the steer axle (3).

The steer axle weighs approximately 184 kg (405 lb).

4. Perform the above steps in reverse order to install the steer axle.

5. Fill the tank with hydraulic oil according to the specifications given in Section

6-3-5 Disassembly/Installation of Link Rod and Steering Cylinders

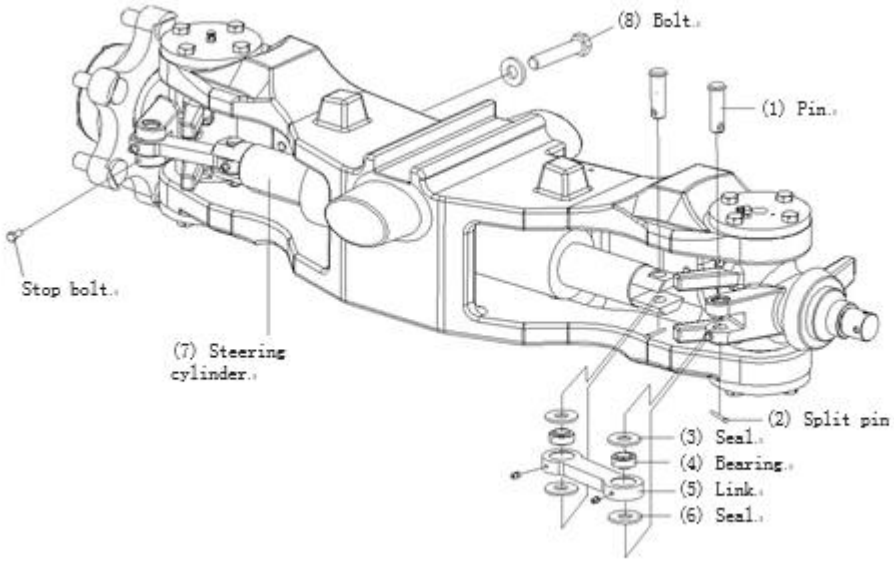


图 6-32 Figure 6-32

Initial steps

1. Remove the steer axle (see Section 00).

Link bar removal / installation

1. Loosen the bolts (2) at the end of the shaft.

2. Pull out the pin (1).

3. Remove the seal (3), bearing (4), and seal (6).

4. Repeat steps 1-3 at the knuckle end.

5. Perform the above steps in reverse order to install the linked components.

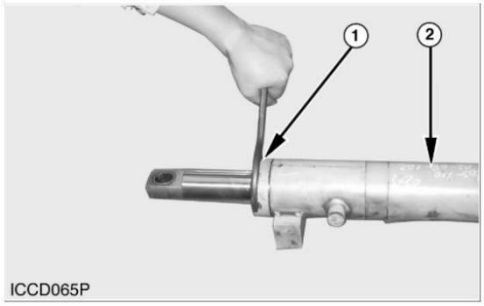
Lubricate the pin (1), both sides of the seals (3, 6), and the bearings (4).

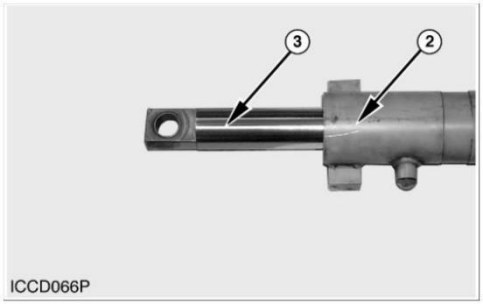
6-3-6 Disassembly/Installation of Steering Cylinder

1. Remove the pins (1) from the LH and Rh shaft ends.

2. Remove the four bolts (8) and washers and remove the steering cylinder.

3. Perform the above steps in reverse order to install the steering cylinder.





Initial steps

1. Remove the steering cylinder (see Section 6-3-5).

Process

1. Place the steering cylinder in a vice.

2. Use a wrench to loosen the head (1) from the tube (2).

3. Remove the rod assembly (3) from the tube (2).

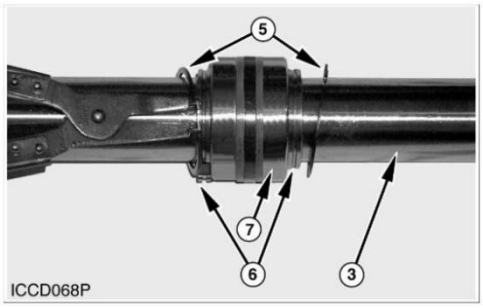
4. Remove the retaining ring (5) from each side of the piston (7) with a pliers and ring (6), and the piston (7) holds the piston in place on the rod (3).

