

SERVICE MANUAL

HL630VQ

HL635VQ

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SAFETY

**WHEEL LOADER
SAFETY**



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

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TO THE OPERATOR OF A DISD WHEEL LOADER



DANGER!

Unsafe use of the wheel loader could lead to serious injury or death. Operating procedures, maintenance and equipment practices or traveling or shipping methods that do not follow the safety guidelines on the following pages could cause serious, potentially fatal injuries or extensive damage to the machine or nearby property.

Please respect the importance of taking responsibility for your own safety, and that other people who may be affected by your actions.

Safety information on the following pages is organized into the following topics.

1. "General Safety Essentials" on page 6.
2. "Location of Safety Labels" on page 6.
3. "Unauthorized Modifications" on page 6.
4. "General Hazard Information" on page 7.
5. "Before Starting Engine" on page 15.
6. "Machine Operation" on page 18.
7. "Maintenance" on page 25.
8. "Battery" on page 33.
9. "Towing" on page 35.
10. "Shipping and Transportation" on page 36.



WARNING!

Improper operation and maintenance of this machine can be hazardous and could result in serious injury or death.

Operator and maintenance personnel should read this manual thoroughly before beginning operation or maintenance.

Keep this manual in the storage compartment to the rear of the operator's seat, and have all personnel involved in working on the machine periodically read the manual.

Some actions involved in operation and maintenance of the machine can cause a serious accident, if they are not done in a manner described in this manual.

The procedures and precautions given in this manual apply only to intended uses of the machine.

If you use your machine for any unintended uses that are not specifically prohibited, you must be sure that it is safe for any others. In no event should you or others engage in prohibited uses or actions as described in this manual.

DISD delivers machines that comply with all applicable regulations and standards of the country to which it has been shipped. If this machine has been purchased in another country or purchased from someone in another country, it may lack certain safety devices and specifications that are necessary for use in your country. If there is any question about whether your product complies with the applicable standards and regulations of your country, consult DISD or your DISD distributor before operating the machine.



SAFETY ALERT SYMBOL!



Be Prepared - Get to Know All Operating and Safety Instructions

This is the Safety Alert Symbol. Wherever it appears - in this manual or on safety signs on the machine - you should be alert to potential for personal injury or accidents. Always observe safety precautions and follow recommended procedures.

LEARN SIGNAL WORDS USED WITH SAFETY ALERT SYMBOL

Words “**CAUTION**,” “**WARNING**,” and “**DANGER**” used throughout this manual and on labels on machine indicate hazards or unsafe practices. All three statements indicate that safety is involved. Observe precautions indicated whenever you see the Safety Alert “Triangle,” no matter which signal word appears next to the “Exclamation Point” symbol.



CAUTION!

This word is used on safety messages and safety labels and indicates potential of a hazardous situation that, if not avoided, could result in minor or moderate injury. It may also be used to alert against a generally unsafe practice.



WARNING!

This word is used on safety messages and safety labels and indicates potential of a hazardous situation that, if not avoided, could result in serious injury or death. It may also be used to alert against a highly unsafe practice.



DANGER!

This word is used on safety messages and safety labels and indicates imminent hazard of a situation that, if not avoided, is very likely to cause death or extremely serious injury. It may also be used to alert against equipment that may explode or detonate if handled or treated carelessly.

Safety precautions are described in SAFETY from page 6 on.

DISD cannot predict every circumstance that might involve a potential hazard in operation and maintenance. Therefore the safety messages in this manual and on the machine may not include all possible safety precautions. If any procedures or actions not specifically recommended or allowed in this manual are used, you must be sure that you and others can do such procedures and actions safely and without damaging the machine. If your unsure about the safety of some procedures, contact a DISD distributor.

GENERAL SAFETY ESSENTIALS

ACCESSORY APPLICATIONS

This wheel loader has been designed primarily for moving earth with a bucket. For use as a grapple or for other object handling, contact Daewoo. Lifting-work applications are permitted in approved lift configuration, to rated capacity only, with no side-loading (unless prohibited by local regulation). Do not use machine for activities for which it was not intended. Do not use bucket for lifting work, unless lift slings are used in approved configuration.

LOCATION OF SAFETY LABELS

Location of safety labels (decals) can vary from unit to unit. Refer to appropriate Operation and Maintenance Manual, and Parts Manual for your unit.

There are several specific warning signs on this machine. The exact location of hazards and the description of the hazards are reviewed in the appropriate Operation and Maintenance Manual.

Please become familiarized with all warning signs.

Make sure that all of the warning signs are legible. Clean the warning signs or replace the warning signs if you cannot read the words. Replace the illustrations if the illustrations are not visible. When you clean the warning signs, use a cloth, water and soap. Do not use solvent, gasoline, or other harsh chemicals to clean the safety signs. Solvents, gasoline, or other harsh chemicals could loosen the adhesive that secures the warning sign. Loose adhesive will allow the warning sign to fall off.

Replace any safety sign that is damaged, or missing. If a safety sign is attached to a part that is replaced, install a safety sign on the replacement part.

UNAUTHORIZED MODIFICATIONS

Any modification made without authorization or written approval from Daewoo can create a safety hazard, for which the machine owner must be held responsible.

For safety's sake, replace all OEM parts with the correct authorized or genuine Daewoo part. For example, not taking the time to replace fasteners, bolts or nuts with the correct replacement parts could lead to a condition in which the safety of critical assemblies is dangerously compromised.

GENERAL HAZARD INFORMATION

SAFETY RULES

Only trained and authorized personnel can operate and maintain the machine.

Follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.

Do not operate the machine if you are not feeling well, if you are taking medication that makes you feel sleepy, if you have been drinking, or if you are suffering from emotional problems. These problems will interfere with your sense of judgement in emergencies and may cause accidents.

When working with another operator or with a person on work site traffic duty, be sure that all personnel know the nature of the work and understand all hand signals that are to be used.

Always observe strictly any other rules related to safety.

SAFETY FEATURES

Be sure that all guards and covers are installed in their proper position. Have guards and covers repaired immediately if damaged.

Be sure that you understand the method of use of safety features such as transmission lever neutral lock and the seat belt, and use them properly.

Never remove any safety features. Always keep them in good operating condition.

Failure to use safety features according to the instructions in the Operation and Maintenance Manual could result in serious bodily injury.

INSIDE OPERATOR'S COMPARTMENT

When entering the operator's compartment, always remove all mud and oil from the soles of your shoes. If you operate the accelerator and brake pedals with mud or oil stuck to your shoes, your foot may slip and this may cause a serious accident.

Clean grease and dirt from pedals and controls. This contributes to safe operation. Cleaning also provides an opportunity to inspect equipment. Minor damage can be repaired or corrected before major problems result.

Keep cab floor and consoles free of tools and personal items.

After using the ashtray, make sure that any matches or cigarettes are properly extinguished, and be sure to close the ashtray. If the ashtray is left open, there is danger of fire.

Do not stick suction pads to the window glass. Suction pads act as a lens and may cause fire.

Do not leave lighters laying around the operator's compartment. If the temperature inside the operator's compartment becomes high, there is danger that the lighter may explode.

Do not use cellular telephones inside the operator's compartment when driving or operating the machine. There is danger that this may lead to an unexpected accident.

Never bring any dangerous objects such as flammable or explosive items into the operator's cab. To ensure safety, do not use the radio or music headphones when operating the machine. There is danger that this may lead to a serious accident.

When operating the machine, do not put your hands or head out of the window.

When standing up from the operator's seat, always place transmission neutral lock lever in the "LOCK" position and set pilot cutoff switch to "O" (OFF) position. If you accidentally touch the work equipment levers when they are not locked, the machine may suddenly move and cause serious injury or damage.

When leaving the machine, lower the work equipment completely to the ground, set transmission neutral lock lever in the "LOCK" position, set pilot cutoff switch to "O" (OFF) position, "APPLY" parking brake, and shut down engine. Use the key to lock all the equipment. Always remove the key and take it with you.

CLOTHING AND PERSONAL PROTECTIVE ITEMS

Contain long hair, and avoid loose clothing and jewelry. They can catch on controls or in protruding parts and cause serious injury or death.

Do not wear oily clothes. They are highly flammable.

Full eye protection, a hard hat, safety shoes and gloves may be required at the work site. While working on the machine, never use inadequate tools.

They could break or slip, causing injury, or they may not adequately perform intended functions.



Figure.1

BREATHING MASKS, EAR PROTECTION MAY BE REQUIRED

Do not forget that some risks to your health may not be immediately apparent. Exhaust gases and noise pollution may not be visible, but these hazards can cause disabling or permanent injuries.

ASBESTOS DUST HAZARD PREVENTION

Asbestos dust can be HAZARDOUS to your health if it is inhaled. Materials containing asbestos fiber can be present on work site. Breathing air that contains asbestos fiber can ultimately cause serious or fatal lung damage. To prevent lung damage from asbestos fiber, observe following precautions;

- Use a respirator that is approved for use in an asbestos-laden atmosphere.
- Never use compressed air for cleaning.
- Use water for cleaning to keep down the dust.
- Work on the machine or component with the wind at your back whenever possible.
- Always observe any rules and regulations related to the work site and working environment

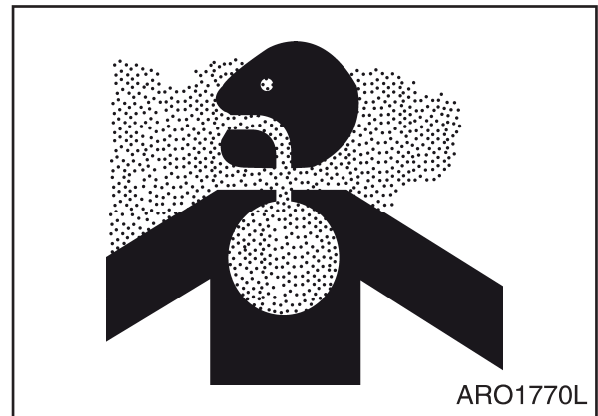


Figure.2

MOUNTING AND DISMOUNTING

Before getting on or off the machine, if there is any oil, grease, or mud on the handrails, steps, or track shoes, wipe it off immediately. Always keep these parts clean. Repair any damage and tighten any loose bolts.

Never get on or off a moving machine. In particular, never get on or off a moving machine. These actions may lead to serious injury.

When getting on or off the machine, always face the machine, and maintain a three-point contact (both feet and one hand or one foot and both hands) with the handholds and steps to ensure that you support yourself securely.

Never hold any control levers when getting on or off the machine.

Never get up from operator's seat or leave operator's station and dismount machine if engine is running.

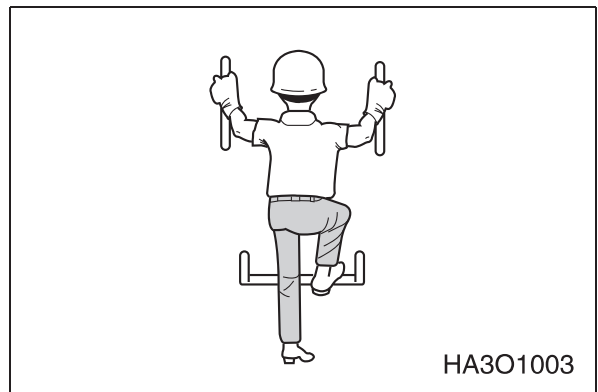


Figure.3

FUEL, OIL AND HYDRAULIC FLUID FIRE HAZARDS

Fuel, oil and antifreeze will catch fire if it is brought close to a flame. Fuel is particularly flammable and can be hazardous.

Always strictly observe the following.

Add fuel, oil, antifreeze and hydraulic fluid to the machine only in a well-ventilated area. The machine must be parked with controls, lights and switches turned "OFF." The engine must be "OFF" and any flames, glowing embers, auxiliary heating units or spark-causing equipment must be doused, turned off and/or kept well clear of the machine.



Figure.4

Static electricity can produce dangerous sparks at the fuel filling nozzle. In very cold, dry weather or other conditions that could produce a static discharge, keep the tip of the fuel nozzle in constant contact with the neck of the fuel filling nozzle, to provide a ground.

Keep fuel and other fluid reservoir caps tight and do not start the engine until caps have been secured.

PRECAUTIONS WHEN HANDLING FLUIDS AT HIGH TEMPERATURE

Immediately after operations are stopped, the coolant, engine oil, and hydraulic oil are at high temperature and the radiator and hydraulic tank are still under pressure. Attempting to remove the cap, drain the oil or coolant, or replace the filters may lead to serious burns. Always wait for the temperature to go down, and follow the specified procedures when carrying out these operations.



Figure.5

To prevent hot coolant from spurting out, shut down engine, wait for the coolant to cool, then loosen the cap slowly to relieve the pressure. To prevent hot oil from spurting out, shut down engine, wait for the oil to cool, then loosen the cap slowly to relieve the pressure.



Figure.6

INJURY FROM WORK EQUIPMENT

Do not enter or put your hand, arm or any other part of your body between movable parts, such as between the work equipment and cylinders, or between the machine and work equipment.

If the control levers are operated, the clearance between the machine and the work equipment will change and this may lead to serious damage or personal injury.

If going between movable parts is necessary, always position and secure the work equipment so that it cannot move.



Figure.7

FIRE EXTINGUISHER AND FIRST AID KIT

As a precaution if any injury or fire should occur, always do the following.

- Be sure that fire extinguishers have been provided and read the labels to ensure that you know how to use them. It is recommended that an appropriately sized (2.27 kg [5 lb] or larger) multipurpose “A/B/C” fire extinguisher be mounted in the cab. Check and service the fire extinguisher at regular intervals and make sure that all work site crew members are adequately trained in its use.
- Provide a first aid kit in the storage compartment and keep another at the work site. Check the kit periodically and make any additions if necessary.
- Know what to do in case of injury from fire.
- Keep emergency numbers for doctor, ambulance service, hospital and fire department you’re your telephone.

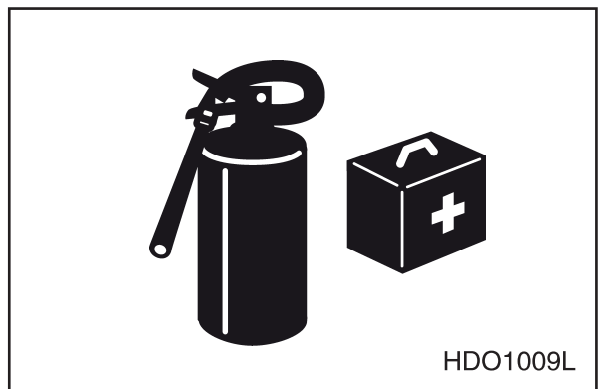


Figure.8

If the machine catches fire, it may lead to serious personal injury or death. If a fire occurs during operation, escape from the machine as follows;

- Turn the starter switch “OFF” and shut down engine.
- If there is time, use the fire extinguisher to extinguish as much of the fire as possible.
- Use the handrails and steps to escape from the machine.

The above is the basic method for escaping from the machine, but changing the method may be necessary according to the conditions, so carry out practice drills at the work site.

PROTECTION FROM FALLING OR FLYING OBJECTS

On work sites where there is danger that falling objects or flying objects may hit the operator's cab select a guard to match the operating conditions to protect the operator.

Work in mines, tunnels, deep pits or on loose or wet surfaces could produce danger of falling rock, roll over or hazardous flying objects. Additional protection for operator's cab could be required in form of a FOPS/Falling Object Protective Structure and/or ROPS/Roll Over Protective Structure reinforcement system (Option).

Any reinforcement system that is installed on machine must pass safety and certification standards and carry appropriate labeling and rating information. For example, most often added type of reinforcement system, FOPS, must meet or exceed Society of Automotive Engineers standard SAE J1356, "Performance Criteria for Falling Object Guards for Wheel loaders. (Option)" Never attempt to alter or modify any type of protective structure reinforcement system, by drilling holes, welding or remounting or relocating fasteners. Any serious impact or damage to system requires a complete integrity reevaluation.

Reinstallation, recertification and/ or replacement of system may be necessary.



Figure.9



Figure.10

INSTALL ADDITIONAL SAFETY EQUIPMENT IF CONDITIONS REQUIRE

Laminate glass protection for the front, side or rear windows may also be recommended depending upon particular site conditions.

Contact your distributor for available safety guards and/or recommendations if there is any danger of getting hit by objects that could strike the operator's cab. Make sure that all other work site crew members are kept well away from wheel loader and safe from potential hazards.

MAINTAIN STANDARD SAFETY EQUIPMENT IN GOOD CONDITION

Machinery guards and body panel covers must be in place at all times. Keep well clear of rotating parts. Pinch point hazards such as cooling fan and alternator drive belts could catch hair, jewelry or oversize or very loose clothing.

Safety labels must be replaced if they are damaged or become unreadable. Information on labels gives work crew members an important safety reminder. Part numbers for each decal and required mounting locations are shown on pages 1-2 through 1-4 of this section.

ATTACHMENT PRECAUTIONS

Options kits are available through your dealer. Contact for information on available one-way (single-acting) and two-way (double-acting) piping / valving / auxiliary control kits. Because cannot anticipate, identify or test all attachments that owners may wish to install on their machines, please contact for authorization and approval of attachments and their compatibility with options kits.

ACCUMULATOR

The pilot control system is equipped with an accumulator. For a brief period of time after the engine has been shut down, the accumulator will store a pressure charge that may enable hydraulic controls to be activated. Activation of any controls may enable the selected function to operate under force of gravity.

When performing maintenance on the pilot control system, the hydraulic pressure in the system must be released as describe in Operation and Maintenance Manual.

The accumulator is charged with high-pressure nitrogen gas, so it is extremely dangerous if it is handled in the wrong way. Always observe the following precautions;

- Do not drill or make any holes in the accumulator or expose it any flame, fire or heat source.
- Do not weld on the accumulator, or try attaching anything to it.
- When carrying out disassembly or maintenance of the accumulator, or when disposing of the accumulator, the charged gas must be properly released. Contact your distributor.
- Wear safety goggles and protective gloves when working on an accumulator. Hydraulic oil under pressure can penetrate the skin and cause serious injuries.

ENGINE VENTILATION

Engine exhaust gases can cause loss of judgment, loss of alertness, and loss of motor control. These gases can also cause unconsciousness, serious injury and fatal accidents.

Make sure of adequate ventilation before starting engine in any enclosed area.

You should also be aware of open windows, doors or ductwork into which exhaust may be carried, or blown

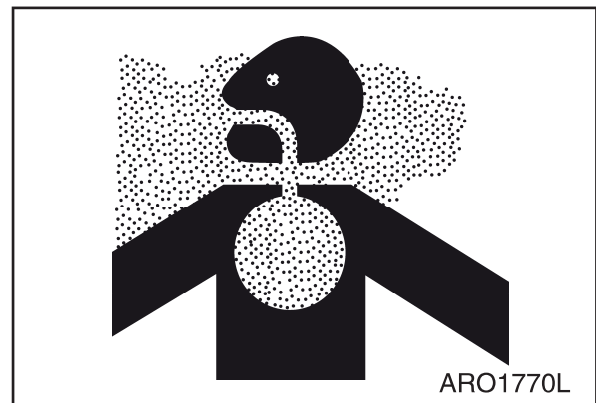


Figure.11

BEFORE STARTING ENGINE

WORK SITE PRECAUTIONS

Before starting operations, thoroughly check the area for any unusual conditions that could be dangerous. Check the terrain and condition of the ground at the work site, and determine the best and safest method of operation.

Make the ground surface as hard and horizontal as possible before carrying out operations. If there is a lot of dust and sand on the work site, spray water before starting operations.

If you need to operate on a street, protect pedestrians and cars by designating a person for work site traffic duty or by erecting fences and posting “No Entry” signs around the work site.

Erect fences, post “No Entry” signs, and take other steps to prevent people from coming close to or entering the work site. If people come close

to a moving machine, they may be hit or caught by the machine, and this may lead to serious personal injury or death.

Water lines, gas lines, phone lines and high-voltage electrical lines may be buried under the work site. Contact each utility and identify their locations. Be careful not to damage or cut any of these lines.

NEVER be in water that is in excess of the permissible water depth. Refer to “Operation Manual.”

Any type of object in the vicinity of the boom could represent a potential hazard, or cause the operator to react suddenly and cause an accident. Use a spotter or signal person working near bridges, phone lines, work site scaffolds, or other obstructions.

Minimum levels of insurance coverage, work permits or certification, physical barriers around the work site or restricted hours of operation may be mandated by governing authorities. There may also be regulations, guidelines, standards or restrictions on equipment that may have to be followed for local requirements.

There may also be regulations related to performing certain kinds of work. If there is any question about whether your machine and work site complies with the applicable standards and regulations contact your local authorities and agencies.

Avoid entering soft ground. It will be difficult for the machine to escape.

Avoid operating your machine to close to the edge of cliffs, overhangs, and deep ditches. The ground may be weak in such areas. If the ground should collapse, the machine could fall or tip over and this could result in serious injury or death.

Remember that the soil after heavy rain, blasting or after earthquakes, is weakened in these areas.

Earth laid on the ground and the soil near ditches is loose. It can collapse under the weight of vibration of your machine and cause your machine to tip over. Install the head guard (FOPS) if working in areas where there is danger of falling rocks.

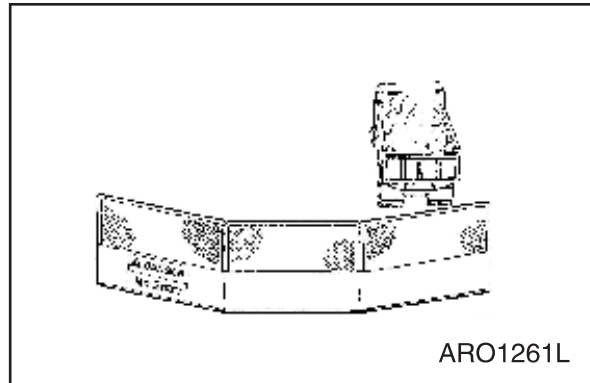


Figure.12

CHECKS BEFORE STARTING ENGINE

Every day before starting the engine for the first time, carry out the following checks. If these checks are not carried out properly, there is danger of serious injury.

- Completely remove all wood chips, leaves, grass, paper and other flammable materials accumulated in the engine compartment and around the battery. They could cause a fire.
Remove any dirt from the window glass, mirrors, handrails, and steps.
- Do not leave tools or spare parts laying around in the operator's compartment. The vibration of the machine when traveling or during operations may cause them to fall and damage or break the control levers or switches. They may also get caught in the gap of the control levers and cause the work equipment to malfunction or move dangerously. This may lead to unexpected accidents.
- Check the coolant level, fuel level, and hydraulic tank oil level, and check for clogged air cleaner and damage to the electrical wiring.
- Adjust the operator's seat to a position where it is easy to operate the machine, and check the seat belt and mounts for damage and wear.
- Check the operation of the gauges and the angle of the mirrors, and check that the safety lever is in "LOCKED" position.
- If any abnormalities are found in the above checks, carry out repairs immediately.

ENGINE STARTING

- Walk around your machine before getting in operator's cab. Look for evidence of leaking fluid, loose fasteners, misaligned assemblies or any other indications of possible equipment hazard.
- All equipment covers and machinery safety guards must be in place, to protect against injury while machine is being operated.
- Look around work site area for potential hazards, or people or property that could be at risk while operation is in progress.
- NEVER start engine if there is any indication that maintenance or service work is in progress, or if a warning tag is attached to controls in cab.
- A machine that has not been used recently, or is being operated in extremely cold temperatures, could require a warm-up or maintenance service before start up.
- Check gauges and monitor displays for normal operation before starting engine. Listen for unusual noises and remain alert for other potentially hazardous conditions at start of work cycle.
- Check tire inflation and check tires for damage or uneven wear. Perform maintenance before operation.
- Do not short circuit the starting motor to start the engine. This is not only dangerous, but may also damage the machine.
- When starting the engine, sound the horn as an alert.
- Start and operate the machine only while seated.

BEFORE OPERATING MACHINE

If checks are not carried out properly after starting the engine, it may result in a delay in discovering abnormalities in the machine, and this may lead to personal injury or damage to the machine.

Carry out the checks in an open area where there are no obstructions. Do not let anyone near the machine when carrying out the checks.

- Check the operating condition of the equipment, and the actuation of the bucket, boom, and travel systems.
- Check the machine for any abnormal noise, vibration, heat, smell, or abnormality with the gauges. Check also for leakage of air, oil, and fuel.
- If any abnormality is found, repair the problem immediately. If the machine is used without repairing the problems, it may lead to unexpected injury or failure.
- Clear all personnel from directly around machine and from the area.
- Clear all obstacles from the machine's path. Beware of hazards.
- Be sure that all windows are clean. Secure the doors and the windows in the open position or in the shut position.
- Adjust the rear view mirrors for best visibility close to the machine. Make sure that the horn, the travel alarm (if equipped), and all other warning devices are working properly.
- Fasten the seat belt securely.
- Warm up the engine and hydraulic oil before operating machine.
- Before moving the machine, check the position of undercarriage. The normal travel position is with idler wheels to the front under the cab and the drive sprockets to the rear. When the undercarriage is in the reversed position, the travel controls must be operated in opposite directions

MACHINE OPERATION

IMPORTANT

If you need more information or have any questions or concerns about safe operating procedures or working the wheel loader correctly in a particular application or in the specific conditions of your individual operating environment, please consult your local representative.

OPERATE WHILE SEATED AT OPERATOR'S STATION ONLY

Never reach in through a window to work a control. Do not try to operate wheel loader unless you're in command position - seated at controls. You should stay alert and focused on your work at all times. Do not twist out of seat if job activity behind you (or to the side) requires your attention. Use a spotter or signal person if you cannot see clearly and something is happening behind you. Replace damaged safety labels and lost or damaged operator's manuals. Do not let anyone operate machine unless they've been fully and completely trained, in safety and in operation of the machine.

SEAT BELTS SHOULD BE USED AT ALL TIMES

Whenever engine is running, operator should be seated at the control station with seat belt properly engaged.

MOVEMENT ALARMS

If wheel loader is equipped with an audible travel movement alarm, test alarm on a daily basis. Audible alarm should sound as soon as travel system is engaged.



Figure.13



Figure.14

TRAVEL PRECAUTIONS

When traveling, wheel loader always keeps lights on; make sure that you are in compliance with all state and local regulations concerning warning flags and signs.

Never turn the starter switch to the "O" (OFF) position when traveling. It is dangerous if the engine stops when the machine is traveling. It will be impossible to operate the steering unless the unit is equipped with an emergency steering system.

Pilot control valve lever (joystick) should not be operated while traveling.

Lower work equipment so that it is 400 mm (16 in) above ground.

Never travel over obstacles or slopes that will cause machine to tilt severely. Travel around any slope or obstacle that causes 10° tilt, or more.

Do not operate the steering suddenly. The work equipment may hit the ground and cause the machine to lose its balance, and this may damage the machine or structures in the area.

When traveling on rough ground, travel at low speed, and avoid sudden changes in direction.

Always keep to the permissible water depth.

When traveling over bridges or structures on private land, check first that the bridge or structure can withstand the weight of the machine. When traveling on public roads, check with the local authorities and follow their instructions.

SLOPING TERRAIN REQUIRES CAUTION

Dig evenly around work site whenever possible, trying to gradually level any existing slope. If it's not possible to level area or avoid working on a slope, reducing size and cycling rate workload is recommended.

On sloping surfaces, use caution when positioning wheel loader before starting a work cycle. Stay alert for unstable situations to avoid getting into them. For example, you should always avoid working bucket over downhill side of machine when parked perpendicular to slope. Avoid full extensions of bucket in a downhill direction. Lifting bucket too high, too close to machine, while wheel loader is turned uphill can also be hazardous.

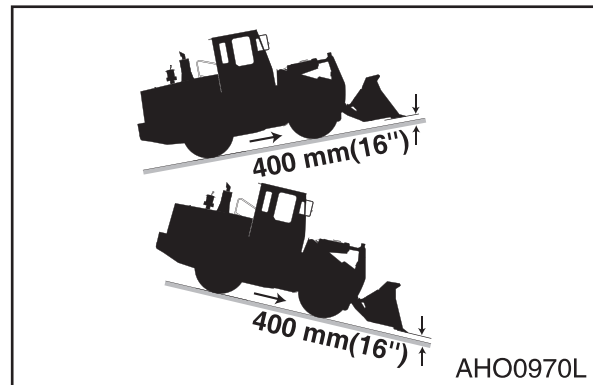


Figure.15

AVOID HIGH-VOLTAGE CABLES

Serious injury or death can result from contact or proximity to high-voltage electric lines. The bucket does not have to make physical contact with power lines for current to be transmitted.

Use a spotter and hand signals to stay away from power lines not clearly visible to operator.

| VOLTAGE | MINIMUM SAFE DISTANCE |
|----------|-----------------------|
| 6.6 kV | 3 m (9' 10") |
| 33.0 kV | 4 m (13' 1") |
| 66.0 kV | 5 m (16' 5") |
| 154.0 kV | 8 m (26' 3") |
| 275.0 kV | 10 m (32' 10") |

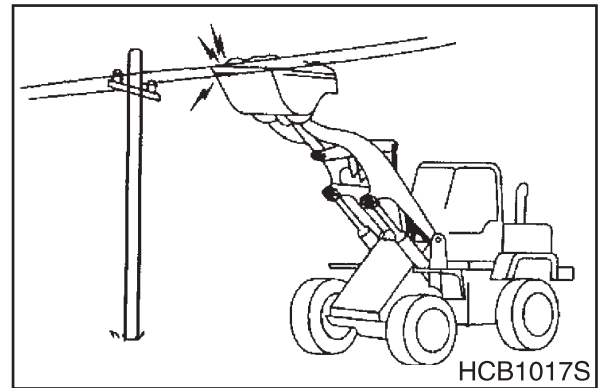


Figure.16

Use these minimum distances as a guideline only. Depending upon voltage in line and atmospheric conditions, strong current shocks can occur with boom or bucket as far away as 4 - 6 m (13 - 20 ft) from power line. Very high voltage and rainy weather could further decrease that safety margin.

NOTE: Before starting any type of operation near power lines (either above ground or buried cable-type) you should always contact power utility directly and work out a safety plan with them.

BEFORE STARTING TO DIG, CONTACT AUTHORITIES

Below ground hazards also include natural gas lines, water mains, tunnels and buried foundations. Know what's underneath work site before starting to dig.

BE AWARE OF HEIGHT OBSTACLES

Any type of object in vicinity of boom could represent a potential hazard, or cause operator to react suddenly and cause an accident. Use a spotter or signal person working near bridges, phone lines, work site scaffolds, or other obstructions.

USE CARE ON LOOSE SUPPORT

Working heavy loads over loose, soft ground or uneven, broken terrain can cause dangerous side load conditions and possible tip over and injury. Travel without a load or balanced load may also be hazardous. If temperatures are changing, be cautious of dark and wet patches when working or traveling over frozen ground. Stay away from ditches, overhangs and all other weak support surfaces. Halt work and install support mats or blocking if work is required in an area of poor support.

USE SOLID SUPPORT BLOCKING

Never rely on lift jacks or other inadequate supports when work is being done. Block wheels fore and aft to prevent any movement.

DIGGING BENEATH OVERHANGS

Digging beneath an overhang is dangerous. Overhang could collapse on top of operator and cause serious injury or death. Go on to another digging area before steep overhangs are formed. Know height and reach limits of wheel loader and plan ahead while working. Park wheel loader away from overhangs before work shut down.



Figure.17

DIGGING BENEATH WHEEL LOADER

Digging beneath wheel loader is dangerous. Earth beneath could collapse. This could cause wheel loader to tip, which could cause serious injury or death to operator. Working around deep pits, trenching or along high walls may require support blocks, especially after heavy rainfalls or during spring thaws.

STAY ALERT FOR PEOPLE MOVING THROUGH WORK AREA

When loading a truck you should always know where the driver is.

Avoid loading over the cab of a truck even if the driver is in a safe spot. Someone else could have gone inside, for any number of reasons. Avoid working where unseen passersby might be.

Slow down work cycle and use slower travel speeds in congested or populated areas. Use a commonly understood signal so that other members of work crew can warn operator to slow or halt work in an impending hazardous situation.



Figure.18

BE AWARE OF AND CONFORM TO LOCAL REGULATIONS

Minimum levels of insurance coverage, work permits or certification, physical barriers around work-site or restricted hours of operation may be mandated by governing authorities. There may also be guidelines, standards or restrictions on equipment that may be used to perform certain kinds of work. Check and follow all local requirements, which may also be related to below ground hazards and power lines.

NEVER USE ETHER STARTING AIDS

An electric-grid type manifold heater is used for cold starting. Glowing heater element can cause ether or other starting fluid to detonate, causing injury.



Figure.17

OBSERVE GENERAL SAFETY RULES

Only trained and authorized personnel, with a good knowledge and awareness of safe procedures, may be allowed to operate or perform maintenance or service on wheel loader.

All personnel at work site should be aware of assigned individual responsibilities and tasks.

Communication and hand signals used should be understood by everyone.

Terrain and soil conditions at work site, approaching traffic, weather-related hazards and any above or below ground obstacles or hazards should be observed and monitored by all work crew members.

TAKE TIME TO PROVIDE GOOD VISIBILITY

Be careful not to go close to the edge of a cliff by mistake.

Use the machine only for its main purpose. Using it for other purposes will cause failures.

To ensure an ample view, do as follows:

- When working in dark areas, attach working lights and front lights to the machine. If necessary, set up lighting at the work site.
- Stop operations when the visibility is poor, such as in fog, mist, snow, and rain. Wait for the visibility to improve to a level which causes no problems for the operation.
- Keep dirt and dust off of windows and off lens surfaces of work lights. Stop working if lights, windows or mirrors need cleaning or adjustment.

To avoid hitting the work equipment, always do the following;

- When working in tunnels, on bridges, under electric wires, or when parking the machine or carrying out other operations in places with limited height, be extremely careful not to hit the bucket or other parts.
- To prevent collisions, operate the machine at a safe speed when working in confined spaces, indoors, or in crowded areas.
- Do not pass the bucket over the heads of workers or over the operator's compartment of dump truck.

KEEP “PINCH POINT” AREAS CLEAR – USE CAUTION IN REVERSE

Use a signal person in high traffic areas and whenever operator’s view is not clear, such as when traveling in reverse.

Anyone standing near wheels, or working assemblies of the attachment, is at risk of being caught between moving parts of machine.

Never allow anyone to ride on any part of machine or attachment, including any part of operator’s cab.

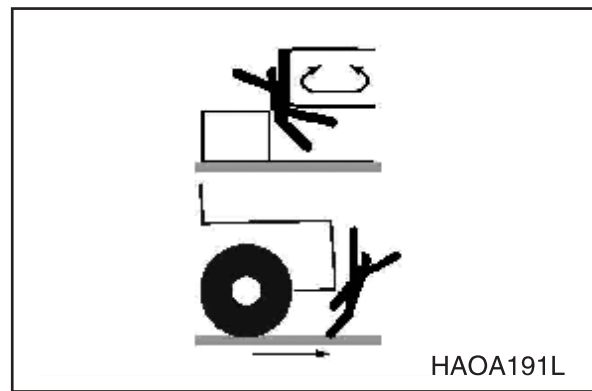


Figure.20

OPERATE CAREFULLY ON SNOW AND ICE AND IN VERY COLD TEMPERATURES

In icy cold weather avoid sudden travel movements and stay away from even very slight slopes. Machine could skid off to one side very easily.

Snow accumulation could hide or obscure potential hazards. Use care while operating or while using machine to clear snow.

Warming up engine for a short period may be necessary, to avoid operating with sluggish or reduced working capacity. Jolting shocks and impact loads caused by bumping or bottoming boom or attachment are more likely to cause severe stress in very cold temperatures. Reducing work cycle rate and work load may be necessary.

When the temperature rises, frozen road surfaces become soft, so the machine travel becomes unstable. In cold weather, do not touch metal surfaces with your bare hands. If you touch a metal surface in extremely cold weather, your skin may freeze to the metal surface.

PARKING MACHINE

Avoid making sudden stops, or parking machine wherever it happens to be at the end of the work day. Plan ahead so that the wheel loader will be on firm, level ground away from traffic and away from high walls, cliff edges and any area of potential water accumulation or runoff. If parking on inclines is unavoidable, block wheels to prevent movement. Lower bucket or other working attachment completely to ground, or to an overnight support saddle. There should be no possibility of unintended or accidental movement.

When parking on public roads, provide fences, signs, flags, or lights, and put up any other necessary signs to ensure that passing traffic can see the machine clearly, and park the machine so that the machine, flags, and fences do not obstruct traffic.

SHUTDOWN CONTROL FUNCTIONS

After bucket has been lowered to overnight storage position, move all switches and controls to “OFF” position. Pull parking brake knob to “APPLIED” position. This will apply parking brake. Move pilot cutoff switch to “LOCK” position. This will disable pilot control valve lever (joystick). Move key in starter switch to “OFF” position, and remove key from switch.

Engage all lock-down security equipment that may have been installed on machine.

IMPORTANT

When hydraulic system maintenance or service work must be performed, be aware that accumulators in system store fluid under pressure after system has been shut down. To release hydraulic pressure in accumulators, operate control with engine “OFF” until accumulator pressure is completely dissipated.

NEVER LET ANYONE RIDE ON ATTACHMENT

Never let anyone ride on any work attachment, such as the bucket, crusher, grapple, or clamshell (grab bucket). There is a danger of the person falling and suffering serious injury.



Figure.21

MAINTENANCE

USE WARNING TAG DURING SERVICE

Alert others that service or maintenance is being performed and tag operator's cab controls - and other machine areas if required - with a warning notice.

Warning tags for controls are available from distributors; see Figure 22.

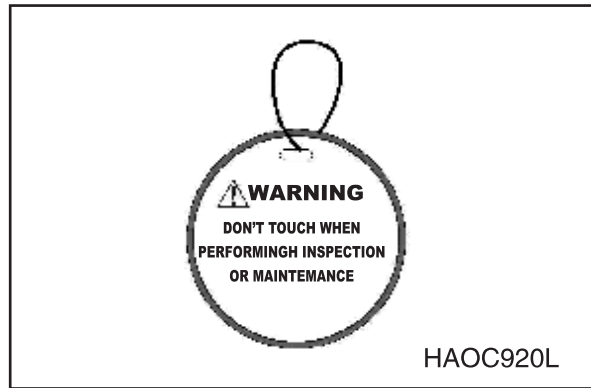


Figure.22

CLEAN BEFORE INSPECTION OR MAINTENANCE

Clean the machine before carrying out inspection and maintenance. This prevents dirt from getting into the machine and also ensures safety during maintenance.

If inspection and maintenance are carried out

when the machine is dirty, it will become more difficult to locate the problems, and also there is danger that you may get dirt or mud in your eyes or that you may slip and injure yourself.

When washing the machine, do the following;

- Wear shoes with nonslip soles to prevent yourself from slipping and falling on wet places.
- Wear safety glasses and protective clothing when washing the machine with high-pressure steam.
- Take action to prevent touching high-pressure water and cutting your skin or having mud fly into your eyes.
- Do not spray water directly on electrical components (sensors, connector) (1, Figure 23). If water gets into the electrical system, there is danger that it will cause defective operation and malfunction.

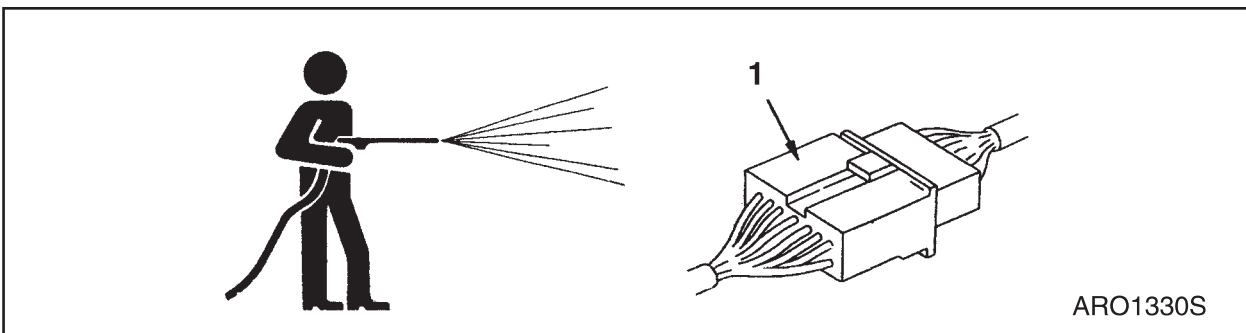


Figure.23

Pick up any tools or hammers that are laying in the work place, wipe up any grease or oil or any other slippery substances, and clean the area to make it possible to carry out the operation in safety. If the work place is left untidy, you may trip or slip and suffer injury.

PROPER TOOLS

Use only tools suited to the task. Using damaged, low quality, faulty, or makeshift tools could cause personal injury. There is danger that pieces from, chisels with crushed heads, or hammers, may get into your eyes and cause blindness.

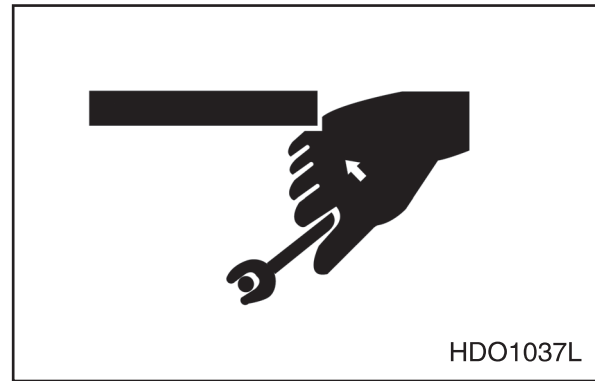


Figure.24

USE OF LIGHTING

When checking fuel, oil, battery electrolyte, or window washing fluid, always use lighting with anti-explosion specifications. If such lighting equipment is not used, there is danger of explosion.

If work is carried out in dark places without using lighting, it may lead to injury, so always use proper lighting.

Even if the place is dark, never use a lighter or flame instead of lighting. There is danger of fire.

There is also danger that the battery gas may catch fire and cause an explosion.

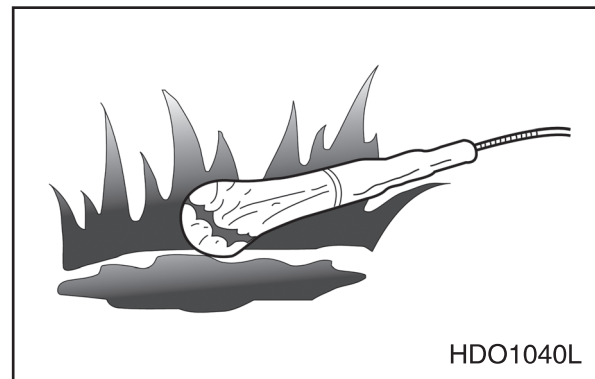


Figure.25

FIRE PREVENTION AND EXPLOSION PREVENTION

All fuels, most lubricants and some coolant mixtures are flammable. Leaking fuel or fuel that is spilled onto hot surfaces or onto electrical components can cause a fire.

Store all fuels and all lubricants in properly marked containers and away from all unauthorized persons.

Store oily rags and other flammable material in a protective container.

Do not smoke while you refuel the machine or while you are in a refueling area.

Do not smoke in battery charging areas or in areas that contain flammable material.

Clean all electrical connections and tighten all electrical connections. Check the electrical wires daily for wires that are loose or frayed. Tighten all loose electrical wires before you operate the machine. Repair all frayed electrical wires before you operate the machine.

Remove all flammable materials before they accumulate on the machine.

Do not weld on pipes or on tubes that contain flammable fluids. Do not flame cut on pipes or on tubes that contain flammable fluids. Before you weld on pipes or on tubes or before you flame cut on pipes or on tubes, clean the pipes or tubes thoroughly with a nonflammable solvent.

BURN PREVENTION

When checking the radiator coolant level, shut down engine, let the engine and radiator cool down, then check the coolant recovery tank. If the coolant level in the coolant recovery tank is near the upper limit, there is enough coolant in the radiator.

Loosen the radiator cap gradually to release the internal pressure before removing the radiator cap.

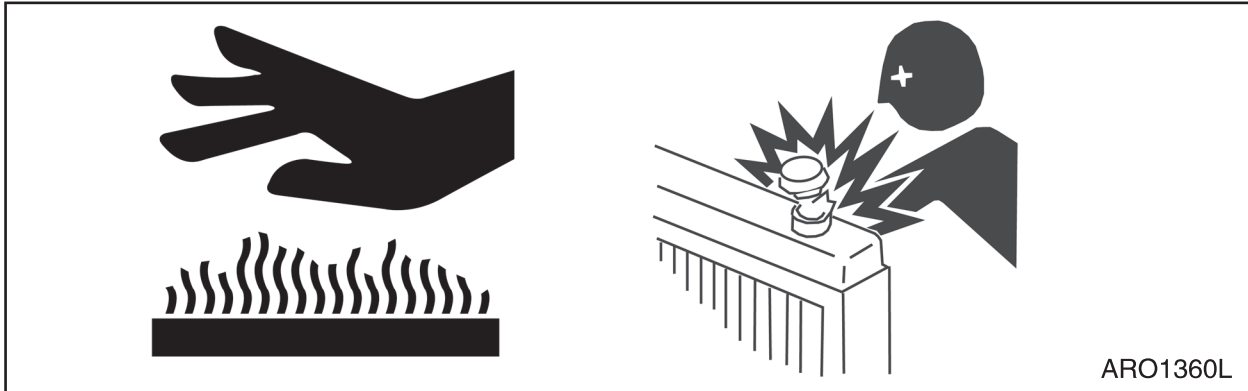


Figure.26

If the coolant level in the coolant recovery tank is below the lower limit, add coolant.

Cooling system conditioner contains alkali. Alkali can cause personal injury. Do not allow alkali to contact the skin, the eyes, or the mouth.

Allow cooling system components to cool before you drain the cooling system.

Hot oil and hot components can cause personal injury. Do not allow hot oil or hot components to contact the skin.

Remove the hydraulic tank filter plug only after the engine has been stopped. Make sure that the hydraulic tank filter plug is cool before you remove it with your bare hand. Remove the hydraulic tank filter plug slowly to relieve pressure.

Relieve all pressure in the hydraulic oil system, in the fuel system, or in the cooling system before you disconnect any lines, fittings, or related items.

Batteries give off flammable fumes that can explode.

Do not smoke while you are checking the battery electrolyte levels.

Electrolyte is an acid. Electrolyte can cause personal injury. Do not allow electrolyte to contact the skin or the eyes.

Always wear protective glasses when you work on batteries.

WELDING REPAIRS

When carrying out welding repairs, carry out the welding in a properly equipped place. The welding should be performed by a qualified worker. During welding operations, there is the danger of, generation of gas, fire, or electric shock, so never let an unqualified worker do welding.

The qualified welder must do the following;

- To prevent explosion of the battery, disconnect the battery terminals and remove batteries.
- To prevent generation of gas, remove the paint from the location of the weld.
- If hydraulic equipment, piping or places close to them are heated, a flammable gas or mist will be generated and there is danger of it catching fire. To avoid this, never subject these places to heat.
- Do not weld on pipes or on tubes that contain flammable fluids. Do not flame cut on pipes or on tubes that contain flammable fluids. Before you weld on pipes or on tubes or before you flame cut on pipes or on tubes, clean the pipes or tubes thoroughly with a nonflammable solvent.
- If heat is applied directly to rubber hoses or piping under pressure, they may suddenly break so cover them with a fireproof covering.
- Wear protective clothing.
- Make sure there is good ventilation.
- Remove all flammable objects and provide a fire extinguisher.

PRECAUTIONS FOR REMOVAL, INSTALLATION, AND STORAGE OF ATTACHMENTS

Before starting removal and installation of attachments, decide the team leader.

Do not allow anyone except the authorized workers close to the machine or attachment.

Place attachments that have been removed from the machine in a safe place so that they do not fall. Put up a fence around the attachments and take other measures to prevent unauthorized persons from entering.



Figure.27

PRECAUTIONS WHEN WORKING ON MACHINE

When carrying out maintenance operations on the machine, keep the area around your feet clean and tidy to prevent you from falling.

Always do the following;

- Do not spill oil or grease.
- Do not leave tools laying about.
- Watch your step when walking.

Never jump down from the machine. When getting on or off the machine, use the steps and handrails, and maintain a three-point contact (both feet and one hand or both hands and one foot) to support yourself securely.

If the job requires it, wear protective clothing.

To prevent injury from slipping or falling, when working on the hood or covers, never use any part except the inspection passage fitted with nonslip pads.



Fig.28

LOCK INSPECTION COVERS

When carrying out maintenance with the inspection cover open, lock the cover securely in position with the lock bar.

If maintenance work is carried out with the inspection cover open but not locked, there is danger that it may suddenly close and cause injury if there is a gust of wind.

CRUSHING PREVENTION AND CUTTING PREVENTION

You should always have at least two people working together if the engine must be run during service. One person needs to remain in the operator's seat, ready to work the controls or stop the machine and shut off the engine.

Unless you are instructed otherwise, never attempt adjustments while the machine is moving or while the engine is running.

Stay clear of all rotating parts and moving parts.

Keep objects away from moving fan blades. The fan blades will throw objects and the fan blades can cut objects.

Do not use a wire rope cable that is kinked or frayed. Wear gloves when you handle a wire rope cable.

When you strike a retainer pin, the retainer pin might fly out. The loose retainer pin can injure personnel.

Make sure that the area is clear of people when you strike a retainer pin. To avoid injury to your eyes, wear protective glasses when you strike a retainer pin.

DO NOT RUN ENGINE IF REPAIRS OR WORK ARE BEING PERFORMED ALONE

You should always have at least two people working together if engine must be run during service. One person needs to remain in operator's seat, ready to work controls or stop machine and shut "OFF" engine.

ALWAYS USE ADEQUATE EQUIPMENT SUPPORTS AND BLOCKING

Do not allow weight or equipment loads to remain suspended. Lower everything to ground before leaving operator's seat. Do not use hollow, cracked or unsteady, wobbling weight supports. Do not work under any equipment supported solely by a lift jack.

DO NOT WORK ON HOT ENGINES OR HOT COOLING OR HYDRAULIC SYSTEMS

Wait for engine to cool off after normal operation. Park wheel loader on firm, level ground and lower all equipment before shutting down and switching "OFF" controls. When engine lube oil, gearbox lubricant or other fluids require change, wait for fluid temperatures to decrease to a moderate level before removing drain plugs.

NOTE: *Oil will drain more quickly and completely if it is warm. Do not drain fluids at temperatures exceeding 95°C (203°F), however do not allow full cool down.*

HYDRAULIC CYLINDER SEALS REQUIRE PERIODIC REPLACEMENT

Check cylinder drift rate at regular intervals.

HIGH PRESSURE HYDRAULIC LINES CAN STORE A GREAT DEAL OF ENERGY

Exposed hydraulic hoses on arm or boom could react with explosive force if struck by a falling rock, overhead obstacle or other work site hazard. Extra safety guards may be required. NEVER allow hoses to be hit, bent or interfered with during operation.

PRECAUTIONS WITH HIGH PRESSURE LINE, TUBES AND HOSES

When inspecting or replacing high-pressure piping or hoses, check that the pressure has been released from the circuit. Failure to release the pressure may lead to serious injury. Always do the following;

- Wear protective glasses and leather gloves.
- Fluid leaks from hydraulic hoses or pressurized components can be difficult to see but pressurized oil has enough force to pierce the skin and cause serious injury. Always use a piece of wood or cardboard to check for suspected hydraulic leaks. Never use your hands or expose your fingers.
- Do not bend high pressure lines. Do not strike high pressure lines. Do not install lines, tubes or hoses that are bent or damaged.
- Make sure that all clamps, guards and heat shields are installed correctly to prevent vibration, rubbing against other parts, and excessive heat during operation.
 - If any of the following conditions are found, replace the part.
 - Damage or leakage from hose end.
 - Wear, damage, cutting of covering, or exposure of strengthening wire layer.
 - Cover portion is swollen in places.
 - There is twisting or crushing at movable parts of hose.
 - Foreign material is embedded in the covering.
 - Hose end is deformed.

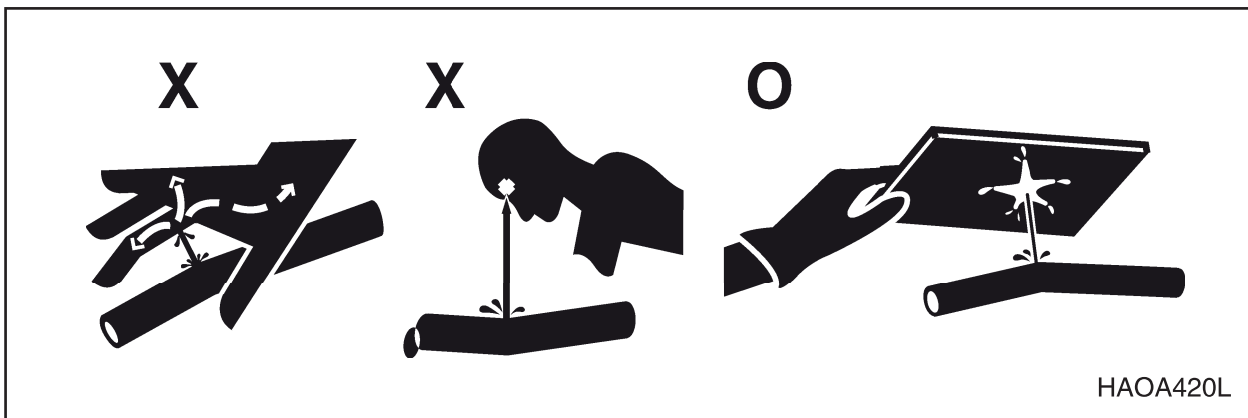


Figure.29

OBTAIN IMMEDIATE MEDICAL ATTENTION IF PRESSURIZED OIL PIERCES SKIN.



WARNING!

Failure to obtain prompt medical assistance could result in gangrene or other serious damage to tissue.

USE CORRECT REPLACEMENT FASTENERS TIGHTENED TO PROPER TORQUE

Refer to “General Maintenance” section of Shop Manual for information on tightening torques and recommended assembly compounds and always use correct part.

Poor or incorrect fastener connections can dangerously weaken assemblies.

SAFETY-CRITICAL PARTS MUST BE REPLACED PERIODICALLY

Replace following fire-related components as soon as they begin to show any sign of wear, or at regular periodic intervals, whether or not deterioration is visible:

- Fuel system flexible hoses, the tank overflow drain hose and the fuel filler cap.
- Hydraulic system hoses, especially the pump outlet lines and front and rear pump branch hoses.
- Keep mounting brackets and hose and cable routing straps tight. Hose routing should have gradual bends.

DISPOSE OF ALL PETROLEUM-BASED OILS AND FLUIDS PROPERLY

Physical contact with used motor oil may pose a health risk. Wipe oil from your hands promptly and wash off any remaining residue.

Used motor oil is an environmental contaminant and may only be disposed of at approved collection facilities. To prevent pollution of the environment, always do the following;

- Never dump waste oil in a sewer system, rivers, etc.
- Always put oil drained from your machine in containers. Never drain oil directly onto the ground.
- Obey appropriate laws and regulations when disposing of harmful materials such as oil, fuel, solvent, filters, and batteries.

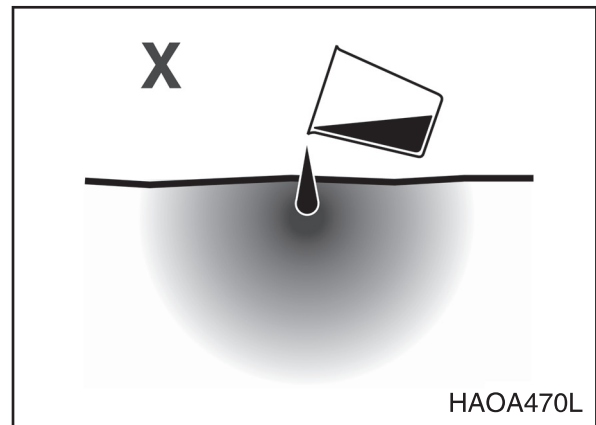


Figure.30

CHECK TIRE PRESSURE AND CONDITION

Maintain tire pressure but do not over inflate. Inspect tires and wheels daily. When inflating tires, follow procedures in Maintenance Section, which include using an extension to allow you to avoid standing in front of or over a tire. Do not change a tire unless you have both experience and proper equipment.

BATTERY HAZARD PREVENTION

Battery electrolyte contains diluted sulfuric acid and batteries generate hydrogen gas. Hydrogen gas is highly explosive, and mistakes in handling them can cause serious injury or fire. To prevent problems, always do the following;

- Do not smoke or bring any flame near the battery.
- When working with batteries, ALWAYS wear safety glasses and rubber gloves.
- If you spill battery electrolyte on yourself or your clothes, immediately flush the area with water.
- If battery electrolyte gets into your eyes, flush them immediately with large quantities of water and see a doctor at once.
- If you accidentally drink battery electrolyte, drink a large quantity of water or milk, raw egg or vegetable oil. Call a doctor or poison prevention center immediately.
- When cleaning the top surface of the battery, wipe it with a clean, damp cloth. Never use gasoline, thinner, or any other organic solvent or detergent.
- Tighten the battery caps securely.
- Explosive battery gas can be set off by sparks from incidental contact or static discharge. Turn "OFF" all switches and engine when working on batteries. Keep battery terminals tight. Contact between a loose terminal and post can create an explosive spark.
- If the battery electrolyte is frozen, do not charge the battery or start the engine with power from another source. There is danger that the battery may catch fire.
- When charging the battery or starting with power from another source, let the battery electrolyte melt and check that there is no leakage of battery electrolyte before starting the operation.
- Always remove the battery from the machine before charging.

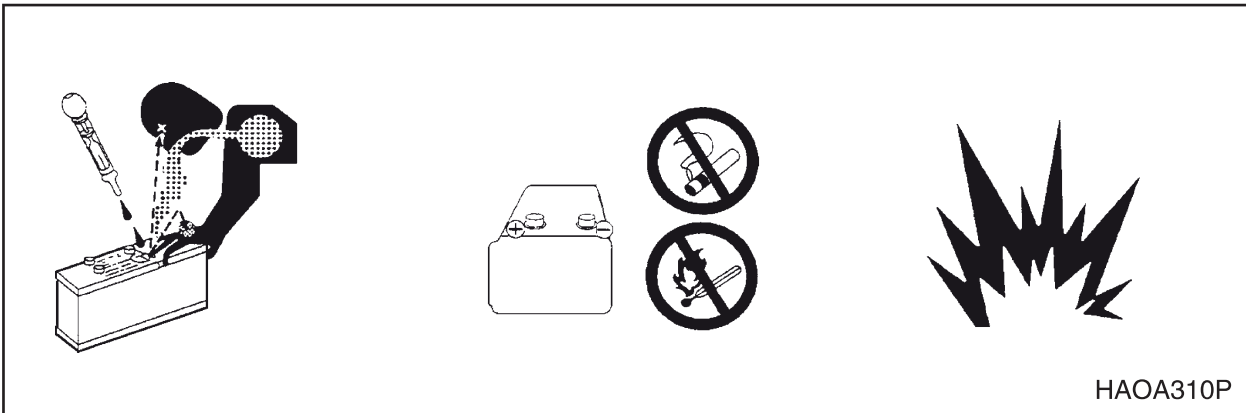


Figure.31

DISCONNECT BATTERIES BEFORE ELECTRICAL SERVICE OR ELECTRICAL WELDING

Remove cable to negative terminal first when disconnecting cable. Connect positive terminal cables first when installing a battery.

USE LOW HEAT PORTABLE LIGHTING

Hot surfaces on trouble lights or portable work lights can set off fuel or battery explosive gases.

BOOST STARTING OR CHARGING ENGINE BATTERIES

If any mistake is made in the method of connecting the booster cables, it may cause an explosion or fire. Always do the following:

- Turn off all electrical equipment before connecting leads to the battery. This includes electrical switches on the battery charger or boost starting equipment.
- When boost-starting from another machine or vehicle do not allow the two machines to touch. Wear safety glasses or goggles while required battery connections are made.
- 24 volt battery units consisting of two series-connected twelve volt batteries have a cable connecting one positive terminal on one of the 12 volt batteries to a negative terminal on the other battery. Booster or charger cable connections must be made between the nonseries-connected positive terminals and between the negative terminal of the booster battery and the metal frame of the machine being boosted or charged. Refer to the procedure and illustration in Operation and Maintenance Manual.
- Connect positive cable first when installing cables and disconnect the negative cable first when removing them. The final cable connection, at the metal frame of the machine being charged or boost-started, should be as far away from the batteries as possible.

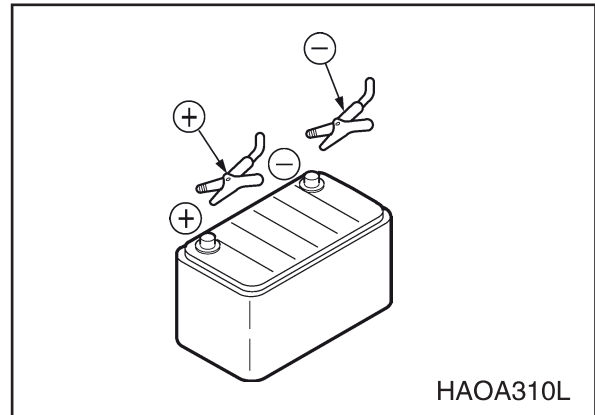


Figure.32

TOWING

PRECAUTIONS WHEN TOWING

If any mistake is made in the method of selecting or inspecting the towing wire or in the method of towing, it may lead to serious personal injury. Always do the following;

- Always use the method of towing given in this Operation and Maintenance Manual. Do not use any other method.
- Use leather gloves when handling the wire rope.
- When carrying out the preparation work for towing with two or more workers, determine the signals to use and follow these signals correctly.
- If the engine on the problem machine will not start or there is a failure in the brake system, always contact your DISD distributor.
- Never go between the towing machine and the towed machine during the towing operation.
- It is dangerous to carry out towing on slopes, so select a place where the slope is gradual. If there is no place where the slope is gradual, carry out operations to reduce the angle of the slope before starting the towing operation.
- When towing a problem machine, always use a wire rope with a sufficient towing capacity.
- Do not use a frayed, kinked rope or a rope with any loss of diameter.

SHIPPING AND TRANSPORTATION

OBEY STATE AND LOCAL OVER-THE-ROAD REGULATIONS


Check state and local restrictions regarding weight, width and length of a load before making any other preparation for transport.

Hauling vehicle, trailer and load must all be in compliance with local regulations governing intended shipping route.

Partial disassembly or tear-down of wheel loader may be necessary to meet travel restrictions or particular conditions at work site.

Refer to the section "Transportation" section of operation manual.

SUMMARY OF SAFETY PRECAUTIONS FOR LIFTING

| |
|--|
|  WARNING! |
| Improper lifting can allow load to shift and cause personal injury or damage to the machine |

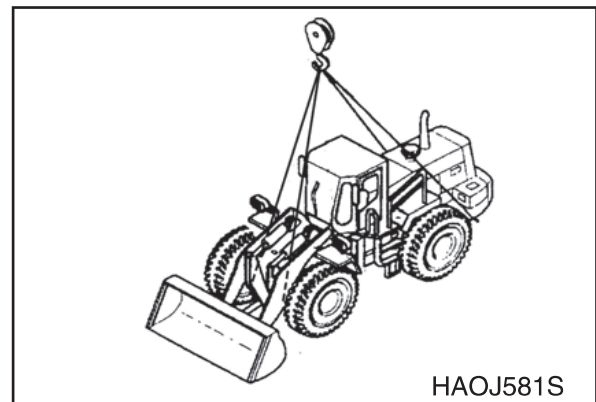


Figure.33

To make safe lifts, the following items must be evaluated by operator and work site crew.

- Condition of ground support.
- Wheel loader configuration and attachments.
- Weight, lifting height and lifting radius.
- Safe rigging of load.
- Proper handling of suspended load.

Taglines on opposite sides of load can be very helpful in keeping a suspended load secure, if they are anchored safely to control points on ground.

SPECIFICATIONS

SPECIFICATIONS FOR



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

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COMPONENT LOCATIONS

Figure 1 identifies the location of major machine components.

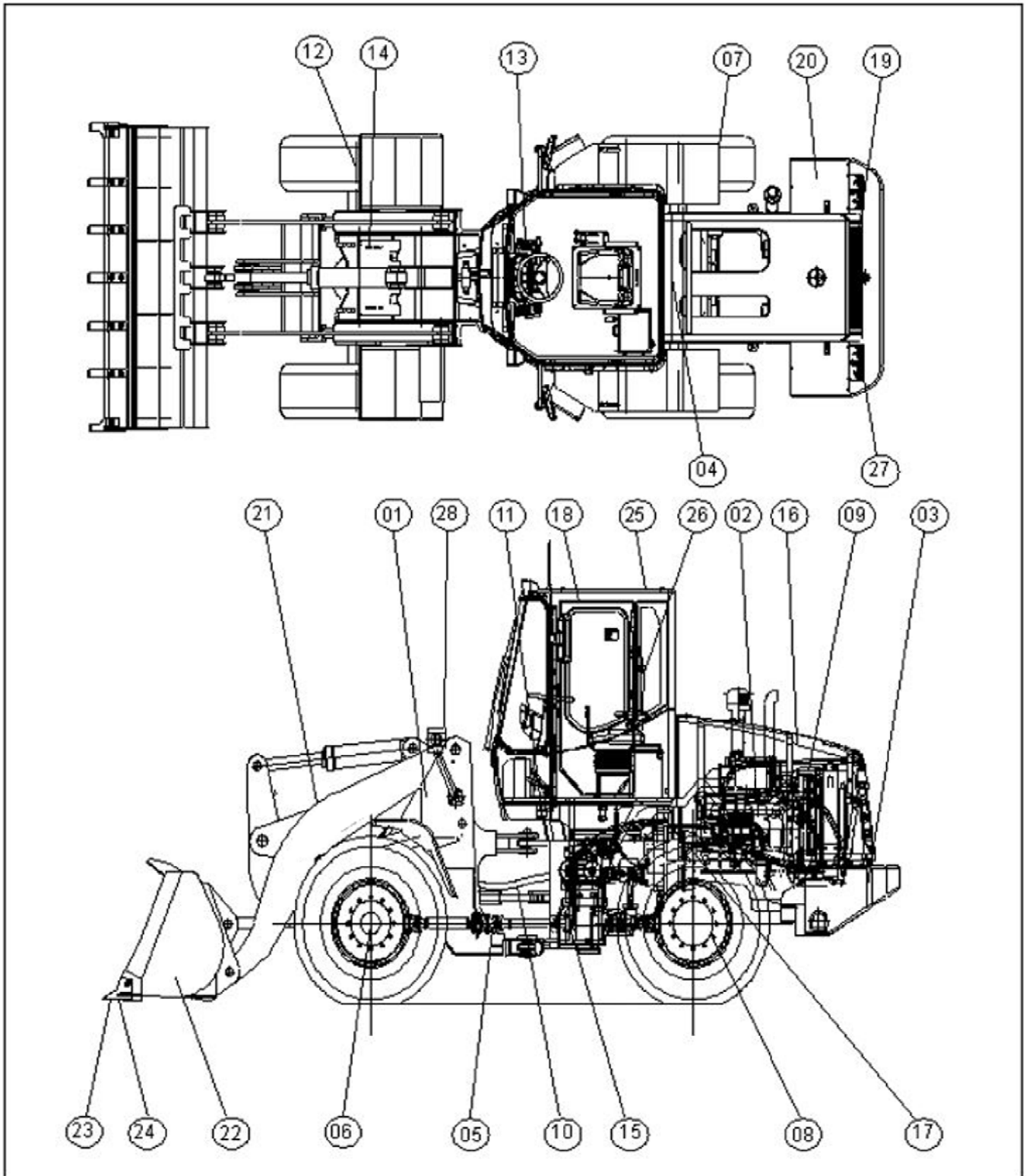


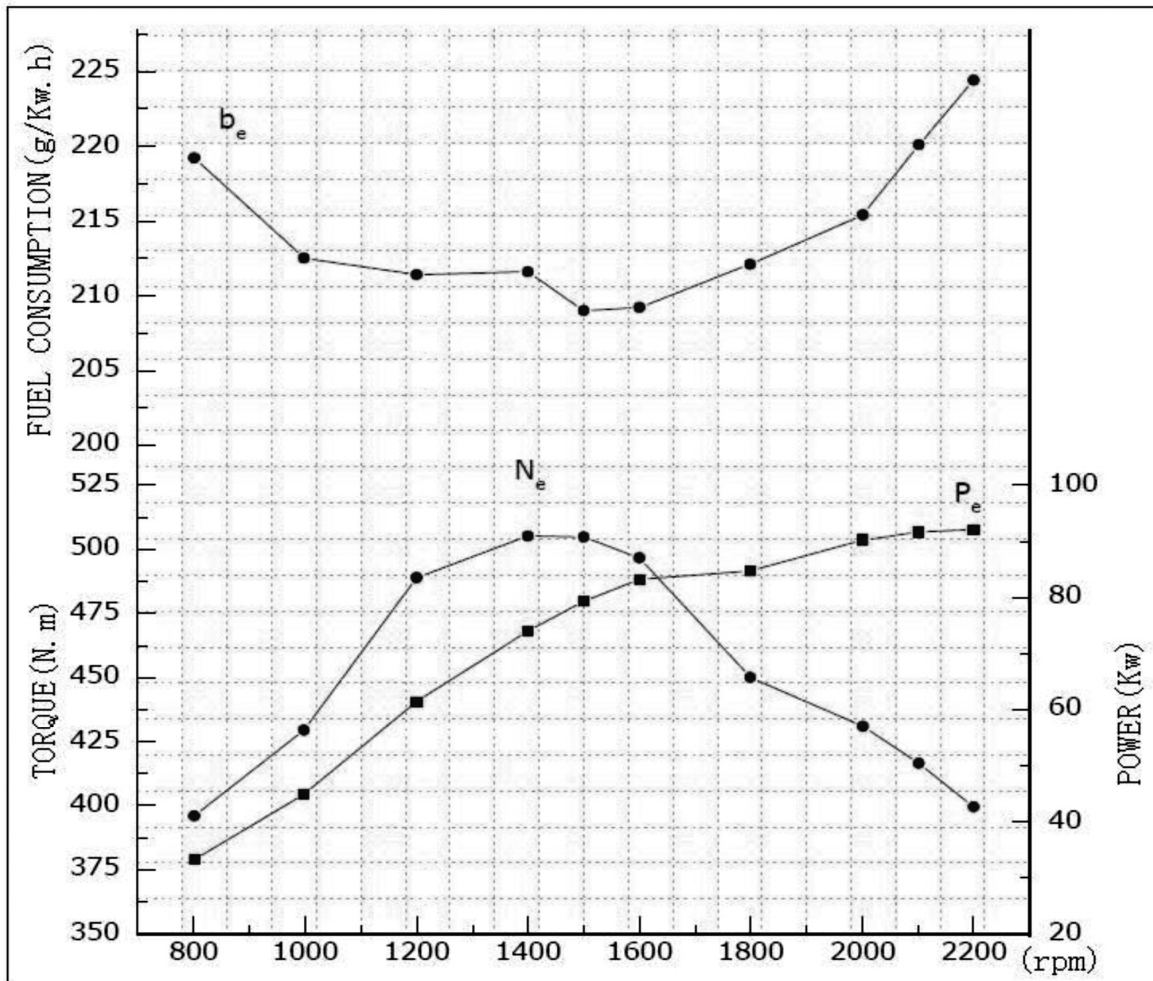
Figure.1

| Reference Number | Description | Reference Number | Description |
|------------------|------------------------|------------------|-----------------|
| 1 | Frame | 15 | Handrail |
| 2 | E/G and T/M Ass`y | 16 | Engine Cover |
| 3 | Fuel Tank | 17 | Damper |
| 4 | Oil Tank | 18 | Cabin Interior |
| 5 | Axel and Driving shaft | 19 | Radiator Grille |
| 6 | Axel and Driving shaft | 20 | Counterweight |
| 7 | Tire | 21 | Working Device |
| 8 | Axle Hub | 22 | Bucket |
| 9 | Cooling Pipe line | 23 | Tooth |
| 10 | Main Pipe line | 24 | Cutting Edge |
| 11 | Steering Pipe line | 25 | Cabin |
| 12 | Brake Pipe line | 26 | Seat |
| 13 | Brake System | 27 | Lamp-Rear |
| 14 | Main Control valve | 28 | Lamp-Front |

GENERAL SPECIFICATIONS

| Item | | |
|--|---|---|
| Standard Bucket Capacity | | 1.70 m ³ (2.22 yd ³) |
| Vehicle Weight | | 10,300 kg (22,708 lb) |
| Engine | | |
| Type | Weichai | |
| Rated power (SAE J 1995 gross) | 125 ps @ 2,200 rpm (123 hp @ 2,200 rpm) | |
| Max. Torque (SAE J 1995 gross) | 51 kg•m / 1,500 rpm (368 ft lb @ 1,500 rpm) | |
| Transmission | | |
| Mechanical gear shift | Mechanical gear shift | |
| Speeds | 2 Forward, 1 Reverse | |
| Brake Systems | | |
| Service Brakes | 4 Wheel, Dry Disks, Single Pedal | |
| Parking Brake | Dry Disc on Transmission | |
| Performance | | |
| Travel Speed (1 / 2) | 8 (4.97) / 15 (9.3) km/h (mph) | |
| Steering Angle | + 40° | |
| Min. Tire Turning Radius (Tire Center) | 4,241 mm | |
| Max Tractive Effort | 9,693 kg (21,772 lb) | |
| Max. Breakout Force | 9,184kg (20,247 lb) | |
| Bucket Rise Time | 5.5 Seconds | |
| Bucket Dump Time | 1.0 Seconds | |
| Bucket Descent Time | 3.2 Seconds | |
| Working Range | | |
| Dump Height at 45° (w/o teeth) | 2,910 mm (9' - 6") | |
| Dump Reach at 45° (w/o teeth) | 950 mm (3' - 1") | |
| Max Dump Angle at Fully Raised | 45° | |
| Max Tilt Angle at Carry | 50° | |
| Travel Dimension | | |
| Overall Length | 6,900 mm (22' - 8") | |
| Overall Width | 2,515 mm (8' - 3") | |
| Overall Height | 3,280 mm (10' - 9") | |
| Tread | 1,850 mm (6' - 1") | |
| Axle Base | 2,830mm (9' - 3") | |
| Ground Clearance | 340 mm (1' - 1") | |

ENGINE PERFORMANCE CURVES



| Serial Number | 1001 and Up |
|--|---|
| Engine Type | WP6G125E22 |
| Rated Power (209 hp @ 2,200 rpm) | 125 ps @ 2,200 rpm (123 hp @ 2,200 rpm) |
| Maximum Torque (666 ft lb @ 1,300 rpm) | 51 kg•m @ 1,500 rpm (368 ft lb @ 1,500 rpm) |
| Fuel Consumption | 158 g / ps.h |
| Performance Standard | SAE J 1995 gross |

NOTE: Barometric Pressure: 760 mm (30") Mercury

Temperature: 20°C (68°F)

W/O Cooling Fan: Driven by engine

Alternator: 24 V, 50 amp

Exhaust System: Complete, attached

Air Cleaner; Installed

WORKING RANGE AND DIMENSIONS

Figure 3, illustrates exterior machine dimensions and working range of machine when it is equipped with a standard bucket.

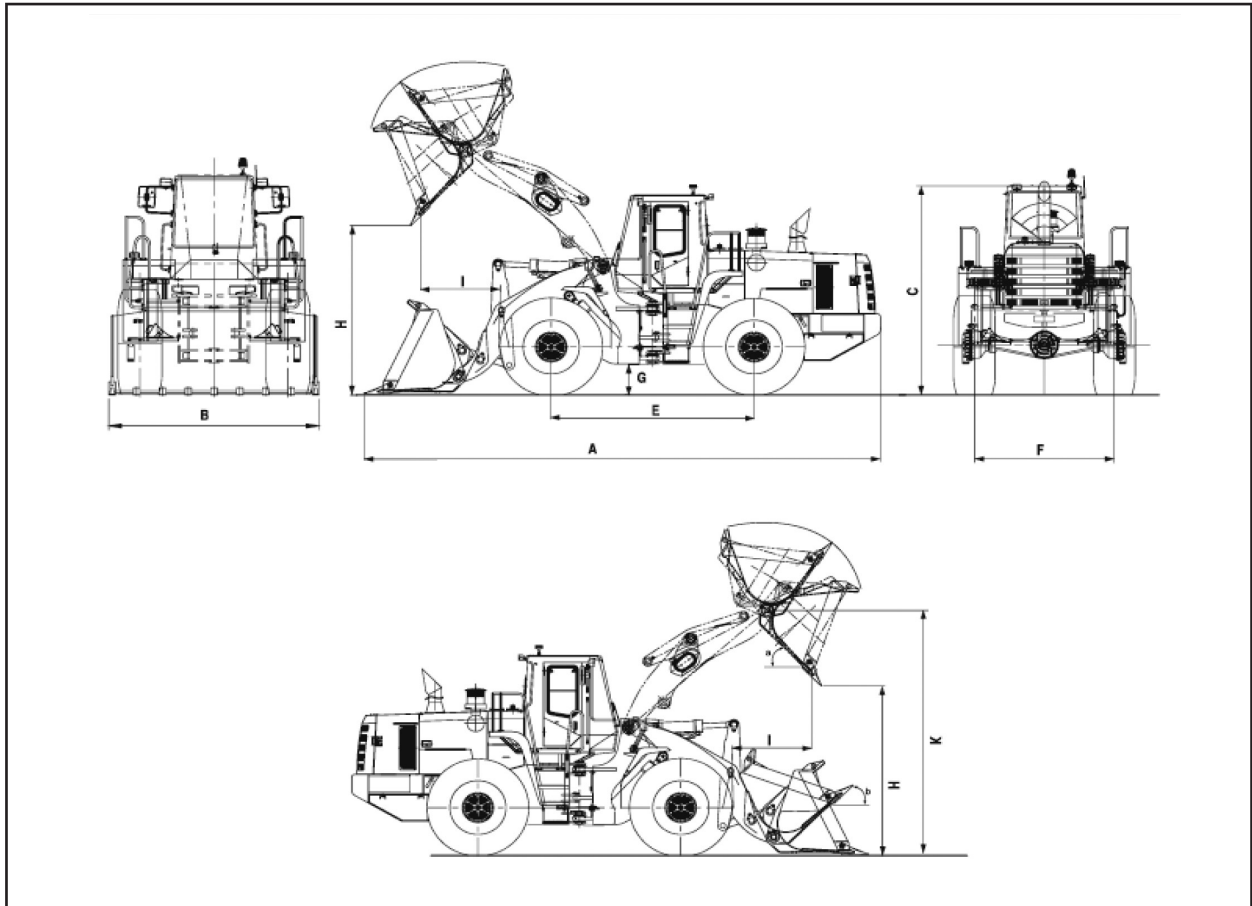


Figure.3

| Category | Dimension | Category | Dimension |
|----------------------|---------------------|-------------------------------------|--------------------|
| Overall Length (A) | 6,900 mm (22' - 8") | Dump Height, to tooth (H) | 2,900 mm (9' - 6") |
| Overall Width (B) | 2,515 mm (8' - 3") | Dump Distance, to Bucket Edge (I) | 950 mm (3' - 1") |
| Overall Height (C) | 3,280 mm (10' - 9") | Dump Height to Bucket Pivot (K) | 3,727 mm (12'3") |
| Axle Base (E) | 2,830mm (9' - 3") | Max. Dump Angle at Fully Raised (a) | 45° |
| Tread (F) | 1,850 mm (6' - 1") | Max. Tilt Angle at Carry (b) | 50° |
| Ground Clearance (G) | 340 mm (1' - 1") | Tire Size | 17.5-25 |

WORKING CAPACITIES

BUCKET CAPACITY

Standard toothed bucket has a capacity of 1.7 m³. An optional bucket equipped with big bucket has a capacity of 2.2 m³.

TIPPING LOAD

Static Tipping Load with bucket at max reach position is 6,530 kg (14,396 lb).

MATERIAL WEIGHT

The data below describes weight of a cubic meter (cubic yard) of many types of workload materials.

APPROXIMATE WEIGHT OF WORKLOAD MATERIALS

| MATERIAL | LOW WEIGHT OR DENSITY 1,100 KG/M ³ (1,850 LB/YD ³), OR LESS | MEDIUM WEIGHT OR DENSITY 1,600 KG/M ³ (2,700 LB/YD ³), OR LESS | HIGH WEIGHT OR DENSITY 2,000 KG/M ³ (3,370 LB/YD ³), OR LESS |
|----------------------------------|---|--|--|
| Charcoal | 401 kg/m ³ (695 lb/yd ³) | ----- | ----- |
| Coke, blast furnace size | 433 kg/m ³ (729 lb/yd ³) | ----- | ----- |
| Coke, foundry size | 449 kg/m ³ (756 lb/yd ³) | ----- | ----- |
| Coal, bituminous slack, piled | 801 kg/m ³ (1,350 lb/yd ³) | ----- | ----- |
| Coal, bituminous r. of m., piled | 881 kg/m ³ (1,485 lb/yd ³) | ----- | ----- |
| Coal, anthracite | 897 kg/m ³ (1,512 lb/yd ³) | ----- | ----- |
| Clay, DRY, in broken lumps | 1,009 kg/m ³ (1,701 lb/yd ³) | ----- | ----- |
| Clay, DAMP, natural bed | ----- | 1,746 kg/m ³ (2,943 lb/yd ³) | ----- |

| Material | LOW WEIGHT OR DENSITY 1,100 KG/M³ (1,850 LB/YD³), OR LESS | MEDIUM WEIGHT OR DENSITY 1,600 KG/M³ (2,700 LB/YD³), OR LESS | HIGH WEIGHT OR DENSITY 2,000 KG/M³ (3,370 LB/YD³), OR LESS |
|------------------------------------|--|---|---|
| Cement, Portland, DRY granular | ----- | 1,506 kg/m ³ (2,583 lb/yd ³) | ----- |
| Cement, Portland, DRY clinkers | ----- | 1,362 kg/m ³ (2,295 lb/yd ³) | ----- |
| Dolomite, crushed | ----- | 1,522 kg/m ³ (2,565 lb/yd ³) | ----- |
| Earth, loamy, DRY, loose | ----- | 1,202 kg/m ³ (2,025 lb/yd ³) | ----- |
| Earth, DRY, packed | ----- | 1,522 kg/m ³ (2,565 lb/y d ³) | ----- |
| Earth, WET, muddy | ----- | ----- | 1,762 kg/m ³ (2,970lb/yd ³) |
| Gypsum, calcined, (heated, powder) | 961kg/m ³ (1,620 lb/yd ³) | ----- | ----- |
| Gypsum, crushed to 3 inch size | ----- | 1,522 kg/m ³ (2,565 lb/y d ³) | ----- |
| Gravel, DRY, packed fragments | ----- | ----- | 1,810 kg/m ³ (3,051 lb/y d ³) |
| Gravel, WET, packed fragments | ----- | ----- | 1,522 kg/m ³ (3,240 lb/y d ³) |
| Limestone, graded above 2 | ----- | 1,282 kg/m ³ (2,160 lb/y d ³) | ----- |
| Limestone, graded 1-1/2 or 2 | ----- | 1,362 kg/m ³ (2,295 lb/y d ³) | ----- |
| Limestone, crushed | ----- | 1,522 kg/m ³ (2,565 lb/y d ³) | ----- |
| Limestone, fine | ----- | ----- | 1,602 kg/m ³ (2,705 lb/y d ³) |
| Phosphate, rock | ----- | 1,282 kg/m ³ (2,160 lb/y d ³) | ----- |

| Material | LOW WEIGHT OR DENSITY 1,100 KG/M³ (1,850 LB/YD³), OR LESS | MEDIUM WEIGHT OR DENSITY 1,600 KG/M³ (2,700 LB/YD³), OR LESS | HIGH WEIGHT OR DENSITY 2,000 KG/M³ (3,370 LB/YD³), OR LESS |
|---------------------|--|---|---|
| Salt | 929 kg/m ³ (1,566 lb/yd ³) | ----- | ----- |
| Snow, light density | 529 kg/m ³ (891 lb/yd ³) | ----- | ----- |
| Sand, DRY, loose | ----- | 1,522 kg/m ³ (2,565 lb/yd ³) | ----- |
| Sand, WET, packed | ----- | ----- | 1,922 kg/m ³ (3,240 lb/yd ³) |
| Shale, broken | ----- | 1,362 kg/m ³ (2,295 lb/y d ³) | ----- |
| Sulphur, broken | 529 kg/m ³ (891 lb/yd ³) | ----- | ----- |

IMPORTANT

Weights are approximations of estimated average volume and mass. Exposure to rain, snow or ground water; settling or compaction due to overhead weight and chemical or industrial processing or changes due to thermal or chemical transformations could all increase value of weights listed in table..

GENERAL MAINTENANCE

GENERAL MAINTENANCE PROCEDURES



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that is in good working order.

Use lifting and hoisting equipment capable of safely handling load.


Remember, that ultimately safety is your own personal responsibility.

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WELDING PRECAUTIONS AND GUIDELINES

| |
|---|
| IMPORTANT |
| <p>To avoid accidents, personal injury and the possibility of causing damage to the machine or to components, welding must only be performed by properly trained and qualified personnel, who possess the correct certification (when required) for the specific welding fabrication or specialized repair being performed.</p> |

| |
|---|
|  WARNING! |
| <p>Structural elements of the machine may be built from a variety of steels. These could contain unique alloys or may have been heat treated to obtain particular strength characteristics. It is extremely important that welding repairs on these types of steel are performed with the proper procedures and equipment. If repairs are performed incorrectly, structural weakening or other damage to the machine (that is not always readily visible) could be caused. Always consult DISD After Sales Service before welding on integral components (loader arm, frames, car body, track frames, turntable, attachment, etc.) of the machine. It is possible that some types of structurally critical repairs may require Magnetic Particle or Liquid Penetrant testing, to make sure there are no hidden cracks or damage, before the machine can be returned to service.</p> |

| |
|---|
|  CAUTION! |
| <p>Always perform welding procedures with the proper safety equipment on hand. Adequate ventilation and a dry work area are absolutely essential. Keep a fire extinguisher nearby and always wear protective clothing and the recommended type of eye protection.</p> |



CAUTION!

Observe the following safety precautions:

1. Use extra caution and adequate safety shielding when welding near fuel and oil tanks, batteries, hydraulic piping lines or other fire hazards.
2. Never weld when the engine is running. Battery cables must be disconnected before the welding procedure is started.
3. Never weld on a wet or damp surface. The presence of moisture causes hydrogen embrittlement and structural weakening of the weld.
4. If welding procedures are being performed near cylinder rods, operator's cab window areas or any other assemblies that could be damaged by weld spatters, use adequate shielding protection in front of the assembly.
5. During equipment setup, always attach ground cables directly to the area or component being welded to prevent arcing through bearings, bushings, or spacers.
6. Always use correct welding rods for the type of weld being performed and observe recommended precautions and time constraints. AWS Class E7018 welding rods for low alloy to medium carbon steel must be used within two hours after removal from a freshly opened container. Class E11018G welding rods for T-1 and other higher strength steel must be used within 1/2 hour.

HYDRAULIC SYSTEM - GENERAL PRECAUTIONS

Always maintain oil level in the system at recommended levels. Assemblies that operate under heavy loads, at high speed, with extremely precise dimensional tolerances between moving parts - pistons and cylinders, or shoes and swash plates, for example - can be severely damaged if oil supply runs dry.

Assemblies can be run dry and damaged severely in a very short time when piping or hoses are disconnected to repair leaks and/or replace damaged components. Hoses that are inadvertently switched during disassembly (inlet for outlet and vice versa), air introduced into the system or assemblies that are low on oil due to neglect or careless maintenance, could all produce sufficient fluid loss to cause damage. When starting the engine (particularly after long layoff or storage intervals), make sure that all hydraulic controls and operating circuits are in neutral, or "OFF." That will prevent pumps or other components that may be temporarily oil-starved from being run under a load.

Replacement of any hydraulic system component could require thorough cleaning, flushing, and some amount of pre-filling with fresh, clean oil if the protective seal on replacement parts has obviously been broken or if seal integrity may have been compromised. When protective seals are removed before installation and reassembly, inspect all replacement parts carefully, before they are installed. If the replacement part is bone dry (with no trace of factory pre-lube) or has been contaminated by dirt or by questionable oils, flushing and pre-filling with clean hydraulic fluid is recommended.

Vibration, irregular or difficult movement or unusual noise from any part of the hydraulic system could be an indication of air in the system (and many other types of problems). As a general precaution (and to help minimize the risk of potential long-term damage), allow the engine to run at no-load idle speed immediately after initial start-up. Hydraulic fluid will circulate, releasing any air that may have been trapped in the system before load demands are imposed.

A daily walk-around pre-start equipment safety inspection, including a quick visual scan for any exterior evidence of leaking hydraulic fluid, can help extend the service life of system components.

IMPORTANT

Hydraulic system operating conditions (repetitive cycling, heavy work loads, fluid circulating under high pressure) make it extremely critical that dust, grit or any other type of contamination be kept out of the system. Observe fluid and filter change maintenance interval recommendations and always pre-clean any exterior surface of the system before it is exposed to air. For example, the reservoir filler cap and neck area, hoses that have to be disassembled, and the covers and external surfaces of filter canisters should all be cleaned before disassembly.

MAINTENANCE SERVICE AND REPAIR PROCEDURE

GENERAL PRECAUTIONS

Fluid level and condition should always be checked whenever any other type of maintenance service or repair is being performed.

NOTE: *If the unit is being used in an extreme temperature environment (in sub-freezing climates or in high temperature, high humidity tropical conditions), frequent purging of moisture condensation from the hydraulic reservoir drain tap should be a regular and frequent part of the operating routine. In more moderate, temperate climates, draining reservoir sediment and moisture may not be required more than once or twice every few months.*

Inspect drained oil and used filters for signs of abnormal coloring or visible fluid contamination at every oil change. Abrasive grit or dust particles will cause discoloration and darkening of the fluid. Visible accumulations of dirt or grit could be an indication that filter elements are overloaded (and will require more frequent replacement) or that disintegrating bearings or other component failures in the hydraulic circuit may be imminent or have already occurred. Open the drain plugs on the main pump casings and check and compare drain oil in the pumps. Look for evidence of grit or metallic particles.

Vibration or unusual noise during operation could be an indication of air leaking into the circuit (Refer to the appropriate Troubleshooting section for component or unit for procedures.), or it may be evidence of a defective pump. The gear-type pilot pump could be defective, causing low pilot pressure, or a main pump broken shoe or piston could be responsible.

NOTE: *If equipped, indicated operating pressure, as shown on the multidisplay digital gauge on the Instrument Panel ("F-Pump" and "R-Pump") will be reduced as a result of a mechanical problem inside the pump. However, pressure loss could also be due to cavitation or air leakage, or other faults in the hydraulic system.*

Check the exterior case drain oil in the main pumps. If no metallic particles are found, make sure there is no air in the system. Unbolt and remove the tank return drain line from the top part of the swing motor, both travel motors and each main pump. If there is air in any one of the drain lines, carefully pre-fill the assembly before bolting together the drain line piping connections. Run the system at low rpm.

HYDRAULIC SYSTEM CLEANLINESS AND OIL LEAKS

MAINTENANCE PRECAUTIONS FOR HYDRAULIC SYSTEM SERVICE

Whenever maintenance, repairs or any other type of troubleshooting or service is being performed, it's important to remember that the hydraulic system - including both the interior and exterior surfaces of assemblies, and every drop of operating fluid - must be protected from contamination.

Dust and other foreign contaminants are major contributors to premature wear in hydraulic circuits. The narrow tolerances, rapidly moving parts and high operating pressures of the system require that fluid be kept as clean as possible. The performance and dependability of the machine (and the service life of individual components) can be noticeably reduced if proper precautions are not observed:

- Use a safe, noncombustible, evaporative-type, low-residue solvent and thoroughly clean exterior surfaces of assemblies before any part of the circuit is opened up or disassembled.

NOTE:*It's just as important to clean the cap and reservoir top before routine fluid changes or quick checks as it is before major repairs. (Accumulated dirt attracts moisture, oil and other fluids - and more dirt.)*

- Keep dismantled parts covered during disassembly. Use clean caps, plugs or tape to protect the disconnected openings of flanges, manifolds and piping.
- Do not allow cleaning solvents or other fluids to mix with the oil in the system. Use clean oil to flush any traces of solvent or other residue before reassembly.
- If metal or rubber fragments are found in the system, flush and replace all fluid in the system and troubleshoot the circuit to identify the source of contamination.

IMPORTANT

Make sure that cleaning solvents will be compatible with rubber materials used in the hydraulic system. Many petroleum based compounds can cause swelling, softening, or other deterioration of system sealing elements, such as O-rings, caps and other seals.

OIL LEAKAGE PRECAUTIONS

Oil that is visibly seeping from joints or seals should always serve as a "red flag" alarm.

Leaks must alert the machine operator and maintenance crew that air, water and dirt have an open, free passageway through which to enter the circuit. Harsh, corrosive salt air, freezing and thawing condensation cycles and working environments that are full of fine dust are especially hazardous. Clogging of valve spools or external piping (especially pilot circuit piping) can gradually diminish or very suddenly put a complete stop to normal hydraulic function. You can prevent having to make these types of repairs by following recommended assembly procedures:

1. Use new O-rings and oil seals whenever hydraulic assemblies are rebuilt.
2. Prepare joint surfaces before assembly by checking alignment and flatness. Clean and repair corrosion or any other damage.
3. Follow bolt torque recommendations and all other assembly requirements

NOTE: Grease lip seals before assembly.

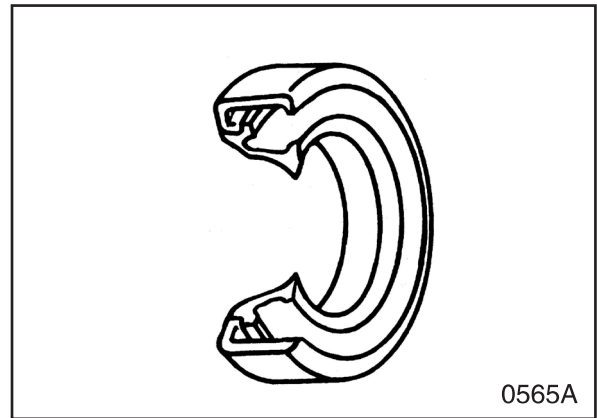


Figure.1

CLEANING AND INSPECTION

GENERAL GUIDELINES

All parts must be clean to permit an effective inspection. During assembly, it is very important that no dirt or foreign material enters unit being assembled. Even minute particles can cause malfunction of close fitting parts such as thrust bearing, matched parts, etc.



WARNING!

Care should be exercised to avoid inhalation of vapors, exposure to skin and creating fire hazards when using solvent type cleaners.

1. Clean all metal parts thoroughly using a suitable cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved up and down slowly until all oils, lubricants, and/or foreign materials are dissolved and parts are thoroughly clean.
2. For bearings that can be removed, soak them in a suitable cleaning fluid for a minute or two, then remove bearings from cleaning fluid and strike flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. To dry bearings, use moisture-free compressed air. Be careful to direct air stream across bearing to avoid spinning bearings that are not lubricated. **DO NOT SPIN BEARINGS WHEN DRYING;** bearings may be rotated slowly by hand to facilitate drying process.
3. Carefully inspect all bearing rollers, cages and cups for wear, chipping or nicks to determine condition. Do not replace a bearing cone or cup individually without replacing mating cup or cone at the same time. After inspection, dip bearings in light weight oil and wrap in clean lintless cloth or paper to protect them until installation.
For those bearings that are to be inspected in place; inspect bearings for roughness of rotation, scoring, pitting, cracked or chipped races. If any of these defects are found, replace bearings. Also inspect defective bearing housing and/or shaft for grooved, galled or burred conditions that indicate bearing has been turning in its housing or on its shaft.
4. It is more economical to replace oil seals, O-rings, sealing rings, gaskets and snap rings when unit is disassembled than waiting for premature failures; refer to latest Micro Fiche and/or Parts Book for replacement items. Be extremely careful when installing sealing members, to avoid cutting or scratching. Curling under of any seal lip will seriously impair its efficiency. Apply a thin coat of Loctite

#120 to outer diameter, of metal casing, on oil seals to assure an oil tight fit into retainer. Use extreme care not to get Loctite on lips of oil seals. If this happens, that portion of the seal will become brittle and allow leakage.

When replacing lip type seals, make sure spring loaded side is towards oil to be sealed.

5. If available, use magna-flux or similar process for checking for cracks that are not visible to the eye. Examine teeth on all gears carefully for wear, pitting, chipping, nicks, cracks or scores. Replace all gears showing cracks or spots where case hardening has worn through. Small nicks may be removed with suitable hone. Inspect shafts and quills to make certain they have not been sprung, bent, or splines twisted and that shafts are true.

NOTE: Spline wear is not considered detrimental except where it affects tightness of splined parts.

Inspect thrust washers for distortion, scores, burs, and wear. Replace thrust washer if defective or worn.

6. Inspect bores and bearing surfaces of cast parts and machined surfaces for scratches, wear, grooves and dirt. Remove any scratches and burrs with crocus cloth. Remove foreign material. Replace any parts that are deeply grooved or scratched which would affect their operation.

BEARING INSPECTION

The conditions of the bearing are vital to the smooth and efficient operation of the machinery. When any component containing bearings is disassembled, always carefully examine the condition of the bearings and all of its components for wear and damage.

Once the bearing is removed, clean all parts thoroughly using a suitable cleaning solution. If the bearing is excessively dirty soak the bearing assembly in a light solution and move the bearing around until all lubricants and or foreign materials are dissolved and the parts are thoroughly clean.

When drying bearings, moisture free compressed air can be used. Be careful not to direct the air in a direction which will force the bearing to dry spin while not being properly lubricated.

After the bearings have been cleaned and dried, carefully inspect all bearing rollers, cages and cups for wear, chipping or nicks. If the bearing cannot be removed and is to be inspected in place, check for roughness of rotation, scoring, pitting, cracked or chipped races. If any of these defects are found replace the whole bearing assembly. NEVER replace the bearing alone without replacing the mating cup or the cone at the same time.

After inspection lightly coat the bearing and related parts with oil and wrap in a clean lintless cloth or paper and protect them from moisture and other foreign materials until installation.

It is also important to inspect the bearing housing and/or shaft for grooved, galled or burred conditions that indicate that the bearing has been turning in its housing or on its shaft.

If available, use magna-flux or similar process for checking for cracks that are not visible to the naked eye.

The following illustrations will aid in identifying and diagnosing some of the bearing related problems.

NOTE: *The illustrations will only show tapered roller bearings, but the principles of identifying, diagnosing and remedying the defects are common to all styles and types of bearings.*

Normal Bearing

Smooth even surfaces with no discoloration or marks.

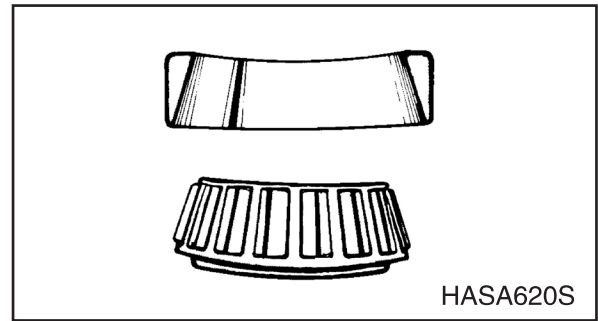


Figure.2

Bent Cage

Cage damage due to improper handling or tool usage.

Replace bearing.

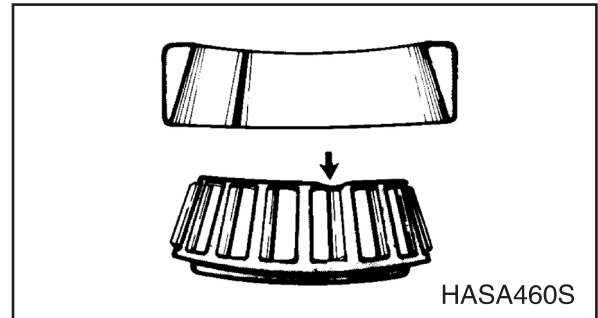


Figure.3

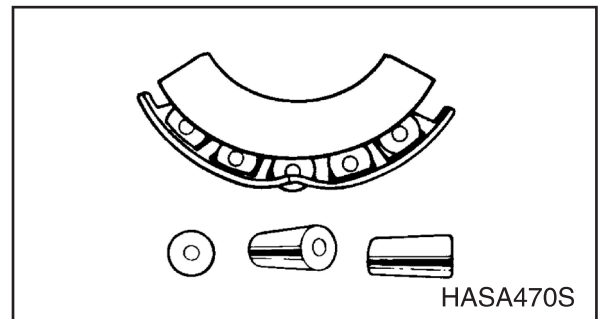


Figure.4

Galling

Metal smears on roller ends due to over heat, lubricant failure or overload.

Replace bearing - check seals and check for proper lubrication.

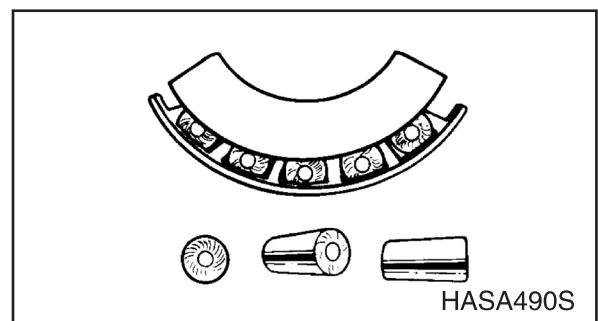


Figure.5

Abrasive Step Wear

Pattern on roller ends caused by fine abrasives.
Clean all parts and housings, check all parts and housings, check seals and bearings and replace if leaking, rough or noisy.

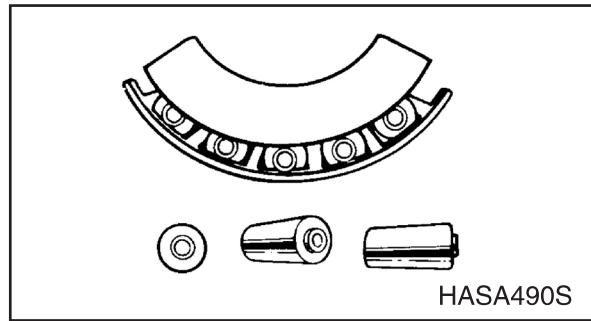


Figure.6

Etching

Bearing surfaces appear gray or grayish black in color with related etching away of material usually at roller spacing.
Replace bearings - check seals and check for proper lubrication.

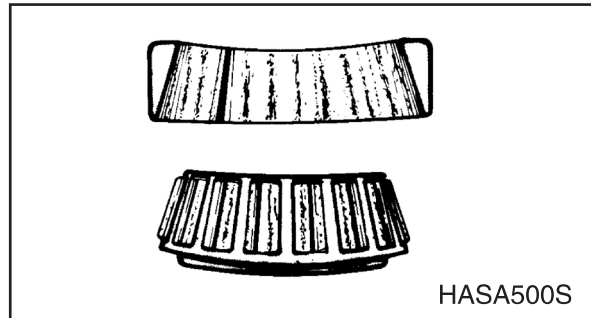


Figure.7

Misalignment

Outer race misalignment due to foreign object.
Clean related parts and replace bearing. Make sure races are properly seated.

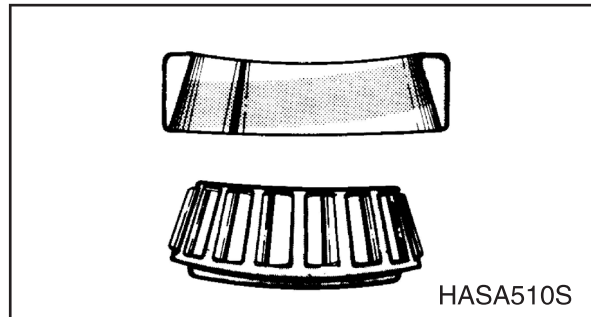


Figure.8

Indentations

Surface depressions on race and rollers caused by hard particles of foreign materials.
Clean all parts and housings, check seals and replace bearings if rough or noisy.

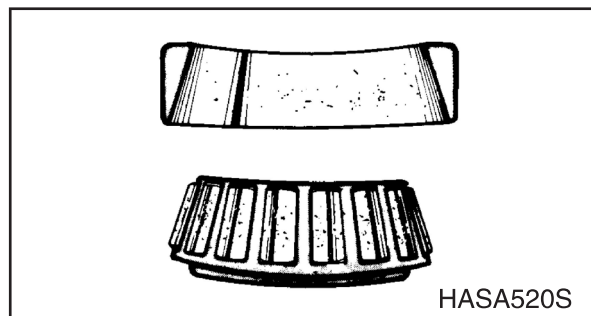


Figure.9

Fatigue Spalling

Flaking of surface metal resulting from fatigue.

Replace bearing - clean all related parts.

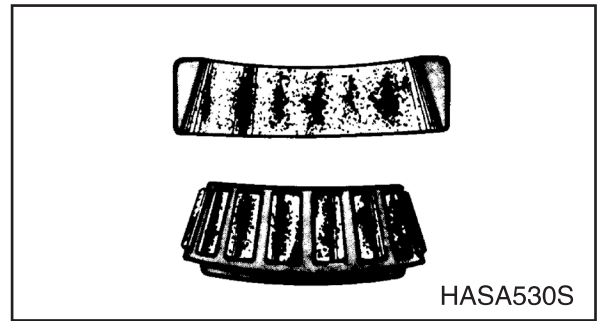


Figure.10

Brinelling

Surface indentations in raceway caused by rollers either under impact loading or vibration while the bearing is not rotating.

Replace bearing if rough or noisy.

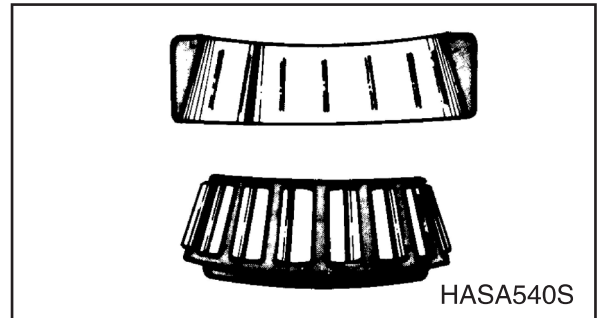


Figure.11

Cage Wear

Wear around outside diameter of cage and roller pockets caused by abrasive material and inefficient lubrication.

Replace bearings - check seals.

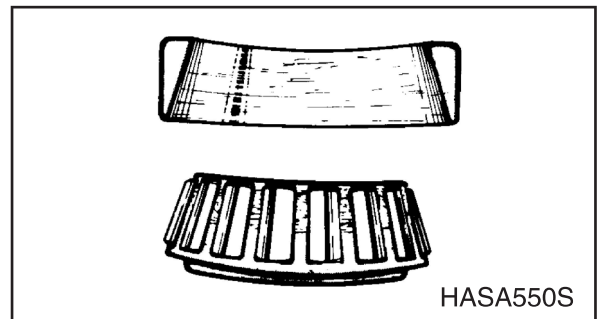


Figure.12

Abrasive Roller Wear

Pattern on races and rollers caused by fine abrasives.

Clean all parts and housings, check seals and bearings and replace if leaking, rough or noisy.

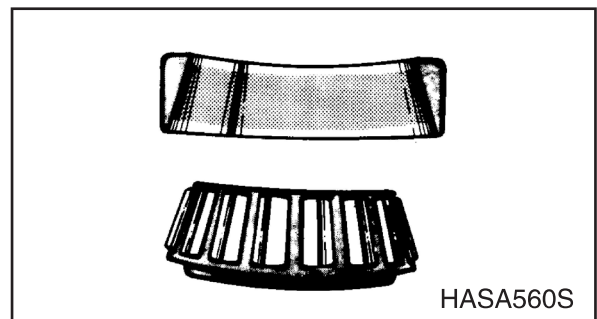


Figure.13

Cracked Inner Race

Race cracked due to improper fit, cocking or poor bearing seat.

Replace all parts and housings, check seals and bearings and replace if leaking.