5. Remove the piston (7) from the piston rod (3).

6. Remove the O-ring seal (8) from the rod.

7. Remove the seal ring (9) and the backup seal ring (10) from the piston.

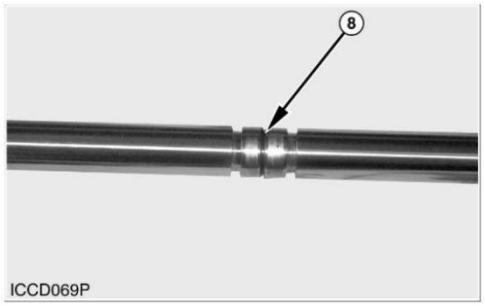
8. Loosen the head on the other end of the tube.

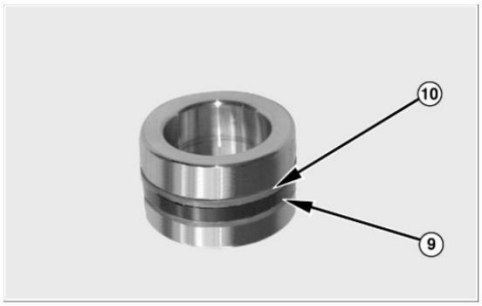


9. Remove the O-ring (12) and backup ring from each head (1

10. Remove the scratch seal (14), support ring, from the bore of each ram (15), U-gasket (16), and Du bushing (17).

11. Perform the above steps in reverse order to install the steering cylinder.





6-3-7 Disassembly/Installation of Knuckle, Pin and Bearing .

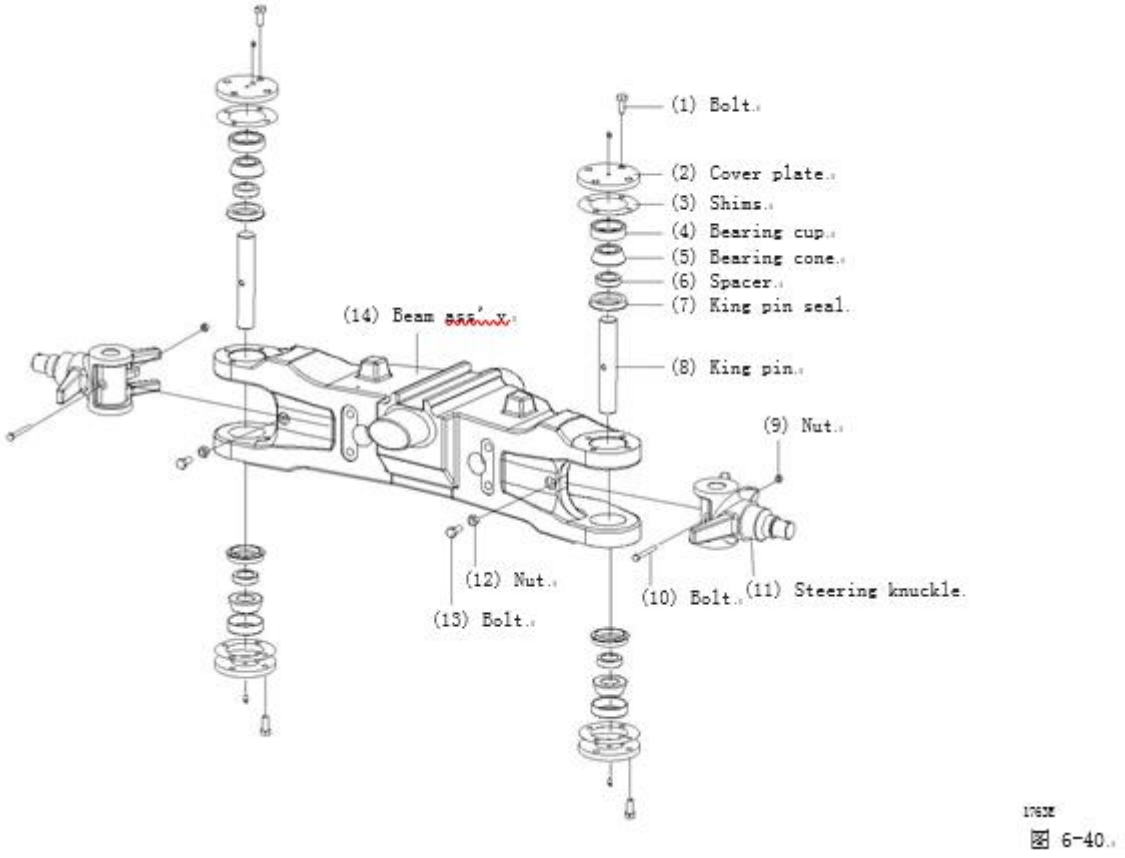


Figure 6-40

Tools needed: feeler gauge

Initial steps

1. Remove the rear wheel and hub (see Section 6-3-3).

2. Remove the link component (see Section 6-3-5).

Disassembly / assembly

1. Remove the bolts (1), cover plate (2), and shim (3) from the top and bottom of beam assembly (14).

Perform the above steps in reverse order for installation.

Note: the steering angle sensor is installed on the top of the right steering knuckle.Be careful not to damage it.

2. Remove the nut (9) and remove the bolt (10).

3. Pull out the King pin (8) and remove the knuckle (11).

4. Remove the spacer (6), the bearing cup (4), and the bearing cone (5) from the knuckle (10).

5. Perform the above steps in reverse order to install the knuckle, kingpin and bearing.Lubricate the seals in the King pin (8), bearing (4-5), and knuckle (10).