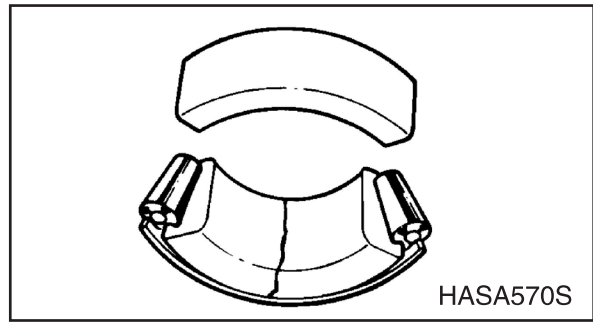


Figure.14

Smears

Smearing of metal due to slippage caused by poor fitting, lubrication, overheating, overloads or handling damage.

Replace bearings, clean related parts and check for proper fit and lubrication.

Replace shaft if damaged.

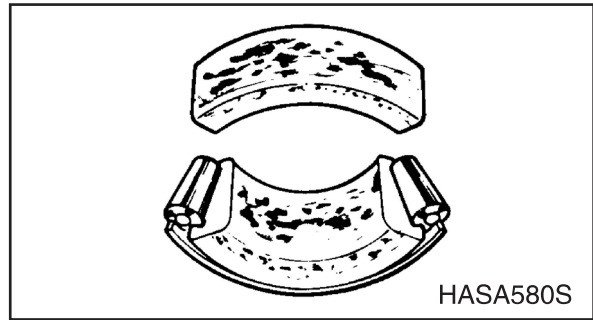


Figure.15

Frottage

Corrosion set up by small relative movement of parts with no lubrication.

Replace bearing. Clean all related parts. Check seals and check for proper lubrication.

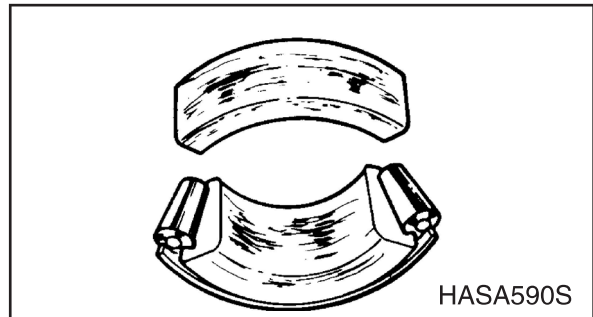


Figure.16

Heat Discoloration

Heat discoloration can range from faint yellow to dark blue resulting from overload or incorrect lubrication.

Excessive heat can cause softening of races or rollers.

To check for loss of temper on races or rollers, a simple file test may be made. A file drawn over a tempered part will grab and cut metal, whereas a file drawn over a hard part will glide readily with no metal cutting.

Replace bearing if over heating damage is indicated. Check seals and other related parts for damage.

Stain Discoloration

Discoloration can range from light brown to black caused by incorrect lubrication or moisture.

if the stain can be removed by light polishing or if no evidence of overheating is visible, the bearing can be reused.

Check seals and other related parts for damage.

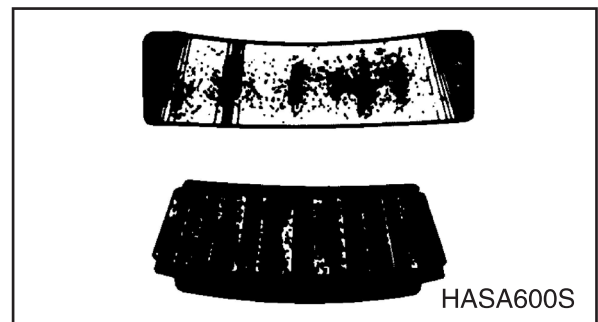


Figure.17

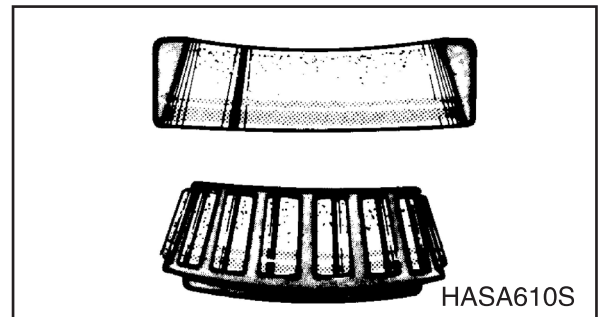


Figure.18

STANDARD TORQUES



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

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TORQUE VALUES FOR STANDARD METRIC FASTENERS

NOTE: The units for the torque values are kg•m (ft lb).

| Dia. x Pitch (mm) | Grade | | | | | | | | | | |
|----------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|--------------------|
| | 3.6 (4A) | 4.6 (4D) | 4.8 (4S) | 5.6 (5D) | 5.8 (5S) | 6.6 (6D) | 6.8 (6S) | 6.9 (6G) | 8.8 (8G) | 10.9 (10K) | 12.9 (12K) |
| M5 x Std. | 0.15 (1.08) | 0.16 (1.15) | 0.25 (1.80) | 0.22 (1.59) | 0.31 (2.24) | 0.28 (2.02) | 0.43 (3.11) | 0.48 (3.47) | 0.50 (3.61) | 0.75 (5.42) | 0.90 (6.50) |
| M6 x Std. | 0.28 (2.02) | 0.30 (2.16) | 0.55 (3.25) | 0.40 (2.89) | 0.55 (3.97) | 0.47 (3.39) | 0.77 (5.56) | 0.85 (6.14) | 0.90 (6.50) | 1.25 (9.04) | 1.50 (10.84) |
| M7 x Std. | 0.43 (3.11) | 0.46 (3.32) | 0.70 (5.06) | 0.63 (4.55) | 0.83 (6.00) | 0.78 (5.64) | 1.20 (8.67) | 1.30 (9.40) | 1.40 (10.12) | 1.95 (14.10) | 2.35 (1.99) |
| M8 x Std. | 0.70 (5.06) | 0.75 (5.42) | 1.10 (7.95) | 1.00 (7.23) | 1.40 (10.12) | 1.25 (9.04) | 1.90 (13.74) | 2.10 (15.18) | 2.20 (15.91) | 3.10 (22.42) | 3.80 (27.48) |
| M8 x 1 | 0.73 (5.28) | 0.80 (5.78) | 1.20 (8.67) | 1.00 (7.23) | 1.50 (10.84) | 1.35 (9.76) | 2.10 (15.18) | 2.30 (16.63) | 2.40 (17.35) | 3.35 (24.23) | 4.10 (29.65) |
| M10 x Std. | 1.35 (9.76) | 1.40 (10.12) | 2.20 (15.91) | 1.90 (13.74) | 2.70 (19.52) | 2.35 (19.99) | 3.70 (26.76) | 4.20 (30.37) | 4.40 (31.18) | 6.20 (44.84) | 7.20 (52.07) |
| M10 x 1 | 1.50 (10.84) | 1.60 (11.57) | 2.50 (18.08) | 2.10 (15.18) | 3.10 (22.42) | 2.80 (20.25) | 4.30 (31.10) | 4.90 (35.44) | 5.00 (36.16) | 7.00 (50.63) | 8.40 (60.75) |
| M12 x Std. | 2.40 (17.35) | 2.50 (18.08) | 3.70 (26.76) | 3.30 (23.86) | 4.70 (33.99) | 4.20 (30.37) | 6.30 (45.56) | 7.20 (52.07) | 7.50 (54.24) | 10.50 (75.94) | 12.50 (90.41) |
| M12 x 1.5 | 2.55 (18.44) | 2.70 (19.52) | 4.00 (28.93) | 3.50 (25.31) | 5.00 (36.16) | 4.50 (32.54) | 6.80 (49.18) | 7.70 (55.69) | 8.00 (57.86) | 11.20 (81.00) | 13.40 (96.92) |
| M14 x Std. | 3.70 (26.76) | 3.90 (28.20) | 6.00 (43.23) | 5.20 (37.61) | 7.50 (54.24) | 7.00 (50.63) | 10.00 (72.33) | 11.50 (83.17) | 12.00 (86.79) | 17.00 (122.96) | 20.00 (144.66) |
| M14 x 1.5 | 4.10 (29.65) | 4.30 (31.10) | 6.60 (47.73) | 5.70 (41.22) | 8.30 (60.03) | 7.50 (54.24) | 11.10 (80.28) | 12.50 (90.41) | 13.00 (94.02) | 18.50 (11.26) | 22.00 (158.12) |
| M16 x Std. | 5.60 (40.50) | 6.00 (43.39) | 9.00 (65.09) | 8.00 (57.86) | 11.50 (83.17) | 10.50 (75.94) | 15.50 (112.11) | 17.90 (129.47) | 18.50 (133.81) | 26.00 (188.05) | 31.00 (224.22) |
| M16 x 1.5 | 6.20 (44.84) | 6.50 (47.01) | 9.70 (70.16) | 8.60 (62.20) | 12.50 (90.41) | 11.30 (81.73) | 17.00 (122.96) | 19.50 (141.04) | 20.00 (144.66) | 28.00 (202.52) | 35.50 (256.77) |
| M18 x Std. | 7.80 (56.41) | 8.30 (60.03) | 12.50 (90.41) | 11.00 (79.56) | 16.00 (115.72) | 14.50 (104.87) | 21.00 (151.89) | 27.50 (198.90) | 28.50 (206.14) | 41.00 (296.55) | 43.00 (311.01) |
| M18 x 1.5 | 9.10 (65.82) | 9.50 (68.71) | 14.40 (104.15) | 12.50 (90.41) | 18.50 (133.81) | 16.70 (120.79) | 24.50 (177.20) | 27.50 (198.90) | 28.50 (206.14) | 41.00 (296.55) | 49.00 (354.41) |
| M20 x Std. | 11.50 (83.17) | 12.00 (86.79) | 20.50 (148.27) | 18.00 (130.19) | 25.00 (180.82) | 22.50 (162.74) | 35.00 (253.15) | 39.50 (285.70) | 41.00 (296.55) | 58.00 (419.51) | 68.00 (491.84) |
| M20 x 1.5 | 12.80 (92.58) | 13.50 (97.64) | 20.50 (148.27) | 18.00 (130.19) | 25.00 (180.82) | 22.50 (162.74) | 35.00 (253.15) | 39.50 (285.70) | 41.00 (296.55) | 58.00 (419.51) | 68.00 (491.84) |
| M22 x Std. | 15.50 (112.11) | 16.00 (115.72) | 24.50 (177.20) | 21.00 (151.89) | 30.00 (216.99) | 26.00 (188.05) | 42.00 (303.78) | 46.00 (332.71) | 49.00 (354.41) | 67.00 (484.61) | 75.00 (542.47) |
| M22 x 1.5 | 17.00 (122.96) | 18.50 (133.81) | 28.00 (202.52) | 24.00 (173.59) | 34.00 (245.92) | 29.00 (209.75) | 47.00 (339.95) | 52.00 (44.76) | 56.00 (405.04) | 75.00 (542.47) | 85.00 (614.80) |
| M24 x Std. | 20.50 (148.27) | 21.50 (155.50) | 33.00 (238.68) | 27.00 (195.29) | 40.00 (289.32) | 34.00 (245.92) | 55.00 (397.81) | 58.00 (419.51) | 63.00 (455.67) | 82.00 (593.10) | 92.00 (655.43) |
| M24 x 1.5 | 23.00 (166.35) | 35.00 (253.15) | 37.00 (267.62) | 31.00 (224.22) | 45.00 (325.48) | 38.00 (202.52) | 61.00 (441.21) | 67.00 (484.61) | 74.00 (535.24) | 93.00 (672.66) | 103.00 (744.99) |

TORQUE VALUES FOR STANDARD U.S. FASTENERS

| TYPE | S.A.E. GRADE | DESCRIPTION | BOLT HEAD MARKING |
|------|--------------|--|---|
| 1 | 1 OR 2 | WILL HAVE NO MARKINGS IN THE CENTER OF THE HEAD. Low or Medium Carbon Steel Not Heat Treated. |  |
| 5 | 5 | WILL HAVE THREE RADIAL LINES. Quenched and Tempered Medium Carbon Steel. |  |
| 8 | 8 | WILL HAVE 6 RADIAL LINES. Quenched and Tempered Special Carbon or Alloy Steel. |  |

Recommended torque, in foot pounds, for all Standard Application Nuts and Bolts, provided:

1. All thread surfaces are clean and lubricated with SAE-30 engine oil. (See Note.)
2. Joints are rigid, that is, no gaskets or compressible materials are used.
3. When reusing nuts or bolts, use minimum torque values.

NOTE: *Multiply the standard torque by:*

0.65 when finished jam nuts are used.

0.70 when Molykote, white lead or similar mixtures are used as lubricants.

0.75 when parkerized bolts or nuts are used.

0.85 when cadmium plated bolts or nuts and zinc bolts w/waxed zinc nuts are used.

0.90 when hardened surfaces are used under the nut or bolt head.

NOTE: *When reusing bolts and nuts in service, use minimum torque values.*

The following General Torque Values must be used in all cases where **SPECIAL TORQUE VALUES** are not given

| NOTE: TORQUE VALUES LISTED THROUGHOUT THIS MANUAL ARE LUBRICATED (WET) THREADS; VALUES SHOULD BE INCREASED 1/3 FOR NONLUBRICATED (DRY) THREADS. | | | | |
|--|--|-------------------------------|--|-------------------------------|
| THREAD SIZE | HEAT TREATED MATERIAL GRADE 5 AND GRADE 8 | | | |
| | GRADE 5 (3 RADIAL DASHES ON HEAD) | | GRADE 8 (6 RADIAL DASHES ON HEAD) | |
| | FOOT POUNDS (ft lb) | NEWTON METER (N•m) | FOOT POUNDS (ft lb) | NEWTON METER (N•m) |
| 1/4" - 20 | 6 | 8 | 9 | 12 |
| 1/4" - 28 | 7 | 9 | 11 | 15 |
| 5/16" - 18 | 13 | 18 | 18 | 24 |
| 5/16" - 24 | 15 | 20 | 21 | 28 |
| 3/8" - 16 | 24 | 33 | 34 | 46 |
| 3/8" - 24 | 27 | 37 | 38 | 52 |
| 7/16" - 14 | 38 | 52 | 54 | 73 |
| 7/16" - 20 | 42 | 57 | 60 | 81 |
| 1/2" - 13 | 58 | 79 | 82 | 111 |
| 1/2" - 20 | 65 | 88 | 90 | 122 |
| 9/16" - 12 | 84 | 114 | 120 | 163 |
| 9/16" - 18 | 93 | 126 | 132 | 179 |
| 5/8" - 11 | 115 | 156 | 165 | 224 |
| 5/8" - 18 | 130 | 176 | 185 | 251 |
| 3/4" - 10 | 205 | 278 | 290 | 393 |
| 3/4" - 16 | 240 | 312 | 320 | 434 |
| 7/8" - 9 | 305 | 414 | 455 | 617 |
| 7/8" - 14 | 334 | 454 | 515 | 698 |
| 1" - 8 | 455 | 617 | 695 | 942 |
| 1" - 14 | 510 | 691 | 785 | 1064 |
| 1 1/8" - 7 | 610 | 827 | 990 | 1342 |
| 1 1/8" - 12 | 685 | 929 | 1110 | 1505 |
| 1 1/4" - 7 | 860 | 1166 | 1400 | 1898 |
| 1 1/4" - 12 | 955 | 1295 | 1550 | 2102 |
| 1 3/8" - 6 | 1130 | 1532 | 1830 | 2481 |
| 1 3/8" - 12 | 1290 | 1749 | 2085 | 2827 |
| 1 1/2" - 6 | 1400 | 2034 | 2430 | 3295 |
| 1 1/2" - 12 | 1690 | 2291 | 2730 | 3701 |
| 1 3/4" - 5 | 2370 | 3213 | 3810 | 5166 |
| 2" - 4 1/2 | 3550 | 4813 | 5760 | 7810 |

NOTE: If any bolts and nuts are found loose or at values less than what the chart states, it is recommended that the loose bolt and/or nut be replaced with a new one.

TYPE 8 PHOSPHATE COATED HARDWARE

This chart provides tightening torque for general purpose applications using original equipment standard hardware as listed in the Parts Manual for the machine involved. **DO NOT SUBSTITUTE.** In most cases, original equipment standard hardware is defined as Type 8, coarse thread bolts and nuts and thru hardened flat washers (Rockwell "C" 38 - 45), all phosphate coated and assembled without supplemental lubrication (as received) condition.

The torques shown below also apply to the following:

1. Phosphate coated bolts used in tapped holes in steel or gray iron.
2. Phosphate coated bolts used with phosphate coated prevailing torque nuts (nuts with distorted threads or plastic inserts).
3. Phosphate coated bolts used with copper plated weld nuts.

Markings on bolt heads or nuts indicate material grade ONLY and are NOT to be used to determine required torque.

| NOMINAL THREAD DIAMETER | STANDARD TORQUE ±10% | |
|-------------------------------|--------------------------|------------------------|
| | KILOGRAM METER (kg•m) | FOOT POUNDS (ft lb) |
| 1/4" | 1.1 | 8 |
| 5/16" | 2.2 | 16 |
| 3/8" | 3.9 | 28 |
| 7/16" | 6.2 | 45 |
| 1/2" | 9.7 | 70 |
| 9/16" | 13.8 | 100 |
| 5/8" | 19.4 | 140 |
| 3/4" | 33.2 | 240 |
| 7/8" | 53.9 | 390 |
| 1" | 80.2 | 580 |
| 1 - 1/8" | 113.4 | 820 |
| 1 - 1/4" | 160.4 | 1160 |
| 1 - 3/8" | 210.2 | 1520 |
| 1 - 1/2" | 279.4 | 2020 |
| 1 - 3/4" | 347.1 | 2510 |
| 2 | 522.8 | 3780 |

TORQUE VALUES FOR HOSE CLAMPS

The following chart provides the tightening torques for hose clamps used in all rubber applications (radiator, air cleaner, operating lever boots, hydraulic system, etc.).

| CLAMP TYPE AND SIZE | TORQUE | | | |
|---|---------------------------------------|------------------------|-------------------------------|------------------------|
| | RADIATOR, AIR CLEANER, BOOTS, ETC. | | HYDRAULIC SYSTEM | |
| | KILOGRAM ME- TER (kg•m) | INCH POUNDS (in lb) | KILOGRAM ME- TER (kg•m) | INCH POUNDS (in lb) |
| “T” Bolt (Any Diameter) | 0.68 - 0.72 | 59 - 63 | ----- | ----- |
| Worm Drive - Under 44 mm (1-3/4 in) Open Diameter | 0.2 - 0.3 | 20 - 30 | 0.5 - 0.6 | 40 - 50 |
| Worm Drive - Over 44 mm (1-3/4 in) Open Diameter | 0.5 - 0.6 | 40 - 50 | ----- | ----- |
| Worm Drive - All “Ultra- Tite” | 0.6 - 0.7 | 50 - 60 | 0.5 - 0.6 | 40 - 50 |

TORQUE VALUES FOR SPLIT FLANGES

The following chart provides the tightening torques for split flange connections used in hydraulic systems. Split flanges and fitting shoulders should fit squarely. Install all bolts, finger tight and then torque evenly.

NOTE: Over torquing bolts will damage the flanges and/or bolts, which may cause leakage.

| FLANGE SIZE (*) | BOLT SIZE | BOLT TORQUE | |
|-----------------|-----------|------------------------|---------------------|
| | | KILOGRAM ME-TER (kg•m) | INCH POUNDS (in lb) |
| 1/2" | 5/16" | 2.1 - 2.5 | 15 - 18 |
| 3/4" | 3/8" | 3.0 - 3.7 | 22 - 27 |
| 1" | 3/8" | 3.7 - 4.8 | 27 - 35 |
| 1 - 1/4" | 7/16" | 4.8 - 6.2 | 35 - 45 |
| 1 - 1/2" | 1/2" | 6.4 - 8.0 | 46 - 58 |
| 2" | 1/2" | 7.6 - 9.0 | 55 - 65 |
| 2 - 1/2" | 1/2" | 10.9 - 12.6 | 79 - 91 |
| 3" | 5/8" | 19.1 - 20.7 | 138 - 150 |
| 3 - 1/2" | 5/8" | 16.2 - 18.4 | 117 - 133 |

(*) - Inside diameter of flange on end of hydraulic tube or hose fitting.

NOTE: Values stated in chart are for Standard Pressure Series (Code 61) Split Flanges.

TORQUE WRENCH EXTENSION TOOLS

Very large diameter, high grade fasteners (nuts, bolts, cap screws, etc.) require a great deal of turning force to achieve recommended tightening torque values.

Common problems that could occur as a result are:

- Recommended torque exceeds the measuring capacity of the torque wrench.
- Specialized sockets do not fit the adapter on the front end (nose) of the torque wrench.
- Generating adequate force on the back end (handle) of the wrench is difficult or impossible.
- Restricted access or an obstruction may make use of the torque wrench impossible.
- A unique application requires fabrication of an adapter or other special extension.

Most standard torque wrenches can be adapted to suit any one of the proceeding needs or situations, if the right extension tool is used or fabricated.

TORQUE MULTIPLICATION

A wrench extension tool can be used to increase the tightening force on a high capacity nut or bolt. For example, doubling the distance between the bolt and the back (handle) end of the torque wrench doubles the tightening force on the bolt. It also halves the indicated reading on the scale or dial of the torque wrench. To accurately adjust or convert indicated scale or dial readings, use the following formula:

$I = A \times T / A + B$ where:

I = Indicated force shown on the torque wrench scale or dial.

T = Tightening force applied to the nut or bolt (actual Torque).

A = Length of the torque wrench (between the center of the nut or bolt and the center of the handle).

B = Length of the extension.

As an example, if a 12” extension is added to a 12” torque wrench, and the indicated torque on the dial reads “150 ft lb,” the real force applied to the bolt is 300 ft lb:

$$I = \frac{A \times T}{A + B} = \frac{12 \times 300}{12 + 12} = \frac{3600}{24} = 150$$

NOTE: The formula assumes that there is no added deflection or “give” in the joint between the extension and torque wrench. Readings may also be inaccurate:

- If the extension itself absorbs some of the tightening force and starts to bend or bow out.
- If an extension has to be fabricated that is not perfectly straight (for example, an extension made to go around an obstruction, to allow access to a difficult to tighten fastener), the materials and methods used must be solid enough to transmit full tightening torque.

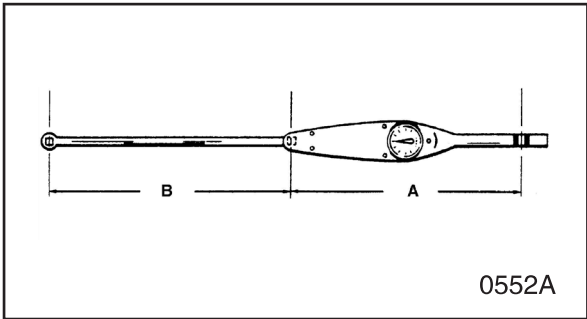


Figure.1

OTHER USES FOR TORQUE WRENCH EXTENSION TOOLS

Torque wrench extensions are sometimes made up for reasons other than increasing leverage on a fastener.

For example, a torque wrench and extension can be used to measure adjustment “tightness” of a linkage or assembly. Specially fabricated extensions can be used to make very precise checks of the force required to engage or disengage a clutch mechanism, release a spring-applied brake assembly, or “take up” free play in most any movable linkage.

Once the value of the adjustment force is established, repeated checks at regular intervals can help to monitor and maintain peak operating efficiency. These types of adjustment checks are especially useful if physical measurements of linkage travel are difficult to make or will not provide the needed degree of precision and accuracy.

To allow the assembly or mechanism to accept a torque wrench, welding a nut or other adapter on the end of a linkage shaft or other leverage point will allow turning the shaft or assembly manually.

TIGHTENING TORQUE SPECIFICATIONS (METRIC)

(For coated threads, prelubricated assemblies.)

CAUTION!

Disassembly, overhaul and replacement of components on the machine, installation of new or replacement parts and/or other service-related maintenance may require the use of thread or flange sealing assembly compound.

Use the information on this page as a general guide in selecting specific formulas that will meet the particular requirements of individual assembly installations. DISD does not specifically endorse a specific manufacturer or brand name but the following table of “Loctite” applications is included for which cross-references to other makers’ products should also be widely available.

IMPORTANT

Use primer “T” or “N” for all cold weather assembly of fastener adhesives, with Thread locker sealers 222, 242/243, 262, 271, 272, or 277.

I. "Loctite" Fastener Adhesives

| Product | Application | Color | Removal | Break-away Cure Strength (in lb) of Sealer Alone |
|------------|---|--------|--|--|
| 222 | Low strength for 6 mm (1/4") or smaller fasteners. | Purple | Hand tools | 45 |
| 242 or 243 | Medium strength for 6 mm (1/4") and larger fasteners. | Blue | Hand tools | 80 |
| 262 | High strength for high grade fasteners subject to shock, stress and vibration. | Red | Heat/260°C (500°F) Remove HOT (NO solvent) | 160 |
| 271 | Extra high strength for fine thread fasteners up to 25 mm (1") diameter. | Red | Heat/260°C (500°F) Remove HOT | 160 |
| 272 | High temperature/high strength for hostile environments to 232°C (450°F). | Red | Heat/316°C (600°F) Remove HOT | 180 |
| 277 | Extra high strength for coarse thread fasteners 25 mm (1") diameter and larger. | Red | Heat/260°C (500°F) Remove HOT | 210 |

II. "Loctite" Pipe Thread Sealant

| Product | Application | Color | Removal | Required Setup |
|---------|---|--------|------------|---|
| 545 | "No-filler/non-clog" formula for high-pressure hydraulic systems. Over-application will not restrict or foul system components. | Purple | Hand tools | 4 Hours (or 1/2 hour with Locquic "T" Primer) |
| 656 | Solvent-resistant, higher viscosity tapered thread sealer. | White | Hand tools | 4 Hours (or 1/2 hour with Locquic "T" Primer) |

III. "Loctite" gasket/flange sealer

| Product | Application | Color | Notes |
|---------|--|--------|--|
| 518 | Gasket eliminator specifically made for aluminum flanges/surfaces. For hydraulic systems to 34,475 kPa (5,000 psi). | Red | Use Locquic "N" primer for fast (1/2 - 4 hours) setup. Unprimed setup 4 - 24 hours. |
| 504 | Low pressure/wide-gap gasket eliminator compound. Fills gaps to 0.0012 mm (0.030"), cures to rigid seal. | Orange | Use Locquic "N" primer for faster (1/2 - 4 hours) setup. Unprimed setup 4 - 24 hours. |
| 515 | General purpose, fast setup, flexible-cure gasket eliminator. For nonrigid assemblies subject to shock, vibration or deflection. | Purple | Use Locquic "N" primer for faster (1/4 - 2 hours) setup. Unprimed setup 1 - 12 hours. |

IV. "Loctite" retaining compounds

| Product | Application | Color | Notes |
|---------|--|-------|---|
| 609 | For bushings, sleeves, press-fit bearings, splines and collars. For gaps to 0.0002 mm (0.005"), temperatures to 121°C (250°F). | Green | Use Locquic "N" primer for increased bond strength and all cold temperature applications. |
| 620 | For high temperatures to 232°C (450°F). | Green | Same as 609, above. |
| 680 | For high strength bonds and tight clearance gaps, to 0.00008 mm (0.002"). | Green | Same as 609, above. |

V. "Loctite" Adhesives

| Product | Application | Color | Notes |
|---------|---|-------|---|
| 380 | Black Max instant adhesive for shock and vibration-resistant bonds. | Black | May take 120 hours to reach full cure strength. |
| 454 | Adhesive for porous surfaces. | Clear | Full strength in 24 hours. |
| 480 | Increased strength (+50%), shock and vibration-resistant. | Black | Full strength in 24 hours. |

UPPER STRUCTURE

COUNTERWEIGHT



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

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Specifications

NOTE: *Weigh*

Weight 800 kg (1,764 lb)

Counterweight

1.Parts list

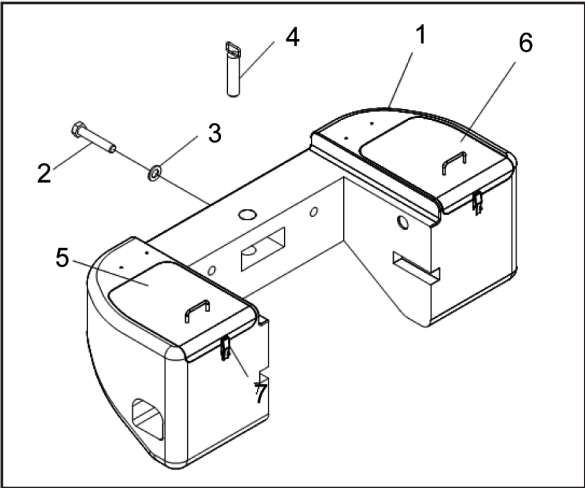


Fig.1

| Reference Number | Description | Reference Number | Description |
|------------------|---------------|------------------|-------------|
| 1 | COUNTERWEIGHT | 5 | COVER(R,H) |
| 2 | BOLT | 6 | COVER(L,H) |
| 3 | WASHER;HARDEN | 7 | LOCK |
| 4 | PIN | | |

2. TORQUE

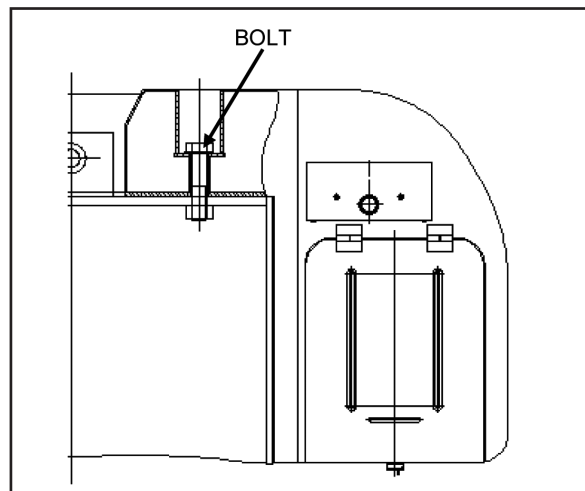


Fig.2

NOTE: 1) Tighten bolt to torque value list in the following table.

| |
|----------------------|
| 100 kg·m (726 ft lb) |
|----------------------|

HYDRAULIC OIL TANK



CAUTION!

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GENERAL DESCRIPTION

PARTS LIST

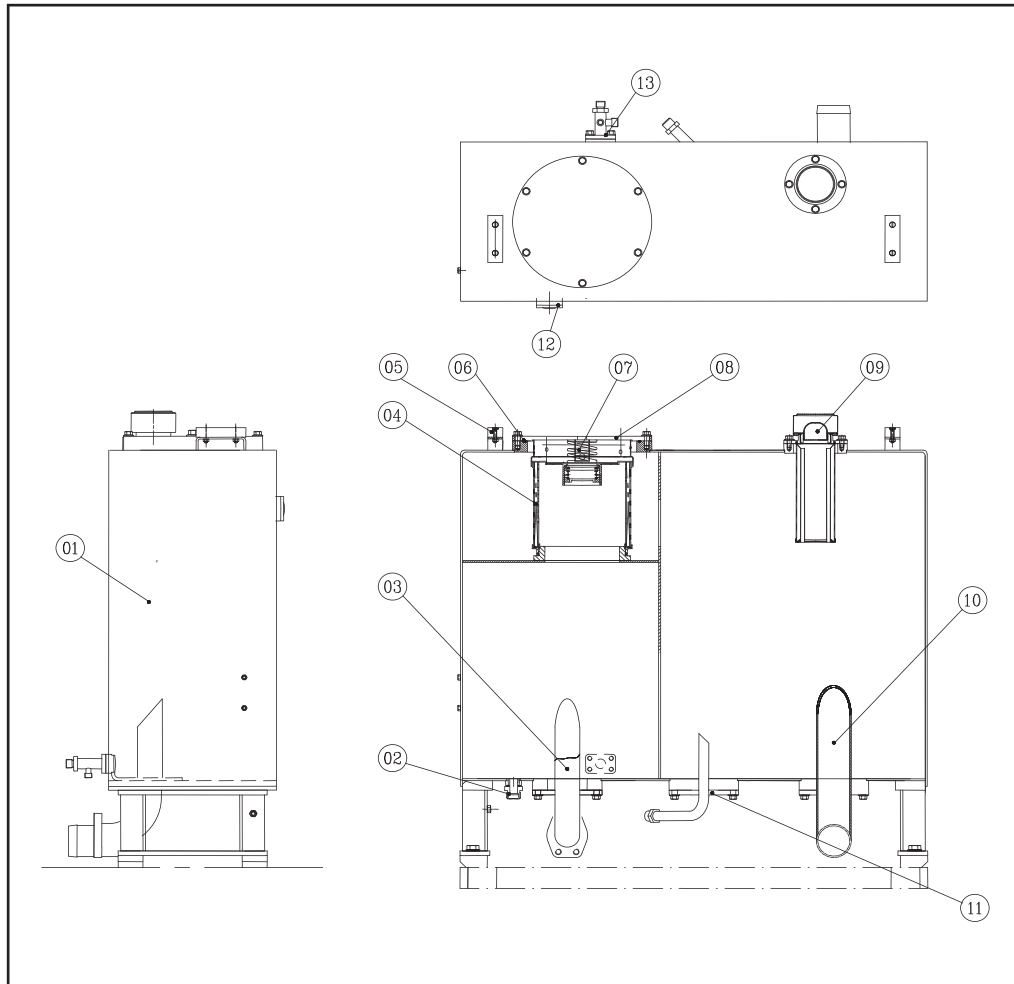


Figure.1

| Reference Number | Description | Reference Number | Description |
|------------------|---------------|------------------|--------------|
| 01 | Oil Tank | 08 | Cover |
| 02 | Adapter | 09 | Air Breather |
| 03 | Return Pipe | 10 | Spring |
| 04 | Return Filter | 11 | Air Breather |
| 05 | Rubber | 12 | Level Gauge |
| 06 | O Ring | 13 | Adapter |
| 07 | Spring | | |

SPECIFICATIONS

| | SD300 |
|---------------------|---------------------|
| TYPE | Pressure seal |
| Capacity (system) | 128 L |
| Air breather | |
| Starting pressure | 0.035 MPa |
| Return filter | |
| Filter accuracy | 12 μ |
| Pressure descending | 0.045 MPa @800L/min |

LOWER STRUCTURE AND CHASSIS

**CENTER JOINT
(ARTICULATION JOINT)**



CAUTION!

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General Description

The loader frame is an articulated type: the front frame is joined to the rear frame with two hinge pins around which the loader pivots for steering.

| |
|--|
|  CAUTION! |
| <p>When the loader is steered, the area near center hinge pins becomes so narrow that you may get caught between front and rear frames. Before trying to service the loader, make sure to set frame lock plate.</p> <p>Prior to moving (traveling) the loader, make sure the frame lock plate is set to original position.</p> |

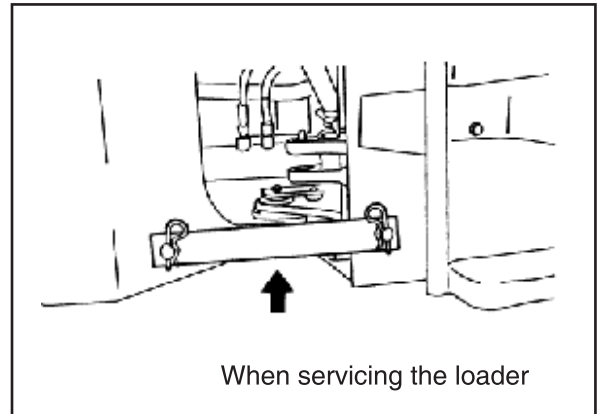


Figure.1

Maintenance Standard

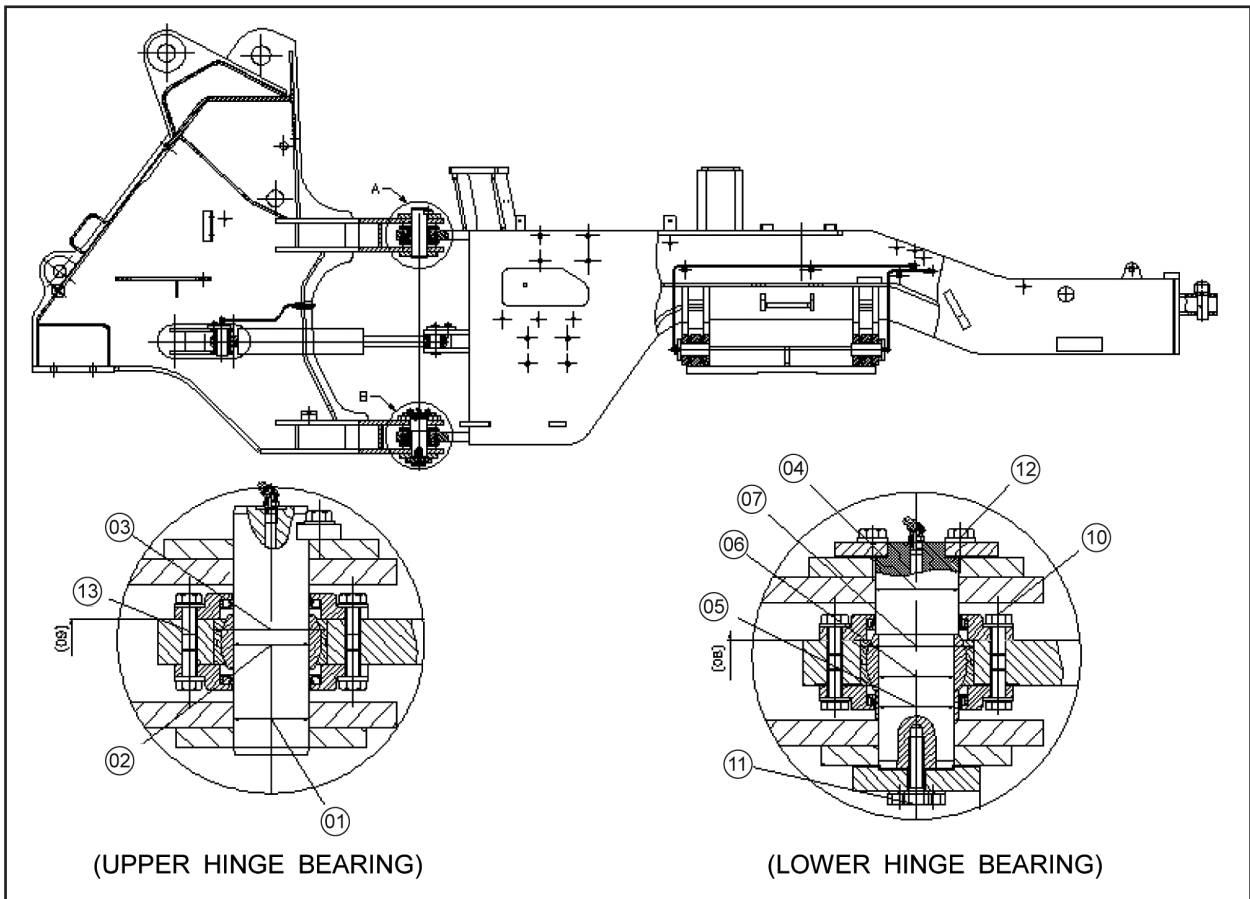


Figure.2

UNIT :mm

| No. | Check item | Criteria | | | | Remedy |
|-----|--|------------------------------------|-----------|--------|--------------------|-----------|
| | | Standard size | Tolerance | | Standard Clearance | |
| 1 | Clearance between upper hinge pin and front frame | | 60 | 0 | | +0.046 |
| | | -0.019 | | 0 | | |
| 2 | Clearance between upper hinge pin and bearing | 60 | 0 | 0 | -0.015-0.019 | - |
| | | | -0.019 | -0.015 | | |
| 3 | Clearance between bearing and rear frame | 90 | 0 | 0 | -0.035-0.015 | - |
| | | | -0.015 | -0.035 | | |
| 4 | Clearance between lower hinge pin and front frame | 66 | 0 | +0.046 | 0-0.12 | - |
| | | | -0.074 | 0 | | |
| 5 | Clearance between lower hinge pin and spacer | 60 | 0 | +0.414 | 0.34-0.433 | - |
| | | | -0.019 | +0.34 | | |
| 6 | Clearance between lower hinge pin and bearing | 60 | 0 | 0 | -0.015-0.019 | - |
| | | | -0.019 | -0.015 | | |
| 7 | Clearance between lower hinge bearing and rear frame | 90 | 0 | 0 | -0.035-0.015 | - |
| | | | -0.015 | -0.035 | | |
| 8 | Shim thickness for lower hinge and cap (rear frame) | 0.5~1.0 | - | - | - | - |
| 9 | Shim thickness for upper hinge and cap (rear frame) | 0.5~1.0 | - | - | - | - |
| 10 | Tightening torque of lower hinge cap mounting bolt(M12) | Final value: 9±1.0 kg•m | | | | Retighten |
| 11 | Tightening torque of lower hinge cap mounting bolt (M16) | Final value: 9±1.0 kg•m | | | | |
| 12 | Tightening torque of lower hinge pin mounting bolt | When adjusting with shim: 6~7 kg•m | | | | |
| | | Final value: 9±1.0 kg•m | | | | |
| 13 | Tightening torque of upper hinge cap mounting bolt | Final value: 9±1.0 kg•m | | | | |

ENGINE AND DRIVE TRAIN

3ton Diesel Engine



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that is in good working order.

















Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

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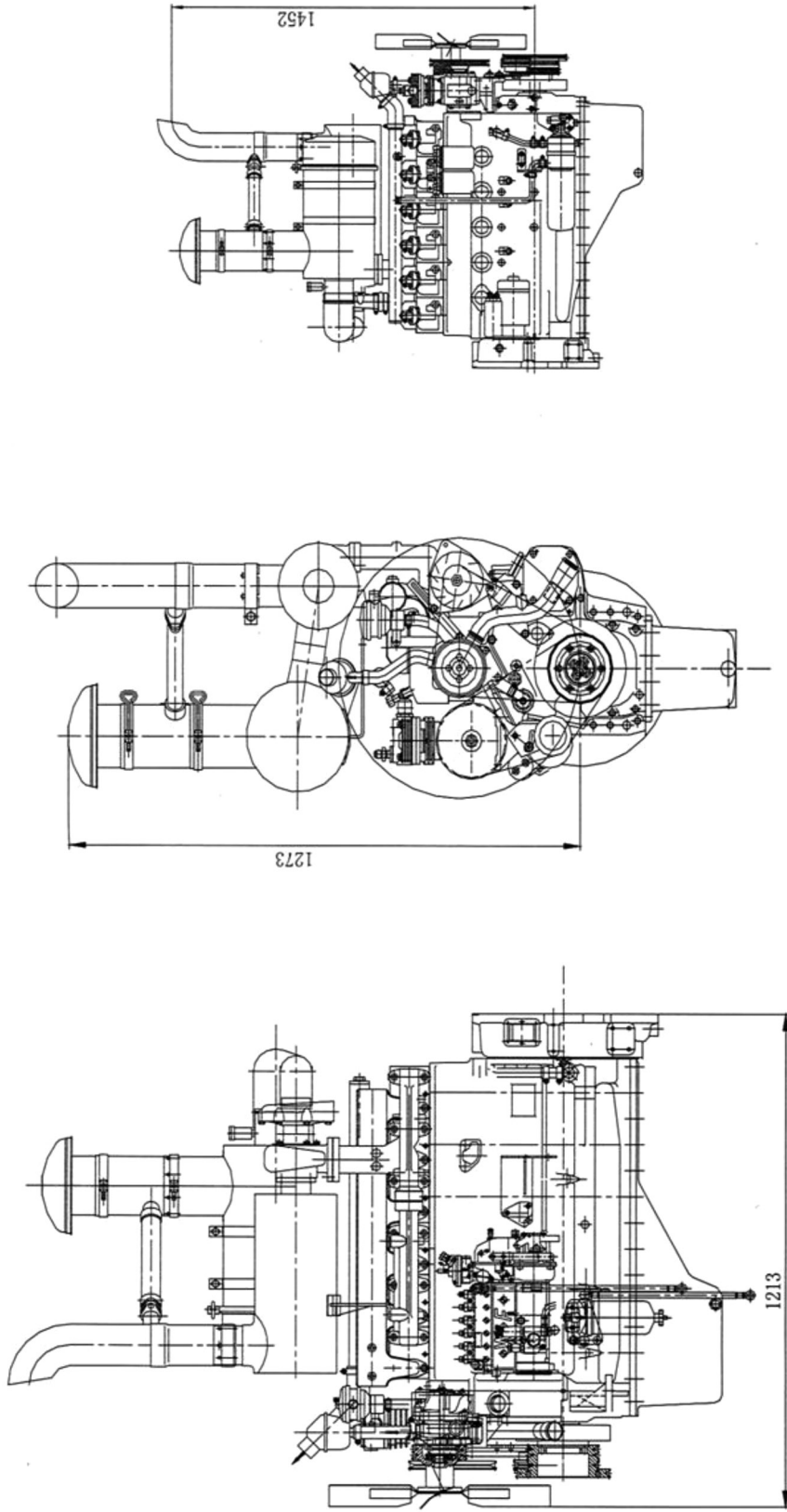
DESCRIPTION OF THE ILLUSTRATION MARKS

| | | | |
|---|--|---|---|
|  | Dismounting (assembly parts) |  | Oil coating |
|  | Fitting (assembly parts) |  | Special tools, such as K --- ---, KUKKO, --- ---, TS --- ---W |
|  | Marking (do before disassemble, adjust when assemble) |  | Pay attention to assembly direction |
|  | Filling- full charge (such as lubricating oil, cooling water etc.) |  | Deflating |
|  | Draining off (lubricating oil or cooling water) |  | Unloosing (such as: unloose clamping equipment) |
|  | (loose-proof-fixed) Coat fluid sealant |  | Clamping (such as: reinforcing clamp equipment) |
|  | Accident preventing (marks for dangerous occasion) |  | Inspecting-adjusting (such as: tightening torque, dimen- sion pressure and clearance) |
|  | Replacement when reassembly |  | Inspecting |

Main performance and technical parameters of 226B series diesel engine

| | | | | | | | | | | | | |
|--|------------|---|-------------|---|-------------|---|-------------|---|-------------|---|-------------|--|
| Item | Design No. | 13023850 | 13023806 | 13020033 | 13027501 | 13020034 | 13020143 | 13020162 | 13023925 | 13023860 | 13027547 | |
| Model | | TD226B-6G | | TD226B-4G | | TD226B-4G | | TD226B-4G | | D226B-4G | | |
| Numbers of Cylinder | | 6 | | 6 | | 4 | | 4 | | 4 | | |
| Cylinder bore/stroke, mm | | 105 x 120 | | 105 x 120 | | 105 x 120 | | 105 x 120 | | 105 x 120 | | |
| Total displacement, L | | 6.23 | | 6.23 | | 4.16 | | 4.16 | | 4.16 | | |
| Model | | 4 - stroke, water - cooled, in - line, direct - injection, wet cylinder liner | | 4 - stroke, water - cooled, in - line, direct - injection, wet cylinder liner | | 4 - stroke, water - cooled, in - line, direct - injection, wet cylinder liner | | 4 - stroke, water - cooled, in - line, direct - injection, wet cylinder liner | | 4 - stroke, water - cooled, in - line, direct - injection, wet cylinder liner | | |
| Compression ratio | | 18:1 | 15.5:1 | 18:1 | 15.5:1 | 15.5:1 | 15.5:1 | 18:1 | 15.5:1 | 18:1 | 16.4:1 | |
| ICN (CB/TRE7), kW/r/min | | 92/2200 | 118/2000 | 86/2000 | 105/2200 | 115/2000 | 86/2350 | 68/2350 | 70/2200 | 130/2100 | 60/2500 | |
| Maximum torque, N·m | | 500 | 648 | 500 | 560 | 600 | 450 | 355 | 380 | 640 | 275 | |
| Maximum torque speed, r/min | | 1400 ~ 1600 | 1400 ~ 1600 | 1400 ~ 1600 | 1400 ~ 1600 | 1400 ~ 1600 | 1400 ~ 1600 | 1400 ~ 1600 | 1400 ~ 1600 | 1400 ~ 1600 | 1400 ~ 1600 | |
| Mean effective pressure, kPa | | 805 | 1136 | 828 | 919 | 1108 | 705 | 835 | 918 | 1192 | 692 | |
| Mean piston speed, m/s | | 8.2 | 8 | 8 | 8.8 | 8 | 9.4 | 9.4 | 8.8 | 8.4 | 10 | |
| Fuel supply advance angle° | | 21 ± 0.5 | 21 ± 0.5 | 20 ± 0.5 | 21 ± 0.5 | 21 ± 0.5 | 22 ± 0.5 | 22 ± 0.5 | 21 ± 0.5 | 17.5 ± 0.5 | 23 ± 0.5 | |
| Compression pressure at cold state, kPa | | 3000 (lower limit: 2500) | | | | | | | | | | |
| Minimum idle speed, r/min | | 750 ± 50 | 750 ± 50 | 750 ± 50 | 750 ± 50 | 750 ± 50 | 750 ± 50 | 750 ± 50 | 750 ± 50 | 750 ± 50 | 750 ± 50 | |
| Maximum idle speed, r/min | | 2420 | 2200 | 2200 | 2420 | 2200 | 2585 | 2585 | 2420 | 2310 | 2750 | |
| Highest exhaust temperature after turbine, °C | | 550 | 550 | 550 | 550 | 550 | 550 | 550 | 550 | 550 | 650 | |
| Air intake method | | Turbocharged | | Turbocharged | | Turbocharged | | Turbocharged | | Natural aspiration | | |
| Lubricating method | | Forced lubrication | | | | | | | | | | |
| Ignition sequence | | 1 - 3 - 4 - 2 | | | | | | | | | | |
| Oil capacity (sump), L | | 14 | | | | | | | | | | |
| Oil pressure, kPa | | 300 ~ 600 | | | | | | | | | | |
| Oil pressure at idle speed, kPa | | ≥ 120 | | | | | | | | | | |
| Allowed highest oil temperature of cooling water, °C | | 110 | | | | | | | | | | |
| Starting method | | 95 | | | | | | | | | | |
| Allowed gradient (longitudinal/horizontal) | | Electric starting | | | | | | | | | | |
| Crankshaft direction of rotation (in view of flywheel end) | | 25/30 | 25/30 | 25/30 | 25/30 | 25/30 | 25/30 | 25/30 | 25/30 | 25/30 | 25/30 | |
| Application | | Counterclockwise Construction machinery | | | | | | | | | | |

Outline Drawing of 226B Series Diesel Engine for Construction Machinery



Outline drawing of 6-cylinder engine

FUEL, OIL, COOLANT AND AUXILIARY MATERIALS

OIL

Quality Rating

Oil is rated based on its quality and characteristics, usually rated with API or GB.

Allowable oil:

- API grade: CD, CD-II, CE
- GB grade: CD, CD-II, CE

Turbo-charged diesel engine adopts CD grades oil, allowing high-grade oil replace low-grade oil.

Viscosity

Since oil viscosity depends greatly on temperature, please refer to Fig. 2-1 and choose most suitable oil according to ambient temperature (°C).

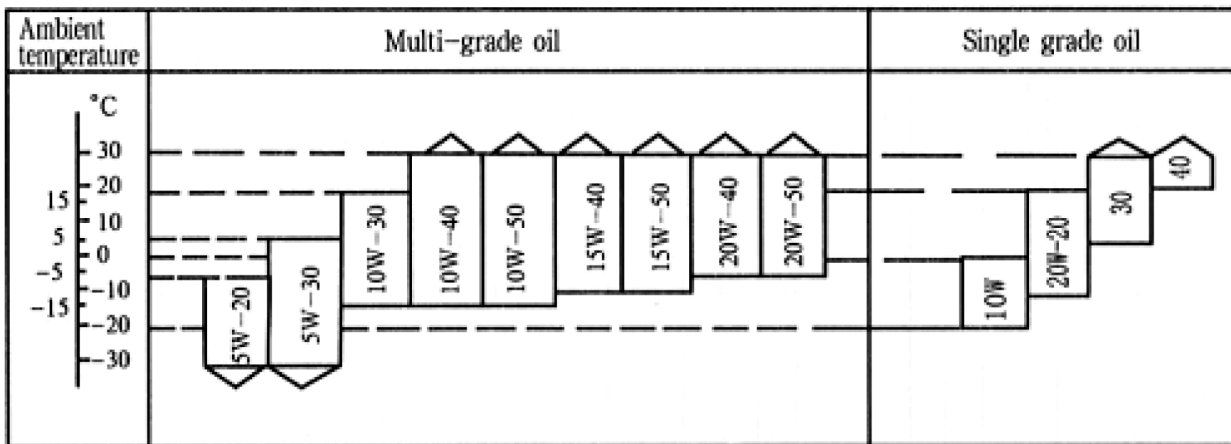


Figure 2-1 Selection of Oil Brand

Ambient temperature should not exceed temperature limit for a long time so as to reduce wear within minimum limit.

Multi-grade oil can be used to avoid changing oil during change of seasons.

Multi-grade oil (especially light oil) can reduce fuel consumption.

Recommendation

CD grade 15W/40 oil should be used when the ambient temperature is above -15°C and 5W/20 oil when below -15°C. Multi-grade oil should be used to avoid changing oil during change of seasons and to reduce fuel consumption.

Weichai Power specially used (Shell) CD/15W-40 oil is suggested which consists of imported high quality base oil and selected additive with nationwide unified selling price.

CAUTION!

1. Do not check lubricating oil when engine is running.
2. Do not use oil with different grades at the same time.

FUEL

Quality Rating

For construction machinery diesel engine uses light diesel as its fuel. Sulfur content in stipulated brands of fuel should not exceed 0.5%.

Use following brands of oil according to ambient temperature

Recommend to use 0# diesel fuel (GB252) when the temperature is higher than 5°C.

At a low temperature, diesel fuel may produce wax which in turn causes bad flow-ability of diesel fuel, blocks fuel system and thus results in breakdown of diesel engine. It is therefore advisable to use diesel fuel for winter when the ambient temperature below 0°C. It is recommended, according to GB252 diesel fuel standard, to use -10# diesel fuel when the ambient temperature is above -5°C, use -20# diesel fuel when the ambient temperature is above -14°C, use -35# diesel fuel when the ambient temperature is above -29°C and use -50# diesel fuel when the ambient temperature is above -44°C.

Coolant

Cooling water of diesel engine must be soft water with anticorrosive agent and long-acting anti-icing fluid.

Long – Acting Anti – Icing Fluid

Long – acting anti – icing fluid has the features of rust proof and freeze proof. The mixture ratio of long – acting anti – icing fluid is detailed in the “Instruction of Anti – Icing Fluid”. See table 2–1 for China – made long – acting anti – icing fluid.

Table 2–1 Long – acting anti – icing fluid (Made in China)

| Items \ Types | JFL – 318 | JFL – 336 | JFL – 345 |
|------------------------------|------------------|------------------|------------------|
| Content of glycol (%) | 33 | 50 | 56 |
| Specific gravity (at 15.6°C) | 1.05 | 1.074 | 1.082 |
| Boiling point (°C) | 104.5±1 | 108.5±1 | 110.0±1 |
| Freezing point (°C) | -18±1 | -36±1 | -45±1 |
| Available lowest Temp. (°C) | -10 | -26 | -35 |



CAUTION!

- 1. Check the density of anti-icing fluid regularly when ambient temperature is below 0°C. Check the density of anti-icing fluid once for every 1000h and check it at least once a quarter; replace the anti-icing fluid to avoid corrosion and thus damage for every two years.**
- 2. For engine operating in the region above 0°C, antirust and anti-deposit water can be used as coolant. It is forbidden to use untreated water as coolant of diesel engine.**

Anticorrosive Agent

When the ambient temperature is above 5°C (in summer and autumn or in regions with relatively higher temperature), anticorrosive agent (NL type emulsified antirust or LQS general protectively agent) can be added into the cooling water. The mixing ratio of corrosive agent with soft water is detailed in corresponding instructions.

Cooling Water

Components of cooling water are shown in Table 2-2 as follows:

Table 2-2

| Water Quality | Min. | Max. | |
|--|------|------|--|
| PH value | 6.5 | 8.5 | Only the cooling water with this water quality of composition can be mixed with long-acting antifreeze and antirust. |
| Ion content of chloride, mg/dm ³ | - | 100 | |
| Content of carbonate, mg/dm ³ | - | 100 | |
| Content of total anion, mg/dm ³ | - | 150 | |
| Total hardness when using long-acting antifreeze, mg/dm ³ | 3 | 12 | |
| Carbonate hardness, mg/dm ³ | 3 | - | |
| Total hardness when using antirust (pay close attention to supplier's instruction for its value), mg/dm ³ | 0 | 10 | |

CAUTION: *Inner galvanized pipe is not suitable for mounting antirust, thus is not ideal material for cooling water pipe.*

DIESEL ENGINE STRUCTURE

Engine Body

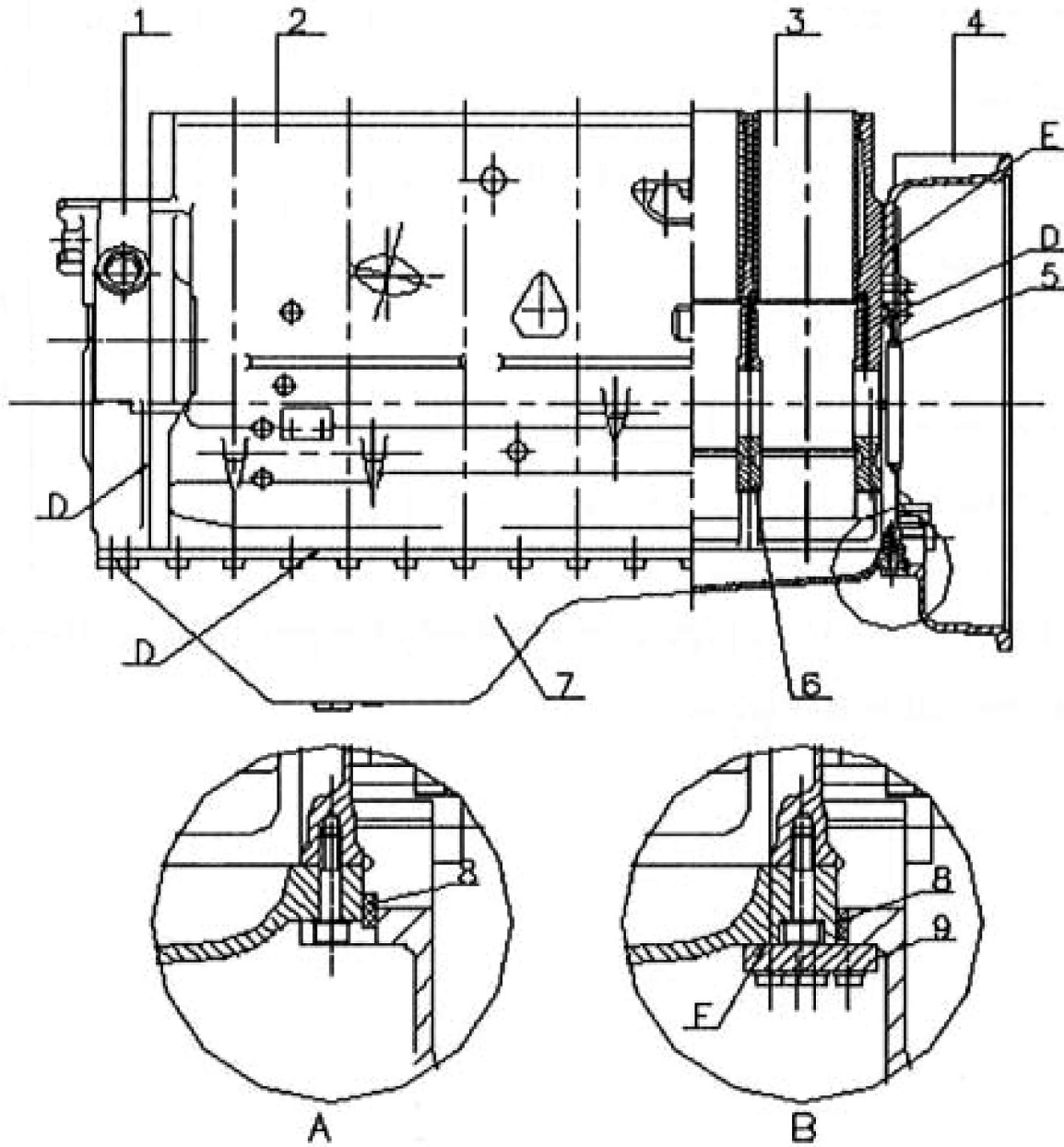


Figure 3-1

| Reference Number | Description | Reference Number | Description |
|------------------|---------------------|------------------|--------------------|
| 1 | Front cover | 6 | Main bearing cover |
| 2 | Cylinder block | 7 | Control Panel |
| 3 | Cylinder liner | 8 | Oil seal |
| 4 | Flywheel housing | 9 | Seal plate |
| 5 | Rear oil seal cover | | |

CAUTION: When “A” structure is adopted, coat sealant on “D” joint face; when “B” structure is adopted, coat sealant on “D” and “E” joint faces.

The engine body is high gantry structure, made of high-strength grey cast iron and has a high strength and stiffness. Four-cylinder and six-cylinder engine bodies have five and seven main bearings respectively, the first (from flywheel end) being mounted with thrust plate.

Tightening sequence is shown in Fig. 3-2, beginning from the middle main bearing and extending to the two ends. For the camshaft bearing ports, a steel back copper bearing is only mounted in the last bearing port (counter from flywheel end). There are two holes in this bearing with one hole aiming at the oil hole in the cylinder block, and the other hole should be located at the upper position (Fig. 3-3). For turbocharged or turbocharged and intercooled diesel engines, a nozzle for cooling piston is mounted for each cylinder on the right side of the engine body (from view of flywheel end).

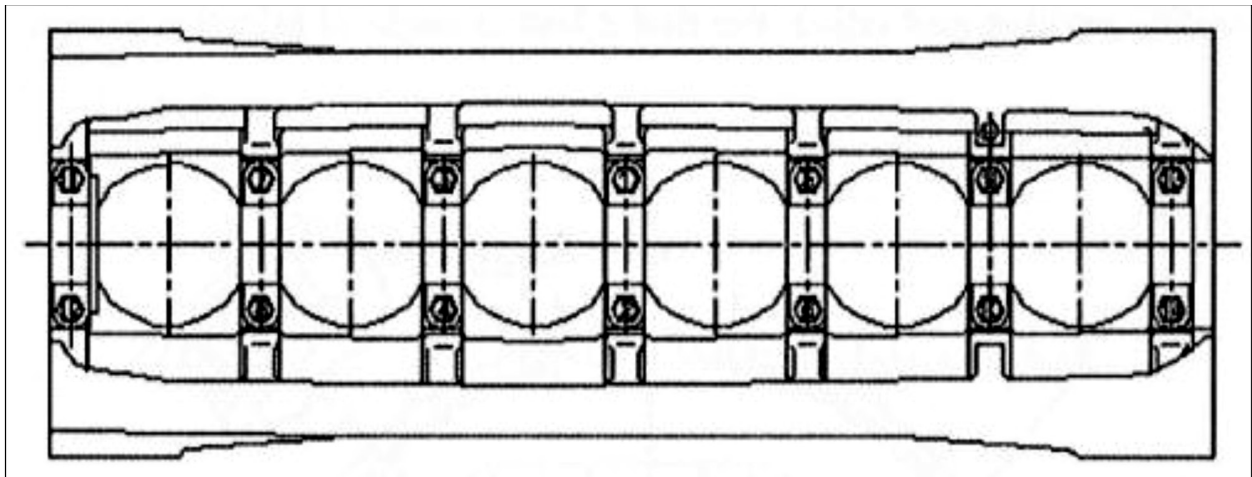


Figure 3-2

Wet cylinder liner is adopted for 226B series diesel engine. To ensure sealing of the cylinder liner after mounting onto the engine body, two rubber seal rings should be mounted respectively on the mounting positions of upper and lower of cylinder liner. Cylinder liners are separated into Group A (in green or marked with “A”) and Group B (in red or marked with “B”) according to bore dimensions. The same diesel engine must be mounted with the same group of cylinder liners. If marks can not be identified when repairing, use cylinder liner of Group A.

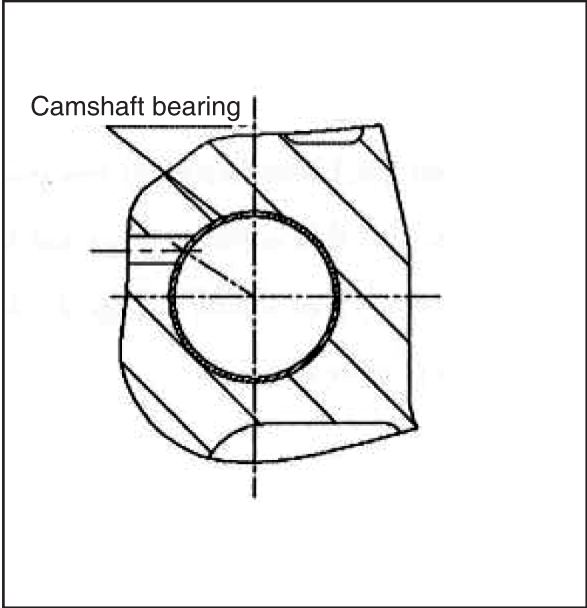


Figure 3-3

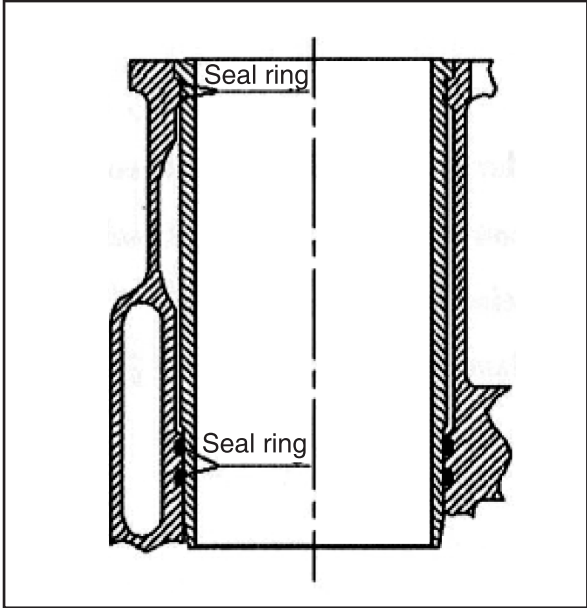


Figure 3-4

Front end of engine body is connected with front wall cover and the rear end is connected with oil seal cover and flywheel housing. The connecting surfaces of front wall cover, rear oil seal cover and engine body is coated with sealant thoroughly. There are mounting holes for fuel injection pump I front wall cover. According to the requirement of users, flywheel housing sizes are different. And there is a window on flywheel housing (Fig. 3-5) for checking the graduation on flywheel to determine the TDC position and adjust the fuel advance angle of injection pump.

There two power output devices for partial construction machinery diesel engine. For this engine, there two output shafts with transmission ratio of 1:1 and 1:1.136 respectively (as shown in Fig.3-6). When mounting, coat sealant on the front and rear joint faces of gear box.

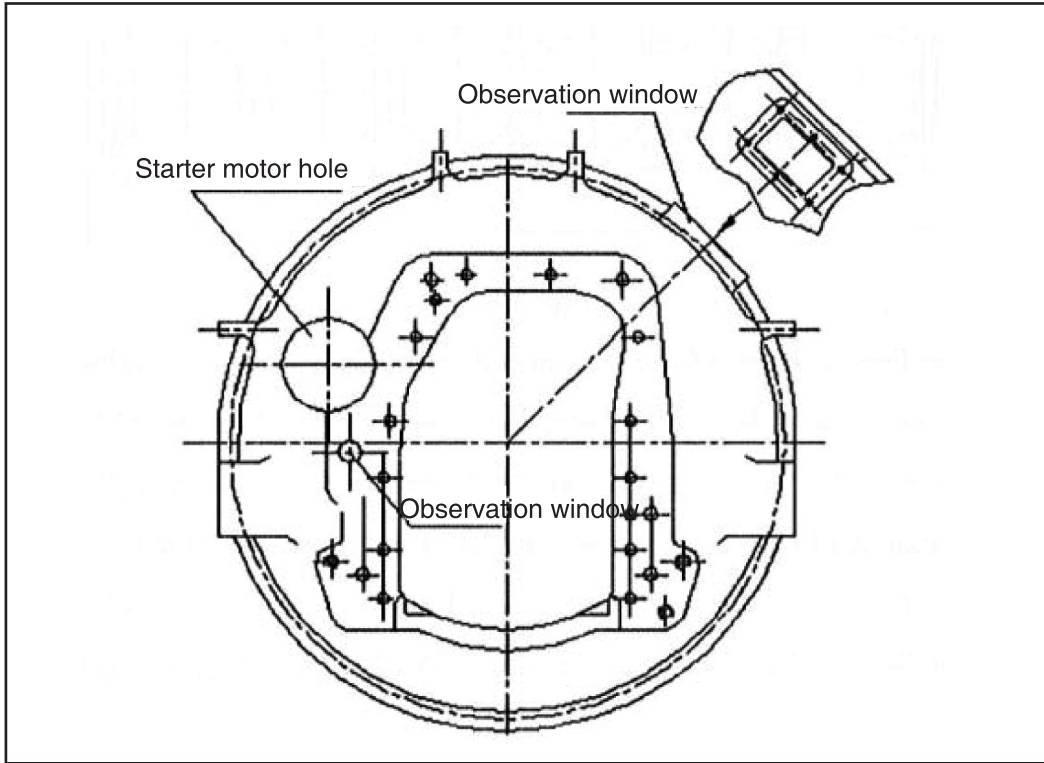


Figure 3-5

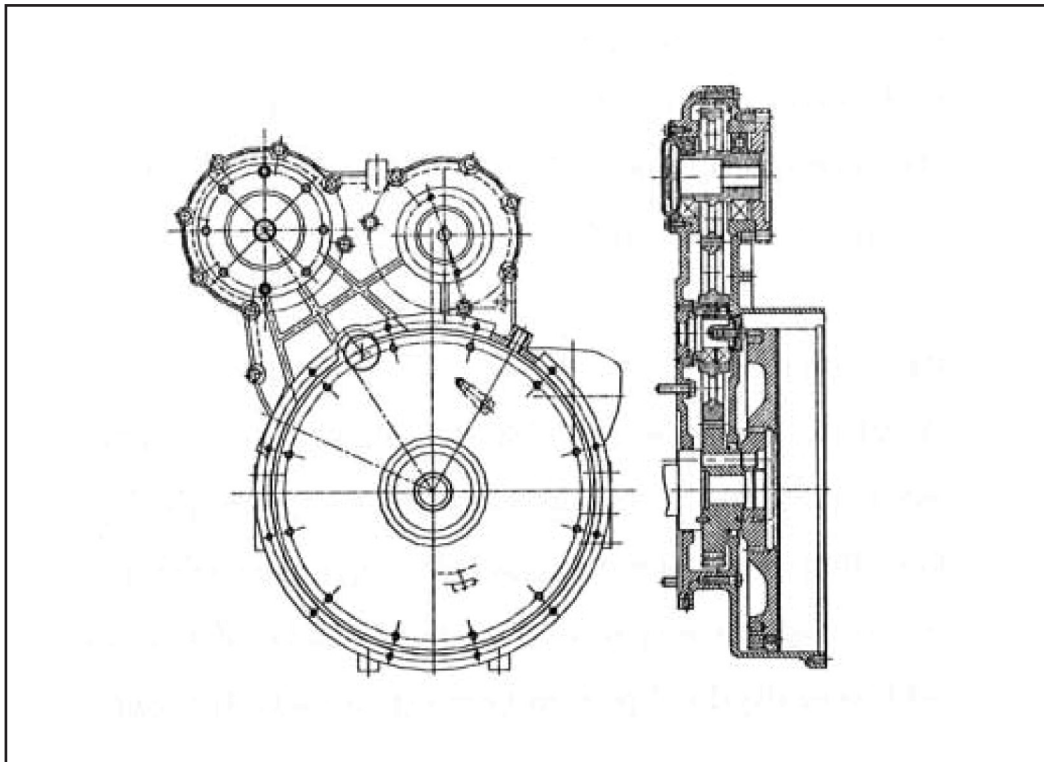


Figure 3-6

CRANK AND CONNECTING ROD MECHANISM

The crank and connecting rod mechanism is composed of crankshaft, flywheel, piston, connecting rod, vibration absorber and two-stage balance device (only for 4-cylinder engine) etc.

Crankshaft

Crankshaft is forged into shape as a whole. Crank arm has balance block through dynamic balance. Timing gear is shrinkage fitted onto the crankshaft. Crankshaft front oil seal is mounted between front wall cover and hub and when mounting, coat seal lip with grease.

Flywheel

Flywheel is mounted at the rear end of crankshaft and tightened with six M16-12.9 socket head screws. There are many types of flywheel for option according to application and connecting method. There are graduations and TDC mark "OT" (Fig.3-7). There is a window on the side face of flywheel housing. When the "OT" graduation line on the flywheel is aligning with the indicator on the flywheel housing, it is meaning that 1st and 6th cylinders are at TDC.

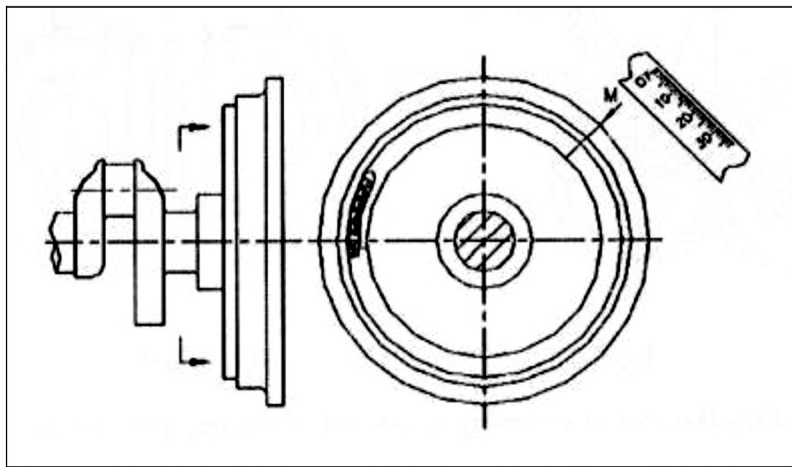


Figure 3-7

Two-stage balancing system

4-cylinder diesel engine is mounted with two-stage balancing system for the purpose of balancing secondary reciprocating inertial forces of piston connecting rod group and reducing diesel engine vibration. Ring gear 1 of two-stage balancing system driving gear is mounted on crank arm and when mounting, the ring gear should be heated to 250°C and the mark "0-0" on the ring gear should be on stipulated position (Fig. 3-8). The mark "1" on balancing shaft driving gear 2 of secondary balancing driving system should align with the mark "1-1" on driven gear 3. Two-stage balancing system is mounted on main bearing cover and when mounting, the mark "0-0" on ring gear 1 should align with the mark on balancing shaft driving gear 2. When mounting, oil line should be kept smooth to ensure lubrication of bearing of two-stage balancing system (Fig. 3-9).

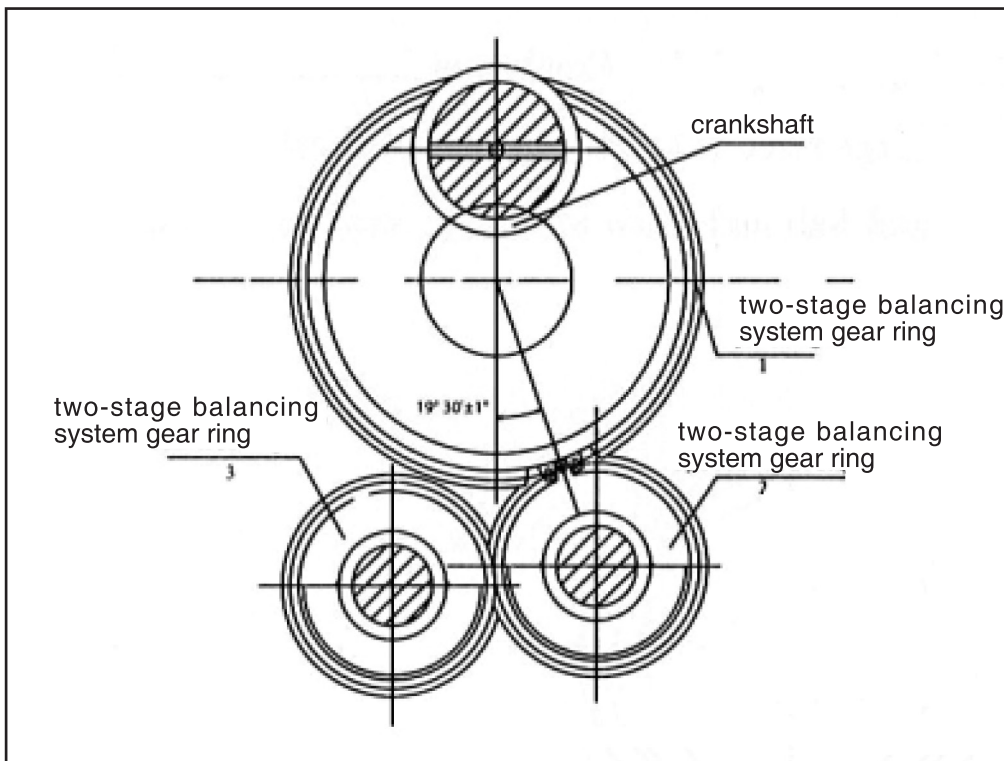


Figure 3-8

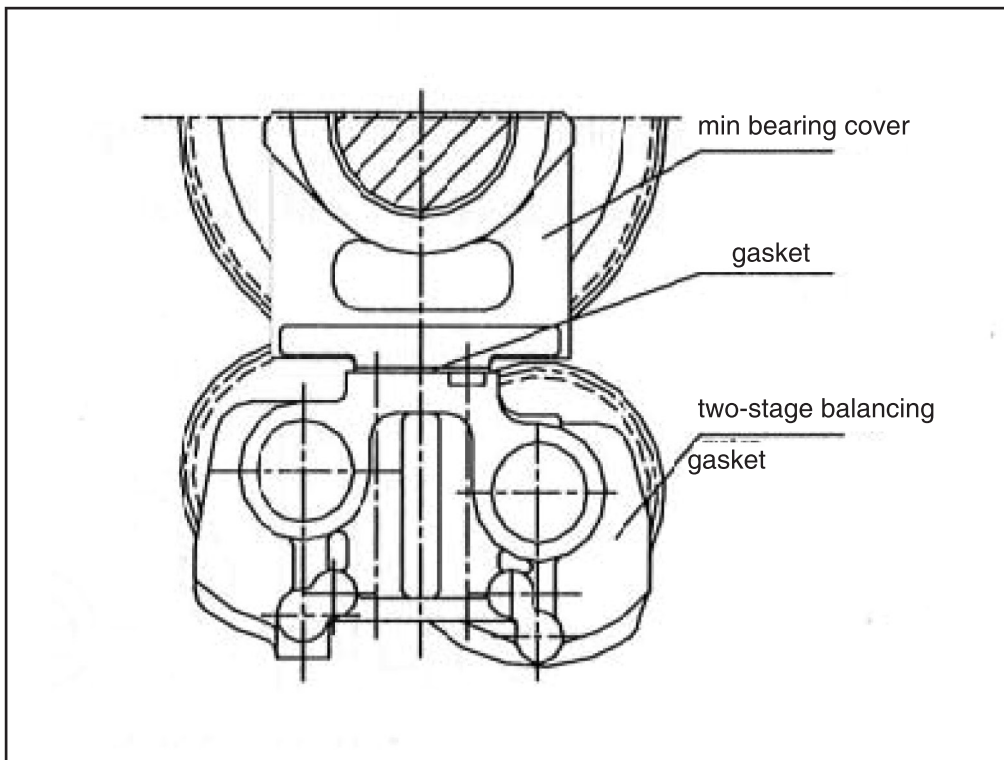


Figure 3-9

Piston assembly

The piston assembly composed of piston, piston ring, piston pin and retainer.

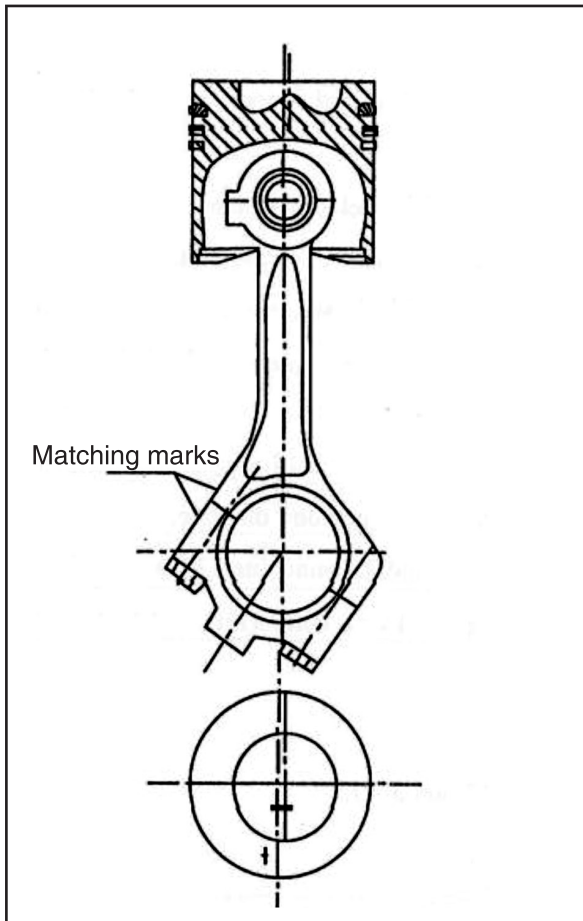


Figure 3-10

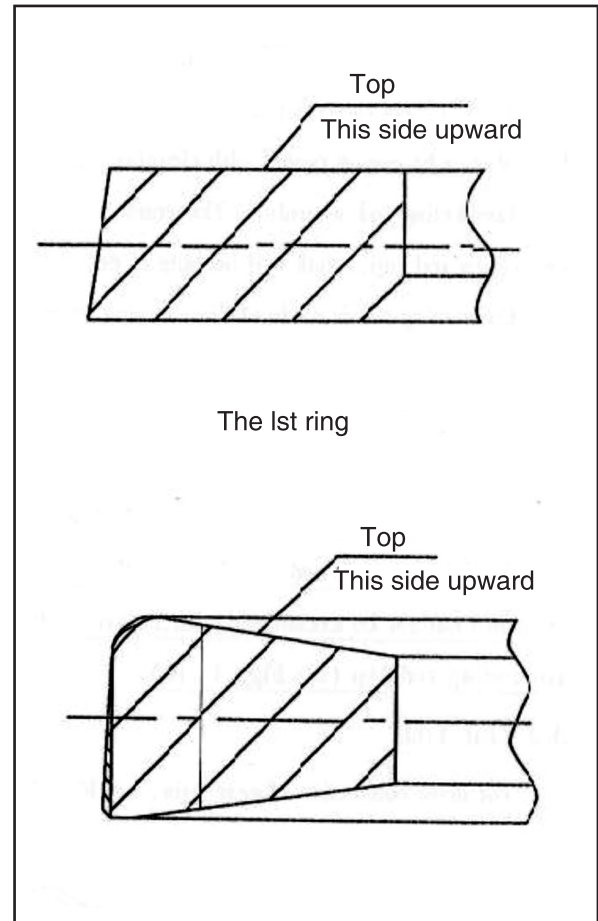


Figure 3-11

For turbocharged, turbocharged and intercooled and natural aspiration 4-cylinder engine and 6-cylinder engine, the pistons, piston rings and piston pins are different from each other. Combustion chamber and piston pin hole on piston deviate from piston center. Pay attention to their directions when mounting (see Fig. 3-10).

There piston rings are mounted on piston, the first being ladder ring and the second tapered ring. These two air rings have directions when mounting. The side with the mark "TOP" (or factory mark) on the piston ring faces up (to piston top) (Fig. 3-11). The third is spiral spring oil ring.

Piston is separated into Group A (in green or marked as "A") or Group B (in red or marked as "B") according to piston skirt dimensions. When mounting, piston and cylinder liner are required to use the same group. When repairing, if marks can not be identified, use cylinder liner and piston of Group A.

When piston group is put into cylinder liner, piston surface and inner surface of cylinder liner should be evenly coated with cleaning oil.

Connecting rod assembly

The connecting rod assembly includes connecting rod body, connecting rod cap, small end bushing of connecting rod and connecting rod bolt.

Connecting rod is made of die-forging. Connecting rod body and connecting rod cap are connected with two connecting rod bolts, which should be as per requirements of twisting angle tightening specification.

The connecting rod bolts can be used only once and not repetitively, otherwise such serious accidents may take place as bolt fracture and even machinery damage.

Connecting rod body and connecting rod cap should be machined in a combined way and can not be exchanged. There are matching marks on connecting rod body and connecting rod cap (Fig. 3-10).

GEAR TRAIN

For drive connection of gear train, see Fig. 3-12 and 3-13.

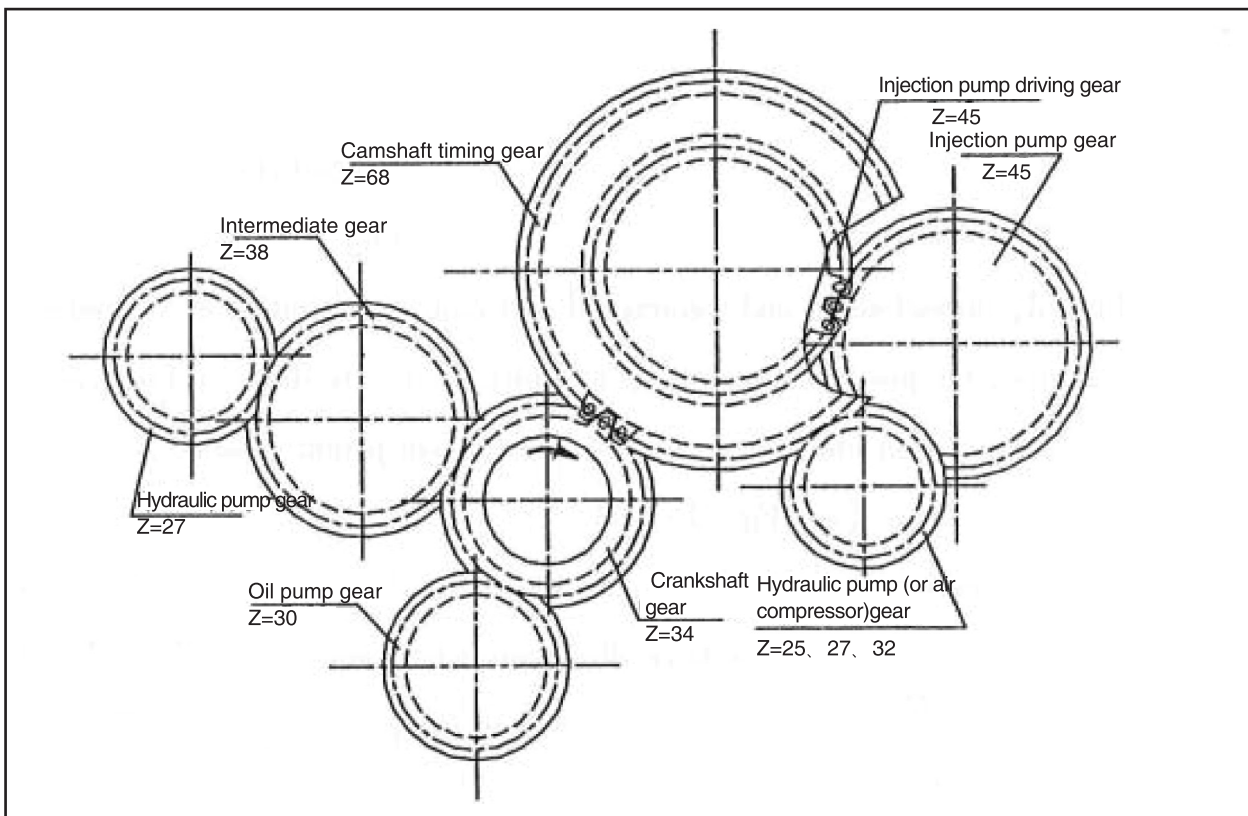
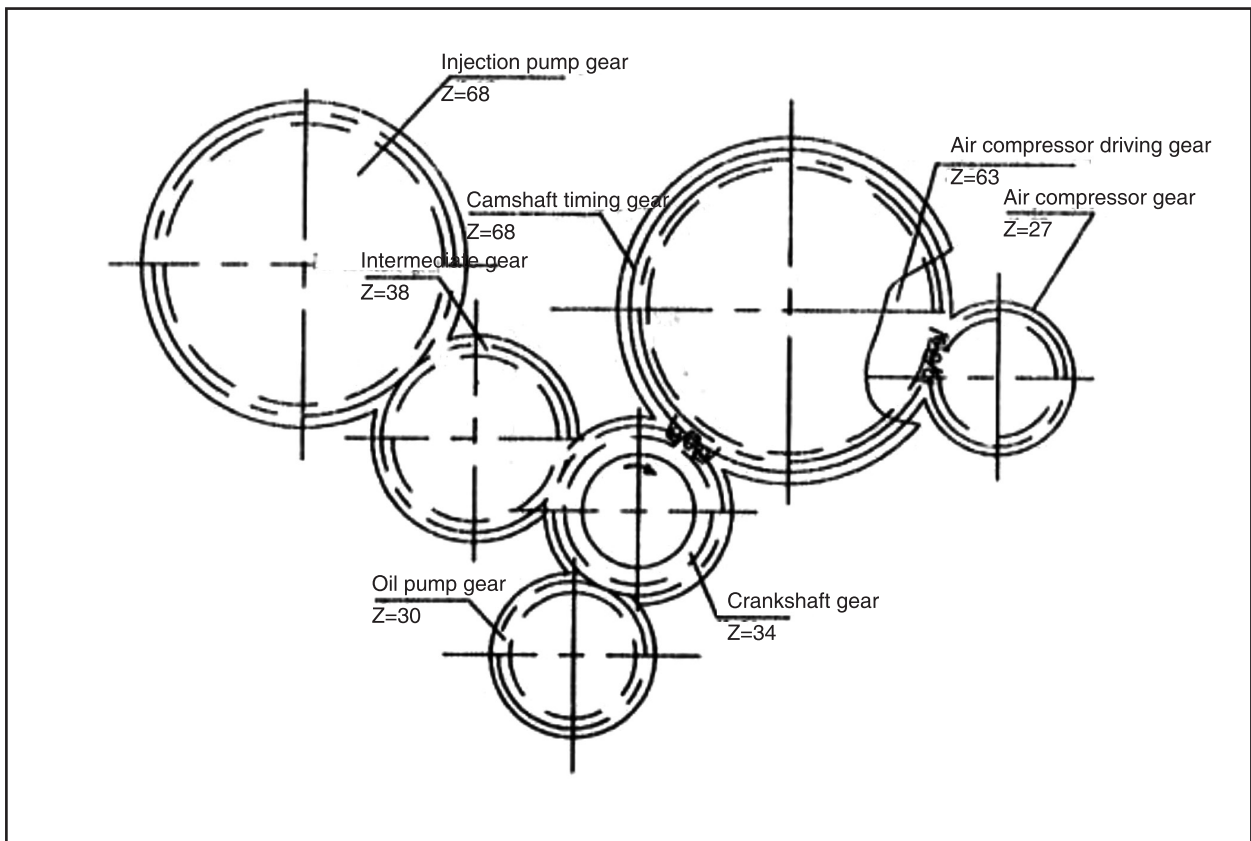


Figure 3-12



CYLINDER HEAD AND VALVE TRAIN

Cylinder head

Cylinder head is made of cast alloy, and one head for one cylinder. Each cylinder head has one inlet valve and one outlet valve. The intake port and exhaust port are designed at the same the side. Inlet and outlet valves have valve seats. The fuel injector is installed on the other side of intake and exhaust port on cylinder head and on flange face of inlet and outlet port of cylinder head, there are drain holes and air holes.

Cylinder head is installed on engine body. It is noted that inlet and outlet flange face of each cylinder head should be kept on the same surface to ensure the sealing after mounting intake and exhaust manifolds. Each cylinder head is tightened with four M14-12.9 bolts and when tightening, use twisting angle tightening method.

Valve train system

Valve train system consists of distribution camshaft, tappet, push rod, rock arm, rock arm support, valve, valve spring and accessories.

FUEL SUPPLY SYSTEM

Fuel supply system is shown in Fig. 3-14.

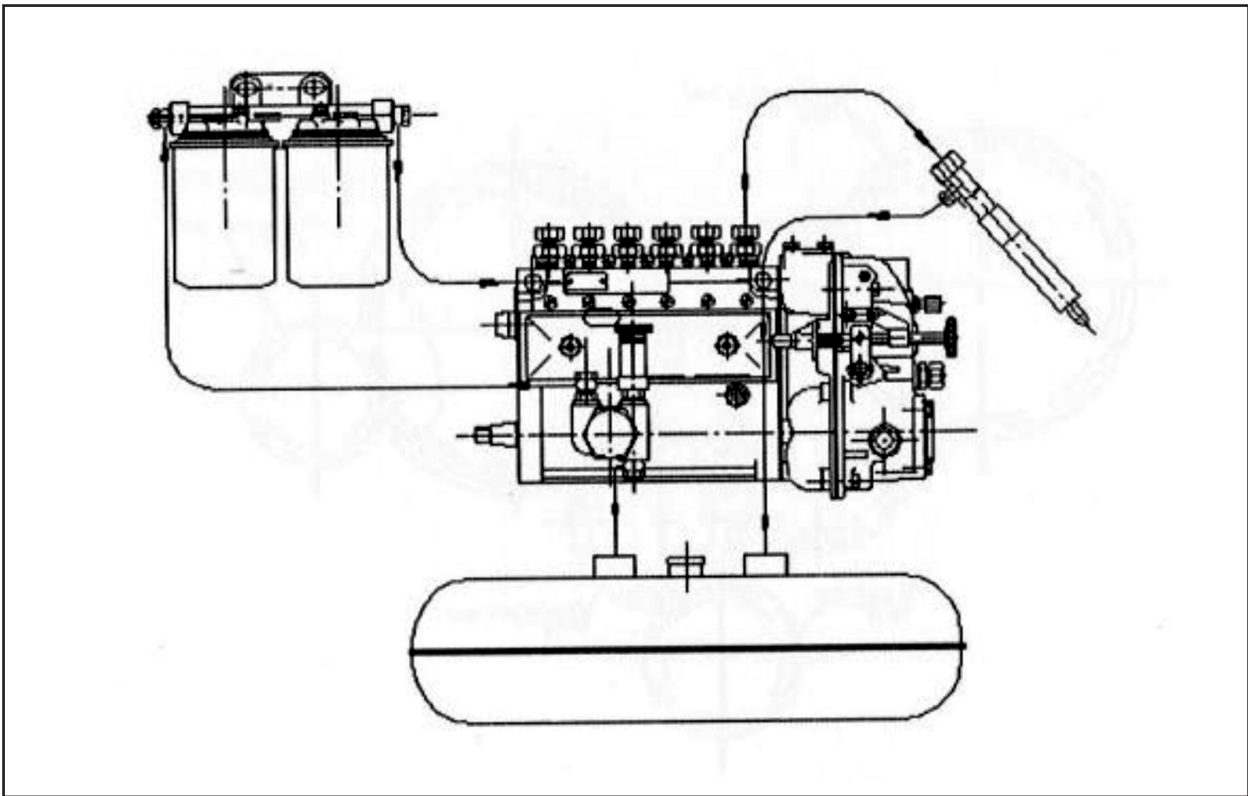


Figure 3-14

Fuel supply system consists of fuel injection pump, governor, fuel supply pump, fuel filter, injector, high pressure pump, low pressure pump and accessories.

Fuel injection pump governor assembly

Injection pump, governor and fuel supply pump are usually together called fuel injection pump subassembly. 226B construction machinery diesel engine mainly adopts type AD or PW (i.e. EP9) injection pump, RSV or RSV-K governor and plunger type fuel supply system. Governor is mounted with smoke-limiter, which is connected with air intake pipe through an air tube. When intake pressure is lower than a certain number, fuel injected can be restricted for the purpose of reducing the limit of smoke exhaust (smoke-limiter has been adjust in delivery tests, please do not adjust or alter it). The transmission of injection pump is shown in Fig. 3-12 and 3-13.

Mounting of injection pump located at the opposite side of camshaft

Fuel injection pump end face is mounted with mounting flange and mounting slot of flange end face is mounted with O-ring. Adapting flange of injection pump camshaft input end is mounted with fuel supply starting point locating hole. When the hole aligns with hole of support (2) mounted on the pump body (insert a $\Phi 8$ cylindrical pin in the holes, see Fig. 3-15), fuel injection pump is at fuel supply starting position.

When mounting fuel injection pump driven gear, turn the crankshaft to the angle of fuel supply starting point of fuel injection pump (i.e. the indicator on the windows of flywheel housing aligns with scale of fuel supply advance angle on the housing).

Mount fuel injection pump gear, make it engage with the intermediate gear and tighten clamp nut of fuel injection pump gear.

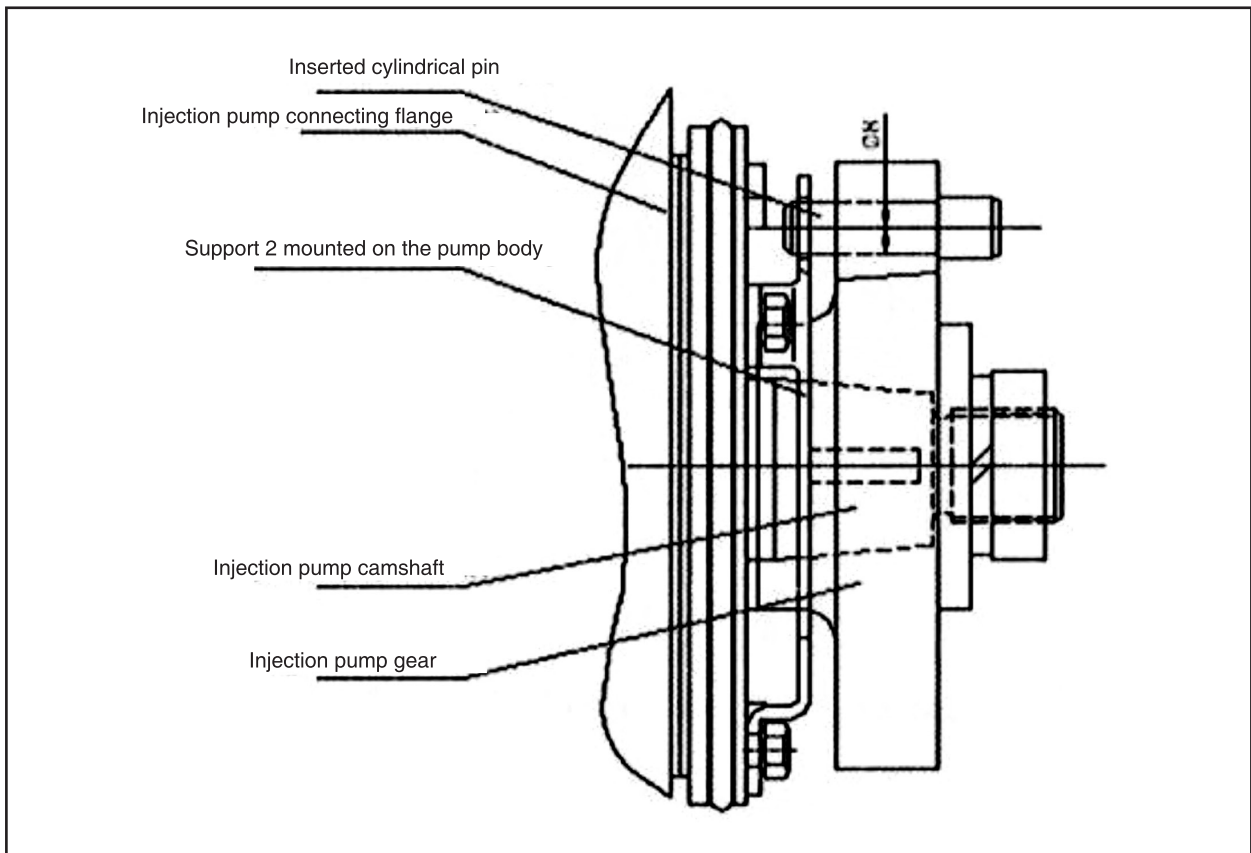


Figure 3-15

Mounting of injection pump located at the camshaft side

There is a mounting flange with an O-ring on the end face of injection pump. The injection pump is fixed on the flange hole on the cylinder block with four studs. The tightening force should be $35+5\text{Nm}$. After the injection pump is mounted, mount the injection pump gear with the mark "O" aligning with the mark "O-O" on the injection pump driving gear (Fig. 3-12).

Check and adjustment of fuel supply starting

Fuel supply advance angle should be checked after the fuel injection pump is mounted. Correct fuel supply advance angle gives the diesel engine a good performance. The check of fuel supply advance angle can be confirmed by measuring the displacement from piston to top dead center, or can be confirmed with scales on the flywheel. The former method is more accurate and thus is advisable to adopt.

Check with piston displacement method (Fig. 3-16 and 3-17).

- Turn crankshaft to make the cylinder piston at front wall cover end on the top dead center of compression stroke (both inlet and outlet valves are closed).
- Remove rocker seat.
- Remove valve spring of inlet or outlet valve and now the head of valve would fall onto the piston.
- The measuring rod of dial gauge with clamp is placed on valve stem top (Fig. 3-16).

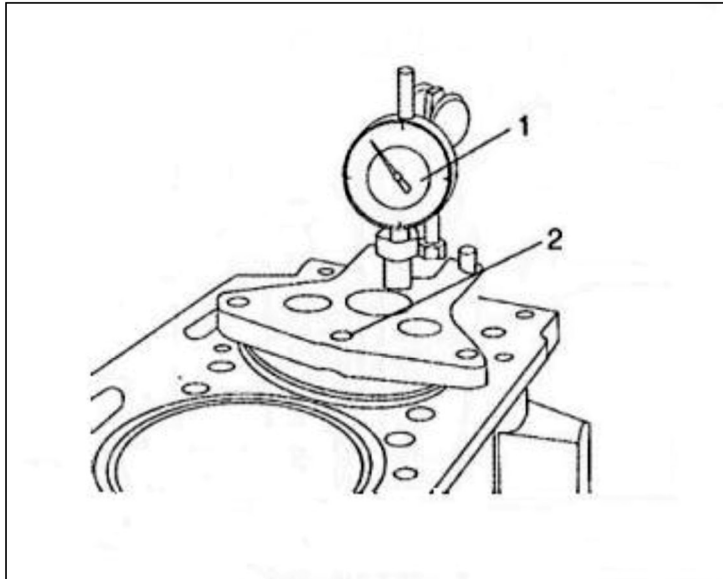


Figure 3-16

- Turn crankshaft clockwise and counter-clockwise and measure the position of piston on top dead center and turn the dial gauge to 0.
- Turn the crankshaft to the opposite direction to working direction (counter-clockwise from front end) to drop the valve, valve drop should not be more than 15mm.
- Remove high pressure fuel pipe of fuel injection pump connected to the cylinder and mount special tools with connecting nut 3 and drip pipe 4 (which is inside the rubber tube) (Fig.3-17).

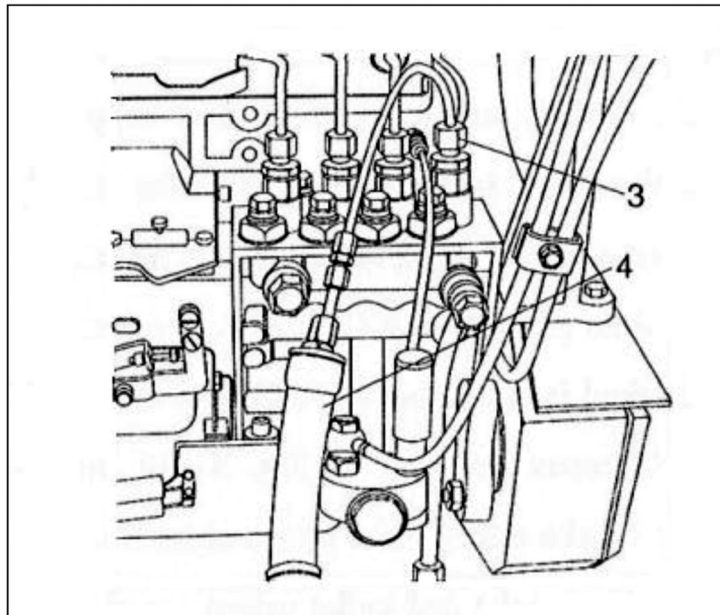


Figure 3-17

- Remove the air from fuel piping with hand pump on the fuel supply pump until diesel fuel flows from overflow pipe without air bubbles.
- Turn the diesel engine crankshaft slowly to the working direction, observe closely and control drip time of overflow pipe and make drip drop one every second and then stop turning crankshaft, the current position is the fuel starting point of this cylinder. Match the numbers displayed on the dial gauge with the relation table of diesel engine crankshaft angle and piston displacement to get fuel supply angle.
- Make adjustment if the fuel supply angle measured differs from stipulated fuel supply advance angle.

CAUTION: When turning crankshaft, the turning angle should not be too big to avoid valve falling into the cylinder. A clip can be mounted on the groove of valve stem in order to avoid this kind of incidents.

Check with graduations on the flywheel

Top dead center and fuel supply graduation are scaled on flywheel circumference. Fuel supply angles can be read through needles from side window 2 on the flywheel housing (Fig. 3-18)

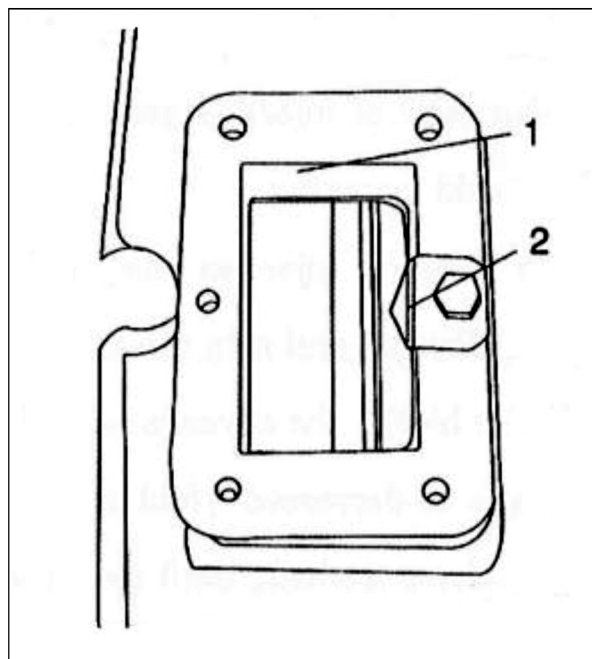


Figure 3-18

Detailed detection steps are as follows

- Remove the air from oil pipelines.
- Loosen connecting nut of high pressure pipe of the cylinder near the wall cover and injection pump to disconnect high pressure pipelines from injection pump.

- Turn the crankshaft to the working direction of diesel engine to make piston of cylinder near the front wall cover in the compression process, and then continue to turn crankshaft slowly to near crankshaft fuel supply starting point and meanwhile observe the fuel in the drip pipe connected with outlet valve port of injection pump and adjust fuel to one drop every 4-5 seconds, then stop turning crankshaft. Keep it within the stipulated limit, or make adjustments to fuel supply advance angle.