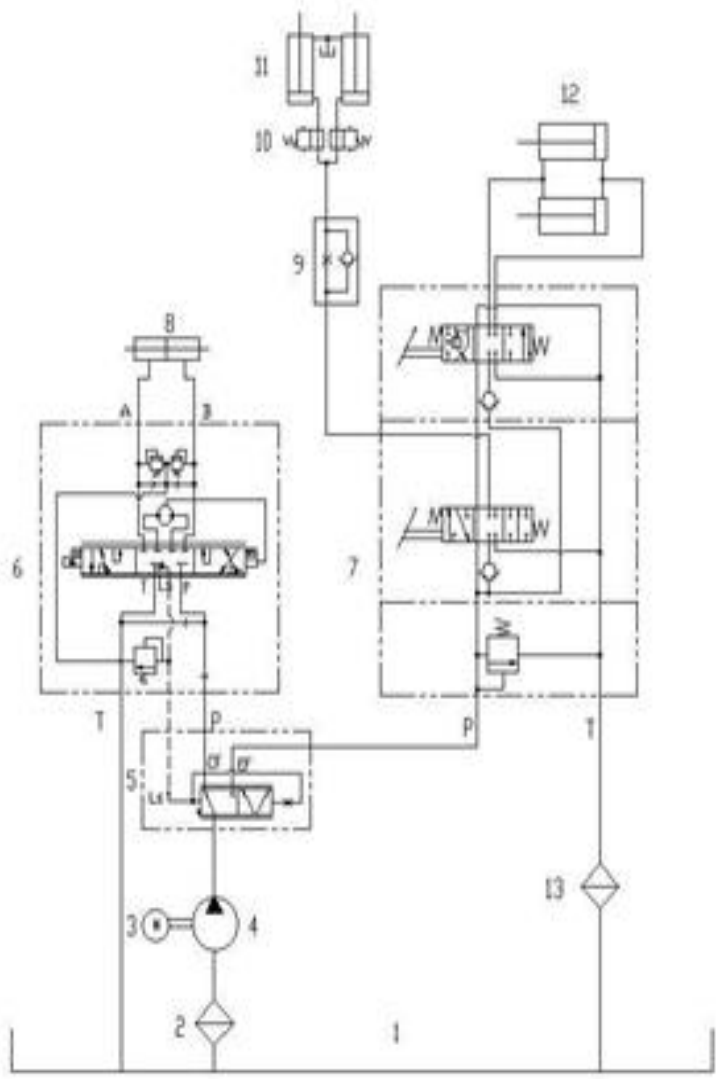
6-4 Troubleshooting

Problem	Possible causes
It takes too much force to turn the steering wheel	Priority valve (if equipped) releases pressure oil at a low setting
	The pump oil pressure is low and the pump is worn.
	Steering gear cover too tight
	The steering column is not aligned with the steering gear.
	The priority valve spool remains in one position.
	The steering gear does not need lubrication.
	The level in the hydraulic supply tank is low.
The steering wheel did not return to the center position correctly.	The steering gear cover is too tight.
	The steering column is not properly aligned.
	The valve element in the steering gear is limited.
	The priority check valve allows the lift and tilt hydraulic oil to affect the hydraulic circuit.
Pump oil leakage.	Loose hose connections.
	Bad shaft seal
Low oil pressure.	The oil level is low.
	The priority valve (if equipped) relief valve spring is weak.
	The relief valve (priority valve) does not move from the open position.
	Oil leakage inside or outside the system.
	Bad pump.
The pump makes noise when	Air in the steering hydraulic circuit.

turning the steering wheel, and Can't move smoothly	The pump is too worn.
	The oil pipe connection at the inlet side of the pump is loose.
	The viscosity of the oil is wrong.
	The oil level in the hydraulic tank is very low.
	The oil level in the tank is very low.
	There is air in the steering system.
	Incorrect pump operation.
	Dirt in the steering system
	The steering gear is not operating correctly.
	Limitation of the steer axle linkage.
	The steering cylinder has worn components.
The oil temperature is too high.	The viscosity of the oil is wrong.
	Air is mixed with oil.
	Relief valve set too high (priority valve).
	There are restrictions in the return circuit.

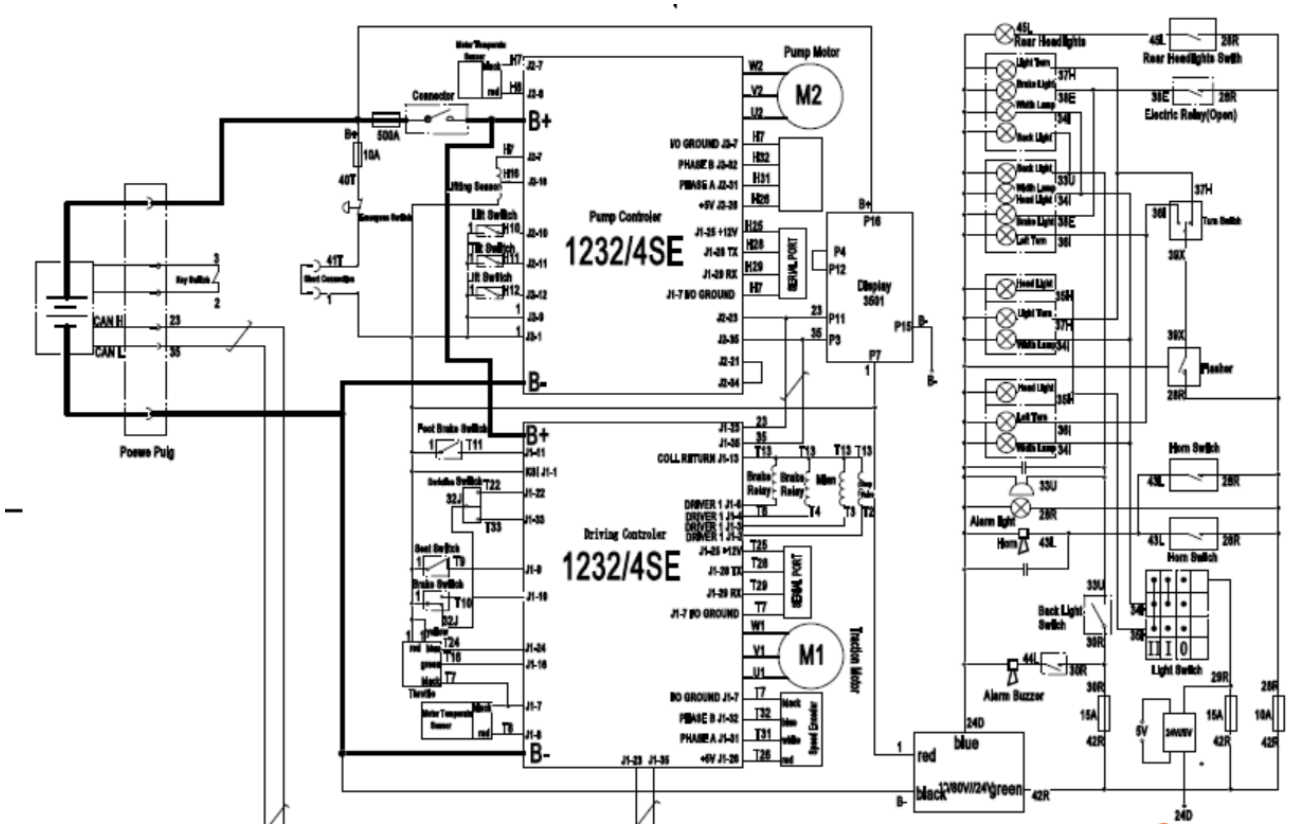
7 Schematic diagram

7-1 Hydraulic schematic diagram



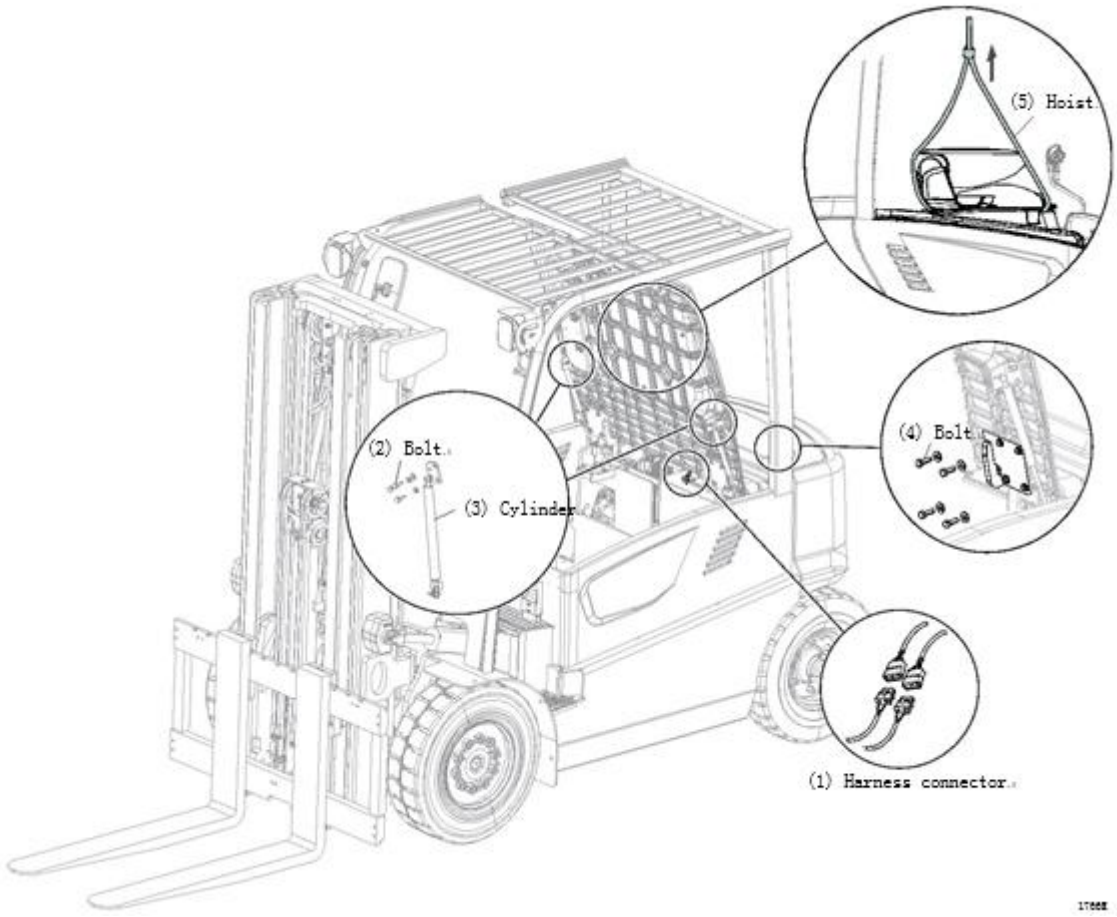
1 Hydraulic tank
2 Oil filter
3 Pump motor
4 Gear pump
5 Priority valve
6 Steering valve
7 Multi-way valve
8 Steering cylinder
9 Speed limit valve
10 Shut-off valve
11 Lift cylinder
12 Tilt cylinder
13 Oil filter