Adjustment and check of fuel supply advance angle

- Advance angle adjustment: (the advance angle is shown in table “Main performance and technical parameters of 226B series diesel engine”)
- Adjustment of advance angle when the injection pump is located at the opposite side of camshaft: the adjusting method is different from that of the injection pump is located at the camshaft side. Remove fuel injection pump gear on the front wall cover to check bore cover board. Loosen the four tightening bolts of fuel injection pump gear, turn the hexagon nuts of fuel injection pump shaft end with socket wrench. Clockwise turning means to increase fuel supply advance angle and counter-clockwise turning means to decrease the fuel supply advance angle. After adjustment tighten the four tightening bolts of injection gear and tighten the hexagon nuts on the fuel injection pump shaft end to avoid loosening.
- Adjustment of advance angle when the injection pump is located at the camshaft side. Loosen the nuts for injection pump flange, and turn the injection pump. When turning the upper end of pump towards the cylinder block, the advance angle is increased (fuel supply advanced); contrarily, the advance angle is decreased (fuel supply delayed). After adjusted, check advance angle according to above method, until meet the specified values.
- Advance angle check
- Adjust the high pressure fuel pipeline end to one drop for every 4-5 seconds with the above adjusting method. And now observe if the scale of flywheel end reaches the stipulated number, otherwise continue adjusting until the stipulated requirements and then tighten high pressure pipeline of the first cylinder.

Injector assembly

Diesel engine adopts BOSCH S type multiple-hole injector with hole number and hole diameter 5X0.276, of which opening pressure is 25MPa.

Fuel filter

In order to get a more refined filtering of diesel fuel and prevent impurity and dirt in the diesel from wearing and rusting of precision components in the supply system, the diesel engine is mounted with fuel filter.

Users shall regularly clean and change fuel filter with the following steps:

- Close the valve on the fuel pipes.
- Turn the special wrench for the fuel filter counter-clockwise and remove fuel filter 1.
- Before new fuel filter is mounted, coat oil evenly on the seal ring 2.
- Tighten the new fuel filter by hand.

- Open the valves on the fuel pipe.
- Release the air from fuel system.
- Check tightness of fuel filter. Detailed operation is shown in Fig. 3-19.

When using and maintaining, users should not randomly change fuel injection pump and injector and other parts.

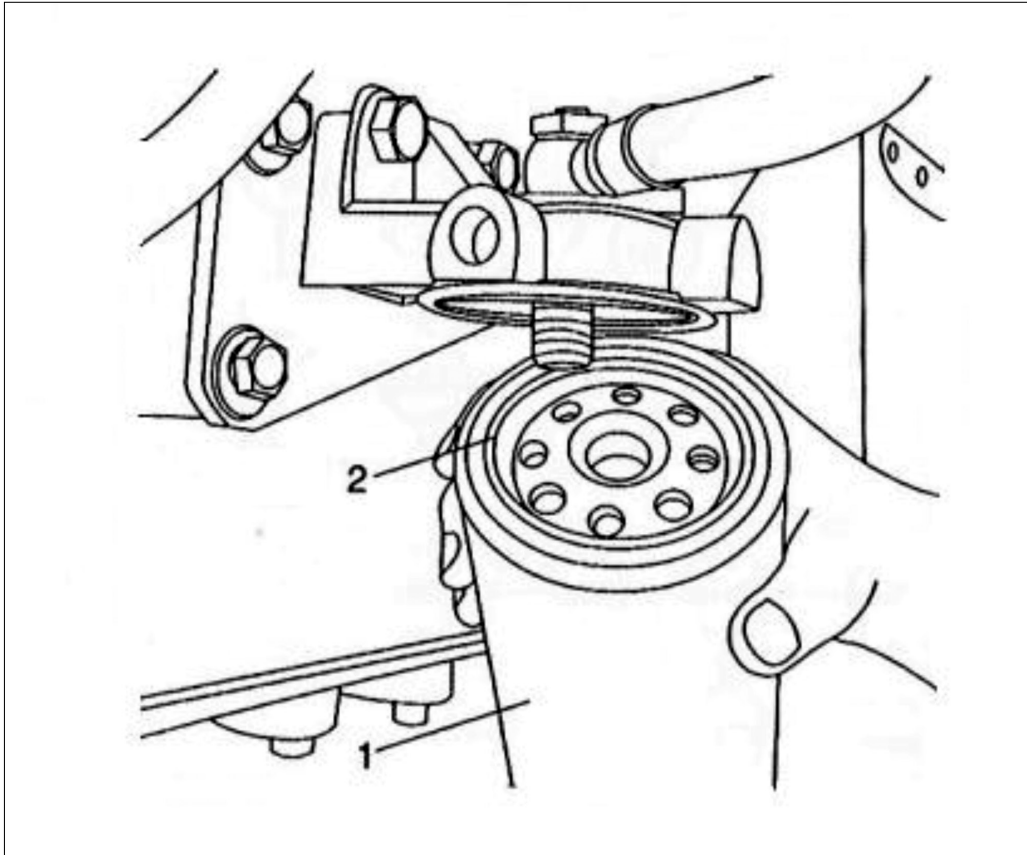


Figure 3-19

LUBRICATION SYATEM

Lubrication system diagram is shown in Fig. 3-20 and 3-21. The lubrication system of left setting injection pump (view from the free end) is shown in Fig. 3-20; and that of the right setting injection pump is shown in Fig. 3-21.

Lubrication system is composed of strainer, oil pump, oil cooler, oil filter and pressure limit valve.

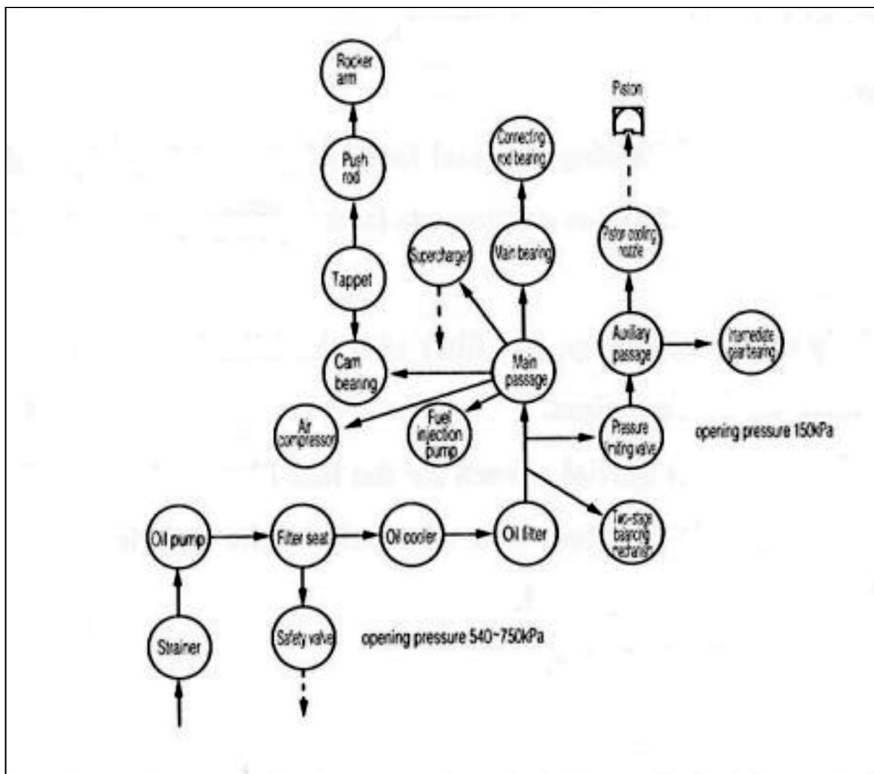


Figure 3-20

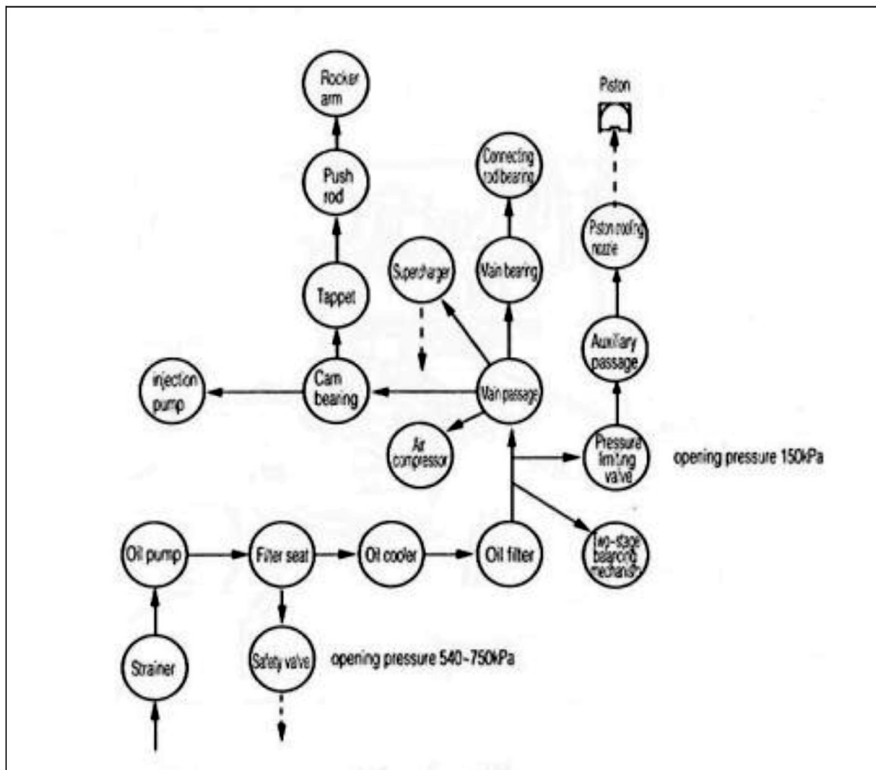


Figure 3-21

Strainer is the entrance of oil pump. The connecting part of strainer and oil pump inlet port is sealed with O type seal ring. Pay attention to its tightness when mounting, otherwise if oil pump takes in air, it would affect oil supply and thus result in such serious accidents as bearing shell burning and even engine damage.

Oil pump is of gear pump. Oil is pressed from oil pump and then enters into the filter seat, where a safety valve is mounted with opening pressure 540-750kPa. When oil pressure from the oil pump exceeds this value, release the oil to the oil sump. Pressure sensor and oil cooler interfaces are set on the filter seat.

Oil cooler and oil filter are in series connection with filter seat. Oil enters through filter seat into oil cooler and then to the oil filter and goes back to filter seat and finally to the main oil passage. Oil cooler is plate-fin type. Oil filter is screw-in filters. It can only be used once. Pressure lubrication is adopted in main bearing, connecting rod bearing, cam bearing, two-stage balancing system bearing, rocker arm bearing, intermediate gear bearing, injection pump, turbocharger and air compressor, while splash lubrication is adopted in connecting rod small end, gear train, piston and cylinder liner.

COOLING SYSTEM

Introduction to cooling system

Cooling system is functionally to ensure diesel engine working continuously at a moderate temperature. Forced circulation guarantees to reach the operating temperature rapidly. There are different cooling systems according to the application and the structure of diesel engine. It is composed of water pump, fan, expansion tank, water tank and thermostat.

Water tank covers in the cooling system should be kept undamaged and closed, since the internal pressure of 50kPa kept in the cooling system helps the steam pressure in the cooling system exceed the atmospheric pressure, which will increase cooling efficiency of the cooling system and thus it is not advisable to pen the covers.

- Cooling water circulation system adopting fin and tube radiator and fan (Fig. 3-22)
The cooling water is pumped into the cylinder block and cylinder head by water pump and then enters into water outlet pipe. The water ways of oil cooler and air compressor is also flowing into the water outlet pipe. The water came from the outlet pipe flows into the radiator through thermostat and then flows back to water pump. In the radiator, the heat of cooling water transfers to the air flow produced by fan. Before the temperature of cooling water reaches to the specified value, the cooling water flows back directly to water pump or partially by controlling of the thermostat. So the water temperature can be controlled automatically at all load conditions.
- Single circulation cooling water system adopting water cooled intercooler for turbocharged and intercooled engine

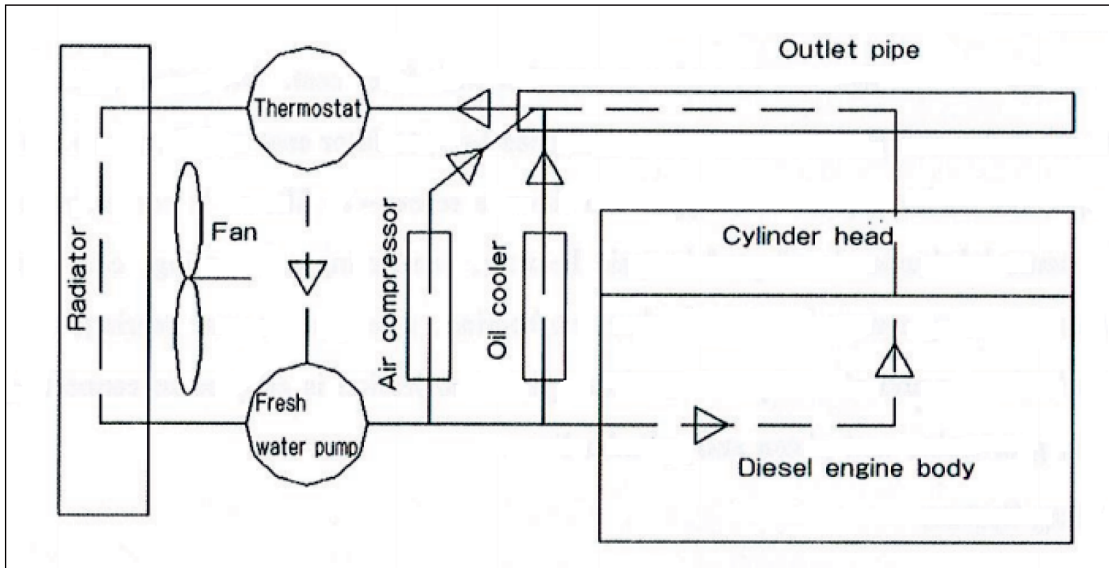


Figure 3-22

The temperature of intake air is increased by compressing of turbocharger. In order to lower the temperature of turbocharged air entering into the cylinder, it is necessary to cool the turbocharged air. The turbocharged air is cooled directly by the circulating water of the engine. This is the so called single circulation cooling system. This system is basically the same with that adopting fin and tube radiator. The difference is that the intercooler is paralleled after the water pump. This system is suitable for diesel engine that is difficult to adopting air-air intercooler.

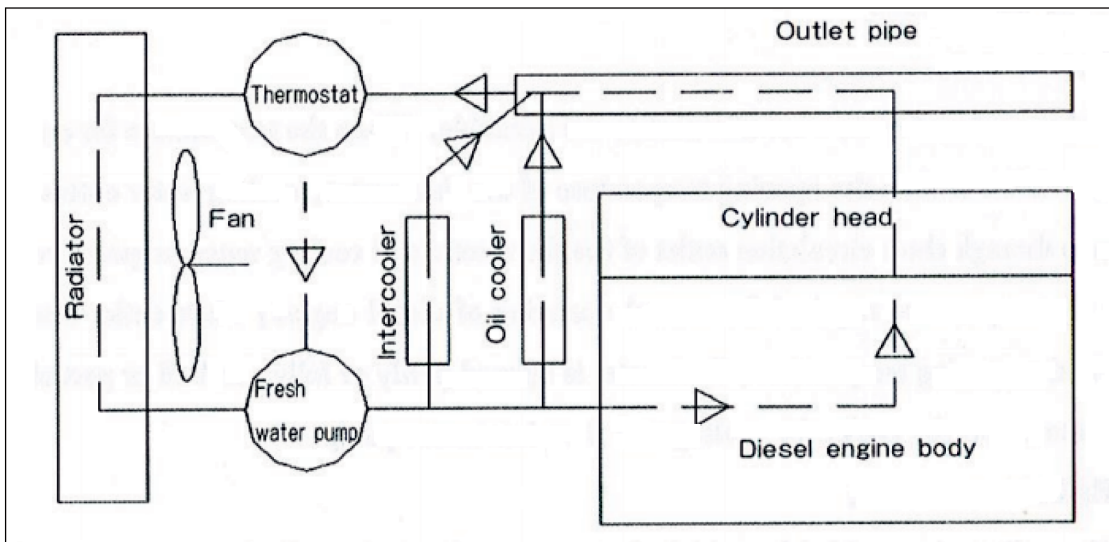


Figure 3-23

Main parts of cooling system

Water pump

Water pump is of centrifugal type. Water pump turbine shell is on middle block, which is mounted on front part of engine together with water pump. Water pump impeller has two types (86mm and 110mm in diameter). According to different rated speed of the diesel engine and required cooling flow, choose water pumps of different sizes. When adding water to the water pump, connect one inlet with radiator and the other with short circulation outlet of thermostat.

Outlet pump

Cooling water pumped out of water enters into outlet pipe through engine body and cylinder head. There are two kinds of water outlet pipe. One is welded part which is connected with the water outlet on the top of cylinder head. The other one is aluminum casting pipe connecting with intake pipe. A inside thermostat is mounted in the outlet end of water pump. This kind of water outlet pipe is connected with the outlet on the intake/exhaust flange at the side of cylinder head. The air outlet hole on the inlet and outlet flange face is connected with outlet pipe, making the air in the cooling system enters into outlet pipe. An inner-placed thermostat is mounted near the outlet pipe. A 6mm air outlet pipe is connected on the surface of water outlet pipe, which should be connected with expansion tank or the upper cavity of radiator and the air in the cooling system is expelled through this pipe to avoid air resistance and high water thermostat.

Thermostat

Outer-set and inner-set thermostats are available. When the temperature for outlet cooling water is lower than the opening temperature of the thermostat, cooling water enters into water pump through short circulation outlet of the thermostat and cooling water temperature thus rises to the temperature required for normal operating of diesel engine; when outlet temperature exceeds the opening temperature, thermostat is opened partly or fully, and all or part of cooling water enters into the cooler for cooling and then into water pump.

Radiator and fan

The radiator is provided by vehicle factory according to heat dissipating capacity of diesel engine. Metal plate pressed fan and plastic pressed shaped fan are available. The fan can be mounted at different positions. There are two kinds of transmission types, one is rigid transmission, and the other is silicon oil clutch transmission (or viscous transmission).

INTAKE AND EXHAUST SYSTEM

The intake and exhaust system is composed of the air filter, air intake pipe, exhaust pipe, exhaust silencer, waste gas turbo-turbocharger (for turbocharged diesel engine), intercooler (for the diesel engine with intercooler) and connecting pipes etc.

Intake

The air intake for the diesel engine is required to be clean and sufficient, therefore the intake air must be filtered, and the piping resistance for air intake should be as small as possible.

Diesel engine for construction machinery adopts dry type air filter with paper element. For the diesel engines with different powers, select the air filter with corresponding capacity. Meanwhile, the air filters with different models should be selected based on dust content in the air at working environment.

Dry type paper filter usually has rough filter that makes air swirl, paper filter element and security filter element as well as automatic dust valve for dust removal from rough filtering. The resistance of air filter should not be too high. The maximum resistance is not allowed to exceed 3kPa at unpolluted condition, and 5kPa at polluted condition. A maintenance indicator is mounted at the outlet of air filter, when the indicator displays red signal, the filter should be taken care of or changed timely. Otherwise it would influence performance and service life of the diesel engine.

When the air filter and connecting piping are installed, the user shall pay close attention to the tightness and the reliability. If not, it could result in the filter failure or short-circuit. Because when the air which has not been filtered enters directly into the diesel engine, it could result in early wear of the diesel engine. The diesel engine will have following phenomena: even if the use time has not reached specified service life, but some abnormal phenomena occur. For example, oil consumption increased greatly, crankshaft case blow-by, engine power reduction, generating black smoke etc. If the condition is serious, it would also generate serious wears of cylinder liners and piston rings, piston ring breaking, cylinder score and other troubles.

There are metal plate welded intake pipe and cast aluminum alloy intake pipe with many kinds of structure for different diesel engine. When mounting the intake pipe on the cylinder head, compound material gasket and stainless steel gasket are used for aluminum pipe and metal plate pipe respectively.

CAUTION!

- 1. When the filter element is damaged or when the intake resistance has reached specified pressure drop, the cartridge must be timely changed.**
- 2. In the air intake passage before the turbocharger, any loose parts are forbidden. If not, it could enter the turbocharger to damage the impeller.**

Exhaust

The 4-cylinder diesel engine adopts integrated exhaust pipe; 6-cylinder diesel engine adopts integrated or one pipe for 3 cylinders (two pipes are inserted together) , the inserting place should be sealed with thin sheet ring.

The smaller exhaust resistance of the diesel engine, the better of the performance of diesel engine. When the value is increased to a certain digit value, it will have disadvantageous influence on the diesel engine performances, therefore the exhaust pipe is required to have a suitable pipe diameter and flow area, and the bends shall be as fewer as possible. For turbo-charged and natural aspiration diesel engines, the total resistance of the exhaust main pipe and the silencer should not exceed 5kPa and 7.5kPa respectively.

Turbocharger and intercooler system

Turbocharger

The turbocharger model and the turbocharger with intercooler model for series 226B diesel engine adopt all radial-flow type waste gas turbocharger. The oil for lubricating and cooling the turbocharger is introduced from the main oil passage, after entering into the turbocharger, oil returns back directly to lower part of the crankcase.

The waste gas turbocharger is a high-speed, high-temperature running machine. After the diesel engine is started up, it shall run idling for 3-5 min first, then for loading running. Stop of the engine immediately is not allowed while the diesel engine is running at high-speed and big-load. The diesel engine shall gradually reduce the load and speed, and should run idly for 3-5 min. If not, it could result in the turbocharger bearing damage and failure. After the turbocharger is disassembled, and before it is reassembled, clean machine oil should be filled into the oil inlet.

Turbocharged air cooler (i. e. intercooler)

There are two kinds of intercooler of 226B series diesel engine for construction machinery: air-to-air cooling type and cooling water-air cooling type. The intercooler should be selected according to the applications.

The intake air of diesel increases in temperature after passing through turbocharger. The intercooler is used to reduce intake air temperature. For air cooled intercooler, it is required to reduce the air intake temperature to 42-50°C. For water cooled intercooler, the cooling effect of intake air is affected by the temperature of circulating water.

Air-to-air type intercooler is usually mounted with circulating water radiator of diesel engine and is cooled with fan. The intercooler is located before or after the radiator according to the wind direction of fan. It is required generally to cool the intercooler first and then the radiator. The intercooler and radiator can also be arranged parallelly.

For water-air intercooler (Fig. 3-23) the turbocharged air is cooled through the circulating water. The intercooler is of closed box structure. The turbocharged air flows from the top to the bottom, and the water inlet and outlet are at the same end.

ELECTRIC SYSTEM

This system is composed of starter, charging generator, control instrument and battery with voltage of 24V or 12V.

Starter

The starter is DC motor which is electromagnetically controlled. Its principle diagram is shown in Fig. 3-24. At 24V working voltage, there are rated powers of 4kW and 6kW; when the working voltage is 12V, the rated power is 3-4kW.

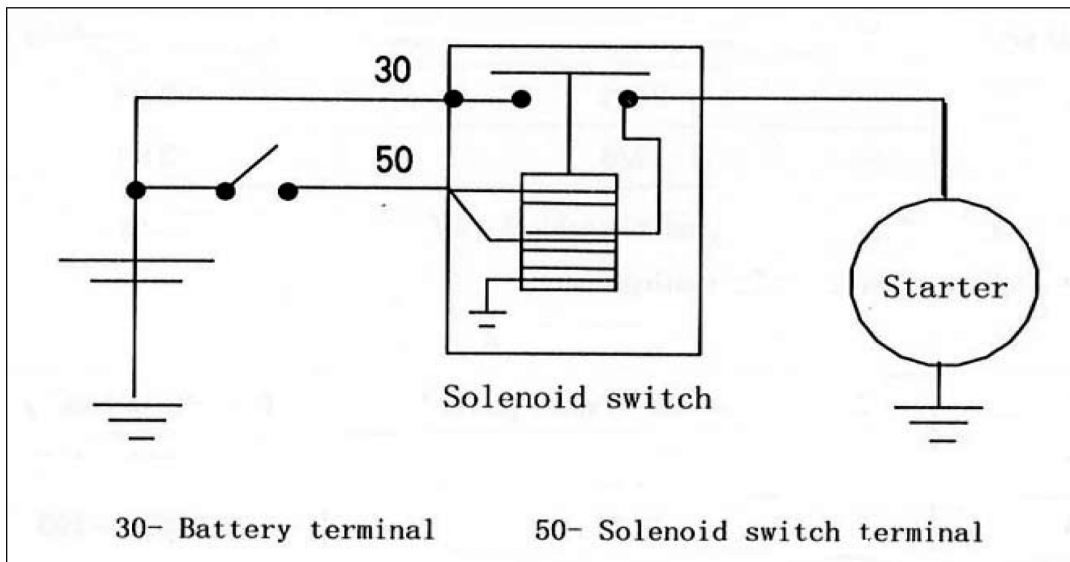


Figure 3-24 Electric schematic diagram of starting motor

Generator

It is a silicon rectification generator with transistor regulator. Its rated voltage is 28V or 14V. Please refer to Fig. 3-25 for principle diagram. Generator should have a parallel operation with battery and excites itself when working.

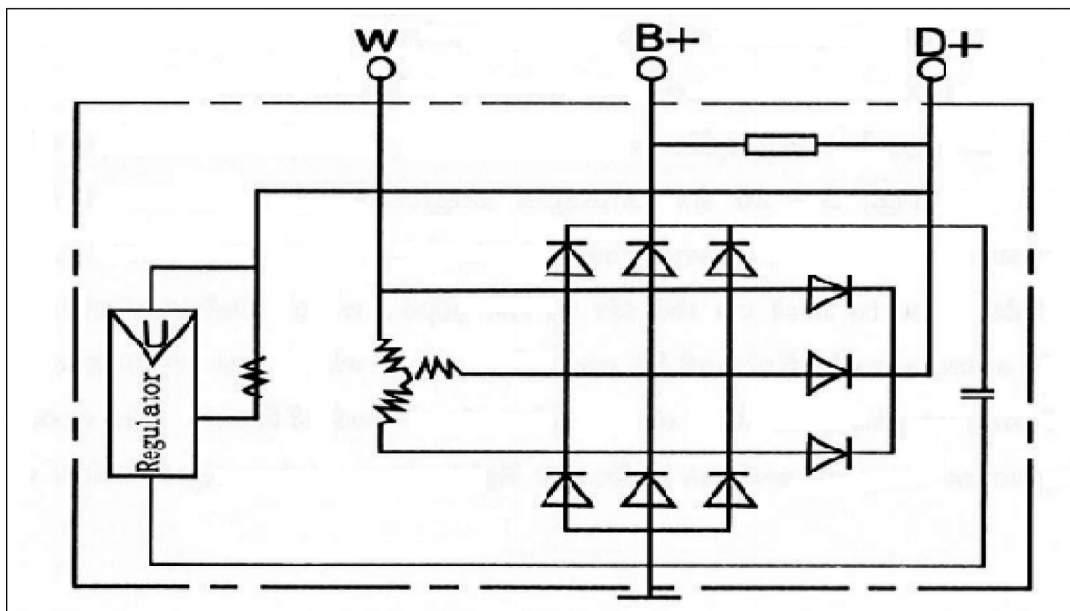


Figure 3-25 Principle diagram of generator

Battery

When started with 24V voltage, refer to table 3-1 for the capacity of battery: (Take Beijing “Prestolite” as an example for starting motor)

Table 3-1

| Cylinder No. | Voltage of starter V/rated power kW | Capacity of battery Ah |
|--------------|-------------------------------------|------------------------|
| 4 | 24/6 | 2 X 150 |
| 6 | 24/6 | 2 X 150 |

When started with 12V voltage, refer to table 3-2 for the capacity of battery: (Take Beijing “Prestolite” as an example for starting motor)

Table 3-2

| Cylinder No. | Voltage of starter V/rated power kW | Capacity of battery Ah |
|--------------|-------------------------------------|------------------------|
| 4 | 12/3.5 | (130) ~ 150 |
| 6 | 12/4 | (165) ~ 195 |

NOTE: 1. The battery capacity in brackets in table 3-2 is the min battery capacity (suitable for temperate zone).

2. The battery capacity without brackets in table 3-2 is the recommended battery capacity (suitable for frigid zone).

Flame pre-heater

Flame pre-heater is auxiliary equipment for cold start used in cold weather. The whole system consists of temperature sensor, solenoid valve, flame heater plug, electronic control unit and preheating indicator that installed on outlet water pipe of the diesel engine (please refer to Fig. 3-26 for principle diagram). The fuel enters into heater plug through low pressure pipe of fuel system and is ignited by the electric heating. The fuel flame enters into air inlet pipe to heat up the air in the pipe, which makes starting up easy. The whole process is automatically finished by control system, which can automatically control preheating time of preheat plug (installed on air inlet pipe) and of flame. The operator is allowed to start the engine as long as preheat indicator light gives flicker signal after connecting key switch.

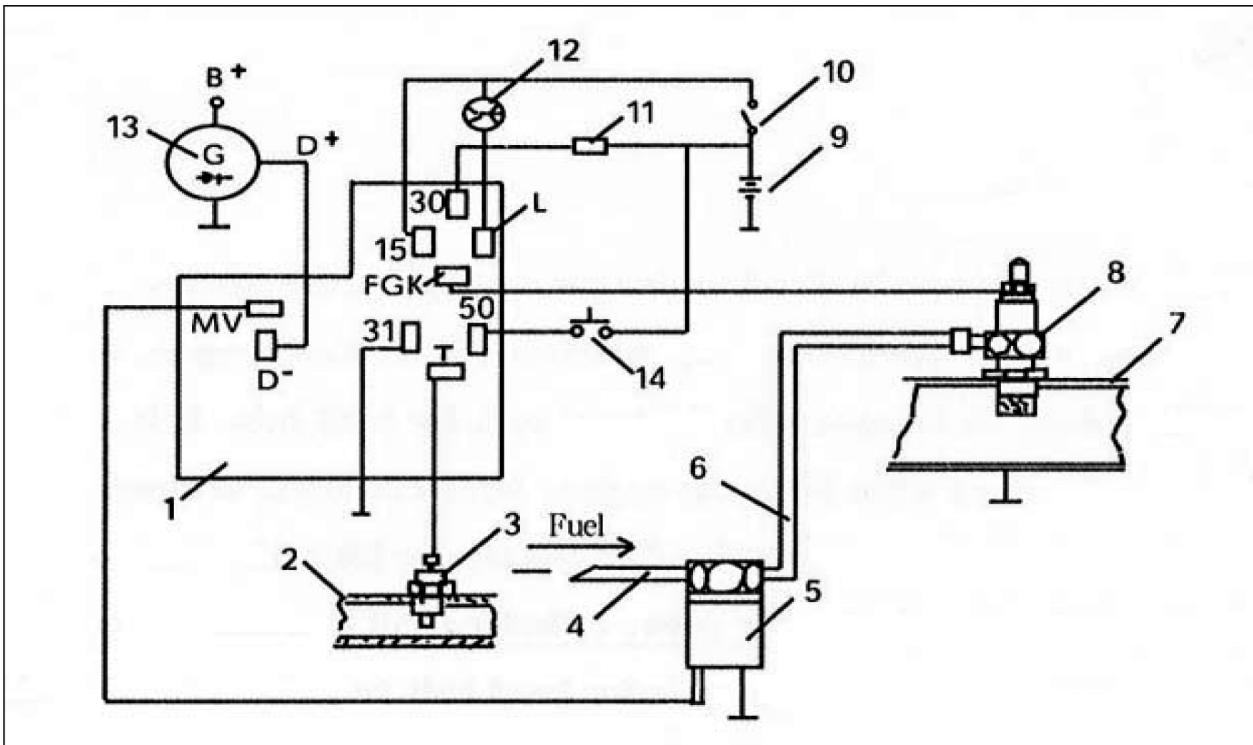


Figure 3-26

| Reference Number | Description | Reference Number | Description |
|------------------|-----------------------------|------------------|--------------------------------|
| 1 | Electronic control unit A24 | 8 | Pre-heater plug R3 |
| 2 | Cooling water pipe | 9 | Battery |
| 3 | Temperature sensor | 10 | Key switch |
| 4 | Fuel supply pipe | 11 | Fuse 25A |
| 5 | Solenoid valve Y21 | 12 | Preheat indicator light 112/29 |
| 6 | Fuel pipe | 13 | Generator |
| 7 | Air intake pipe | 14 | Starting button |

AIR COMPRESSOR

The single cylinder and reciprocating air compressor, driven through gear or belt installed on camshaft timing gear case, is cooled by wind or water. When the air compressor is driven by belt, it is mounted on the upper left of gear case (view from the front end); for gear driven air compressor, it is driven by the camshaft timing gear (Fig. 3-12) or the driving gear of air compressor coaxial with the camshaft timing gear (Fig. 3-13). The lubrication oil in air compressor is introduced from main oil gallery and comes into bearing of air compressor and flows back to the gear case, and then flows to oil sump.

The entering air to air compressor should be filtered. The air inlet should be connected after the air filter of diesel engine using air pipe.

INSTALLATION AND CONNECTION OF DIESEL ENGINE

LIFTING OF DIESEL ENGINE

Incorrect lifting might make diesel engine get damaged in the process of lifting. Two special cylinder head bolts on every diesel engine are used to lift diesel engine. M14 threaded rod, assembled lifting ring, on hexagonal head face of cylinder head bolt. It is suggested to adopt hanger shown as Fig. 4-1 when lifting the engine. Make crankshaft of diesel engine keep level condition at the time of lifting. Do not only adopt one rope or lift in the shape of triangle (shown as the right Fig. of 4-1). As hanger rope, cylinder head bolt and lifting ring are not on a straight line, lifting might damage cylinder head bolt or make it break, which damage diesel engine. Users should pay close attention to it.

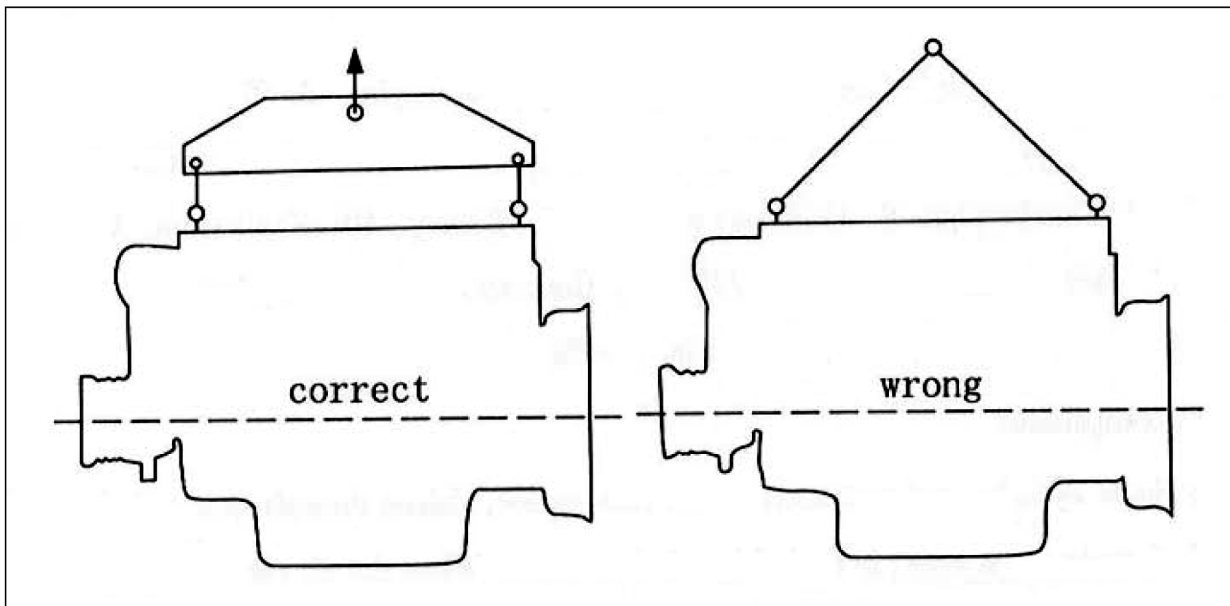


Figure 4-1

INSTALLATION OF DIESEL ENGINE

Adopt elastic connection and make sure the crankshaft center line of diesel engine is in the same axes with input axis of driving device (gear case, transmission case or generator) as well as crankshaft not to bear additional axial force because of installation.

INSTALLATION OF EXHAUST CONNECTION SYSTEM

It should connect the exhaust pipe of diesel engine to outdoor anti avoid exhaust pipe from overly bending. Expansion joint should be installed in the middle of pipeline that should have additional supporting. The inside diameter of exhaust pipe should not be less than 120mm and exhaust back pressure should be not exceed 6kPa.

The capacity of fuel tank should meet the demand of diesel engine working for 8 hours at rated load. The position of fuel tank outlet should not be lower than the inlet of fuel supply pump. The inside diameter of fuel pipe should not be less than 7.5 mm.

OPERATION OF DIESEL ENGINE

PREPARATION BEFORE USE

Unsealing

After unpackaged the diesel engine, user should firstly check the diesel engine and its accessories according to the packing list, and inspect if the diesel engine damaged and the connecting elements loosen. Then, carry out the followings:

- Clean the antirust coat and anticorrosive agent of external parts.
- Discharge the oil in fuel filter and fuel system components. (It is also allowable that start without discharging oil in fuel system. But only the oil in oil seals used up and normal diesel fuel provided, can the engine high loaded running.)
- Check if the water and covers are blocked. Check if the water temperature, oil temperature sensors are complete.

CAUTION: *The diesel engine should not be started up before it is correctly installed and connected to its final location. Keep ventilation when diesel engine runs in enclosed environment to make sure the waste gas exhausted into the atmospheric air.*

Fill in oil

- The oil should meet the requirements. If the oil does not meet the requirements, it may result in lack of oil pressure, wearing and starting up difficulty. The oil must be very clean.
- Tighten the oil drain plug.
- Open the filler cap 1 in Fig. 5-1 and fill in oil. The oil must be filtered through a filter mesh.

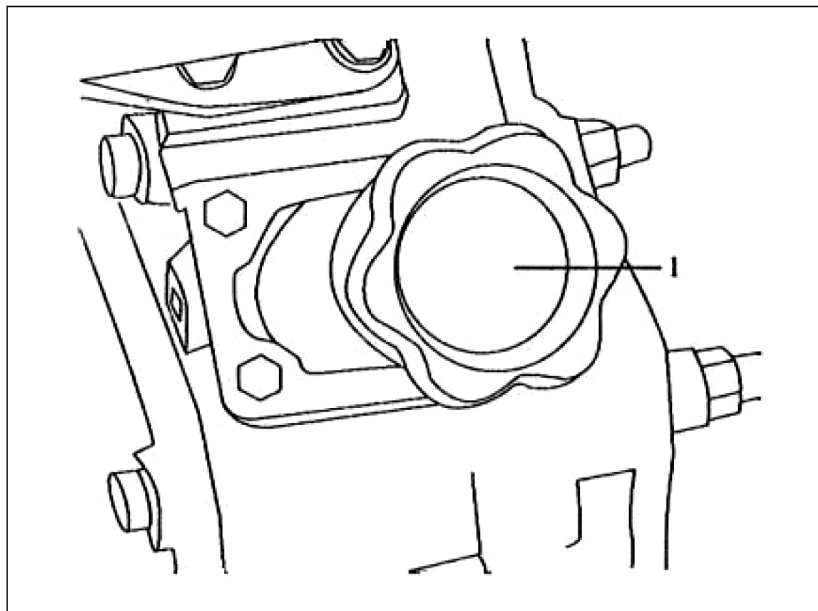


Figure 5-1

- The diesel engine should be placed at a horizontal location. Pull the dipstick out to inspect the oil level. The oil can be filled to the upper limit of dipstick if necessary.
- Tighten the filler cap.

CAUTION: *Each time before starting up the diesel engine, the level of the oil must be checked.*

Fill in fuel

- The diesel fuel to be used should meet the specification.
- Pay attention to the cleanliness of the diesel fuel. Before filling, the diesel fuel should be better laid up over 72 hours at a still condition. The diesel fuel should be filled in the oil tank through a built-in filter mesh.

CAUTION: *Check fuel level every time when the engine is started.*

Fuel system venting

- Unscrew the fuel-through screw 1 (in Fig. 5-2) at the outlet port of the fuel delivery pump for half a turn, and press the hand pump 2 of the fuel delivery pump 3 upward and downward, until the diesel fuel overflows out, then tighten the fuel-through screw.
- Unscrew the venting screw 4 on the fuel filter 5 (in Fig. 5-3). Press the hand pump upward and downward, until the diesel fuel overflows out, tighten the venting screw.
- Unscrew the venting screw 6 on the fuel injection pump 7. Press the hand pump of the fuel delivery pump upward and downward, until the diesel fuel overflows out, tighten the venting screw.
- Continue to press the hand pump upward and downward, and inspect if the fuel piping has any leakage, tighten the hand pump.

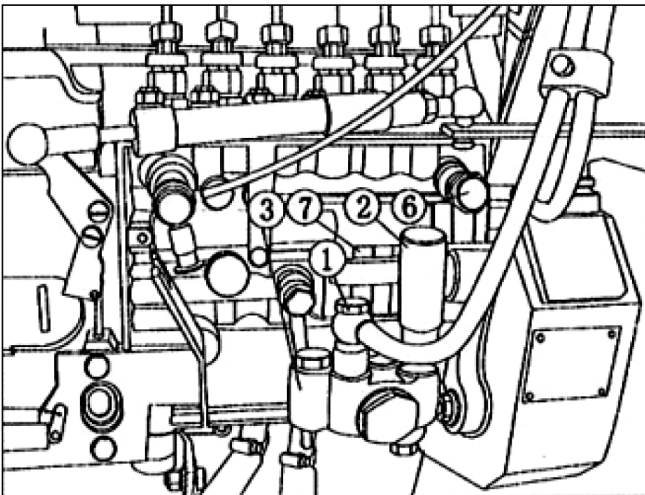


Figure 5-2a

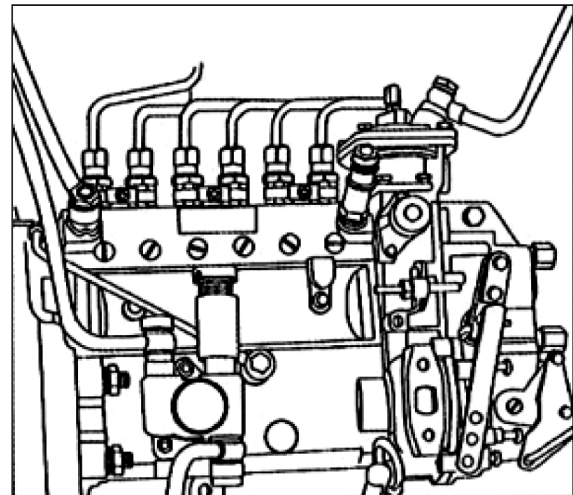


Figure 5-2b

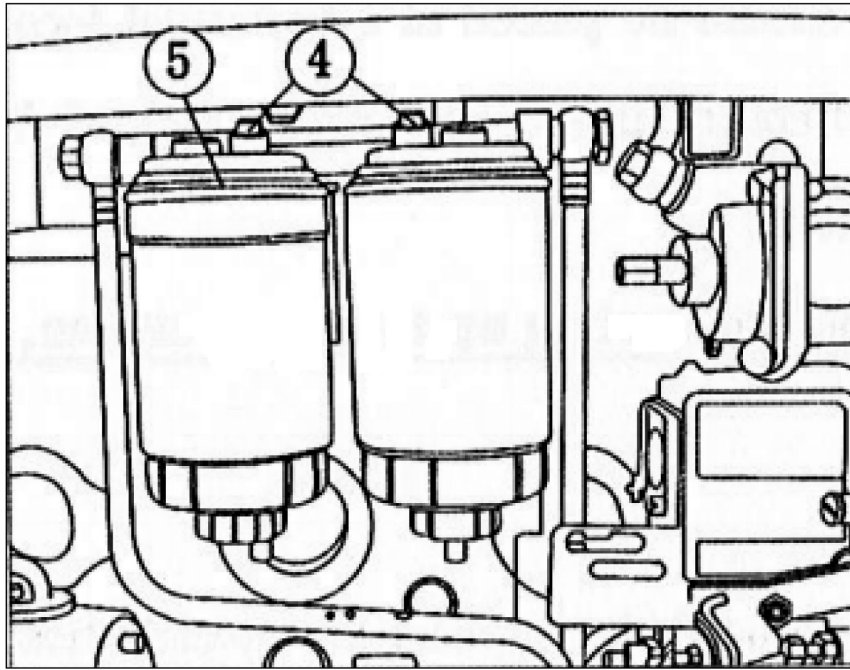


Figure 5-2b

Fill in coolant

The coolant is composed of soft clean water, anticorrosive agent and long-acting antifreeze. When compounding it, the stipulations given by the additive production factory must be strictly executed.

CAUTION: *Frequent adding water and changing water can result in the scale formation in the cooling system. Therefore, the leakage of cooling system should be repaired as soon as possible. When adding water, add the soft clean water and avoid changing the coolant as much as possible. The drained coolant from water tank could be reused after filtered through fabric or fine net.*

Check the coolant level every time when engine is started.

PRECAUTION FOR OPERATION

Precaution for running

During starting the engine, if it can not be started in 15s, restart after 2 minutes.

After starting, run idly for about 2-3 minutes, and the oil pressure should be above 120kPa. Diesel engine can not run at high speed and on high load suddenly when the cooling water temperature is not more than 60, because this would have influence on the wear ability and reliability of the diesel engine.

Diesel engine works in medium load in running -- in period (in 3000km).

Inspection on oil level should be done after stopping the engine for 5 minutes. Before stopping the engine, the load and speed should be decreased and the engine runs at idling speed for 5-10 minutes at least.

CAUTION: *In order to avoid the diesel engine from damaging, when the diesel engine is working, the cable connecting the diesel engine pressure regulator and the cable connecting the positive pole of the accumulator should not be dismantled. Different from the direct current generator, strictly prohibit the alternating current generator to conduct voltage inspection through moment grounding.*

For the diesel engine in which the cooling water has not added long-acting antifreeze, when it is used in the cold days, the cooling water must be drained off after stop so as to prevent the diesel engine from breaking due to freezing. The drain port is at the oil cooler. After the drainage screw plug is dismantled, the cooling water in the diesel engine can be drained off.

Precaution during starting and running in cold weather

- For the engine without adding long-acting anti-freeze in cooling water, while operating in cold weather, after stop the engine, the cooling water must be drained out in order to prevent engine frozen. Outlet is at oil cooler and the water could be drained through removing outlet plug.
- Before cold season coming, make sure to check the electrolyte level, viscosity and cell voltage. If the vehicle being in low temperature for long lime, the battery should be took off and put in warmer place.
- If the air entry which could be controlled h switch, it should be switched to “winter” position.

PERIODICAL INSPECTION AND TECHNICAL MAINTENANCE OF DIESEL ENGINE

ROUTINE MAINTENANCE

The routine maintenance of the engine includes the following items:

- Inspect the levels of coolant, engine oil and fuel, and check whether the grease is enough;
- Check whether there is leakage of oil, water or air;
- Check whether the external and auxiliary parts are well connected and fastened;
- Check whether the fan belt is too tight or loose; whether there is crack or scratch on the belt; and whether there is breakage on the fan;
- Check oil pressure of diesel engine;
- Check water temperature of diesel engine;
- Check whether the temperature, color, sound and vibration of exhaust are normal, and whether the speed is steady.

PERIODIC MAINTENANCE

Periodic maintenance should be carried out according the following table. It should be done more frequently according to the actual situation if the diesel engine is running in dusty environment or in case of frequent shutdown.

Maintenance Period

| Maintenance Period | Running Time (h) | Remarks |
|---------------------|--------------------|---------|
| First Inspection | 30~50 | |
| Routine Inspection | Every 250 | |
| Level-1 maintenance | Every 500 | |
| Level-2 maintenance | Every 1000 | |
| Level-3 maintenance | Every 2000 | |
| Level-4 maintenance | Every 4000 | |

Maintenance Specifications

| Maintenance Items | Replace | Adjust | Inspect |
|---------------------|---|-----------------|--|
| First Inspection | Oil, Oil filter | Valve clearance | Fasten the pipe clamp; Fasten the V-belt |
| Routine Inspection | Oil, Oil filter, | Valve clearance | Fasten the V-belt |
| Level-1 maintenance | Oil, Oil filter, Fuel Filter | Valve clearance | Air filter; Air intake system; Fasten the pipe clamp; Fasten the V-belt |
| Level-2 maintenance | Oil, Oil filter, Fuel Filter | Valve clearance | Air filter; Air intake system; Fasten the pipe clamp; Fasten the V-belt |
| Level-3 maintenance | Oil, Oil filter, Fuel Filter, Coolant, Air Filter | Valve clearance | Air filter; Air intake system; Fasten the pipe clamp; Fasten the V-belt; Inspect and adjust injection pump on test bench |
| Level-4 maintenance | Oil, Oil filter, Fuel Filter, Coolant, Air Filter | Valve clearance | Air filter; Air intake system; Fasten the pipe clamp; Fasten the V-belt; Check bearing clearance of turbocharger; Inspect and adjust injection pump on test bench |

CHECK AND REPAIR

Along with the wearing and eroding of the parts, the working reliability of the diesel engine will be affected. In order to avoid abnormal working of diesel engine, the following checks are recommended. The 1st check and repair should be performed after the engine running for 2000h or 2years (<2000h).

| Items | Running time (h) |
|---|------------------|
| Check injector | 2000 |
| Check compressing pressure of piston | 2000 |
| Check the bearing clearance of water pump | 5000 |
| Check turbocharger | 5000 |
| Check injection pump | 5000 |
| Check cylinder head | 5000 |
| Check cylinder liner | 5000 |
| Clean the cavity of water cooled exhaust manifold and check corrosion | 10000 |
| Check connecting rod bearing and main bearing | 10000 |
| Check piston | 10000 |
| Check crankshaft | 10000 |
| Check camshaft | 10000 |
| Check two-stage balance mechanism | 10000 |
| Check driving gear | 10000 |
| Check and repair injection pump fully | 10000 |
| Replace oil pump | 10000 |
| Replace water pump | 10000 |
| Replace crankshaft front and rear oil seal | 10000 |
| Replace vibration absorber | 10000 |

LONG TERM STORAGE MAINTENANCE

When the diesel engine in the condition of long time storage, it must test run once every month avoiding the damage of rusting.

Before the diesel engine is stored, all rusting shall be removed through suitable methods, and all locations which are treated by the protective agent (such as lubricating oil line, fuel system, turbocharger) should be thoroughly cleaned.

The protection procedures:

- After the diesel engine warmed, drain off all the oil and clean the filter. Fill in rust proof oil to oil tank or sump.
- Drain completely the diesel fuel in the fuel system and re-fill in the mixture of 90% diesel fuel and 10% rust proof oil for protecting the whole fuel line. Before the mixture is added, they must be blended.
- If the diesel engine was not added with cooling emulsifying liquid, after the cooling water drained, the cooling water emulsifying liquid and anti-rust oil which can protect the water jacket shall be added. Before storage, start the engine with the above emulsifying liquid cording to starting procedure and idle running for 15-25 min.
- Dismount the cover at short face of the intake pipe; spray anti-rust oil into the intake pipe with pressure nozzle. When spraying, use a hand to turn the crankshaft so as to open the air valve to make anti-rust oil to seep in the combustion chamber. Once all storing work completed, the crankshaft should not be turned again so as to prevent the oil film adhered on the cylinder wall from scratching off.
- Drain off all oil liquids in the diesel engine. Drain off the anti-rust liquid or use a pump to drain the anti-rust liquid from the engine base. Drain off emulsifying liquid from the cooling system, and all liquid drainage switches are kept open.
- Dismount the rocker cover and spray anti-rust oil to valve spring and rocker.
- All machining parts and easily rusted parts of the diesel engine should be coated protection oil.

After above procedures are completed, the engine can be sealed and stored.

In order to prevent moisture in the air and foreign matters from entering the diesel engine, during transport and storage period, apply the covers to seal the openings of intake, exhaust and cooling water pipes of the diesel engine, and cover the diesel engine with a plastic hood.

TROUBLE SHOOTING

Trouble shooting table

| Diesel engine fails to start | The engine stops | Under power | Unstable running | Black smoke | Oil pressure low | Unstable speed | Over heat | Knocking of piston | Cause | Remedy |
|------------------------------|------------------|-------------|------------------|-------------|------------------|----------------|-----------|--------------------|--|--|
| ▲ | ▲ | | | | | | | | The power of battery not enough, cable joint loosening | Check and charge |
| ▲ | | | | | | | | | Governor handle not in place | Place it on starting position |
| ▲ | | | | | | | | | Stop handle in stop position | Loosen the stop handle |
| ▲ | ▲ | ▲ | ▲ | | ▲ | ▲ | | | The fuel not enough | Fill in fuel |
| ▲ | ▲ | | | | ▲ | | | | Improper trade mark of the oil | Replace the oil which meets requirement |
| ▲ | ▲ | ▲ | ▲ | ▲ | | | ▲ | ▲ | Fuel injector failure | Check the injector, eliminate or replace |
| | | ▲ | ▲ | | | | | | Valve clearance incorrect | Adjust it according to requirement |
| | | ▲ | ▲ | | | | | | Air filter not clean | Clean it or replace |
| ▲ | | ▲ | ▲ | | | | | | The compressing pressure low | Check and adjust |
| ▲ | ▲ | ▲ | ▲ | | | | | | Governor failure | Repair |
| | | ▲ | ▲ | | ▲ | | | | Fuel filter not clean | Replace |
| ▲ | | | | ▲ | | | | | Over oil | Drain the excess |
| | | | | | ▲ | | | | Oil filter not clean | Check or replace |
| | | | | | ▲ | | | | Oil pressure adjusting valve not close | Check and clean |
| | | | | | | | ▲ | | V belt loosening | Tighten it according to the requirement |
| | | | | | | | ▲ | | The cooling water not enough | Fill in cooling water |
| | | | | | | | ▲ | | Thermostat or pump abnormal | Repair or replace |
| | | ▲ | | | | | ▲ | | The diesel engine running overload | Decrease the load |

Power Corrcction Coefficient

| Ma P. kpa | T °C | | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----|
| | 110 | 0.97322 | 0.97487 | 0.97650 | 0.97813 | 0.97975 | 0.98136 | 0.98297 | 0.98456 | 0.98615 | 0.98773 | 0.98930 | 0.99086 | 0.99242 | 0.99397 | 0.99551 | 0.99704 | |
| 108 | 0.97572 | 0.97737 | 0.97902 | 0.98065 | 0.98227 | 0.98389 | 0.98550 | 0.98710 | 0.98869 | 0.99027 | 0.99185 | 0.99341 | 0.99497 | 0.99652 | 0.99807 | 0.99960 | | |
| 106 | 0.97828 | 0.97993 | 0.98158 | 0.98322 | 0.98485 | 0.98647 | 0.98808 | 0.98968 | 0.99128 | 0.99286 | 0.99444 | 0.99602 | 0.99758 | 0.99914 | 1.00068 | 1.00222 | | |
| 104 | 0.98089 | 0.98255 | 0.98420 | 0.98584 | 0.98748 | 0.98910 | 0.99072 | 0.99232 | 0.99392 | 0.99552 | 0.99710 | 0.99868 | 1.00024 | 1.00180 | 1.00336 | 1.00490 | | |
| 102 | 0.98356 | 0.98523 | 0.98688 | 0.98853 | 0.99016 | 0.99179 | 0.99341 | 0.99503 | 0.99663 | 0.99823 | 0.99981 | 1.00139 | 1.00297 | 1.00453 | 1.00609 | 1.00764 | | |
| 100 | 0.98629 | 0.98796 | 0.98962 | 0.99127 | 0.99291 | 0.99455 | 0.99617 | 0.99779 | 0.99940 | 1.00100 | 1.00259 | 1.00417 | 1.00575 | 1.00732 | 1.00888 | 1.01043 | | |
| 98 | 0.98909 | 0.99076 | 0.99242 | 0.99408 | 0.99573 | 0.99736 | 0.99899 | 1.00061 | 1.00223 | 1.00383 | 1.00543 | 1.00702 | 1.00860 | 1.01017 | 1.01174 | 1.01330 | | |
| 96 | 0.99195 | 0.99362 | 0.99529 | 0.99695 | 0.99860 | 1.00025 | 1.00188 | 1.00351 | 1.00513 | 1.00673 | 1.00834 | 1.00993 | 1.01151 | 1.01309 | 1.01466 | 1.01622 | | |
| 94 | 0.99487 | 0.99656 | 0.99823 | 0.99990 | 1.00155 | 1.00320 | 1.00484 | 1.00647 | 1.00809 | 1.00971 | 1.01131 | 1.01291 | 1.01450 | 1.01608 | 1.01766 | 1.01922 | | |
| 92 | 0.99787 | 0.99956 | 1.00124 | 1.00291 | 1.00457 | 1.00622 | 1.00787 | 1.00950 | 1.01113 | 1.01275 | 1.01436 | 1.01596 | 1.01756 | 1.01915 | 1.02073 | 1.02230 | | |
| 90 | 1.00095 | 1.00264 | 1.00433 | 1.00600 | 1.00767 | 1.00933 | 1.01097 | 1.01262 | 1.01425 | 1.01587 | 1.01749 | 1.01910 | 1.02070 | 1.02229 | 1.02387 | 1.02545 | | |
| 88 | 1.00410 | 1.00580 | 1.00749 | 1.00917 | 1.01084 | 1.01251 | 1.01416 | 1.01581 | 1.01744 | 1.01907 | 1.02069 | 1.02231 | 1.02391 | 1.02551 | 1.02710 | 1.02868 | | |
| 86 | 1.00734 | 1.00904 | 1.01074 | 1.01242 | 1.01410 | 1.01577 | 1.01743 | 1.01908 | 1.02072 | 1.02236 | 1.02398 | 1.02560 | 1.02721 | 1.02881 | 1.03041 | 1.03200 | | |
| 84 | 1.01066 | 1.01237 | 1.01407 | 1.01577 | 1.01745 | 1.01912 | 1.02079 | 1.02244 | 1.02409 | 1.02573 | 1.02736 | 1.02899 | 1.03060 | 1.03221 | 1.03381 | 1.03540 | | |
| 82 | 1.01408 | 1.01579 | 1.01750 | 1.01920 | 1.02089 | 1.02257 | 1.02424 | 1.02590 | 1.02755 | 1.02920 | 1.03084 | 1.03246 | 1.03409 | 1.03570 | 1.03730 | 1.03890 | | |
| 80 | 1.01759 | 1.01931 | 1.02102 | 1.02273 | 1.02442 | 1.02611 | 1.02778 | 1.02945 | 1.03111 | 1.03276 | 1.03441 | 1.03604 | 1.03767 | 1.03928 | 1.04089 | 1.04250 | | |

Note: The temperature in the table is inlet air temperature; the air pressure is dry air pressure (not equal to atmospheric). The temperature range of this table is 10~40°C. The air pressure range is 80~110MPa, all the test should take this range into account by adopting necessary measure or choosing time. Corrected power: $P_0 = a_d * P_c$ (where: P_0 —corrected power, P_c —measured power, a_d —correction coefficient)

FRONT AXLE



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

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GENERAL DESCRIPTION

Structure chart

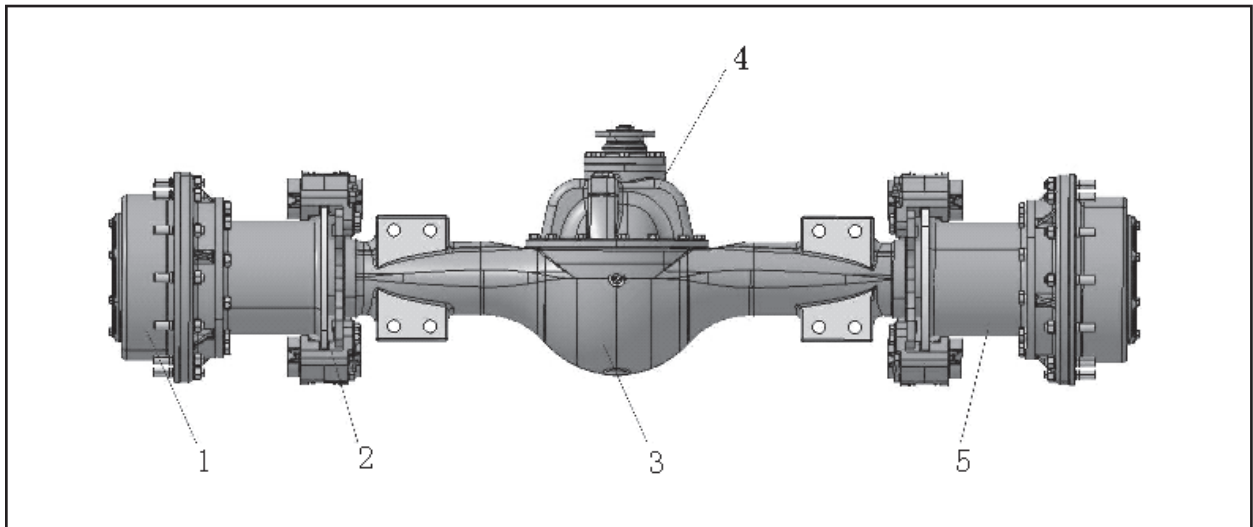


Figure.1

- 1.EDGE REDUCER ASS'Y 2. BRAKE CLAMP ASS'Y 3. SHELL 4. MAIN REDUCER ASS'Y
5. HUB ASS'Y

Basic parameters of drive axle:

| | | |
|--------------------|-----------------------|---------------------------------------|
| Main drive | Type | Spiral bevel gear grade one reduction |
| | Reduction ratio | 4.222 |
| Hub reduction gear | Type | Grade one planet reduction |
| | Reduction ratio | 4.8 |
| Axle oil | GB13895-1992 gear oil | 10Kg |

Internal structure of drive axle

Drive axle assembly is one of the most important spare parts of transmission system, its main function is reduce rotation speed from gear box and increase torque, and make wheels at both sides having speed difference. Besides, it also plays the role of bearing and transmitting. Drive axle assembly of loader is mainly composed of shell, main drive (including differential mechanism), semi axis, hub reduction gear, brake caliper assembly and other parts. Of which, the parts having reduction and differential function is main driver and hub reduction gear; power transmission between main drive and hub reduction gear is realized through semi axis, multiple spine at both sides of semi axis and axle shaft gear of differential mechanism and sun gear of hub reduction gear mesh with each other to realize power connection between main drive and hub reduction gear.

PARTS LIST

Disassembling of front and rear axle

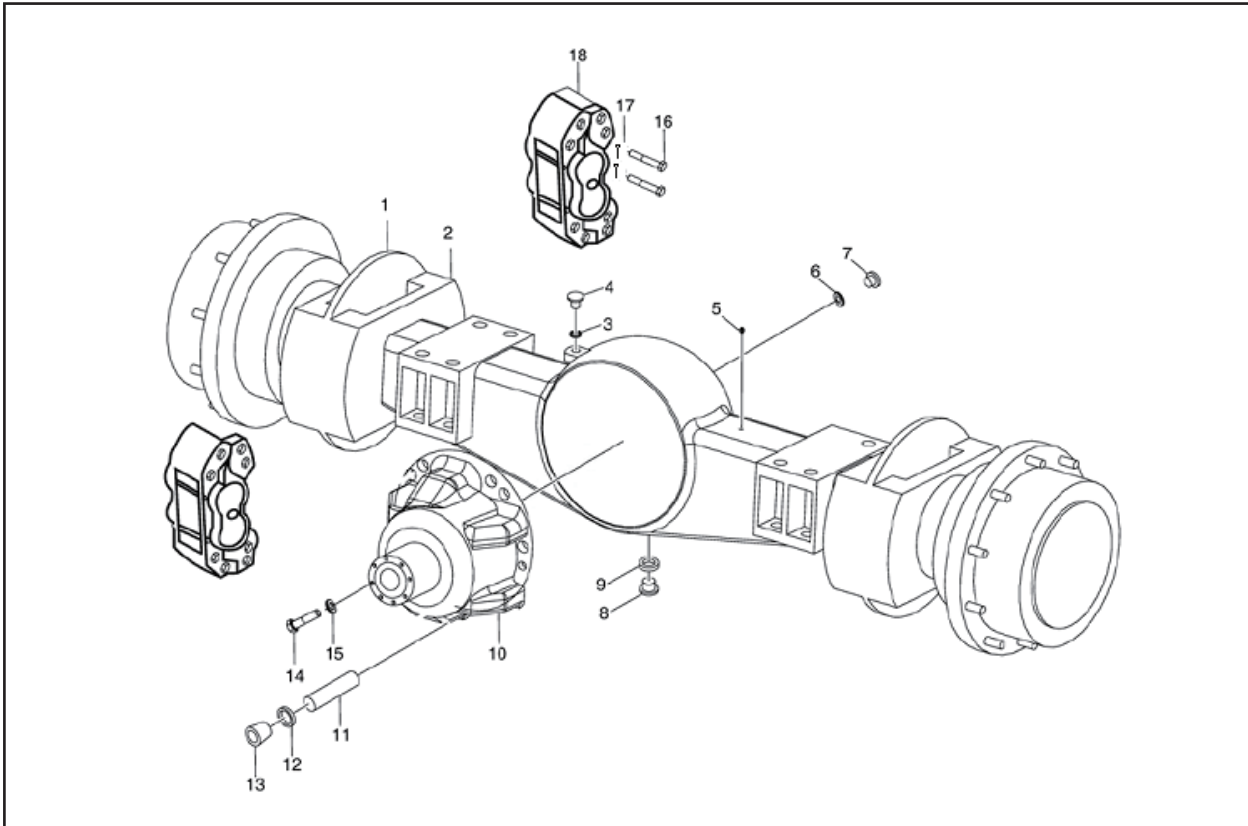


Figure.2

| Reference Number | Description | Reference Number | Description |
|------------------|------------------------|------------------|--------------------|
| 1 | WHEEL REDUCER ASS'Y | 10 | MAIN REDUCER ASS'Y |
| 2 | AXLE ASSY;SHELL | 11 | STUD BOLT |
| 3 | GROUP WASHER $\phi 24$ | 12 | SPACER 12 |
| 4 | PLUG,SCREW | 13 | NUT M12 |
| 5 | DEFLATION VALVE Z1/8 | 14 | BOLT M12X35-10.9 |
| 6 | O-RING | 15 | SPACER 12 |
| 7 | PLUG,SCREW | 16 | BOLT |
| 8 | PLUG,SCREW | 17 | PIN |
| 9 | O-RING | 18 | BRAKE ASSY |

Assemble of Hub drive axle

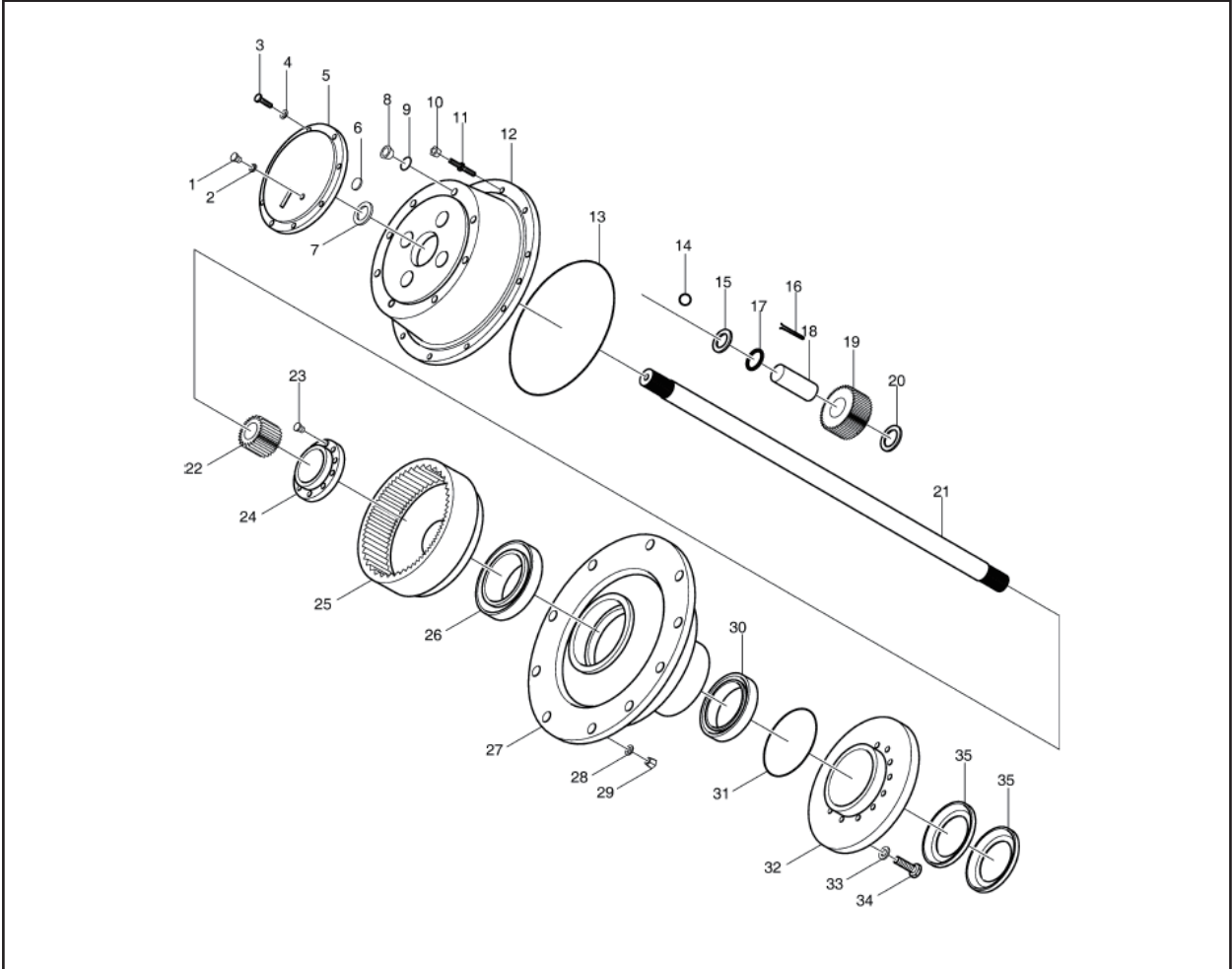


Figure.3

| Reference Number | Description | Reference Number | Description |
|------------------|----------------------|------------------|---------------------|
| 1 | PLUG,SCREW | 19 | PLANET WHEEL |
| 2 | O-RING | 20 | PLANET WHEEL WASHER |
| 3 | BOLT M12X1.5-25 | 21 | HALF SHAFT |
| 4 | SPACER 12 | 22 | SUN WHEEL |
| 5 | COVER | 23 | SCREW M8X15 |
| 6 | BLOCK | 24 | HOLDING NUT |
| 7 | RETAINER RING 48 | 25 | INSIDE GEAR |
| 8 | PLUG,SCREW | 26 | BEARING 7521E |
| 9 | O-RING | 27 | HUB |
| 10 | HUB NUT | 28 | SPRING WASHER |
| 11 | HUB BOLT | 29 | NUT M18 |
| 12 | SHELF,PLANET | 30 | BEARING 2007122E |
| 13 | O-RING SEAL | 31 | O-RING SEAL |
| 14 | STEEL BALL $\phi 6$ | 32 | BRAKE DISC |
| 15 | PLANET WHEEL WASHER | 33 | WASHER 16 |
| 16 | NEEDLE ROLLER 4x23.8 | 34 | BOLT M16X45 |
| 17 | SAPCER SLEEVE | 35 | SEAL ASSY,OIL |
| 18 | PLANET WHEEL SHAFT | | |

Brake assembly

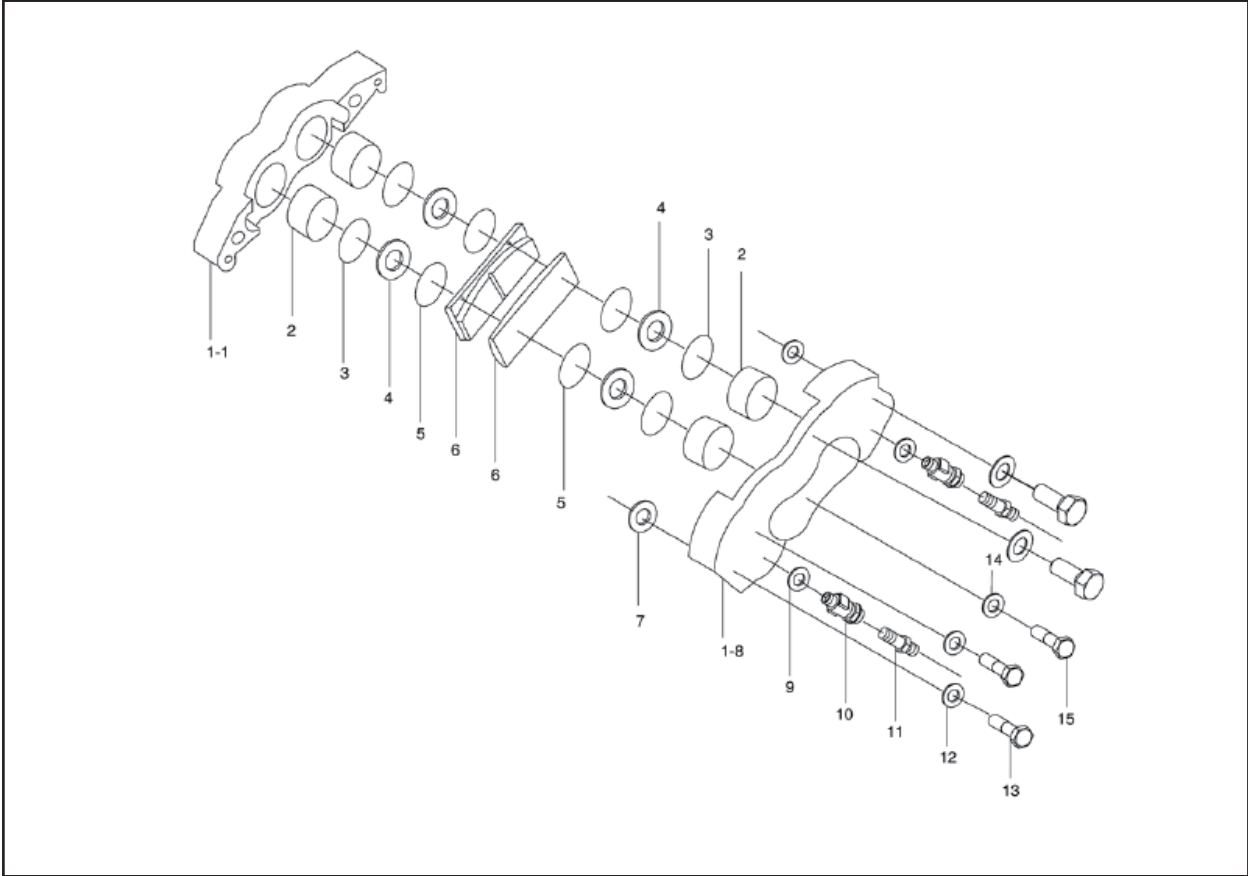


Figure.4

| Reference Number | Description | Reference Number | Description |
|------------------|------------------|------------------|------------------|
| 1-1 | BRAKE, EXTERIOR | 9 | WASHER |
| 1-8 | BRAKE, INNER | 10 | CONNECTING |
| 2 | PISTON | 11 | DEFLATING VALVE |
| 3 | RECTANGULAR SEAL | 12 | SPACER 12 |
| 4 | CASE, DUST | 13 | BOLT |
| 5 | BLOCK RING | 14 | WASHER SPRING 10 |
| 6 | BRAKE DISK | 15 | PIN; BOLT |
| 7 | O-RING 20X2.4 | | |

Main drive assembly

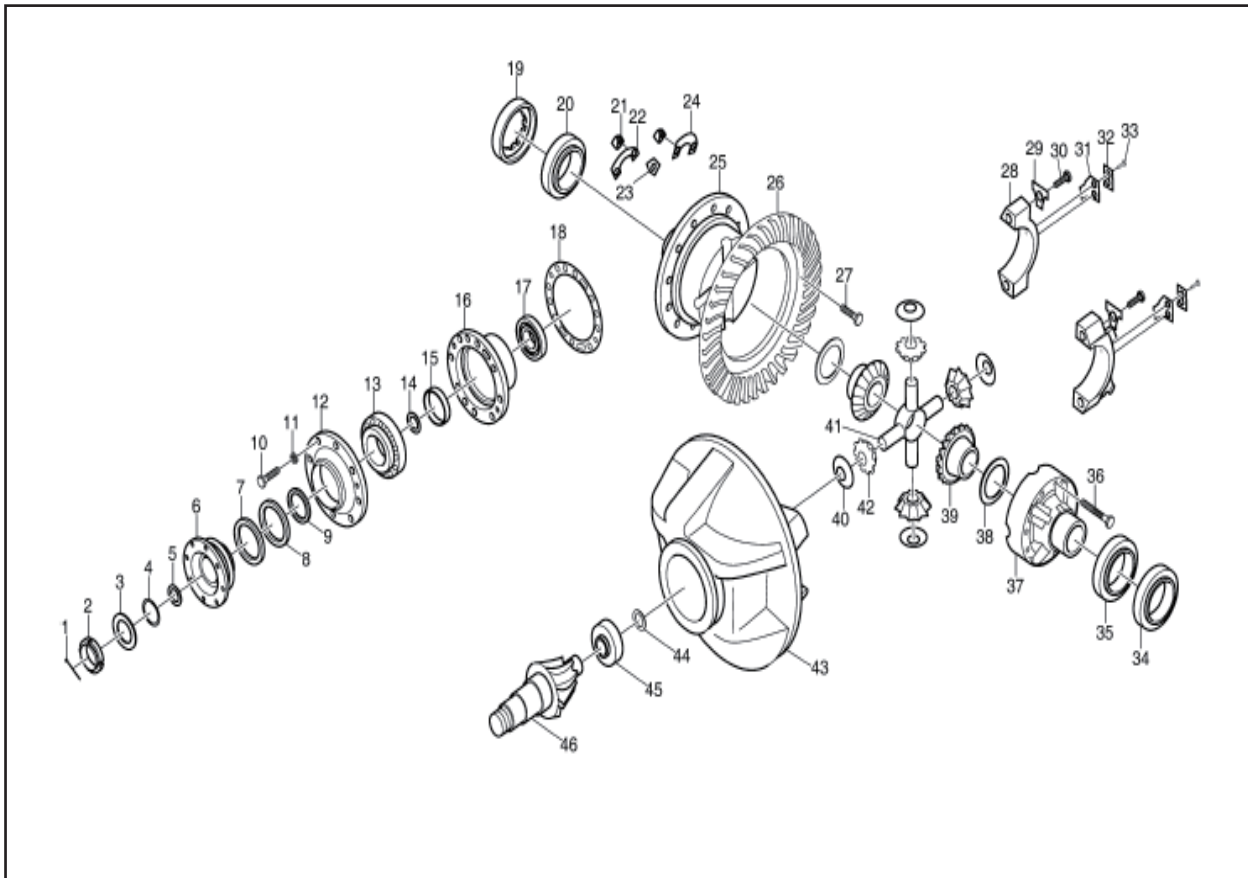


Figure.5

| Reference Number | Description | Reference Number | Description |
|------------------|---------------------|------------------|----------------------------|
| 1 | PIN 5X45 | 24 | HOLDING PLATE |
| 2 | NUT M27x1.5-7H | 25 | DIFFERENTIAL SHELL –LEFT |
| 3 | WASHER | 26 | GEAR,BEVEL;DRIVE(REAR) |
| 4 | O-RING BAFFLE | 28 | DIFFERENTIAL BEARING COVER |
| 5 | O-RING SEAL 40X5.3 | 29 | HOLDING PLATE |
| 6 | INPUT FLANGE GROUP | 30 | BOLT M18x90 |
| 7 | OIL SEAL B62x93x6 | 31 | HOLDING PLATE |
| 8 | OIL SEAL FB62x93x13 | 32 | HOLDING PLATE |
| 9 | STOPPER WASHER | 33 | BOLT M8X12 |
| 10 | BOLT M12x45-10.9 | 34 | REGULATE NUT |
| 11 | SPACER 12 | 35 | BEARING 7516E |
| 12 | OIL SEAL SEAT | 36 | BOLT M14X1.5 |
| 13 | BEARING 27311E | 37 | DIFFERENTIAL SHELL – RIGHT |
| 14 | REGULATE WASHER | 38 | HALF SHAFT GEAR WASHER |
| 15 | SPACER SLEEVE | 39 | HALF SHAFT GEAR |
| 16 | BEARING SEAT | 40 | SUPPORT WASHER |
| 17 | BEARING 27311E | 41 | CROSS SHAFT |
| 18 | REGULATE WASHER | 42 | PLANET GEAR |
| 19 | REGULATE NUT | 43 | MAIN REDUCER SHELL |
| 20 | BEARING 7516E | 44 | RETAINER RING 30 |
| 21 | NUT M14X1.5 | 45 | BEARING 92606E |
| 22 | HOLDING PLATE | 46 | DRIVE GEAR;RIGHT |
| 23 | HOLDING PLATE | | |

SCHEDULED MAINTENANCE

Oil of new drive axle must be replaced after working for 15 days (about 100 working hours), oil shall be replaced once after working for every six months (about 1200 working hours) in following days.

Every month maintenance

1. Check abrasion condition of brake disc, if there is disruptive abrasion; please handle in time if there is any.
2. Check abrasion condition of brake block to guarantee separation and reunion of brake caliper is flexible; it shall be replaced in time when brake block is wearing close to abrasion line (at the bottom of groove).
3. Check if oil level of shell complies with requirements, please add new oil if the oil level descends.
4. Keep axle clean, keep vent pipe smooth, and avoid silt going into axle. Check loosening condition of all fasteners, especially rim nuts, if it is loosed, please refasten again.

Every half year maintenance:

Lubrication oil in axle shall be replaced every half a year, different brands of lubrication oil shall be adopted for different areas and seasons. Please refer to 4.2 for oil replacing method.

Every year maintenance:

Overhaul checking every working year:

1. Check the gap, mesh and abrasion condition of spiral bevel gear of main reducer.
2. Check abrasion condition of differential mechanism gear.
3. Check abrasion condition of hub gear.
4. Check abrasion condition of needle bearing of hub planetary gear.
5. Requirements of installation and debugging items after overhaul checking:
 - 1) After assembling, axle shaft gear and bevel gear shall move flexibly with hand touching rather than locking. The Min. gear backlash of gear is 0.18-0.23mm. Tooth length and tooth height of contacting area of two gears cannot be less than 50%.
 - 2) In order to guarantee enough bearing rigidity of active spiral gear, before assembling oil seal and sealing cover, adopt gradually reducing spacer shim between tapered roller bearing to give 1.0-1.5N.m preloaded torque to roller bearing.
 - 3) Gear backlash between the driving and driven spiral bevel gear is 0.25-0.45mm, the changing amount cannot be more than 0.15mm, gear backlash can be realized through adjusting nuts of both sides of differential mechanism and spacer shim of bearing sleeve. Tooth surface contacting area shall guarantee direction of tooth length and tooth height is not less than 50%, contacting position shall be at the middle side of tooth surface and closer to the smaller side.
 - 4) Adjusting of bearing clearance of shell at both sides of drive axle: Fasten adjusting nuts, give 28 ~ 38N.m preload to shell roller bearing, and then lock two round nuts with screw fastening.

GENERAL DISASSEMBLY AND REASSEMBLY INSTRUCTIONS



WARNING!

Never use gasoline, solvents, or other flammable fluids to clean components. Only use approved commercial solvents that are nonflammable and nontoxic.

IMPORTANT

Use only **GENUINE DOOSAN SPARE PARTS** to warrant proper operations and prevent interchangeability problems.

GENERAL INSTRUCTIONS

1. Thoroughly clean and dry axle before disassembly.
2. All components should be thoroughly cleaned and dried before reassembly. Dirt, chips, and foreign material may cause failures.
3. All ducts and castings should be thoroughly cleaned and dried to remove dirt, chips, and foreign material to prevent damage after reassembly.
4. Reassembly should be done in a clean shop, and should be as dust free as possible.
5. Make sure tools and equipment are at hand.
6. When reassembling Daewoo strongly recommends to replace the following parts with new.
 - Seal Rings.
 - O-rings.
 - Gaskets.
 - Threaded rings with notched collar.
 - Any component damaged during disassembly.
7. When mounting heat fitted components, make sure of their proper position and direction of assembly, after they have cooled.
8. To heat bearings, use proper heating plates, piping, or suitable ovens.
NOTE: *Never heat parts by using a torch. Oil bath, heated by a torch, maybe used to warm components.*
9. Lubricate all sections concerned when reassembling shafts, bearings, etc.
10. Lubricate O-rings before installing them in relevant seats to prevent kinking during assembly, such a position would impair proper sealing.
11. Replace gears only in matched sets to make sure of proper tooth mating.

AXLE DISASSEMBLY

Drive axle disassembly

1. Put drive axle on supporting and make sure main driver assembly is upward.

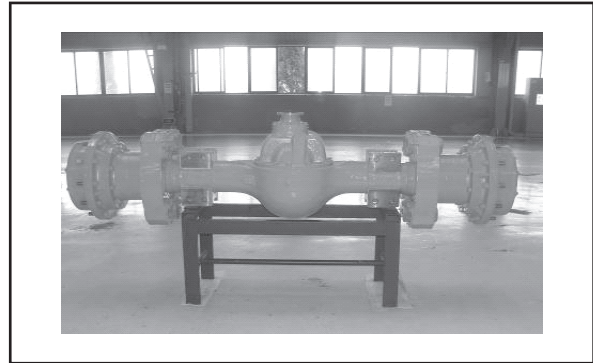


Figure.6

2. Loosen the connection bolts between brake caliper and brake caliper support, dismantle brake caliper assemble.

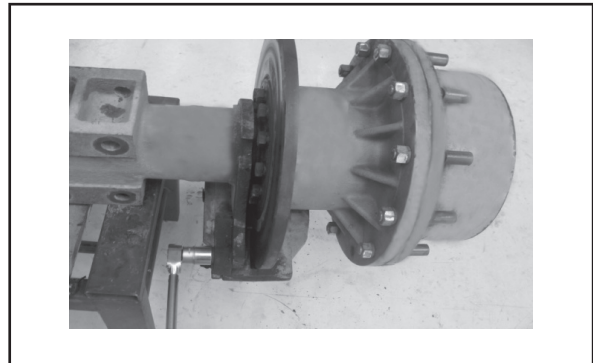


Figure.7

3. Release gear oil from planet carrier
Loosen hub oil releasing drain plug and shell oil releasing drain plug, turn on slowly with hands to avoid oil spilling.

NOTE: Store gear oil with clean container.



Figure.8

4. Release gear oil from shell

Turn on oil releasing bolts axle end cap to release gear oil.

NOTE: Store gear oil with clean container.

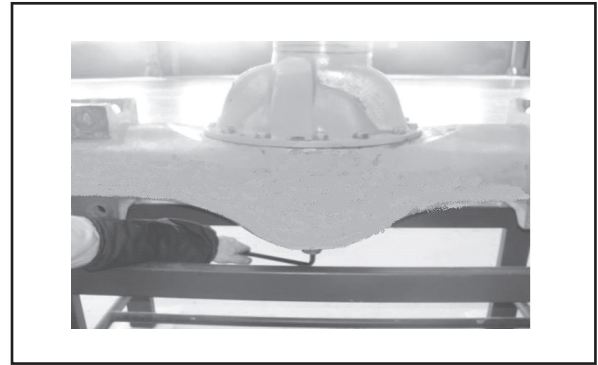


Figure.9

5. Dismantle end cap

Loosen connection bolts between planet carrier and end cap, then get end cap from hub reducer assembly with jackscrew, dismantle end cap.

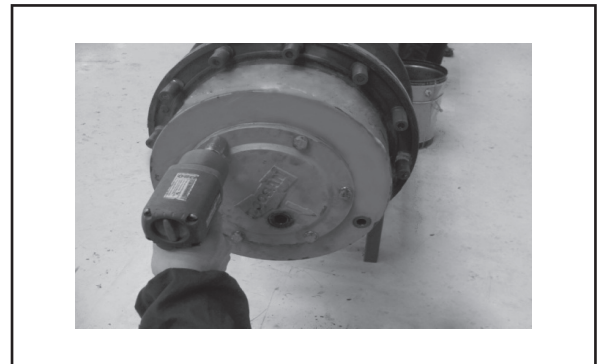


Figure.10

6. Dismantle locating block

Take down locating block with hands.

NOTE: If it is tight when taking down, please use assistant tools to pry out.



Figure.11

7. Dismantle stop collar

Dismantle stop collar from semi axis with stop collar pincers.

NOTE: Before dismantling stop collar, pull out a section of semi axis from shell.

NOTE: It must clamp firmly when using stop collar pincers to avoid safety hazard when it is pop up.

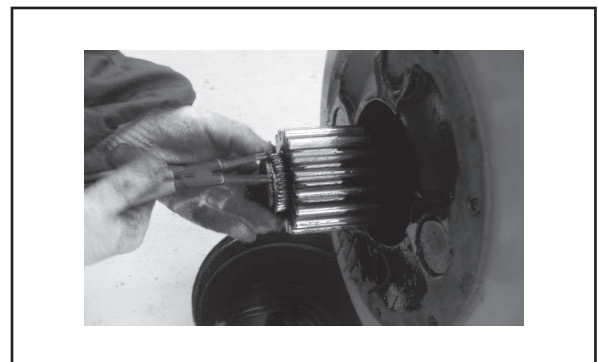


Figure.12

8. Dismantle sun gear
Dismantle semi axis from sun gear.

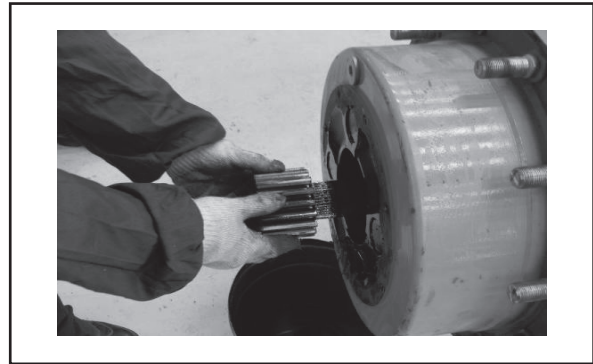


Figure.13

9. Dismantle locating block
Dismantle locating block from semi axle with hands.

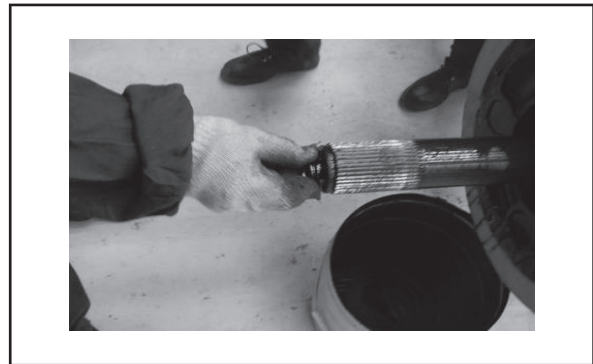


Figure.14

10. Dismantle semi axis
Take semi axis from shell slightly.



Figure.15

11. Hub reducer
First loosen rim bolts with relative tools, then loosen rim from planet carrier with jackscrew and dismantle planet carrier assembly.
NOTE: *Please slowly loosen planet carrier to avoid safety hazard resulted from dropping of planet carrier assembly.*

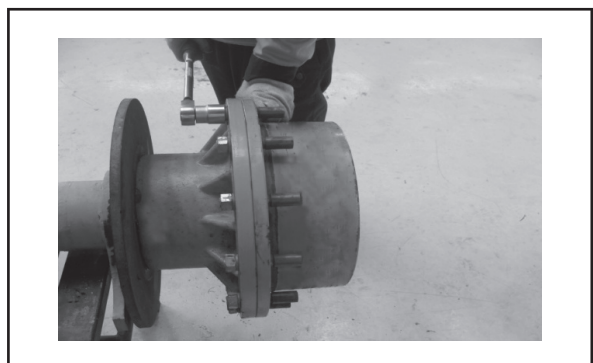


Figure.16

12. Dismantle round bolts
Dismantle round bolts.

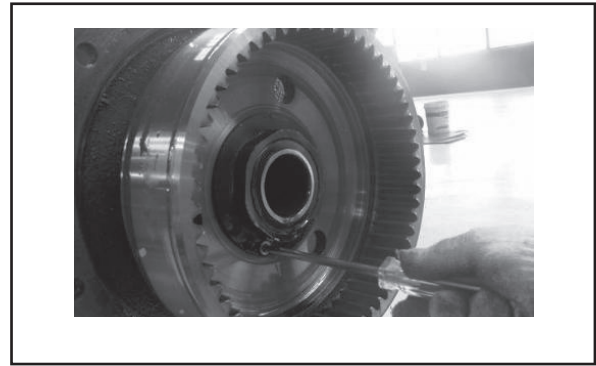


Figure.17

13. Dismantle round nuts
Dismantle round nuts.

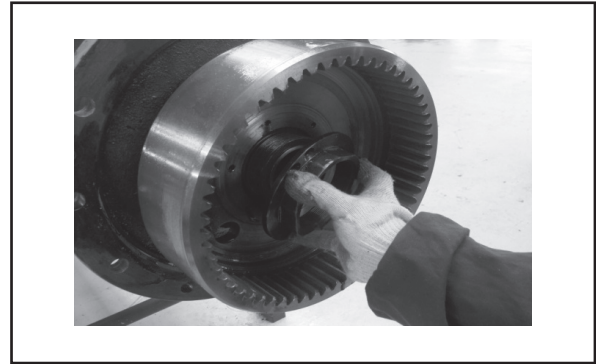


Figure.18

14. Dismantle internal gear
Take internal gear out by slightly rocking.

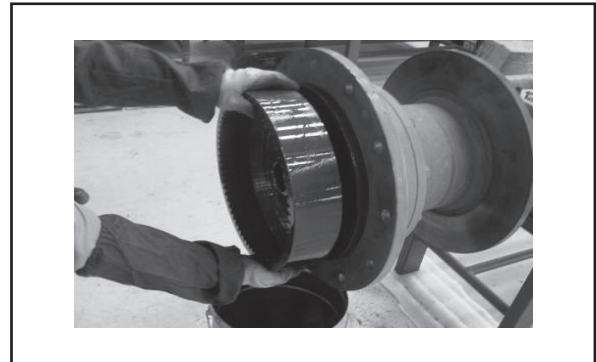


Figure.19

15. Dismantle rolling bearing
Take out rolling bearing with special dismantling tool.

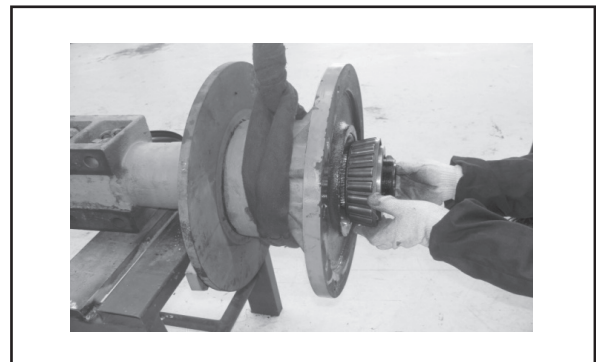


Figure.20

16. Dismantle wheel hub assembly

Take wheel hub assembly from supporting axle.

NOTE: *During hanging and dismantling process, please keep axis of wheel hub assembly is in line with axis of hub reduction supporting axle to avoid scratching oil surface and internal spare parts during dismantling process.*

Remark: *dismantle all parts at the other side of drive axle with the same methods.*

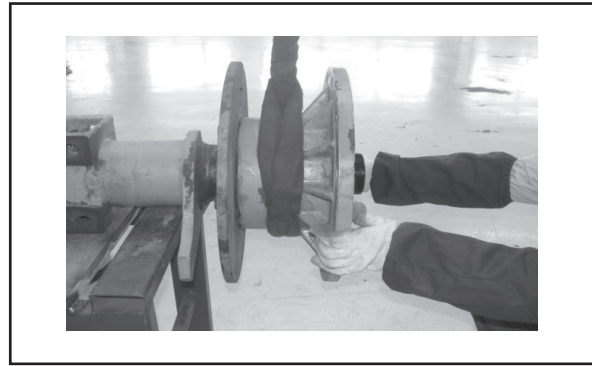


Figure.21

17. Dismantle main drive assembly

Dismantle connection bolts between main drive and shell assembly, take out main drive with jackscrew, and suspend main drive assembly.

Note: *When suspending main drive assembly, guarantee suspending and dismantling tools are at the above of main drive assembly to avoid spare parts inside are knocked again during suspending and dismantling process.*

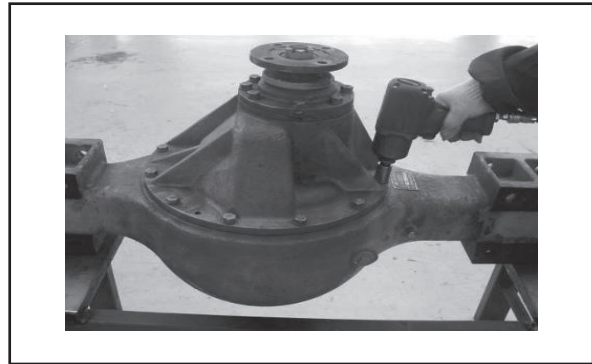


Figure.22

2 Assembly dismantling

2.1 Dismantle planet carrier assembly

1. O ring

Take out O ring.

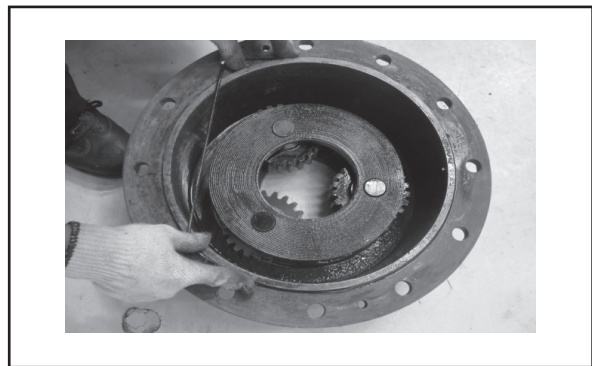


Figure.23

2. Put planet carrier on working platform horizontally.



Figure.24

3. Take out planet axle with tools.



Figure.25

4. Take out steel balls.



Figure.26

5. Take out planet wheel.



Figure.27

6. Take out baffle ring and quill roller from inside of planet wheel.

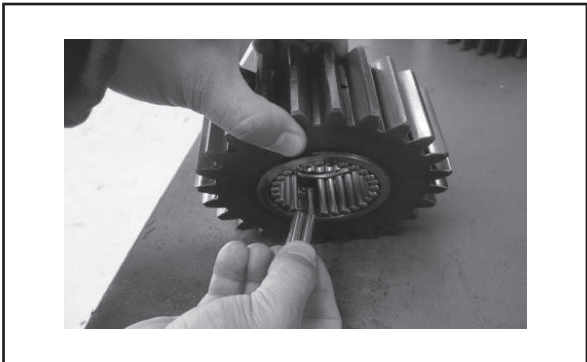


Figure.28

2.2 Dismantle hub assembly

1. Put hub assembly on working platform; loosen connection bolts between brake disc and hub.

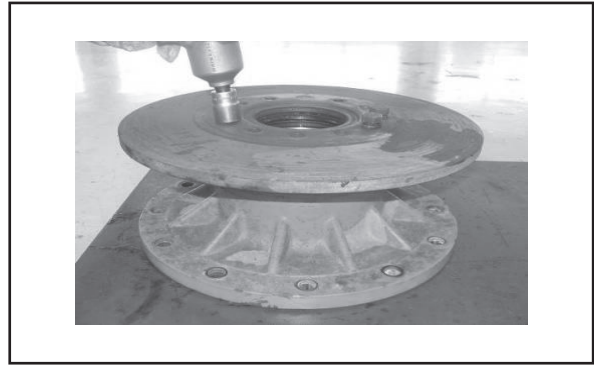


Figure.29

2. Take out brake disc.



Figure.30

3. Take out bearing.

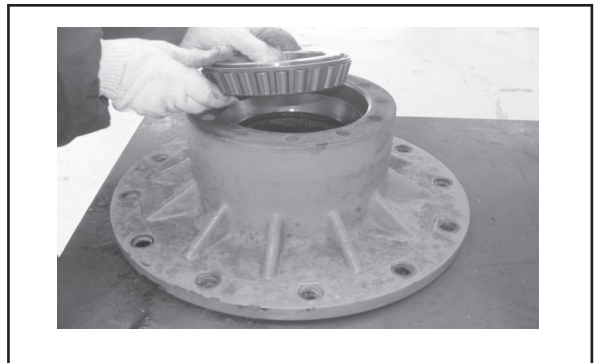


Figure.31

4. Take out oil seal.

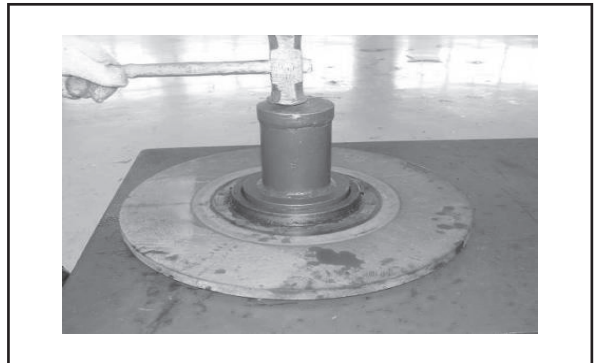


Figure.32

2.3 Dismantle main drive assembly

1. Put main drive assembly (input flange upward) horizontally and fixed on supporting.

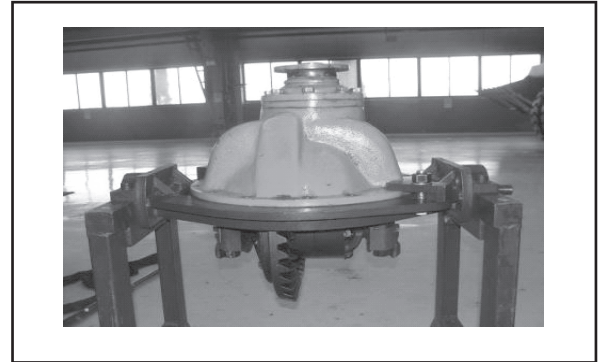


Figure.33

2. Dismantle thrust bolts.

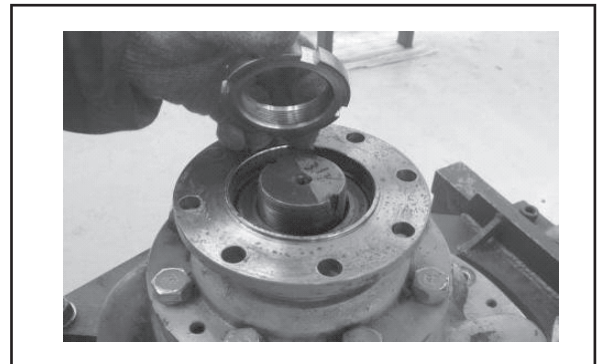


Figure.34

3. Take out input flange.

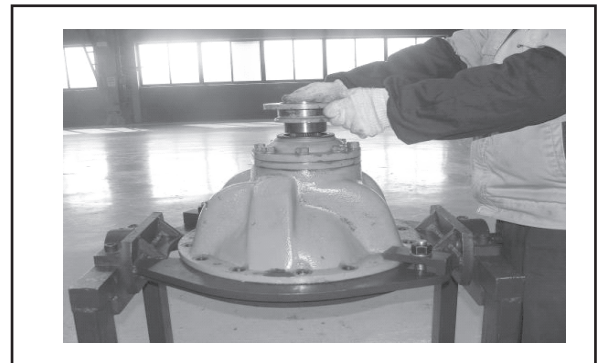


Figure.35

4. Dismantle connection bolts between sealing cover and bearing sleeve, take out sealing cover.

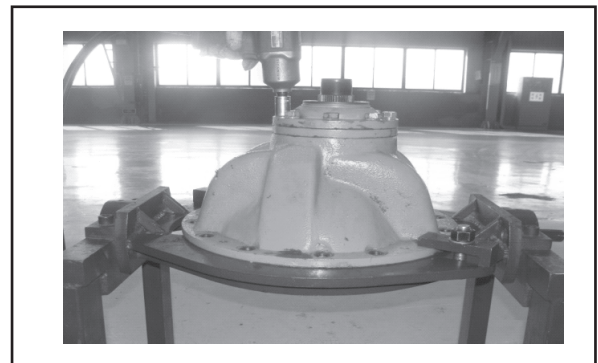


Figure.36

5. Turn main drive for 180°, dismantle bolts fastening locking plate, take out locking plate.

NOTE: *Some of the machine structure may be different from this figure, please adjust working content according to actual structure.*

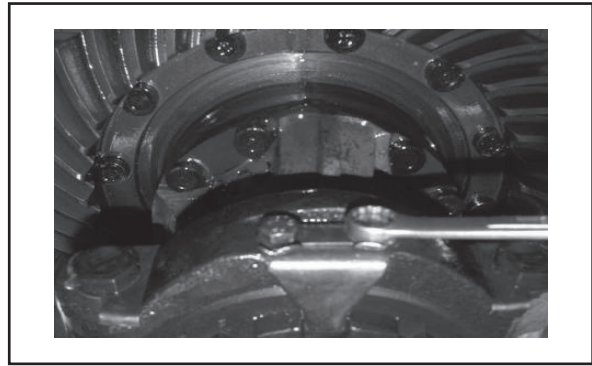


Figure.37

6. Dismantle connection bolts of bearing seat and take out bearing seat.

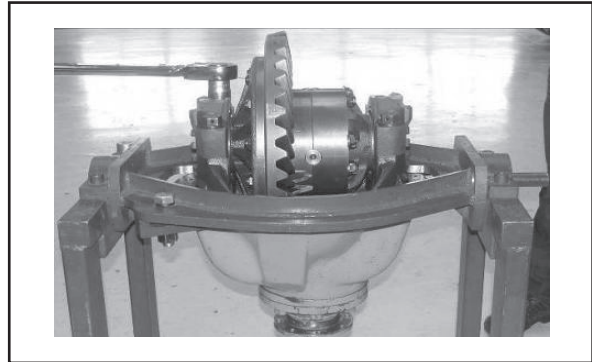


Figure.38

7. Dismantle adjusting nuts.

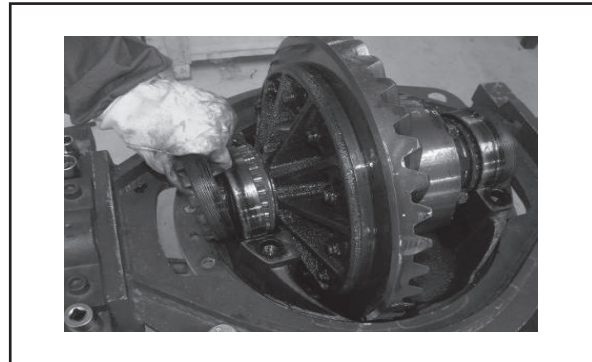


Figure.39

8. Dismantle bearing outer ring.

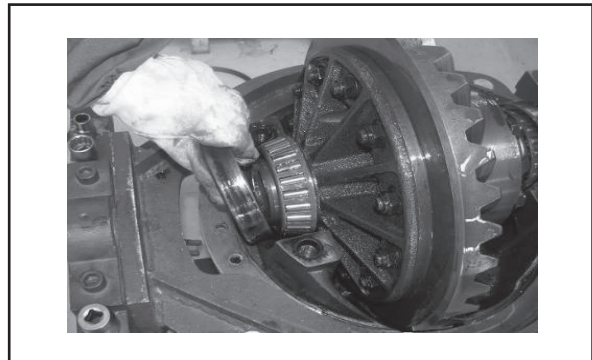


Figure.40

9. Hang out differential mechanism assembly.
NOTE: *Keep balance when hanging out to avoid safety hazard.*

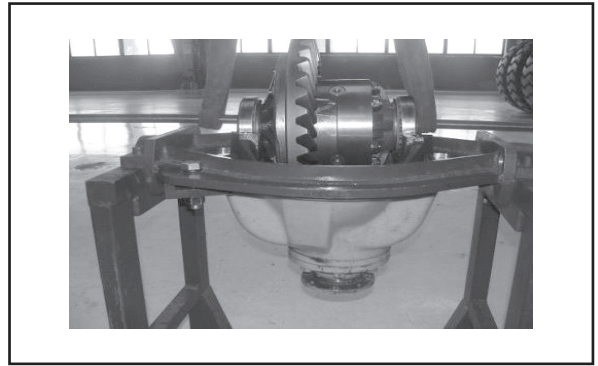


Figure.41

10. Separate active spiral bevel gear assembly and bracket with jackscrew.

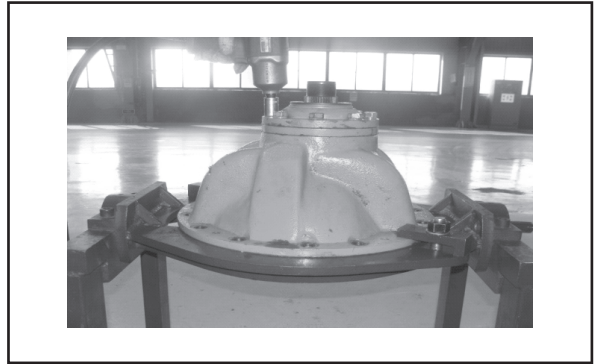


Figure.42

2.4 Dismantle differential assembly

1. Put differential assembly vertically on working platform, and guarantee it is stable.

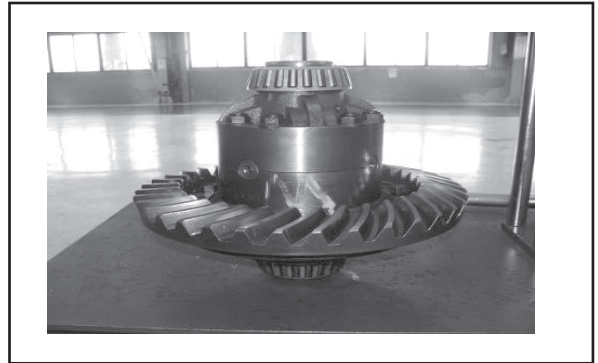


Figure.43

2. Dismantle bearing on left and right shell of differential mechanism.

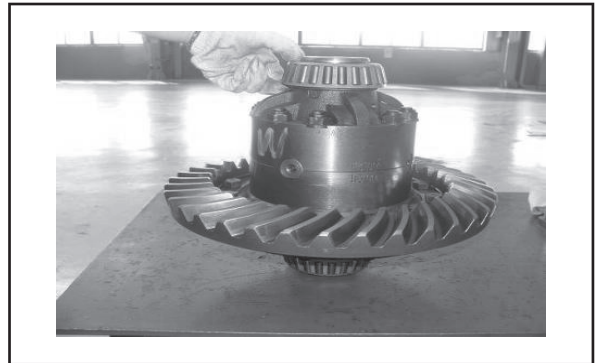


Figure.44

3. Loosen connection nuts between driven spiral bevel gear and right shell of differential mechanism, dismantle driven spiral bevel gear.