7-2 Electrical schematic diagram



8.Others

8-1 Seat cover removal / installation



Initial steps

1. Lift the hood and support it with a hoist.

Process

1. Disconnect the harness connector (1) for the seat.

2. Remove the bolts (2) and washers from each support cylinder (3) and remove the cylinder rod from the bracket.

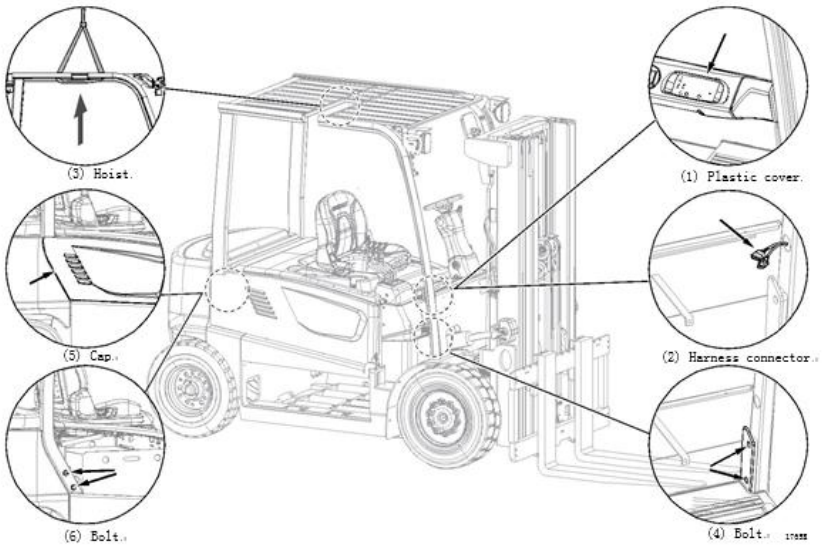
3. After closing the hood and removing the top rear cover, remove the two bolts (4) and washers on both sides.

4. Use the hoist (5) to remove the hood and seat assembly.

5. Perform the above steps in reverse order to install the hood.

Warning
If the nut is removed from the support lever, the hood and valve seat will fall and squeeze, causing serious injury. Support the seat and hood assembly before removing the nut.

8-2 Disassembly/Installation of Overhead Cover



1. After loosening the two bolts, remove the plastic cover (1) from the fairing.

2. Disconnect the harness connector (2) from the IP connector.

3. A supporting overhead hoist (3) with a lifting strap and hoist.

4. Remove the bolts (4) and washers from the inside of the front legs on each side.

5. Remove the cap (5) from the rear legs on each side.

6. Remove the bolts (6) and washers from the rear legs on each side and remove the top guard.

7. Perform the above steps in reverse order to install the top guard.

8-3 Floor removal/installation

Many of the steps in this manual require the removal and installation of certain hydraulic / electrical components.

Removing floors is one of the most convenient ways to access them.