NOTE: Before taking out driven spiral bevel gear, please check or mark assembling sign first so that it can be placed back to the original position.

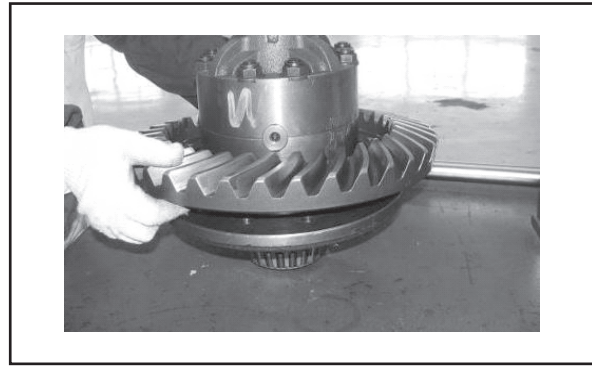


Figure.45

4. Loosen connection nuts of left and right shell, separate left and right shell of differential mechanism.

NOTE: Before separating left and right shell of differential mechanism, please check or mark assembling sign first so that it can be placed back to the original position.

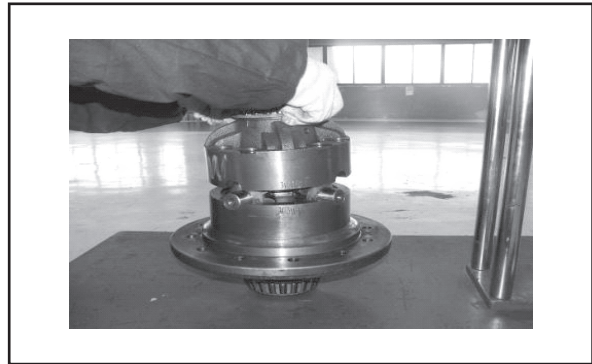


Figure.46

5. Take out semi axis gear gasket and semi axis gear.

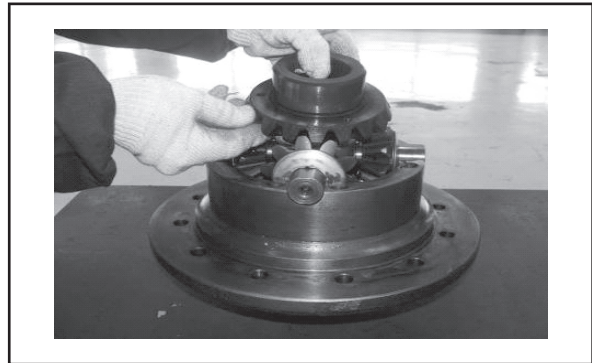


Figure.47

6. Take out joint cross and differential gear together, take out differential gear gasket and gear from joint cross.

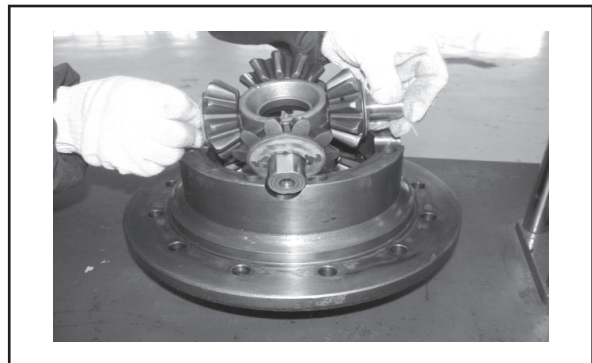


Figure.48

7. Take out semiaxis gear gasket and gear.

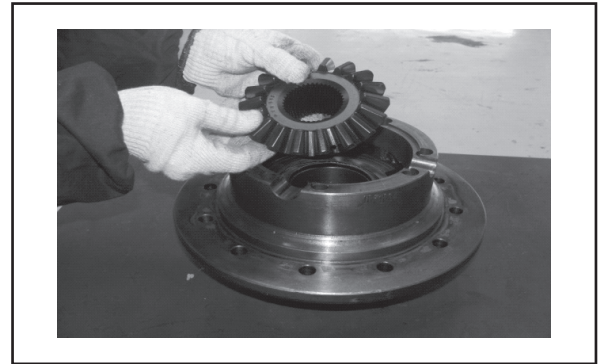


Figure.49

2.5 Dismantle active spiral bevel gear assembly

1. Put active spiral bevel gear assembly on working platform, support flange of bearing sleeve, clamp down on thread end of active spiral bevel gear assembly with down device.

NOTE: *Do not clamp too much to avoid damaging flange, pull out bearing sleeve from active spiral bevel gear assembly.*

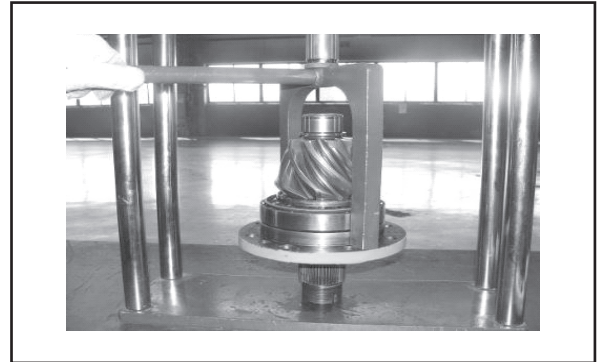


Figure.50

2. Reverse bevel gear assembly and take out bearing.

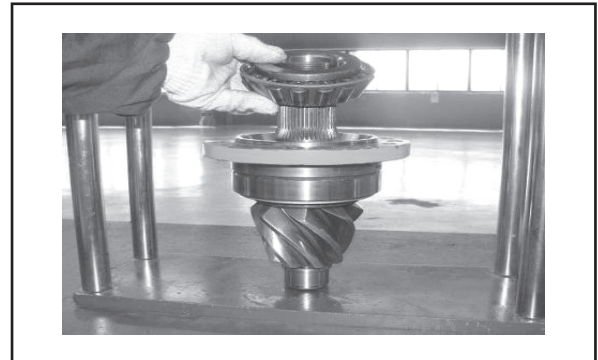


Figure.51

3. Take out bearing sleeve.

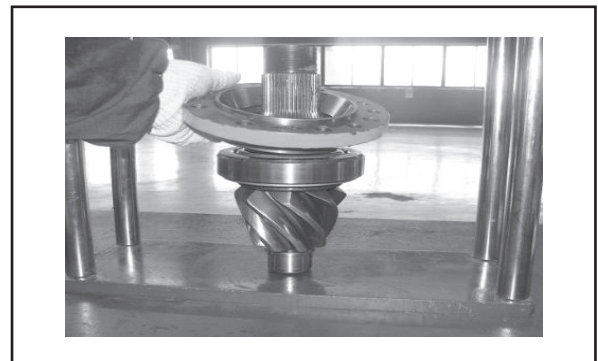


Figure.52

4. Take out adjusting gasket.

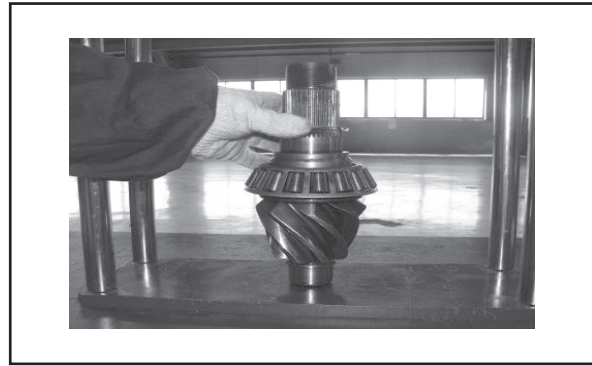


Figure.53

5. Take out spacer bush.

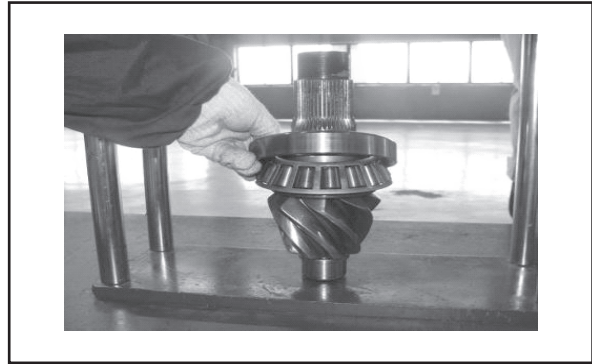


Figure.54

AXLE REASSEMBLY

Axle assembly

1. Shell

Clean shell and suspend with special supporting. Fasten gummed plug screw at oil inlet and oil filler.

NOTE: Plug screw fastening torque:280~330Nm

NOTE: Loctite 262 taper thread sealant.

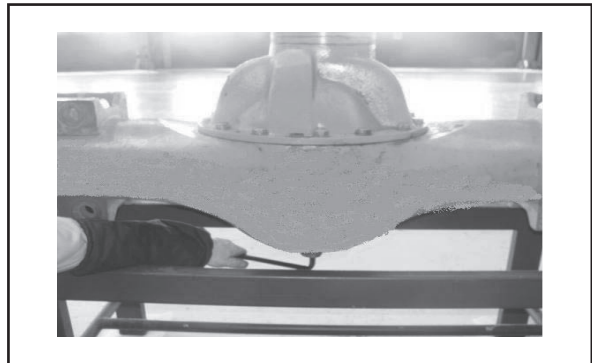


Figure.55

2. Wheel hub assembly

Coat lubrication grease on hub supporting axle of shell assembly; assemble wheel hub assembly on both sides of supporting axle of shell assembly.

NOTE: Use lubrication oil.

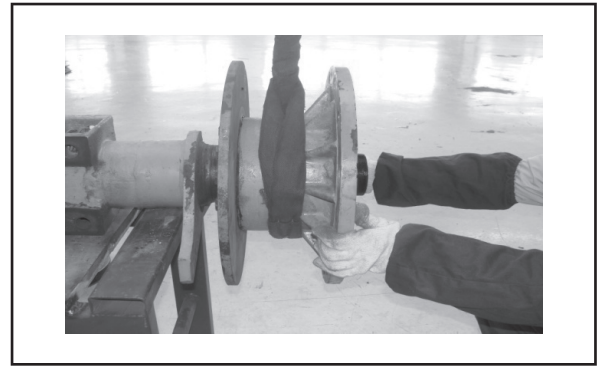


Figure.56

3. Rolling bearing

Assemble rolling bearing on hub supporting axle.

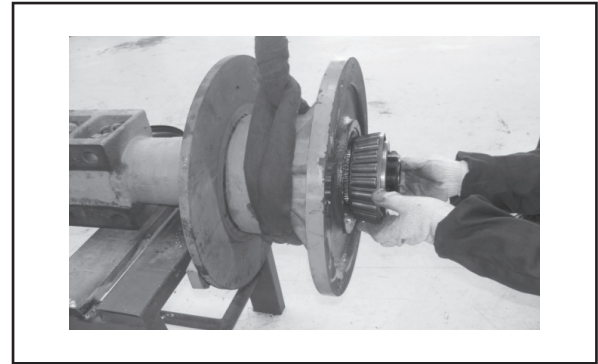


Figure.57

4. Internal gear

Assemble internal gear of drive axle at multiple spline at the end of supporting bearing.

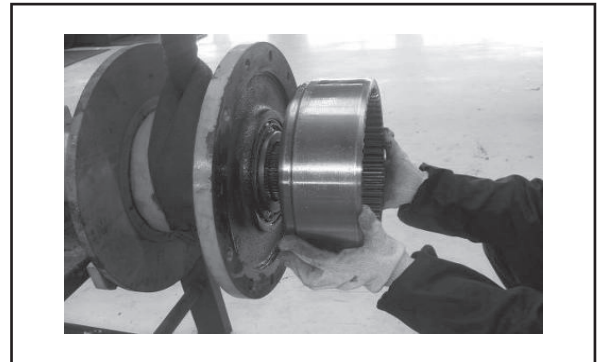


Figure.58

5. Round nuts

Assemble round nuts and fasten. Knock internal gear slightly with copper stick to make internal gear in place.

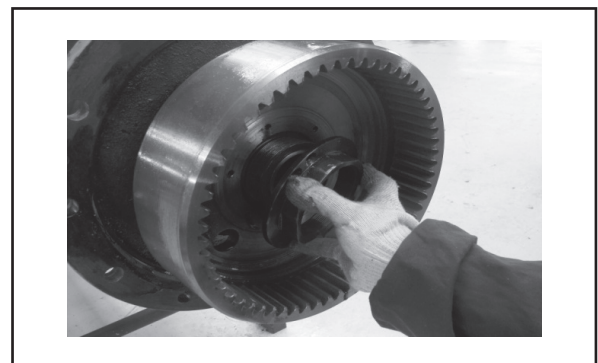


Figure.59

6. Assemble round bolts

1) Grapple the hole on wheel hub with push and pull ergometer, pull ergometer along with tangential direction, indication on ergometer is $160\pm 10\text{N}$, if the indication is not within the range of $160\pm 10\text{N}$, adjust tightness degree of round bolts according to the indication until it is within the range of $160\pm 10\text{N}$. In the end, coat Loctite 262 thread fastening sealant for 5~6 from the second thread hole of internal gear (form a liquid level at 1/3 circle of thread), then fasten bolts, and fix round nuts.

2) Before dynamometry, rotate hub wheel for more than 5 times.

NOTE: *Loctite 262 thread fastening sealant*

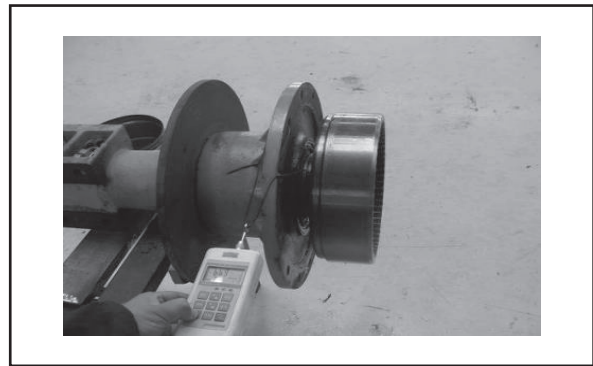


Figure.60

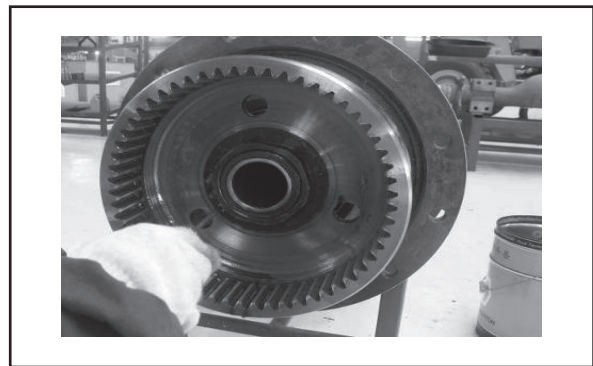


Figure.61

7. Assemble O sealing ring

Assemble O sealing ring on hub assemble.

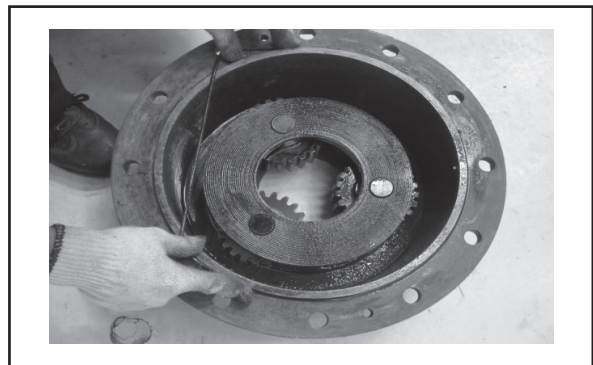


Figure.62

8. Planet carrier assembly

Assemble planet carrier assembly on wheel hub with rim bolts, gaskets and nuts.

NOTE: *Fastening torque:540~650Nm*

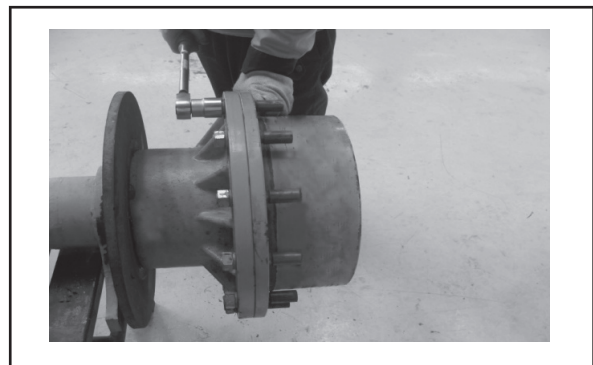


Figure.63

9. Assemble semiaxis

Assemble semiaxis in wheel hub.



Figure.64

10. Assemble sun gear

Assemble sun gear at one side of semiaxis with baffle ring groove (pay attention to semiaxis multiple spline and gear assembly).

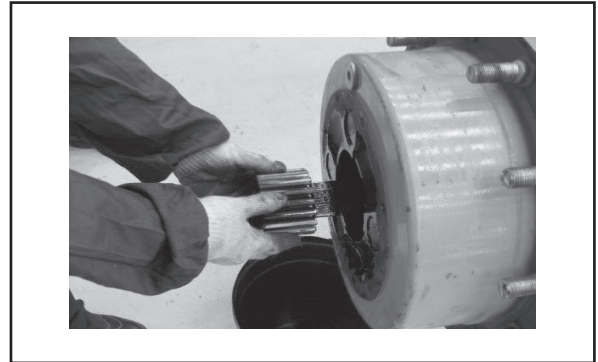


Figure.65

11. Assemble baffle ring

Assemble baffle ring with baffle ring used for axle.

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard when it is popping out during assembling process.*

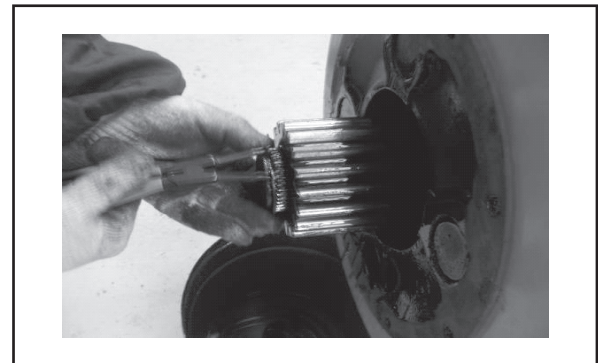


Figure.66

12. Assemble locating block

Stake steel ball on locating block, it can rotate flexibly after staking steel ball.

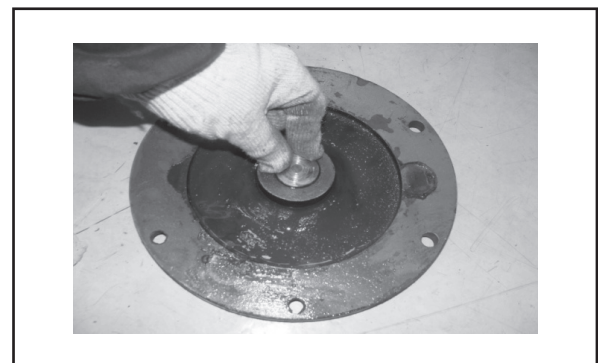


Figure.67

13. Assemble end cap

Coat Loctite 262 thread fastening sealant on screws, location of sealant is 15mm on top of thread end. Fasten cap with bolts and gaskets.

NOTE: *Fasten all screws according to symmetrical and crossing principle.
Fastening torque:110~130Nm
Loctite 262 thread fastening sealant*

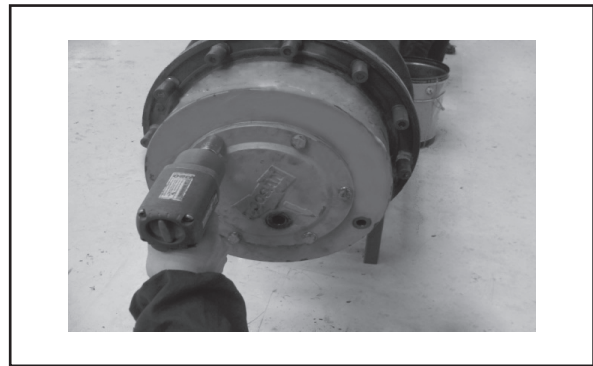


Figure.68

14. Assemble brake caliper assembly

Assemble disc brake on brake caliper supporting, fix with bolts and gaskets.

NOTE: *Fastening torque:540~650Nm
Coat Loctite 262 thread fastening sealant at 20mm length at thread end during assembling.*

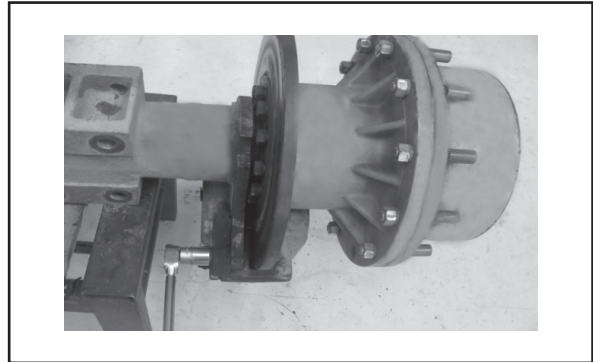


Figure.69

15. Assemble main drive assembly

Coat Loctite 598 silicon rubber surface sealant at the joint surface between shell and bracket, coat $\phi 3 \sim \phi 6$ glue saluting ring with sealing surrounding inside of thread hole at the large end of shell. The coated sealant cannot be in the air for more than ten minutes.

NOTE: *Loctite 598 silicon rubber surface sealant*

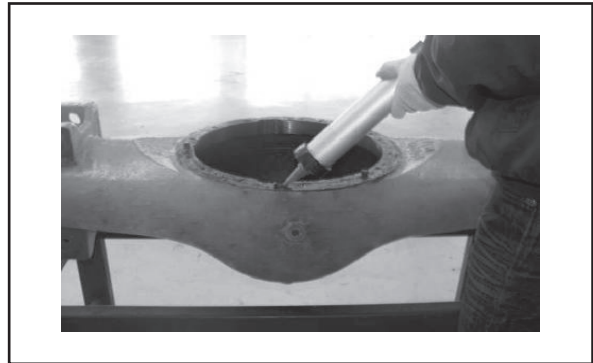


Figure.70

16. Assemble main drive

Hand up main drive assembly with overhead crane, put main drive at main drive shell of the axle, assemble locating pin.

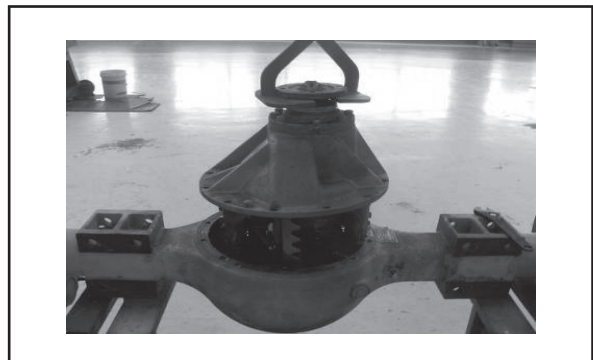


Figure.71

17. Assemble bolts

Coat proper Loctite 262 thread fastening sealant on bolts, the coating position is 15mm length at thread end. Fasten main drive assembly and shell assembly with bolts and gaskets.

NOTE: *Fastening torque : 110~ 130Nm
Loctite 262 thread fastening sealant
Fasten all screws according to
symmetrical and crossing principle.*

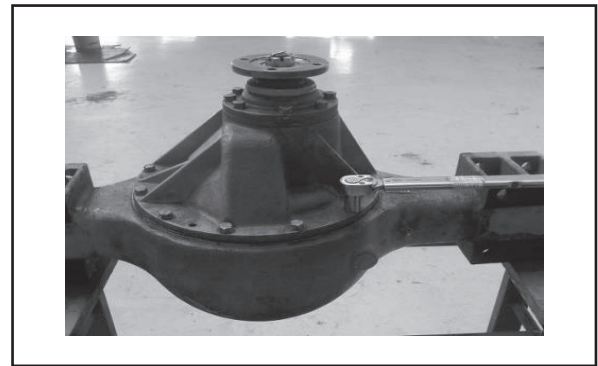


Figure.72

18. Add oil

Add 10L 85W/90 GL-5 gear oil (GB13895-1992) in axle bag of shell and fasten plug screws.

NOTE: *use 85W/90 GL-5 gear oil
Anaerobic type pipe thread sealant
Fastening torque:280 ~ 330 Nm*

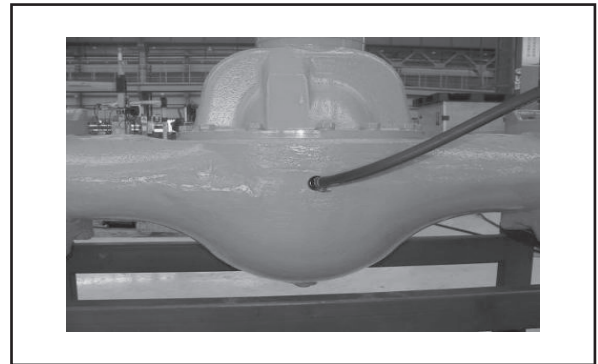


Figure.73

19. Inject 4.5L (subject to overflowing from planet carrier) 85W/90 GL-5 gear oil (GB13895-1992) into two hub reducers and fasten plug screws.

NOTE: *Use 85W/90 GL-5 gear oil
Anaerobic type pipe thread sealant*

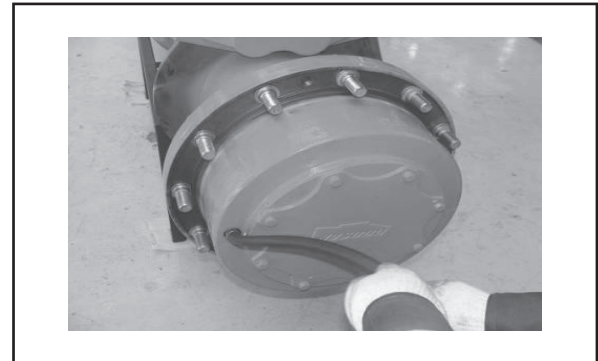


Figure.74

2. Assembly parts assembling

2.1 Install hub assembly

1. Keep the large end of hub upward, assemble bearing outer ring and turn over to keep the small end of hub upward and assemble bearing inner ring.

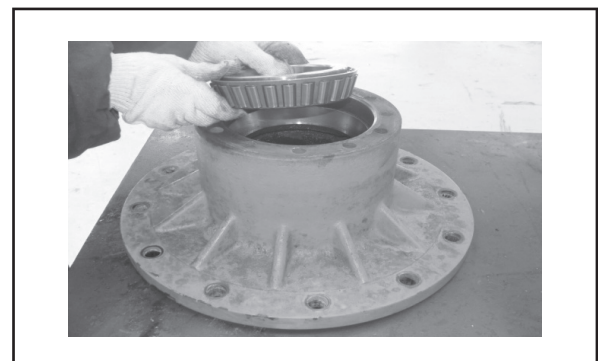


Figure.75

2.Coat lubrication oil at oil seal end, check completeness of oil seal, coat lubrication oil in groove of oil seal evenly, and assemble oil seal in side of oil seal end.

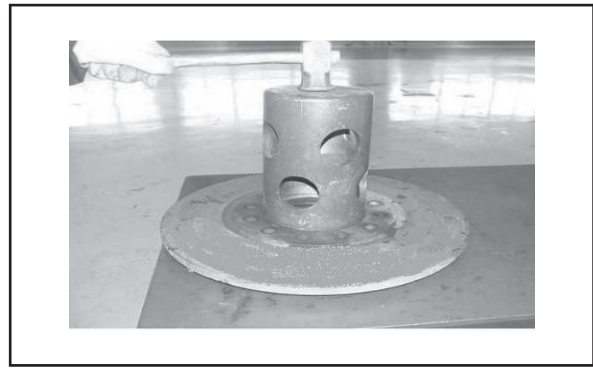


Figure.76

3.Assemble brake disc on hub and fasten with bolts and gaskets.

NOTE: *Fastening torque:280~330Nm
Fasten all screws according to symmetrical and crossing principle.*

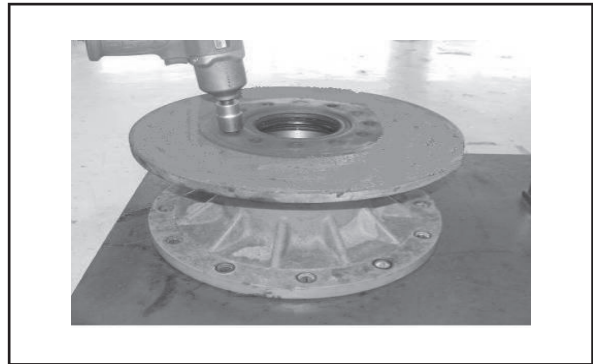


Figure.77

2.2 Assemble planet carrier assembly

1.Stick lubrication grease quill roller (27 units each) on walls of inner holes of planet gears, assemble baffle ring in the middle of quill roller, assemble gaskets at both sides of planet gear, then assemble to the seat hole of planet carrier.

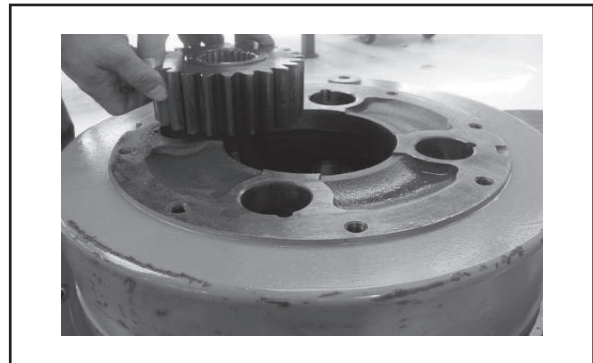


Figure.78

2.Assemble steel balls in holes of planet gear shaft, steel ball shall aim at semi circle of planet carrier, go through the inner hole of planet gear and gasket and assemble on planet carrier. After assembly, planet gear shall rotate flexibly there is no blocking.

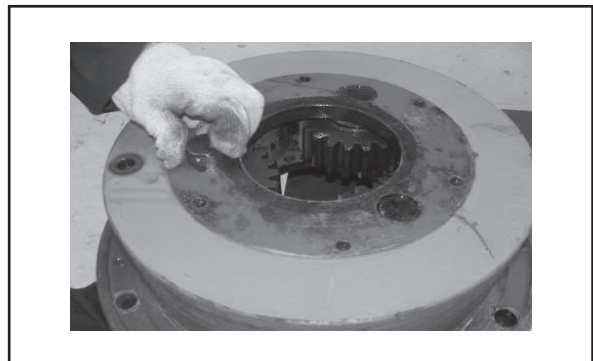


Figure.79

2.3 Install of main drive assembly

1. Assemble rolling bearing on bear neck of the terminal with pressure machine, rotate to the left on active spiral bevel gear front axle, and rotate to the right side.

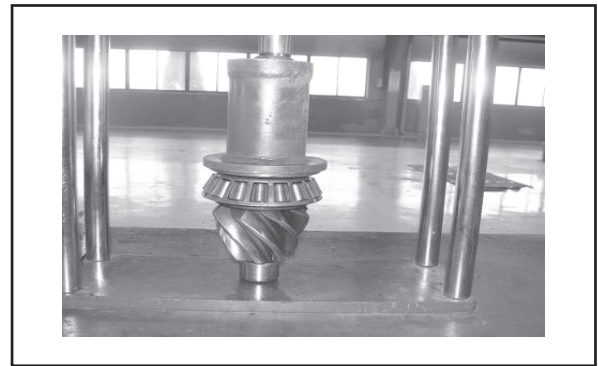


Figure.80

2. Press inner ring into rolling bearing with pressure machine at the other side

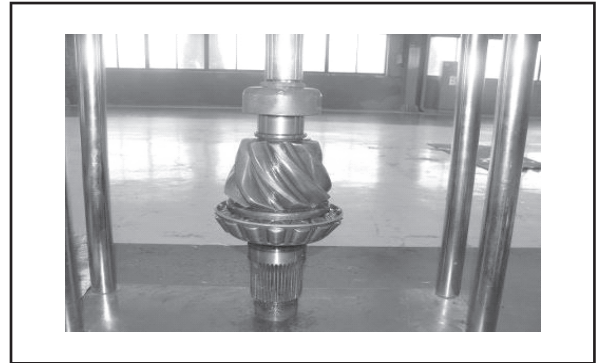


Figure.81

3. Turn over gear and assemble outer ring of gear

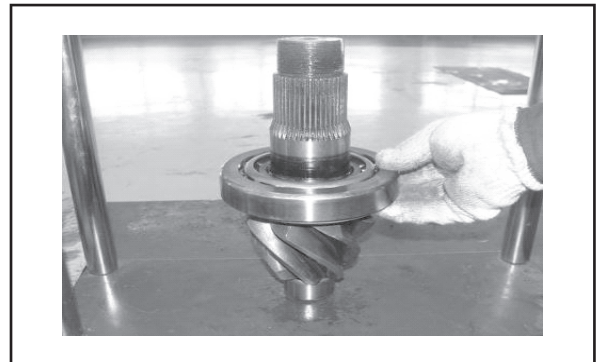


Figure.82

4. Install spacer bush

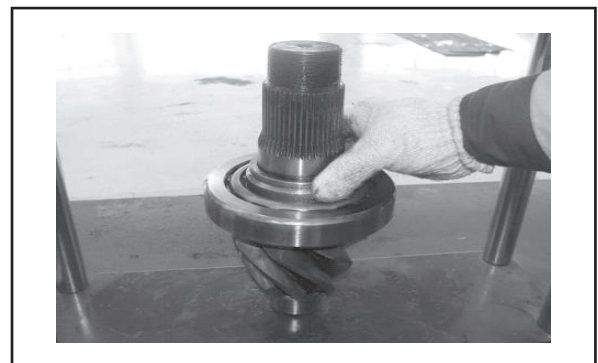


Figure.83

5. Install gaskets

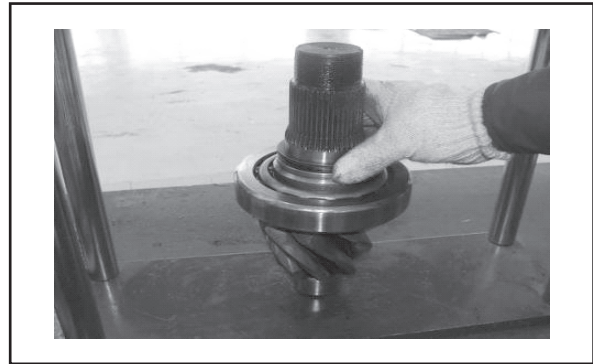


Figure.84

6. Install bearing sleeve

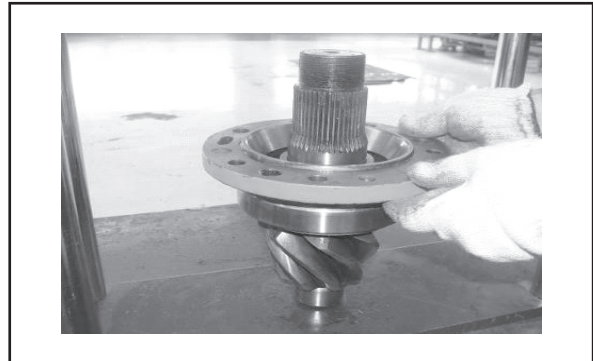


Figure.85

7. Press inner ring of antifriction bearing in the end.

NOTE: *when assembling main reducer, taper rolling bearing shall have certain tightness that is on the basis of eliminating bearing clearance and give certain preload. The purpose is to reduce axial force caused during transmission process which will result in axial displacement, improve supporting rigidity, and guarantee normal mesh of bevel gear pair. But if it is too tight, it will accelerate abrasion of taper rolling bearing. Press with $P= 5420$ kg pressure at the top side of inner ring of rolling bearing, grapple $\Phi 14.5$ hole with pull and push ergometer, pull ergometer along with tangential direction, indication of ergometer when pushing shall be 17.34-30.06N, if the indication is not within the range of 17.34-30.06N, increase or reduce thickness of spacer shim, repeat the above process until the indication is within 17.34-30.06N.*

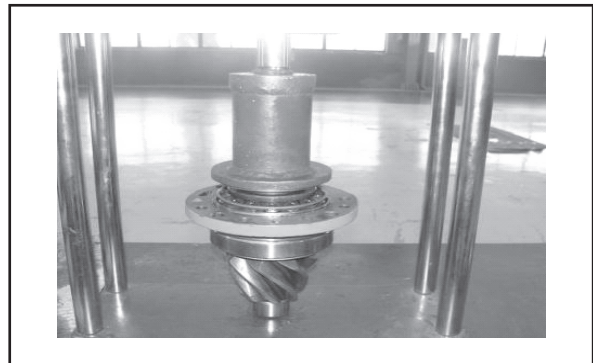


Figure.86

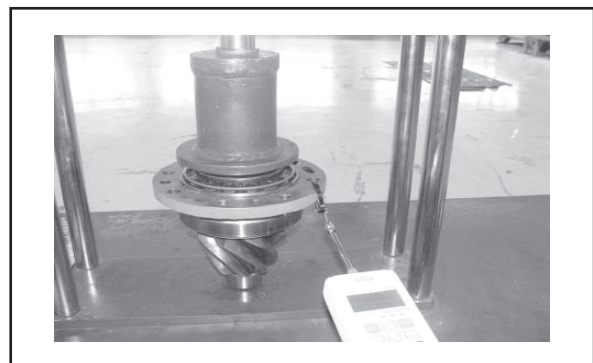


Figure.87

2.4 Assemble of differential assembly

1. Assemble rolling bearing at the bearing position of right shell terminal of differential mechanism.

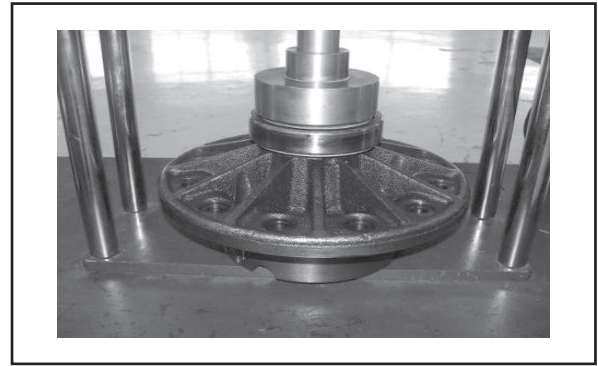


Figure.88

2. Assemble rolling bearing at the bearing position of left shell terminal of differential mechanism.

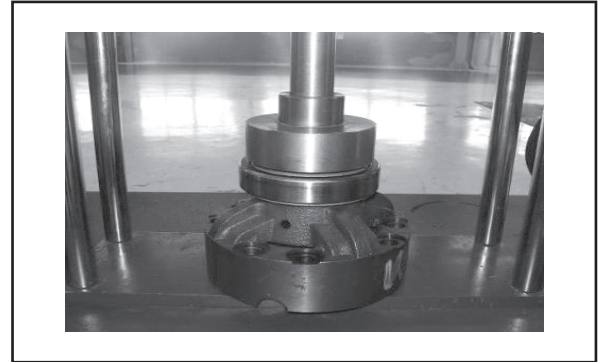


Figure.89

3. Assemble semiaxis gear

Assemble semi axis gear gasket in left shell of differential mechanism

NOTE: *The side of gasket with groove shall toward to the direction of joint cross*

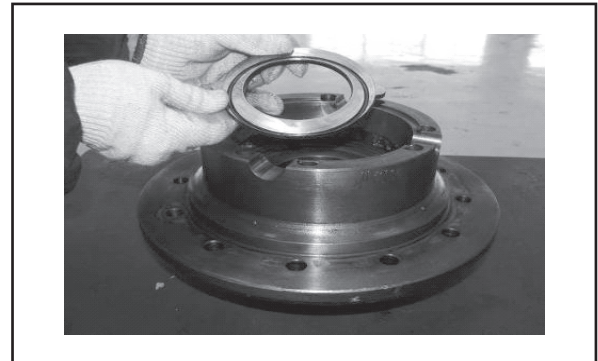


Figure.90

4. Install semiaxis gear

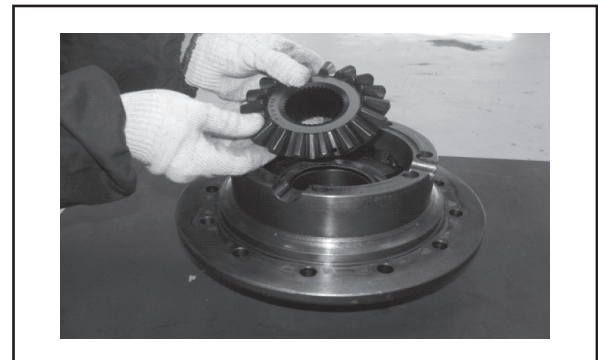


Figure.91

5. Assemble joint cross assembly

Assemble bevel gear (internal of small terminal) and bevel gear gasket on four axles of joint cross.

NOTE: *Lubricate with grease when assembling bevel gear and bevel gear gasket*

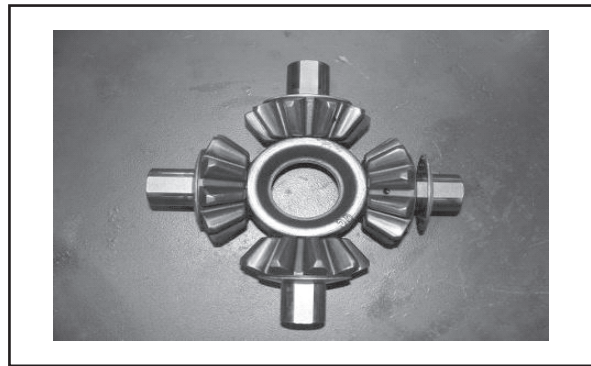


Figure.92

6. Differential mechanism shell

Assemble joint cross in right shell of differential mechanism to make bevel gear and semiaxis gear mesh, turn over left shell assembly of differential mechanism to assemble right shell assembly of differential mechanism, join right shell and left shells of differential mechanism with bolts and fasten with gaskets and nuts.

NOTE: *Nuts fastening torque: 180 ~ 210Nm*

NOTE: *1) Guarantee assembling mark of right shell and left shell of differential mechanism align.*

2) Coat proper Loctite 262 thread fastening sealant at the thread bottom within 12mm length.

3) After assembling, semiaxis gear and taper gear can be rotated manually without blocking.

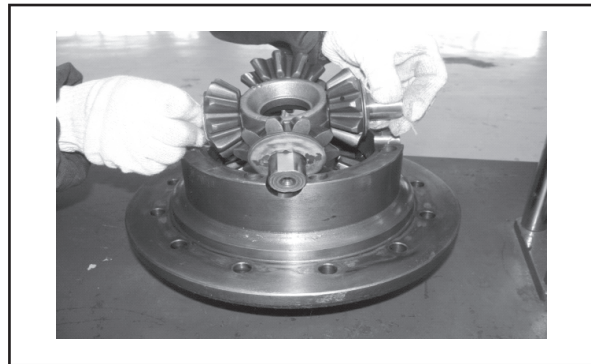


Figure.93

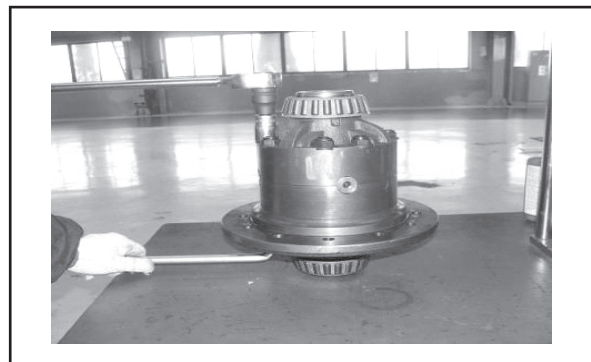


Figure.94

7. Install driven spiral bevel gear

Aim at assembling mark, fasten driven spiral bevel gear (rotate to the left for rear axle, rotate to the right for front axle) with bolts, gaskets and nuts, and fasten screws.

NOTE: Nuts fastening torque 180~210Nm.

NOTE: 1) Coat proper Loctite 262 thread fastening sealant at the thread bottom within 12mm length.

2) Judging method of left and right spiral: face to positive side of gear, right rotation refers to the spiral gear rotates to large terminal clockwise; on the contrary, left rotation refers to the spiral gear rotates to large terminal anticlockwise.

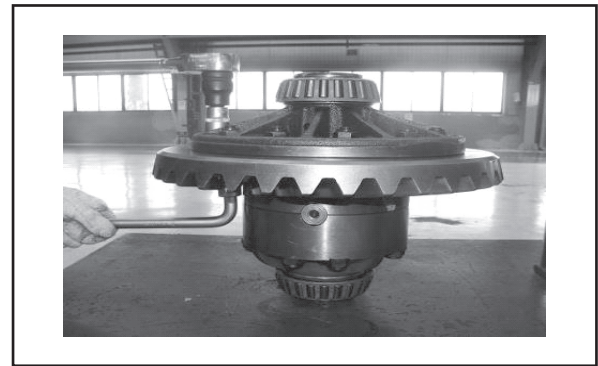


Figure.95

2.5 Install main reducer

1. Install the assembled active spiral bevel gear assembly in bracket, coat sealant line with diameter 2-4mm at the small end, refer to the picture for sealant line; sealant line and diameter of bearing sleeve (the other side of gasket) shall be done according to the above requirements.

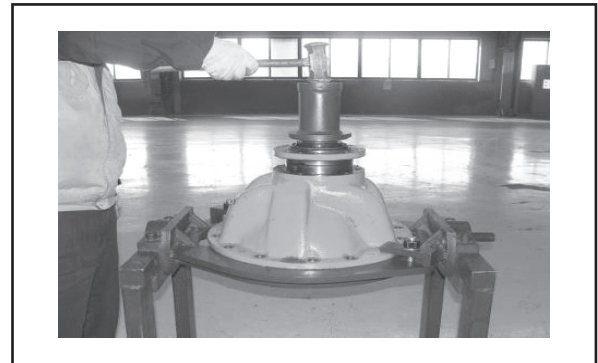


Figure.96

2. Assemble sealing cover

Press oil seal in sealing cover.

NOTE: Coat a layer of proper lubrication oil when assembling oil seal.

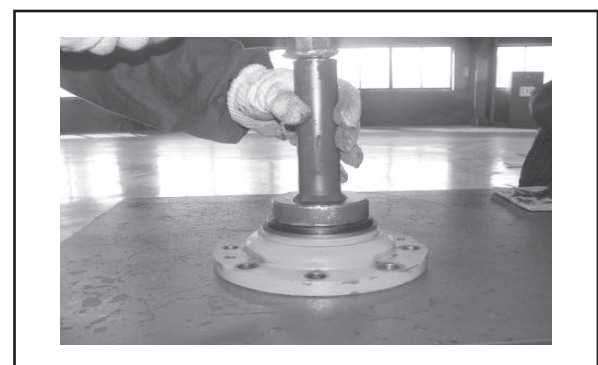


Figure.97

3. Install input flange

Put gasket on the end face of bracket, install sealing cover assembly (coat lubrication grease on oil seal according to common requirements of drive axle), and connect with bracket with bolts and gaskets.

NOTE: *Screw fastening torque 110~130Nm.*

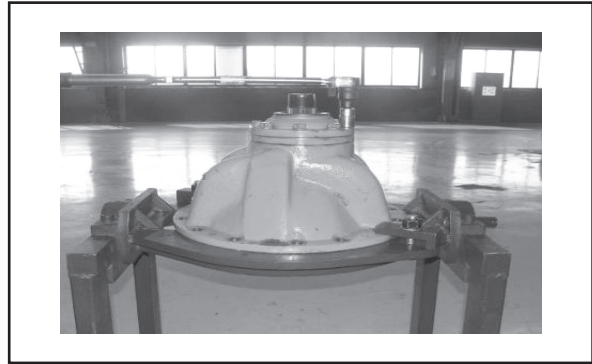


Figure.98

4. Install input flange.



Figure.99

5. Install baffle ring, O ring, coat sealant on one end face of gasket, the surface with sealant is downward, install gasket.

NOTE: *Coat Loctite 598 sealant*



Figure.100

6. Install gasket



Figure.101

7. Install round screws and fasten.

NOTE: Screw fastening torque:320 ~ 400 Nm

NOTE: Before installing flange, install flange on multiple spline on main spiral bevel gear, measure radial play eccentricity of flange, guarantee it cannot be more than 0.08, and mark matching and assembling signs. If it is out of tolerance, rotate flange to certain angle and measure until it complies with requirements, otherwise, replace flange.

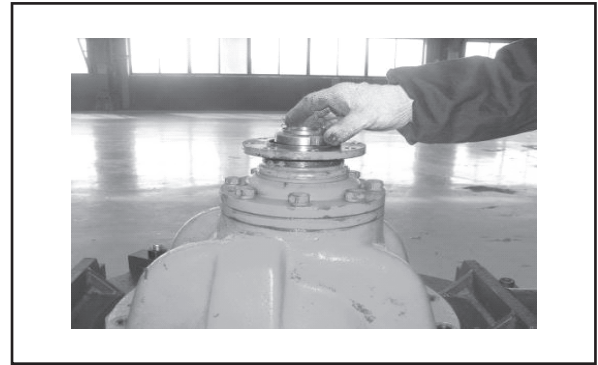


Figure.102

8. Gasket shall be close to $\phi 2 \sim \phi 3$ glue line.

9. Install differential assembly

Turnover carrier, install differential assembly in bracket.

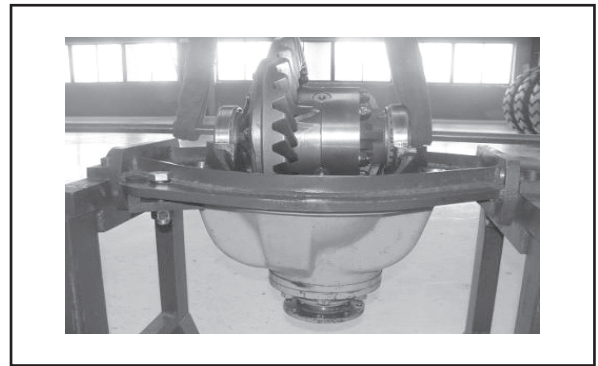


Figure.103

10. Install bearing seat with gaskets and bolts (bolts shall be a little bit tight).

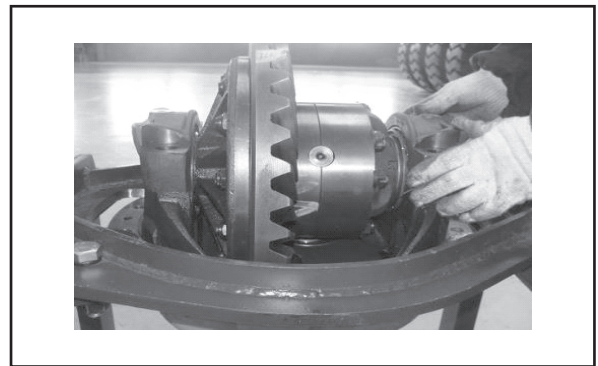


Figure.104

11. Install adjusting nuts.

NOTE: Two bearing seats cannot be exchanged.

12. Coat proper thread sealant on the length of 15~25mm on thread end surface of bolts.

NOTE: Coat Loctite 262 thread fastening sealant.

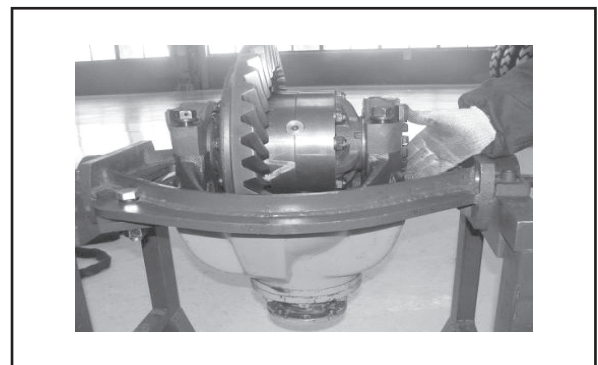


Figure.105

13. Adjust spiral bevel gear

Adjustment of spiral bevel gear mesh condition refers to adjustment of mesh zone and back lash, when adjusting back lash of spiral bevel gear pair, dial gauge can be used to touch the gear surface of large side edge of driven spiral bevel gear, then rotate driven spiral bevel gear to measure back lash directly, the clearance shall be 0.2~0.35mm. Adjusting method of back mesh is to twist adjusting nuts to change position of driven spiral bevel gear (when it is necessary, move active spiral bevel gear assembly to adjust).

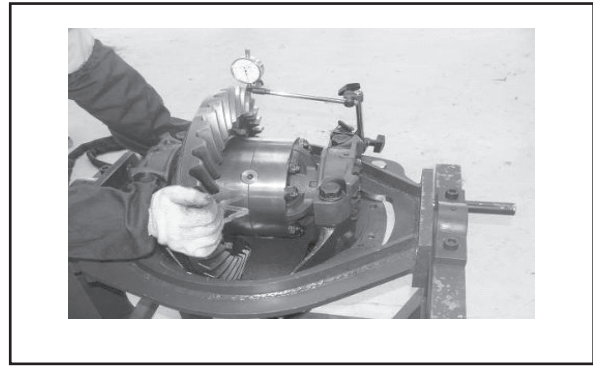


Figure.106

If the clearance is larger than the regulated value, approach active spiral bevel gear from driven spiral bevel gear; otherwise be away from it. In order to keep the adjusted preload of taper rolling bearing of differential mechanism, twisting numbers of adjusting nuts at one side shall be equal to twisting numbers of adjusting nuts at the other side.

When adjusting contact zone of spiral bevel gear pair, coat red color (red lead powder) on driven spiral bevel gear teeth (coat three teeth usually), rotate driven spiral bevel gear with hands repeatedly, check contacting moulage. Adjust the correct position of spiral bevel gear mesh moulage: it shall not be less than 50% along with teeth height direction and teeth length direction, mesh moulage of driven bevel gear shall be close to the center, and in the middle of teeth height, smaller than the small end on teeth length direction. Increasing preload of differential bearing: after adjusting back lash of spiral bevel gear well, it shall guarantee the clearance between taper rolling bearings at both sides of differential mechanism is 0. Following is the adjusting methods.

Adjustment of contact zone and back lash when installing spiral bevel gear

| Contact zone of driven spiral bevel gear | Adjusting method | Gear moving direction |
|--|--|-----------------------|
| | Move driven gear to the direction of active gear, if the clearance is too small, move active gear outside | |
| | Move driven gear away from active gear, if the clearance is too large, move active gear inside | |
| | Move active gear to the direction of driven gear, if the clearance is too small, move driven gear inside and outside | |
| | Move active gear away from driven gear, if clearance is too large, move driven gear inside | |

Method of adjusting mesh zone is usually increasing and decreasing adjusting gaskets and rotating adjusting nuts. Adjusting of contact zone will affect performance and service life greatly, it shall be carried out carefully.

NOTE: *After adjusting, clean off red lead powder.*

14. Install locking plate

Fasten the fixed bolts on bearing seat, fastening torque is 380~450Nm. Put locking plate at the right position, fix it on bearing seat with bolts and gaskets, and fasten fixing bolts of locking plate.

NOTE: *Fastening torque 30~36Nm*

NOTE: *Coat proper Loctite 262 thread fastening sealant on 5-10mm length at the end surface of fixing bolt.*

NOTE: *Coat Loctite 262 thread fastening sealant*

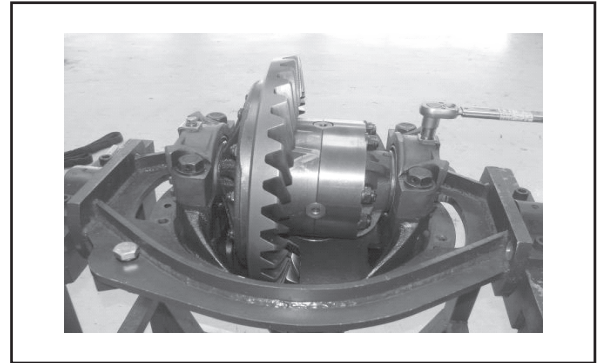


Figure107

REAR AXLE



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

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GENERAL DESCRIPTION

Structure chart

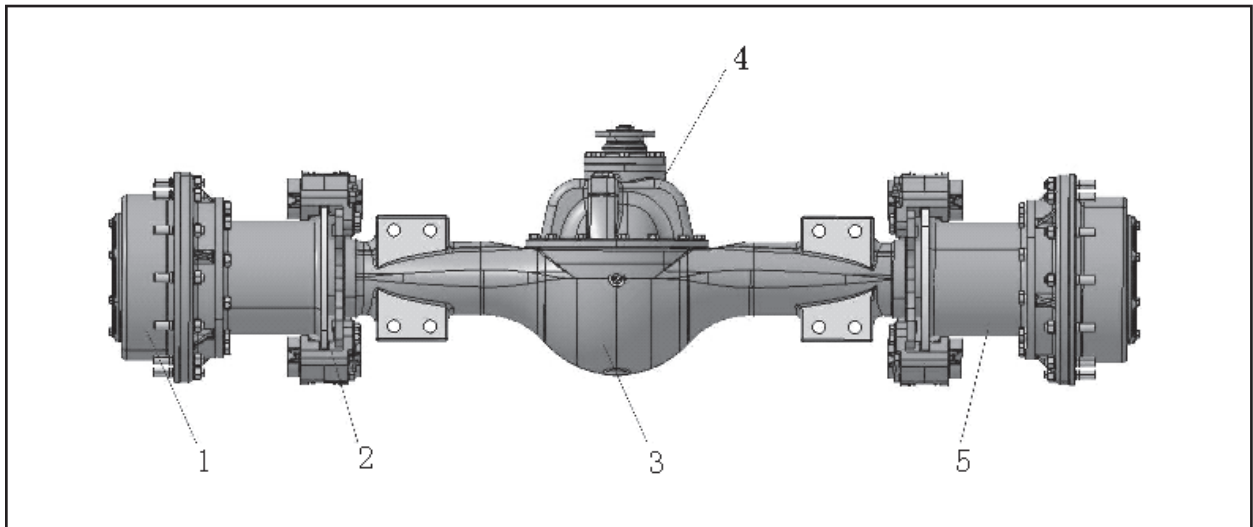


Figure.1

- 1.EDGE REDUCER ASS'Y 2. BRAKE CLAMP ASS'Y 3. SHELL 4. MAIN REDUCER ASS'Y
5. HUB ASS'Y

Basic parameters of drive axle:

| | | |
|--------------------|-----------------------|---------------------------------------|
| Main drive | Type | Spiral bevel gear grade one reduction |
| | Reduction ratio | 4.222 |
| Hub reduction gear | Type | Grade one planet reduction |
| | Reduction ratio | 4.8 |
| Axle oil | GB13895-1992 gear oil | 10Kg |

Internal structure of drive axle

Drive axle assembly is one of the most important spare parts of transmission system, its main function is reduce rotation speed from gear box and increase torque, and make wheels at both sides having speed difference. Besides, it also plays the role of bearing and transmitting. Drive axle assembly of loader is mainly composed of shell, main drive (including differential mechanism), semiaxis, hub reduction gear, brake caliper assembly and other parts. Of which, the parts having reduction and differential function is main driver and hub reduction gear; power transmission between main drive and hub reduction gear is realized through semiaxis, multiple spline at both sides of semiaxis and axle shaft gear of differential mechanism and sun gear of hub reduction gear mesh with each other to realize power connection between main drive and hub reduction gear.

PARTS LIST

Disassembly of rear axle

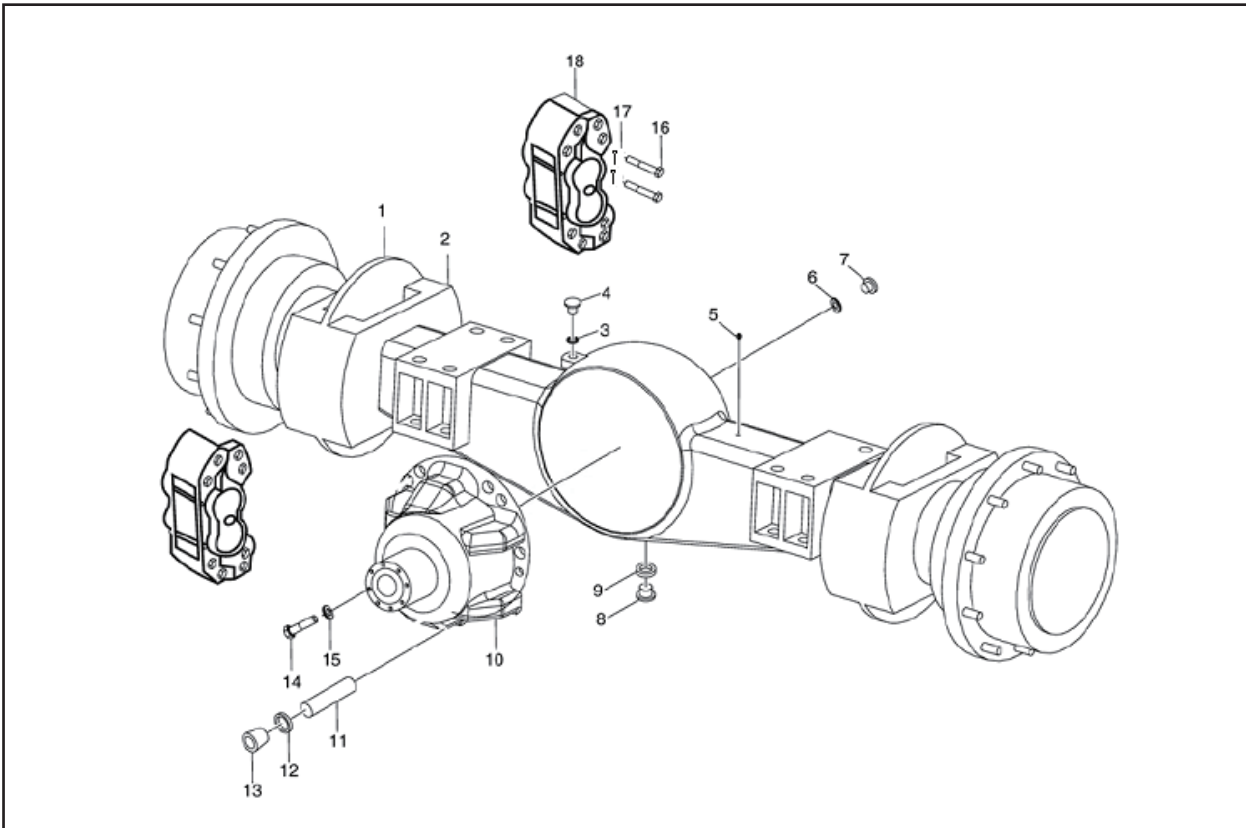


Figure.2

| Reference Number | Description | Reference Number | Description |
|------------------|------------------------|------------------|--------------------|
| 1 | WHEEL REDUCER ASS'Y | 10 | MAIN REDUCER ASS'Y |
| 2 | AXLE ASSY;SHELL | 11 | STUD BOLT |
| 3 | GROUP WASHER $\phi 24$ | 12 | SPACER 12 |
| 4 | PLUG,SCREW | 13 | NUT M12 |
| 5 | DEFLATION VALVE Z1/8 | 14 | BOLT M12X35-10.9 |
| 6 | O-RING | 15 | SPACER 12 |
| 7 | PLUG,SCREW | 16 | BOLT |
| 8 | PLUG,SCREW | 17 | PIN |
| 9 | O-RING | 18 | BRAKE ASSY |

Assemble of Hub drive axle

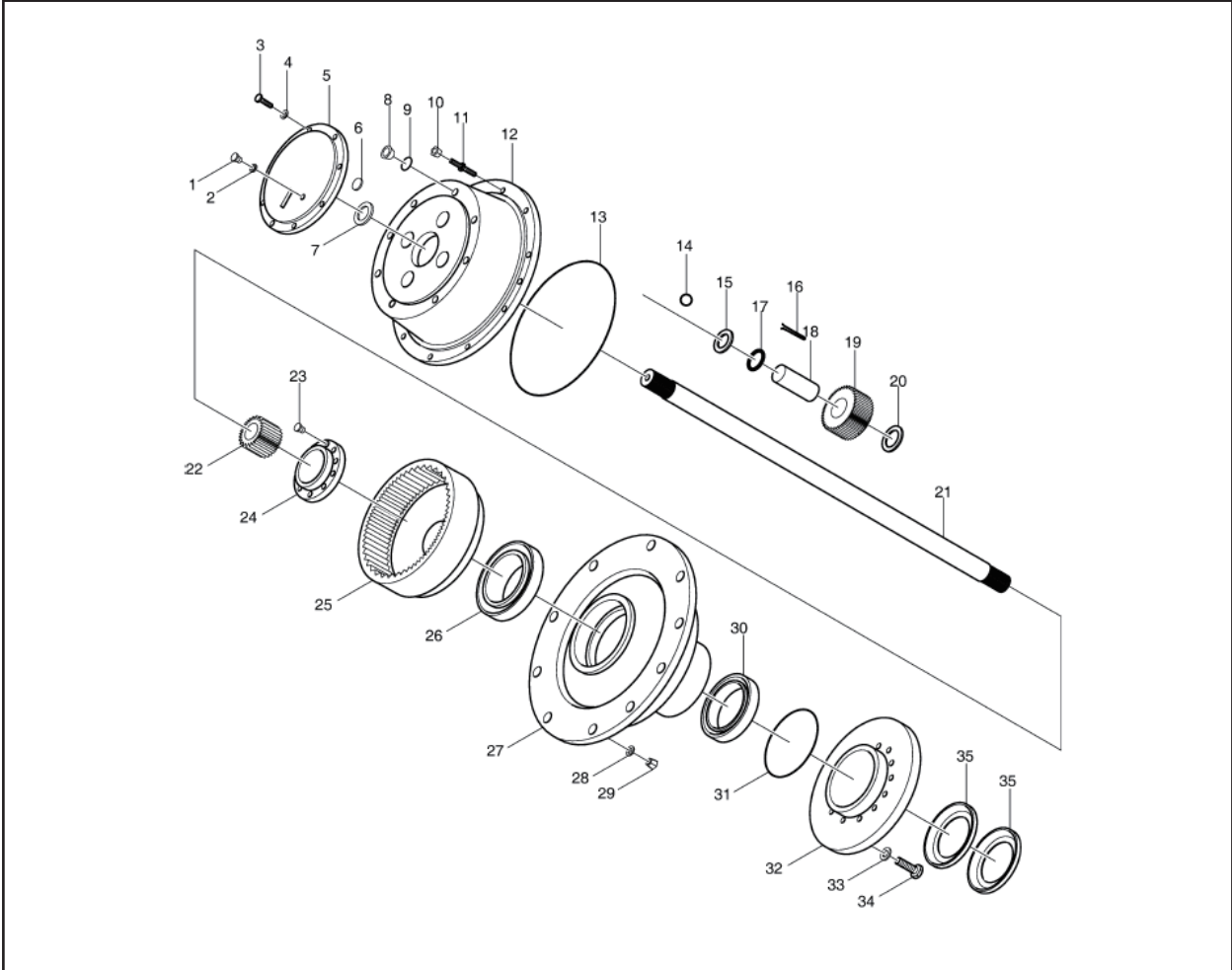


Figure.3

| Reference Number | Description | Reference Number | Description |
|------------------|----------------------|------------------|---------------------|
| 1 | PLUG,SCREW | 19 | PLANET WHEEL |
| 2 | O-RING | 20 | PLANET WHEEL WASHER |
| 3 | BOLT M12X1.5-25 | 21 | HALF SHAFT |
| 4 | SPACER 12 | 22 | SUN WHEEL |
| 5 | COVER | 23 | SCREW M8X15 |
| 6 | BLOCK | 24 | HOLDING NUT |
| 7 | RETAINER RING 48 | 25 | INSIDE GEAR |
| 8 | PLUG,SCREW | 26 | BEARING 7521E |
| 9 | O-RING | 27 | HUB |
| 10 | HUB NUT | 28 | SPRING WASHER |
| 11 | HUB BOLT | 29 | NUT M18 |
| 12 | SHELF,PLANET | 30 | BEARING 2007122E |
| 13 | O-RING SEAL | 31 | O-RING SEAL |
| 14 | STEEL BALL $\phi 6$ | 32 | BRAKE DISC |
| 15 | PLANET WHEEL WASHER | 33 | WASHER 16 |
| 16 | NEEDLE ROLLER 4x23.8 | 34 | BOLT M16X45 |
| 17 | SAPCER SLEEVE | 35 | SEAL ASSY,OIL |
| 18 | PLANET WHEEL SHAFT | | |

Brake assembly

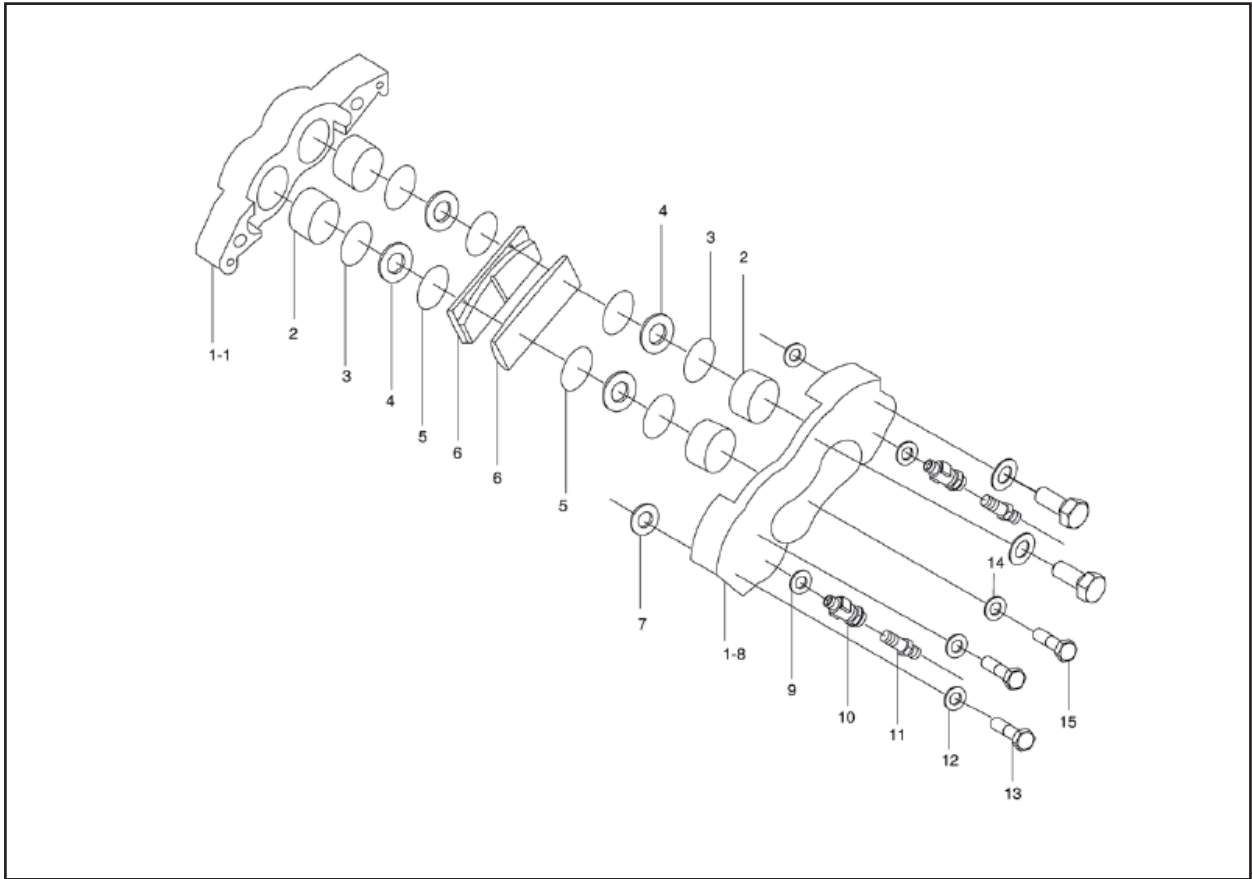


Figure.4

| Reference Number | Description | Reference Number | Description |
|------------------|------------------|------------------|------------------|
| 1-1 | BRAKE, EXTERIOR | 9 | WASHER |
| 1-8 | BRAKE, INNER | 10 | CONNECTING |
| 2 | PISTON | 11 | DEFLATING VALVE |
| 3 | RECTANGULAR SEAL | 12 | SPACER 12 |
| 4 | CASE, DUST | 13 | BOLT |
| 5 | BLOCK RING | 14 | WASHER SPRING 10 |
| 6 | BRAKE DISK | 15 | PIN; BOLT |
| 7 | O-RING 20X2.4 | | |

Main drive assembly

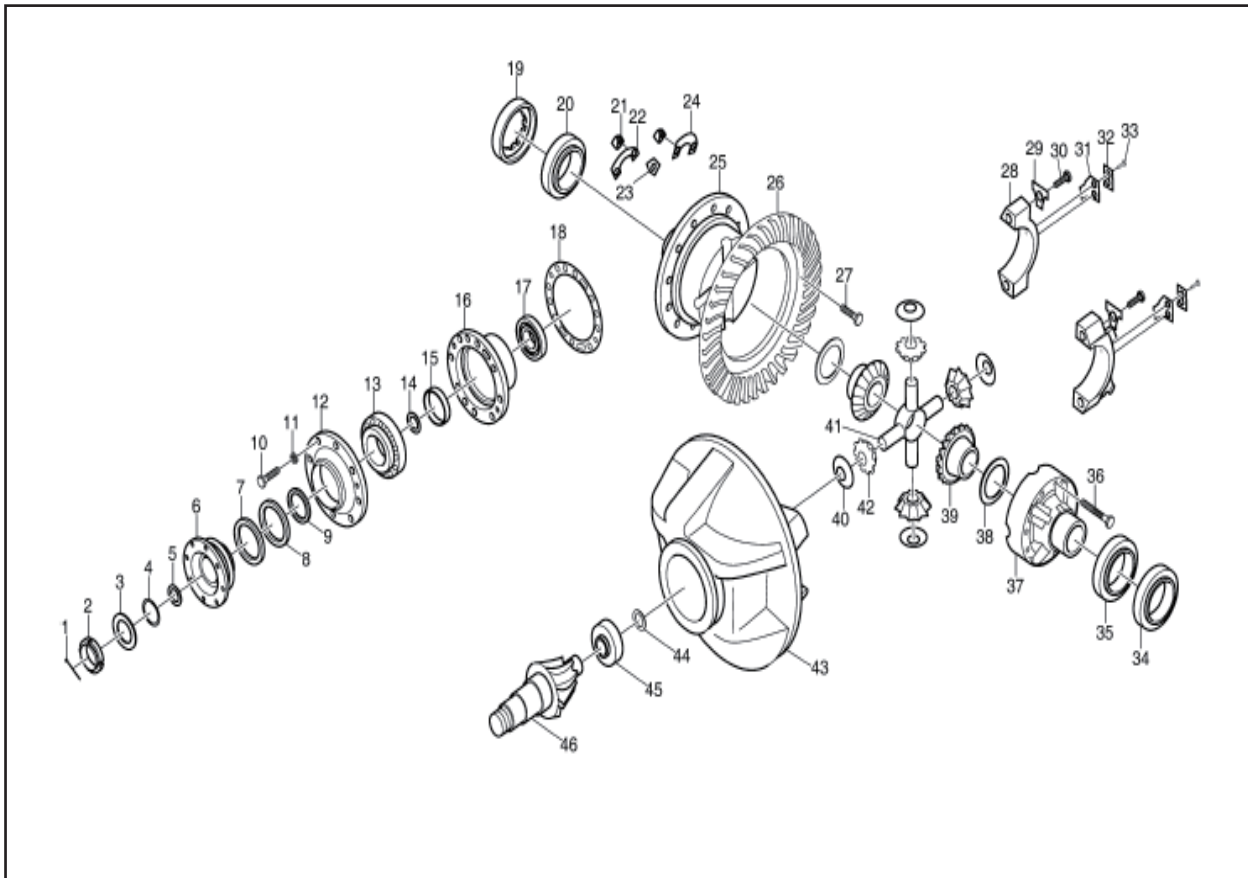


Figure.5

| Reference Number | Description | Reference Number | Description |
|------------------|---------------------|------------------|----------------------------|
| 1 | PIN 5X45 | 24 | HOLDING PLATE |
| 2 | NUT M27x1.5-7H | 25 | DIFFERENTIAL SHELL –LEFT |
| 3 | WASHER | 26 | GEAR,BEVEL;DRIVE(REAR) |
| 4 | O-RING BAFFLE | 28 | DIFFERENTIAL BEARING COVER |
| 5 | O-RING SEAL 40X5.3 | 29 | HOLDING PLATE |
| 6 | INPUT FLANGE GROUP | 30 | BOLT M18x90 |
| 7 | OIL SEAL B62x93x6 | 31 | HOLDING PLATE |
| 8 | OIL SEAL FB62x93x13 | 32 | HOLDING PLATE |
| 9 | STOPPER WASHER | 33 | BOLT M8X12 |
| 10 | BOLT M12x45-10.9 | 34 | REGULATE NUT |
| 11 | SPACER 12 | 35 | BEARING 7516E |
| 12 | OIL SEAL SEAT | 36 | BOLT M14X1.5 |
| 13 | BEARING 27311E | 37 | DIFFERENTIAL SHELL – RIGHT |
| 14 | REGULATE WASHER | 38 | HALF SHAFT GEAR WASHER |
| 15 | SPACER SLEEVE | 39 | HALF SHAFT GEAR |
| 16 | BEARING SEAT | 40 | SUPPORT WASHER |
| 17 | BEARING 27311E | 41 | CROSS SHAFT |
| 18 | REGULATE WASHER | 42 | PLANET GEAR |
| 19 | REGULATE NUT | 43 | MAIN REDUCER SHELL |
| 20 | BEARING 7516E | 44 | RETAINER RING 30 |
| 21 | NUT M14X1.5 | 45 | BEARING 92606E |
| 22 | HOLDING PLATE | 46 | DRIVE GEAR;RIGHT |
| 23 | HOLDING PLATE | | |

SCHEDULED MAINTENANCE

Oil of new drive axle must be replaced after working for 15 days (about 100 working hours), oil shall be replaced once after working for every six months (about 1200 working hours) in following days.

Every month maintenance

1. Check abrasion condition of brake disc, if there is disruptive abrasion; please handle in time if there is any.
2. Check abrasion condition of brake block to guarantee separation and reunion of brake caliper is flexible; it shall be replaced in time when brake block is wearing close to abrasion line (at the bottom of groove).
3. Check if oil level of shell complies with requirements, please add new oil if the oil level descends.
4. Keep axle clean, keep vent pipe smooth, and avoid silt going into axle. Check loosening condition of all fasteners, especially rim nuts, if it is loosed, please refasten again.

Every half year maintenance:

Lubrication oil in axle shall be replaced every half a year, different brands of lubrication oil shall be adopted for different areas and seasons. Please refer to 4.2 for oil replacing method.

Every year maintenance:

Overhaul checking every working year:

1. Check the gap, mesh and abrasion condition of spiral bevel gear of main reducer.
2. Check abrasion condition of differential mechanism gear.
3. Check abrasion condition of hub gear.
4. Check abrasion condition of needle bearing of hub planetary gear.
5. Requirements of installation and debugging items after overhaul checking:
 - 1) After assembling, axle shaft gear and bevel gear shall move flexibly with hand touching rather than locking. The Min. gear backlash of gear is 0.18-0.23mm. Tooth length and tooth height of contacting area of two gears cannot be less than 50%.
 - 2) In order to guarantee enough bearing rigidity of active spiral gear, before assembling oil seal and sealing cover, adopt gradually reducing spacer shim between tapered roller bearing to give 1.0-1.5N.m preloaded torque to roller bearing.
 - 3) Gear backlash between the driving and driven spiral bevel gear is 0.25-0.45mm, the changing amount cannot be more than 0.15mm, gear backlash can be realized through adjusting nuts of both sides of differential mechanism and spacer shim of bearing sleeve. Tooth surface contacting area shall guarantee direction of tooth length and tooth height is not less than 50%, contacting position shall be at the middle side of tooth surface and closer to the smaller side.
 - 4) Adjusting of bearing clearance of shell at both sides of drive axle: Fasten adjusting nuts, give 28-38N.m preload to shell roller bearing, and then lock two round nuts with screw fastening.

GENERAL DISASSEMBLY AND REASSEMBLY INSTRUCTIONS



WARNING!

Never use gasoline, solvents, or other flammable fluids to clean components. Only use approved commercial solvents that are nonflammable and nontoxic.

IMPORTANT

Use only **GENUINE DOOSAN SPARE PARTS** to warrant proper operations and prevent interchangeability problems.

GENERAL INSTRUCTIONS

1. Thoroughly clean and dry axle before disassembly.
2. All components should be thoroughly cleaned and dried before reassembly. Dirt, chips, and foreign material may cause failures.
3. All ducts and castings should be thoroughly cleaned and dried to remove dirt, chips, and foreign material to prevent damage after reassembly.
4. Reassembly should be done in a clean shop, and should be as dust free as possible.
5. Make sure tools and equipment are at hand.
6. When reassembling Daewoo strongly recommends to replace the following parts with new.
 - Seal Rings.
 - O-rings.
 - Gaskets.
 - Threaded rings with notched collar.
 - Any component damaged during disassembly.
7. When mounting heat fitted components, make sure of their proper position and direction of assembly, after they have cooled.
8. To heat bearings, use proper heating plates, piping, or suitable ovens.
NOTE: *Never heat parts by using a torch. Oil bath, heated by a torch, maybe used to warm components.*
9. Lubricate all sections concerned when reassembling shafts, bearings, etc.
10. Lubricate O-rings before installing them in relevant seats to prevent kinking during assembly, such a position would impair proper sealing.
11. Replace gears only in matched sets to make sure of proper tooth mating.

AXLE DISASSEMBLY

Drive axle disassembly

1. Put drive axle on supporting and make sure main driver assembly is upward.

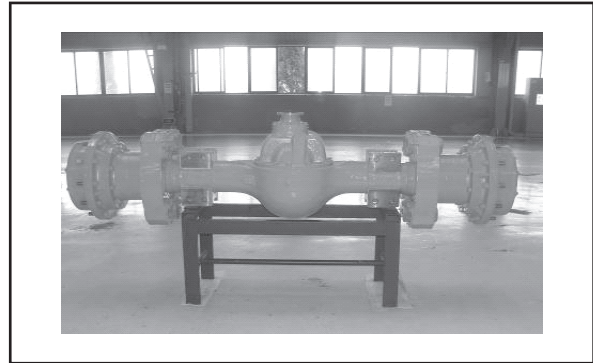


Figure.6

2. Dismantle brake caliper assembly

Loosen the connection bolts between brake caliper and brake caliper support, dismantle brake caliper assemble.

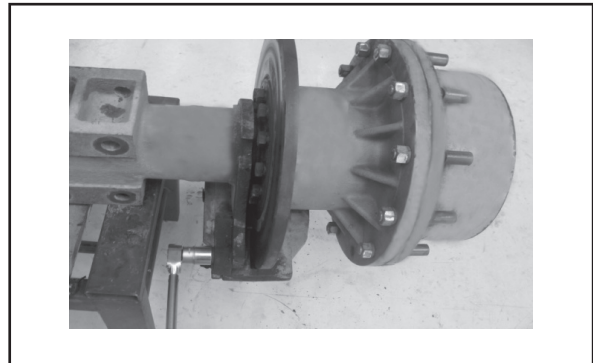


Figure.7

3. Release gear oil from planet carrier

Loosen hub oil releasing drain plug and shell oil releasing drain plug, turn on slowly with hands to avoid oil spilling.

NOTE: Store gear oil with clean container.



Figure.8

4. Release gear oil from shell

Turn on oil releasing bolts axle end cap to release gear oil.

NOTE: *Store gear oil with clean container.*

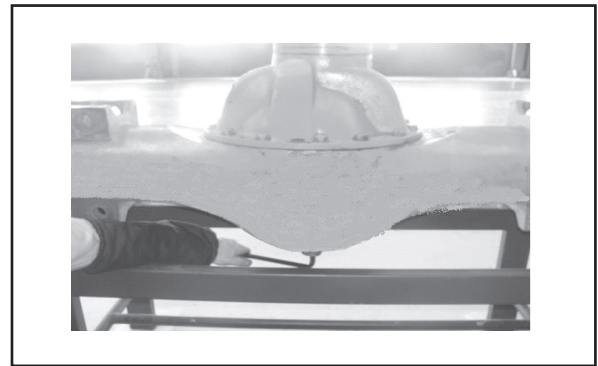


Figure.9

5. Dismantle end cap

Loosen connection bolts between planet carrier and end cap, then get end cap from hub reducer assembly with jackscrew, dismantle end cap.

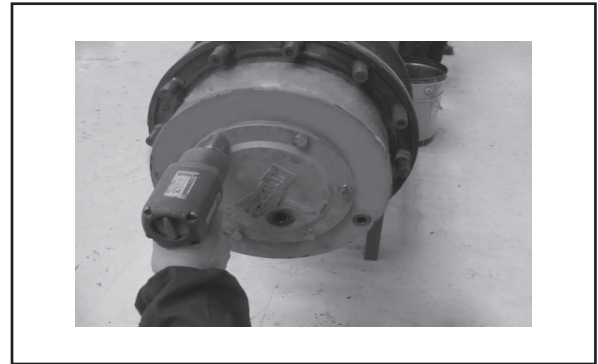


Figure.10

6. Dismantle locating block

Take down locating block with hands.

NOTE: *If it is tight when taking down, please use assistant tools to pry out.*

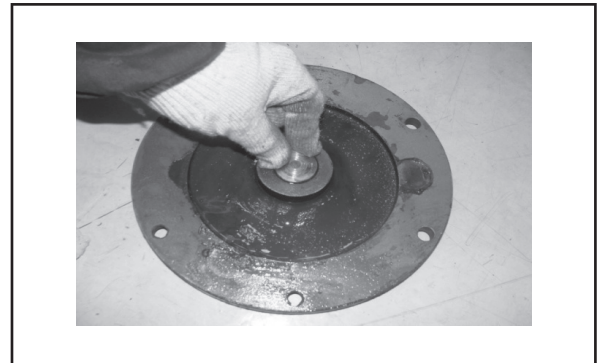


Figure.11

7. Dismantle stop collar

Dismantle stop collar from semi axis with stop collar pincers.

NOTE: *Before dismantling stop collar, pull out a section of semi axis from shell.*

NOTE: *It must clamp firmly when using stop collar pincers to avoid safety hazard when it is popup.*

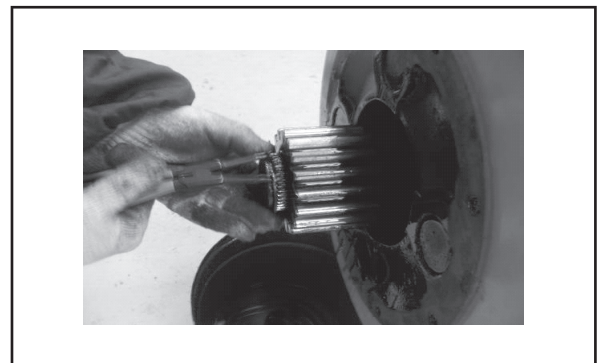


Figure.12

8. Dismantle sun gear
Dismantle semi axis from sun gear.

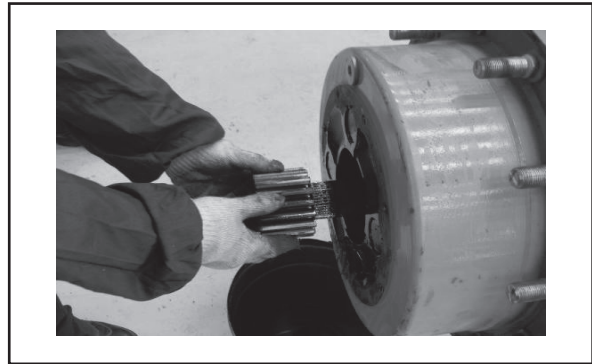


Figure.13

9. Dismantle locating block
Dismantle locating block from semi axle with hands.

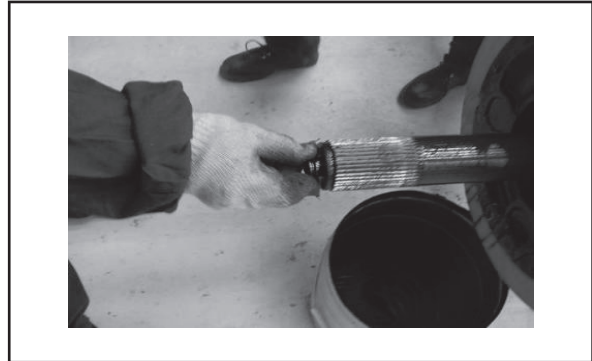


Figure.14

10. Dismantle semi axis
Take semi axis from shell slightly.



Figure.15

11. Hub reducer
First loosen rim bolts with relative tools, then loosen rim from planet carrier with jackscrew and dismantle planet carrier assembly.
NOTE: *Please slowly loosen planet carrier to avoid safety hazard resulted from dropping of planet carrier assembly.*

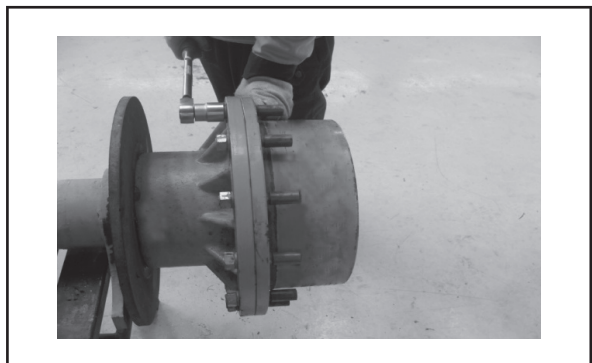


Figure.16

12. Dismantle round bolts
Dismantle round bolts.

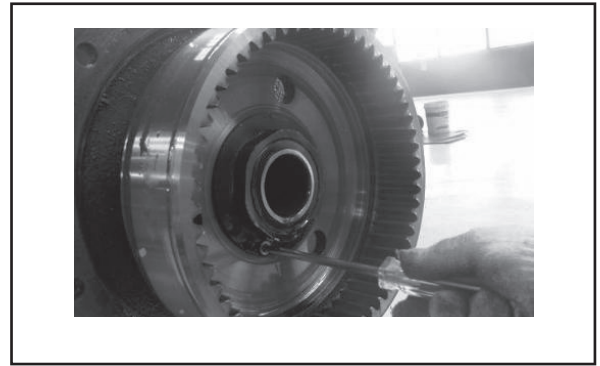


Figure.17

13. Dismantle round nuts
Dismantle round nuts.

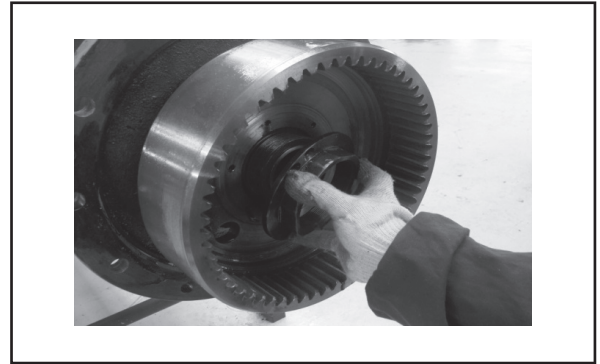


Figure.18

14. Dismantle internal gear
Take internal gear out by slightly rocking.

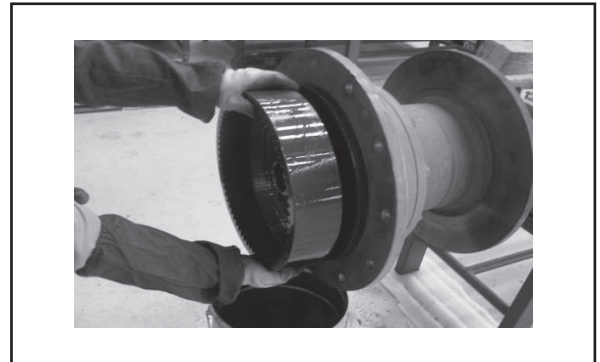


Figure.19

15. Dismantle rolling bearing
Take out rolling bearing with special dismantling tool.

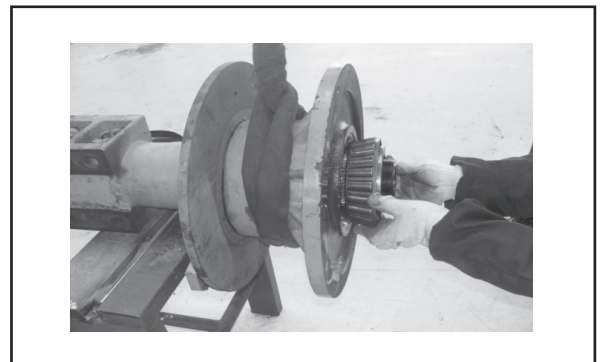


Figure.20

16. Dismantle wheel hub assembly

Take wheel hub assembly from supporting axle.

NOTE: *During hanging and dismantling process, please keep axis of wheel hub assembly is in line with axis of hub reduction supporting axle to avoid scratching oil surface and internal spare parts during dismantling process.*

Remark: *dismantle all parts at the other side of drive axle with the same methods.*

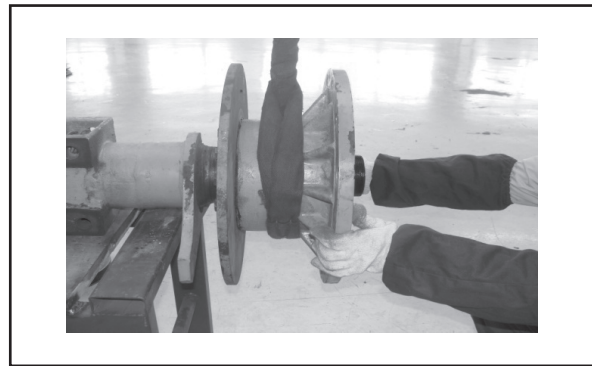


Figure.21

17. Dismantle main drive assembly

Dismantle connection bolts between main drive and shell assembly, take out main drive with jackscrew, and suspend main drive assembly.

Note: *When suspending main drive assembly, guarantee suspending and dismantling tools are at the above of main drive assembly to avoid spare parts inside are knocked again during suspending and dismantling process.*

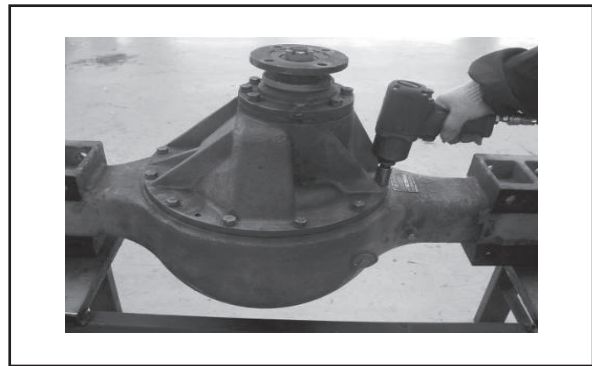


Figure.22

2 Assembly dismantling

2.1 Dismantle planet carrier assembly

1. O ring

Take out O ring.

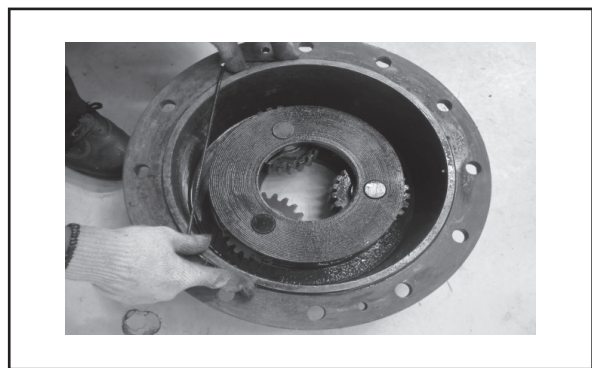


Figure.23

2. Put planet carrier on working platform horizontally.



Figure.24

3. Take out planet axle with tools.



Figure.25

4. Take out steel balls.



Figure.26

5. Take out planet wheel.



Figure.27

6. Take out baffle ring and quill roller from inside of planet wheel.

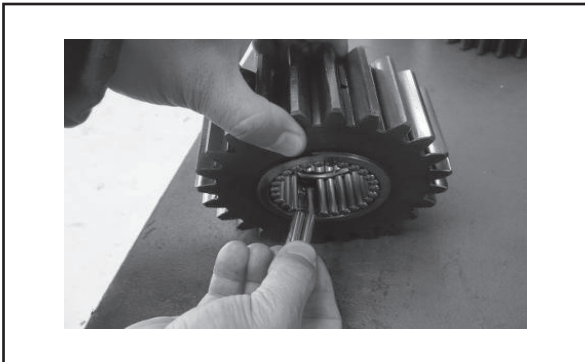


Figure.28

2.2 Dismantle hub assembly

1. Put hub assembly on working platform, loosen connection bolts between brake disc and hub.

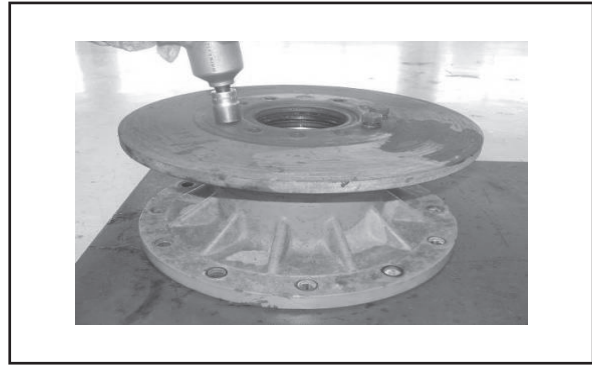


Figure.29

2. Take out brake disc.



Figure.30

3. Take out bearing.

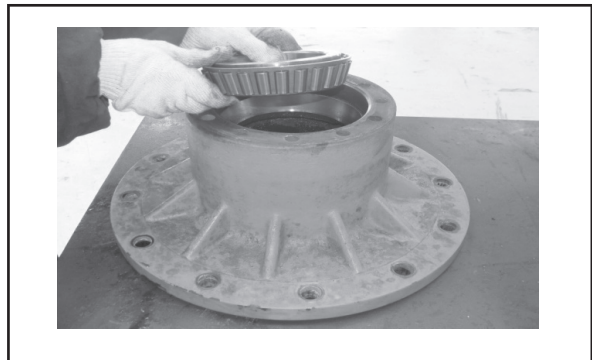


Figure.31

4. Take out oil seal.

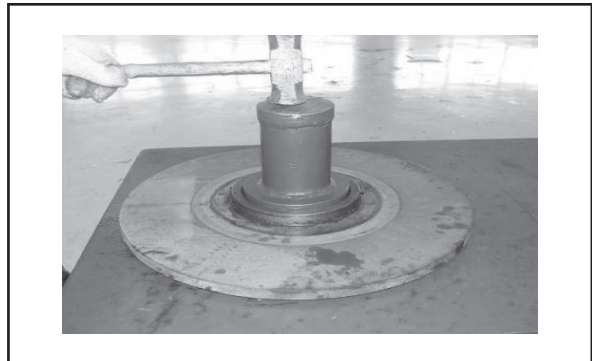


Figure.32

2.3 Dismantle main drive assembly

1. Put main drive assembly (input flange upward) horizontally and fixed on supporting.

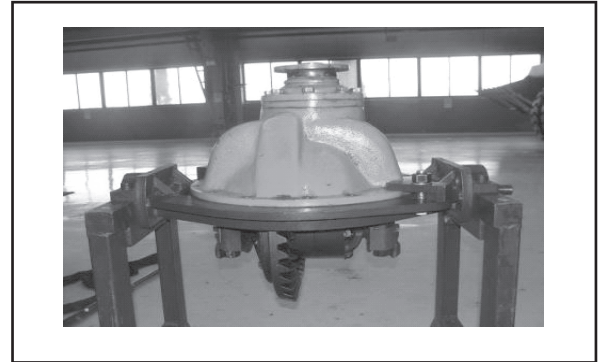


Figure.33

2. Dismantle locknut gasket, O ring and baffle ring.

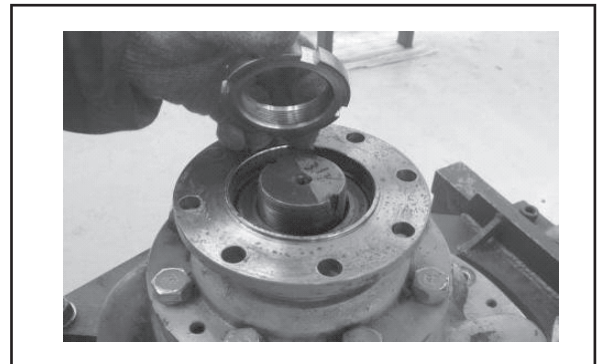


Figure.34

3. Take out input flange.

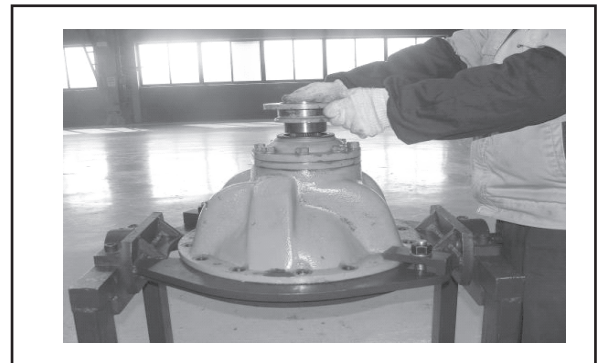


Figure.35

4. Dismantle connection bolts between sealing cover and bearing sleeve, take out sealing cover.

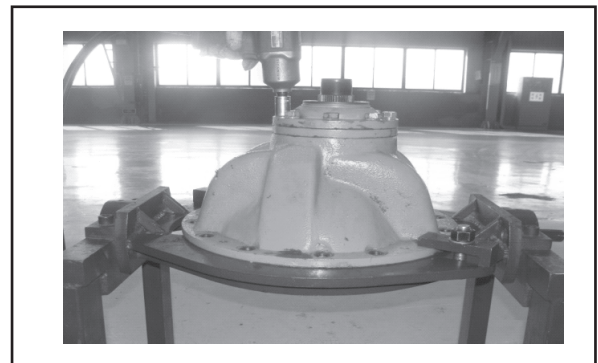


Figure.36

5. Turn main drive for 180°, dismantle bolts fastening locking plate, take out locking plate.

NOTE: *Some of the machine structure may be different from this figure, please adjust working content according to actual structure.*

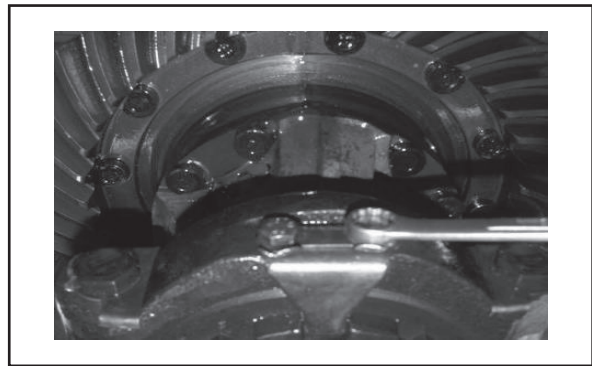


Figure.37

6. Dismantle connection bolts of bearing seat and take out bearing seat.

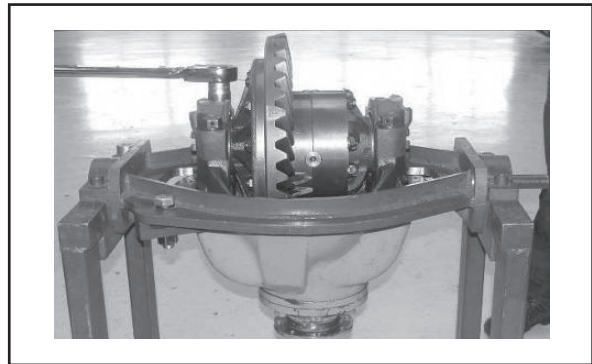


Figure.38

7. Dismantle adjusting nuts.

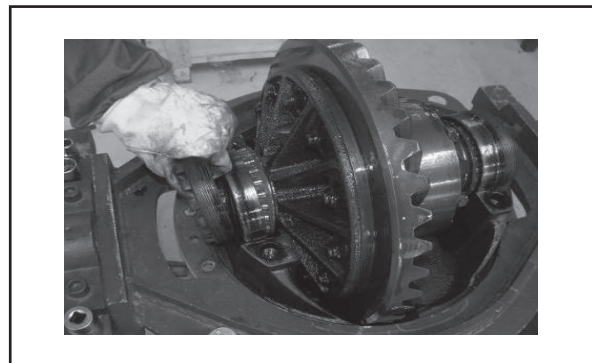


Figure.39

8. Dismantle bearing outer ring.

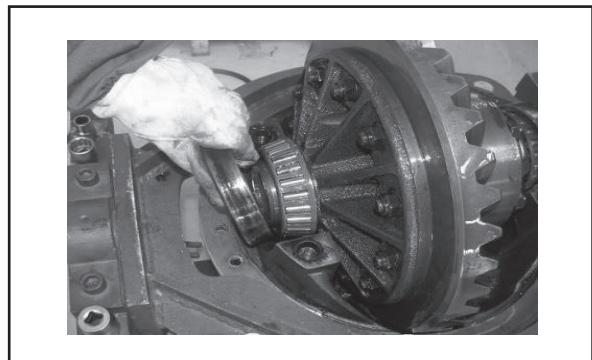


Figure.40

9. Hang out differential mechanism assembly.
NOTE: *Keep balance when hanging out to avoid safety hazard.*

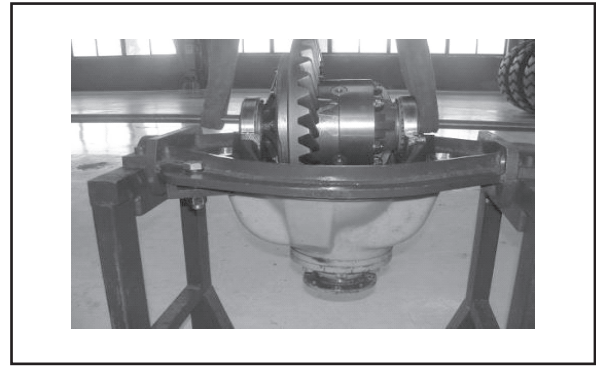


Figure.41

10. Separate active spiral bevel gear assembly and bracket with jackscrew.

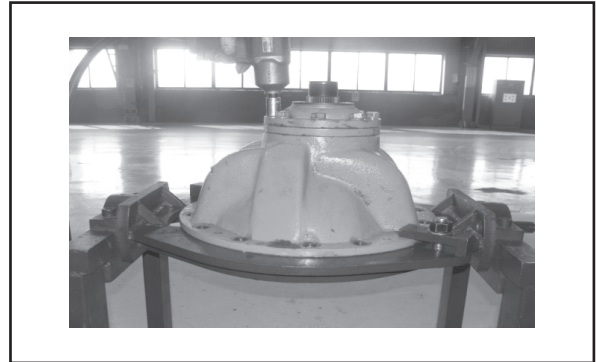


Figure.42

2.4 Dismantle differential assembly

1. Put differential assembly vertically on working platform, and guarantee it is stable.

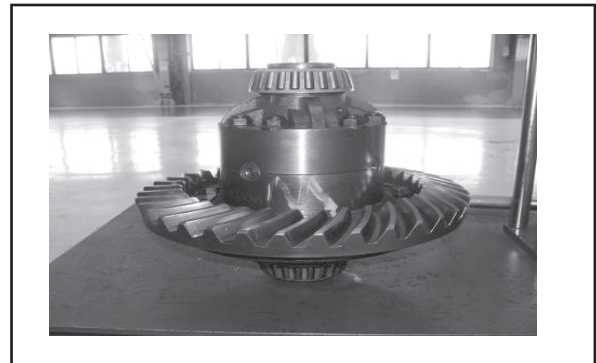


Figure.43

2. Dismantle bearing on left and right shell of differential mechanism.

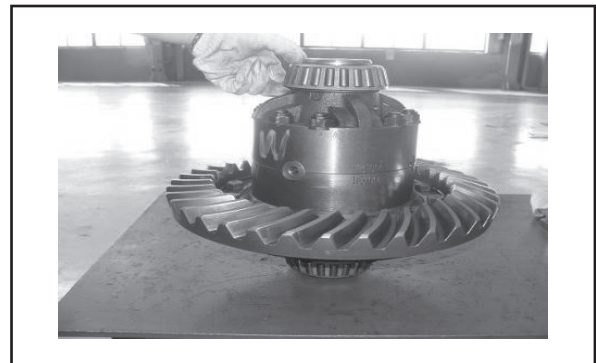


Figure.44

3. Loosen connection nuts between driven spiral bevel gear and right shell of differential mechanism, dismantle driven spiral bevel gear.

NOTE: Before taking out driven spiral bevel gear, please check or mark assembling sign first so that it can be placed back to the original position.

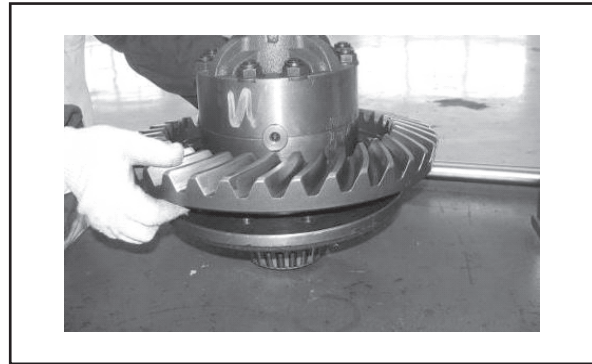


Figure.45

4. Loosen connection nuts of left and right shell, separate left and right shell of differential mechanism.

NOTE: Before separating left and right shell of differential mechanism, please check or mark assembling sign first so that it can be placed back to the original position.

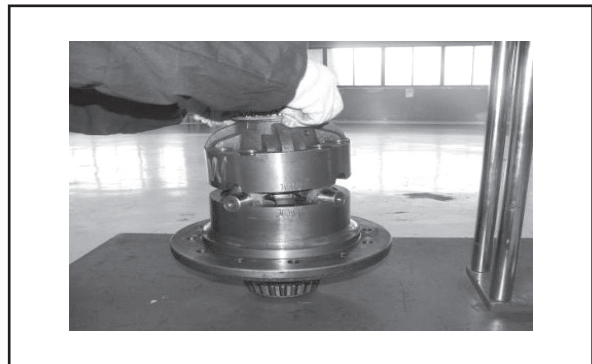


Figure.46

5. Take out semi axis gear gasket and semi axis gear.

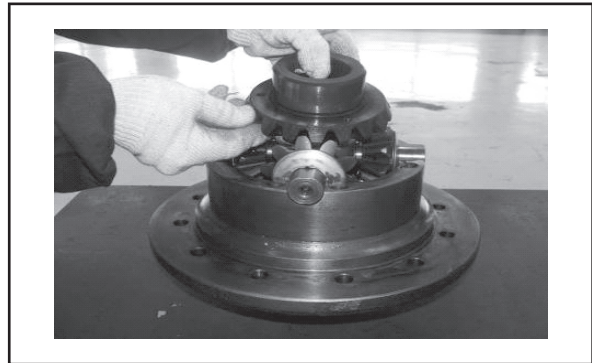


Figure.47

6. Take out joint cross and differential gear together, take out differential gear gasket and gear from joint cross.

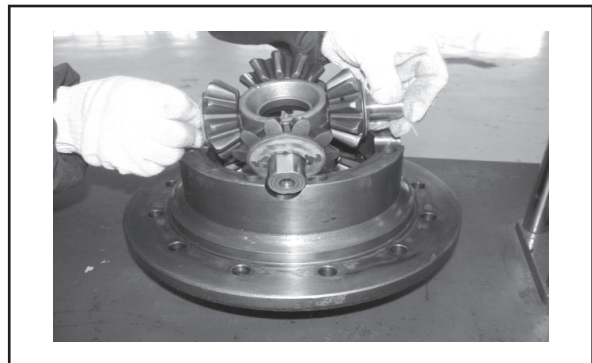


Figure.48

7. Take out semiaxis gear gasket and gear.

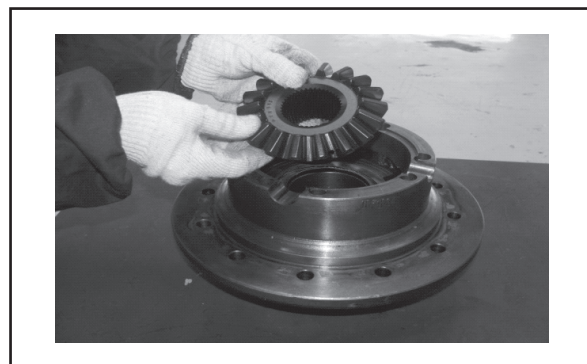


Figure.49

2.5 Dismantle active spiral bevel gear assembly

1. Put active spiral bevel gear assembly on working platform, support flange of bearing sleeve, clamp down on thread end of active spiral bevel gear assembly with down device.

NOTE: *Do not clamp too much to avoid damaging flange, pull out bearing sleeve from active spiral bevel gear assembly.*

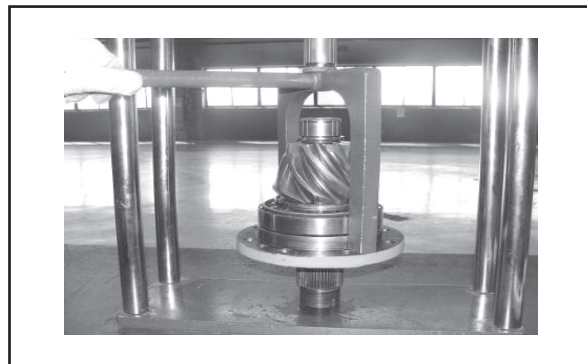


Figure.50

2. Reverse bevel gear assembly and take out bearing.

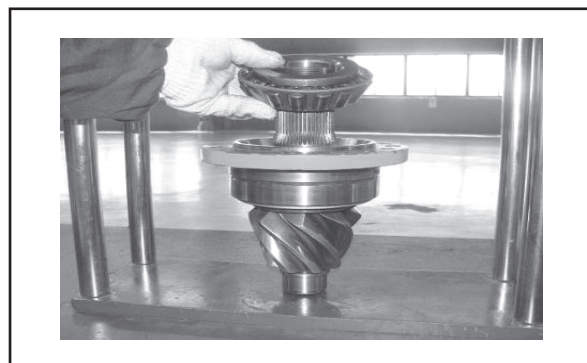


Figure.51

3. Take out bearing sleeve.

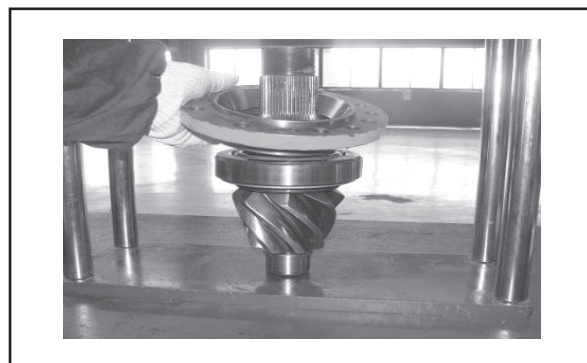


Figure.52

4. Take out adjusting gasket.

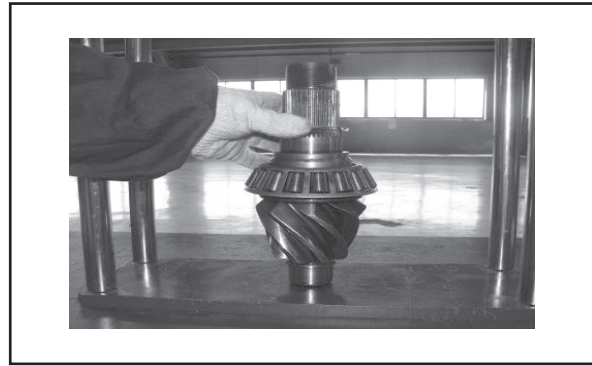


Figure.53

5. Take out spacer bush.

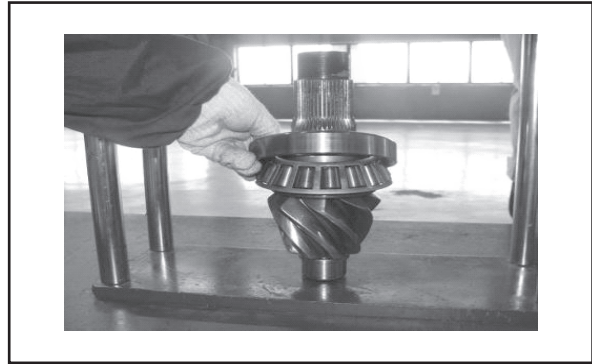


Figure.54

AXLE REASSEMBLY

Axle assembly

1. Shell

Clean shell and suspend with special supporting. Fasten gummed plug screw at oil inlet and oil filler.

NOTE: Plug screw fastening torque:280~330Nm

NOTE: Loctite 262 taper thread sealant.

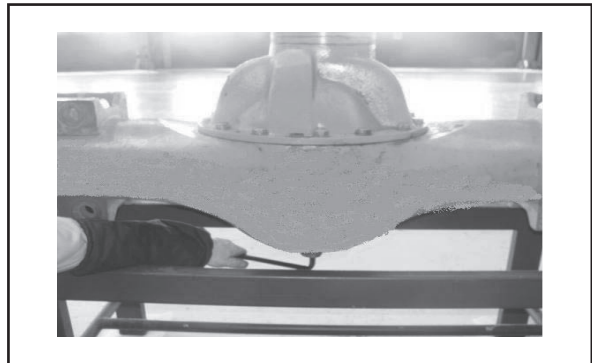


Figure.55

2. Wheel hub assembly

Coat lubrication grease on hub supporting axle of shell assembly; assemble wheel hub assembly on both sides of supporting axle of shell assembly.

NOTE: Use lubrication oil.

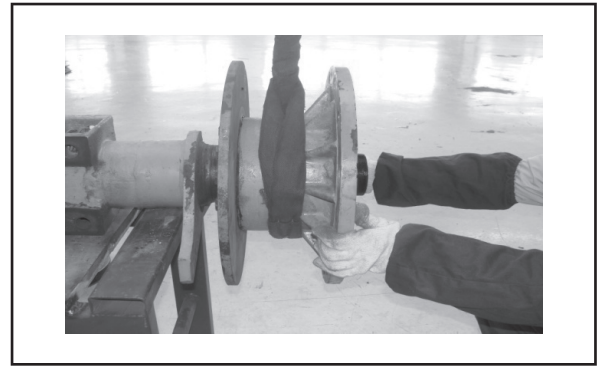


Figure.56

3. Rolling bearing

Assemble rolling bearing on hub supporting axle.

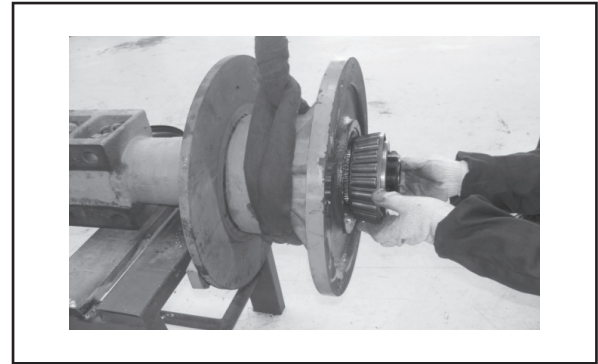


Figure.57

4. Internal gear

Assemble internal gear of drive axle at multiple splines at the end of supporting bearing.

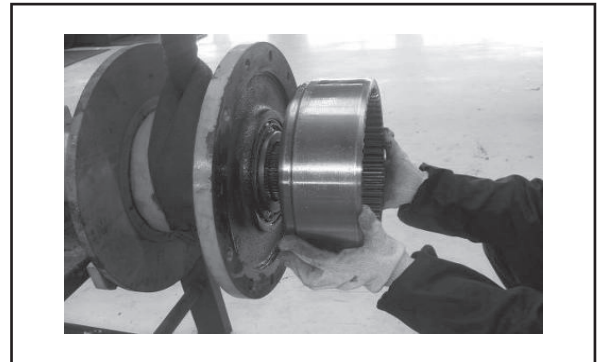


Figure.58

5. Round nuts

Assemble round nuts and fasten. Knock internal gear slightly with copper stick to make internal gear in place.

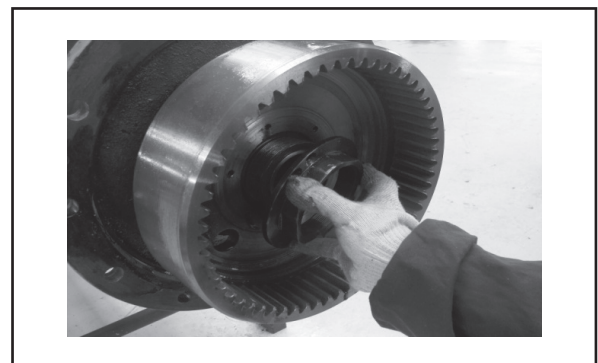


Figure.59

6. Assemble round bolts

1) Grapple the hole on wheel hub with push and pull ergometer, pull ergometer along with tangential direction, indication on ergometer is $160\pm 10\text{N}$, if the indication is not within the range of $160\pm 10\text{N}$, adjust tightness degree of round bolts according to the indication until it is within the range of $160\pm 10\text{N}$. In the end, coat Loctite 262 thread fastening sealant for 5~6 from the second thread hole of internal gear (form a liquid level at 1/3 circle of thread), then fasten bolts, and fix round nuts.

2) Before dynamometry, rotate hub wheel for more than 5 times.

NOTE: *Loctite 262 thread fastening sealant*

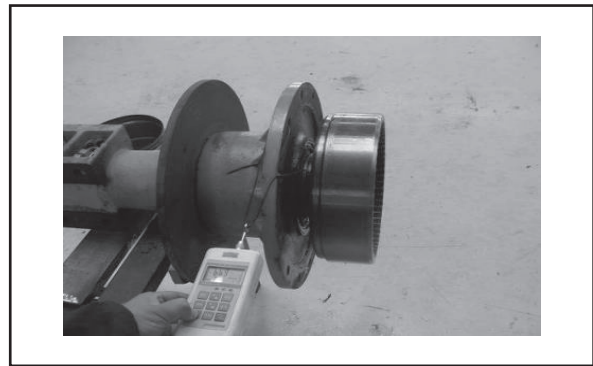


Figure.60

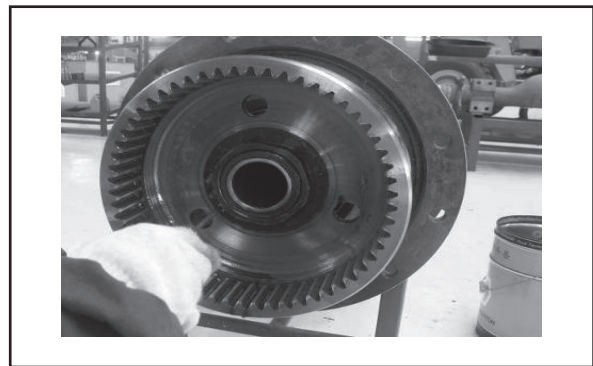


Figure.61

7. Assemble O sealing ring

Assemble O sealing ring on hub assemble.

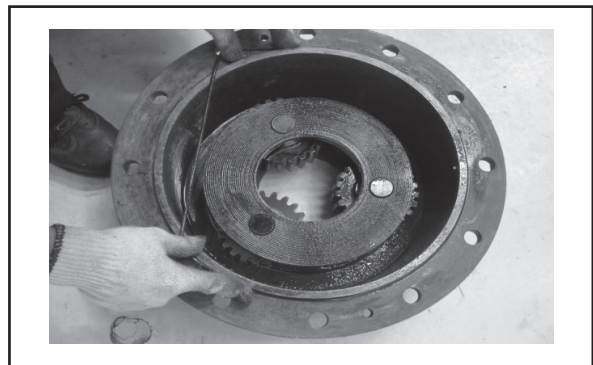


Figure.62

8. Planet carrier assembly

Assemble planet carrier assembly on wheel hub with rim bolts, gaskets and nuts.

NOTE: *Fastening torque:540~650Nm*

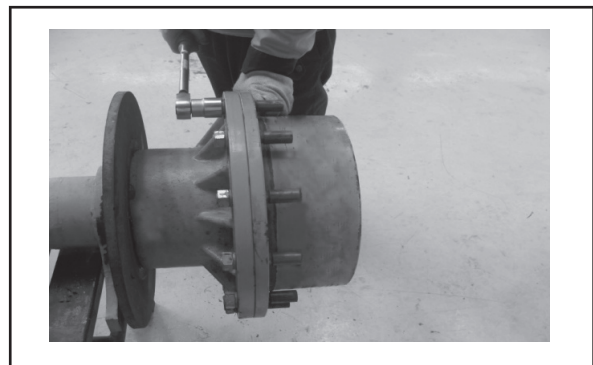


Figure.63

9. Assemble semiaxis

Assemble semiaxis in wheel hub.



Figure.64

10. Assemble sun gear

Assemble sun gear at one side of semiaxis with baffle ring groove (pay Note to semiaxis multiple spline and gear assembly).

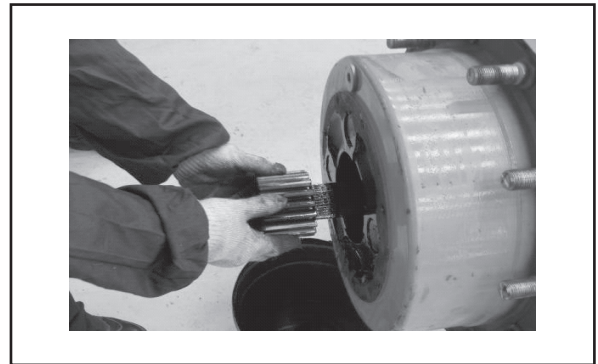


Figure.65

11. Assemble baffle ring

Assemble baffle ring with baffle ring used for axle.

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard when it is popping out during assembling process.*

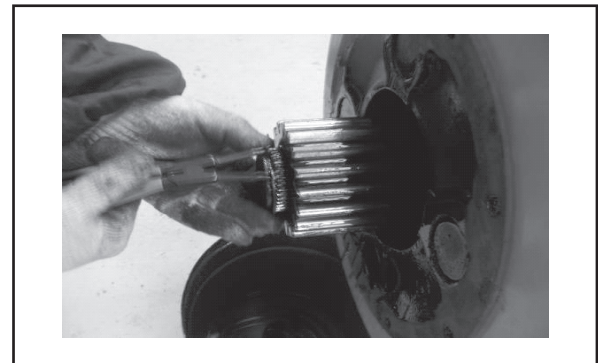


Figure.66

12. Assemble locating block

Stake steel ball on locating block, it can rotate flexibly after staking steel ball.

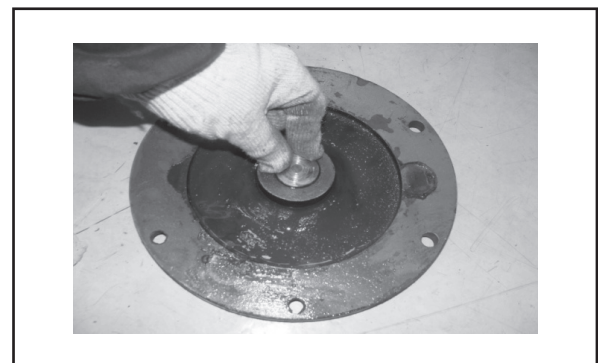


Figure.67

13. Assemble end cap

Coat Loctite 262 thread fastening sealant on screws, location of sealant is 15mm on top of thread end. Fasten cap with bolts and gaskets.

NOTE: *Fasten all screws according to symmetrical and crossing principle.
Fastening torque:110~130Nm
Loctite 262 thread fastening sealant*

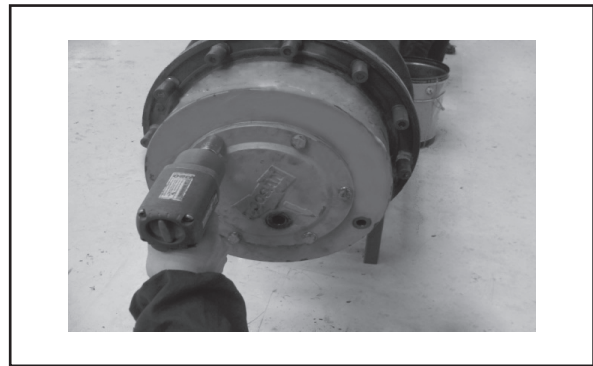


Figure.68

14. Assemble brake caliper assembly

Assemble disc brake on brake caliper supporting, fix with bolts and gaskets.

NOTE: *Fastening torque:540~650Nm
Coat Loctite 262 thread fastening sealant at 20mm length at thread end during assembling.*

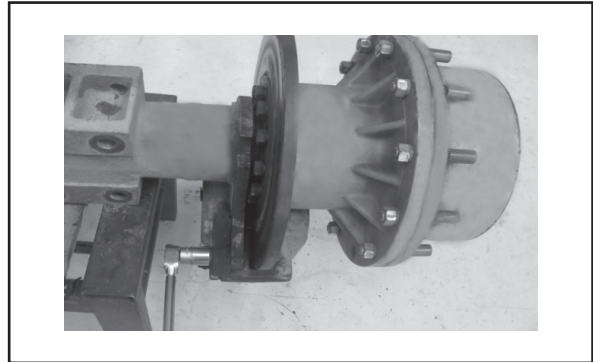


Figure.69

15. Assemble main drive assembly

Coat Loctite 598 silicon rubber surface sealant at the joint surface between shell and bracket, coat $\phi 3 \sim \phi 6$ glue saluting ring with sealing surrounding inside of thread hole at the large end of shell. The coated sealant cannot be in the air for more than ten minutes.

NOTE: *Loctite 598 silicon rubber surface sealant*

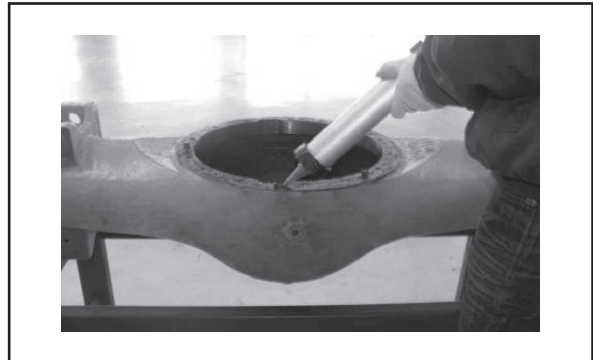


Figure.70

16. Assemble main drive

Hand up main drive assembly with overhead crane, put main drive at main drive shell of the axle, assemble locating pin.

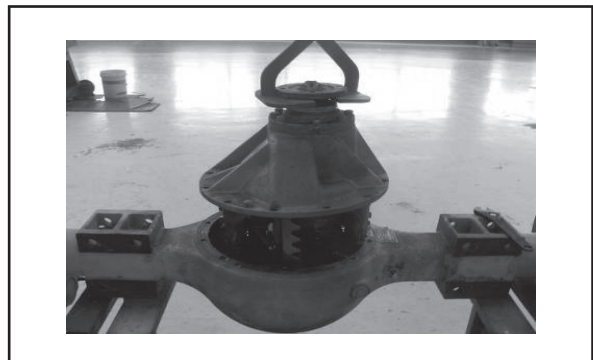


Figure.71

17. Assemble bolts

Coat proper Loctite 262 thread fastening sealant on bolts, the coating position is 15mm length at thread end. Fasten main drive assembly and shell assembly with bolts and gaskets.

NOTE: *Fastening torque : 110~ 130Nm
Loctite 262 thread fastening sealant
Fasten all screws according to
symmetrical and crossing principle.*

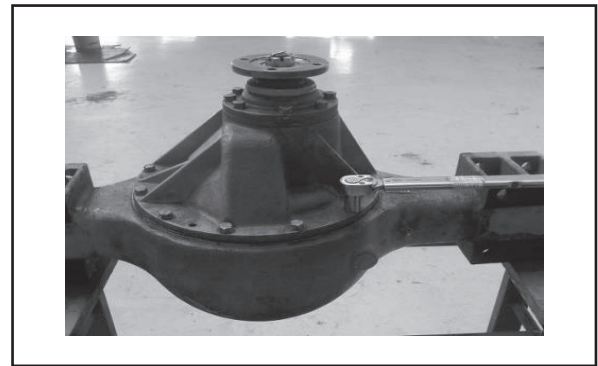


Figure.72

18. Add oil

Add 10L 85W/90 GL-5 gear oil (GB13895-1992) in axle bag of shell and fasten plug screws.

NOTE: *use 85W/90 GL-5 gear oil
Anaerobic type pipe thread sealant
Fastening torque:280 ~ 330 Nm*

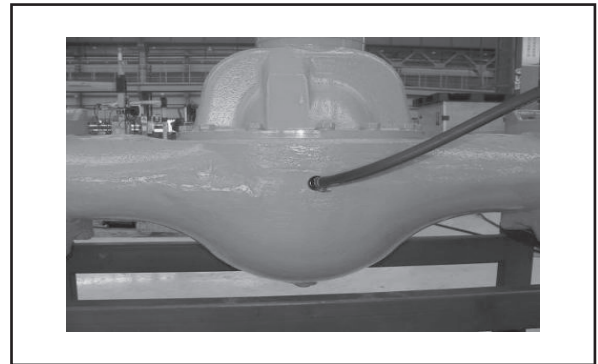


Figure.73



Figure.74

2. Assembly parts assembling

2.1 Install hub assembly

1. Keep the large end of hub upward, assemble bearing outer ring and turn over to keep the small end of hub upward and assemble bearing inner ring.

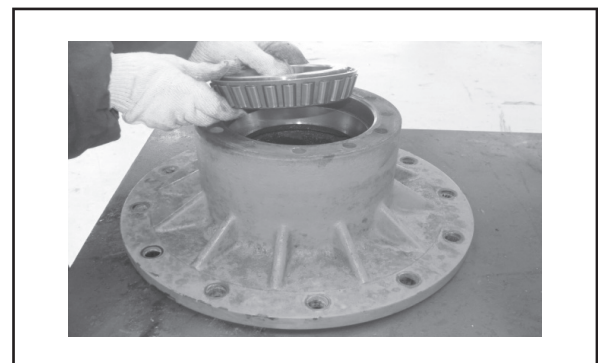


Figure.75

2.Coat lubrication oil at oil seal end, check completeness of oil seal, coat lubrication oil in groove of oil seal evenly, and assemble oil seal in side of oil seal end.

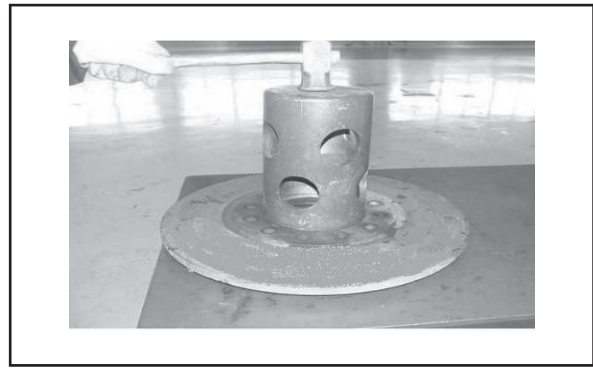


Figure.76

3.Assemble brake disc on hub and fasten with bolts and gaskets.

NOTE: *Fastening torque:280~330Nm
Fasten all screws according to symmetrical and crossing principle.*

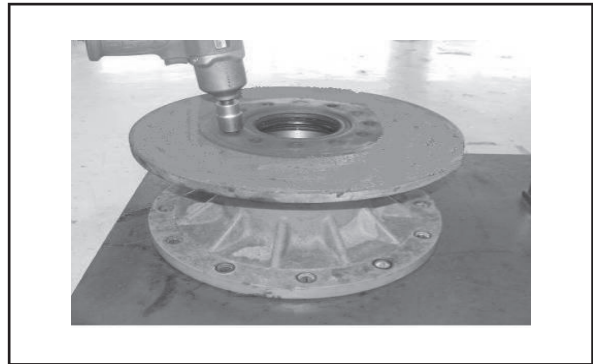


Figure.77

2.2 Install planet carrier assembly

1.Stick lubrication grease quill roller (27 units each) on walls of inner holes of planet gears, assemble baffle ring in the middle of quill roller, assemble gaskets at both sides of planet gear, then assemble to the seat hole of planet carrier.

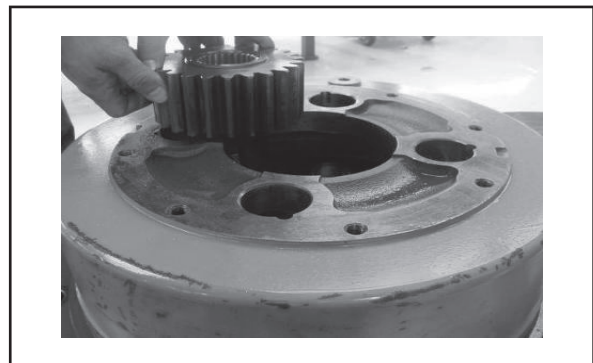


Figure.78

2.Assemble steel balls in holes of planet gear shaft, steel ball shall aim at semi circle of planet carrier, go through the inner hole of planet gear and gasket and assemble on planet carrier. After assembly, planet gear shall rotate flexibly there is no blocking.

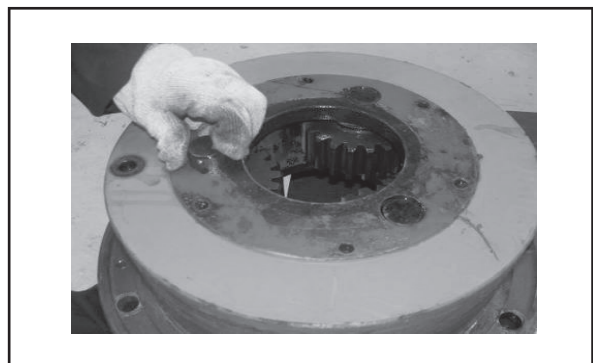


Figure.79

2.3 Assemble of main drive assembly

1. Assemble rolling bearing on bear neck of the terminal with pressure machine, rotate to the left on active spiral bevel gear front axle, and rotate to the right side.

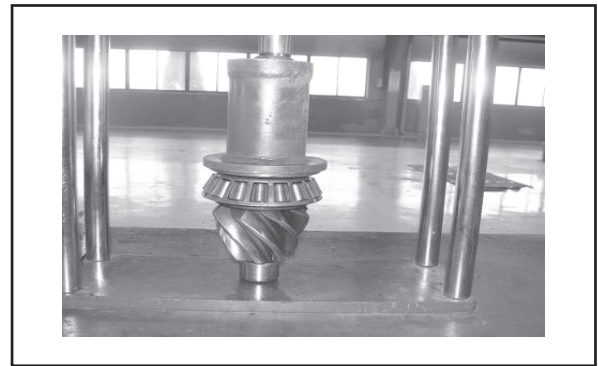


Figure.80

2. Press inner ring into rolling bearing with pressure machine at the other side

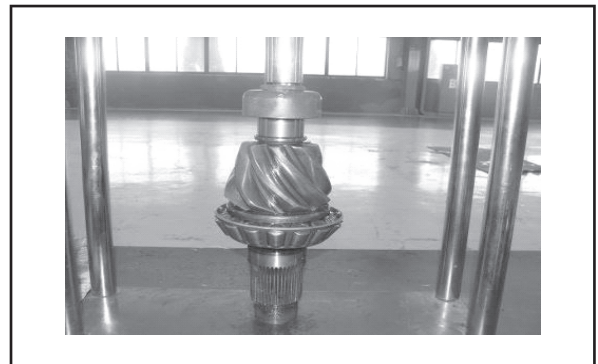


Figure.81

3. Turn over gear and assemble outer ring of gear

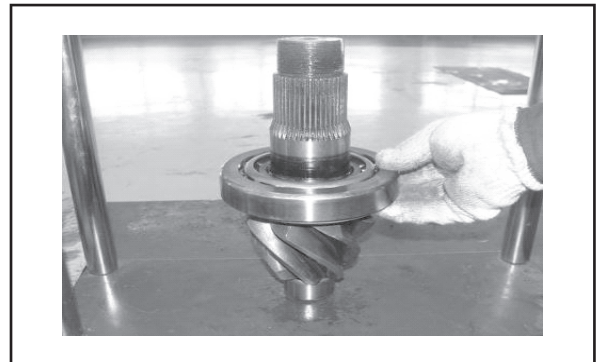


Figure.82

4. Install spacer bush

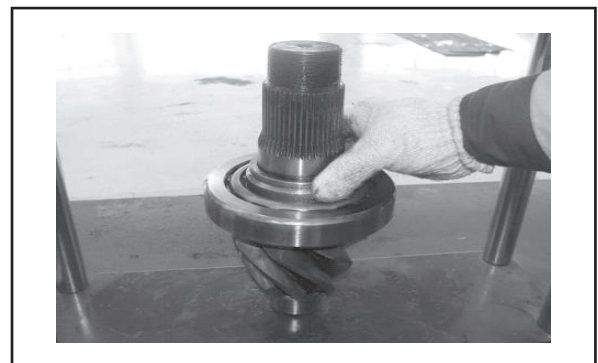


Figure.83

5. Assemble gasket

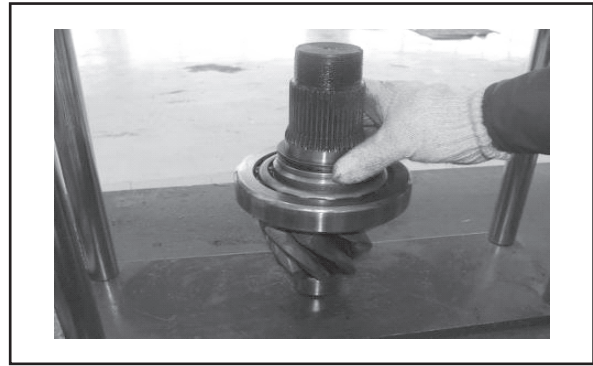


Figure.84

6. Assemble bearing sleeve

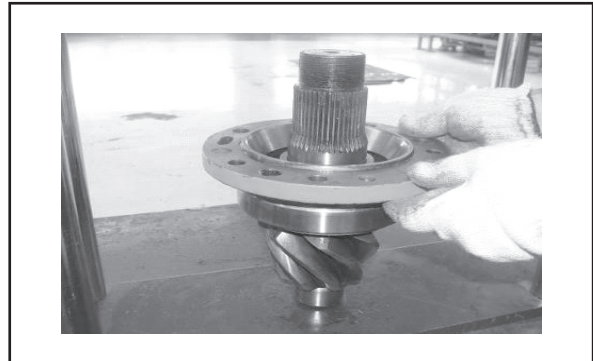


Figure.85

7. Press inner ring of antifriction bearing in the end.

NOTE: when assembling main reducer, taper rolling bearing shall have certain tightness, that is on the basis of eliminating bearing clearance, and give certain preload. The purpose is to reduce axial force caused during transmission process which will result in axial displacement, improve supporting rigidity, and guarantee normal mesh of bevel gear pair. But if it is too tight, it will accelerate abrasion of taper rolling bearing. Press with $P= 5420$ kg pressure at the top side of inner ring of rolling bearing, grapple $\Phi 14.5$ hole with pull and push ergometer, pull ergometer along with tangential direction, indication of ergometer when pushing shall be 17.34-30.06N, if the indication is not within the range of 17.34-30.06N, increase or reduce thickness of spacer shim, repeat the above process until the indication is within 17.34-30.06 N.

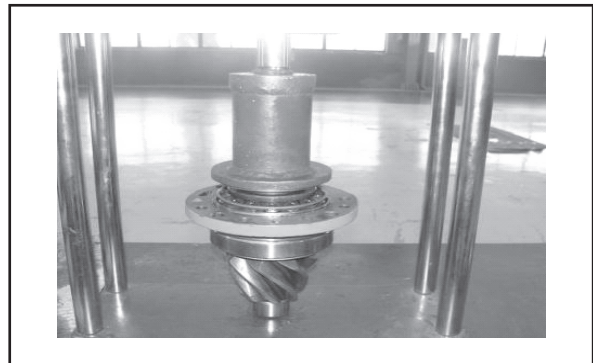


Figure.86

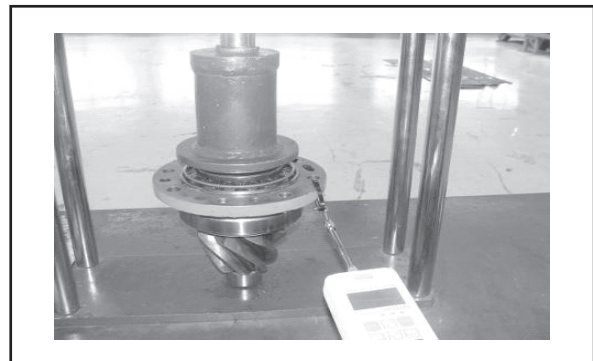


Figure.87

2.4 Assemble of differential assembly

1. Assemble rolling bearing at the bearing position of right shell terminal of differential mechanism.

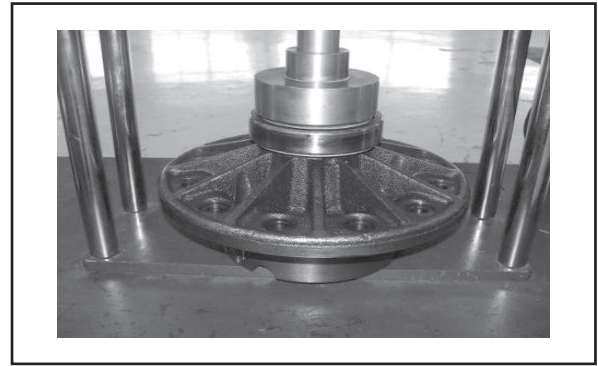


Figure.88

2. Assemble rolling bearing at the bearing position of left shell terminal of differential mechanism.

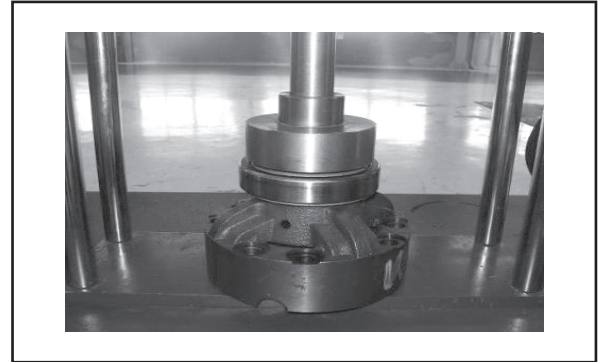


Figure.89

3. Assemble semiaxis gear

Assemble semiaxis gear gasket in left shell of differential mechanism

NOTE: *The side of gasket with groove shall toward to the direction of joint cross*

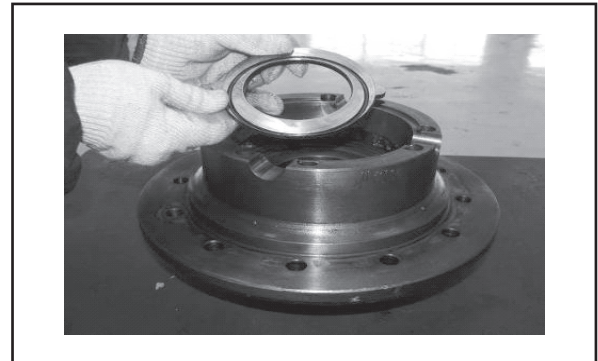


Figure.90

4. Install semiaxis gear

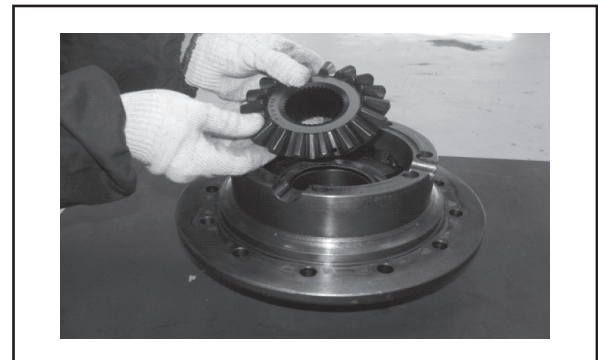


Figure.91

5. Assemble joint cross assembly

Assemble bevel gear (internal of small terminal) and bevel gear gasket on four axles of joint cross.

NOTE: *Lubricate with grease when assembling bevel gear and bevel gear gasket*

NOTE: *Lubricate lubrication oil*

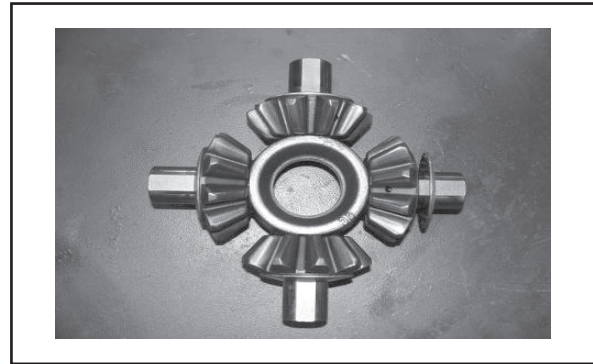


Figure.92

6. Differential mechanism shell

Assemble joint cross in right shell of differential mechanism to make bevel gear and semiaxis gear mesh, turn over left shell assembly of differential mechanism to assemble right shell assembly of differential mechanism, join right shell and left shells of differential mechanism with bolts and fasten with gaskets and nuts.

NOTE: *Nuts fastening torque: 180 ~ 210Nm*

NOTE: 1) *Guarantee assembling mark of right shell and left shell of differential mechanism align.*

2) *Coat proper Loctite 262 thread fastening sealant at the thread bottom within 12mm length.*

3) *After assembling, semiaxis gear and taper gear can be rotated manually without blocking.*

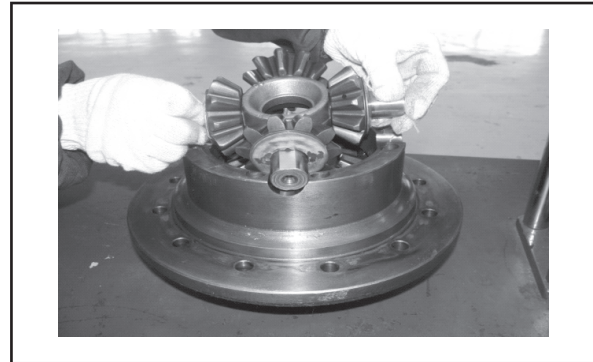


Figure.93

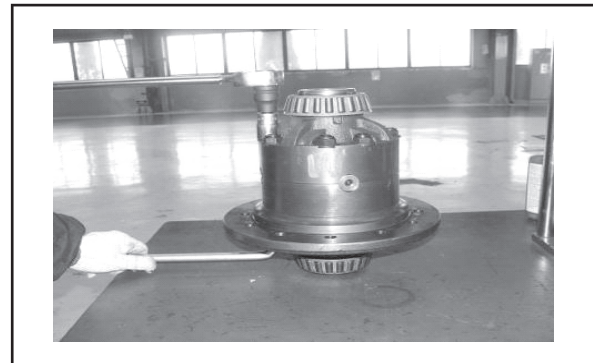


Figure.94

7. Assemble driven spiral bevel gear

Aim at assembling mark, fasten driven spiral bevel gear (rotate to the left for rear axle, rotate to the right for front axle) with bolts, gaskets and nuts, and fasten screws.

NOTE: Nuts fastening torque 180~210Nm.

NOTE: 1) Coat proper Loctite 262 thread fastening sealant at the thread bottom within 12mm length.

2) Judging method of left and right spiral: Face to positive side of gear, right rotation refers to the spiral gear rotates to large terminal clockwise; on the contrary, left rotation refers to the spiral gear rotates to large terminal anticlockwise.

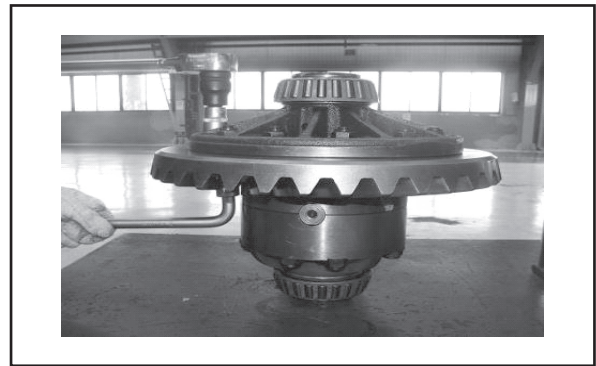


Figure.95

2.5 Assemble main reducer

1. Install the assembled active spiral bevel gear assembly in bracket, coat sealant line with diameter 2-4mm at the small end, refer to the picture for sealant line; sealant line and diameter of bearing sleeve (the other side of gasket) shall be done according to the above requirements.

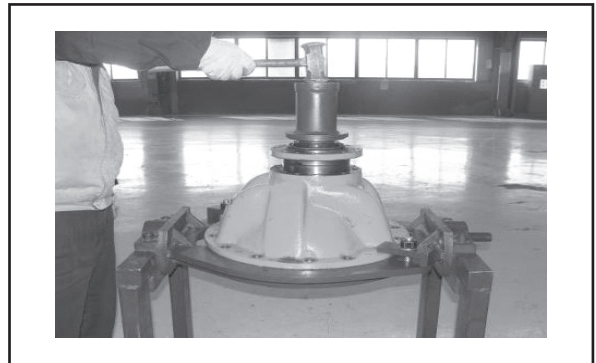


Figure.96

2. Assemble sealing cover

Press oil seal in sealing cover.

NOTE: Coat a layer of proper lubrication oil when assembling oil seal.



Figure.97

3. Install input flange

Put gasket on the end face of bracket, install sealing cover assembly (coat lubrication grease on oil seal according to common requirements of drive axle), and connect with bracket with bolts and gaskets.

NOTE: *Screw fastening torque 110~130Nm.*

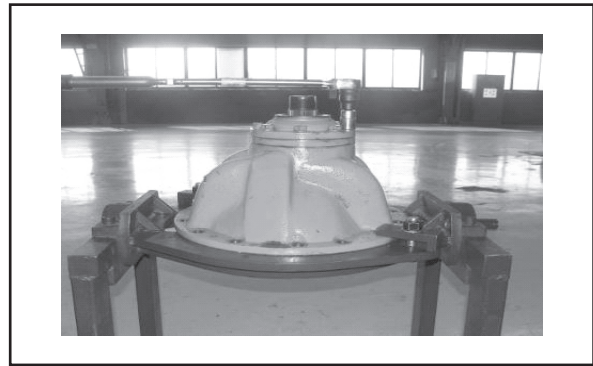


Figure.98

4. Install input flange.



Figure.99

5. Install baffle ring, O ring, coat sealant on one end face of gasket, the surface with sealant is downward, install gasket.

NOTE: *Coat Loctite 598 sealant*



Figure.100

6. Install gasket



Figure.101

7. Install round screws and fasten.

NOTE: Screw fastening torque: 320 ~ 400 Nm

NOTE: Before installing flange, install flange on multiple spline on main spiral bevel gear, measure radial play eccentricity of flange, guarantee it cannot be more than 0.08, and mark matching and assembling signs. If it is out of tolerance, rotate flange to certain angle and measure until it complies with requirements, otherwise, replace flange.

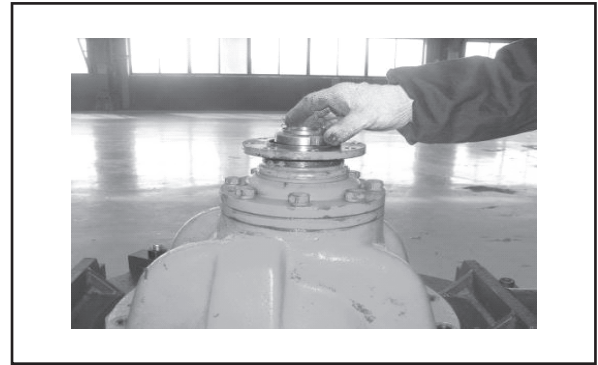


Figure.102

8. Gasket shall be close to $\phi 2 \sim \phi 3$ glue line.

9. Install differential assembly

Turnover carrier, install differential assembly in bracket.

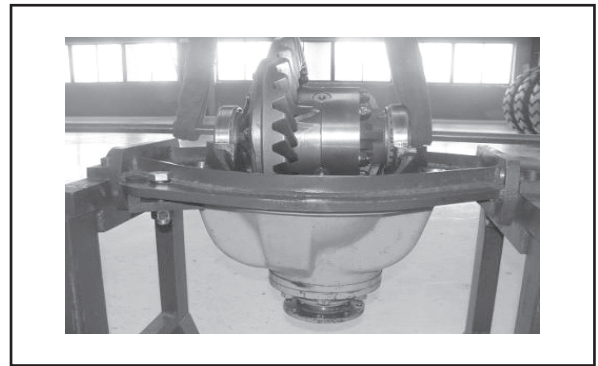


Figure.103

10. Install bearing seat with gaskets and bolts (bolts shall be a little bit tight).

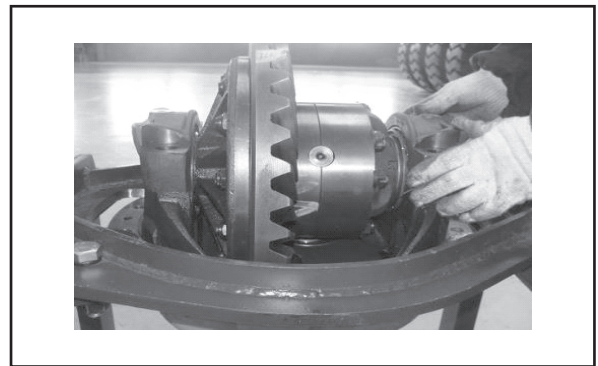


Figure.104

11. Install adjusting nuts.

NOTE: Two bearing seats cannot be exchanged.

12. Coat proper thread sealant on the length of 15~25mm on thread end surface of bolts.

NOTE: Coat Loctite 262 thread fastening sealant.

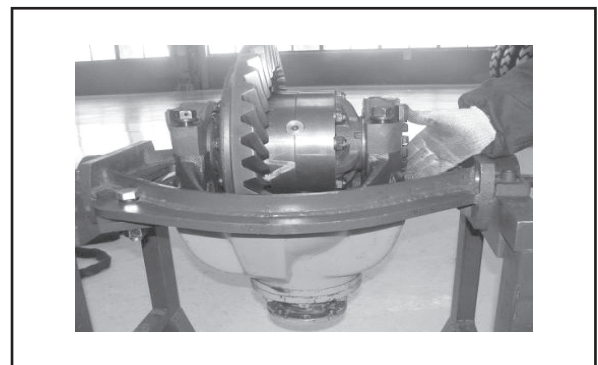


Figure.105

13. Adjust spiral bevel gear

Adjustment of spiral bevel gear mesh condition refers to adjustment of mesh zone and back lash, when adjusting back lash of spiral bevel gear pair, dial gauge can be used to touch the gear surface of large side edge of driven spiral bevel gear, then rotate driven spiral bevel gear to measure back lash directly, the clearance shall be 0.2~0.35mm. Adjusting method of back mesh is to twist adjusting nuts to change position of

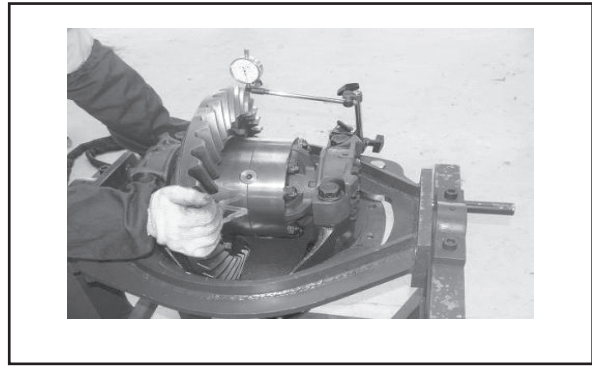


Figure.106

driven spiral bevel gear (when it is necessary, move active spiral bevel gear assembly to adjust). If the clearance is larger than the regulated value, approach active spiral bevel gear from driven spiral bevel gear; otherwise be away from it. In order to keep the adjusted preload of taper rolling bearing of differential mechanism, twisting numbers of adjusting nuts at one side shall be equal to twisting numbers of adjusting nuts at the other side.

When adjusting contact zone of spiral bevel gear pair, coat red color (red lead powder) on driven spiral bevel gear teeth (coat three teeth usually), rotate driven spiral bevel gear with hands repeatedly, check contacting moulage. Adjust the correct position of spiral bevel gear mesh moulage: it shall not be less than 50% along with teeth height direction and teeth length direction, mesh moulage of driven bevel gear shall be close to the center, and in the middle of teeth height, smaller than the small end on teeth length direction. Increasing preload of differential bearing: after adjusting back lash of spiral bevel gear well, it shall guarantee the clearance between taper rolling bearings at both sides of differential mechanism is 0. Following is the adjusting methods.

Adjustment of contact zone and back lash when installing spiral bevel gear

| Contact zone of driven spiral bevel gear | Adjusting method | Gear moving direction |
|--|--|-----------------------|
| | Move driven gear to the direction of active gear, if the clearance is too small, move active gear outside | |
| | Move driven gear away from active gear, if the clearance is too large, move active gear inside | |
| | Move active gear to the direction of driven gear, if the clearance is too small, move driven gear inside and outside | |
| | Move active gear away from driven gear, if clearance is too large, move driven gear inside | |

Method of adjusting mesh zone is usually increasing and decreasing adjusting gaskets and rotating adjusting nuts. Adjusting of contact zone will affect performance and service life greatly, it shall be carried out carefully.

NOTE: *After adjusting, clean off red lead powder.*

14. Install locking plate

Fasten the fixed bolts on bearing seat, fastening torque is 380 ~ 450Nm. Put locking plate at the right position, fix it on bearing seat with bolts and gaskets, and fasten fixing bolts of locking plate.

NOTE: *Fastening torque 30~36Nm*

NOTE: *Coat proper Loctite 262 thread fastening sealant on 5-10mm length at the end surface of fixing bolt.*

NOTE: *Coat Loctite 262 thread fastening sealant*

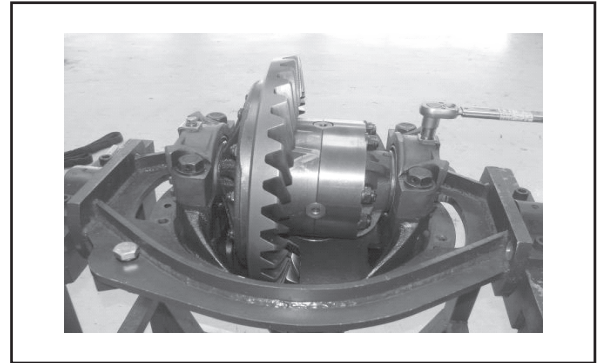


Figure107

AIR CONDITIONER



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

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- Control Panel..... 6
- AC System Circuit Diagram..... 7
- Maintenance..... 8
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GENERAL DESCRIPTION

Heater and AC evaporator share one air blower, and it is located at the front side of driving cab. When it is necessary, the driver can install it in control panel room at the right of control platform to control indoor temperature.

AC of the machine has three functions of refrigeration, heating and natural wind.

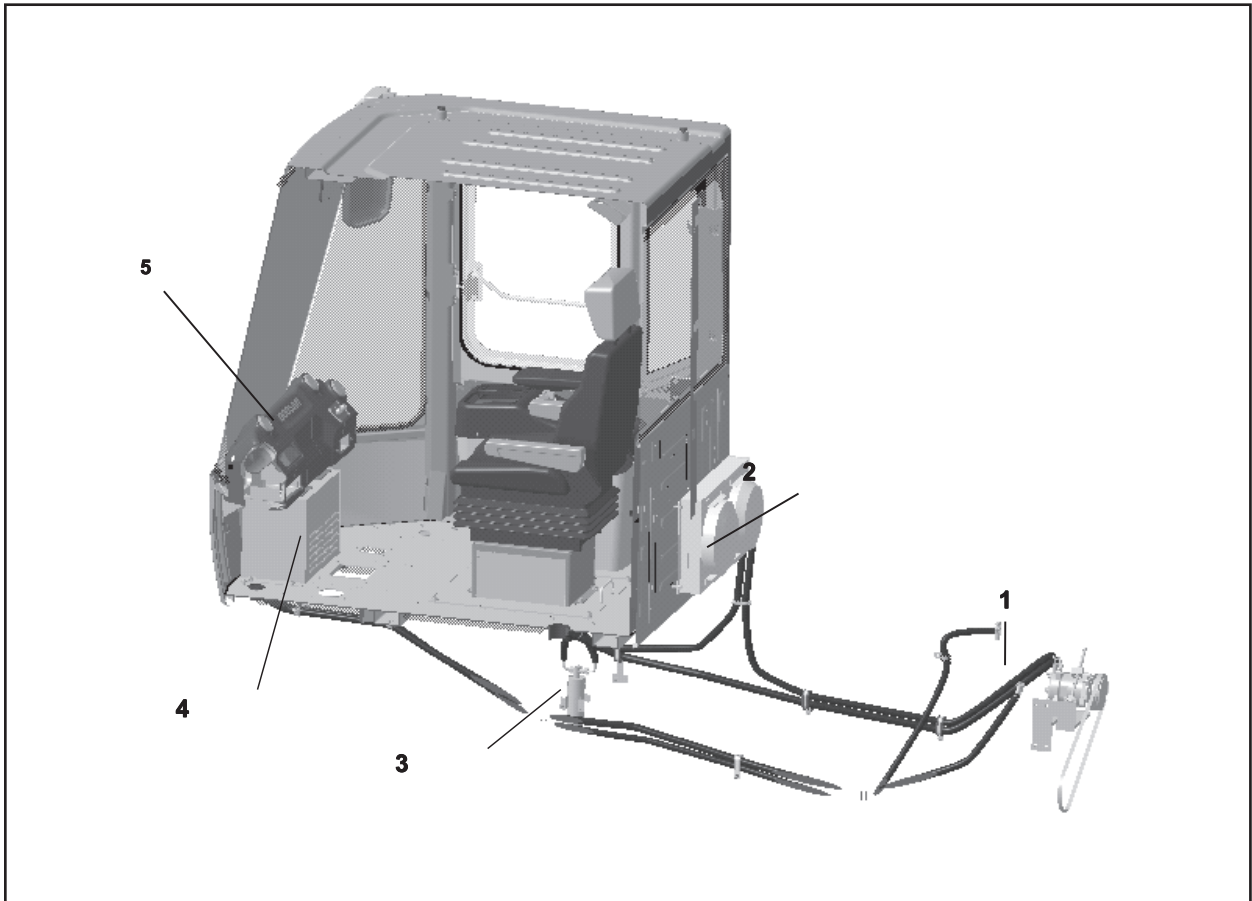


Figure 1 AC system schematic diagram

| Reference Number | Description | Reference Number | Description |
|------------------|----------------|------------------|---------------|
| 1 | Compressor | 4 | Evaporator |
| 2 | Condenser | 5 | Control Panel |
| 3 | Receiver/Drier | | |

Circulation of refrigeration agent

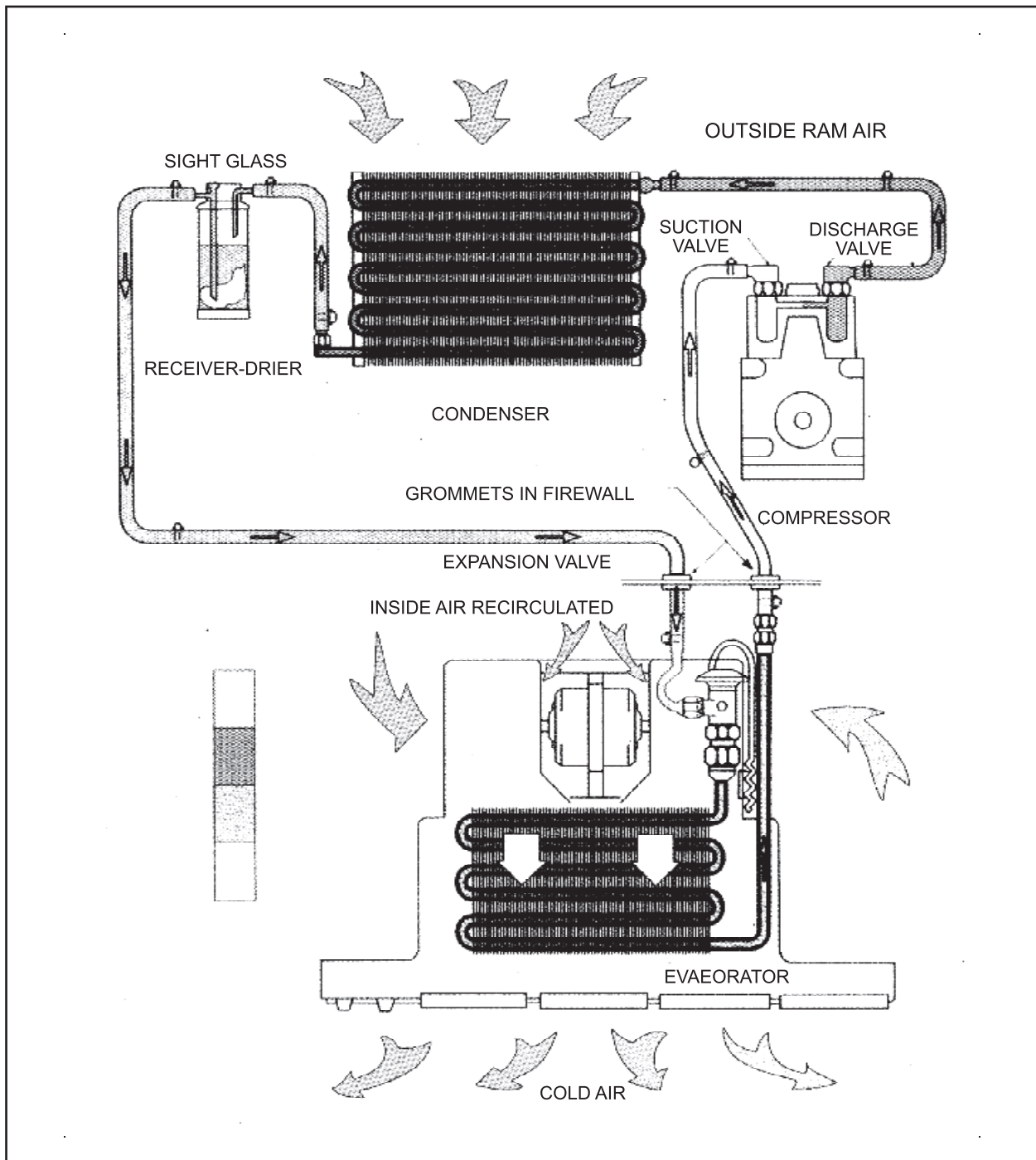


Figure 2 Refrigeration agent circulation schematic diagram

- Refrigeration agent (R134a) is compressed to 15kg/cm² (213psi) within sight view.
- Compressed refrigeration agent flows into condenser under high temperature (about 80°C (176°F)).
- Refrigeration agent of condenser is cooled down by condensation fan to about 60°C. At the same time, refrigeration agent is changed from gas state to liquid state, even if the temperature is reduced from 80°— 60°C (176°— 140°F) to 20°C (68°F) .
- Refrigeration agent is sprayed to evaporator in gas state through expansion valve. And pressure is reduced for 2 kg/cm² (28psi) , and temperature is reduced, too. The result is refrigeration agent absorbs heat from surrounding air to create refrigeration effect, refrigeration agent is changed from gas state to liquid state.
- Refrigeration agent flows into compressor in gas state again and repeat the above process.



CAUTION!

Refrigeration agent is compressed and sealed in AC system. Special protective measures are needed when injecting or releasing refrigeration agent correctly. It is strictly controlled by laws to release refrigeration agent into air. Before maintaining or repair AC, please obey the orders of all federation, states and districts, refrigeration agent used in the system must reach or exceed R134a specifications or environmental standards issued later.

Control panel

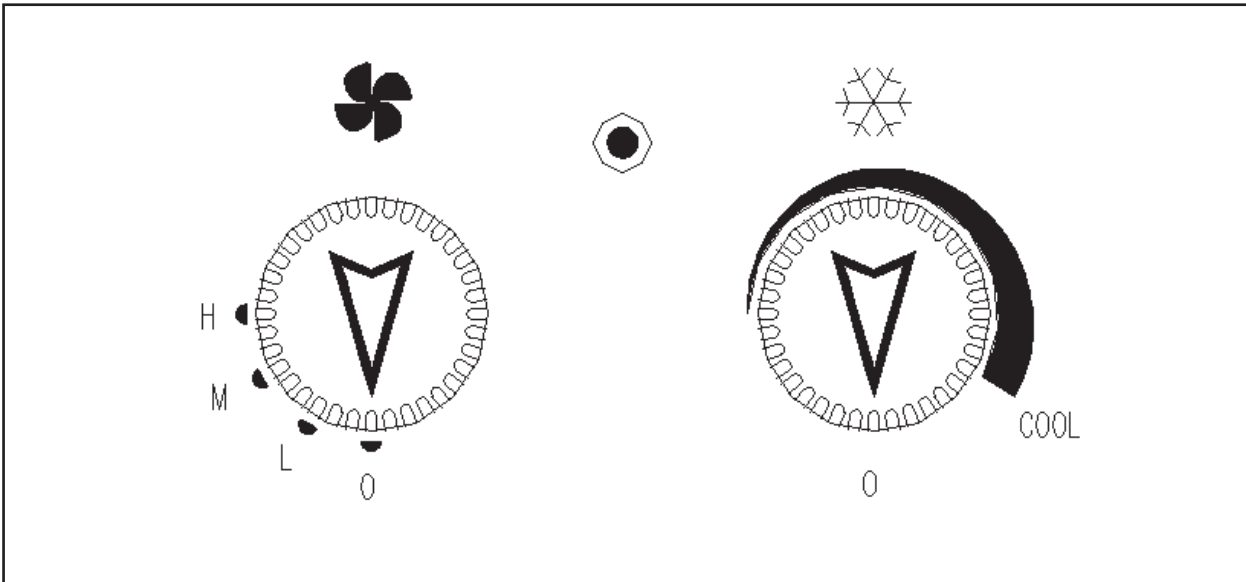


Figure 3 AC control panel diagram

Basic parameters of drive axle:

| Control item | Control switch | Control specifications |
|--------------------------------------|--|------------------------|
| Rotation speed control of air blower | "CLOSE" switch "LOW SPEED" switch "INTERMEDIATE SPEED" switch "HIGH SPEED" switch | |
| Compressor control | Temperature sensor | |

AC system circuit diagram

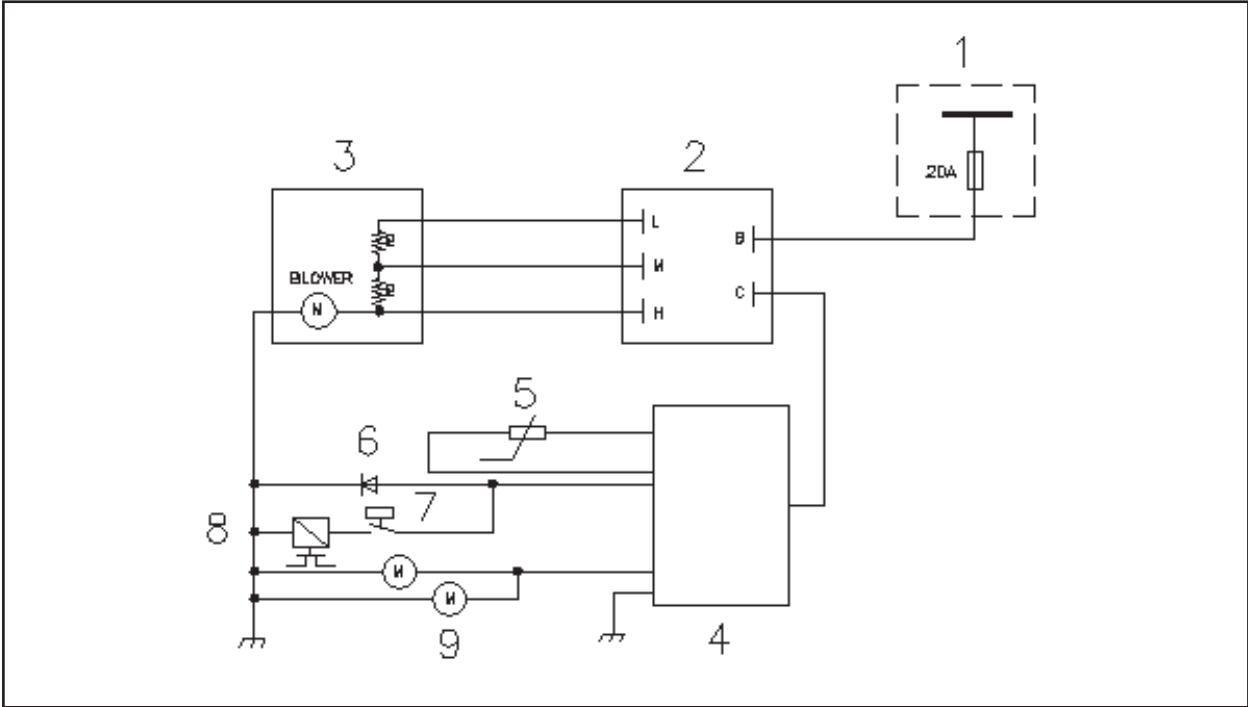


Figure 4 AC system circuit diagram

| Reference Number | Description | Reference Number | Description |
|------------------|--------------------|------------------|-----------------------|
| 1 | Fuse Box | 6 | LED |
| 2 | Blower Switch | 7 | Press. Cut Off Switch |
| 3 | Blower | 8 | Compressor |
| 4 | Thermistor | 9 | Condenser |
| 5 | Temperature Sensor | | |

Maintenance

1.AC outdoors radiator-“condenser” must be cleaned regularly; refer to figure 5.

Treatment method: dismantle condensing fan, condenser is completely exposes, wash with water, but do not use high water pressure to avoid lodging of condenser fan and affect radiation effect.

Maintenance standard: wash once a month in summer, if working environment is too bad, increase washing times properly.

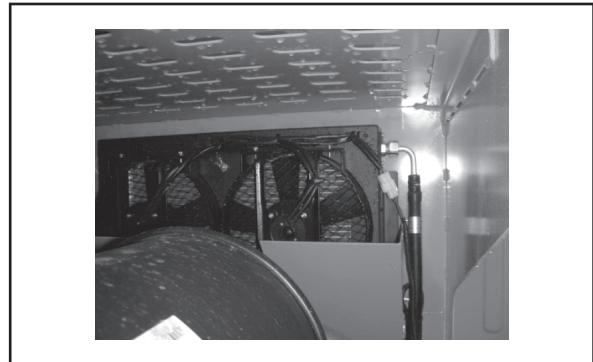


Figure.5

2.Check if fixed bolts of compressor are loosed regularly, if belt of compressor is loosed; refer to figure 6.

Checking method: visually check if AC bolts are loosed, checking method of belt tightness degree: put about 10kg force on middle of belt, force is downward, descending amplitude of belt is about 10-15mm, it cannot be too high or too low; maintenance standard: check once a week in summer.

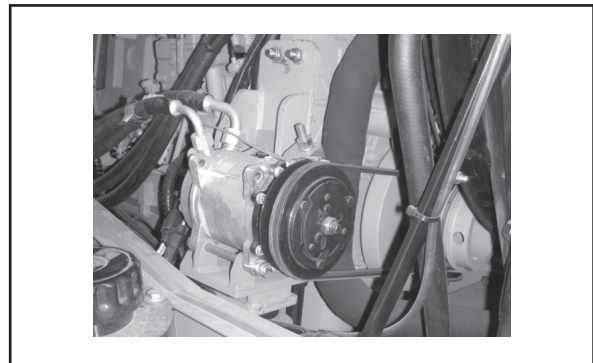


Figure.6

3.Check if there is refrigeration agent in the system

Checking method: check Freon injection mouth of compressor head (refer to the picture), screw off plastic plug, poke with keys or other sharp things (its structure is like the air tap of tyre), check if there is large amount of air jets out, if there is no air or air current is very small, it proves that Freon is leaked (wear gloves and protect eyes during operation, do not burn skin and eyes with refrigeration agent).

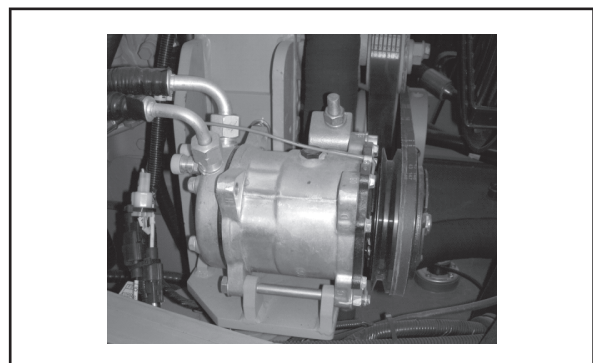


Figure.7

4. Power on checking of the entire machine. Open AC control panel, turn III gear switch to H gear and check if there is wind coming from evaporator and if wind is big enough. Turn on temperature control switch on AC control panel and turns to the maximum position, check if indication light is on, at the same time, listen if AC compressor is absorbing (turn on and turn off temperature control switch repeatedly, there should be clear and melodious absorbing “Pitter-patter” at compressor).

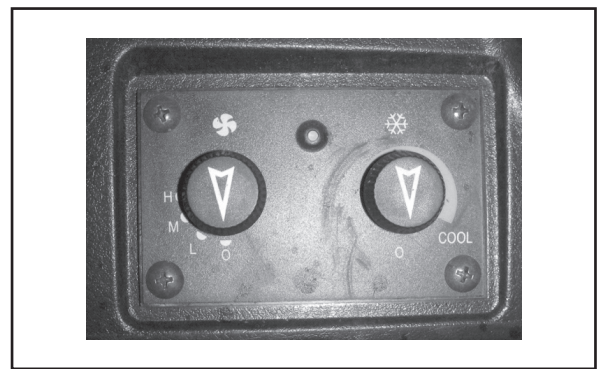


Figure.8

5. Confirmation of charging amount of refrigeration. Agent charging amount of refrigeration agent R134a of the AC system is $1000 \pm 50g$, the process is vacuumizing, charging and retrieving.

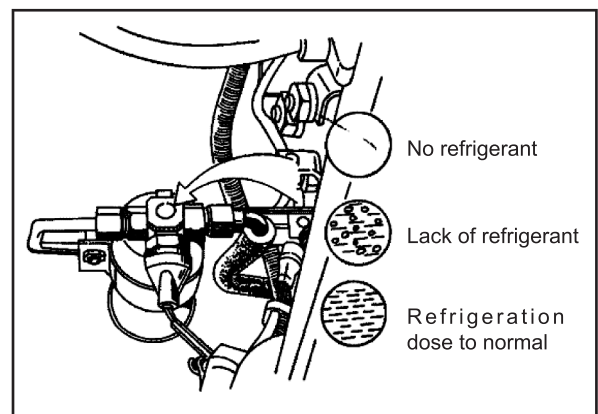


Figure.9

Comparison table between liquid sight glass state of reservoir and trouble analysis

| Liquid sight glass state | Trouble analysis |
|--|--|
| Liquid sight glass is locate, bubbles can be seen at the moment of turning on and turning off AC, and bubbles become transparent suddenly. | Freon charging quantity is proper |
| Few bubbles flowing, compressor head is hot, refrigeration output is not enough, high and low pressure of the system are both very low. | Freon charging quantity is not enough or the system is leaking |
| Turn on and turn off AC, it is hard to see bubbles flowing, compressor head is cold, high and low pressure of the system are both high. | Freon is over charged |
| Freon charging is proper, AC does not refrigerate, it is hard to see bubbles flowing in reservoir, low pressure is negative. | Expansion valve is dirty and blocked or frozen and blocked, it shall be solved by professional personnel |

Trouble shooting

Following is the common troubles and reasons

1. The entire AC system is power off
 - Reason analysis
 - Fuse of AC is burnout.
 - Wiring harness of AC power is not connected.
2. Evaporation fan is running, after turning on temperature control switch, indication light is not on, condensation fan and compressor do not work.
 - Reason analysis
 - Indoor temperature of driving cab is lower than 4°
 - Temperature sensing detector is open circuit or not connected.
 - AC temperature control switch relay is broken.
3. Evaporation fan rotates, condensation fan rotates, compressor does not absorb
 - Coil of compressor clutch is broken
 - High/low pressure switch is broken.
 - Freon is leaked
 - Circuit from high/low pressure switch to compressor is open.
4. Evaporation fan does not run, condensation fan runs, compressor absorbs
 - Earth wire of evaporation fan drops, or earth wire contact is not good.
 - III gear switch is broken
 - Evaporation fan is broken

Transmission and Torque Converter



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Remember, that ultimately safety is your own personal responsibility.

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| Assembling of Transmission Assembly..... | 20 |
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Brief introduction

Structure of transmission

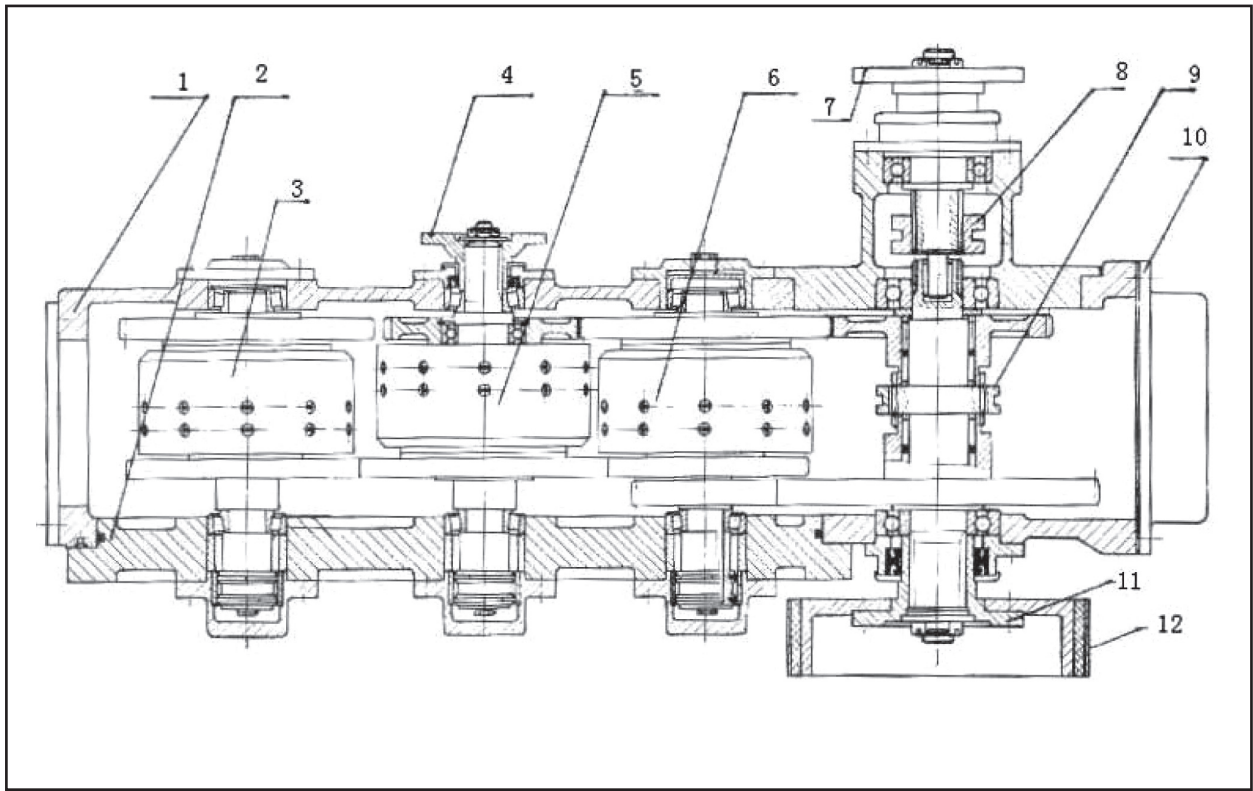


Figure.1

| Reference Number | Description | Reference Number | Description |
|------------------|----------------------|------------------|------------------------|
| 1 | Transmission housing | 7 | Rear output Flange |
| 2 | Cover | 8 | Release Sliding sleeve |
| 3 | Rear shaft ass'y | 9 | Gear ring |
| 4 | Input shaft flange | 10 | Oil sump |
| 5 | Input shaft ass'y | 11 | Front output flange |
| 6 | Mid shaft ass'y | 12 | Parking break |

Basic parameters of transmission

| | |
|--|--|
| Model of bivariant assembly | ZL30 T/M |
| Applicable model | SD200 Wheel Loader |
| Hydraulic torque converter type | Single Stage, Four Part, Two turbo T/M |
| Max. input rotate speed | 2500 r/min |
| Max. input torque | 650 Nm |
| Max. input power | 74 kW |
| Torque ratio | 3.0~3.6 |
| Type of oil cooling | Cooling Water Circulating |
| Working pressure | 1.1~1.5MPa |
| Gearbox type | Dead Axle, Constant Mesh Gear, Shifting fork |
| Gears | Four Front Gears and Two Rear Gears |
| I gear ratio | 3.82 |
| II gear ratio | 2.08 |
| III gear ratio | 1.09 |
| IV gear ratio | 0.59 |
| I reverse gear ratio | 3.05 |
| II reverse gear ratio | 0.87 |
| Gear box oil | 6#Fluid Drive Oil |
| Allowable oil temperature at the bottom of oil pan | 100°C |
| Manipulate pressure of brake safety valve | >0.55MPa |

Transmission principle

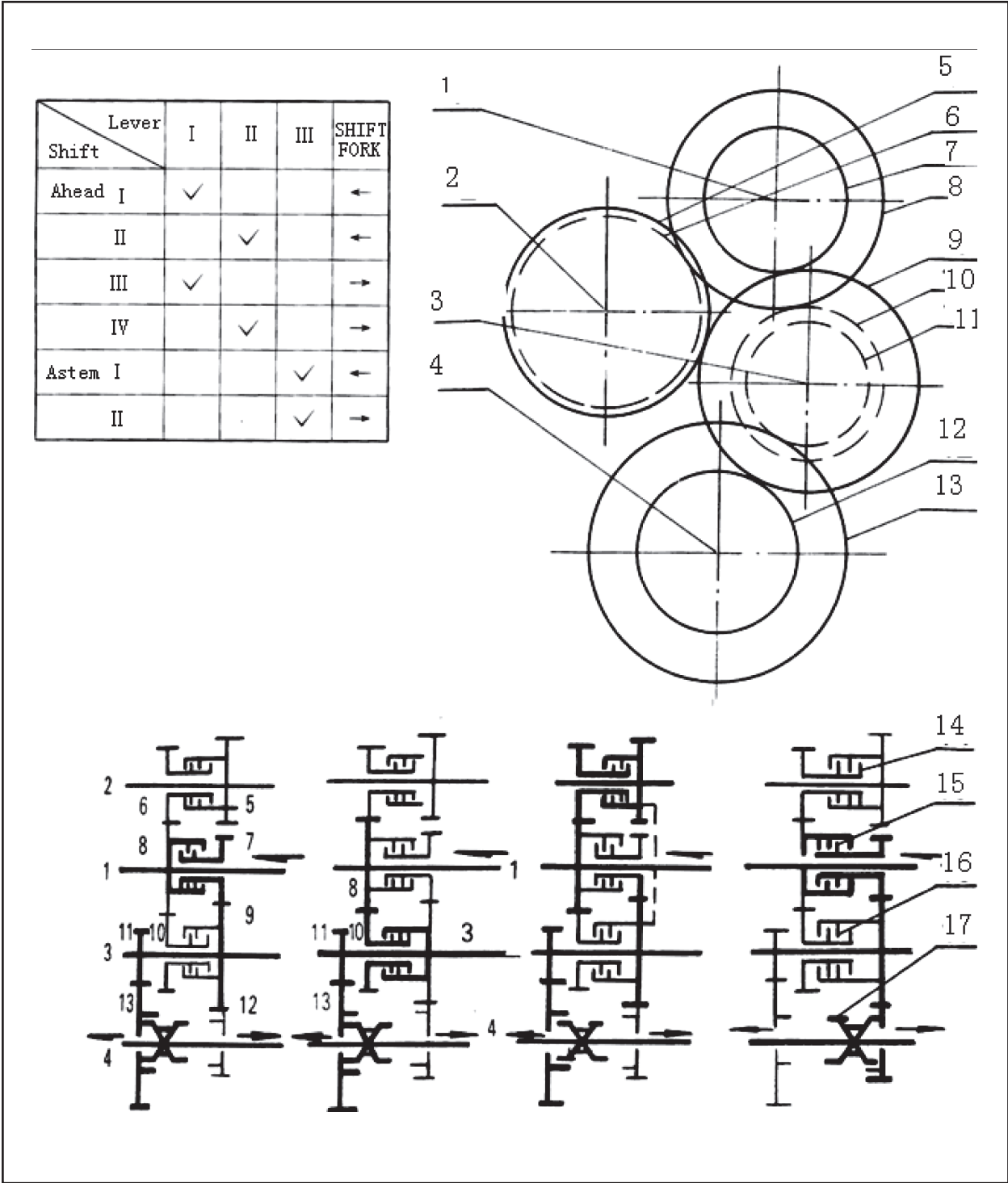


Figure.2

Working principle of torque converter

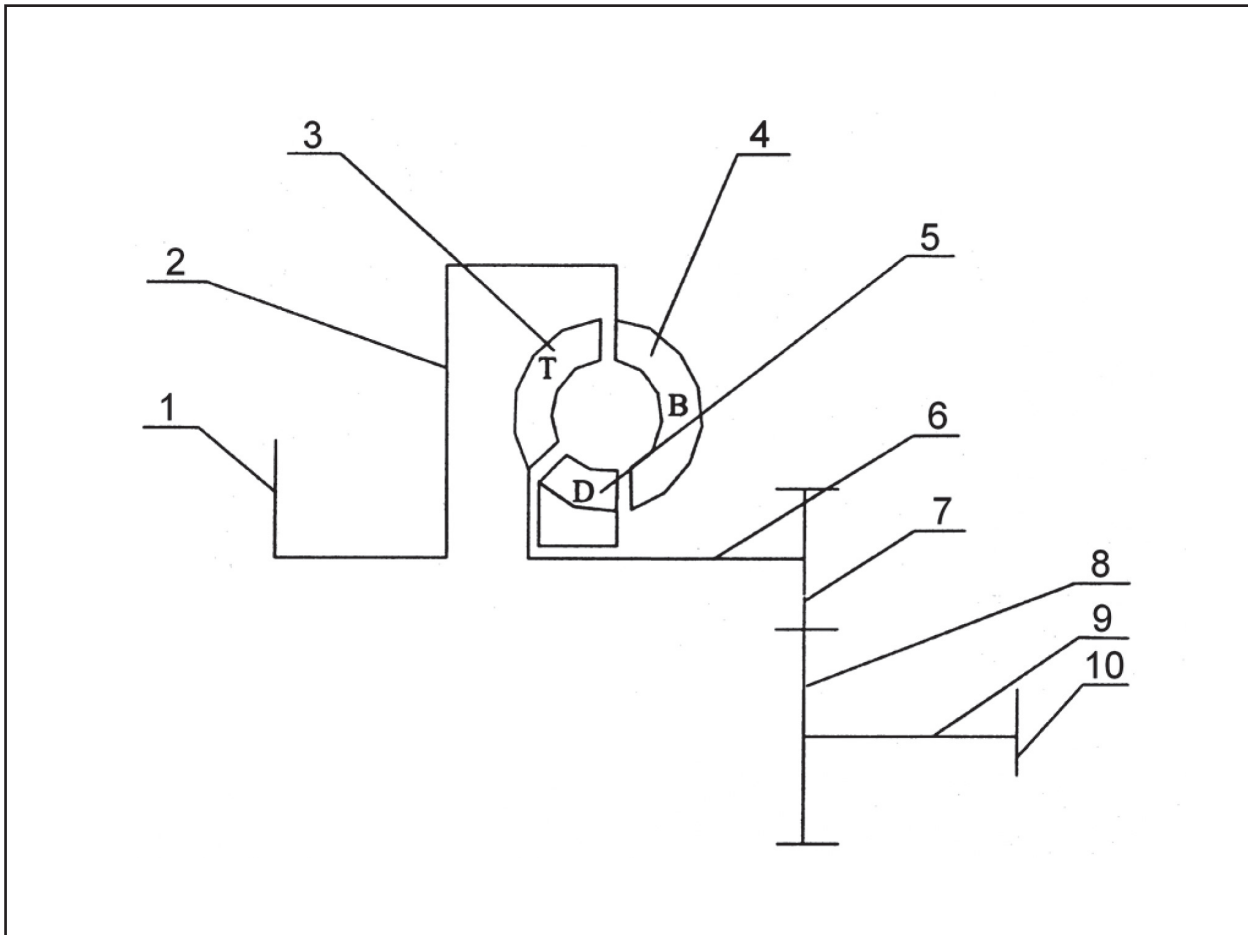


Figure.3

| Reference Number | Description | Reference Number | Description |
|------------------|---------------|------------------|------------------------|
| 1 | Spring plate | 6 | Turbine shaft |
| 2 | Turbine cover | 7 | Output initiative gear |
| 3 | turbine | 8 | Output driven gear |
| 4 | Pump pulley | 9 | Output shaft |
| 5 | guide pulley | 10 | Output flange |

Disassembly of transmission

Disassembly of transmission assembly

1. Put transmission horizontally on working platform with oil pan upward.

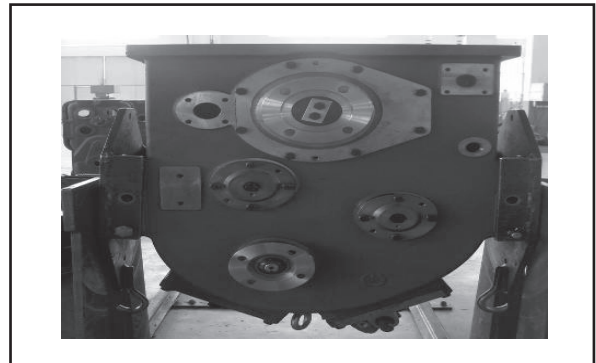


Figure.4

2. Dismantle oil pan

Use relative tools (such as sleeve, open spanner, same with following conditions, and will not state again). Loosen fixed bolts on oil pan, and dismantle oil pan.

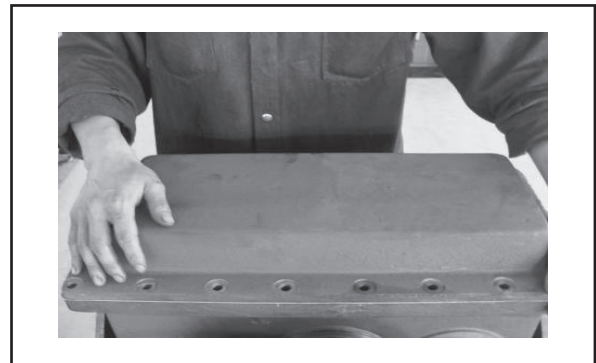


Figure.5

3. Dismantle fixing block of oil pan

Knock out with tools and take out fixing block.

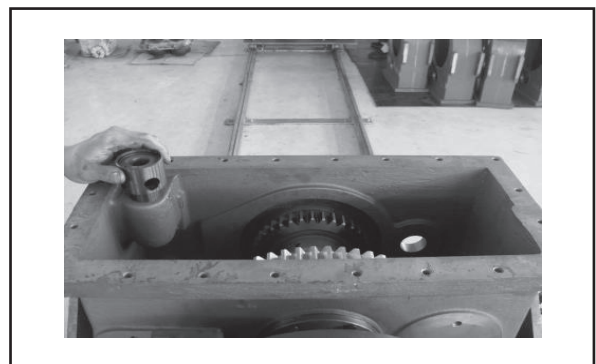


Figure.6

4. Dismantle shifting fork

Twist fixed bolts and take out shifting fork.

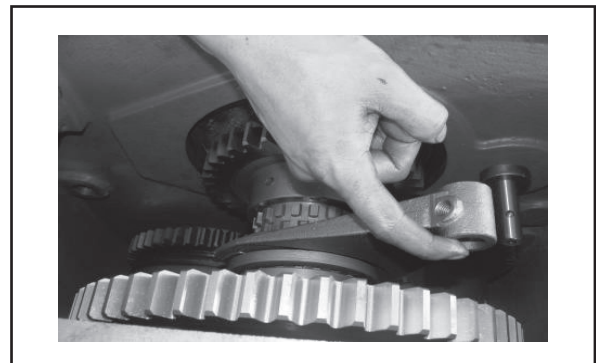


Figure.7

5. Dismantle supporting seat of tie bar of shifting fork twist fixed bolts, take out supporting seat.

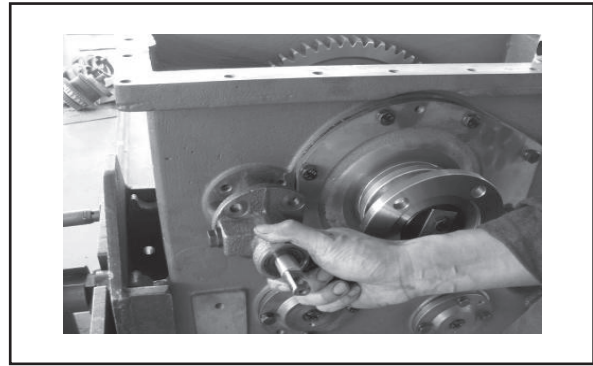


Figure.8

6. Turn over transmission, make the side with brake caliper upward, dismantle end cap and twist fixed bolts, take out end cap.

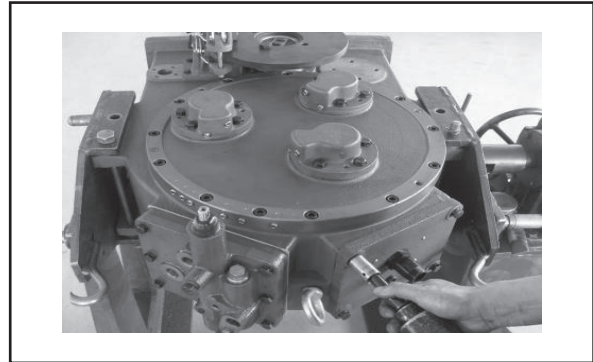


Figure.9

7. Dismantle speed change valve
Twist fixed bolts and get out speed change valve.

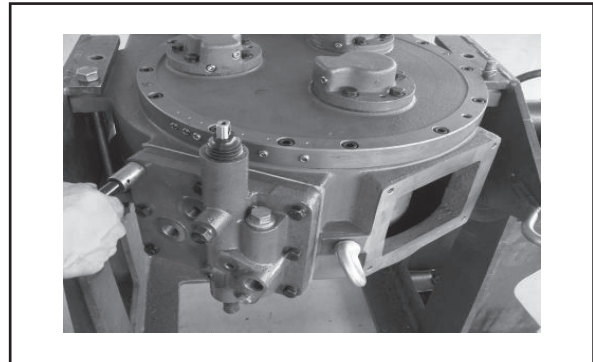


Figure.10

8. Take out clutch end cap of the first and the third gear twist fixed bolts and take out end cap.

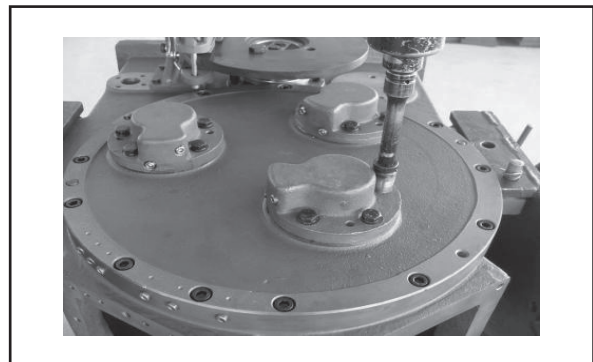


Figure.11

9. Take out brake caliper assembly
Twist fixed bolts and take out brake caliper assembly.

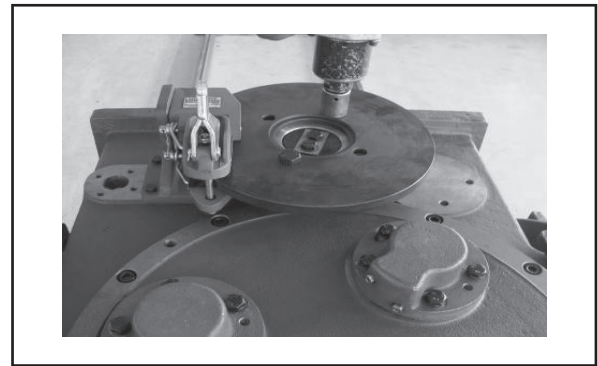


Figure.12

10. Take out fixed plate, sealing ring and cover plate of front output flange, then take out front output flange.

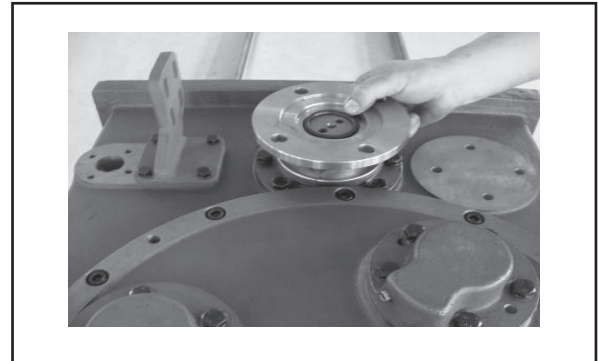


Figure.13

11. Overturn transmission; take out screw fixing plate, sealing ring and cover plate of front output flange, then take out output flange.

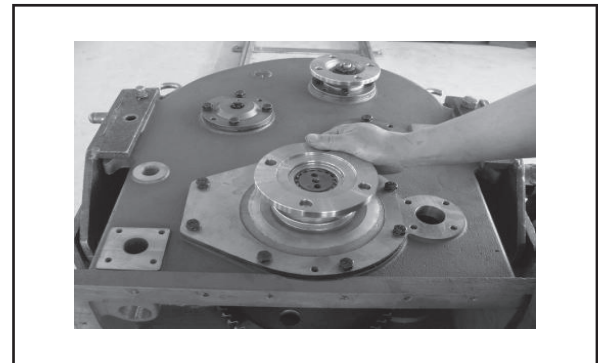


Figure.14

12. Take out output flange end cap
Twist fixed bolts and take out end cap.

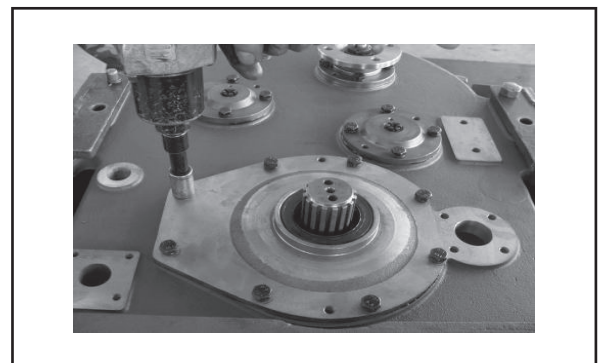


Figure.15

- 13. Take down bearing
Take down bearing with special tool.

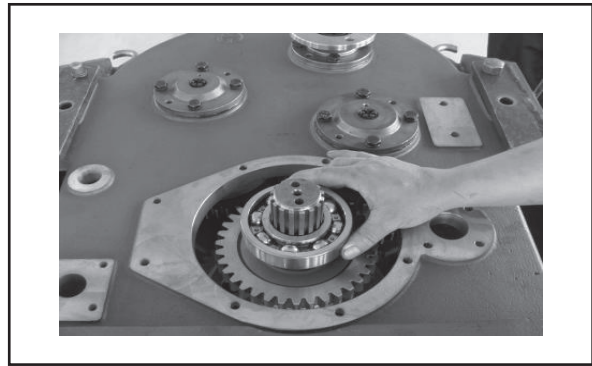


Figure.16

- 14. Take down spacer bush.

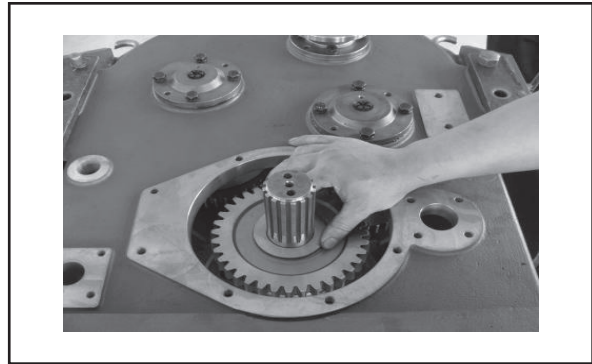


Figure.17

- 15. Take down high speed gear.

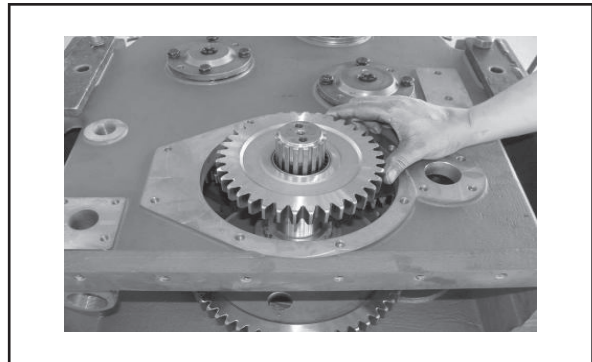


Figure.18

- 16. Take down sliding tooth set

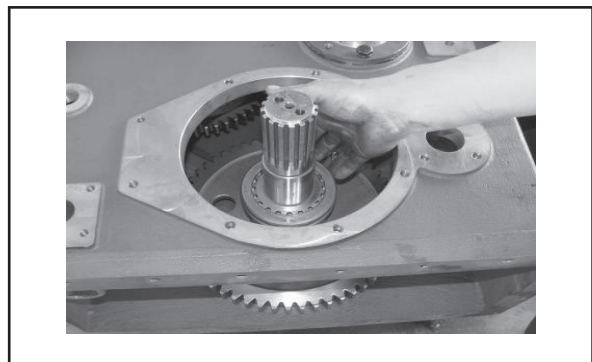


Figure.19

17. Take out output axle
Knock out output axle with tools and take out.

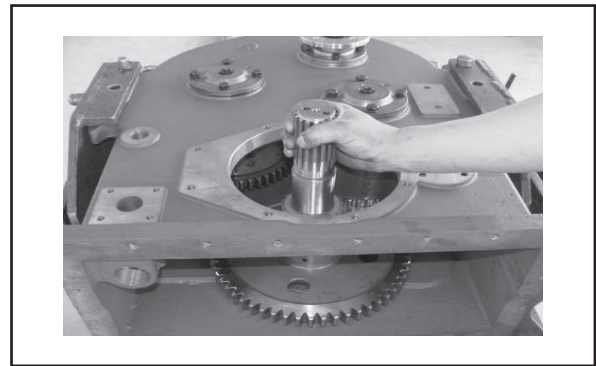


Figure.20

18. Take out low speed gear

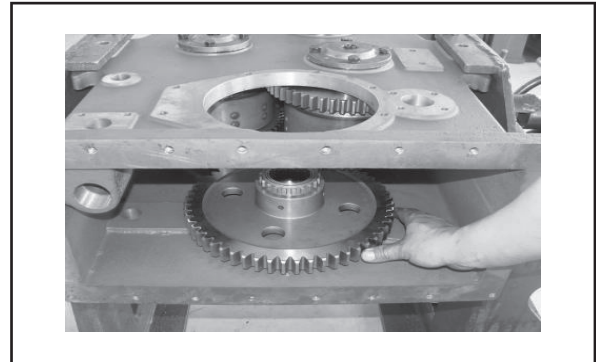


Figure.21

19. Take out bearing
Knock out bearing with tools and take out.

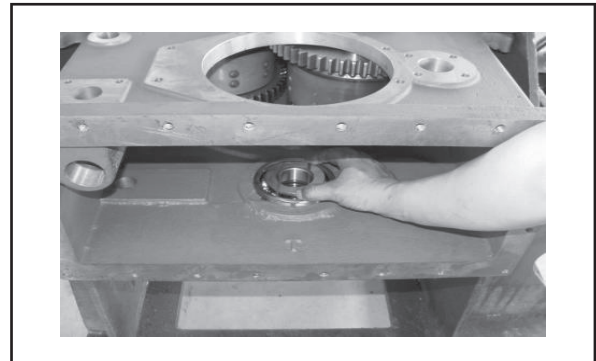


Figure.22

20. Take out adjusting screws of the II gear, the IV gear and reverse gear.

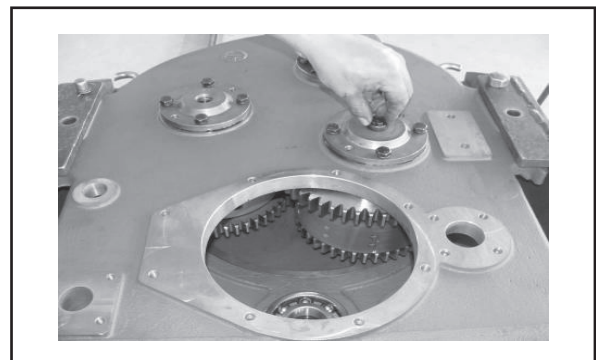


Figure.23

21. Take out nuts, gaskets and flange of input axle .

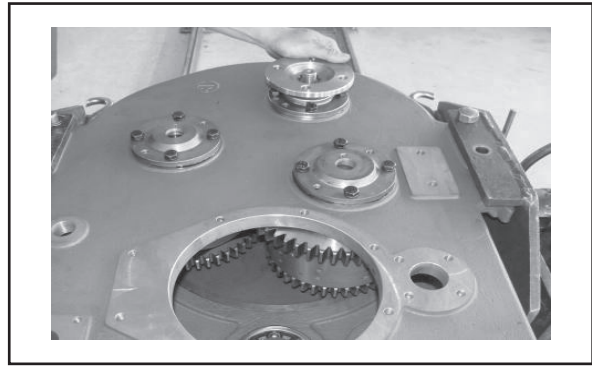


Figure.24

22. Take out end cap.

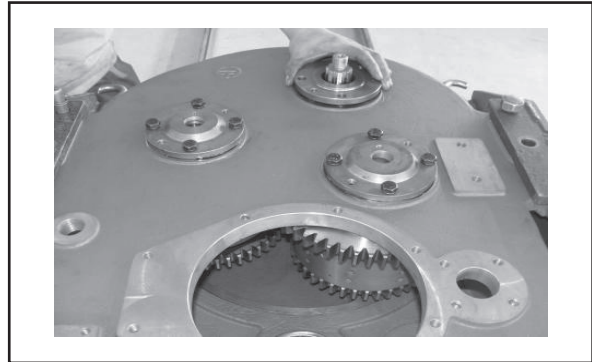


Figure.25

23. Overturn transmission; twist fixed bolts of the cover

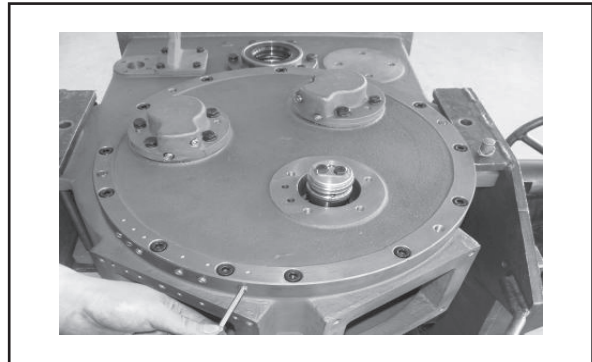


Figure.26

24. Take out clutch end cap of the second gear, the fourth gear and reverse gear.
Twist fixed bolts and take out end cap.