Initial steps

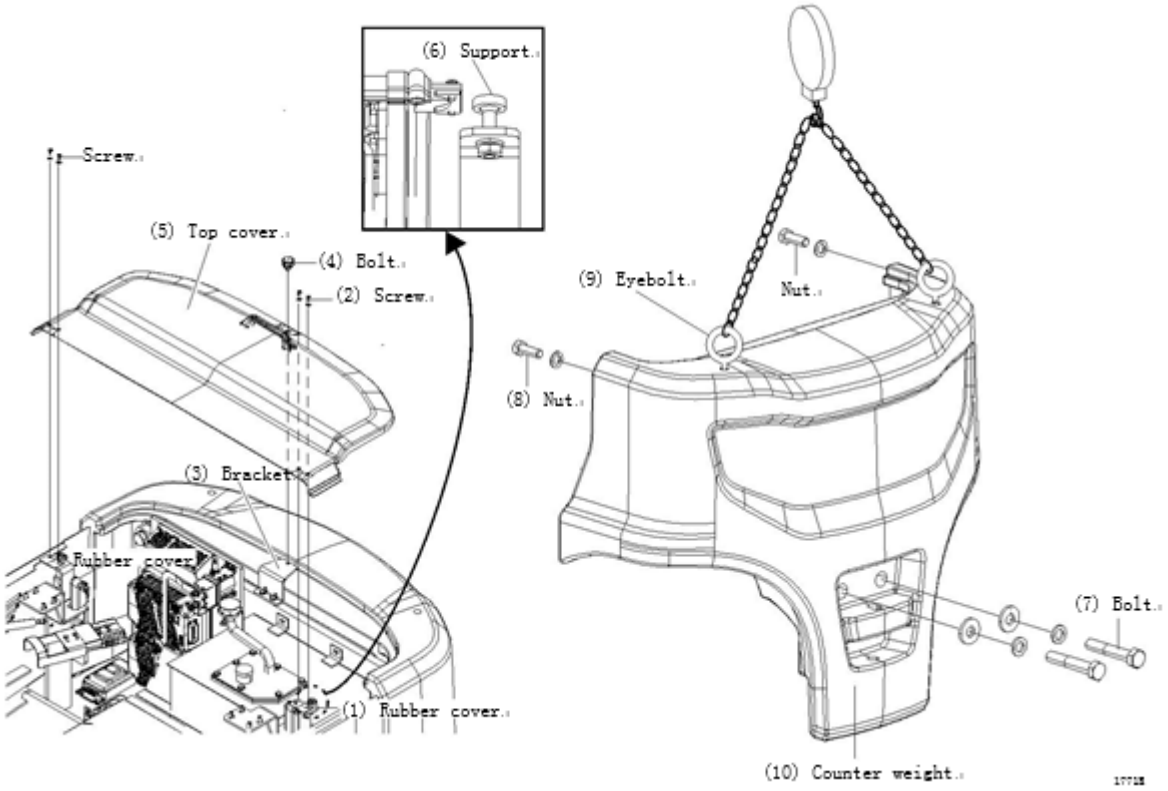
1. Remove the floor mat.

2. Raise the front floorpan slightly and disconnect the harness connector for the accelerator

3. Remove front underside panel (.

3. Perform the above steps in reverse order to install the front underside panel.

8-4 Disassembly/Installation of Top Cover and Counterweight



Tools needed: sling

Top cover removal / installation

1. Remove the two screws (2) from the rubber covers (1) on both sides.

2. Remove the bolts (4) from the bracket (3) and slide out the top cover (5).

Slide out the cover without damaging the bracket.

3. After removing the top cover (5), check whether there is no gap between the two supports (6) and the top cover, and the noise will not be heard when

knocking the cover.

4. Install the top cover in reverse order.

Counterweight removal / installation

1. Remove the two bolts (7) and the washers.

2. Remove the two bolts (8) and the washers.

3. Install the two forged eyebolts (9) at the bolt holes and attach the crane.

4. Remove the counterweight (10).

5. Perform the above steps in reverse order to install the counterweight.

9 Battery charger

9-1 Introduction of Battery Charger

This model adopts the intelligent charger of energy application

Normal working conditions:

1) Altitude not more than one kilometer

2) The surrounding medium temperature is not higher than 40 ℃ and not lower than - 10 ℃

3) The relative humidity of air shall not be greater than 85% (when the medium temperature is 20 ± 5 ℃)