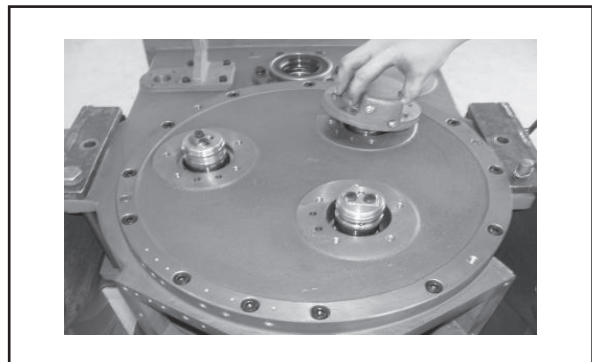


Figure.27

25. Take out sealing ring of each clutch

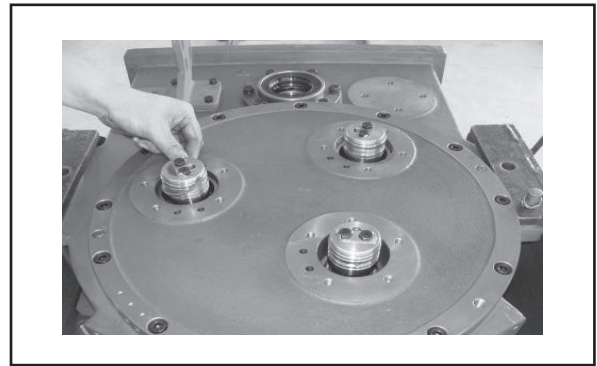


Figure.28

26. Take out end cap of transmission.
Twist fixed bolts and take out end cap.

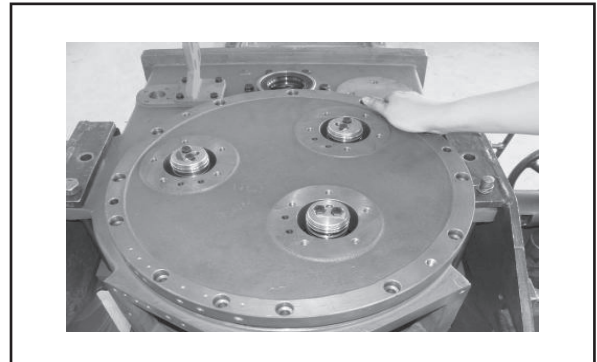


Figure.29

27. Take out clutch of the first and the third gear,
the second and the fourth gear and reverse
gear.

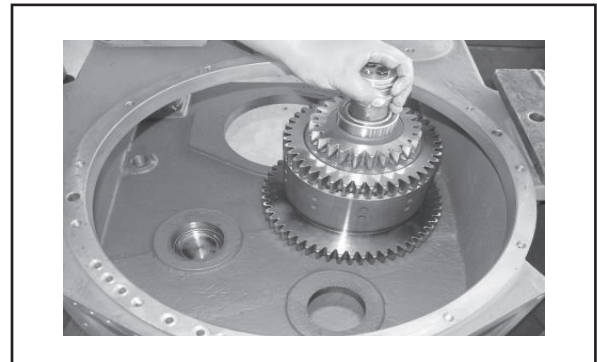


Figure.30

28. Take out fixed set of brake caliper
Twist fixed bolts and take out fixed seat.

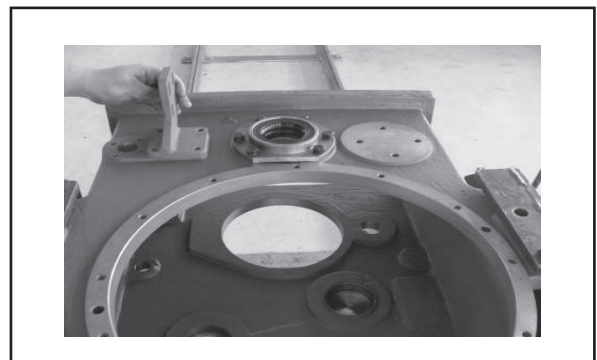


Figure.31

29. Take out end cap of output axle
Twist fixed bolts and take out end cap.

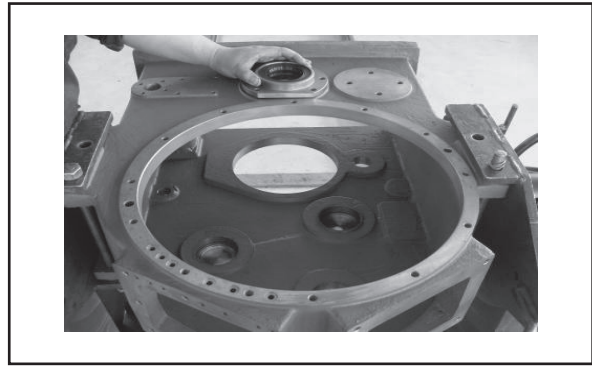


Figure.32

30. Take out bearing of output axle.

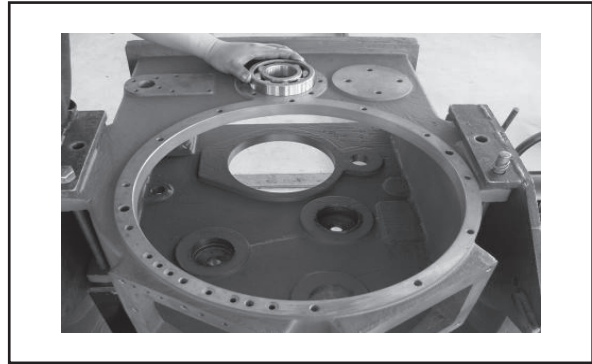


Figure.33

31. Take out sleeve of clutch.

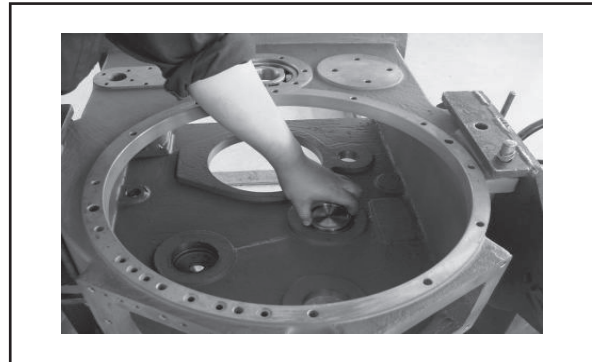


Figure.34

32. Overturn transmission; take out clutch end cap of the second and the fourth gear and reverse gear.

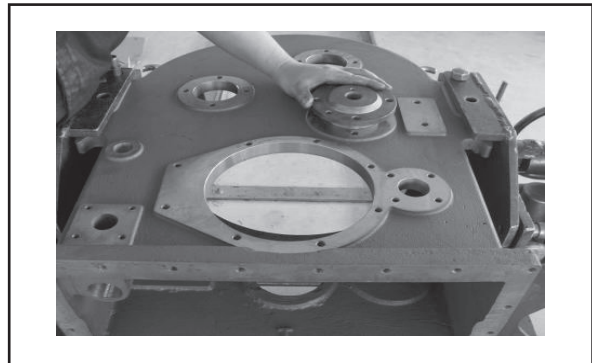


Figure.35

Assembly parts dismantling

Disassembling of torque converter assembly

1. Put torque converter on work platform horizontally.

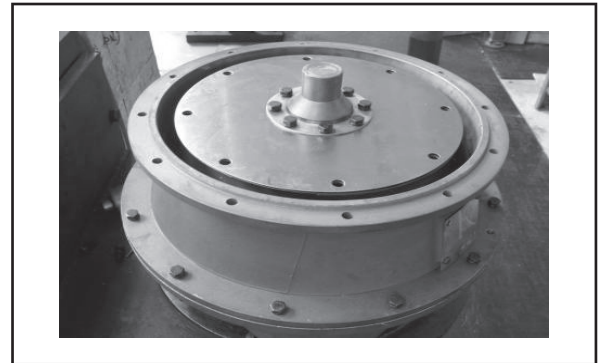


Figure.36

2. Dismantle fixed plate of spring plate.
Twist fixed bolts, take out fixed plate.

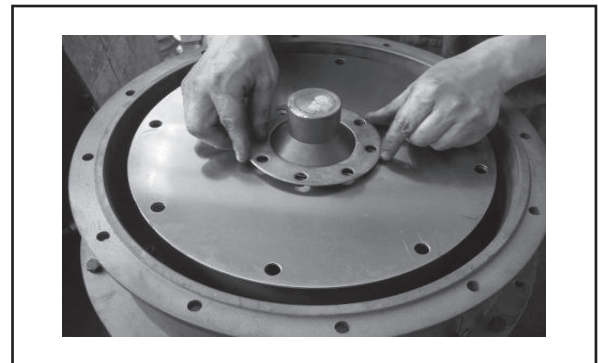


Figure.37

3. Dismantle elastic plate.

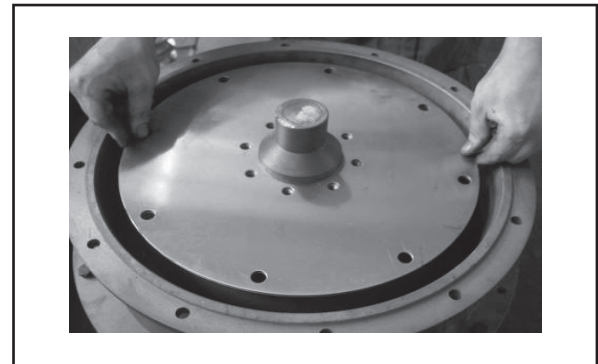


Figure.38

4. Dismantle cover wheel
Twist fixed bolts and take out cover wheel.

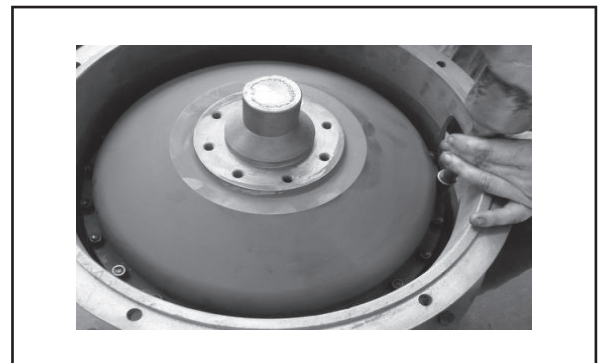


Figure.39

5. Dismantle baffle ring.

NOTE: *It must be clamped reliably when using baffle ring pincer to avoid safety hazard.*

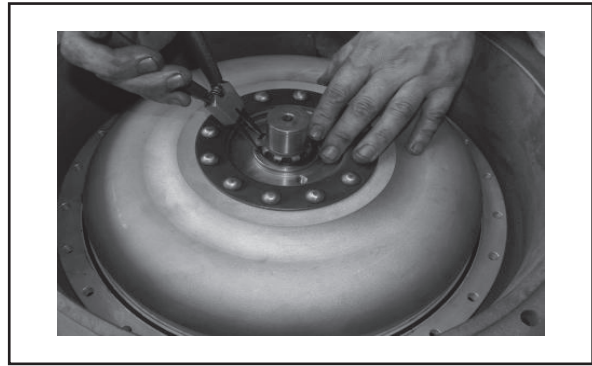


Figure.40

6. Dismantle turbine shell.

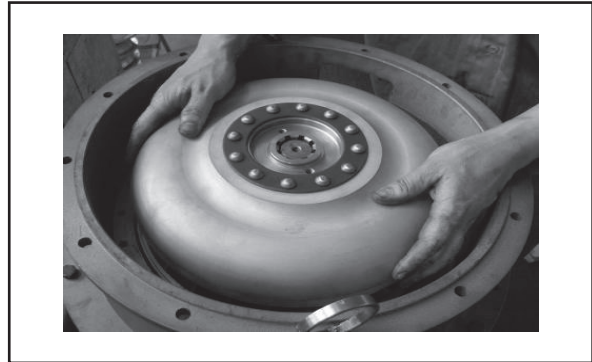


Figure.41

7. Take out sealing ring.



Figure.42

8. Take out baffle ring.

NOTE: *It must be clamped reliably when using baffle ring pincer to avoid safety hazard.*

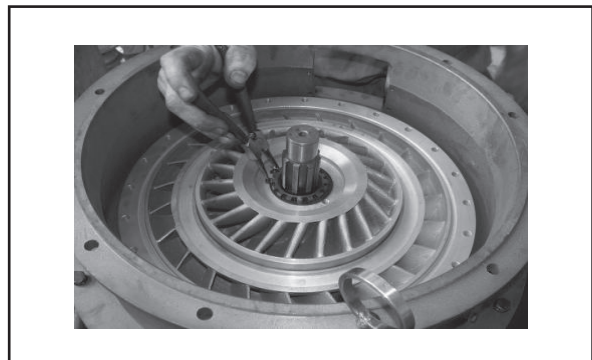


Figure.43

9. Take out guide wheel.

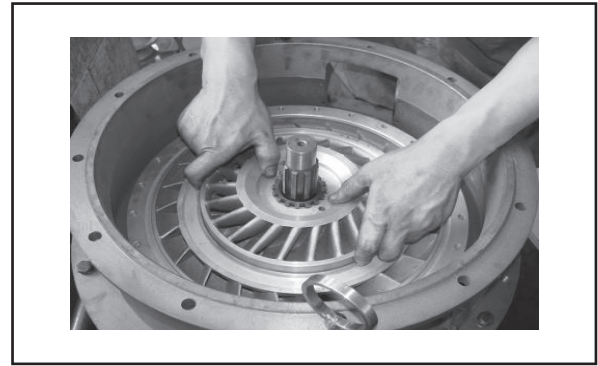


Figure.44

10. Take out pump pulley

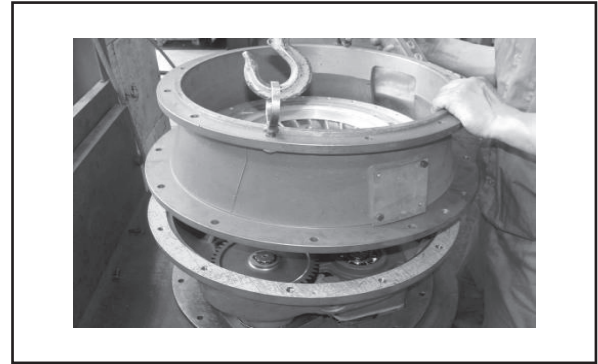


Figure.45

11. Take out gear baffle ring

NOTE: *It must be clamped reliably when using baffle ring pincer to avoid safety hazard.*

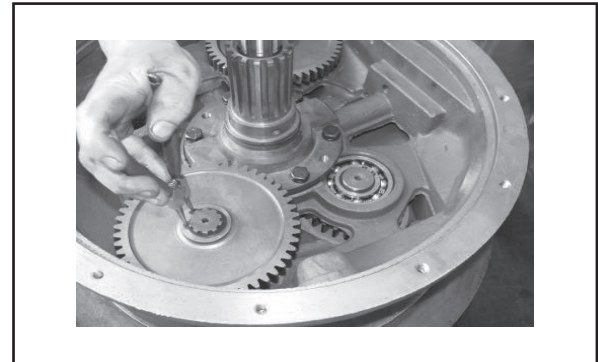


Figure.46

12. Take out gear

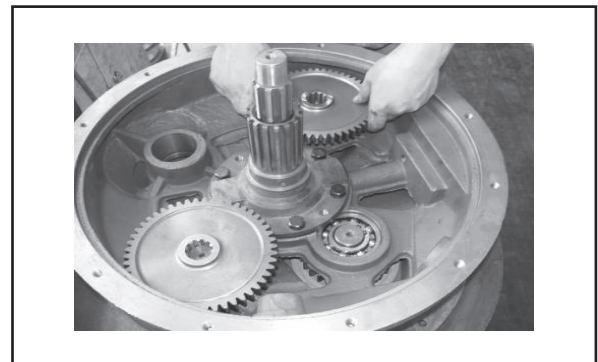


Figure.47

13. Take out guide wheel seat.

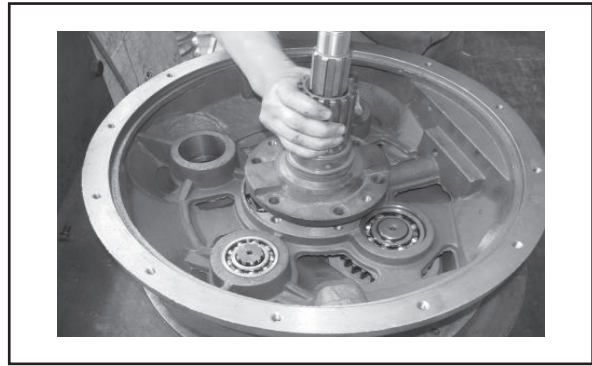


Figure.48

14. Take out bearing.

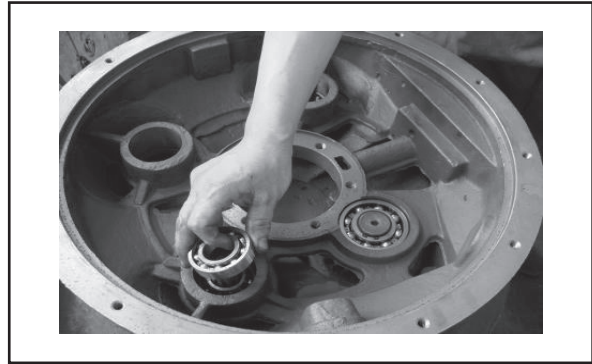


Figure.49

15. Overturn torque converter and take out flange.
Twist bolts and take out flange.

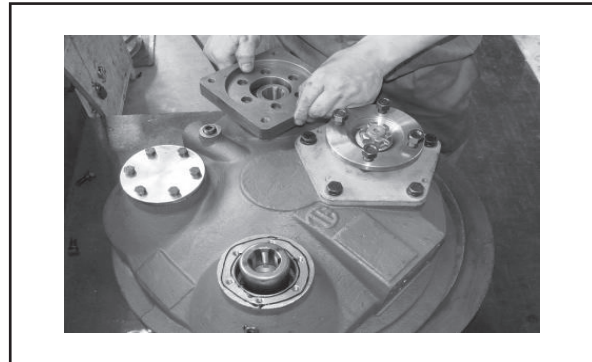


Figure.50

16. Take out all output axles.

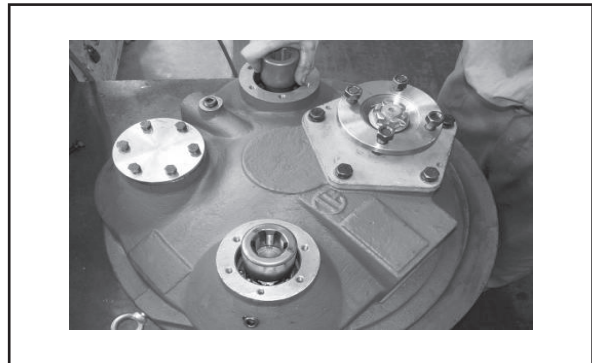


Figure.51

17. Take out baffle ring and shaft sleeve.

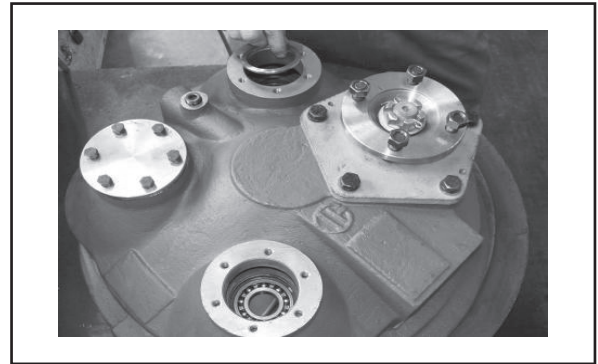


Figure.52

18. Take out bearings.

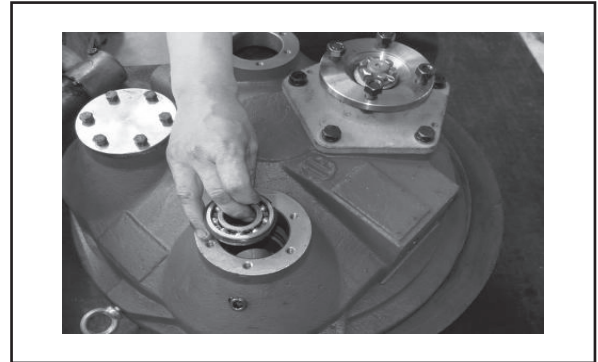


Figure.53

19. Take out output flange
Twist fixed bolts and take out flange.

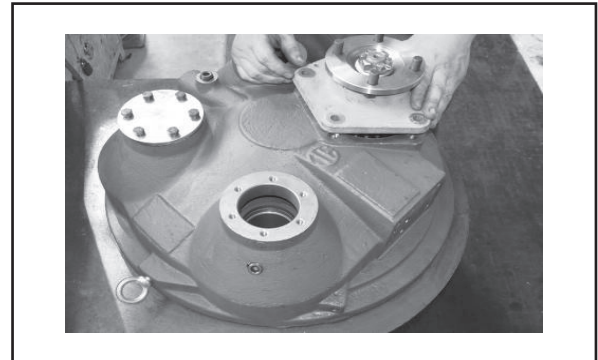


Figure.54

20. Take out sealing end cap.

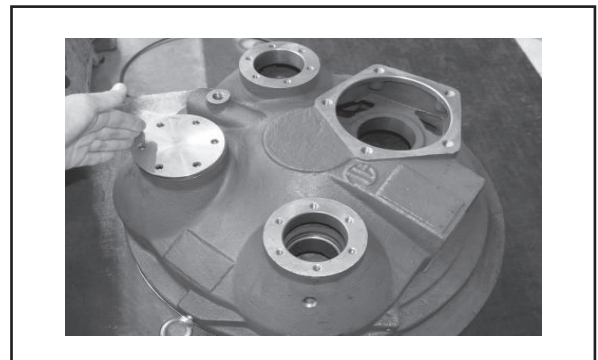


Figure.55

Assembling of transmission

Assembling of transmission assembly

1. Put transmission shell on work platform horizontally.

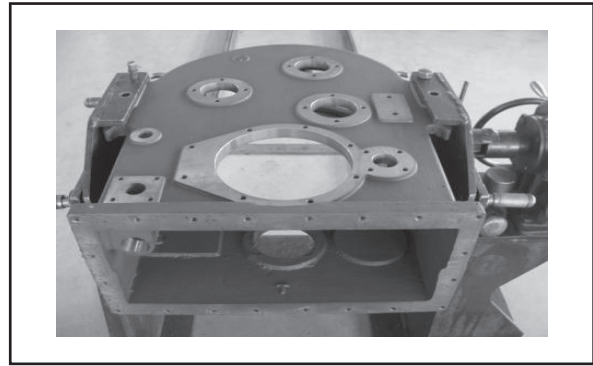


Figure.56

2. Install clutch end cap of reverse gear and the II and the IV gear

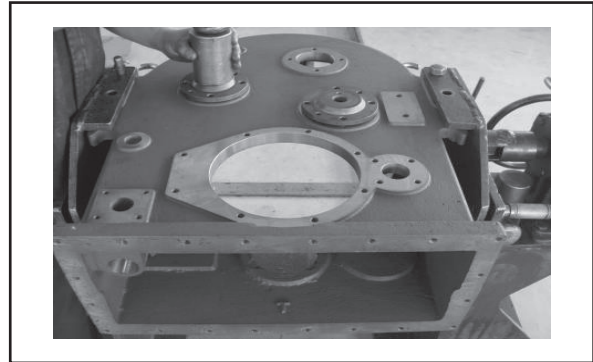


Figure.57

3. Overturn shell and put on work platform horizontally.

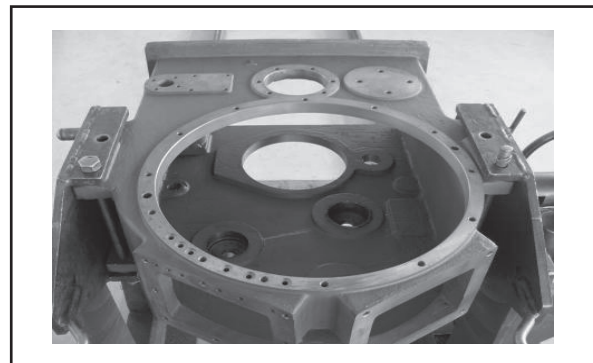


Figure.58

4. Install end cap spacer bush of reverse gear and the second and fourth gear.

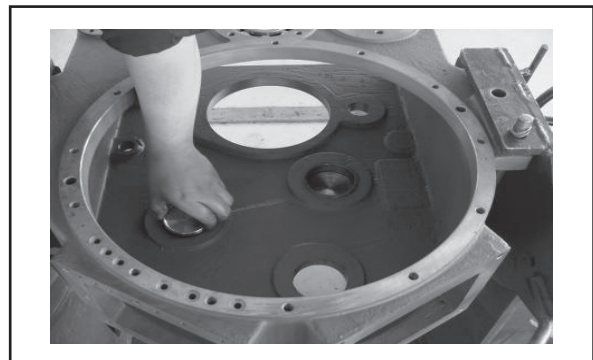


Figure.59

5. Install output axle bearing.

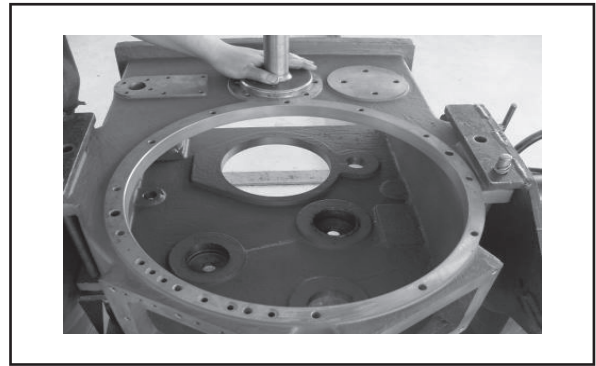


Figure.60

6. Install output flange.

NOTE: 45 ~ 59Nm

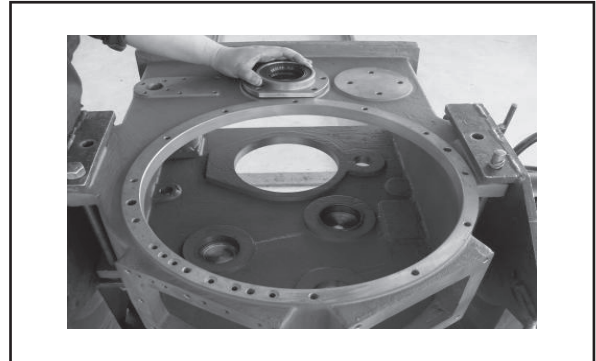


Figure.61

7. Install fixed supporting seat of hand brake disc.

NOTE: Bolts fastening torque 45 ~ 59Nm

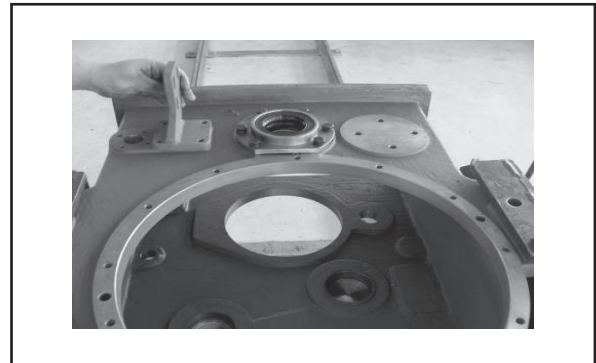


Figure.62

8. Install bearing sleeve of the second and fourth gear.

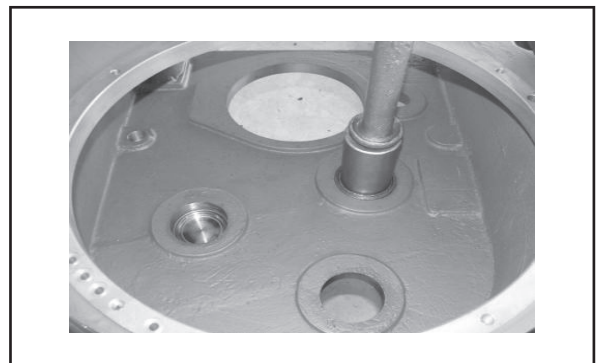


Figure.63

9. Install clutch of the II and IV gear.

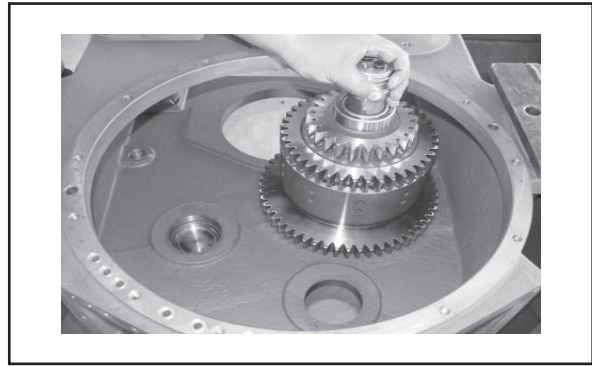


Figure.64

10. Install reverse gear bearing sleeve and reverse gear clutch.

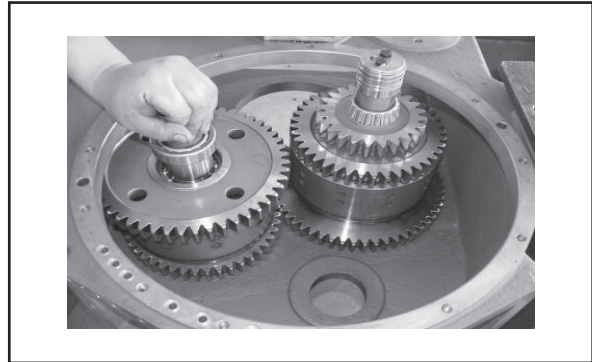


Figure.65

11. Install bearing sleeve of the first and third gear and clutch of the first and third gear.

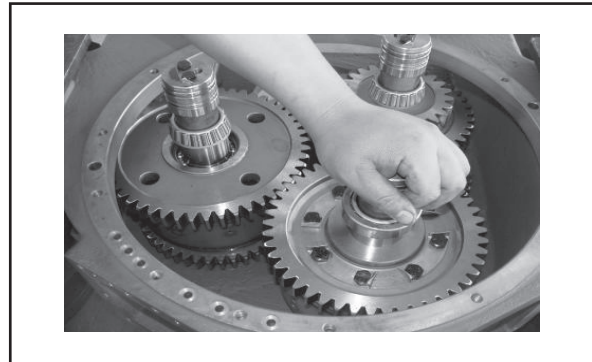


Figure.66

12. Install sealing ring of transmission end cap.

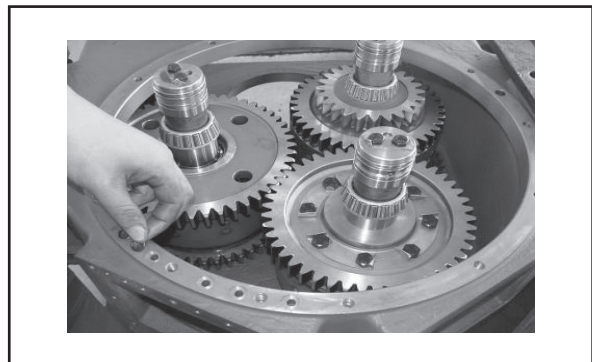


Figure.67

13. Install end cap.

NOTE: Bolts fastening torque is 45~ 59Nm

NOTE: Use Loctite 262 thread fastening sealant

NOTE: Use Loctite 598 surface sealant

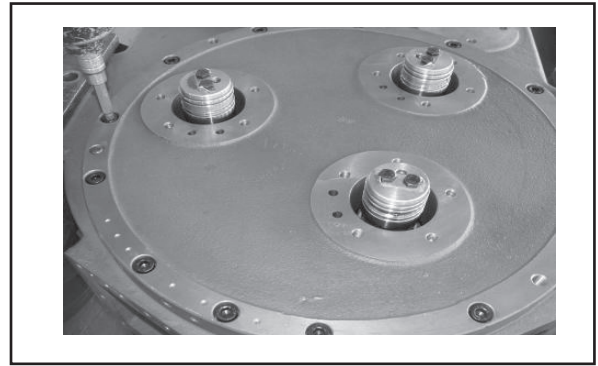


Figure.68

14. Install shaft sleeve of all clutches.

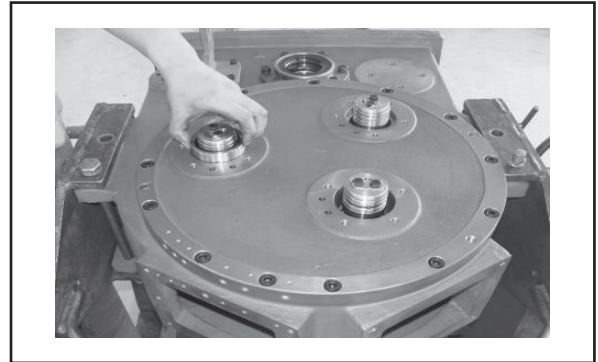


Figure.69

15. Install sealing rings of all clutches.

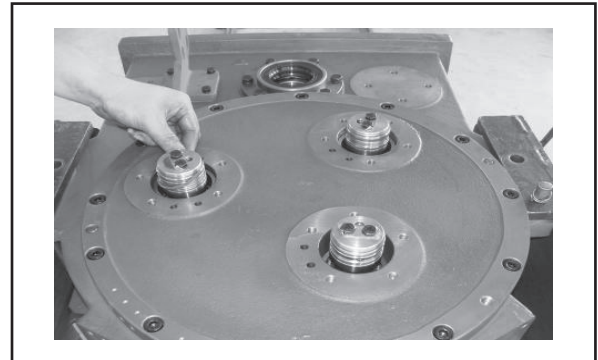


Figure.70

16. Install end cap of the first and third gear and reverse gear.

NOTE: Bolts fastening torque is 45~ 59Nm

NOTE: Use Loctite 262 thread fastening sealant

NOTE: Use Loctite 598 surface sealant

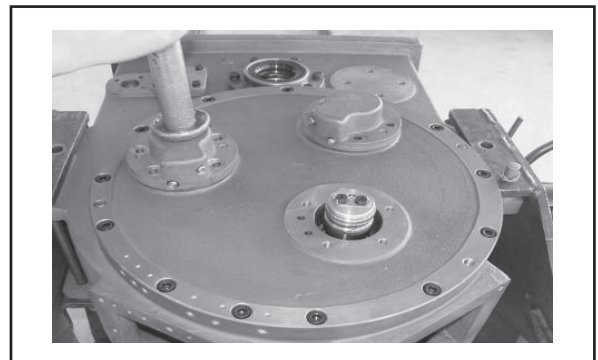


Figure.71

17. Overturn transmission, and put on work platform horizontally.

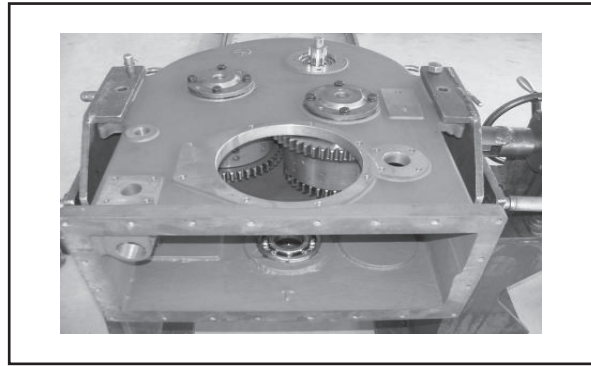


Figure.72

18. Install end cap of the first and third gear.

NOTE: Bolts fastening torque is 45~ 59Nm

NOTE: Use Loctite 262 thread fastening sealant

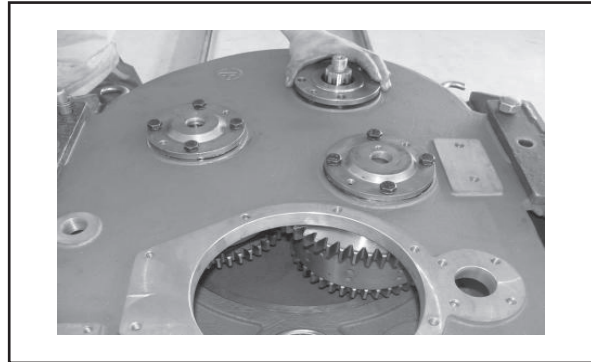


Figure.73

19. Install input flange.

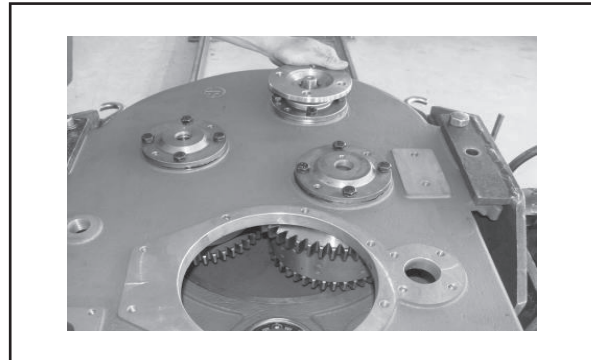


Figure.74

20. Install adjusting nuts of the second and fourth gear and reverse gear

Align teeth of the second and fourth gear and reverse gear; the horizontal height difference shall be controlled at 20-30.

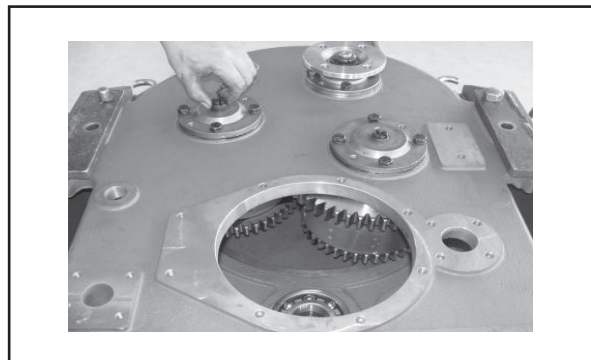


Figure.75

21. Install output axle bearing.

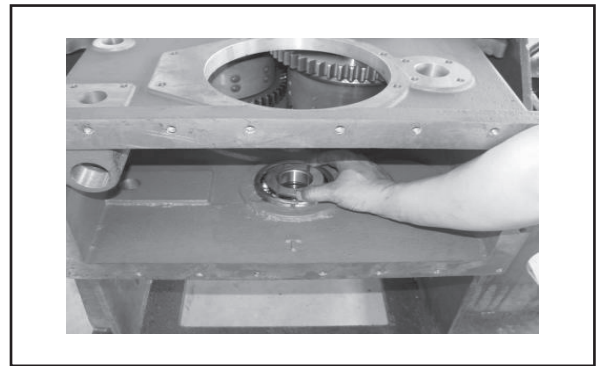


Figure.76

22. Install output low speed gear.

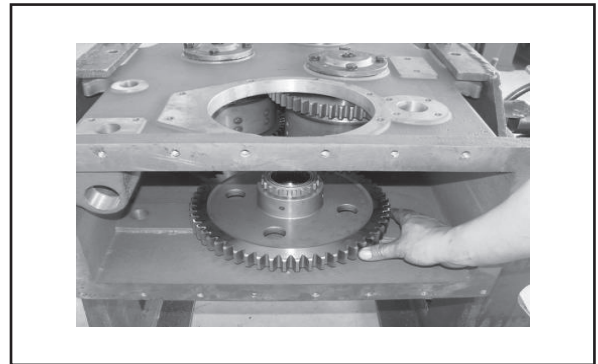


Figure.77

23. Install output axle.

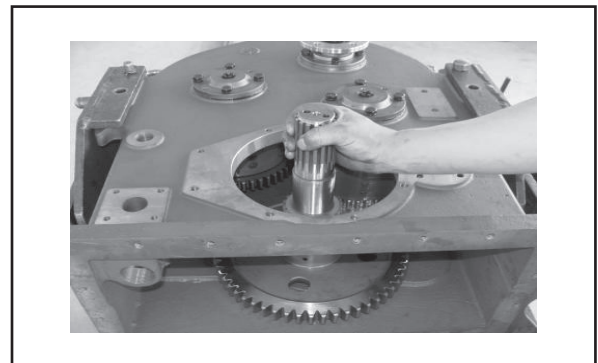


Figure.78

24. Install sliding teeth set.

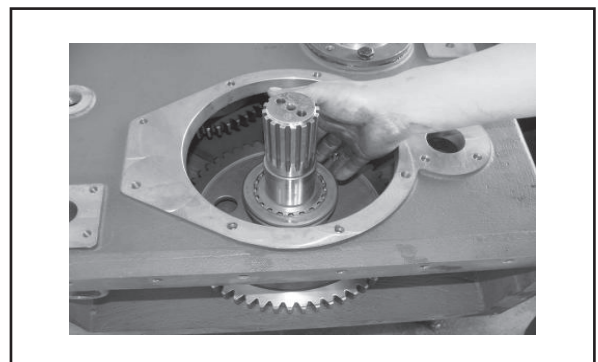


Figure.79

25. Install output axle high speed gear.

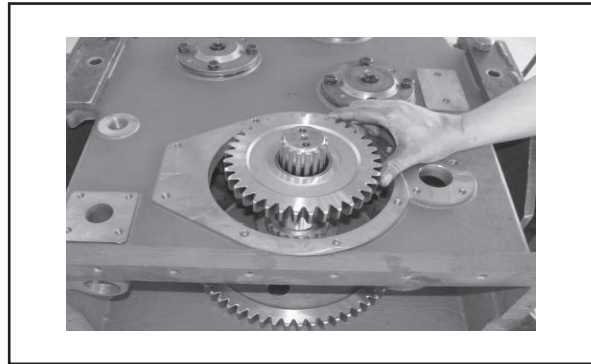


Figure.80

26. Install space ring.

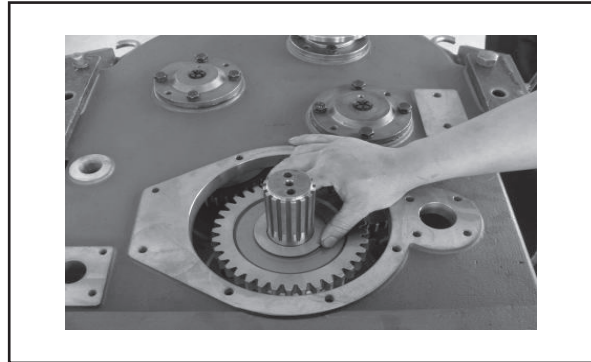


Figure.81

27. Install bearing.

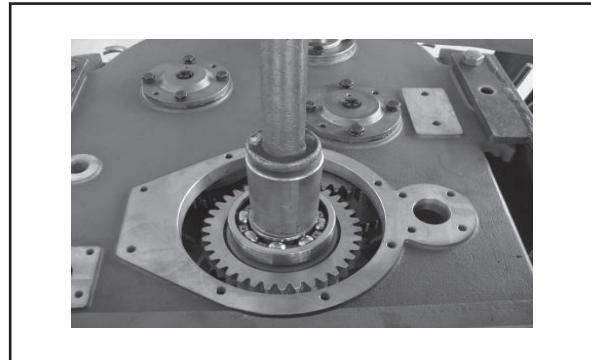


Figure.82

28. Install rear output axle end cap.

NOTE: Bolts fastening torque is 45~ 59Nm

NOTE: Use Loctite 598 surface sealant

NOTE: Use Loctite 262 thread fastening sealant

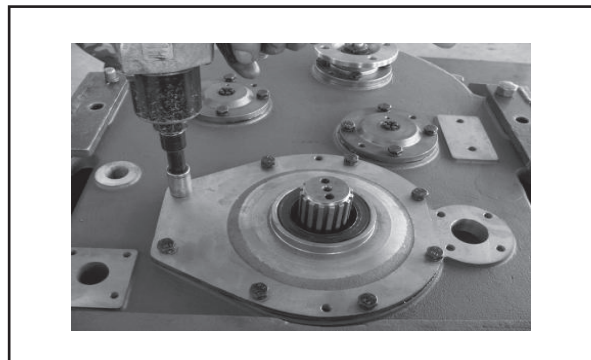


Figure.83

29. Install output flange

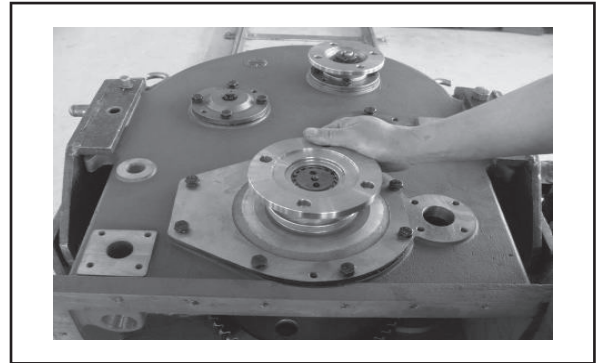


Figure.84

30. Install sealing ring, pressing plate and bolt stator of output flange.

NOTE: *Screw fastening torque is 45~59Nm*

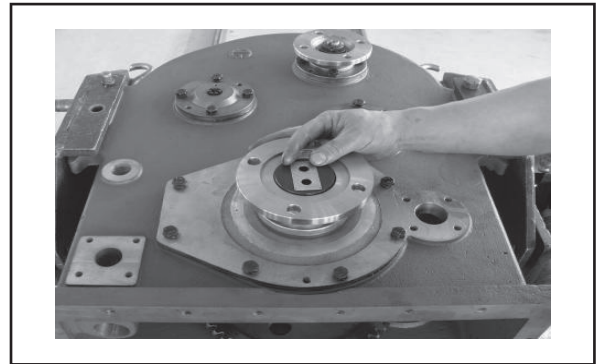


Figure.85

31. Turnover transmission, install flange of front output axle.

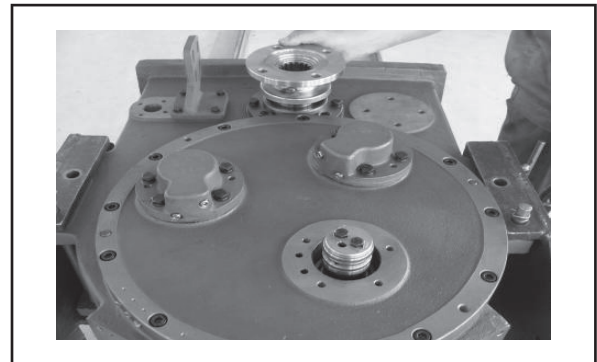


Figure.86

32. Install sealing ring, pressing plate and bolts stator respectively for front output flange.

NOTE: *Screw fastening torque is 45~59Nm*

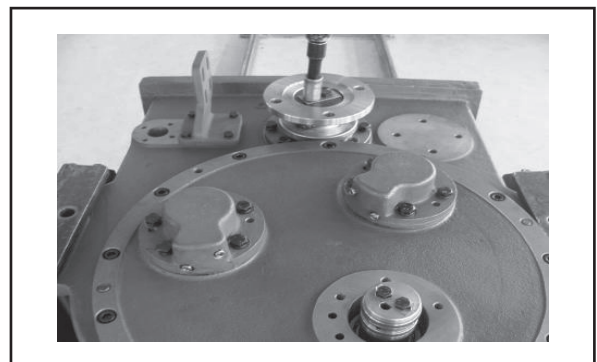


Figure.87

33. Install hand brake assembly

NOTE: Screw fastening torque is 124 ~ 165Nm

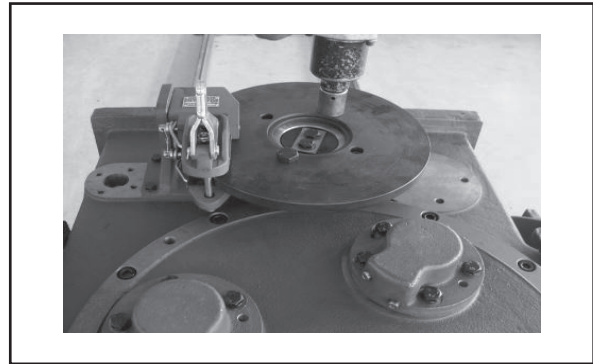


Figure.88

34. Install reverse gear bearing sleeve

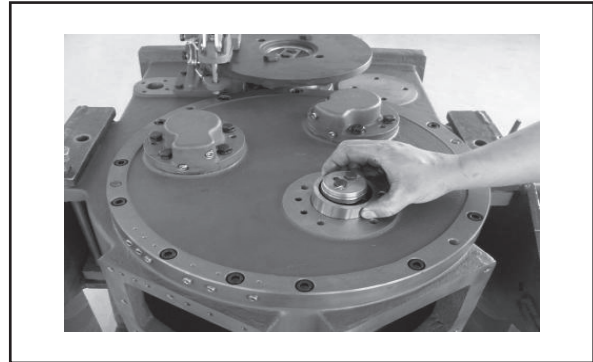


Figure.89

35. Install reverse gear clutch end cap

NOTE: Use Loctite 598 surface sealant

NOTE: Screw fastening torque is 45 ~ 59Nm

NOTE: Use Loctite 262 thread sealant

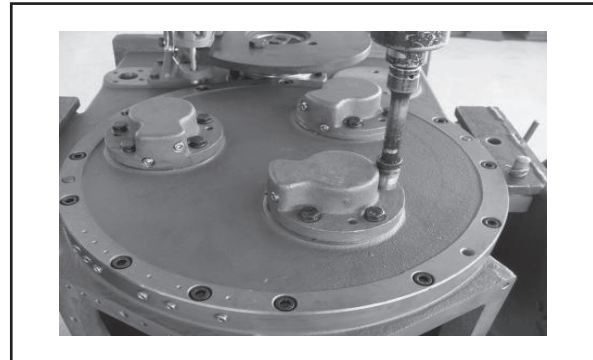


Figure.90

36. Install speed change control valve.

NOTE: Use Loctite 262 thread sealant

NOTE: Screw fastening torque is 45 ~ 59Nm

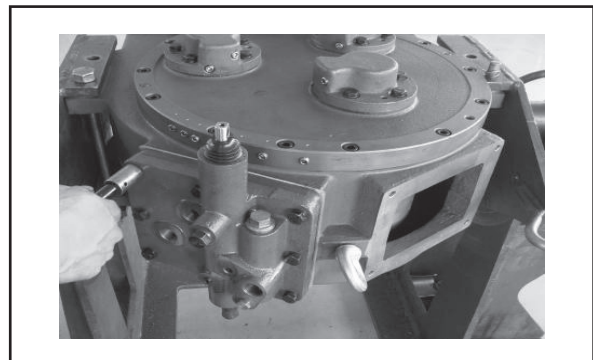


Figure.91

37. Install end cap

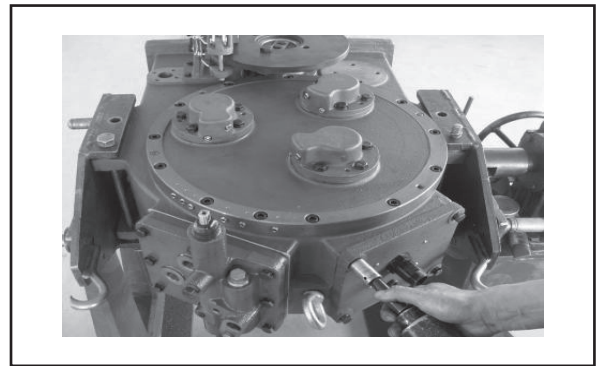


Figure.92

38. Install supporting seat of shifting fork

NOTE: Screw fastening torque is 45~ 59Nm

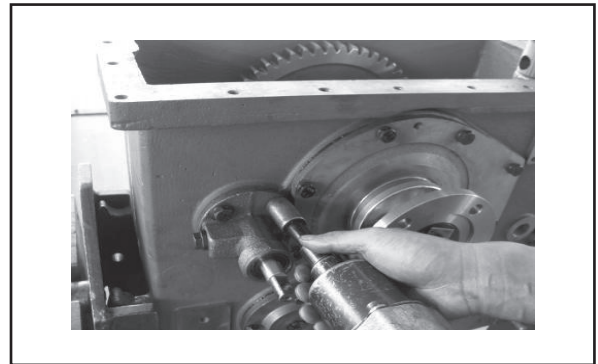


Figure.93

39. Install shifting fork

NOTE: Screw fastening torque is 45~ 59Nm

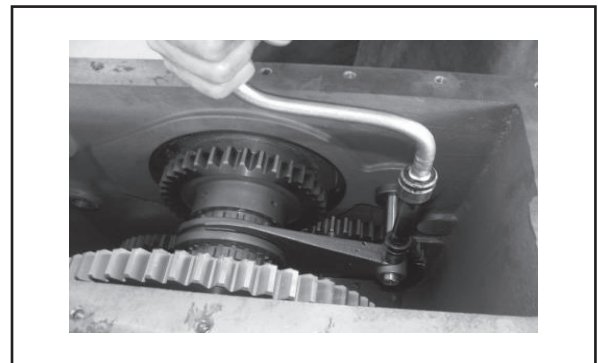


Figure.94

40. Bind shifting fork with iron wire to avoid dropping of bolts.

NOTE: Screw fastening torque is 45~ 59Nm

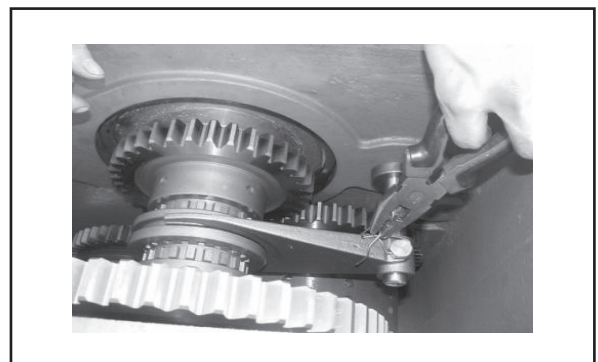


Figure.95

41. Install fixed seat of oil pan

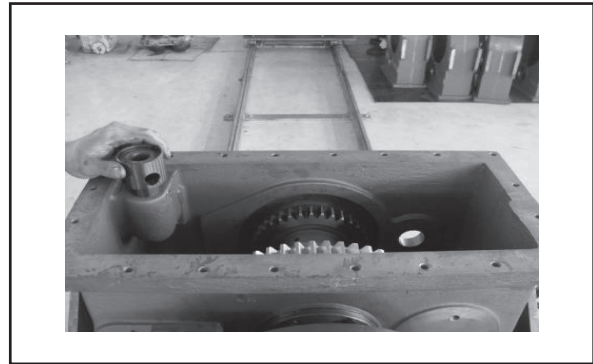


Figure.96

42. Install sealing gasket of oil pan.

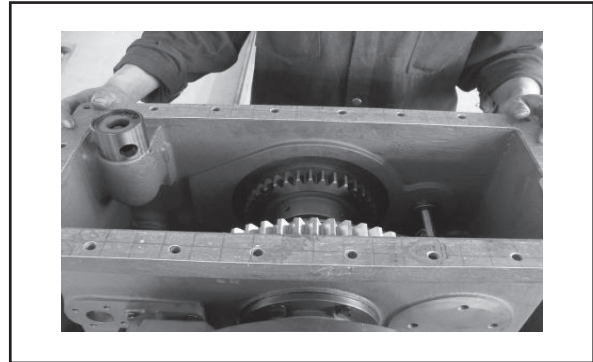


Figure.97

43. Install oil pan

NOTE: Screw fastening torque is 45 ~ 59Nm

NOTE: Use Loctite 598 surface sealant

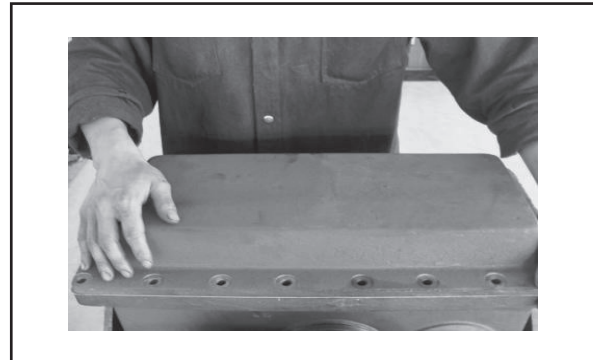


Figure.98

Assembly parts assembling

Installation of II & IV gear clutch

1. Install low speed gear on gear ring

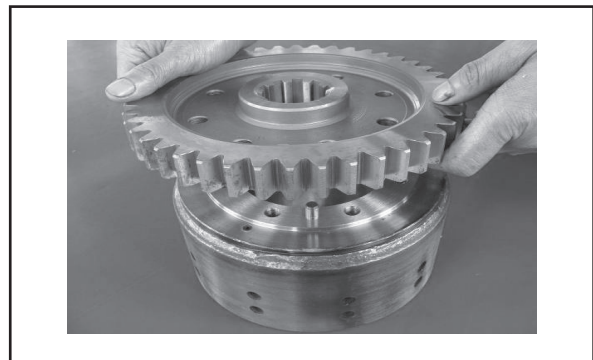


Figure.99

2. Install stator and screw down bolts.

NOTE: *Screw fastening torque is 22 ~ 30Nm*

NOTE: *Use Loctite 262 thread sealant*

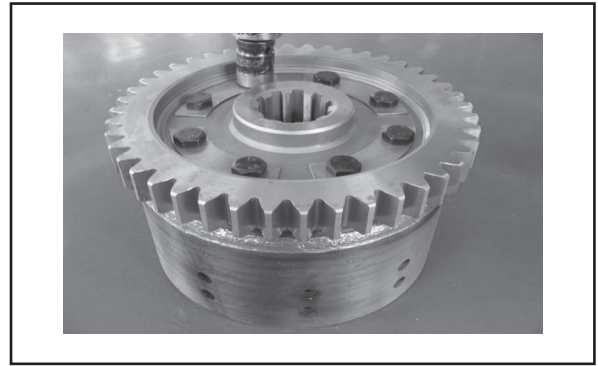


Figure.100

3. Tilt the surrounding edge of stator with tool

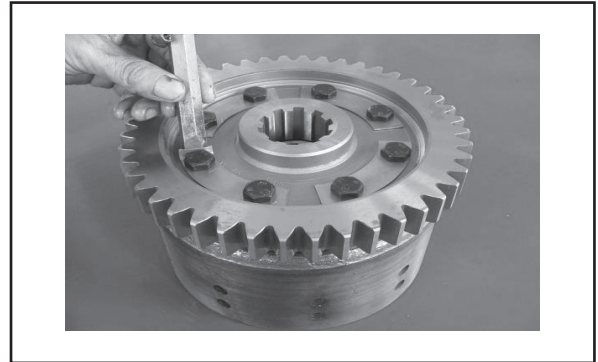


Figure.101

4. Put clutch gear ring on platform horizontally

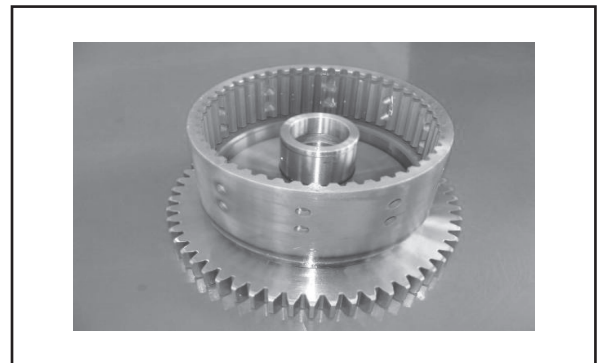


Figure.102

5. Install piston sealing ring



Figure.103

6. Install piston

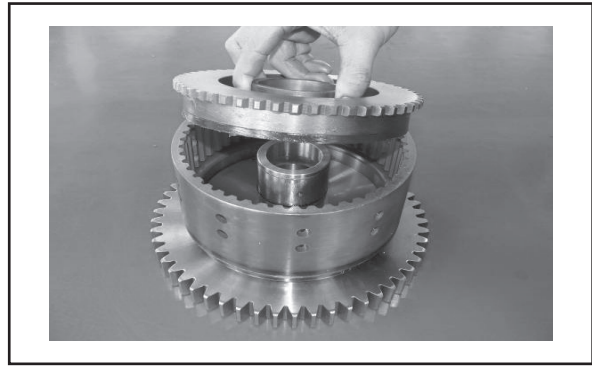


Figure.104

7. Install bearing sleeve

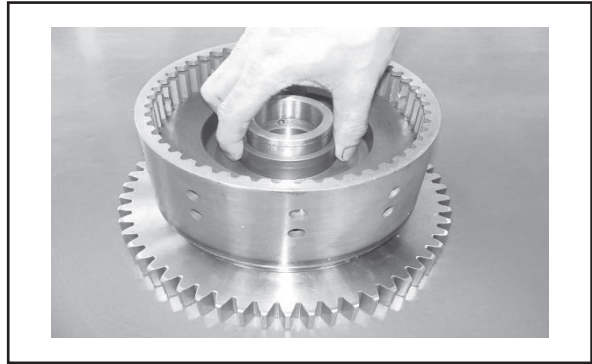


Figure.105

8. Install return spring

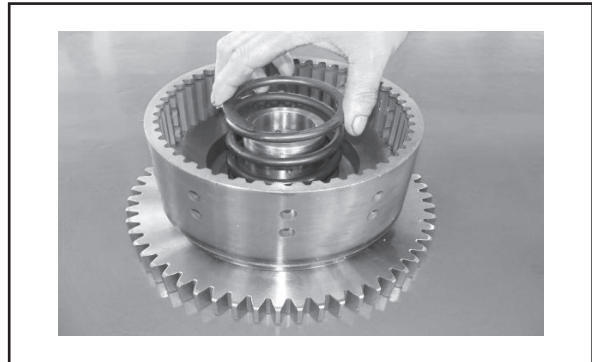


Figure.106

9. Install spring fixing seat.

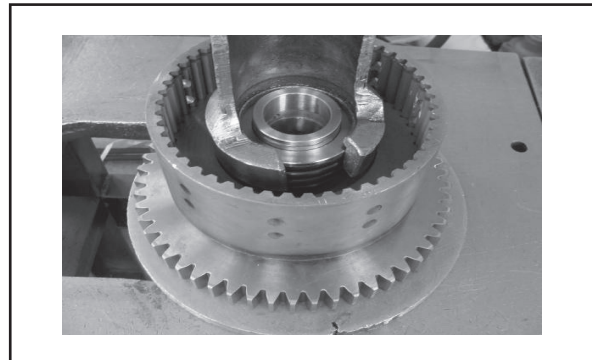


Figure.107

10. Install baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

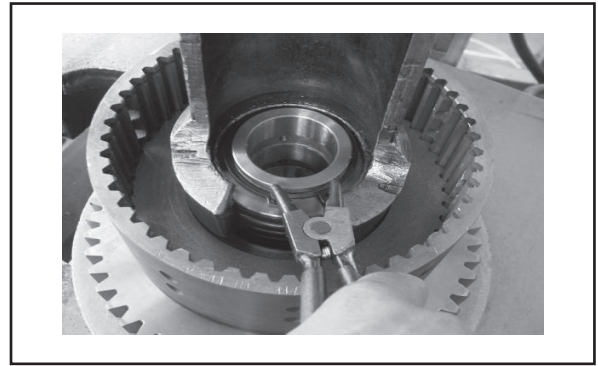


Figure.108

11. Install driven and driving friction plate

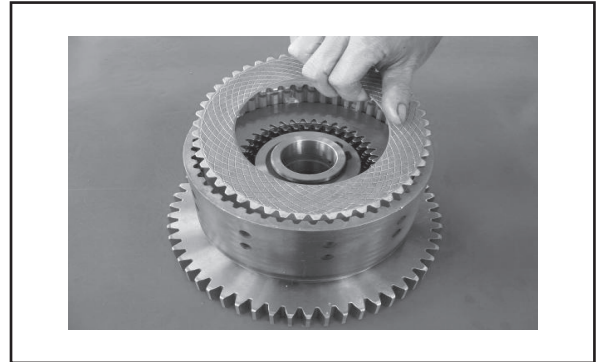


Figure.109

12. Install fixed block

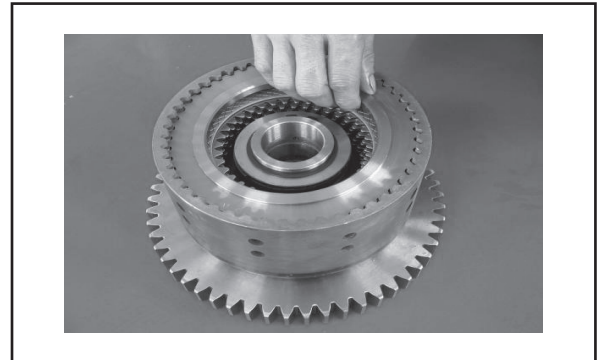


Figure.110

13. Install spring lamination

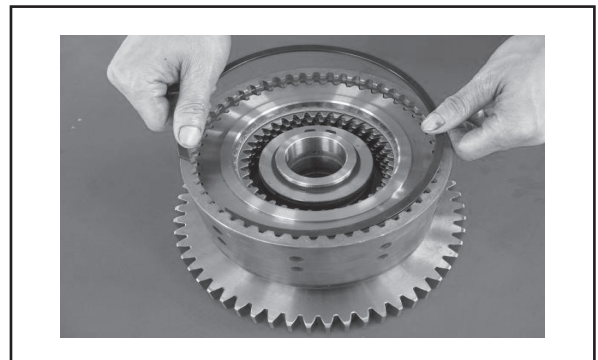


Figure.111

14. Install axle

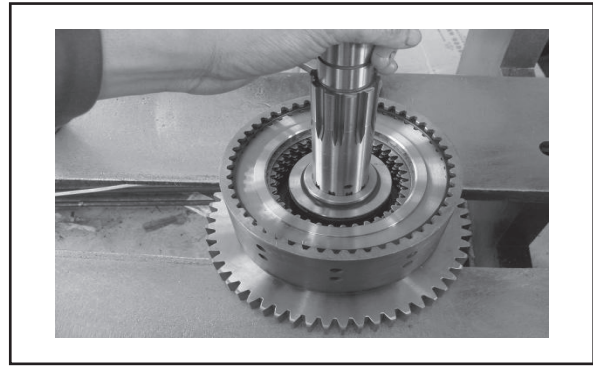


Figure112

15. Install baffle ring of driven gear

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

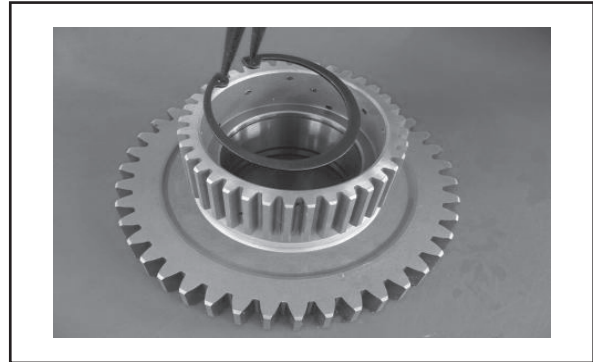


Figure.113

16. Install driven gear

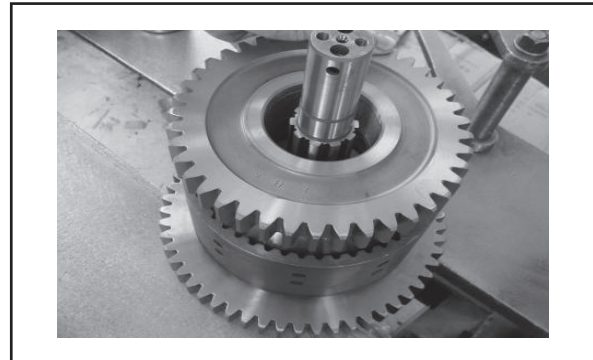


Figure.114

17. Install bearing



Figure.115

18. Install baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

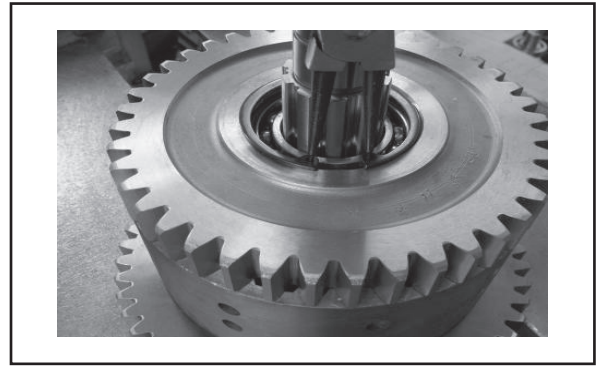


Figure.116

19. Install high speed gear

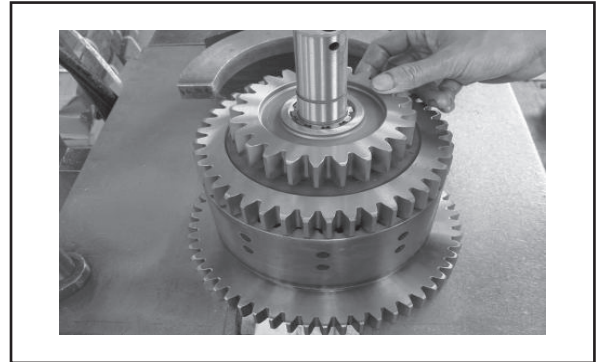


Figure.117

20. Install bearing

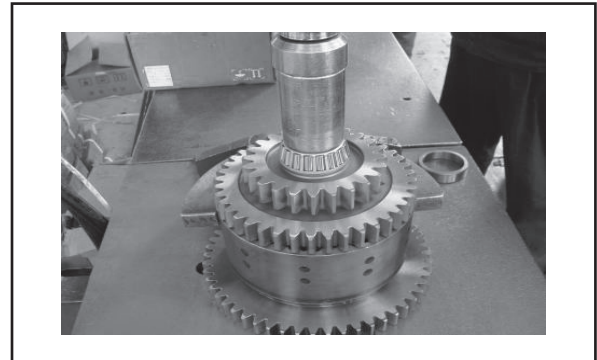


Figure.118

21. Install located block

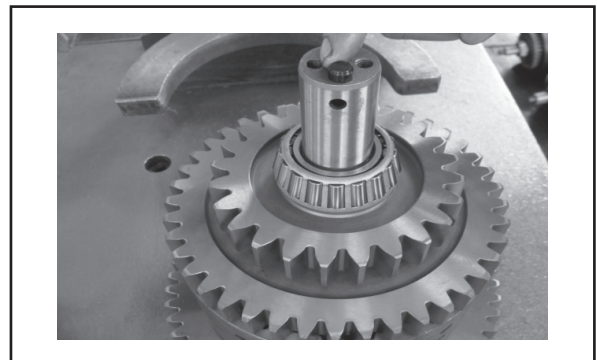


Figure.119

22. Install bearing

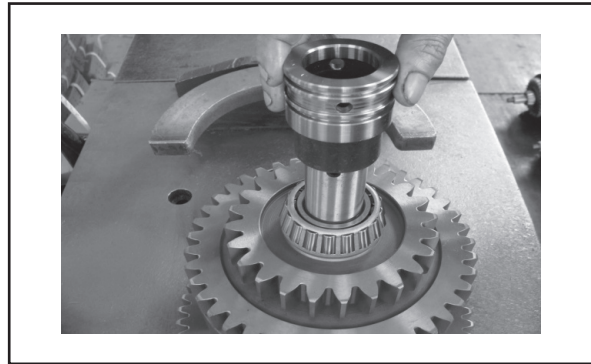


Figure.120

23. Install cover plate

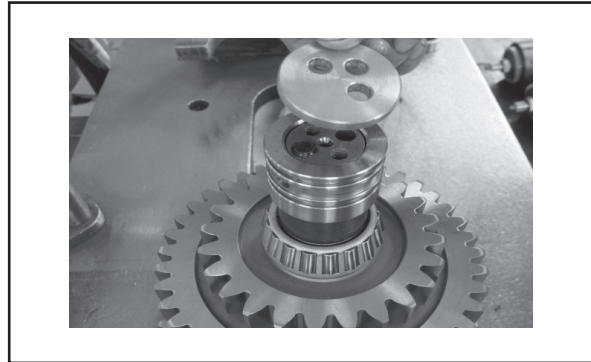


Figure.121

24. Install location

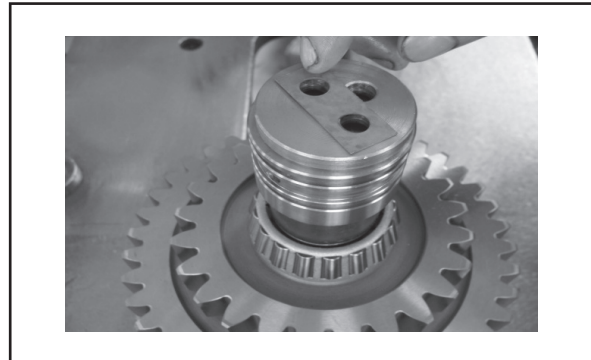


Figure.122

25. Screw down bolts and tilt the edge of stator with tool.

NOTE: Screw fastening torque is 22 ~ 30Nm

NOTE: Use Loctite 262 thread sealant

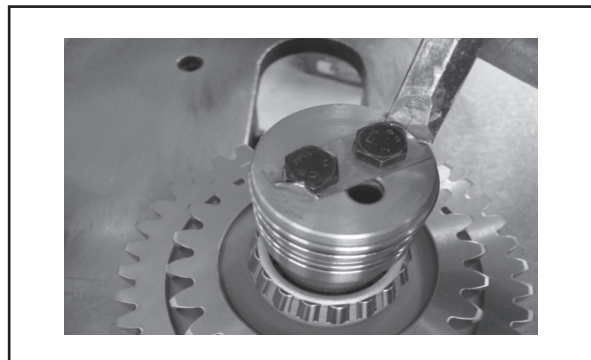


Figure.123

26. Reverse assembly, put it on work platform and install bearing.

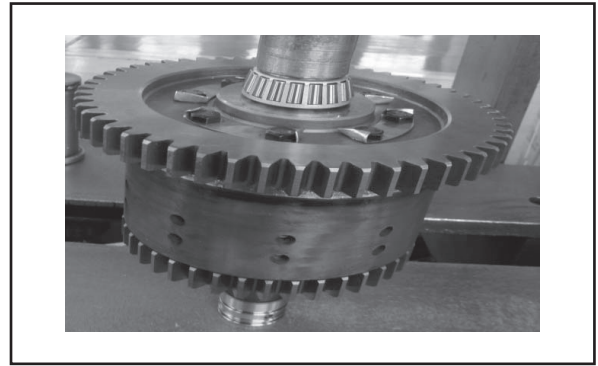


Figure.124

Installation of reverse gear clutch

1. Install low speed gear on gear ring



Figure.125

2. Install stator and screw down bolts

NOTE: Screw fastening torque is 22 ~ 30Nm

NOTE: Use Loctite 262 thread sealant



Figure.126

3. Tilt edge of stator with tools

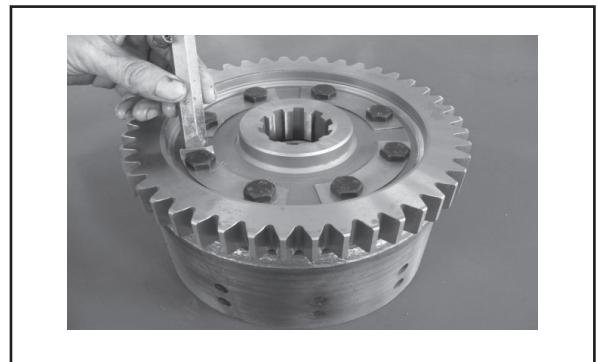


Figure.127

4. Turnover gear ring and put it on work platform

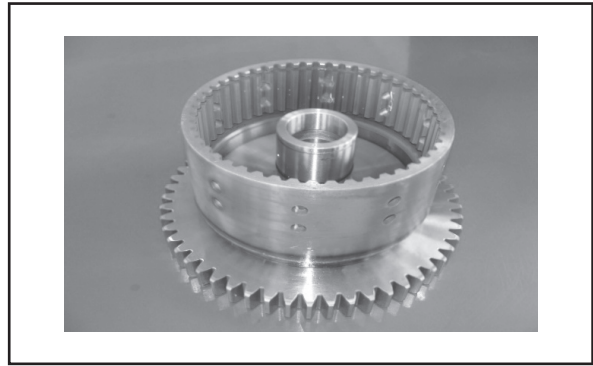


Figure.128

5. Install piston sealing ring

NOTE: *Use lubrication oil*



Figure.129

6. Install piston

NOTE: *Use lubrication oil*

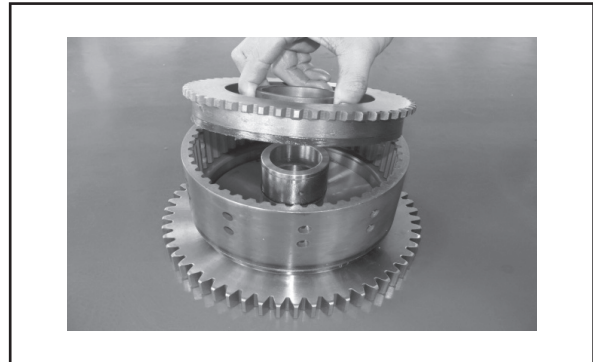


Figure.130

7. Install bearing sleeve

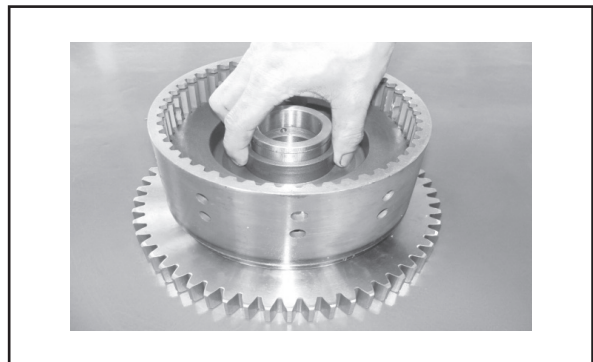


Figure.131

8. Install return spring.

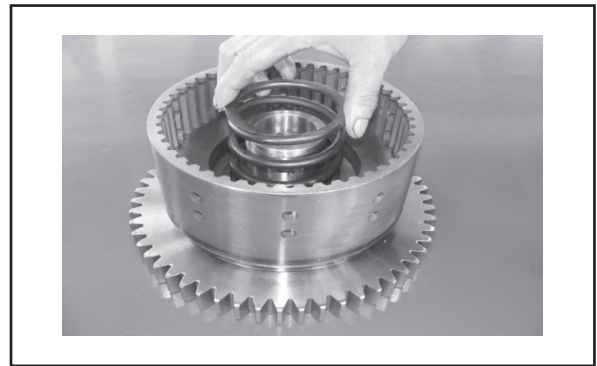


Figure.132

9. Install spring fixed seat.

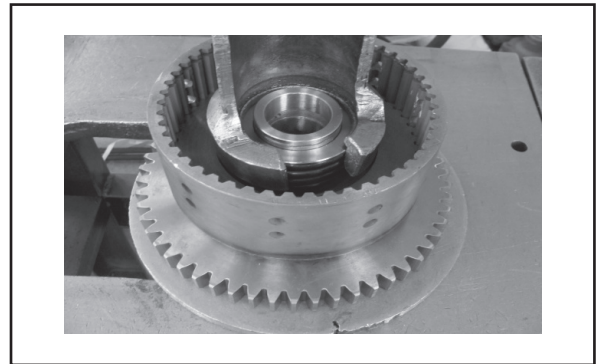


Figure.133

10. Install baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

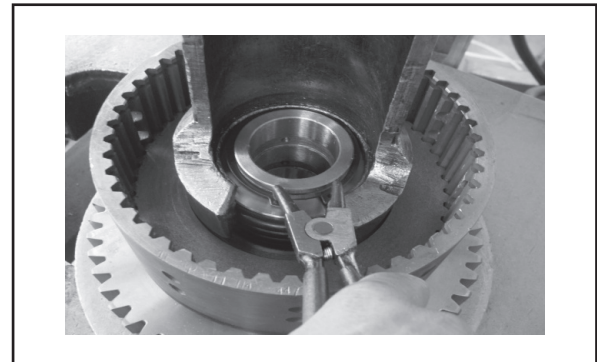


Figure.134

11. Install driven and driving friction plate.

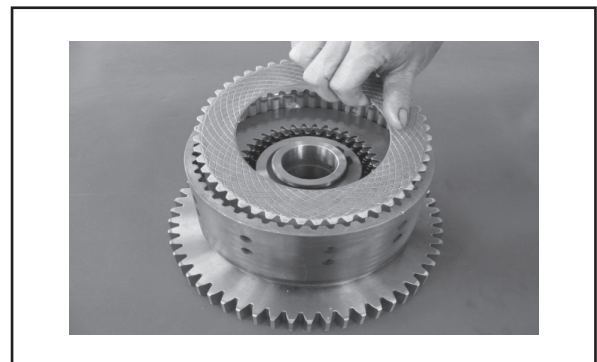


Figure.135

12. Install located block

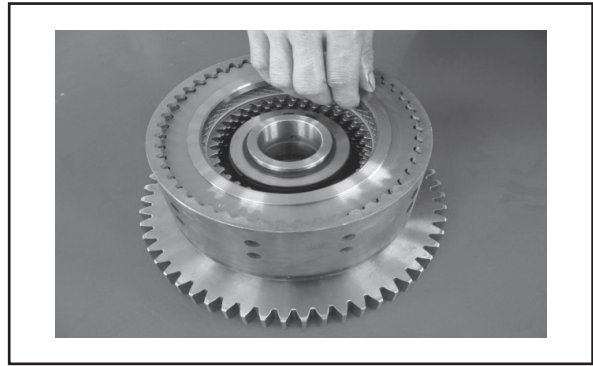


Figure.136

13. Install spring plate

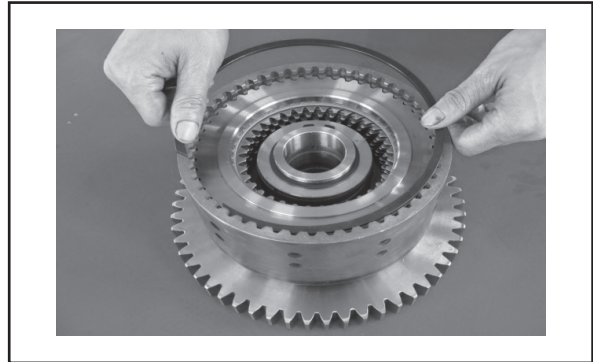


Figure.137

14. Install bearing

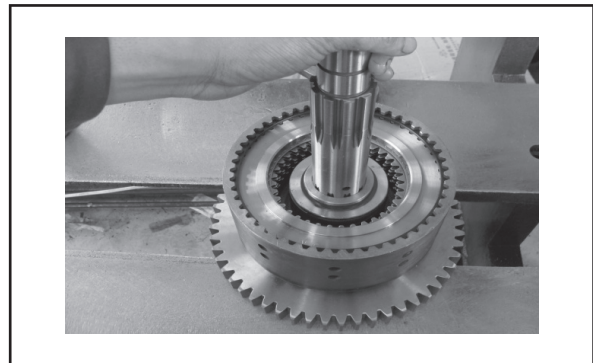


Figure.138

15. Install baffle ring on driven gear

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

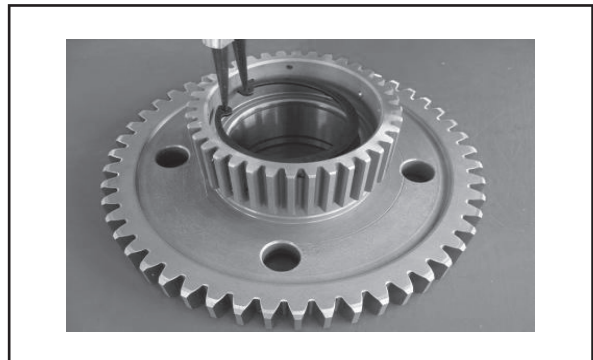


Figure.139

16. Install driven gear

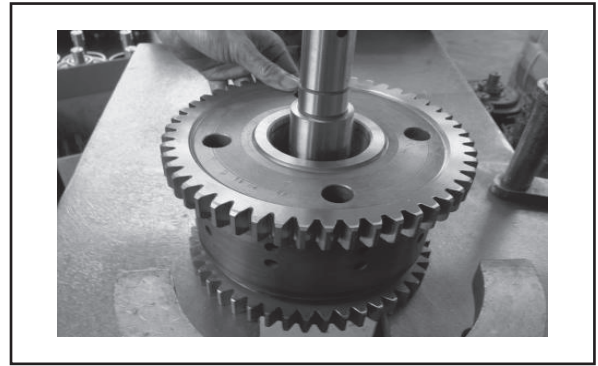


Figure.140

17. Install 2 bearings with press machine



Figure.141

18. Install baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

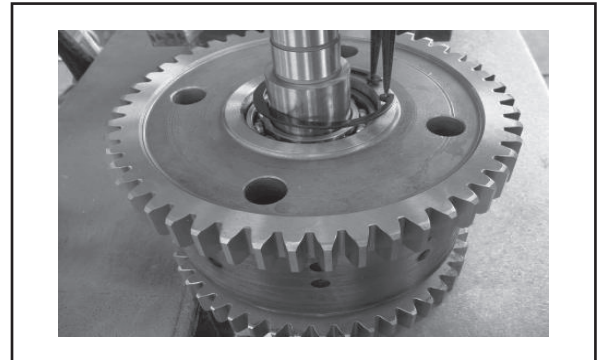


Figure.142

19. Install spacer bush

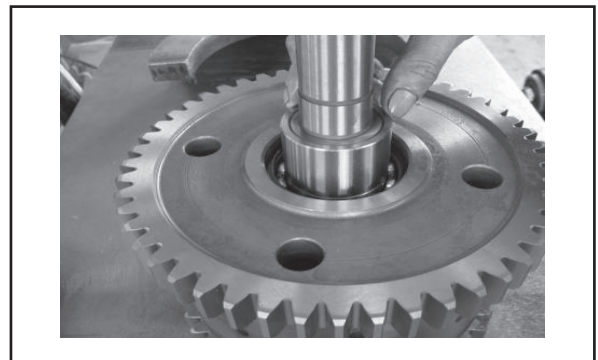


Figure.143

20. Install bearing

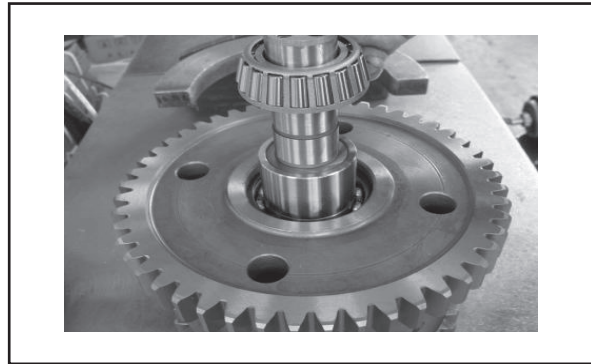


Figure.144

21. Install location block

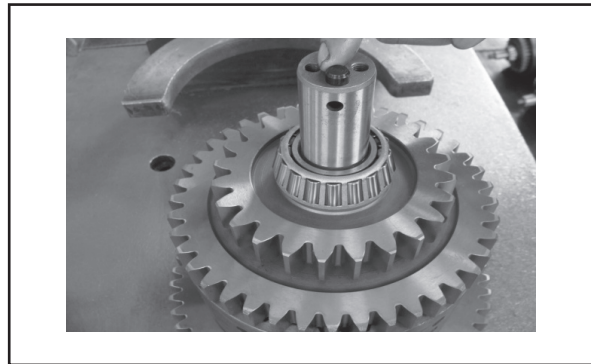


Figure.145

22. Install shaft sleeve

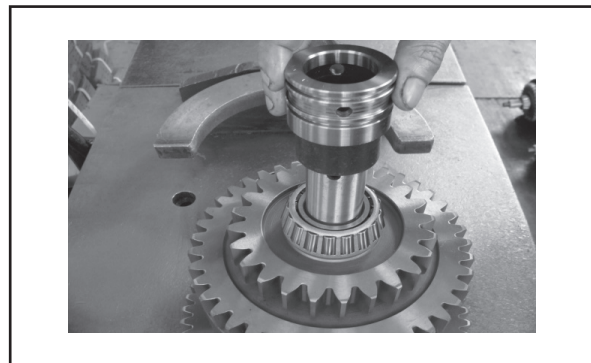


Figure.146

23. Install cover plate

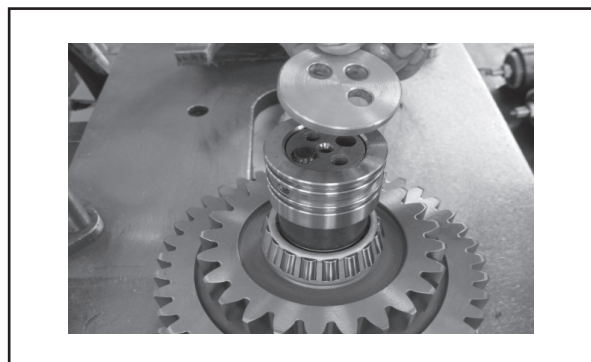


Figure.147

24. Install location plate

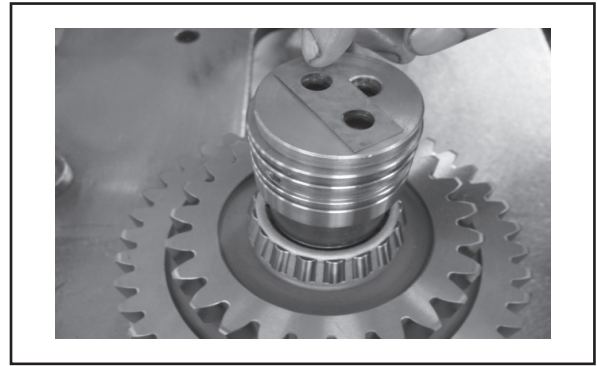


Figure.148

25. Screw down bolts and tilt edge of stator with tools

NOTE: Bolts fastening torque is 22~30Nm

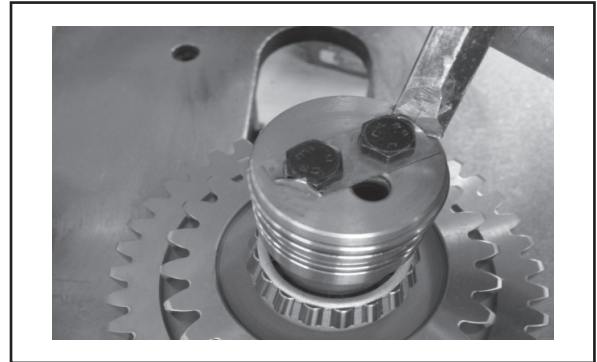


Figure.149

26. Reverse assembly and put it on work platform and install bearing

Clutch structure of I & III gear and reverse gear clutch are the same, but just size of gear is different, so installation process will not be repeated here.

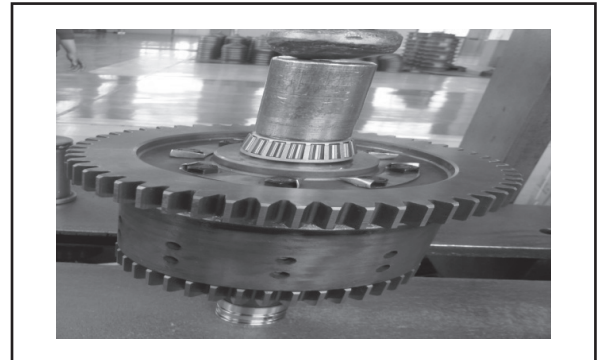


Figure.150

Installation of torque converter assembly

1. Put torque converter shell on installation platform horizontally.

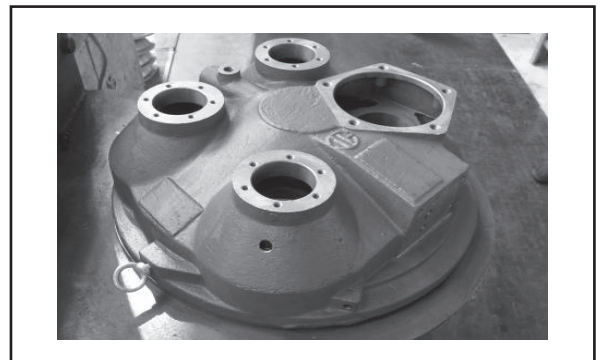


Figure.151

2. Install end cap

NOTE: Screw fastening torque is 22 ~ 30Nm

NOTE: Use Loctite 262 thread sealant

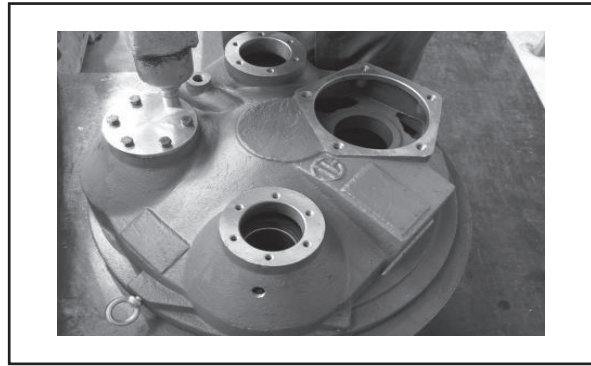


Figure.152

3. Screw on plug

NOTE: Bolt fastening torque is 193 ~ 257Nm

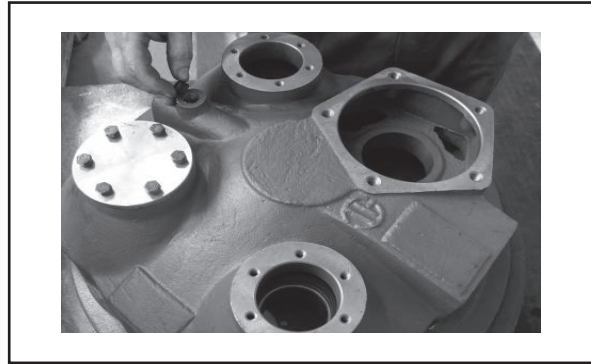


Figure.153

4. Install output flange

NOTE: Screw fastening torque is 110 ~ 130Nm

NOTE: Use Loctite 262 thread sealant

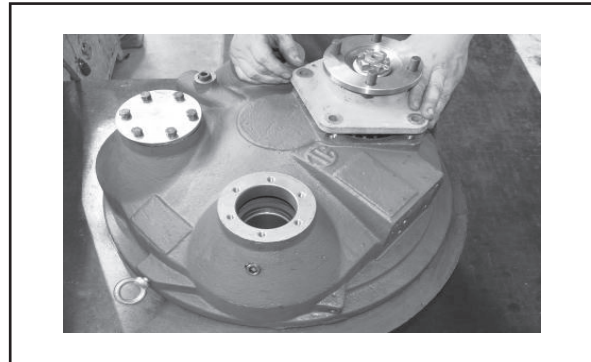


Figure.154

5. Install working pump and steering pump bearing

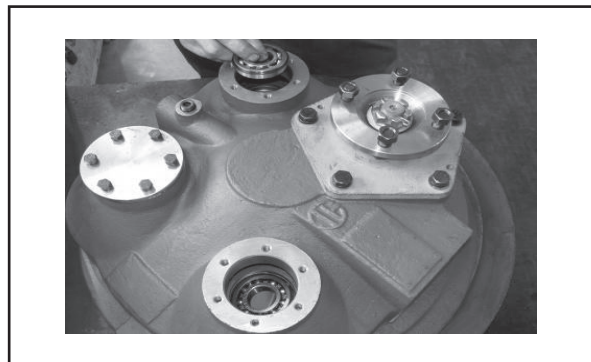


Figure.155

6. Install space ring on top of bearing

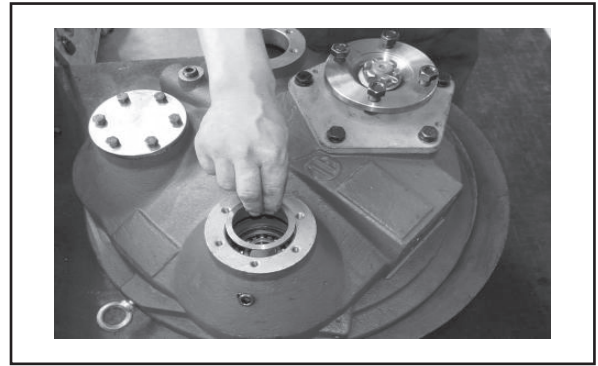


Figure.156

7. Install baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

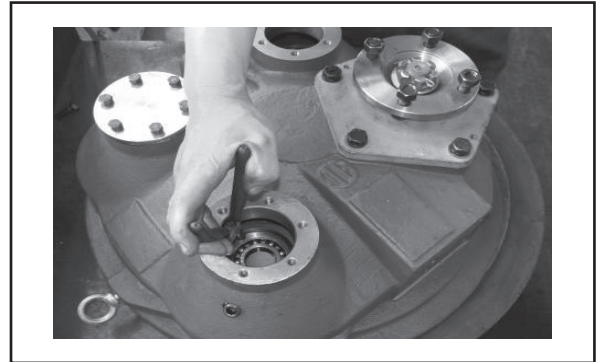


Figure.157

8. Install output axle

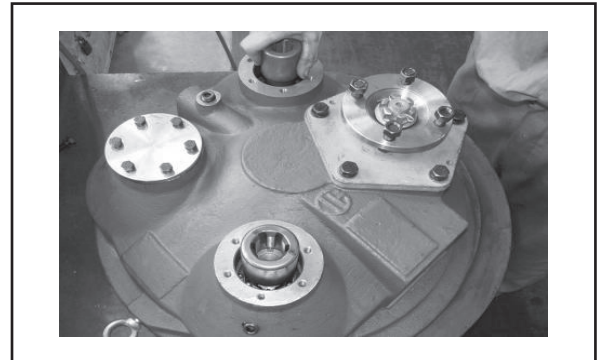


Figure.158

9. Install output flange

NOTE: *Screw fastening torque is 110 ~ 130Nm*

NOTE: *Use Loctite 262 thread sealant*

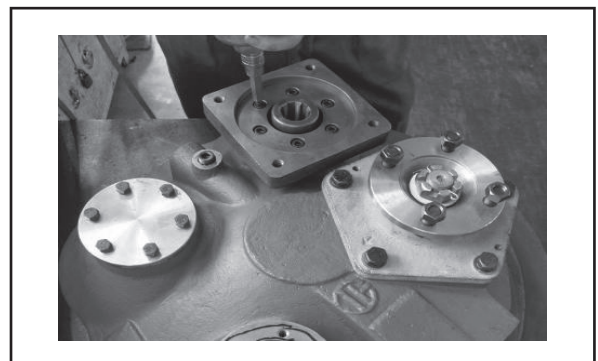


Figure.159

10. Overturn torque converter and put it on work platform horizontally

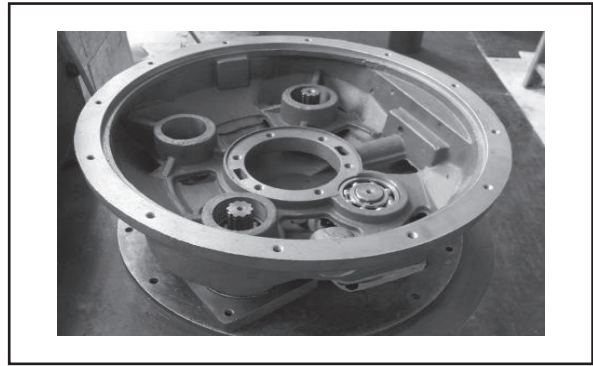


Figure.160

11. Install spacer bush and bearing of working pump and steering pump

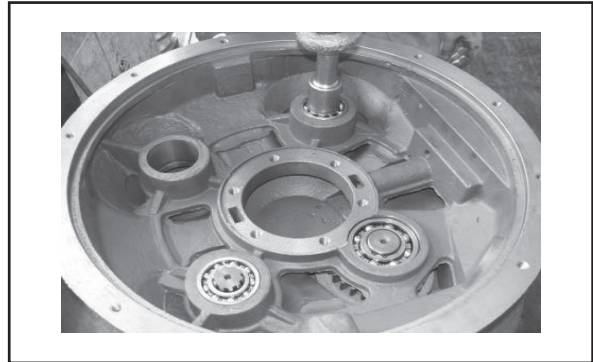


Figure.161

12. Install guide wheel seat
NOTE: Use lubrication oil

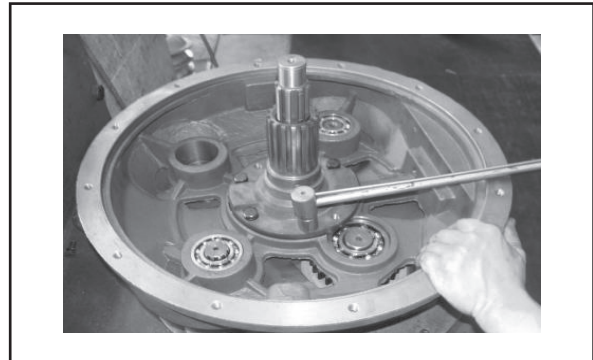


Figure.162

13. Install gear

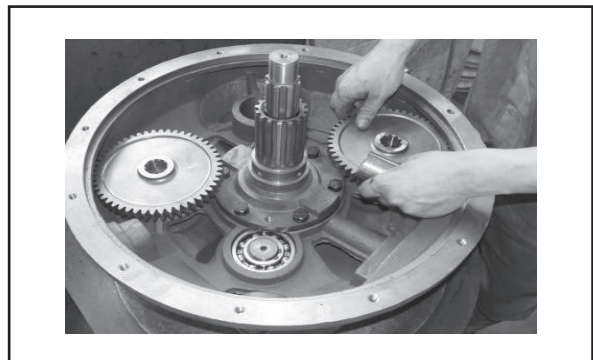


Figure.163

14. Install baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

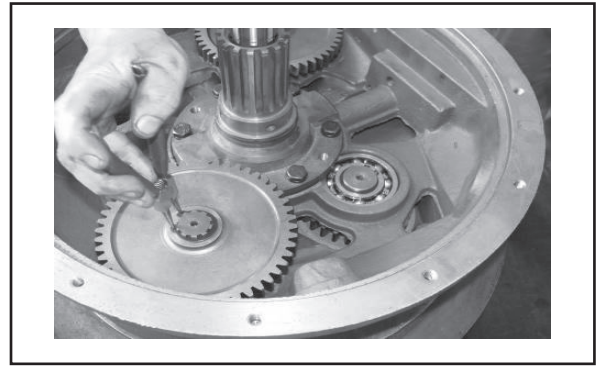


Figure.164

15. Install sealing gasket

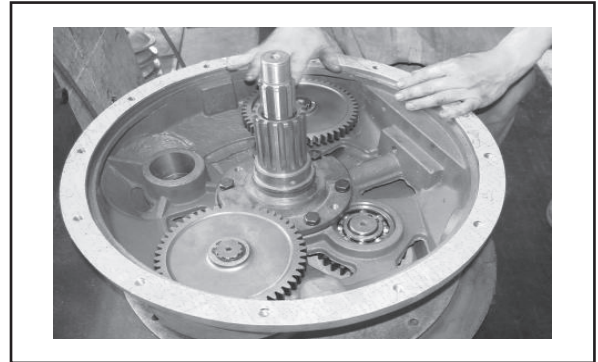


Figure.165

16. Hang transmission shell on pump pulley shell.

NOTE: *Bolt fastening torque is 22 ~ 30Nm*

NOTE: *Use Loctite 598 surface sealant*

NOTE: *Guarantee suspending tool is on top of main drive assembly to avoid knocking spare parts inside during suspending process.*

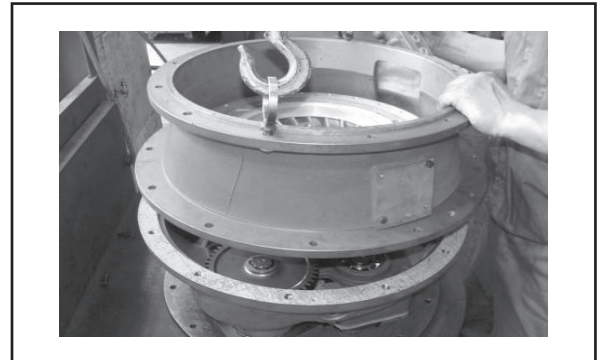


Figure.166

17. Install bearing

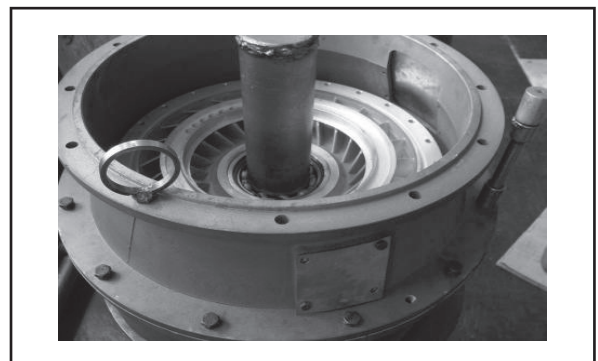


Figure.167

18. Install guide wheel

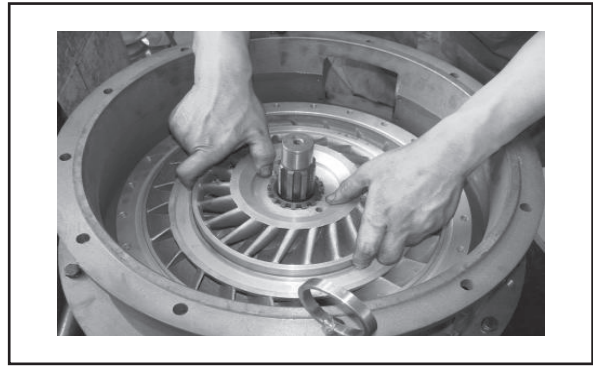


Figure.168

19. Install guide wheel baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

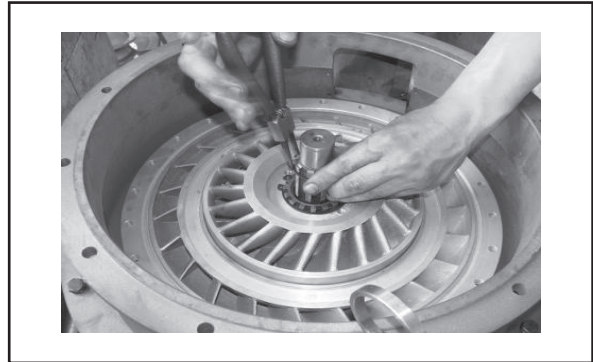


Figure.169

20. Install O ring



Figure.170

21. Install turbine

NOTE: *Bolt fastening torque is 22~ 30Nm*

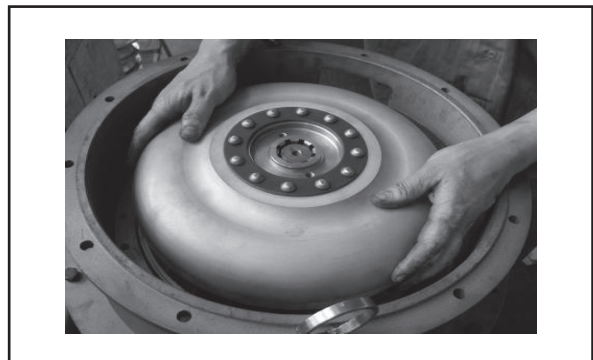


Figure.171

22. Install turbine baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

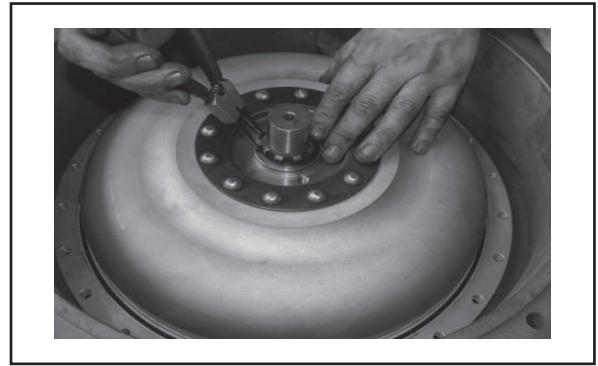


Figure.172

23. Install turbine spacer bush

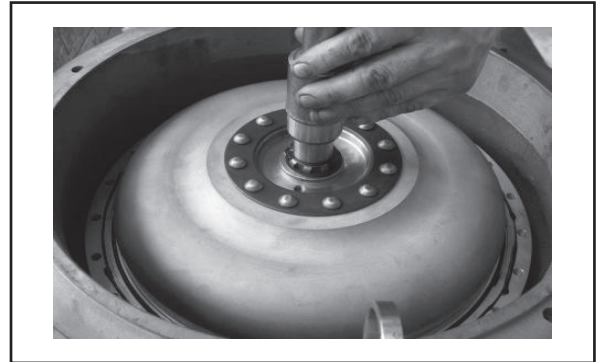


Figure.173

24. Install spacer bush baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

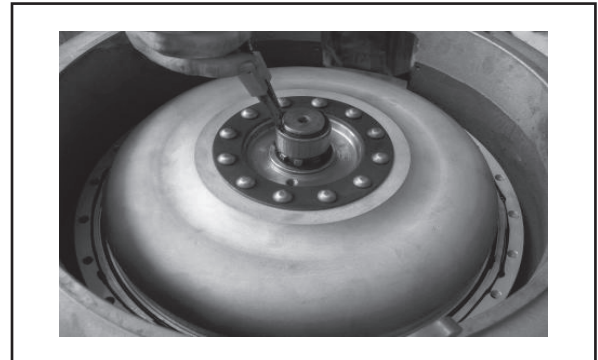


Figure.174

25. Install pump pulley shell

NOTE: *Bolt fastening torque is 45 ~ 59Nm*



Figure.175

26. Install elasticity plate

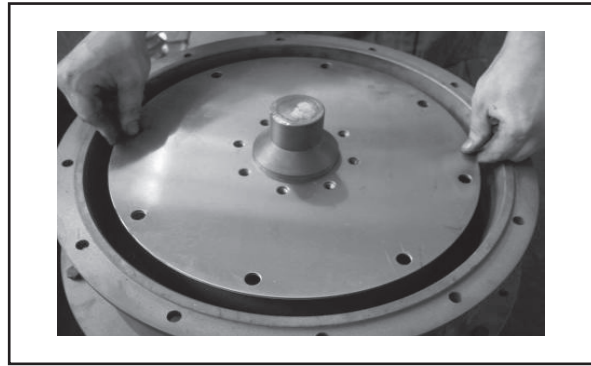


Figure.176

27. Install gasket

NOTE: Bolt fastening torque is 45 ~ 59Nm

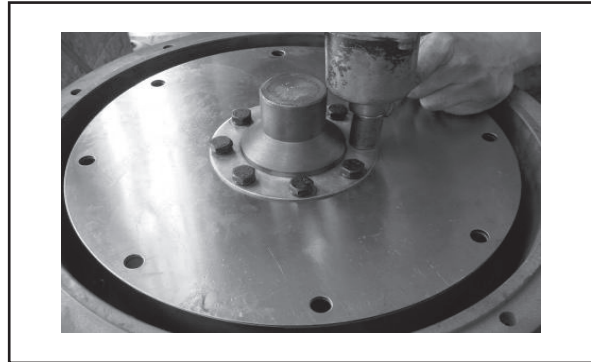


Figure.177

28. Install sealing gasket on pressure regulating valve

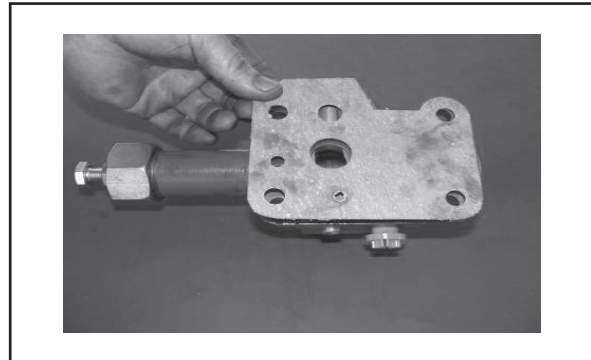


Figure.178

29. Install pressure regulating valve

NOTE: Bolt fastening torque is 45 ~ 59Nm

NOTE: Loctite 598 surface sealant

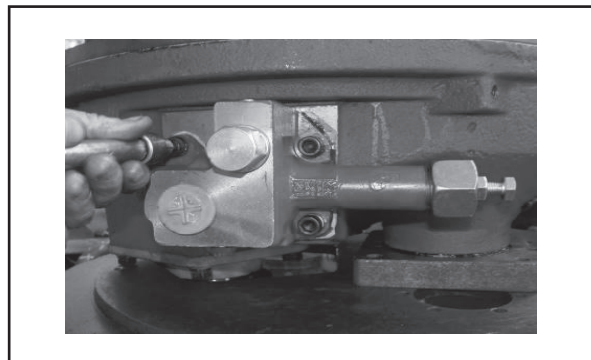


Figure.179

Installation of guide wheel seat assembly

1. Put guide wheel on installation platform horizontally

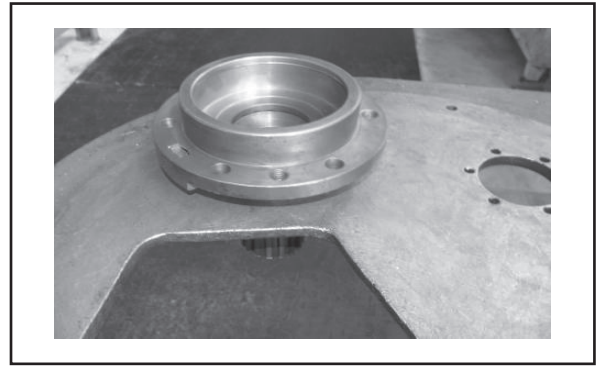


Figure.180

2. Install shaft sleeve

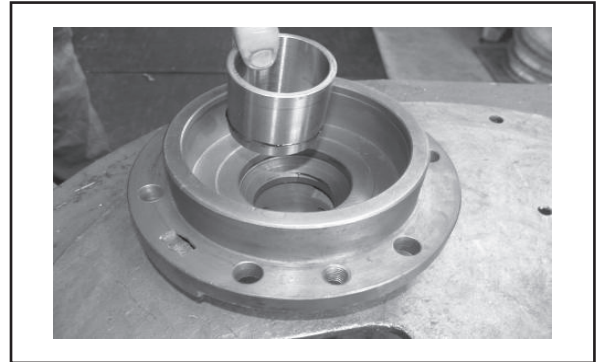


Figure.181

3. Install shaft

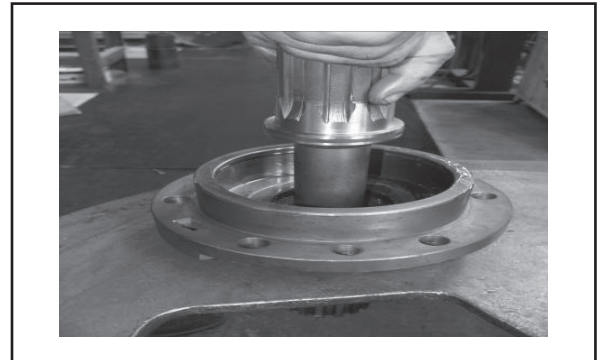


Figure.182

4. Install bearing

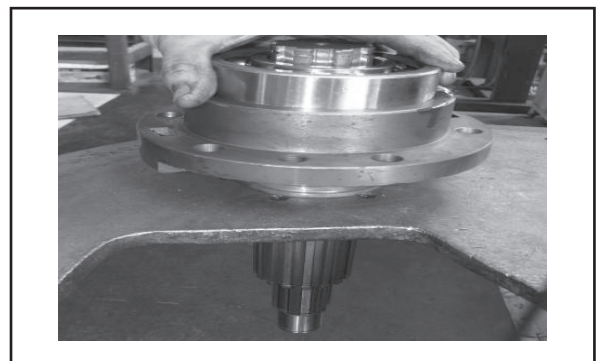


Figure.183

5. Install baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

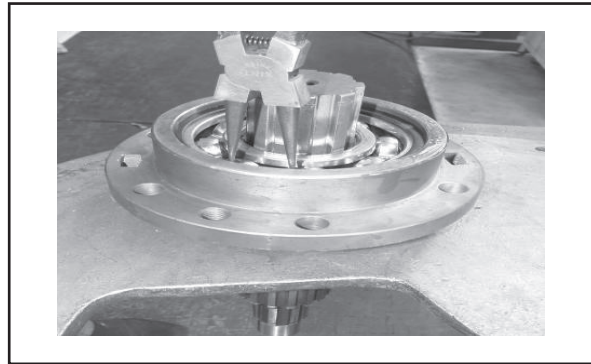


Figure.184

6. Install gear

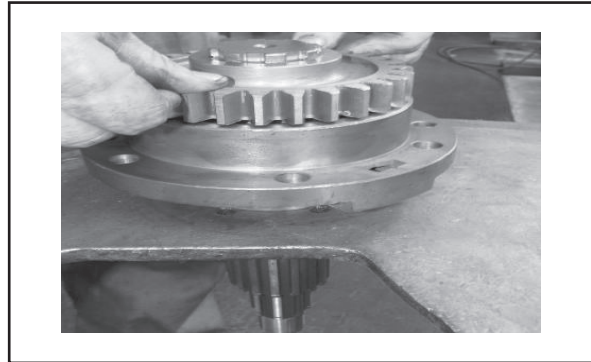


Figure.185

7. Install gear baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

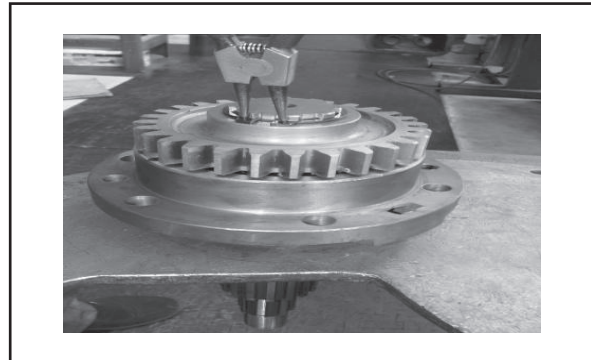


Figure.186

Installation of output flange

- Put flange on work platform horizontally, install bearing

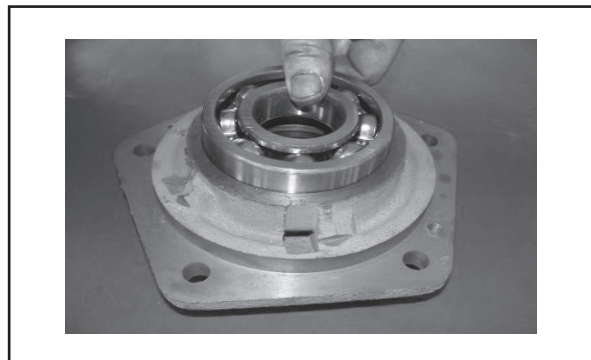


Figure.187

2. Install bearing baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

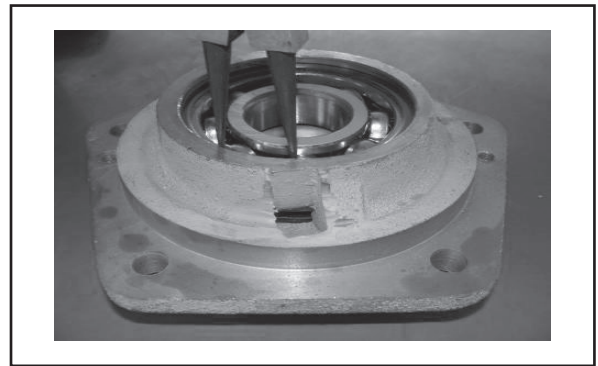


Figure.188

3. Install shaft

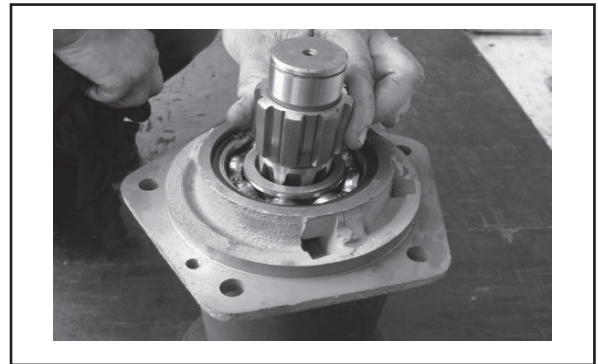


Figure.189

4. Install gear

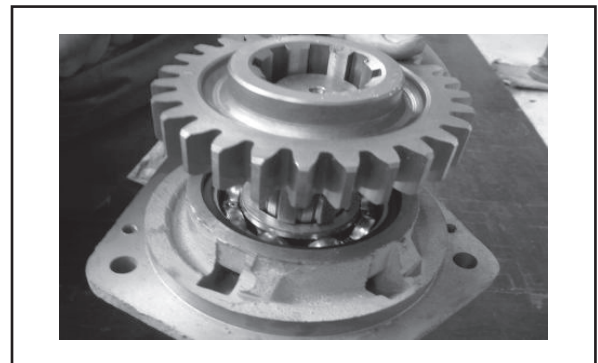


Figure.190

5. Install bearing

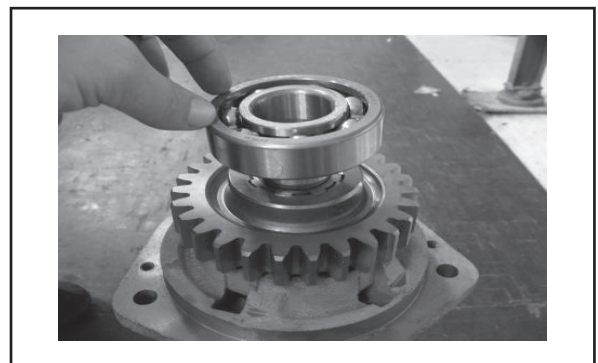


Figure.191

6. Install bearing baffle ring

NOTE: *It must be clamped firmly when using baffle ring pincer to avoid safety hazard.*

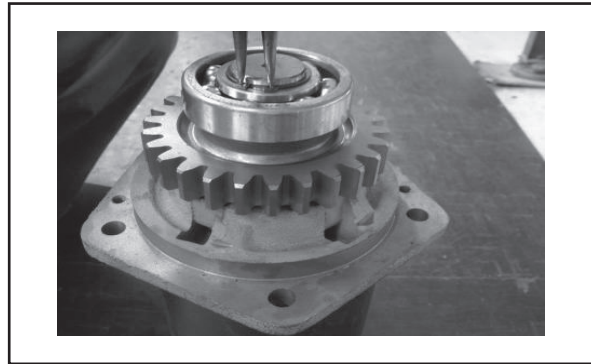


Figure.192

7. Reverse output flange and put it on work platform

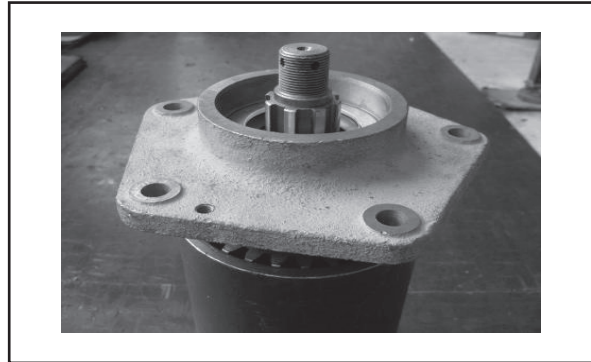


Figure.193

8. Install flange

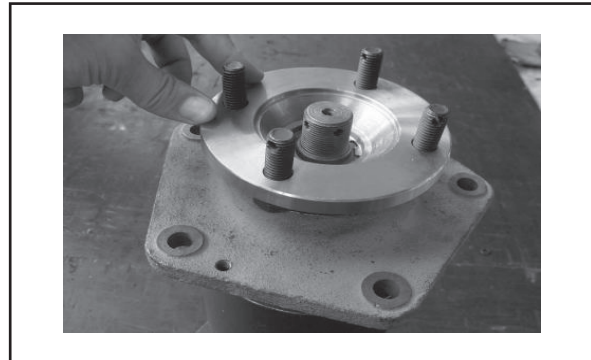


Figure.194

9. Install shock insulator, sealing ring, shock insulator and hold-down but, and fix bolts with cotter pin.

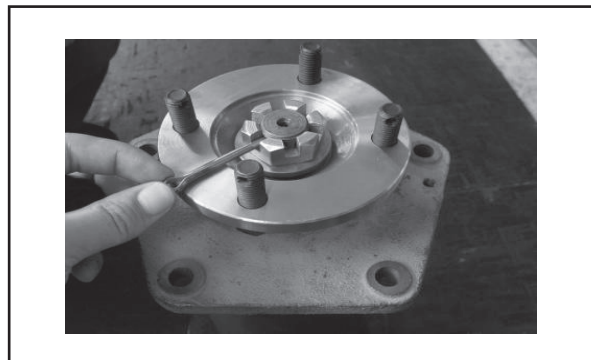


Figure.195

HYDRAULICS

CYLINDERS



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that is in good working order.

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General Description

Working principle

It is usually composed of cylinder body, piston rod and sealing parts, internal of cylinder body is divided into two parts and connect with a oil hold respectively. Since compression of liquid is very small, when oil coming into one oil hole, piston will be propelled to make oil going out from another oil hole, piston drives piston rod stretching (compressing), on the contrary as before.

Cylinder is the implementing part of the straight line movement of output force and piston effective area and the pressure difference at both sides. It is used to change hydraulic energy into mechanic energy. The input of cylinder is flow rate and pressure of fluid, the output is speed and force of straight line movement. Piston of cylinder can finish straight line alternating motion, the output straight line displacement is limited. Cylinder is the energy converting device from hydraulic energy to mechanic energy for alternating straight line movement. Cylinder is basically composed of cylinder barrel, cylinder cover, piston, piston rod, sealing device and cushioning device.

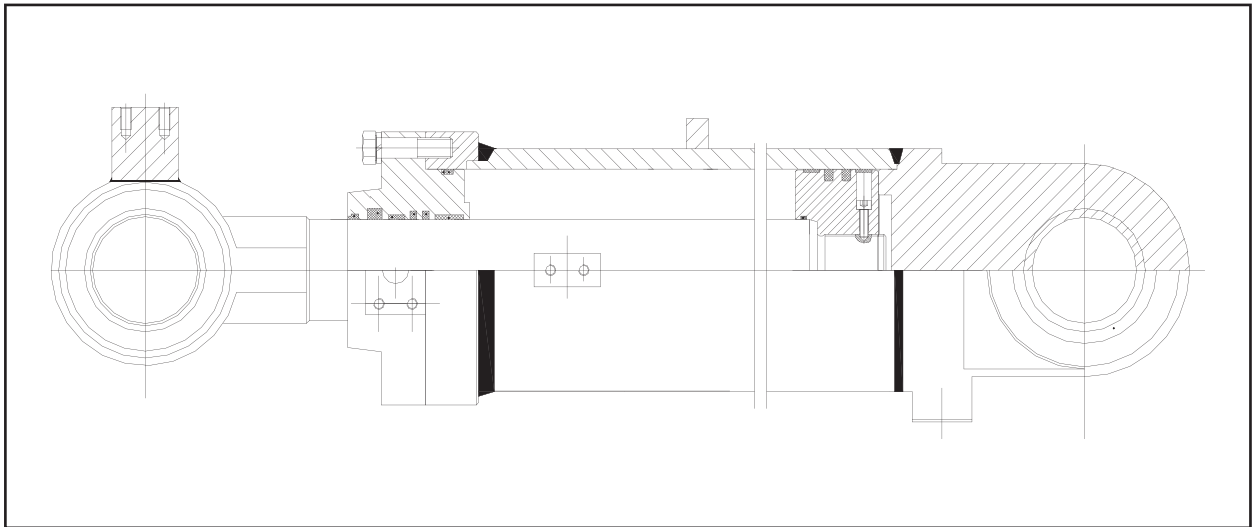


Figure.1

Detailed list of spare parts

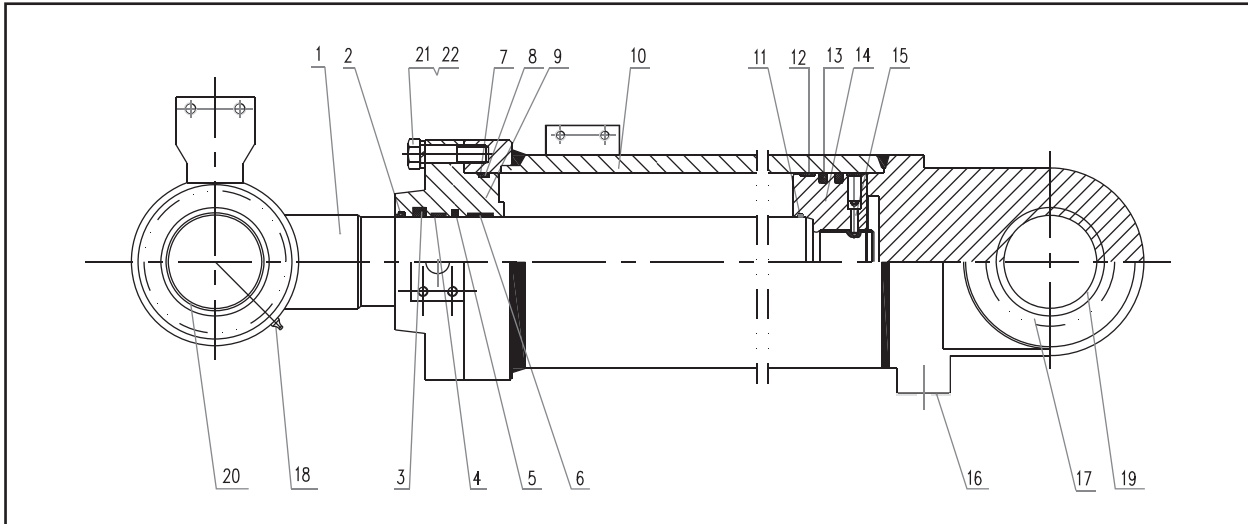


Figure.2

| Reference Number | Description | Reference Number | Description |
|------------------|----------------------------|------------------|-----------------------|
| 1 | Cylinder rod | 12 | Support ring |
| 2 | Dust ring | 13 | SPGO |
| 3 | Obturating ring | 14 | Piston |
| 4 | Support ring | 15 | Socket head cap screw |
| 5 | Cushion seal | 16 | Port protecting cover |
| 6 | Support ring | 17 | Hole protecting cover |
| 7 | Four fluorine block circle | 18 | Oil cup |
| 8 | O-RING | 19 | Cylinder end bush |
| 9 | Guide sleeve | 20 | Bush |
| 10 | Cylinder block | 21 | Bolt |
| 11 | O-RING | 22 | Washer |

Disassembling and assembling steps

Disassembling steps

NOTE: Prepare a container which can store all hydraulic oil of the maintained cylinder, hydraulic oil will flow out from cylinder.

1. Put the cylinder on special supporting vertically, screw down bolts of cylinder cover with pneumatic wrench or torque wrench.

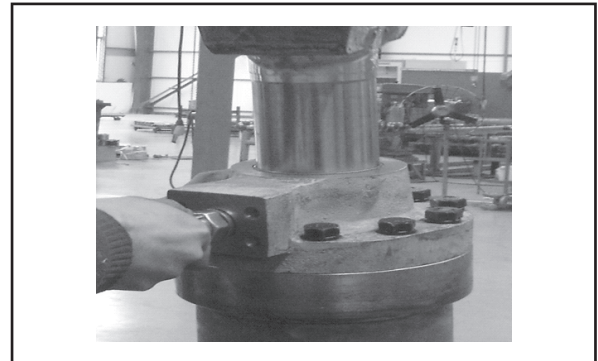


Figure.3

2. Hang piston rod assembly out from cylinder and put it on special protective support.

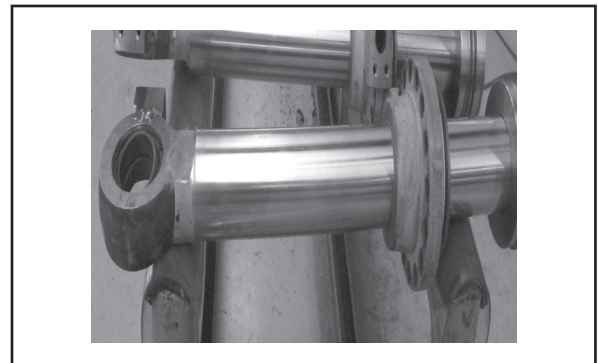


Figure.4

3. Twist piston lock screw with special tools.

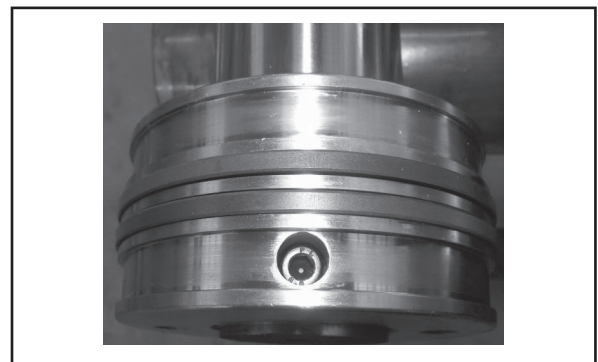


Figure.5

4. Dismantle piston with special piston tightening tool and jackhammer.

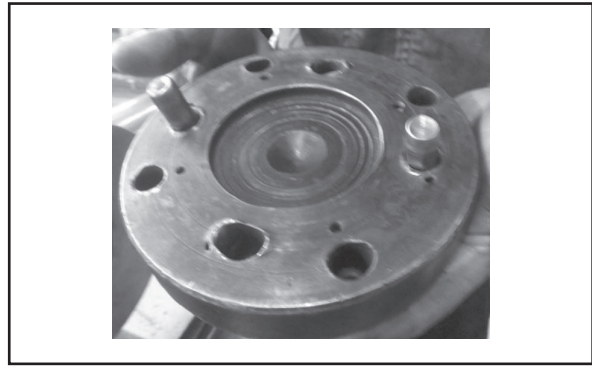


Figure.6

5. Dismantle piston and cylinder cover assembly.

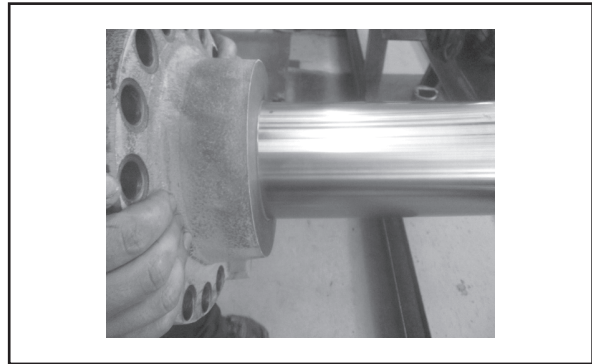


Figure.7

6. Dismantle sealing parts with special tools.

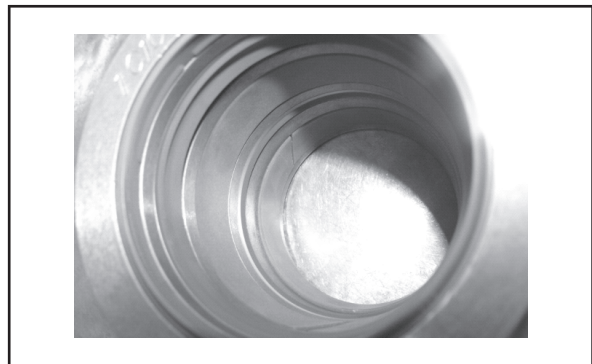


Figure.8

Assembling steps

1. Install sealing parts of cylinder.

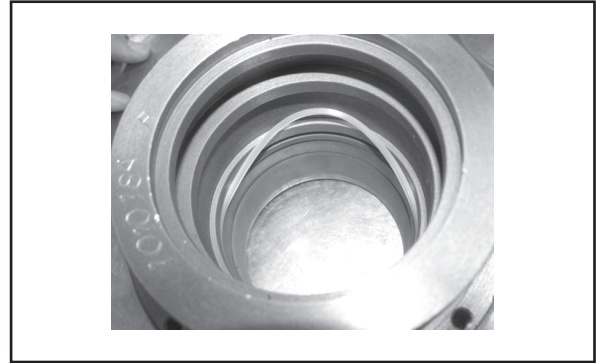


Figure.9

2. Install cylinder cover assembly.

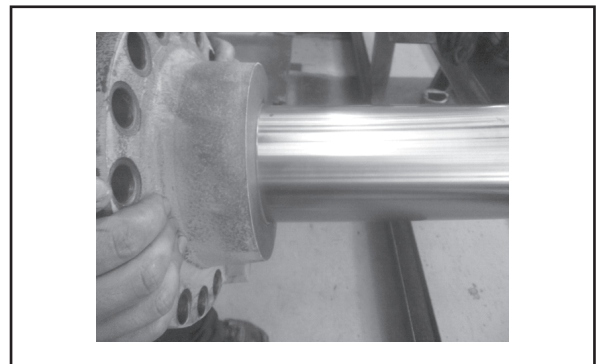


Figure.10

3. Install piston with special tools.

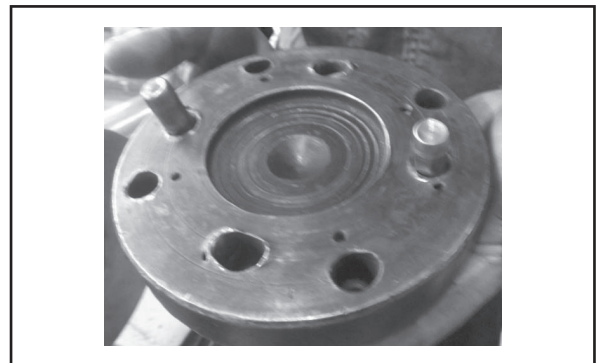


Figure.11

4. Screw down piston bolts with special tools.

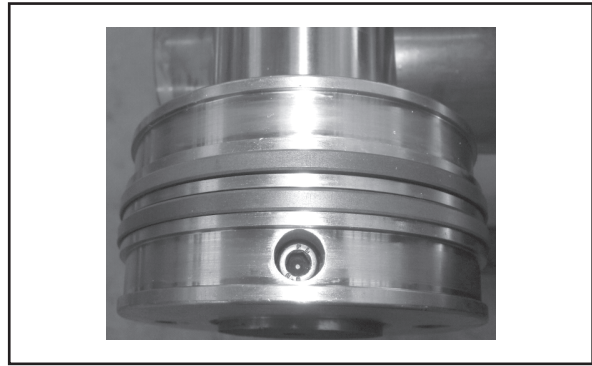


Figure.12

5. Put piston rod in cylinder barrel.

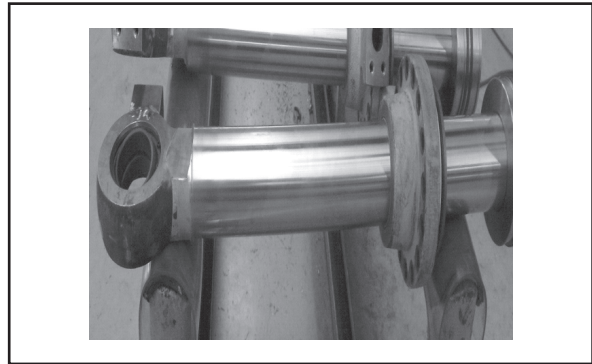


Figure.13

6. Screw down bolts of cylinder cover and cylinder barrel.

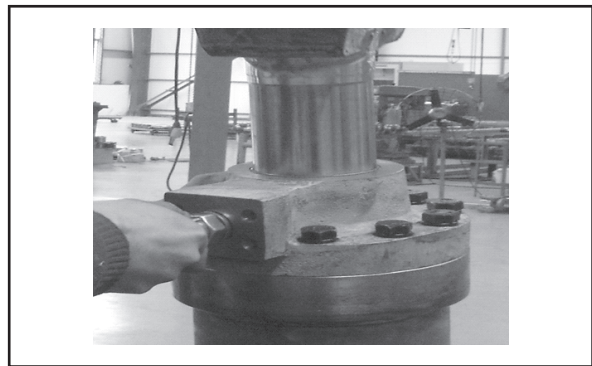


Figure.14

Main Pump



CAUTION!

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Use lifting and hoisting equipment capable of safely handling load.

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| Preparation before Disassembling..... | 5 |
| Disassembly and Assembly Steps..... | 6 |

General description

Work principle

Function of main pump is to convert mechanic energy of diesel into pressure energy of working liquid. Main pump is a kind of hydraulic pump with simple structure and wide application, it has small size, light weight, reliable work, low cost and not too sensitive to hydraulic oil, convenient for maintenance and repair, and therefore it is widely applied in hydraulic system of loaders.

Main pump has many types, according to different pressure grade, it can be divided into four types which are: low pressure ($P < 2.5\text{MPa}$), medium pressure ($P > 2.5\text{—}8\text{MPa}$), mesohigh pressure ($P > 8\text{—}16\text{MPa}$) and high pressure ($P > 16\text{—}31.5\text{MPa}$). At present, mesohigh pressure main pumps are used often for loaders. According to difference of gear mesh form, it can be divided into main pump with external mesh and main pump with internal mesh. Of which main pumps with external mesh are more popular.

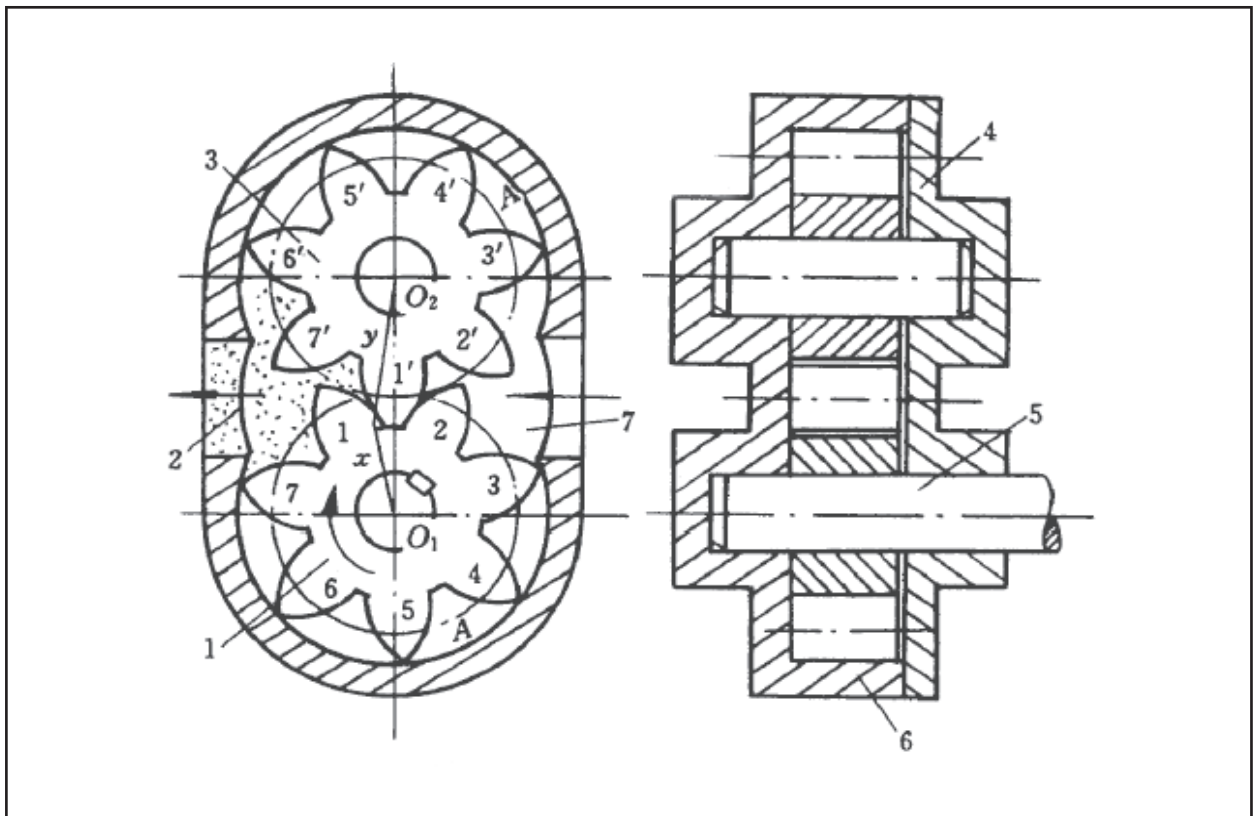


Figure.1

- 1. Driving gear
- 2. Extrusion chamber
- 3. Driven gear
- 4. End cap
- 5. Transmission shaft
- 6. Pump body
- 7. Suction chamber

Detailed list of spare parts

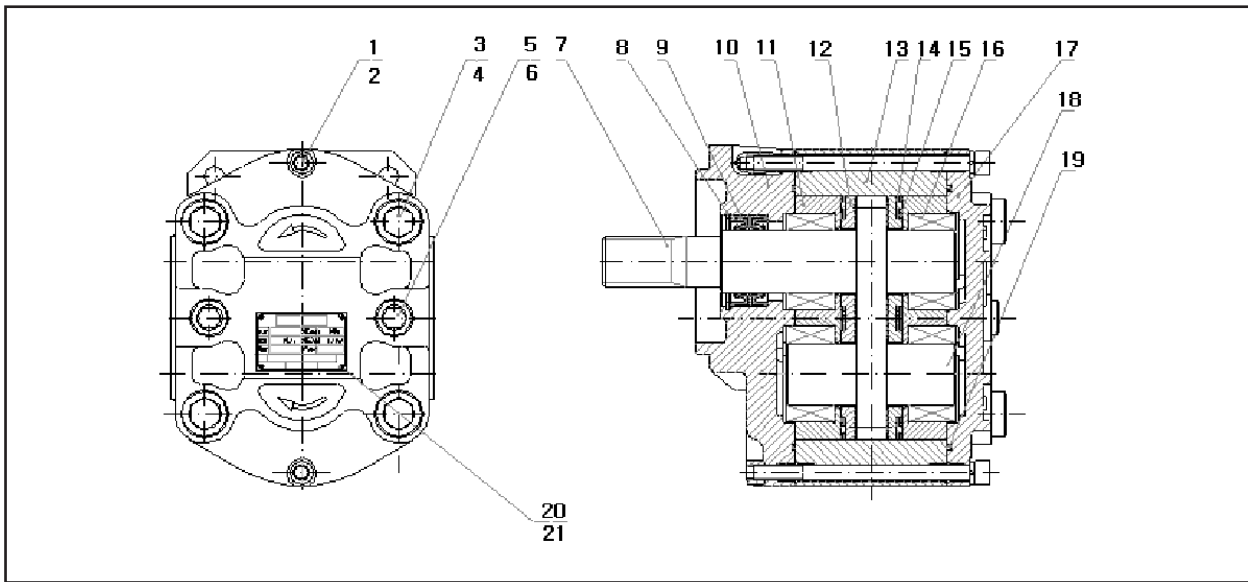


Figure.2

| Reference Number | Description | Reference Number | Description |
|------------------|--------------|------------------|---------------|
| 1 | BOLT | 12 | Side Plate |
| 2 | WASHER | 13 | Pump Block |
| 3 | BOLT | 14 | Seal Ring |
| 4 | WASHER | 15 | Block |
| 5 | BOLT | 16 | Needle Roller |
| 6 | WASHER | 17 | Rear Cover |
| 7 | Drive Gear | 18 | Driven Gear |
| 8 | Snap Ring | 19 | Seal Ring |
| 9 | Oil Seal | 20 | Label |
| 10 | Front Cover | 21 | Screw |
| 11 | Fixing Cover | | |

Parts replacement principle

If main pump needs to be repaired to reach the original performance index, parts replacement principle must be followed to replace parts, following is the detailed replacing rules:

1. Side plate: replace side plate when it is scratched, there is pit, spray and finishing layer sheds, burnt, deformed and cavitations corrosion.
2. Gear: replace gear when one of the following conditions happens: shaft diameter of gear shaft is scratched or worn in sealing zone; teeth surface of gear is worn, scratched, broken or deformed; addendum circle is damaged seriously; multiple spline or flat key and spindle nose are worn, deformed and broken.
3. Castings (front cover, pump body, and rear cover):
 - 3.1 If there is flaw on castings, and sealing zone has chip, rust, deformed pin hole, then replace castings.
 - 3.2 Replace pump body when one of the following conditions happens: oil mouth is broken, pump body is broken and rusty; when bore depth of pump body $> 0.08\text{mm}$.
4. Round pin: round pin must be replaced when the matching does not comply with requirements, pin is broke and deformed, replace the front cover, pump body and rear cover matched with round pin when it is necessary.
5. Rolling bearing: new parts must be replaced when quill roller drops, retainer is damages, quill roller has surface pitting, roller path has surface pitting, over sintering.
6. Second sealing ring: replace with new parts when there is inner diameter abrasion, end face abrasion, thickness is milled, deformed, surface is coarse.
7. Non-metal sealing parts: all non-metal sealing parts must be replaced.
8. Outboard bearing: replace with new parts when parts are worn and rusty.
9. Fastener: replace it when it is drawn out, deformed and damaged.

Preparation before disassembling

1. Clean the surface of pump, and check if the surface has chip and rust.
2. Check model and factory releasing number on nameplate, if there is no nameplate on pump, check factory releasing number at seam allowance of front cover.
3. Fill in relative information on main pump returned for maintenance card before disassembling, such as manufacturer, applicable machine model, applicable working condition, pump model, factory releasing number, factory releasing date, head and marks of fabricator, working parameters (pressure, rotation, impact and the constant running time at the highest pressure) on main machine, total working time of main pump and reason for returning for maintenance, etc.
4. Make sure the production is released from the factory as a whole and it is not disassembled after releasing, otherwise it is not maintained.
5. If there is external leaking, do gas tightness checking to the entire pump and find out leaking position.
6. Check tightening torque of bolts (screw down bolts again with torque wrench, record the Max. tightening torque), learn if tightening torque of all bolts have reached the required specification.

Disassembly and assembly steps

Disassembly steps

1. Dismantle front end cap.

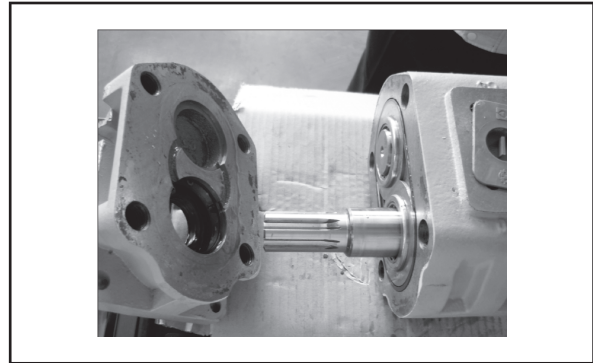


Figure.3

2. Dismantle jump ring with jump ring pincer.

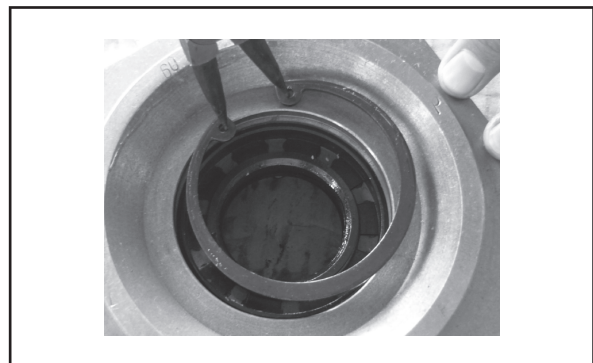


Figure.4

3. Take out framework oil seal.

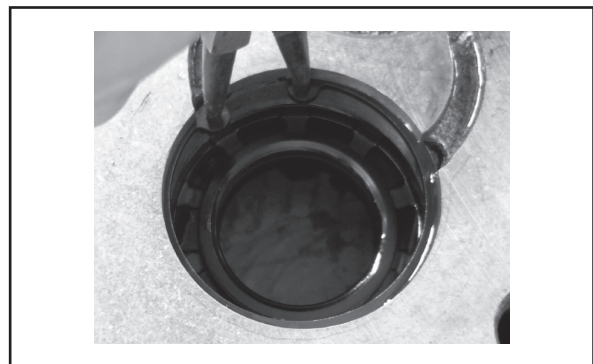


Figure.5

4. Take out support wire.

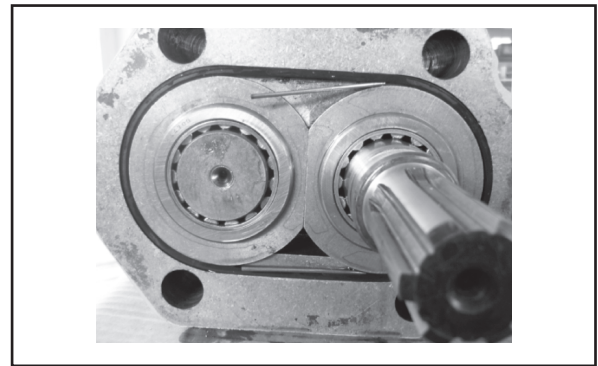


Figure.6

5. Dismantle sealing ring.

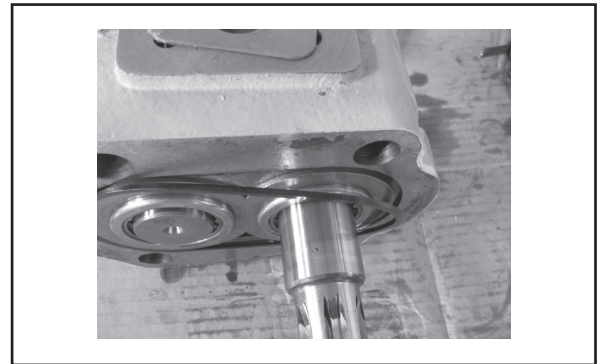


Figure.7

6. Dismantle bearing.

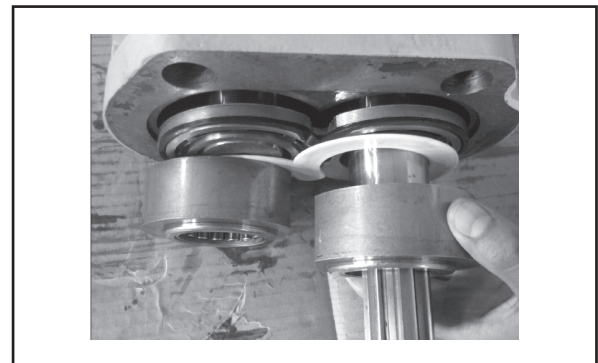


Figure.8

7. Dismantle front ear type sealing ring

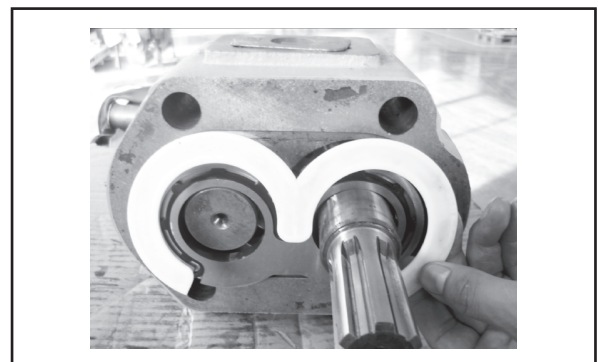


Figure.9

8. Dismantle ear type sealing ring.

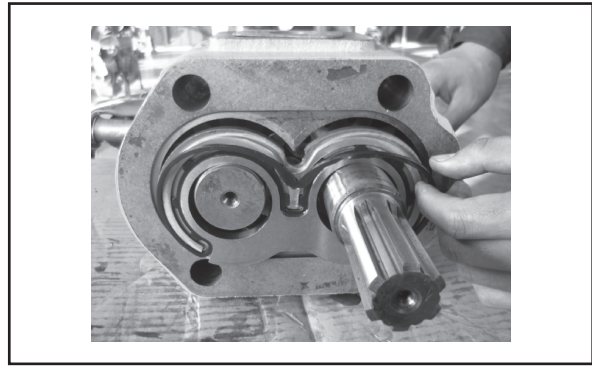


Figure.10

9. Dismantle side plate.



Figure.11

10. Dismantle driven gear.

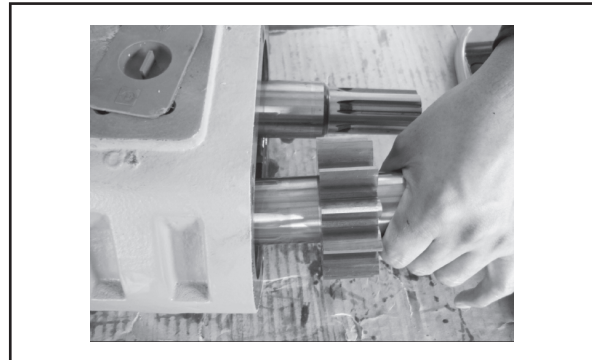


Figure.12

11. Dismantle active gear.

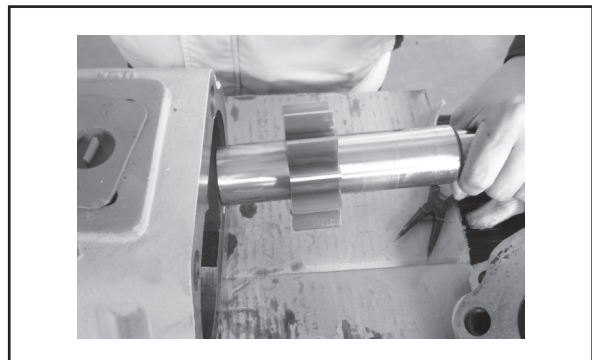


Figure.13

12. Dismantle rear cover bolts.

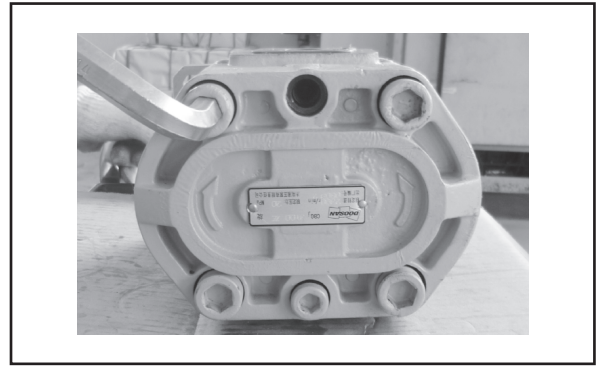


Figure.14

13. Dismantle rear cover.

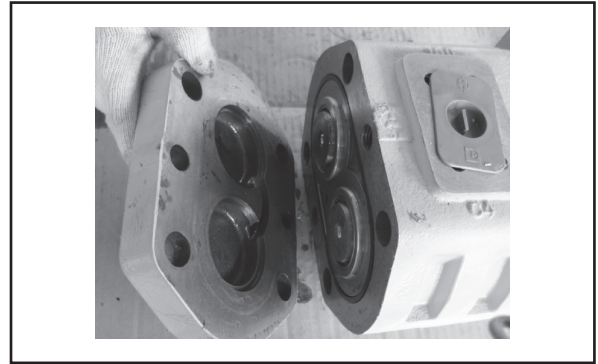


Figure.15

14. Dismantle wire of lower limitation.

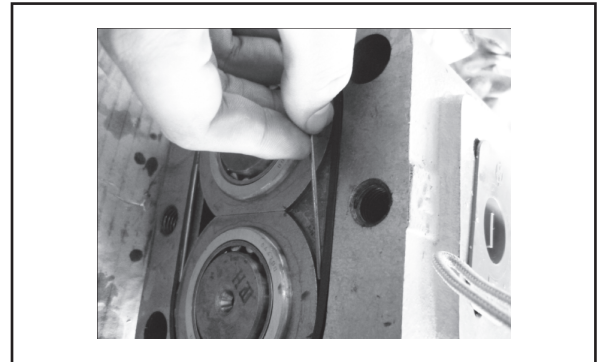


Figure.16

15. Dismantle sealing ring.

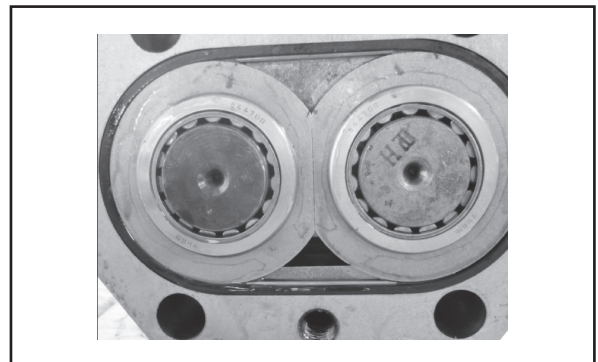


Figure.17

16 Dismantle bearing.

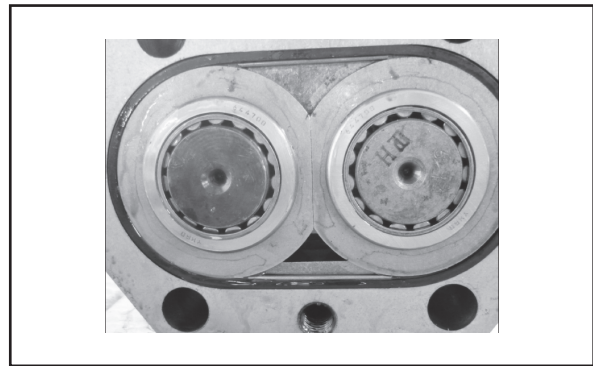


Figure.18

Installation steps

1. Install bearing.

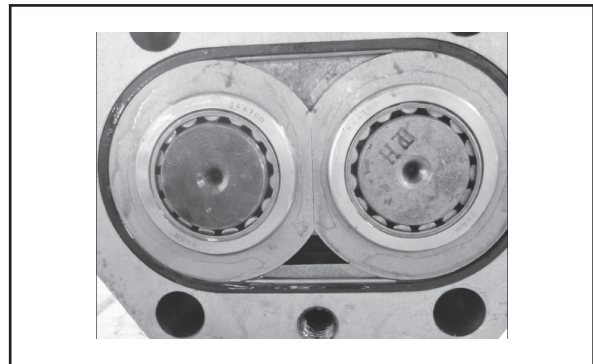


Figure.19

2. Install sealing ring.

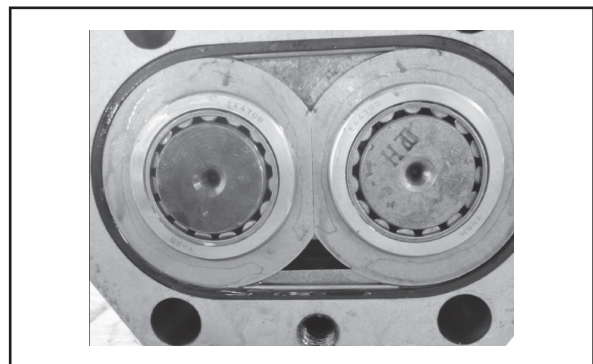


Figure.20

3. Install limitation wire.

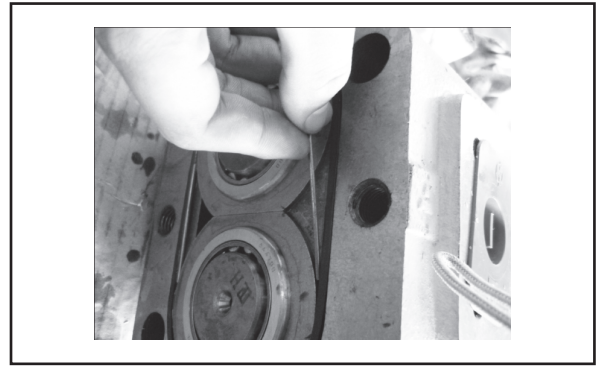


Figure.21

4. Install rear cover.

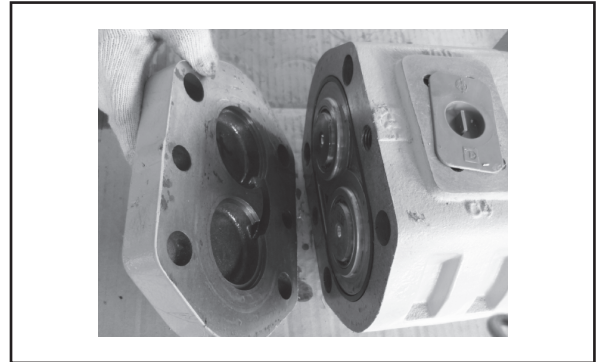


Figure.22

5. Install rear cover bolts.

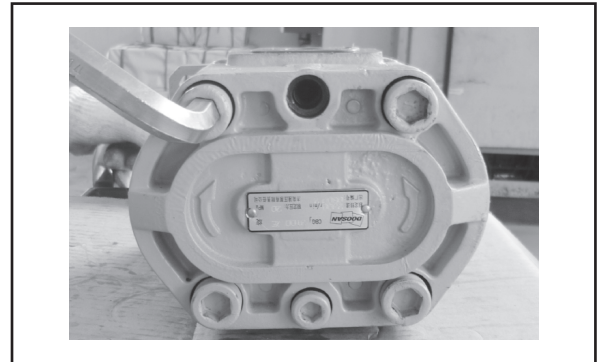


Figure.23

6. Install active gear.

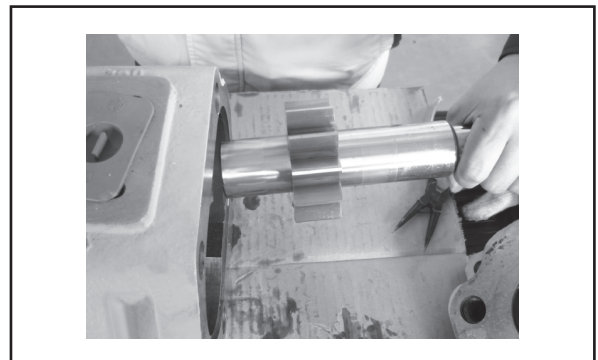


Figure.24

7. Install driven gear.

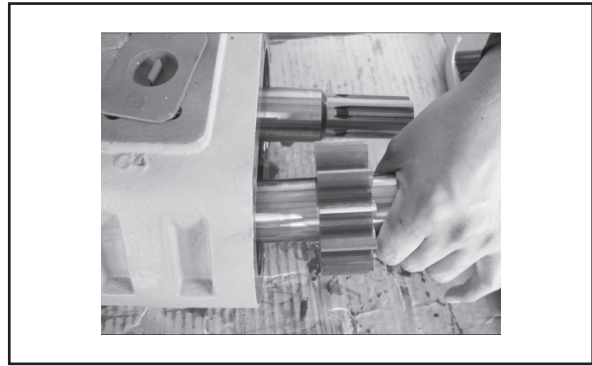


Figure.25

8. Install side plate.



Figure.26

9. Install ear type sealing ring.

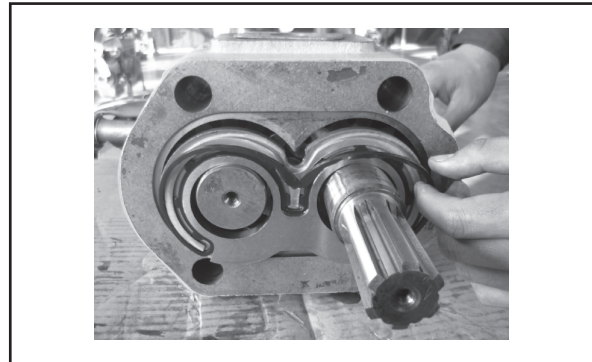


Figure.27

10. Install front ear type sealing ring.

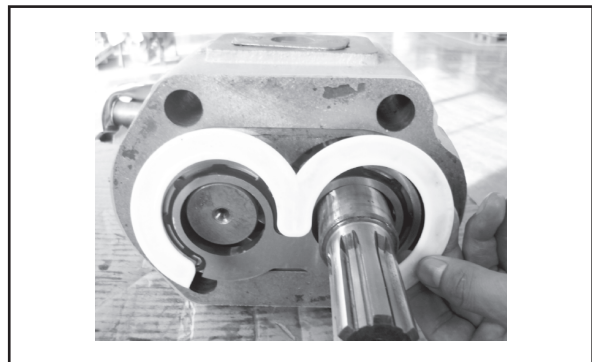


Figure.28

11. Install bearing.

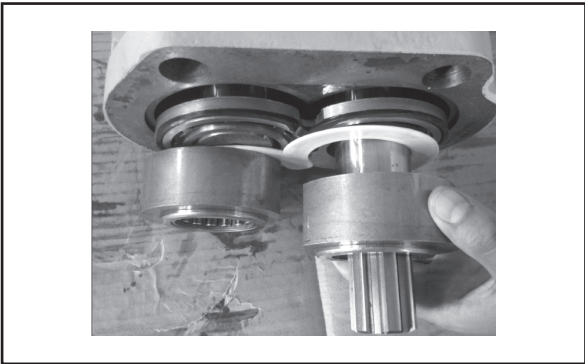


Figure.29

12. Install sealing ring.

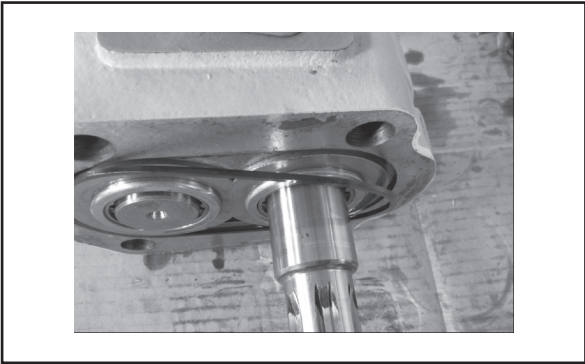


Figure.30

13. Install support wire.

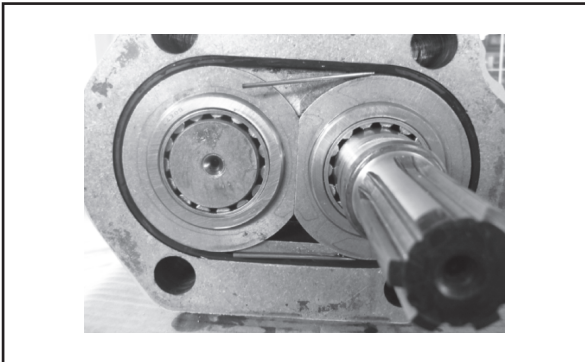


Figure.31

14. Install framework oil seal.

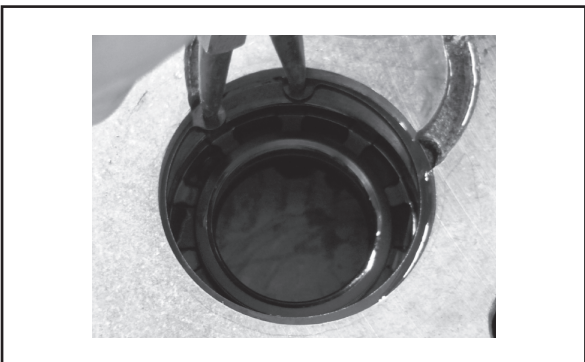


Figure.32

15. Install jump ring with jump ring pincer.

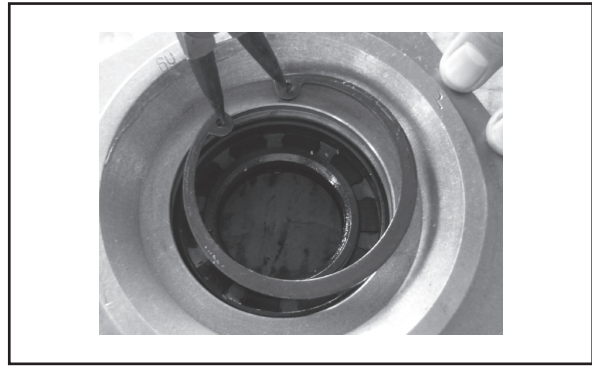


Figure.33

16. Install front end cover.

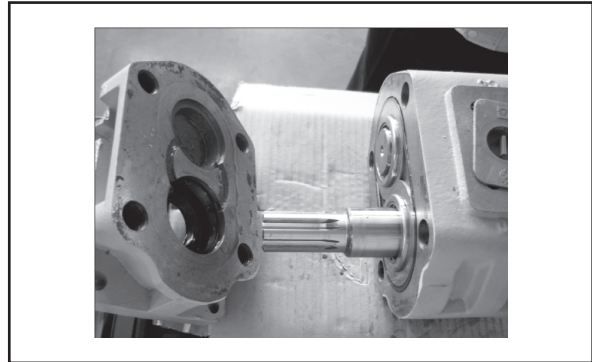


Figure.34

NOTE:

1. Clean parts with cleaning agent, do not use rag to avoid remaining any clothing fiber.
2. Slide touching parts and bearing, coating with hydraulic oil and assemble after cleaning.
3. Replace O ring and sealing parts with new ones:

Disassembling order: front cover →framework oil seal→ O ring →bearing →sealing ring →side plate
→driven gear →active gear →rear cover →O ring →bearing.

Assembling order: bearing →O ring →rear cover→ active gear→ driven gear→ side plate →sealing
ring→ bearing→ O ring→ framework →oil seal→ front cover.

Steer Pump



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- Basic Faults and Overcoming 7

GENERAL DESCRIPTION

1. Source: the hydraulic multi-way directional valve is domestic assorting parts for 950B, 966D and 980S wheel loaders introduced in from abroad.
2. Purpose: the valve is combined with DJS pilot valve, mainly used for ZL40, ZL50, ZL60 and other medium and large size loaders, it can also be used for hydraulic system of bulldozers and other medium and large size engineering machines.
3. Characteristics:
 - a. dopt decompression type pilot valve to control which reduce reversing operating force greatly.
 - b. Improve jogging feature of multi-way valve greatly.
 - c. Relief valve, overload valve, oil compensating valve and check valve adopt plug-in mounting which has good generality and easy for maintenance.
 - d. Four floating is easily realized on the basis of three main valves, which make four main valve structure simple.
 - e. It is convenient for pipe lay out, and reduces pressure loss of the system.
4. Schematic diagram

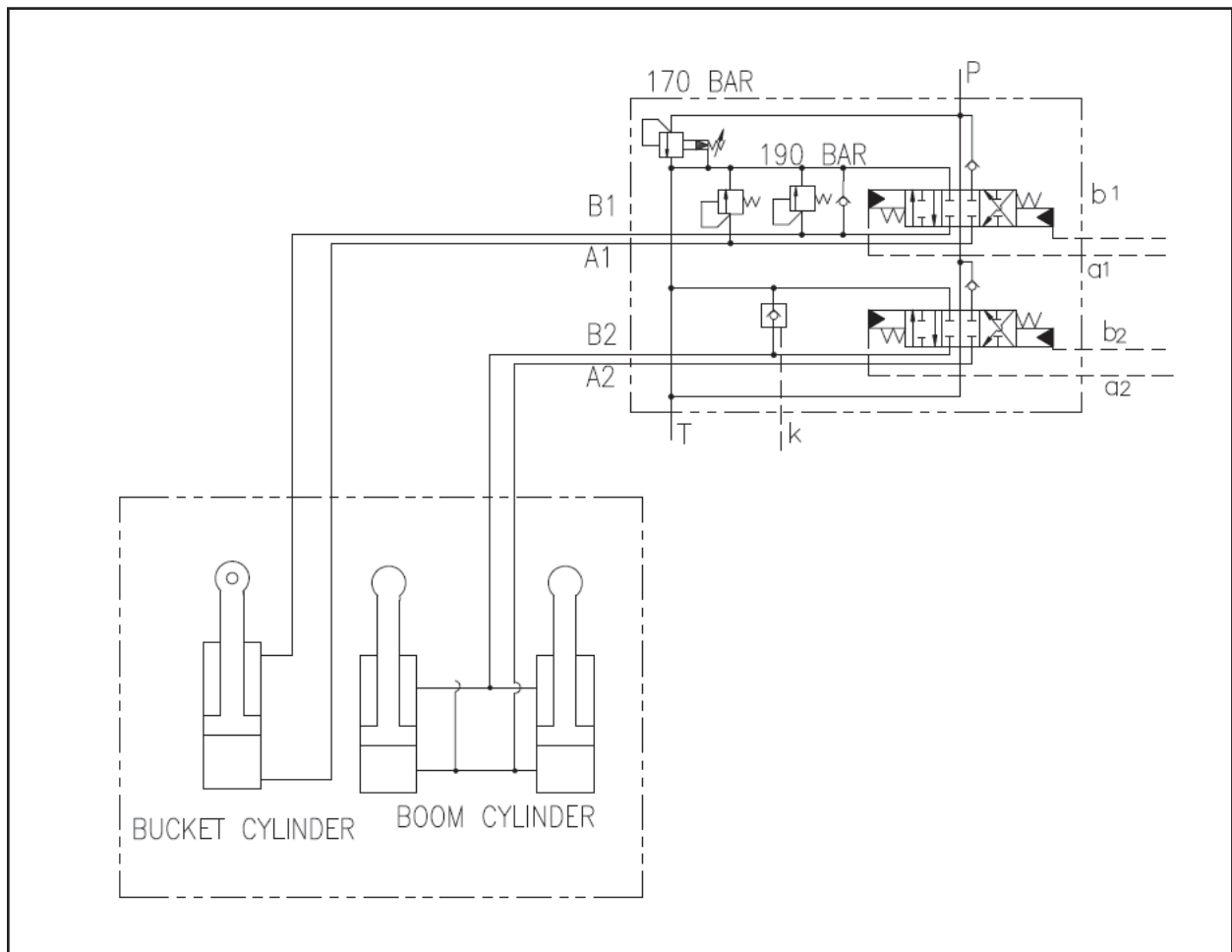


Figure.1

Detailed list of spare parts

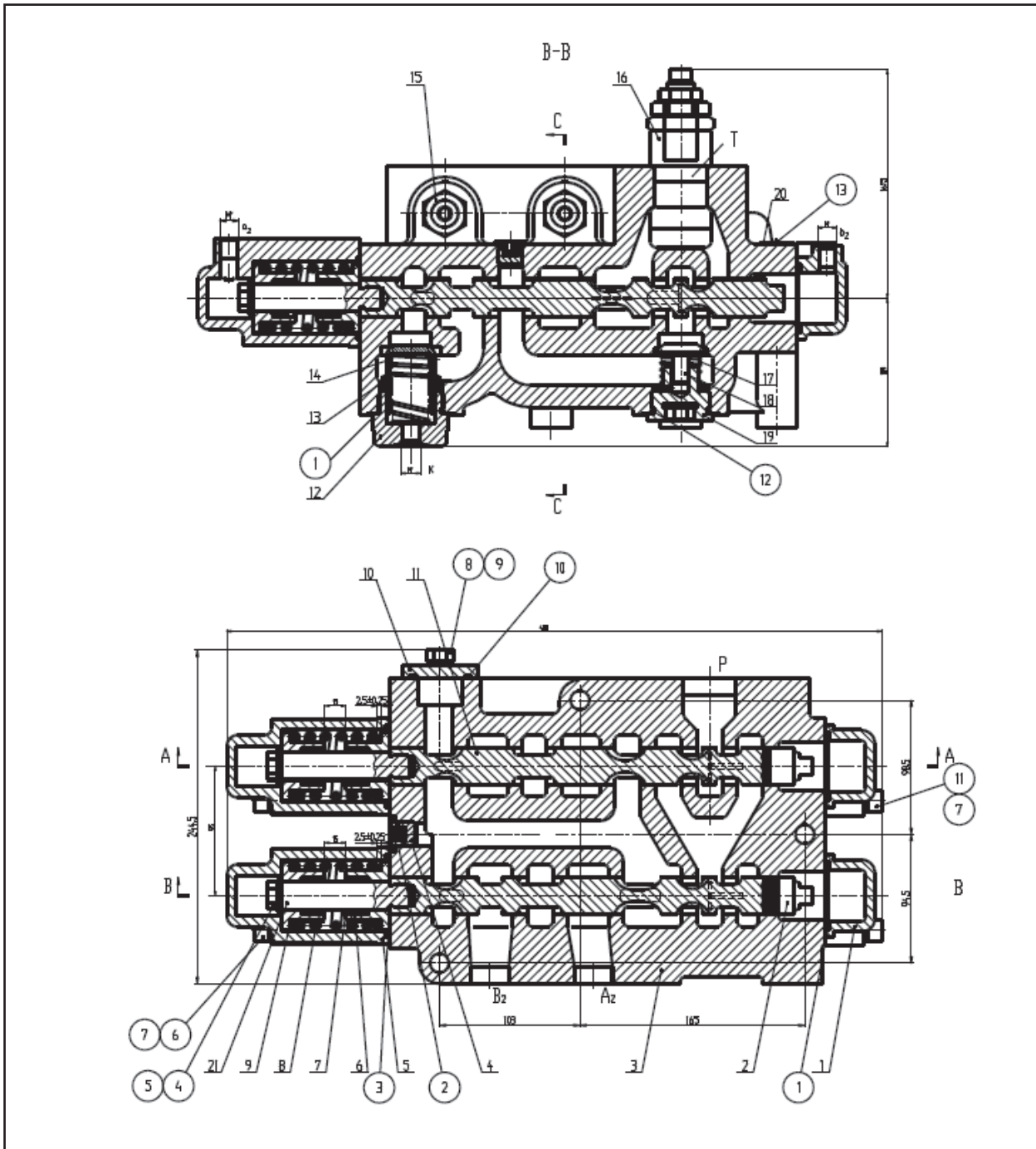


Figure.2

| Reference Number | Description | Reference Number | Description |
|------------------|--------------------|------------------|---------------|
| 1 | Cover | 18 | Check valve |
| 2 | Boom Valve spool | 19 | Cover |
| 3 | Valve body | 20 | Name Plate |
| 4 | Check valve | 21 | Spool joint |
| 5 | Cover | ① | O-Ring 50x3.1 |
| 6 | Spring seat | ② | O-Ring 20x2.4 |
| 7 | Spring | ③ | O-Ring 60x3.1 |
| 8 | Spring | ④ | Gasket2 |
| 9 | Spring gasket | ⑤ | Bolt M12x20 |
| 10 | Cover board | ⑥ | Bolt M10x100 |
| 11 | Bucket valve spool | ⑦ | Gasket10 |
| 12 | Cover | ⑧ | Gasket12 |
| 13 | Spring | ⑨ | Bolt M12x30 |
| 14 | Make-up valve | ⑩ | O-Ring 45x3.1 |
| 15 | Overload valve | (11) | Bolt M10x45 |
| 16 | Relief valve | (12) | O-Ring 44x3.5 |
| 17 | Spring | (13) | Rivet 2x4 |

Disassembly and assembly steps

When repairing the entire valve, put multi-way valve at a flat and clean place, clean all parts after disassembly and then assemble.

1. Dismantle and assemble overload valve and relief valve, do not loosen locknut when dismantling, put wrench at cartridge valve, mark signs on high and low pressure overload valve. Check sealing ring of cartridge valve; assemble again when it is confirmed well.

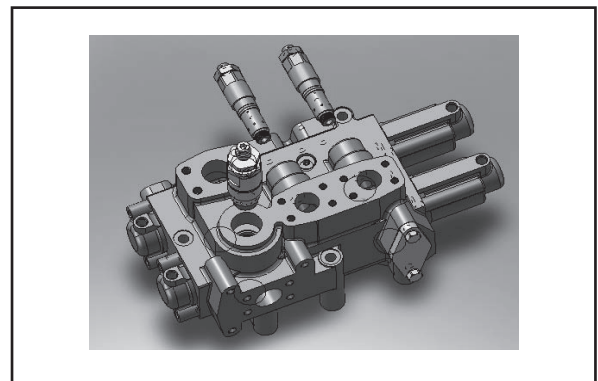


Figure.3

2. Dismantle end cap at bo g ring is good. Pull out valve rod from long end cap; check if the valve rod and valve surface is impacted; install valve rod to valve when it is moving smoothly and there is no blockage, put O ring in oil seal groove of end cap, keep end cap connection oil mouth upward when installing end cap, fastening torque of end cap bolts is 35 ~ 40N.m.

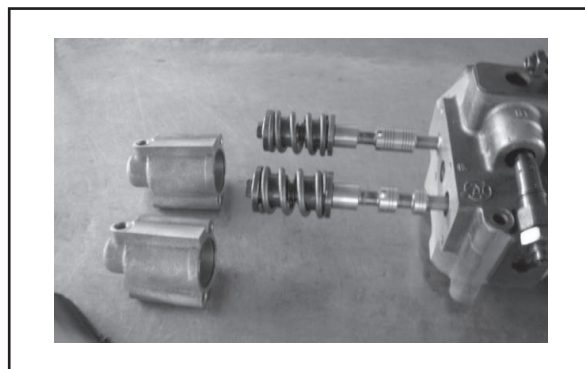


Figure.4

3. If valve rod end spring needs to be replaced, fix valve rod with special fixture, screw out end cap bolts with wrench. Check if the spring is broken or deformed, when installing spring and valve rod, the clearance between return spring and spring seat when spring is at free state is around 2.5mm.

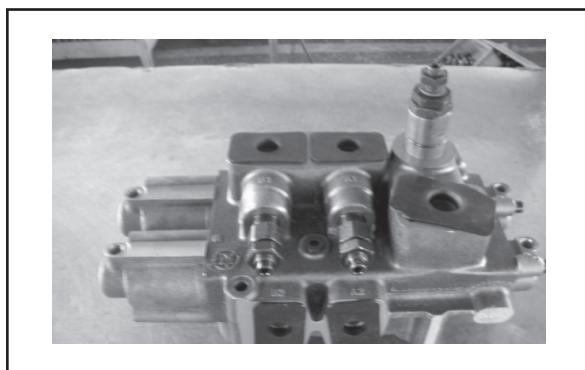


Figure.5

4. Dismantle and assemble check valve. Dismantle three end caps of check valve with inner hexagon screw, mark on each end cap with chalk, check if the check valve is leaking by checking if the spring is deformed and surface normal line of check valve is good. Guarantee check valve and valve seat can move flexibly during installation; while check if 1.0 hole on top of the hydraulic control check valve is blocked before installation. Check if all screw plugs are complete, check if screw plug is screw down and sealing ring is complete when oil is leaking.

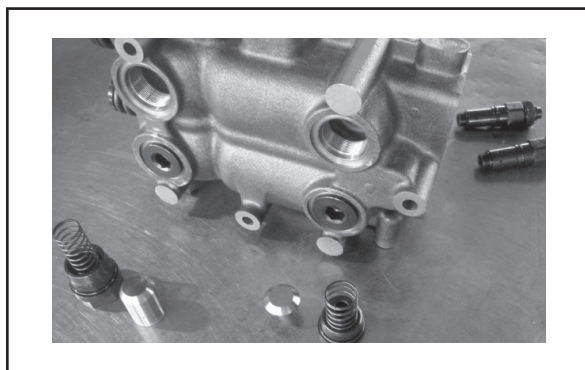


Figure.6

Basic faults and overcoming

| S/N | Faults | Reasons | Overcoming methods |
|-----------------------|--------------------------------|--|---|
| 1 | Working pressure is not enough | Pressure of relief valve is regulated too low | Adjust pressure of relief valve |
| | | Slide valve of relief valve is blocked | Dismantle, clean and assemble again |
| | | Pressure regulation spring is broken | Replace with new one |
| | | System pipe pressure is lost too much | Replace pipeline or regulate pressure of relief valve within the allowable pressure range |
| 2 | Working flow is not enough | Oil supply of the system is not enough | Check oil source, check oil pump |
| | | Leakage in valve is large | |
| | | a. Oil temperature is too high, viscosity decreases | a. Take measures to reduce oil temperature |
| | | b. Selection of oil is improper | b. Replace oil |
| | | c. Clearance between slide valve and valve is too large | c. Replace slide valve according to reasonable clearance |
| Fault of relief valve | Repair relief valve | | |
| 3 | Resetting does not work | Resetting spring is damaged or deformed | Replace new ones |
| | | There is pollutant between valve rod and valve | Clean parts |
| 4 | External leakage | Sealing ring is damaged | Replace new ones |
| | | Fasteners are loosed | Screw down fasteners |
| 5 | Slippage of swing arm is large | Clearance between multi-way valve and valve rod increases | Replace valve rod |
| 6 | Rotating bucket falls | Overload valve or oil compensating valve is blocked by pollutant | Dismantle, clean and reassemble |

Pilot Control Valvet



CAUTION!

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Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

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General description

Schematic diagram

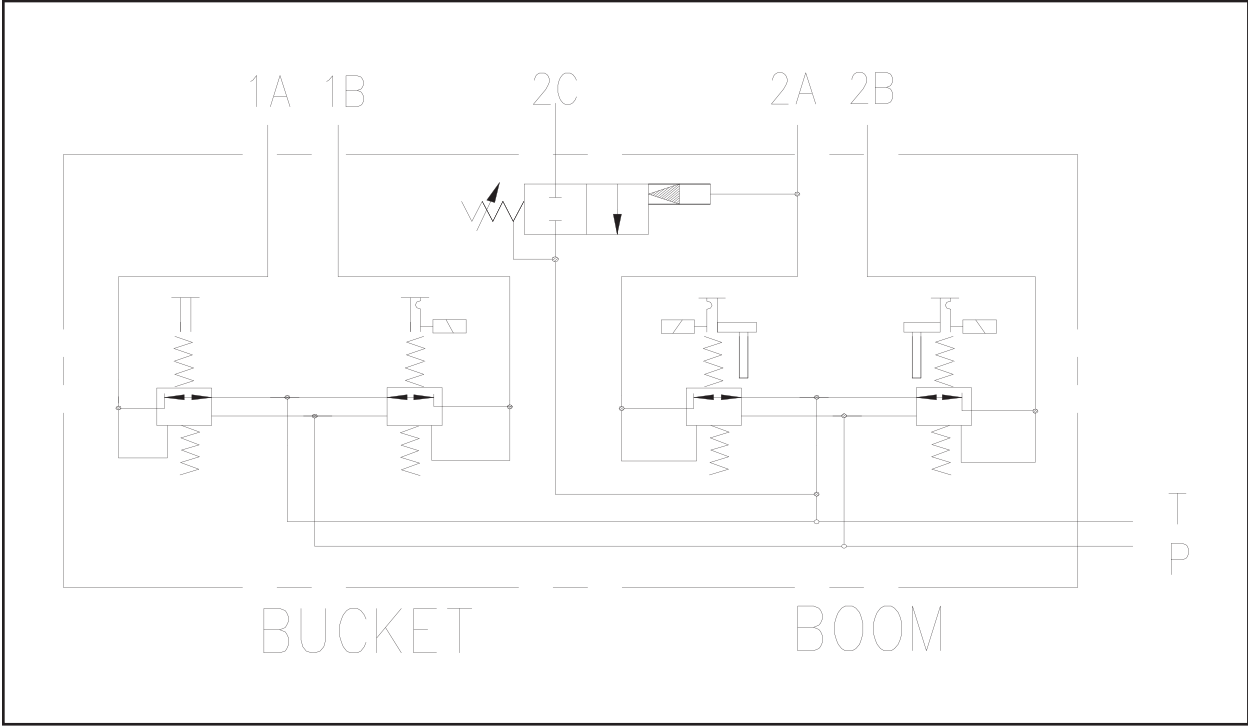


Figure.1

Detailed list of parts for DXS mono lever pilot control valve

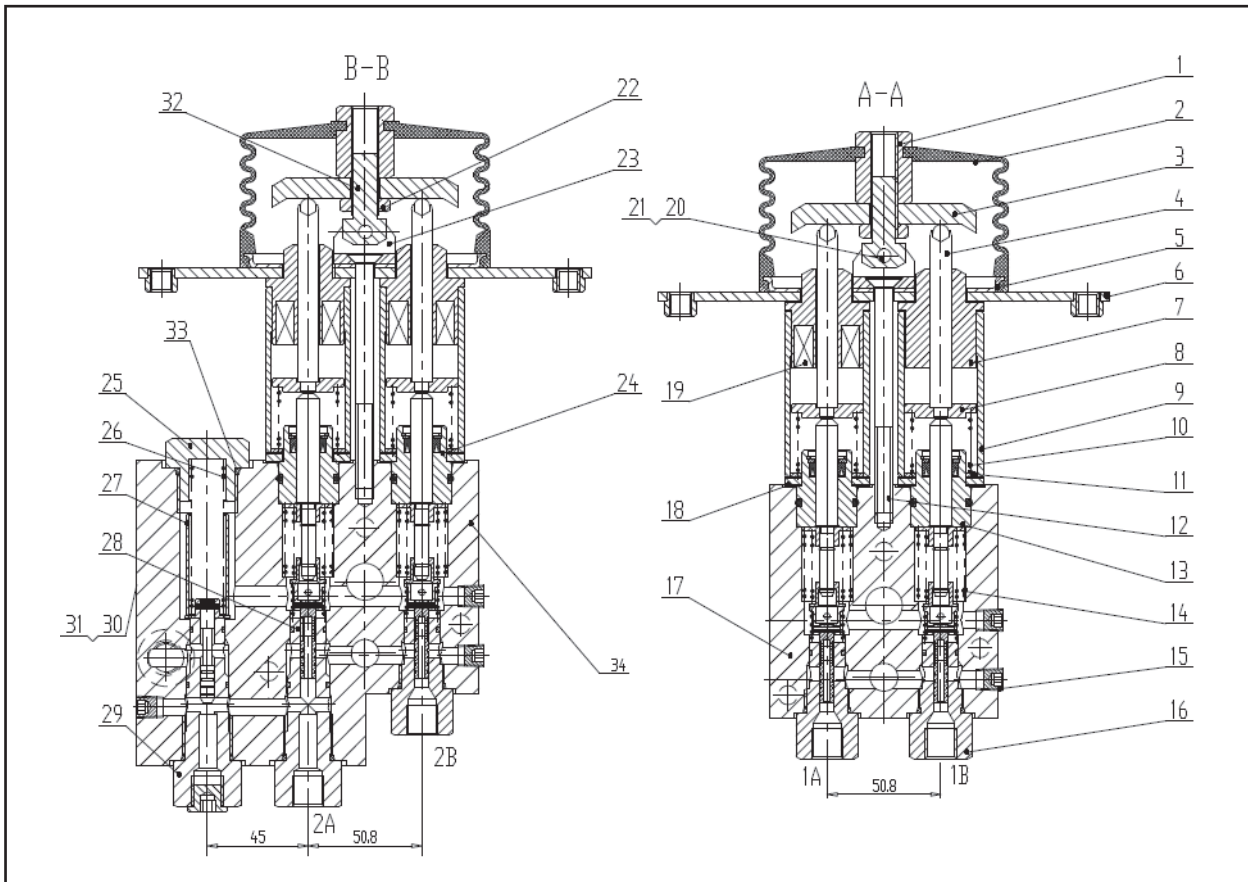


Figure.2

| Reference Number | Description | Reference Number | Description |
|------------------|----------------------------|------------------|-----------------------|
| 1 | Nut | 18 | Gasket |
| 2 | Rubber cover | 19 | Electromagnet |
| 3 | Mound layer | 20 | Pin roll |
| 4 | Pressure pin group | 21 | Cotter pin |
| 5 | Glue set seat | 22 | Nut |
| 6 | Fixed plate | 23 | Support |
| 7 | Shaft sleeve | 24 | Valve rod assembly |
| 8 | Pressing plate | 25 | Screw plug |
| 9 | Sleeve | 26 | Spring |
| 10 | Spring | 27 | Guide sleeve |
| 11 | Gasket | 28 | Measuring assembly II |
| 12 | Inner hexagonal sunk screw | 29 | Sequence valve group |
| 13 | Compression bar assembly | 30 | Nameplate |
| 14 | Spring | 31 | Rivet |
| 15 | Cone screw plug | 32 | Bolt |
| 16 | Measuring assembly I | 33 | O ring |
| 17 | Rotating bucket valve | 34 | Poppet valve |

Detailed list of parts for DJS double handle pilot control valve

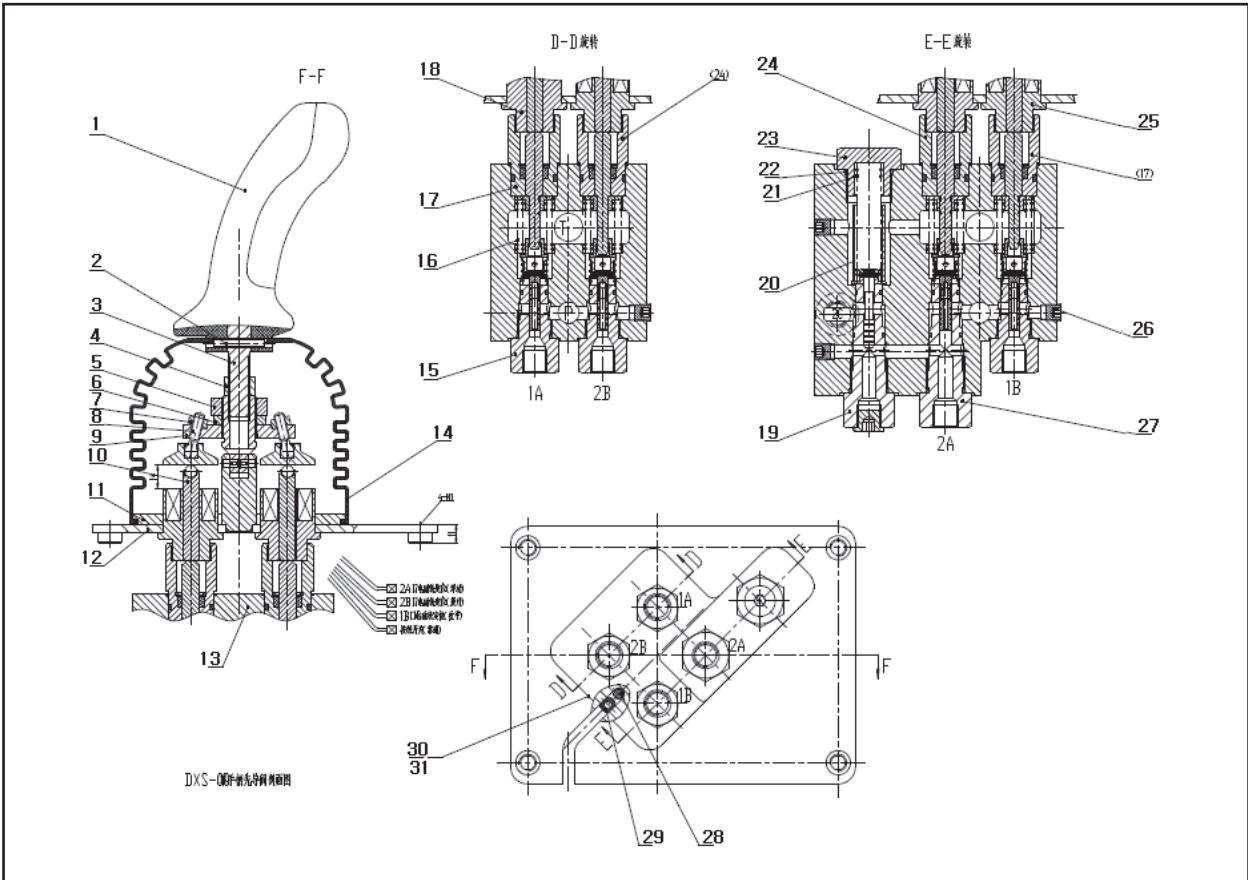


Figure.3

| Reference Number | Description | Reference Number | Description |
|------------------|-------------------------|------------------|-----------------------|
| 1 | Handle assembly | 17 | Compression bar I |
| 2 | Elastic round pin | 18 | Shaft sleeve |
| 3 | Handle joint | 19 | Sequence valve |
| 4 | Nut | 20 | Guide sleeve |
| 5 | Nut | 21 | Spring |
| 6 | Small gasket | 22 | O ring |
| 7 | Nut | 23 | Screw plug |
| 8 | Pressing plate assembly | 24 | Compression bar II |
| 9 | Fixing plate | 25 | Electromagnet |
| 10 | Pressure pin group | 26 | Cone screw plug |
| 11 | Shield plate | 27 | Measuring assembly II |
| 12 | Mounting plate assembly | 28 | Bolt |
| 13 | Valve | 29 | Rubber plug |
| 14 | Rubber cover | 30 | Name plate |
| 15 | Measuring assembly I | 31 | Rivet |
| 16 | Spring | | |

DISASSEMBLY AND ASSEMBLY STEPS OF DXS MONOLEVER PILOT CONTROL VALVE

Disassembly steps of DXS mono lever pilot control valve

1. Loosen two screws on head with wrench

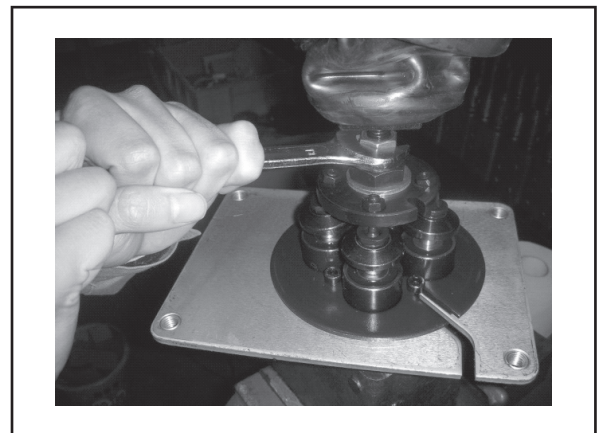


Figure.4

2. Dismantle handle assembly and pressing plate assembly.



Figure.5

3. Screw off four cock screws with wrench and take out cover plate and installation plate assembly.

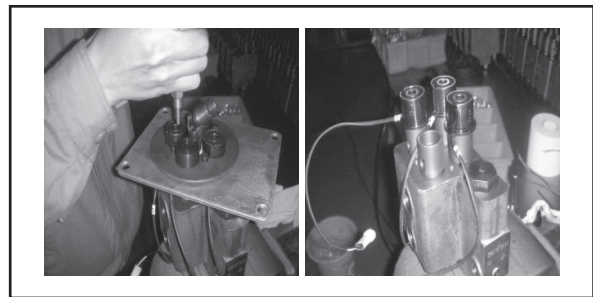


Figure.6

4. Take out pressing plate assembly with vice clamp, take out spool assembly.

NOTE: *Compression bar of swing arm leaguer is different from that of rotating bucket leaguer; mark well to avoid wrong assembling.*

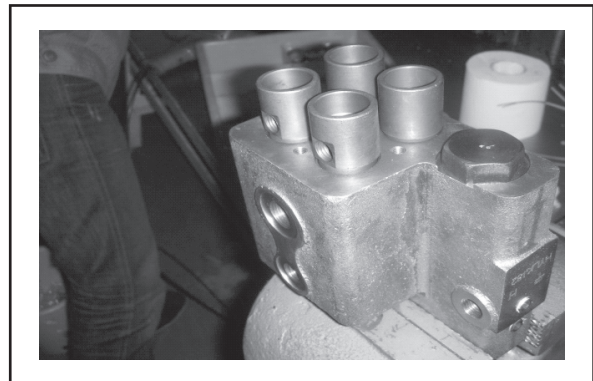


Figure.7

Enclose: *When spool is only need to be taken out, it can be dismantle at the bottom, loosen bottom valve seat with wrench. Check if O ring is good, take out spool assembly.*

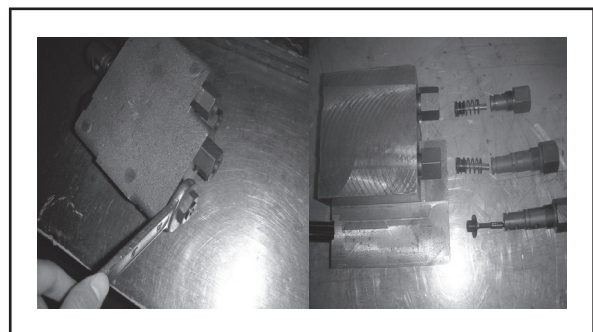


Figure.8

Assembly steps of DXS monolever pilot control valve

1. Clean all parts before assembling, blow with compressed air, and guarantee there is no oil, dirt and other sundries.

When only the bottom seats is dismantled, clean spool and replace spring and assemble directly, and lock valve seat.

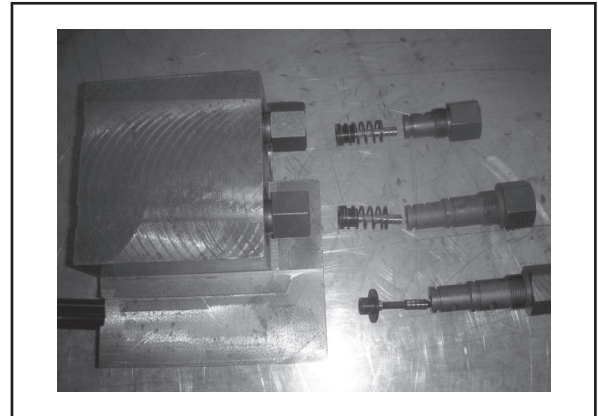


Figure.9

2. Install spool assembly and pressing plate assembly from upward to downward in order, keep the hole on the sleeve outside as is shown in the picture, assemble well and press down.

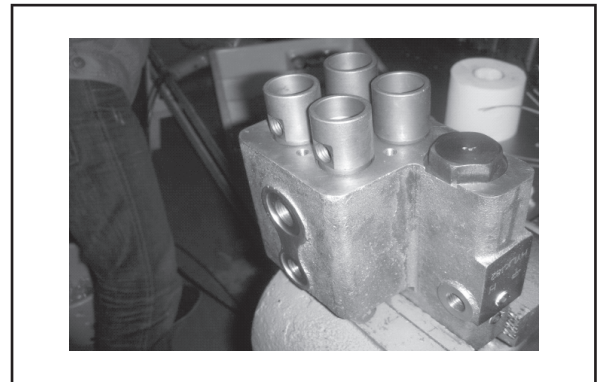


Figure.10

3. Install electromagnet, pressing plate assembly and cover plate, fix with bolts, keep electromagnet clean. Pay attention to color of electromagnet wire.

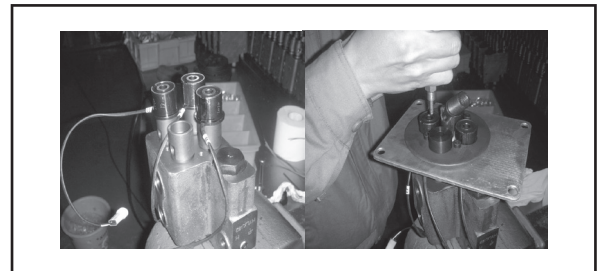


Figure.11

4. Install pressing plate assembly and press pin assembly, adjust with small inner hexagonal wrench, keep the clearance between pressing plate and press pin assembly between 0.2-0.5.

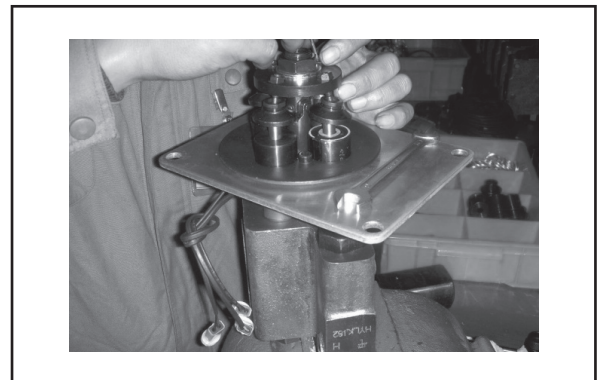


Figure.12

5. Pull handle, adjust nuts to make four pressing plates can coincide with electromagnet, lock nuts, install handle assembly and lock.

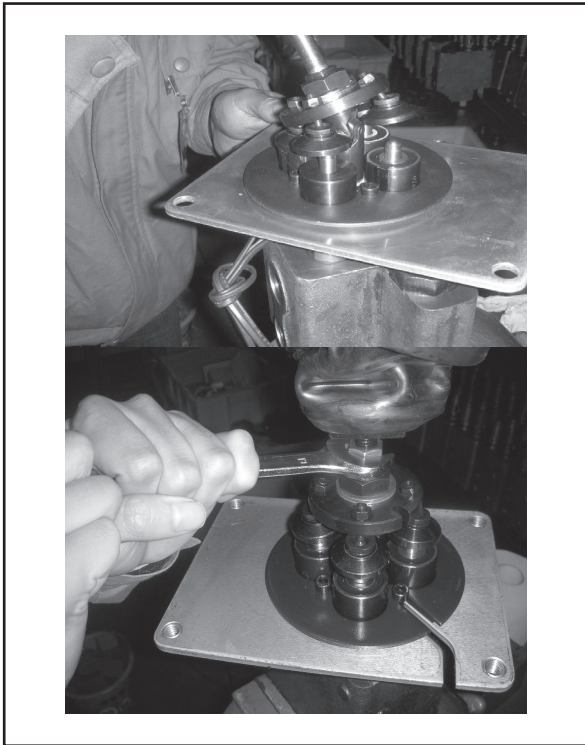


Figure.13

DISASSEMBLY AND ASSEMBLY STEPS OF DJS DOUBLE HANDLE PILOT CONTROL VALVE

Disassembly steps of DJS double handle pilot control valve

1. Loosen locknuts on top with wrench.

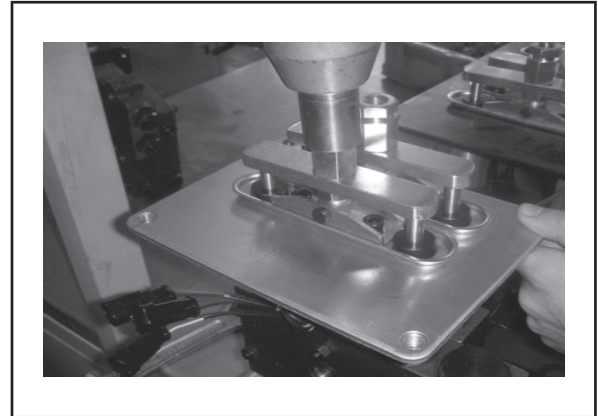


Figure.14

2. Take out pressing plate and contact terminal.

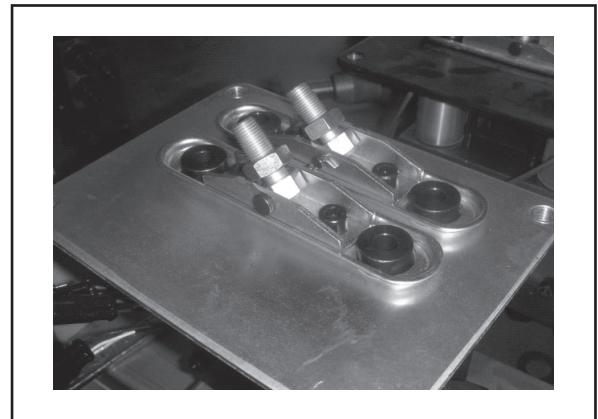


Figure.15

3. Loosen four locknuts with wrench, take out mounting plate.

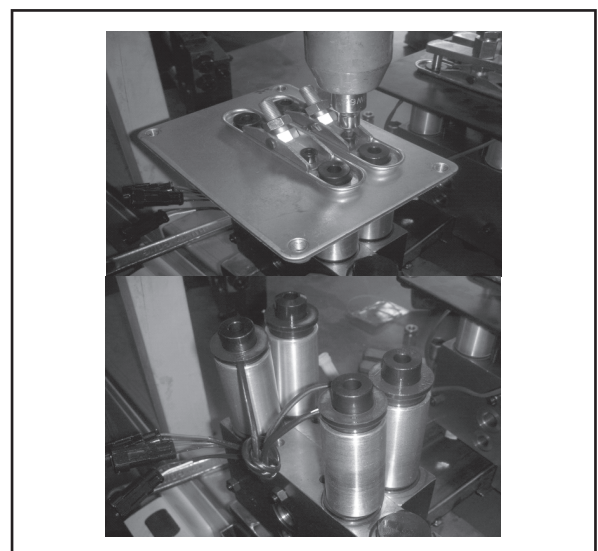


Figure.16

4. Take out electromagnet, sleeve, pressing plate, paper washer, gaskets, etc, pay attention to the position of sleeve and order of paper washer and gaskets.