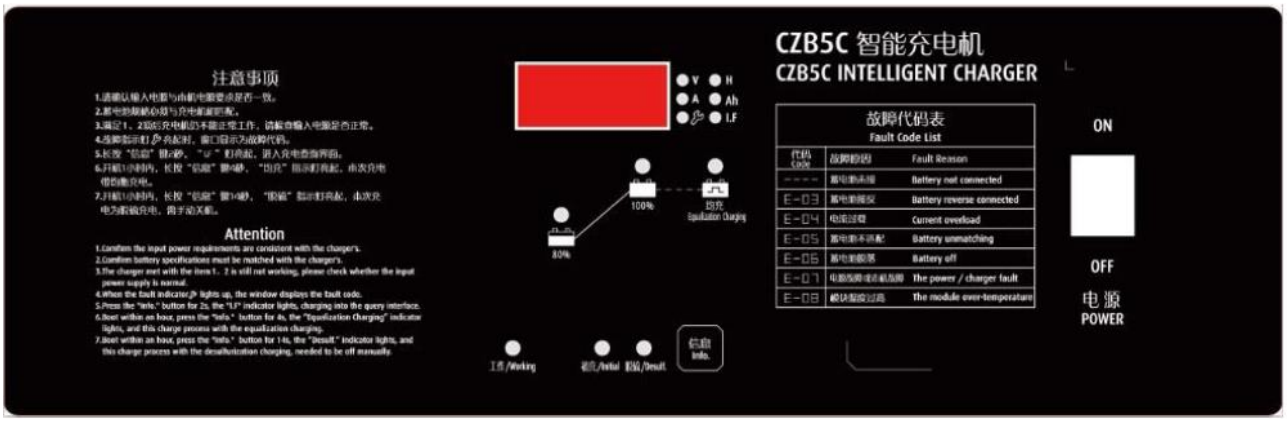
4) Place without conductive dust and environment without explosion risk

5) Environment free of gas and steam that can corrode metal and insulation

6) Where there is no rain or snow

7) Where the vertical plane is not inclined more than 5 degrees and there is no violent vibration and impact

9-2 Introduction of Control Panel



1) Power switch - used to turn on or off the power grid

2) Information window (LED screen) - display various charging parameters, fault code information, etc

3) Information content indicator light - each light is on, and the corresponding information window will display the information of the corresponding content

4) Information key——

A) During the charging process of the charger, the charging voltage, charging time, charging current and charging capacity are automatically displayed in turn.Click the "information" key to directly switch the display content;

B) Press the "information" key for 4s to set the manual equalizing charging function

C) Press the "information" key for 10s to set the initial charging function

D) Press the "information" key for 15s to set the desulfurization charging function

E) Press the "information" key for 6s to cancel the functions of manual equalizing charging, initial charging and desulfurization charging

F) Press the "information" key for 8s to cancel / restore the automatic equalizing charging function

G) Press "information" key for 2s to enter the query interface

5) Charging status indicator——

A) "Working" indicator light: the light is on, indicating that the charger is charging

B) "80%" indicator light: the light is on, indicating that the capacity of charger charging battery is more than 80%

C) "100%" indicator light: the light is on, indicating that the charger is charged and the battery is sufficient

D) "Equalizing charge" indicator: the light is on, indicating that equalizing charge will be carried out in this charge; the light flashes, indicating that equalizing charge is in progress

E) "Initial charge" indicator light: it lights up together with the working indicator light, indicating that the charger is in initial charge

F) "Desulfurization" indicator: the indicator is on, indicating that the charger is desulfurization charging

9-3 Common faults of charger

Serial No.	Trouble code	Cause of failure	Processing method
1	----	The battery has not been connected or the connection is poor	Connect the battery and make sure the connection is reliable
2	E-03	The positive and negative polarity of the battery are reversed	Connect battery polarity correctly
3	E-04	Charging current over-current, sudden change of power grid or short circuit damage of rectifier module of charger	Check whether the power supply of power grid is normal; Replace the rectifier module
4	E-05	Battery Specification mismatch (average cell voltage is less than 1.5V or battery capacity is too large) or battery fault	Check whether the capacity and voltage of the charged battery match the specifications of the charger; Replace the matched battery; Replace faulty battery
5	E-06	During the charging process, the charging connecting line falls off, and the battery is disconnected from the charger	Check the connection points in the charging circuit and clear the oxide layer to ensure good contact
6	E-07	Power supply failure: low power supply voltage, power supply failure or input fuse damage Charger fault: charger has no current output, rectifier module or control board is damaged	Check the input power supply voltage and restore the normal power supply Replace the failed fuse Replace the faulty rectifier module Replace damaged control panel
7	E-08	The fan is damaged or the ambient temperature is too high, which causes the module temperature in the fan to be too high	Replace the damaged fan Check whether the vent of charger is blocked Improve working environment of charger
Note: when the "" indicator light on the panel is on, the fault code will be displayed in the information window			