Figure.17

5. Take out press bar assembly with vice clamp and take out spool assembly.

NOTE: *Compression bar of swing arm leaguer is different from that of rotating bucket league; mark well to avoid wrong assembling.*

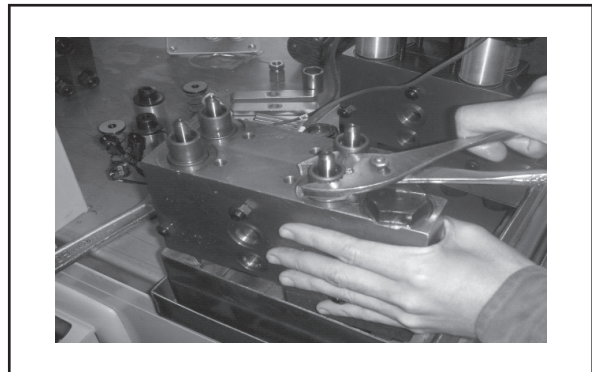


Figure.18

Enclose: *When spool is only need to be taken out, it can be dismantled at the bottom, loosen bottom valve seat with wrench. Check if O ring is good, take out spool assembly.*

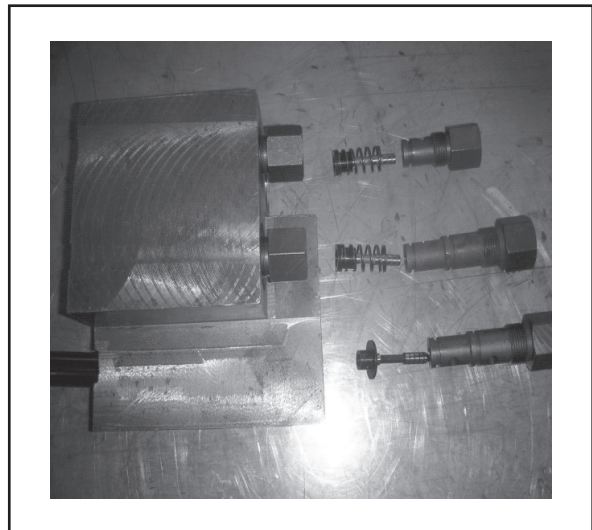


Figure.19

Assembly steps of DJS double handle pilot control valve

1. Clean all parts before assembling, blow with compressed air, and guarantee there is no oil, dirt and other sundries.

NOTE: *When only the bottom seats is dismantled, clean spool and replaces spring and assemble directly, and lock valve seat.*

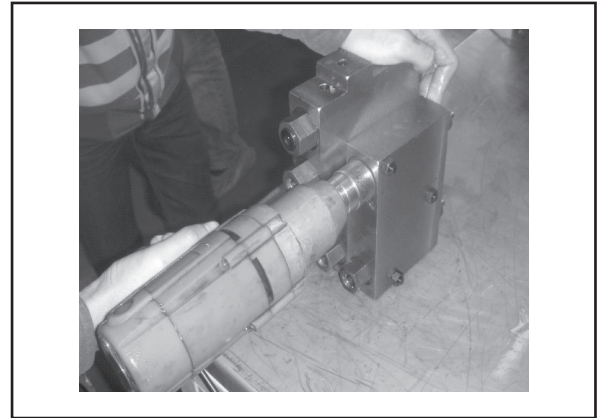


Figure.20

2. Install press bar assembly, paper washer, gasket and spring from upward to downward in order.



Figure.21

3. Install electromagnet, mounting plate and other assembly, and lock the mounting plate, install pressing plate, adjust nuts to guarantee the swinging clearance between pressing bar and pressing pin is 0.25-1.27mm, and lock it.

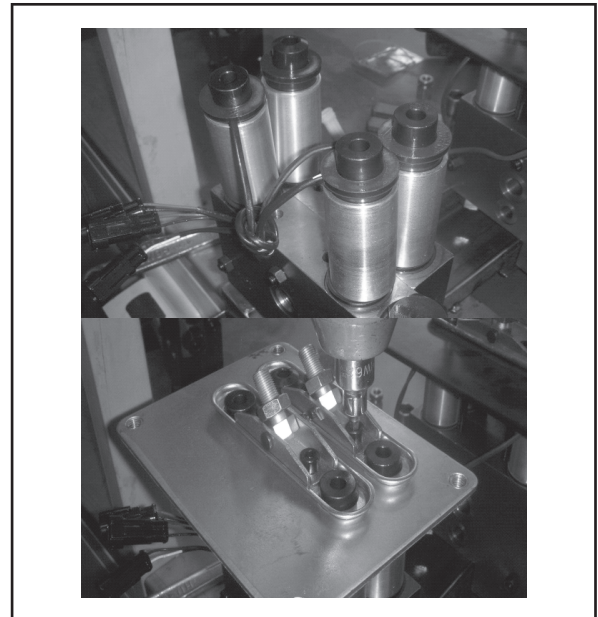


Figure.22

Basic faults and overcoming

| | Faults | Reasons | Overcoming methods |
|---|--|---|---|
| 1 | Resetting does not work | Resetting spring of pilot control valve deforms | Replace with new products |
| | | There are pollutants between pressing bar and matching hole | Clean parts |
| 2 | Location is not reliable | Suction of electromagnet is not enough | Replace with new ones |
| | | Electric current and voltage of electric circuit does not comply with requirements | Overhaul |
| | | There are pollutants between electromagnet and pressing plate | Get rid of pollutants |
| | | Clearance between pressing bar and pressing lever is not adjusted according to requirements | Adjust according to requirements |
| 3 | Control of pilot valve is not flexible | Measuring spool is blocked or moving is not flexible | Check if oil is clean, clean spool and valve port |
| | | Measuring spring deforms | Replace spring |
| | | Control flow rate or pressure is not enough | Check if oil supplying system of pilot is normal |

Priority Valve



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General Description

Work principle

When steering unit is in the middle, if the engine misses, oil pump does not supply oil, control spring of priority valve will push spool to the right side to connect with CF oil way. When diesel engine is started, priority valve will distribute pressure oil to CF oil way, pressure will be reduced after going through meso-position throttle mouth of steering unit, pressure at both sides of throttle mouth will be transferred to both sides of priority spool, the caused hydraulic force will balance with spring force of control spring and liquid power which will make spool balance. Since fluid resistance at throttle mouth is big, very few flow will create enough differential pressure to push priority valve spool moving to the left side and will push spool move to the left, EF valve is opened larger and CF valve is smaller, then flow rate of CF oil way is small.

When turning steering wheel, meso-position throttle mouth of steering unit closes, fluid flowing through steering unit creates pressure drop. Pressure from both sides of throttle changing mouth is transferred to both sides of priority valve spool and forces spool to find a new balanced position. If rotation of steering wheel is improved, throttle changing mouth is larger at the moment of changing, at this time, only more flow rate can create pressure drop before rotation speed is different at throttle mouth so that priority valve spool can be pushed to move to the left side. Therefore, open of valve mouth of CF oilway connecting with priority valve will increase with improving of steering wheel rotation. In the end, oil supplying quantity of priority valve steering unit is equal to rotation of steering wheel plus displacement of steering unit.

When steering cylinder reaches the travelling terminal, if steering wheel is continued to be turned, pressure oil cannot flow to cylinder, then overload pressure will rise quickly, pressure difference between both sides of throttle changing mouth will reduce quickly, when pressure of steering cylinder exceeds regulated value of safety valve, the valve is turned on to discharge load. Pressure drop is created when pressure oil flowing through throttle mouth, the pressure drop is transferred to both sides of priority valve spool and push spool to move to the left side which will force valve mouth connecting with CF oilway get smaller, and valve mouth connecting with EF oilway get bigger, and pressure of steering oilway decreases.

When turning flames out, steering unit can play the role of manual oil pump. Input pressure oil pushes steering cylinder piston, oil from cylinder turns to upstream of throttle mouth of check valve, that is turning when flaming out has nothing to do with priority valve.

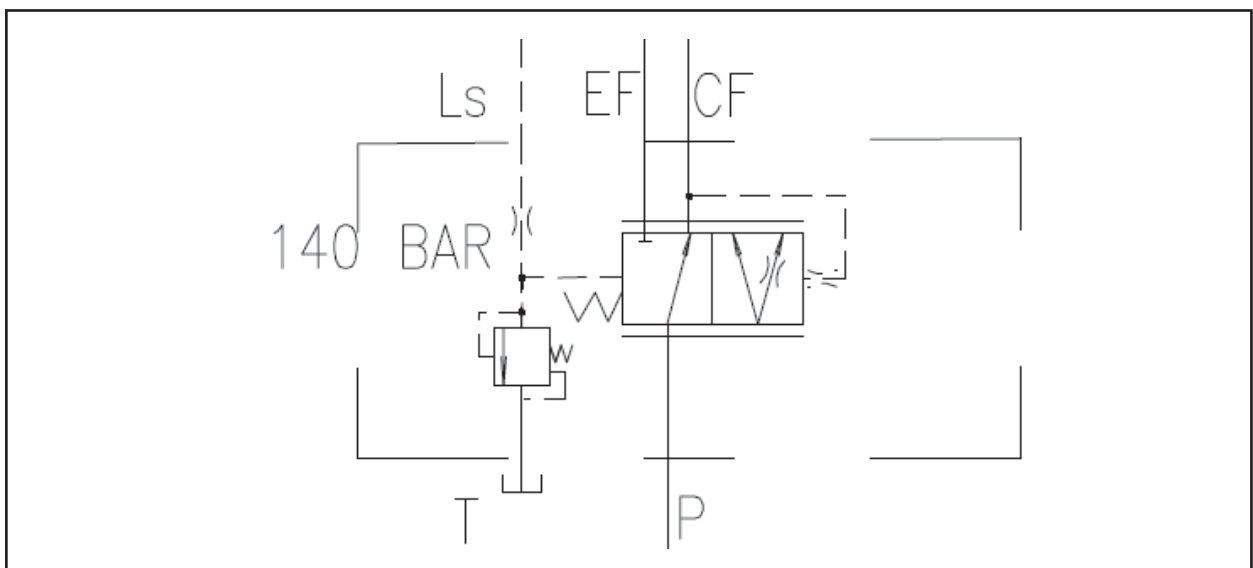


Figure.1

Detailed list of spare parts

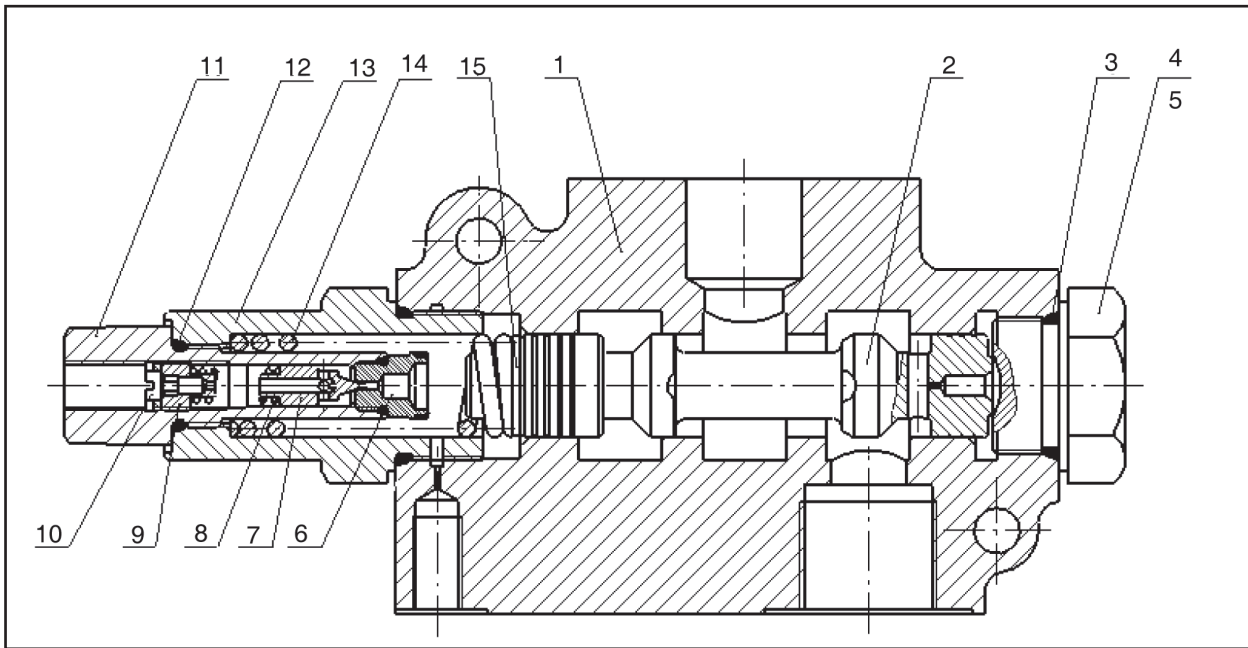


Figure.2

| Reference Number | Description | Reference Number | Description |
|------------------|---------------------|------------------|---------------------|
| 1 | Valve body | 9 | Adjustable Bolt |
| 2 | Valve spool | 10 | Locking Ring |
| 3 | O-Ring35X3.1 | 11 | Relief Valve body |
| 4 | Plug | 12 | O-Ring 22X2.4 |
| 5 | O-Ring38X3.1 | 13 | Relief Valve seat 2 |
| 6 | Relief Valve seat 1 | 14 | Spring |
| 7 | Relief Valve spool | 15 | Gasket |
| 8 | Relief Valve Spring | | |

Disassembly steps of priority valve

1. Turn on relief valve on the left side.

Tools: pneumatic wrench, M24 sleeve

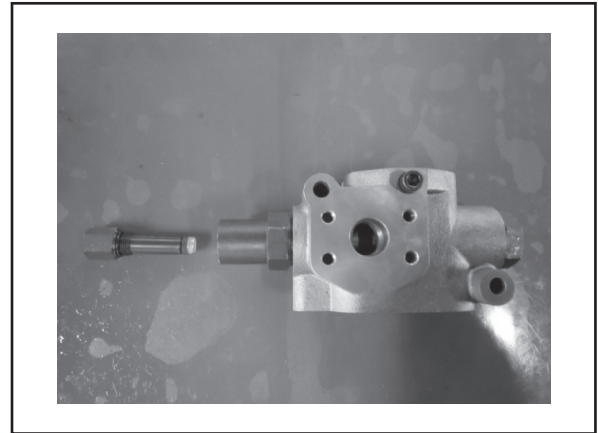


Figure.3

2. Turn on valve seat 2 of relief valve on the left to take out spring.

Tools: pneumatic wrench, self made sleeve (41# wrench)

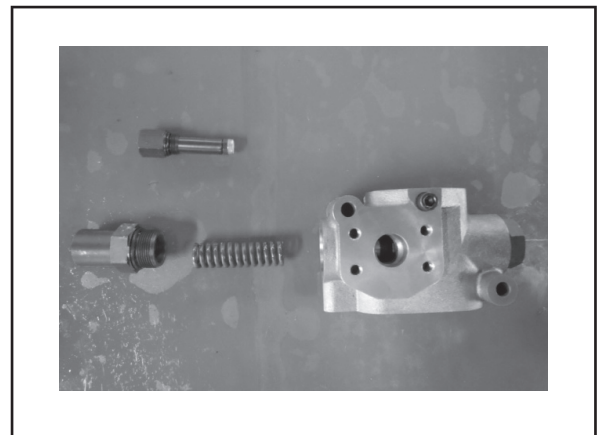


Figure.4

3. Turn on screw plug on the right to take out spool and gasket.

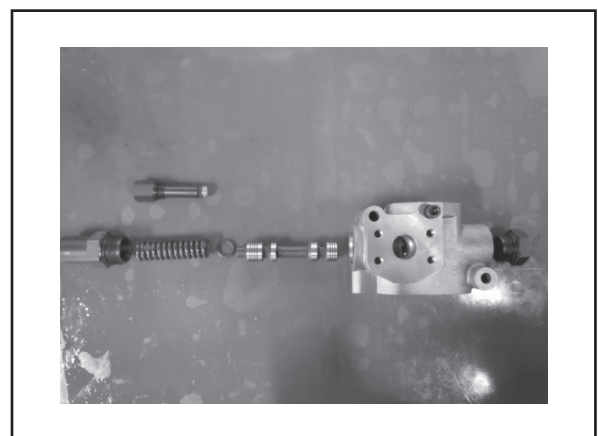


Figure.5

4. Screw out lock ring and adjustable bolt of relief valve to take out spring and relief spool, then take our valve seat 1 of relief valve.

Tools: 4mm inner hexagonal wrench, special screwdriver (plain screwdriver), 14 #wrenches

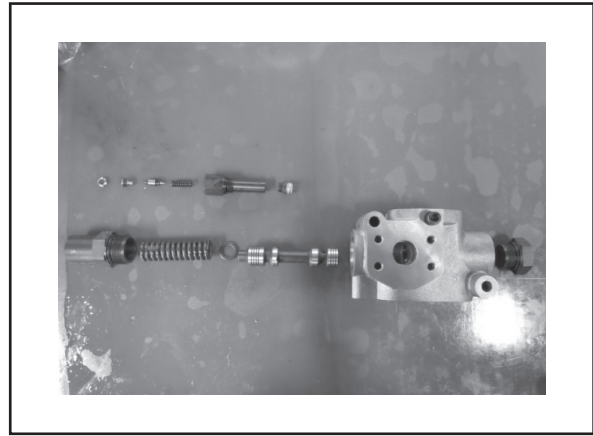


Figure.6

5. Screw out bolts of pressure mouth

Tools: 8mm inner hexagonal wrench

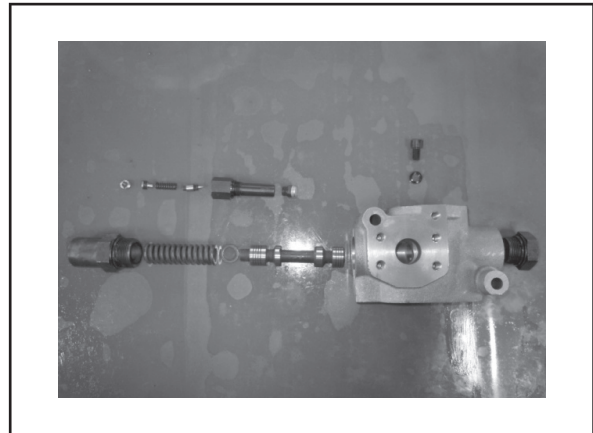


Figure.7

Matters need attention for disassembling priority valve

1. All parts shall be taken slightly during disassembling process, spool shall be pulled out slightly to avoid knock and scratch parts.
2. Step two and step three cannot be reversed (avoid screw out the screw plug on the right and spring pop out spool and cause danger).
3. Dismantle bolts of pressure mouth according to requirements.
4. Check if O ring is deformed, trimmed and aged after disassembling, usually O ring cannot be used again after disassembling.
5. After disassembling, valve body and spool shall be cleaned with 32# hydraulic oil, check if spool surface has obvious scratch; do not use spool and valve body if there is scratch.

Assembling steps of priority valve

1. Screw on bolts of pressure mouth.

Tools: 8mm inner hexagonal wrench

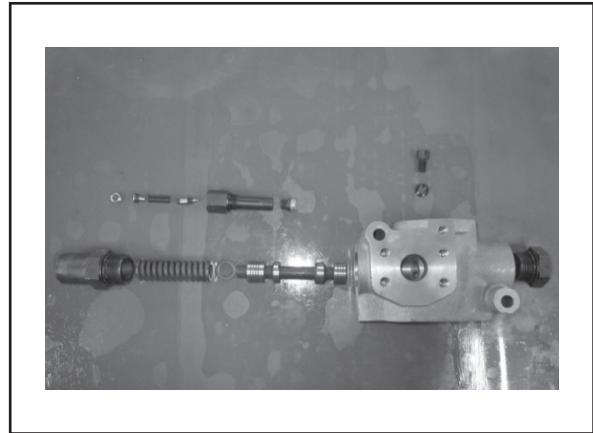


Figure.8

2. Screw on valve seat 1 of relief valve, install spool and spring, then install adjustable bolts and lock ring.

Tools: 4mm inner hexagonal wrench, special screwdriver (plain screwdriver), 14# wrench

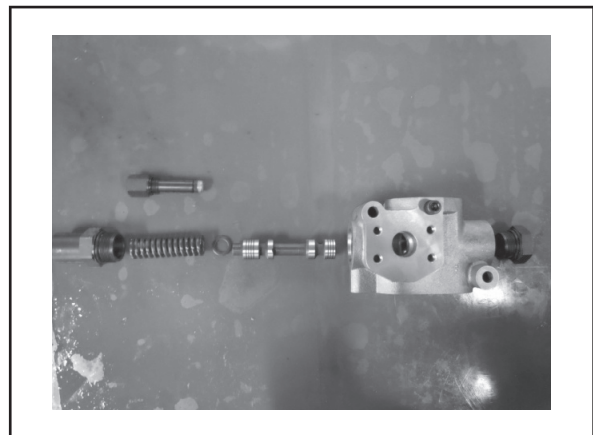


Figure.9

3. Install spool and gasket.

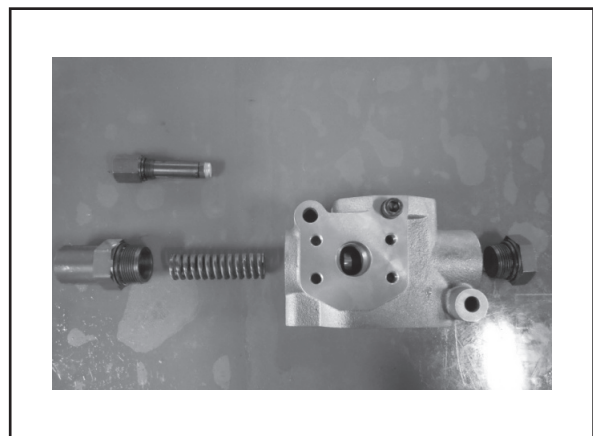


Figure.10

4. Install spring, screw on valve seat 2 of relief valve and screw plug.

Tools: pneumatic wrench, self made sleeve (41# wrench)

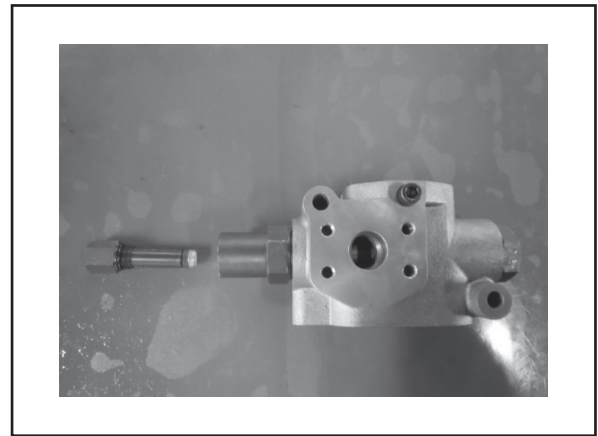


Figure.11

5. Screw on valve seat 1 of relief valve.

Tools: pneumatic wrench, M24 sleeve

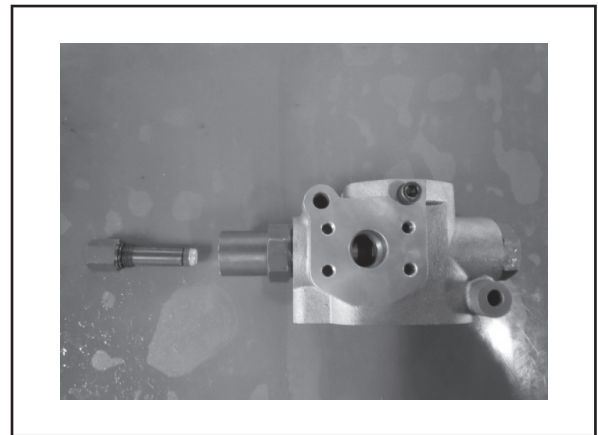


Figure.12

Matters need attention for assembling priority valve

1. Keep all parts clean before assembling.
2. During installation, all spools shall be installed slowly and guarantee they can slide flexibly, if there is blockage, grind spool surface and sharp corner slightly with fine abrasive paper, clean the valve again.
3. Avoid to damage trim of O ring when screwing on screw plug, it is better to coat grease on the surface before installation.

Tools for disassembly and assembly

Main tools for disassembly and assembly are:

- Torque wrench (Electric wrench)
- M27 sleeve
- M22 sleeve
- M16 sleeve
- M6 inner hexagonal spearhead

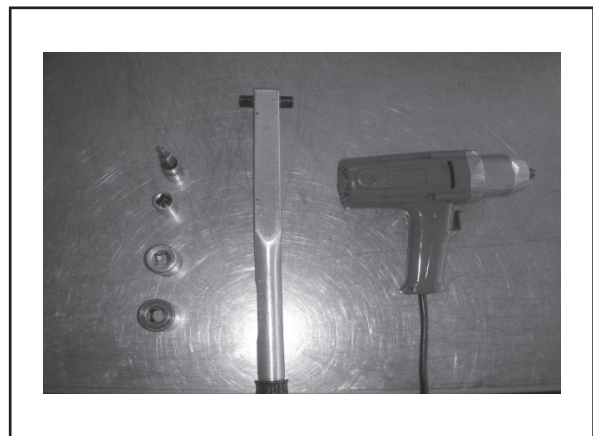


Figure.9

Steering Unit



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General description

Work principle

When steering unit is in the middle, spool and valve bush is at meso-position with the effect of spring lamination, oil from oil pump will enter spool from two rows of holes of valve bush and spool, then returns to oil tank through T oil mouth.

When steering wheel turns right (or left), spool is driven to turn to the right (or left), since the Max. rotation quantity between spool and valve bush is 10.5° , so spool rotates against valve bush, at this moment, oil groove is connected with oil inlet way of valve bush, oil goes through valve bush and oil groove of spool, returns to rotor and stator from valve bush, drives rotor rotating against stator. At the same time, oil from rotor and stator enters one of the chamber of cylinder through oil mouth A (or B) to make cylinder piston stretch out (compress inside), and push steering wheel turns right (or left), oil from the other chamber of cylinder enters valve bush through oil mouth B (or A), returns oil groove through spool, and goes back to oil tank through T oil mouth from valve bush. The relative rotation angle of spool and valve bush is 1.5° , oil way is connected, and rotation of rotor makes oil connects with cylinder, oil supplying quantity and rotation angle of steering wheel become direct ratio.

When steering wheel turns right (or left) for an angle and keeps the state, since the above mentioned oilway is open and oil from oil pump will push rotor to turn right (left), when rotation angle of rotor is the same with rotation angle of steering wheel, since valve bush and rotor is connected through linkage axle, so rotor will drive valve bush to turn right (or left) to keep the same angle with steering wheel. At this moment, valve bush and spool form the position without rotation angle, oilway going to rotor and oil cylinder is closed, oil from oil pump will go into spool through two rows of holes through valve bush and spool, oil goes back to oil tank through T oil way from valve bush. At this time, tyre stops moving, this is hydraulic feedback servo action.

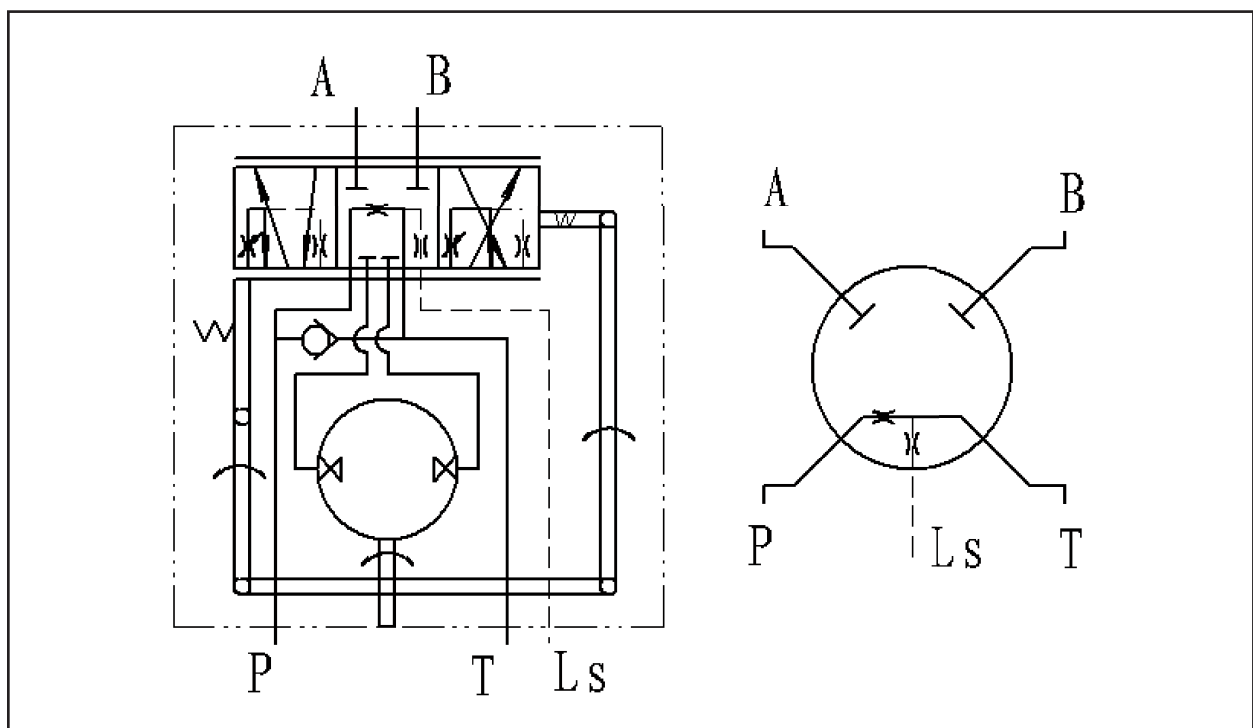


Figure.1

Detailed list of spare parts

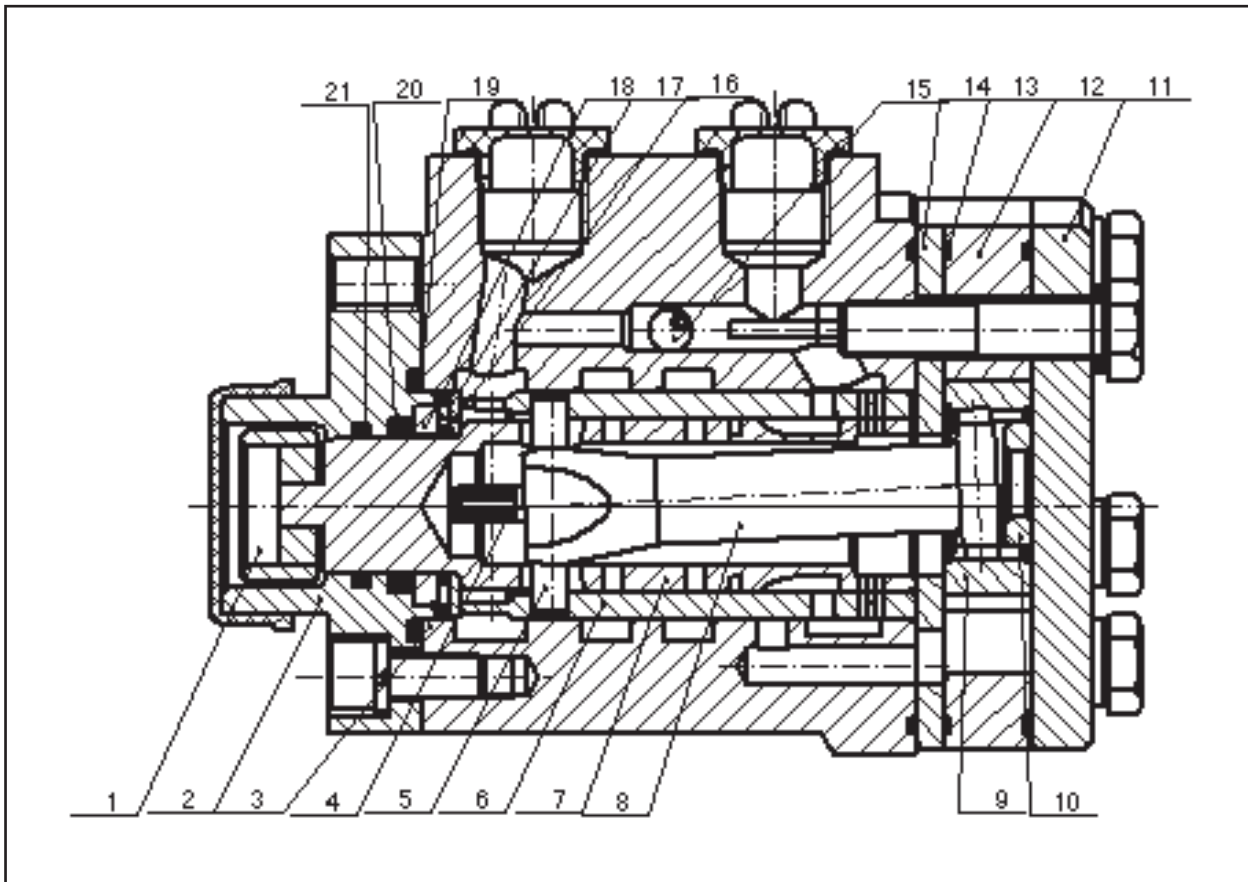


Figure.2

| Reference Number | Description | Reference Number | Description |
|------------------|-------------------|------------------|-----------------|
| 1 | Link block | 12 | Stator |
| 2 | Front cover | 13 | O-Ring |
| 3 | Valve body | 14 | Plate |
| 4 | Spring lamination | 15 | Steel ball |
| 5 | Pin | 16 | Big Baffle ring |
| 6 | Valve bush | 17 | Baffle ring |
| 7 | Valve spool | 18 | Baffle ring |
| 8 | Shaft | 19 | O-Ring |
| 9 | Rotor | 20 | X-Ring |
| 10 | Limited post | 21 | O-Ring |
| 11 | Rear cover | | |

Disassembly steps of steering unit

1. Take out link block.

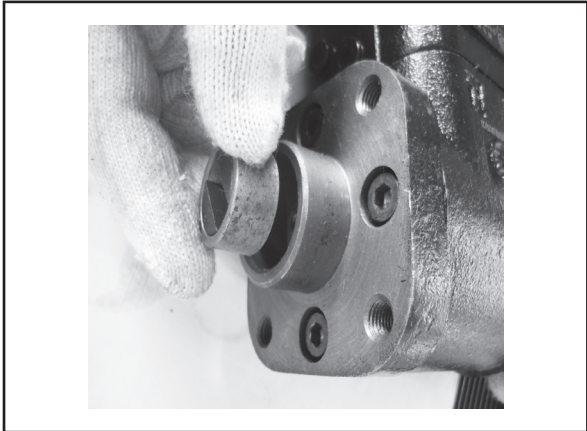


Figure.3

2. Take out front cover.

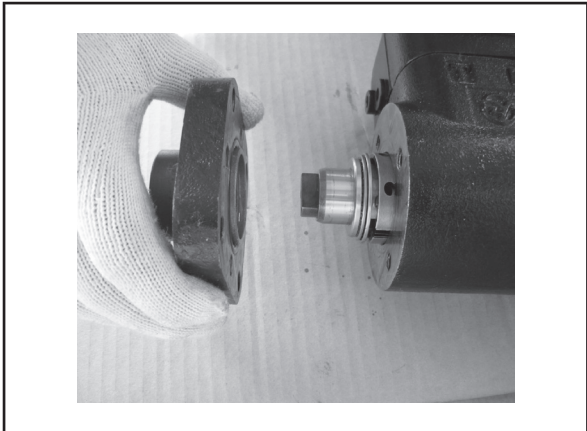


Figure.4

3. Take out multi-roll bearing

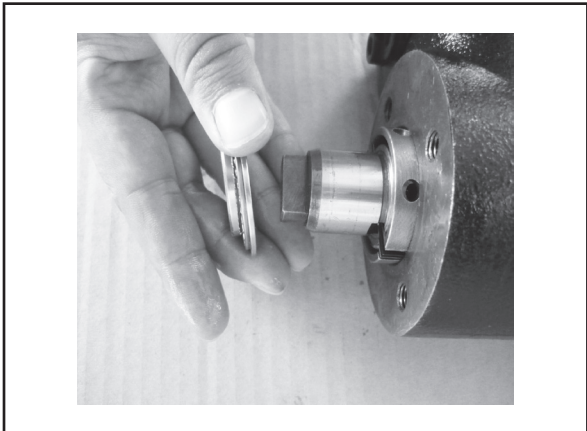


Figure.5

4. Take out bolts of rear cover.

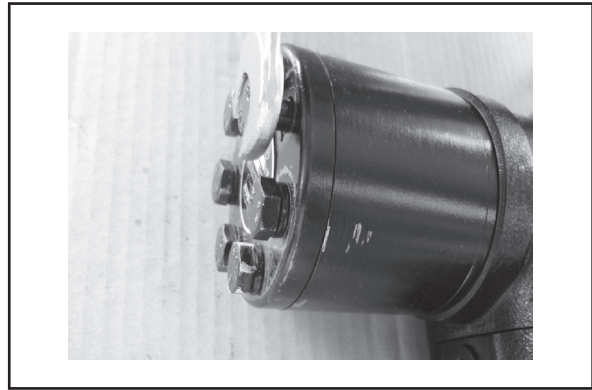


Figure.6

5. Take out rear cover.

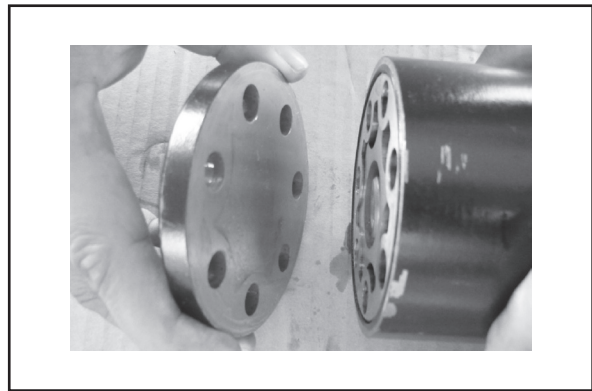


Figure.7

6. Dismantle stator

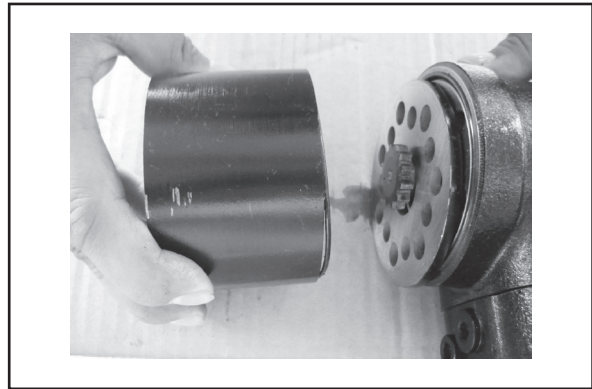


Figure.8

7. O-RING Dismantle O-RING

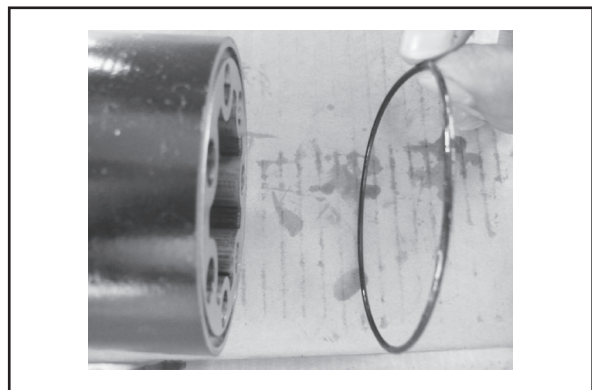


Figure.9

8. Dismantle rotor.

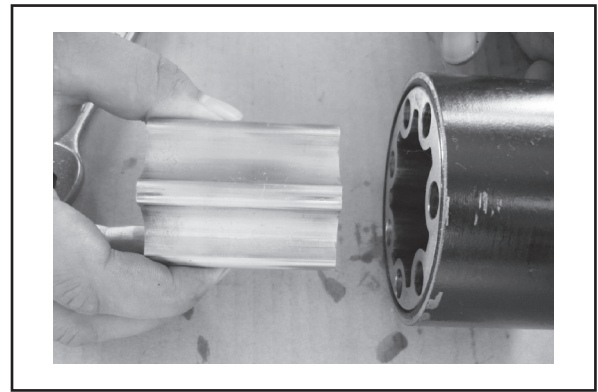


Figure.10

9. Take out limitation block

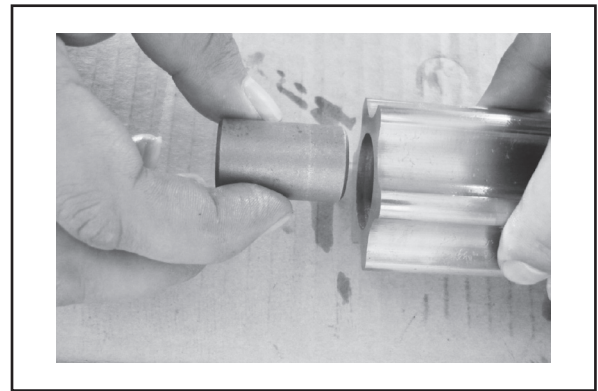


Figure.11

10. Take out link axle

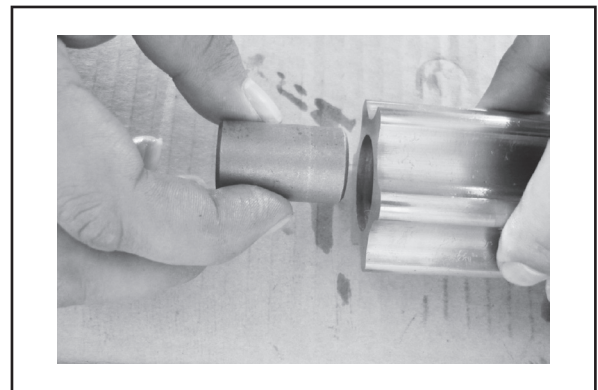


Figure.12

11. Take out clapboard

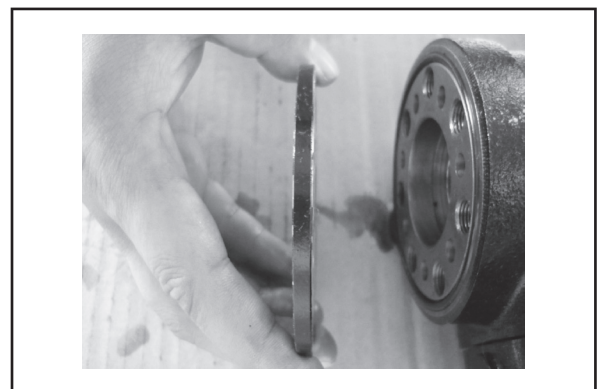


Figure.13

12. Take out valve bush and spool assembly

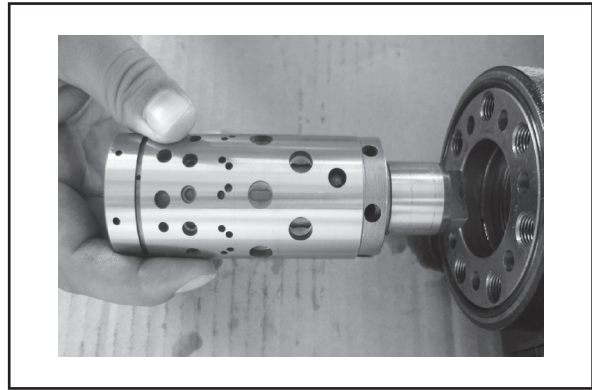


Figure.14

13. Take out dial pin

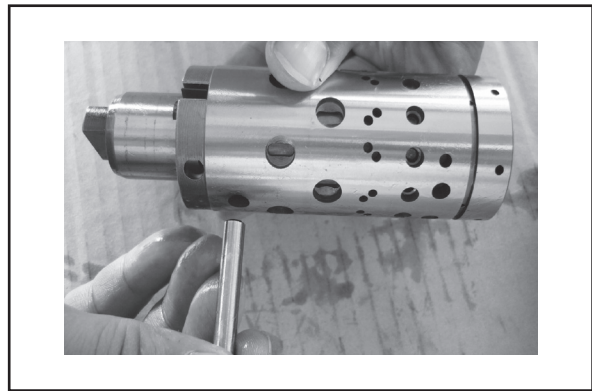


Figure.15

14. Take out spring lamination

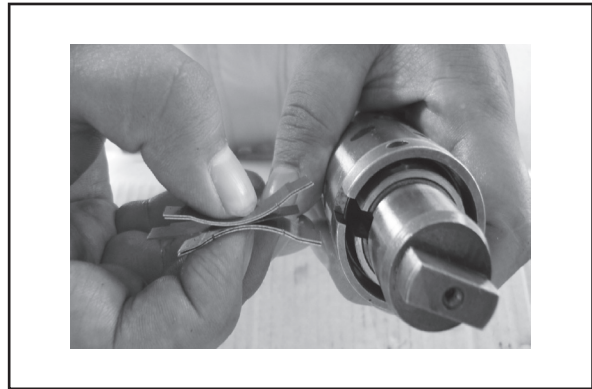


Figure.16

15. Take out valve spool

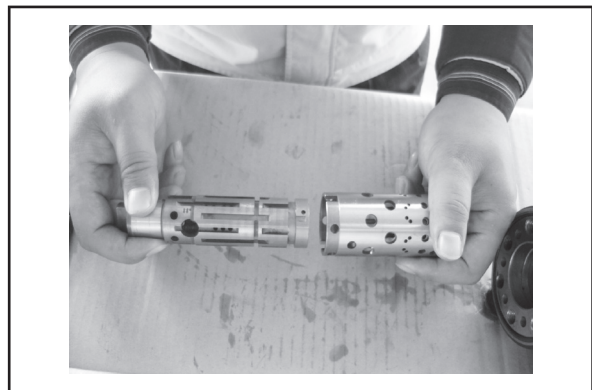


Figure.17

16. Dismantle valve block

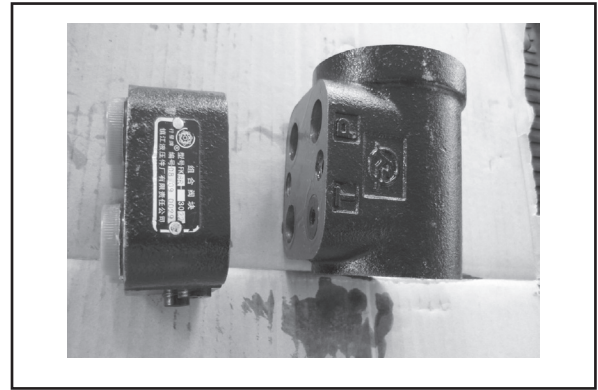


Figure.18

17. Take out check valve

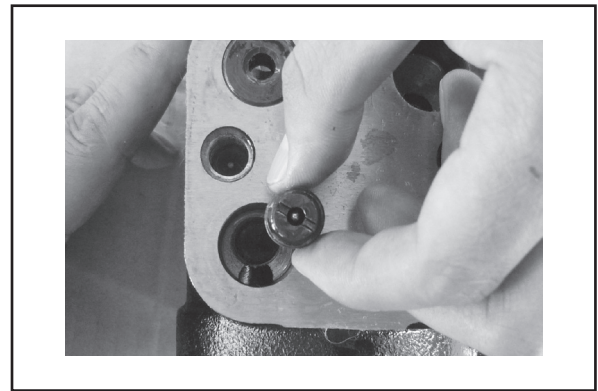


Figure.19

18. Take out oil return throttle valve

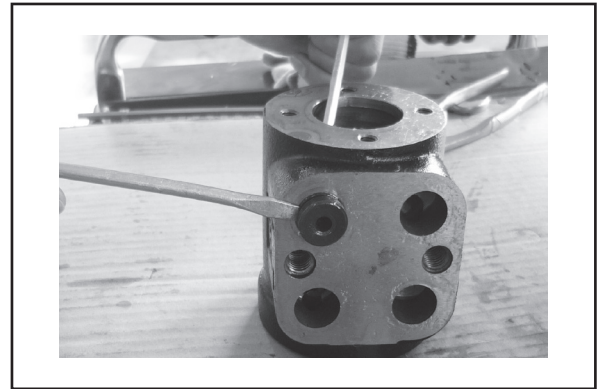


Figure.20

19. Take out oil inlet throttle valve

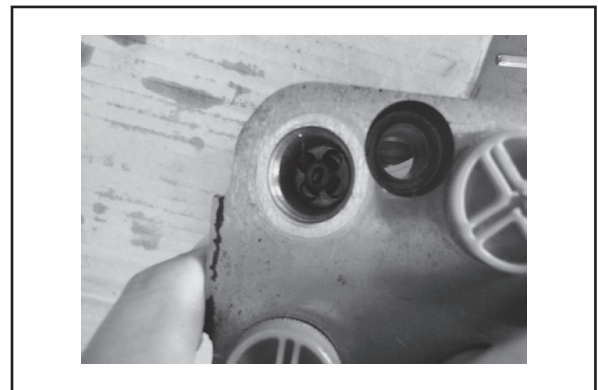


Figure.21

20. Take out oil compensating valve (4EA)

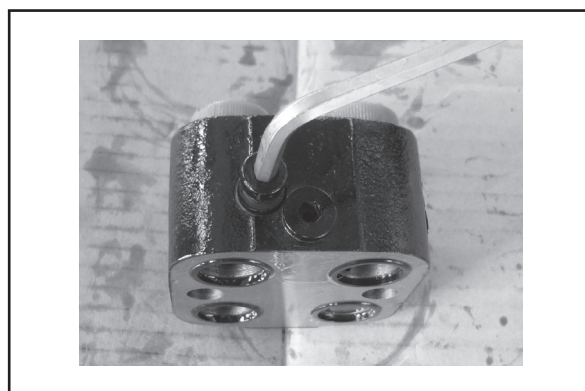


Figure.22

Assembly steps of steering unit

1. Keep four bolt holes of valve body upward.

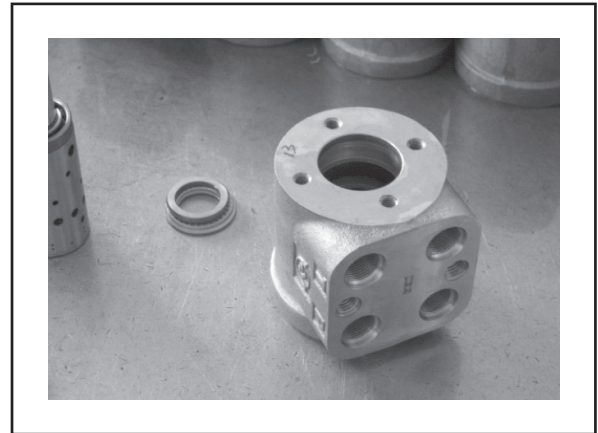


Figure.23

2. Install valve spool, valve bush, spring lamination and dial pin.

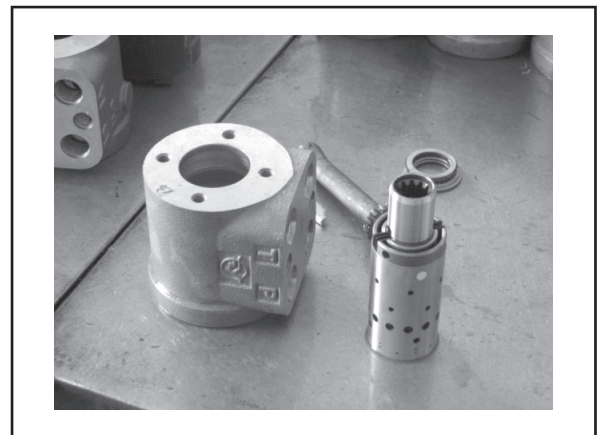


Figure.24

3. Install well assembled valve spool and valve bush into valve body

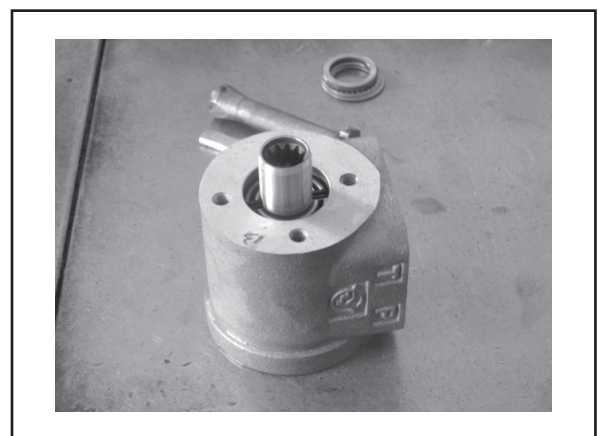


Figure.25

4. Install big baffle ring, needle roller thrust bearing and small baffle ring

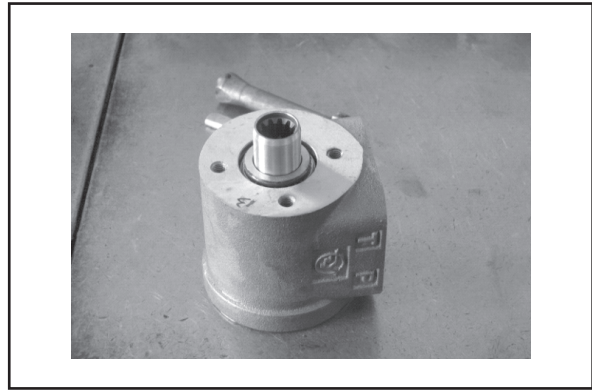


Figure.26

5. Install front cover with well assembled sealing ring

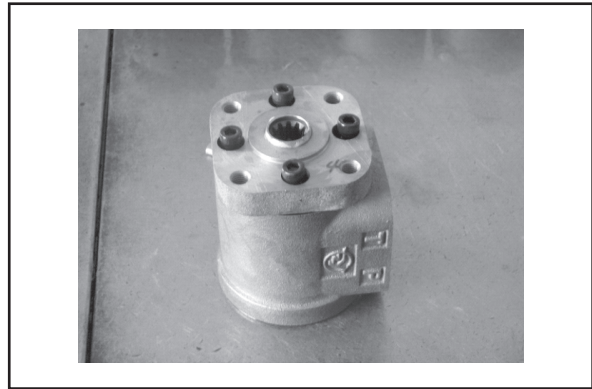


Figure.27

6. Keep fourteen holes of steering unit upward

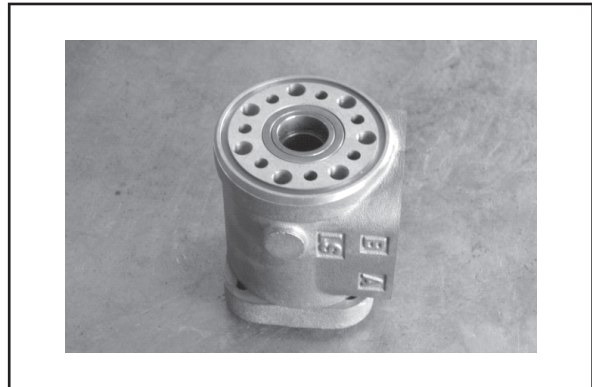


Figure.28

7. Install sealing ring

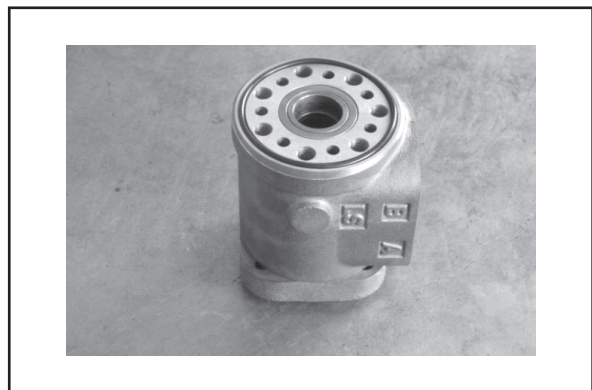


Figure.29

8. Put $\phi 8\text{mm}$ steel balls into the thread holes as shown in the picture

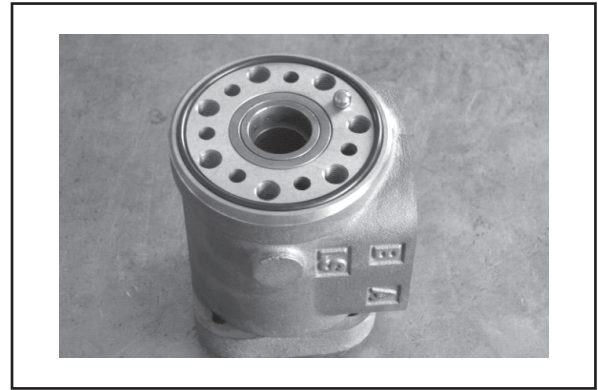


Figure.30

9. Install spacer plate and align the holes.

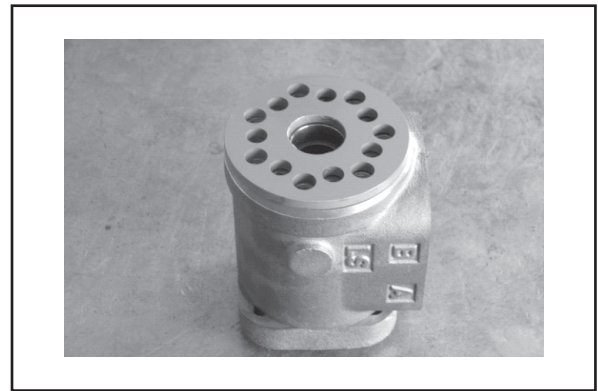


Figure.31

10. Install couple axle, stop dial pin with linkage shaft

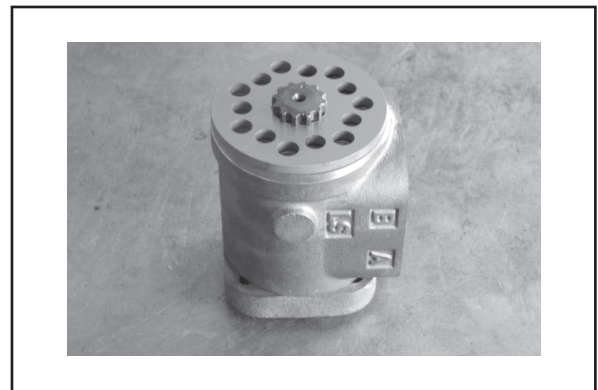


Figure.32

11. Install turn stator vice (note: mark on linkage shaft shall align with groove on rotor)

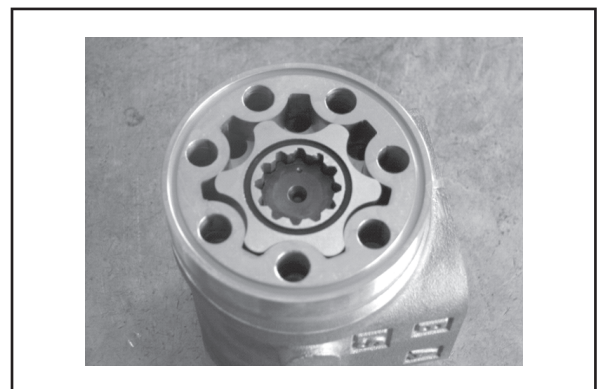


Figure.33

12. Install upper limitation column and sealing ring



Figure.34

13. Install rear cover, combined gasket, bolts, the position shown in the picture by arrow is cotter bolt.

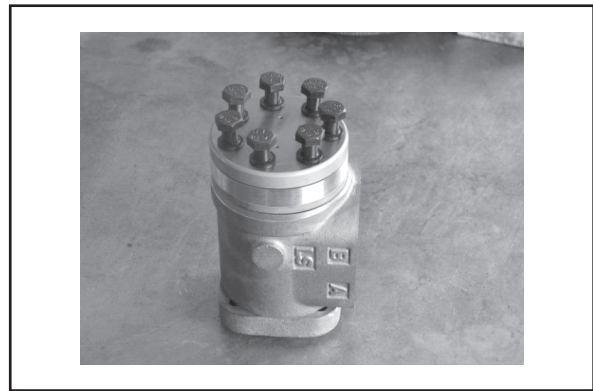


Figure.35

Matters need attention during assembling

1. Clean all parts (except rubber ring) with gasoline or kerosene before assembling. If there is paint on combination surface, clean with acetone, it is forbidden to clean parts with cotton yarn or cloth, soft banister brush or silk shall be used to clean parts, it is better to blow with compressed air, after steering unit is installed well, add 50-100ml hydraulic oil before install in machines, turn around spool, install in machine for test if everything is normal
2. Combination surface of valve body, spacer plate, stator and rear cover must be highly clean, do not knock or scratch.
3. There are spot mark on end surface of rotor and linkage shaft, that is teeth of linkage shaft groove shall align with multiple spline groove inside rotor teeth bottom, pay attention to the relative position during installation.
4. Bolts of rear cover shall adopt qualified combined gaskets.
5. when fastening seven bolts of rear cover, screw on every two bolts in order, screw on gradually, the fastening torque is 40 ~ 50 N.m.
6. (Note) "P", "T", "A", "B" oil mouth of valve body and valve block shall align with each other one by one during installation.

Hydraulic Schematic (SD 200)



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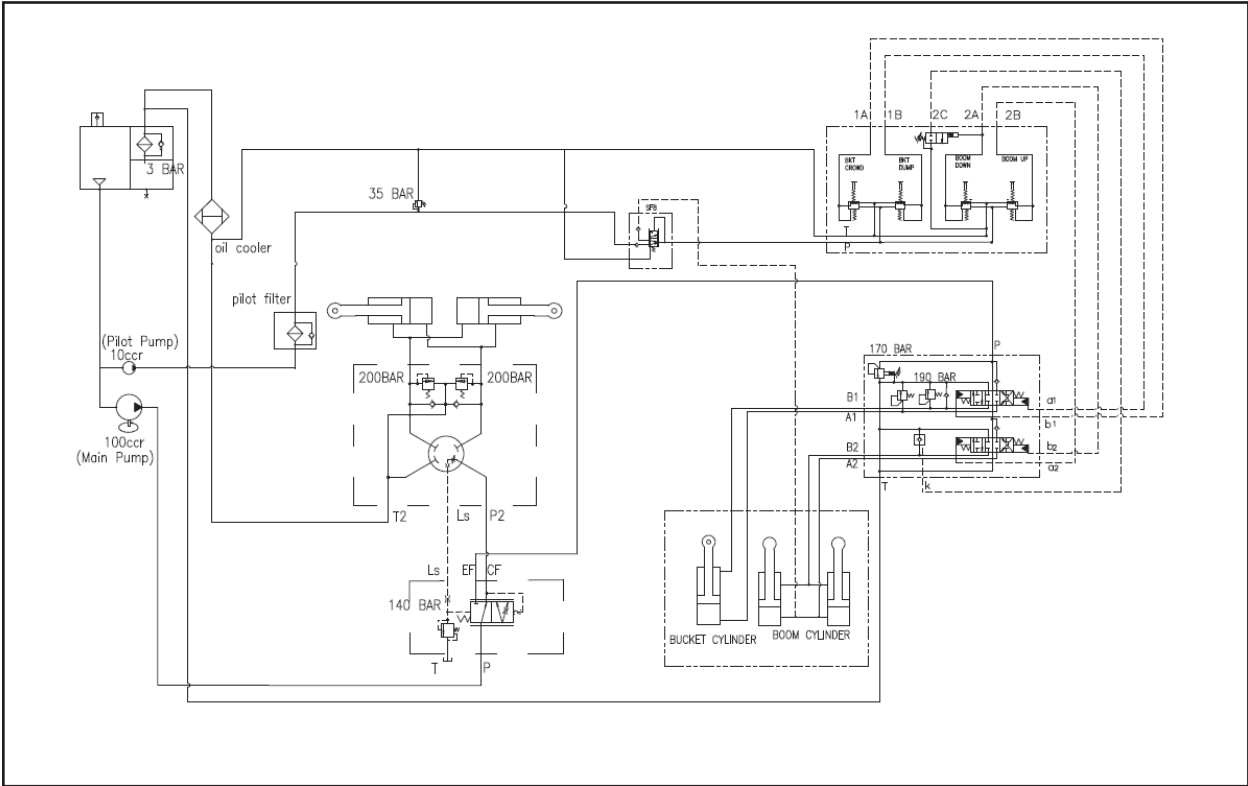
Remember, that ultimately safety is your own personal responsibility.

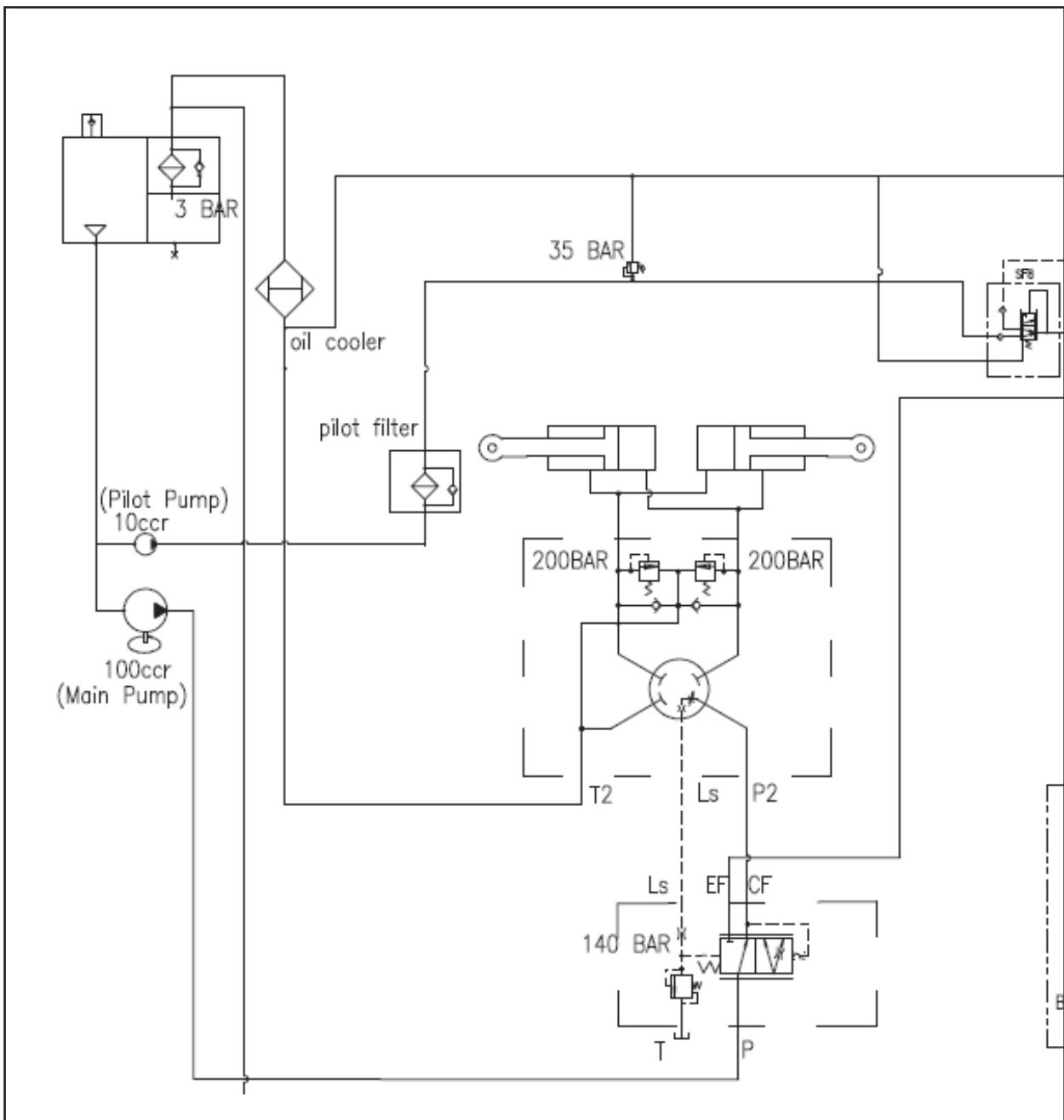
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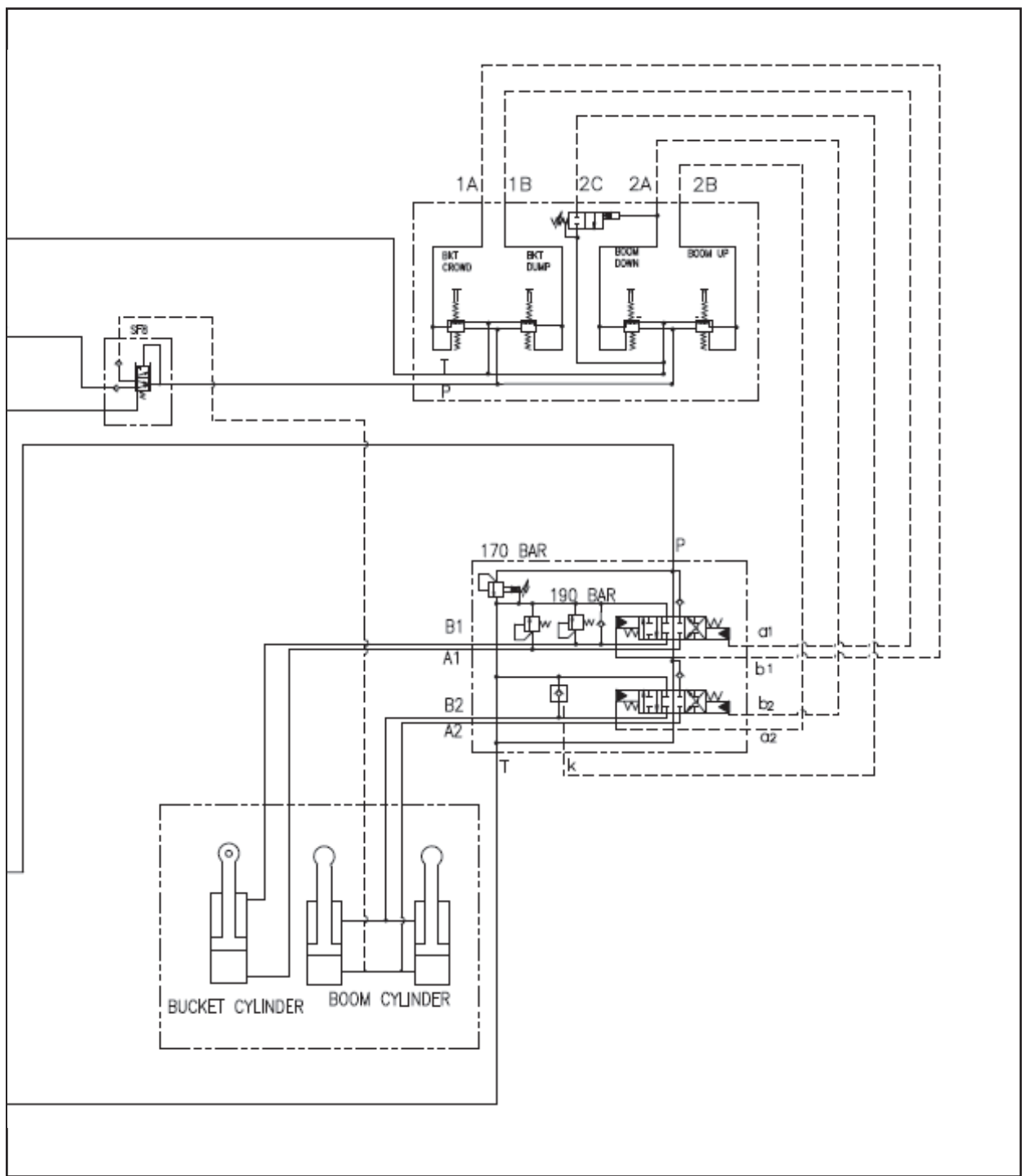
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Schematic Diagram..... 3

General description

Schematic diagram







BRAKE

BRAKE SYSTEM



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General Description

Structure of travelling brake

It usually includes air compressor, oil-water separation combination valve (oil-water separator, pressure control valve), air tank, pneumatic brake valve, air booster pump and caliper disc brake. If it is equipped with emergency braking function, it usually also includes emergency and stopping brake control valve, brake air chamber, quick release valve. In air circuit of brake system, there are some other accessories, such as switch of brake light, switch of power off, etc.

Working Principle of Travelling Brake

Compressed air is output from air compressor driven by engine, and enters into air tank through oil-water separation combination valve (oil-water separator, pressure control valve). When air pressure in air tank reaches the highest braking pressure (usually around 0.784MPa) of brake system, pressure control valve will close the exit going to air tank, open load discharging mouth and discharge the compressed air from air compressor to the air directly. When compressed air in air tank reaches the lowest pressure (usually around 0.71MPa) of brake system, pressure control valve will open the exit going to air tank, and close load discharging mouth to let compressed air from air compressor into air tank for supplementation until the compressed air in air tank reaches the highest working pressure of brake system.

Following is the fundamental diagram

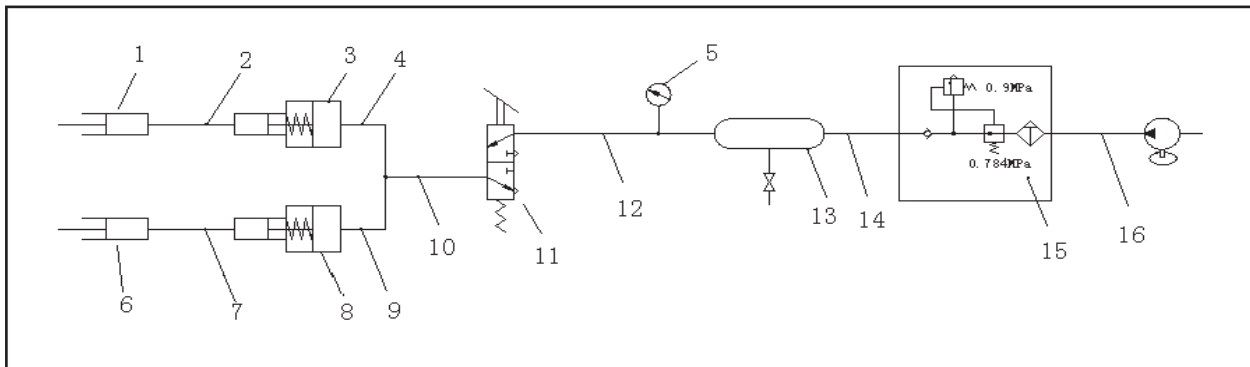


Figure.1

| Reference Number | Description | Reference Number | Description |
|------------------|-----------------|------------------|-------------|
| 1 | REAR AXLE | 9 | HOSE |
| 2 | HOSE | 10 | HOSE |
| 3 | PUMP | 11 | PEDAL |
| 4 | HOSE | 12 | HOSE |
| 5 | SWITCH;PRESSURE | 13 | ACCUMULATOR |
| 6 | FRONT AXLE | 14 | HOSE |
| 7 | HOSE | 15 | VALVE |
| 8 | PUMP | 16 | HOSE |

PARTS LIST

1. Structure Chart of Brake System

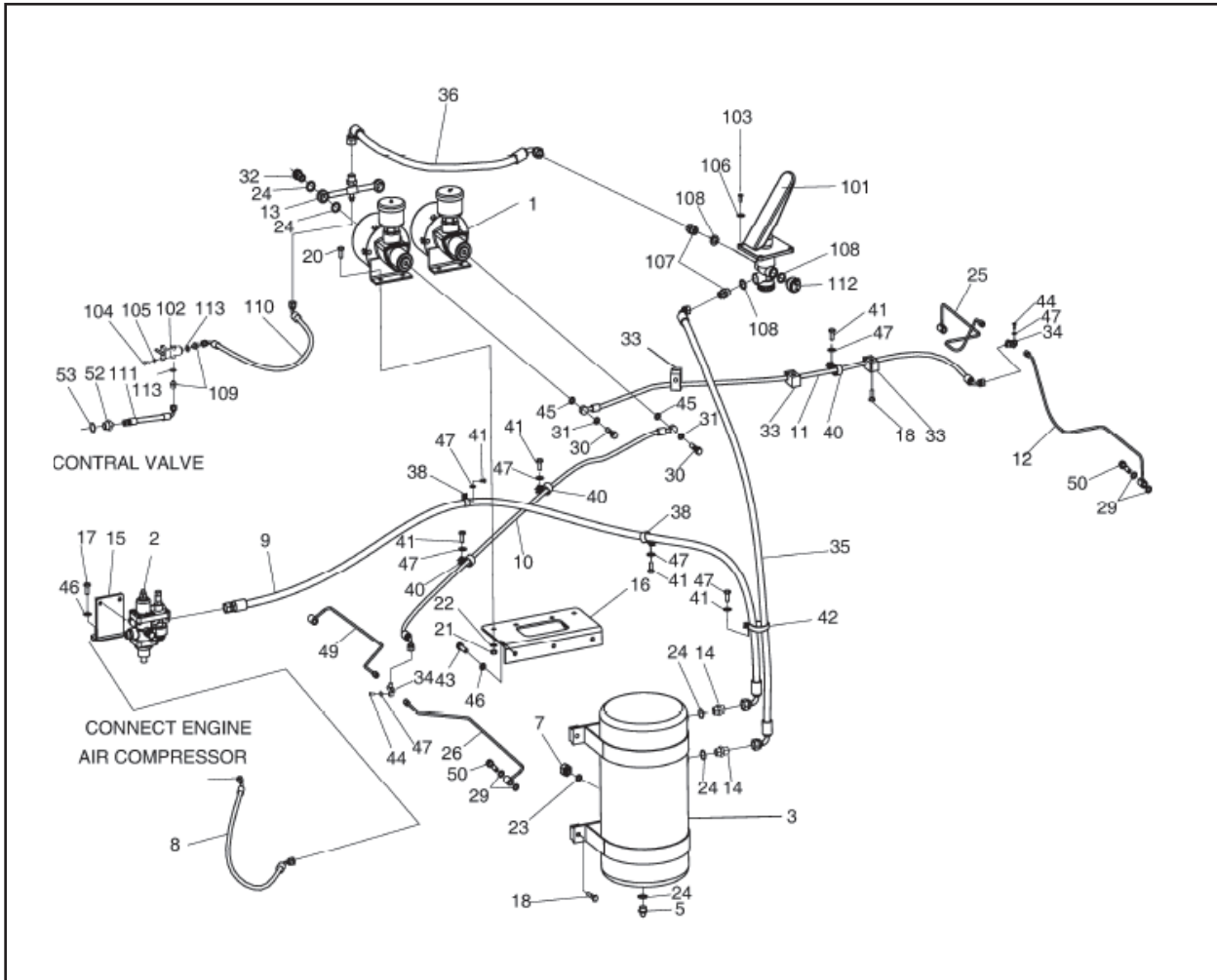


Figure.2

| Reference Number | Description | Reference Number | Description |
|------------------|------------------|------------------|-------------------|
| 1 | PUMP | 35 | HOSE,AIR |
| 2 | VALVE | 36 | HOSE,AIR |
| 3 | ACCUMULATOR | 38 | CLIP |
| 5 | VALVE | 40 | CLIP |
| 7 | SWITCH;PRESSURE | 41 | BOLT |
| 8 | HOSE,AIR | 42 | CLIP |
| 9 | HOSE,AIR | 43 | BOLT |
| 10 | HOSE | 44 | BOLT |
| 11 | HOSE,FLUID | 45 | SEALRING |
| 12 | TUBE | 46 | WASHER;PLAIN M10 |
| 13 | PIPE,AIR | 47 | WASHER |
| 14 | ADAPTER | 49 | TUBE |
| 15 | PLATE | 50 | BOLT |
| 16 | BRACKET | 52 | ADAPTER |
| 17 | BOLT | 53 | WASHER |
| 18 | BOLT | 101 | VALVE,BRAKE PEDAL |
| 20 | BOLT M12X1.75X30 | 102 | SWITCH;SHUT OFF |
| 21 | NUT | 103 | BOLT |
| 22 | WASHER;PLAIN | 104 | BOLT (M5X0.8) |
| 23 | SEAL RING | 105 | WASHER;PLAIN M5 |
| 24 | WASHER,SEAL | 106 | WASHER |
| 25 | TUBE | 107 | ADAPTER |
| 26 | TUBE | 108 | WASHER,SEAL |
| 29 | WASHER | 109 | ADAPTER |
| 30 | BOLT | 110 | HOSE; ; |
| 31 | SEALRING | 111 | HOSE |
| 32 | BOLT | 112 | SWITCH,LAMP |
| 33 | CLAMP | 113 | SEAL RING |
| 34 | TEE | | |

2.Oil-water separator

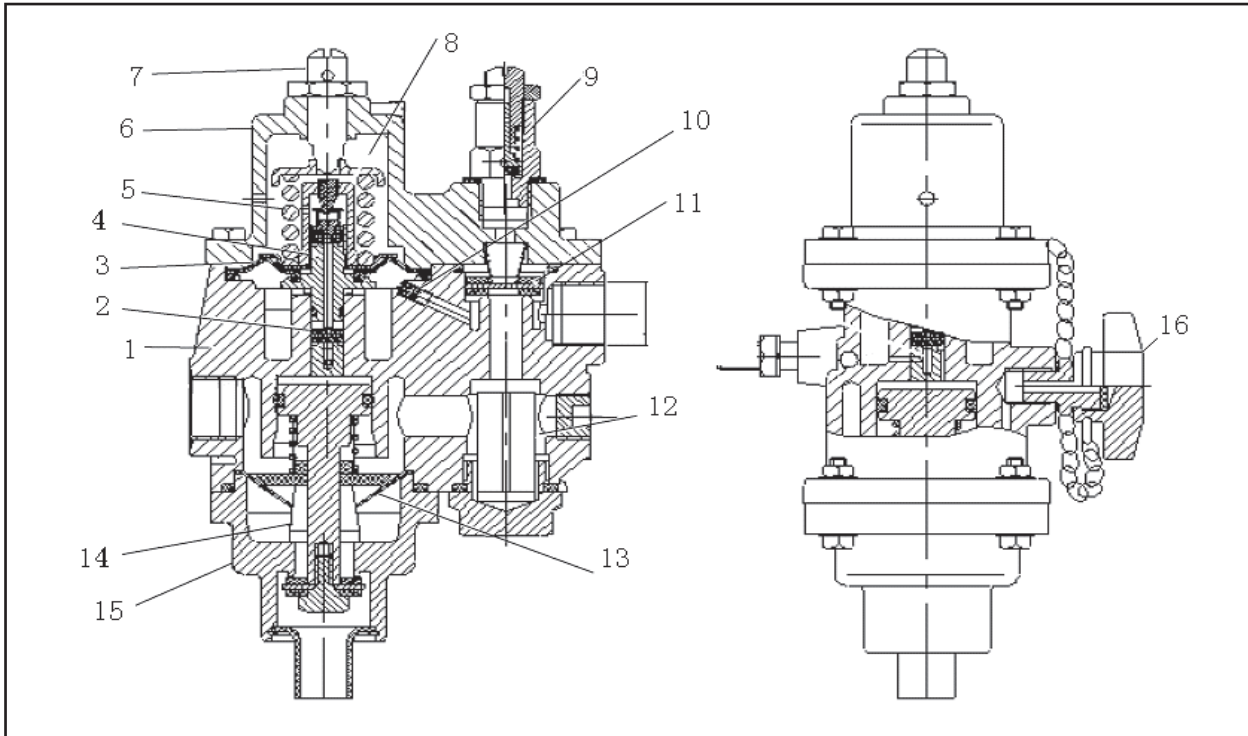


Figure.3

| Reference Number | Description | Reference Number | Description |
|------------------|--------------------------|------------------|---------------------|
| 1 | SHELL ASS'Y | 9 | RELIEF VALVE ASS'Y |
| 2 | REGULATING VALVE | 10 | ORIFICE PLUG |
| 3 | EAR DRUM | 11 | ONE-WAY VALVE |
| 4 | STEM | 12 | FILTER ASS'Y |
| 5 | REGULATING SPRING | 13 | OIL COLLECTOR |
| 6 | UPPER COVER | 14 | AIR BLEEDING PISTON |
| 7 | REGULATING SCREW | 15 | LOWER SHELL |
| 8 | CONTROLLING PISTON ASS'Y | 16 | AEROFIOL NUT |

3.Pneumatic brake valve

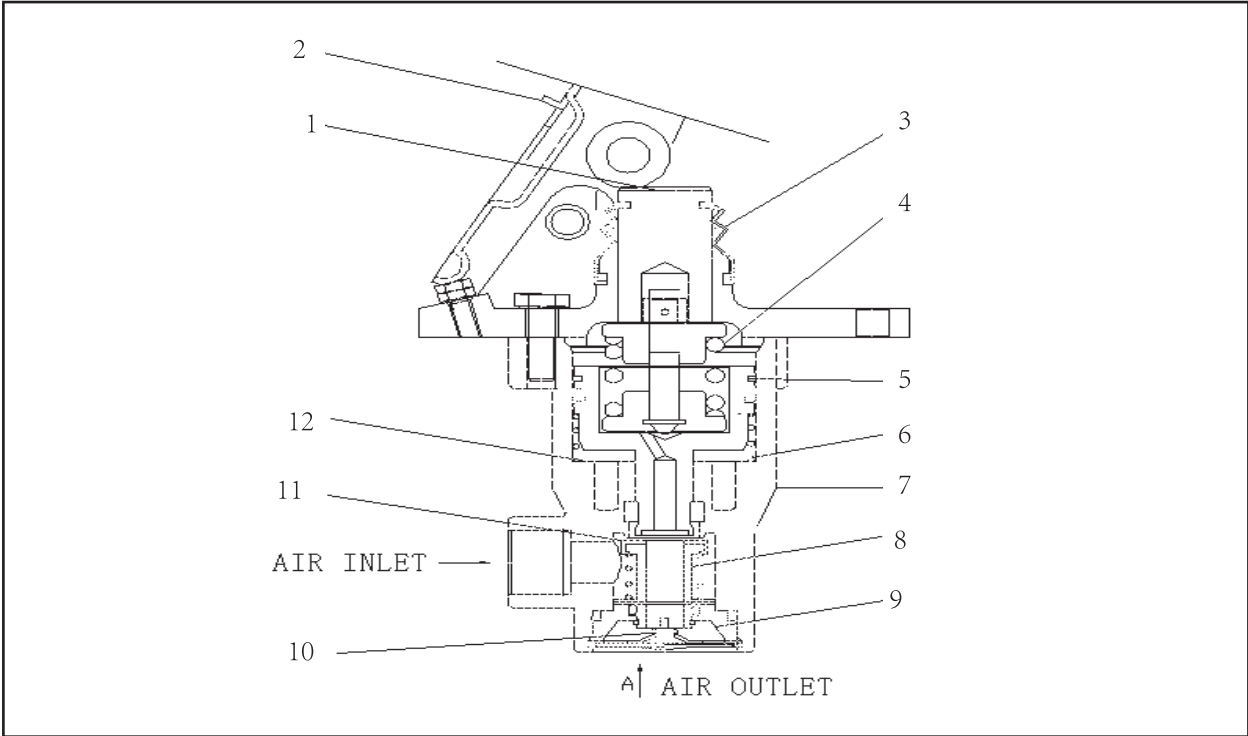


Figure.4

| Reference Number | Description | Reference Number | Description |
|------------------|--------------------|------------------|--------------------|
| 1 | MANDRIL | 7 | VALVE BODY |
| 2 | PEDAL ASS'Y | 8 | INTAKE VALVE ASS'Y |
| 3 | ANTIDUST COVER | 9 | VALVE ASS'Y |
| 4 | BALANCING SPRING | 10 | OUTLET VALVE ASS'Y |
| 5 | PISTON ASS'Y | 11 | SEALING FIN |
| 6 | PISTON FOUR SPRING | 12 | SPRING SEAT |

4.Booster pump

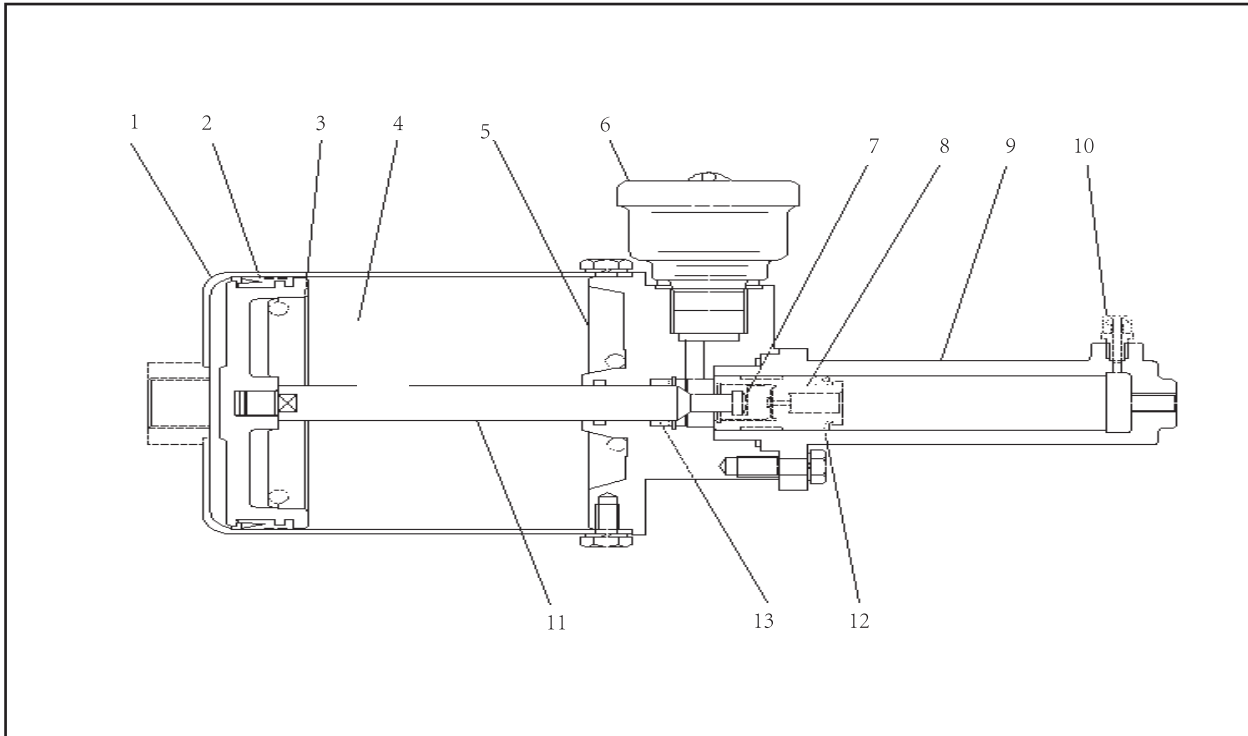


Figure.5

| Reference Number | Description | Reference Number | Description |
|------------------|-------------------|------------------|--------------------|
| 1 | STRENGTH CYLINDER | 8 | PISTON |
| 2 | Y-SEAL RING | 9 | BREAKING PUMP |
| 3 | PISTON | 10 | AIR OUTLET SCREW |
| 4 | RELEASING SPRING | 11 | PUSHING BORER |
| 5 | ENDPLATE | 12 | MAIN PUMP FUR BOWL |
| 6 | STORAGE CUP | 13 | X-SEAL RING |
| 7 | PUTTING SEAT | | |

SPECIAL TOOLS AND MATERIALS

LUBRICANTS, SEALANTS AND OIL

System Maintenance and Failures Analysis

Brake caliper is locking

The so called “locking” failure refers to brake caliper does not return to the original position, that is one of the common failures of brake system. There are many reasons causing such kind failures, such as brake caliper is blocked, booster pump is blocked or brake caliper valve is blocked. If the brake caliper of front and rear bridge is locking, it is may caused by blocking of pneumatic brake caliper. When the failures are solved, loosen pipeline between booster pump and brake caliper, manually check if the brake caliper can return, if it does not work, it may be caused by blocking of brake caliper, if it can be returned manually, but booster pump may be blocked.

No brake or brake distance is too long

1. Pressure adjustment is improper, which causes pressure of compressed air is too low, brake moment is too small. Adjust pressure gauge to the regulated range.
2. It may be caused because air compressor is air leaking or air inlet and outlet valve are blocked because wearing of cylinder barrel and piston ring is too much, driving belt is too loosened. The worn parts shall be replaced in time.
3. Foot brake valve is adjusted improperly, when brake pedal is stepped to the end, air inlet valve of brake valve is not totally opened, air throttle is caused, air pressure becomes weak when going through foot brake valve, and it cannot reach rated working pressure. Adjust the adjusting screw of brake pedal.
4. Failure of booster pump: sealing ring of booster pump is worn, compressed air goes into low pressure chamber, and movement of brake pump piston is slow, or even there is no moving distance, which cause braking power is not enough; compensation hole of brake pump is blocked by dirt, brake fluid cannot go into ante chamber of piston and oil in brake oil way is not enough.

Brake lags behind

1. Air in brake system is not evacuated, air is compressed when braking, air resets when releasing brake, which affects returning of friction plate.
2. Brake air pressure is not enough;
3. Piston of brake caliper is blocked;
4. Foot brake air bleeder or filter screen is blocked, return spring of valve core is broken, piston cannot return and blocks outlet of air hole, which makes brake air discharging is not smooth, brake pressure and oil pressure cannot reduce quickly, brake moment cannot be released, thus it is laged behind.
5. The hole of non-pressure chamber of booster pump connecting with air is blocked or return spring is broken, which affects sensitivity of chamber piston return and cause lag.

Braking deviation

The direct reason of braking deviation is the brake moments of the left side and right side wheels are different, the common phenomenon are:

1. Brake caliper of one side of the wheel is locking, it is hard to trip off during travelling, and usually the rectangle sealing ring of brake caliper is broken.
2. When stepping foot pedal, one side brake caliper is braking, while the other side is inside leaking and oilway is blocked, brake fluid cannot go into brake caliper, which makes different brake moments and causes deviation. Under such kind of condition, please check if the sealing rings of gas cap and brake caliper are turned up or the pipelines are blocked.

There is scream during braking, and brake is hot

1. Connection screws between brake caliper and drive axle are loosed, they rub, impact or abrade each other.
2. There are hard things between brake lining and brake disc.

Storage and usage of brake fluid

1. Brake fluid belongs to inflammable goods; please pay Note to avoid evaporation and fire during usage and storage.
2. Brake fluid shall be stored in warehouse or other assigned place, but it cannot be stored in open air and close to hot source to avoid deteriorating and become invalid.
3. The using department shall set up independent room for storage and there must be obvious marks.
4. It is forbidden to mix and use brake fluid of different brands to avoid layering and lose braking effect.
5. There must be special containers to store brake fluid to avoid mixing of other oil and cause reaction and invalidity.
6. Containers storing brake fluid must be clean and covered to avoid mechanical sundries and water. If the surface of brake fluid has dust and sundries, they must be removed before using, do not mix them, clean and special tool shall be used to add brake fluid.

Replacement of brake fluid and Notes:

Technicians shall guide clients to use and replace brake fluid strictly, when following conditions appear, all brake fluid must be replaced immediately.

1. When brake fluid is mixed with mineral substance, such as gas oil and diesel.
2. When vehicle is travelling normally, brake is light and heavy.
3. When brake fluid in the system is less or when the vehicle having liquid level is warning.
4. When oil color of brake fluid is muddy or there are sundries and sediment.

Notes during replacement:

1. When replacing brake fluid, clean the residual liquid in brake system, and check new brake liquid.
2. When replacing brake fluid, try to reduce the contacting time between brake fluid and air to avoid reducing performance of brake fluid.
3. Before replacing brake fluid, it is better to clean brake system with alcohol, release air in the oilway after replacement.

Treatment of air source

1. Clean air filter core in time.
2. Release water from air tank in time.

PARKING SYSTEM



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General Description

Structure of parking brake

Brake is located at the front end of output axle of gearbox. Driven method is pneumatic control. Pneumatic control usually has emergency brake function. When brake pressure is lower than safe pressure, the system can stop loader automatically.

Working principle of parking brake:

When the loader is driven normally, emergency and parking brake control valve are normally open. Compressed air from air tank goes through emergency and parking brake control valve, quick release valve, one part goes into brake chamber to push piston, compressed spring in brake chamber and store energy. The other part goes into the small chamber of stop valve of variable speed control valve, and connects with shift gear oilway. When emergency and parking brake are needed, emergency and parking brake valve is controlled to stop compressed air, brake chamber, compressed air in stop valve chamber will be discharged into air through quick release valve, shift gear oilway is stopped, gear box is on empty gear automatically, at the same time spring in brake chamber is released to push piston driven shoe brake in brake chamber to realize parking brake or emergency brake. When pressure of brake system is lower than safe pressure (0.3MPa usually), emergency and parking brake control valve will act automatically to realize emergency brake.

PARTS LIST

Assembly structure chart

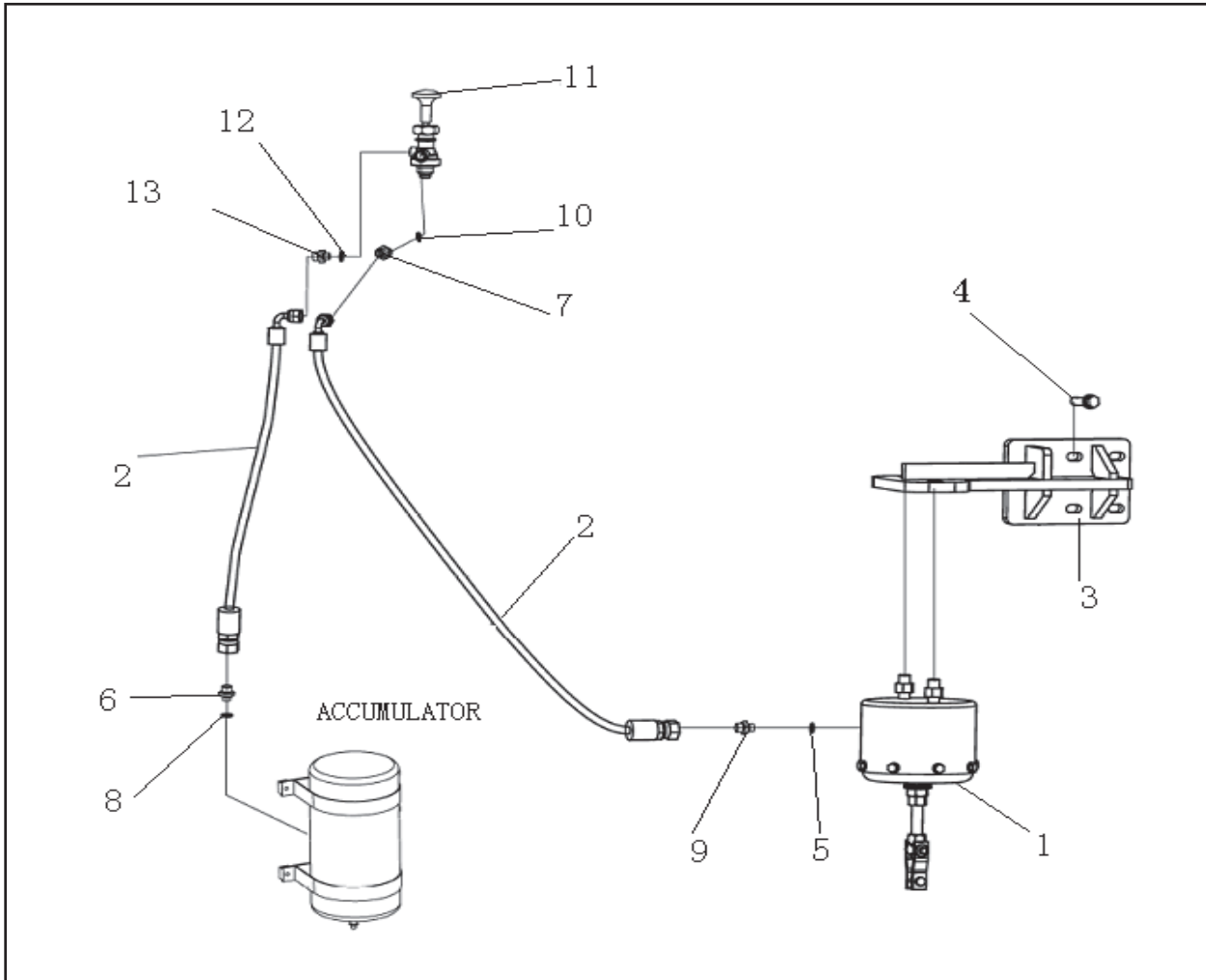


Figure.1

| Reference Number | Description | Reference Number | Description |
|------------------|-------------|------------------|---------------|
| 1 | ACCUMULATOR | 8 | WASHER |
| 2 | HOSE | 9 | ADAPTER |
| 3 | BRACKET | 10 | SEAL RING |
| 4 | BOLT,HEX | 11 | VALVE,CONTROL |
| 5 | SEAL RING | 12 | WASHER |
| 6 | ADAPTER | 13 | ADAPTER |
| 7 | ADAPTER | | |

ELECTRICAL SYSTEM

ELECTRICAL SYSTEM



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| Proximity Switch..... | 25 |

OVERVIEW

Voltage of electrical system of the machine is DC 24V, the rated voltage of all electrical parts is 24V. Electrical cable wire adopts single wire system, and negative earth is adopted. Electrical system includes two serial 12V storage batteries and three phase DC generator with entire rectifier. Wire harness of the system can be distinguished by different insulation color. Each color symbol used for electrical system is listed below.

Electric Wire Color

| Symbol | Color |
|--------|-------------|
| W | White |
| G | Green |
| Or | Orange |
| B | Black |
| L | Blue |
| Lg | Light Green |

| Symbol | Color |
|--------|--------|
| R | Red |
| Gr | Gray |
| P | Pink |
| Y | Yellow |
| Br | Brown |
| V | Violet |

NOTE: *RW: Red wire with White stripe.*

R - Base Color, W - Stripe Color.

NOTE: *0.85G: Nominal sectional area of wire core less insulator = 0.85 mm² (0.03 in²).*

ELECTRIC SUPPLY SYSTEM

Power circuit supplies electric current to each electrical part. It is composed of storage battery, generator, fusible line and fuse box. Negative electrode of storage battery is earth connected and connects with balance weight.

Even if keys switch is at "OFF" position, when the general power is switched off, storage battery still supplies electric current to following parts, and returns back to fuse box through fusible link.

1. Input terminal of storage battery relay power supply.
2. Key switch terminal "B".
3. Cabin light power supply terminal.
4. General stop electromagnet power input terminal.
5. Generator terminal "B".
6. Preheat relay power input terminal.

When switch of keys is at "ON" and "START" position, electric current flows to fusible wire from storage battery, reaches key switch terminal "B"/"BR" through fuse box, and reaches storage battery relay control terminal "+" through guide line, activate storage battery relay coil and make the system power on.

When all contact terminals of storage battery are connected well, electrical device can be operated.

When generator does not work, all electrical equipments power source is supplied by storage battery. Once diesel engine is started, power will be supplied by generator.

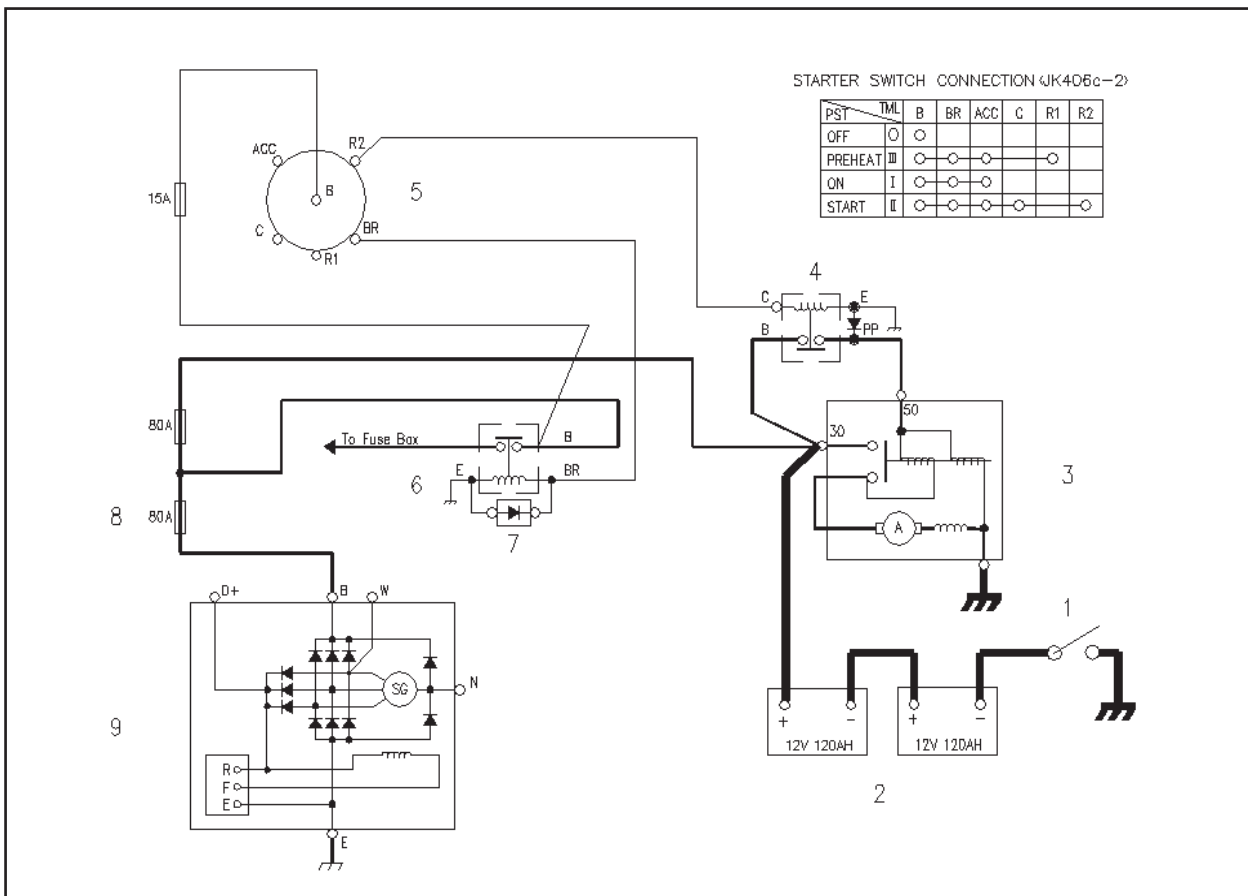


Figure.1 Power supply circuit diagram

| Reference Number | Description | Reference Number | Description |
|------------------|-------------------|------------------|---------------|
| 1 | Disconnect Switch | 6 | Battery Relay |
| 2 | Battery | 7 | Diode |
| 3 | Starter | 8 | Fuse |
| 4 | Starter Relay | 9 | Alternator |
| 5 | Starter Switch | | |

ENGINE STARTING CIRCUIT

Running condition during starting process

Turn key switch (6) to "ON" position, connect terminal "B" and "BR", output electric current starts power relay (8), then fuse box is power on.

After key switch (6) is turned to "ON" position, terminal "R2" and "B" are connected, starter relay (4) is started, then other contact terminals "B" and "PP" are connected, active gear of starter (3) is propelled to contact ring gear of flywheel and connect with contact terminal of starter.

Electric current comes out from storage battery (2), goes through terminal "B" and "PP" of starter relay (4) and arrives at starter (3) terminal "50".

Running condition after starting

Once generator is started, the belt will drive AC generator (9) to create electric current. Electric current goes through generator (9) terminal "B", safety plate (7), power relay (8) terminal "B" and supply power to fuse box.

Engine Preheating System

Engine preheating system is flame preheating system, its main functions are: heat air inlet temperature through burning diesel to solve the problem that engine is difficult to be started in winter resulted from low temperature. Main parts include: preheating switch (6), temperature sensor (11), preheating controller (7), preheating indicator (12), preheating relay (8), flame preheating solenoid valve (10) and preheating plug (9).

Working principle:

1. Preheating switch (6) is turned on;
2. When water temperature of engine is higher than 0°C (water temperature R_t resistivity is smaller than $2700\pm 300\Omega$), controller (7) is not at preheating state, preheating indicator light (12) is on for 2S and then off;
3. When water temperature of engine is lower than 0°C (water temperature R_t resistivity is smaller than $2700\pm 300\Omega$), controller (7) is at preheating state; preheating time is related with voltage;

Relationship between preheating time and voltage

| Voltage(V) | 18 | 20 | 22 | 24 |
|------------|-----------|-----------|-----------|-----------|
| Time(S) | 55 ± 5 | 41 ± 4 | 30 ± 3 | 26 ± 2 |

4. When preheating time is up, preheating indicator light (12) is off (if ignition switch is off during preheating time, controller stops working), it enters into 30S period waiting for starting;
 - ① Turn off starting gear (ON) of ignition switch (4) during this period (preheating plug is power on during this period), oil supplying solenoid valve is connected, preheating indicator light (12) is on again, flame preheating plug (9) is power on;
 - ② Turn off starting gear (ON) of ignition switch (4) during this period, 24V voltage is not input into 50 terminals, engine is not starter, controller stops working;
5. After starting switch (4) is reset from starting position, if generator (3) does not send out D+ signal to controller (7) (that is starting is unsuccessful), controller stops working after 6S; if generator sends out D+ signal to controller (that is starting is successful), after entering into preheating period, working time R_t resistivity and water temperature sensor (11) is functional relation, the longest is 120S, the shortest is 60S;
6. When R_t circuit of water temperature sensor (11) is broken, the system enters into preheating state, after all starting procedures are finished, preheating indicator light (12) blinks for 15S for warning, the heating time is the longest of the system after then;
7. When working voltage is lower than 15V, the system does not at preheating state, preheating indicator light (12) blinks for 15S for warning.
8. When controller (7) stops working under any working state, preheating switch (6) must be turned off to enter into preheating state again, that is cancel 15 terminal voltage, connects with preheating switch (6) again.

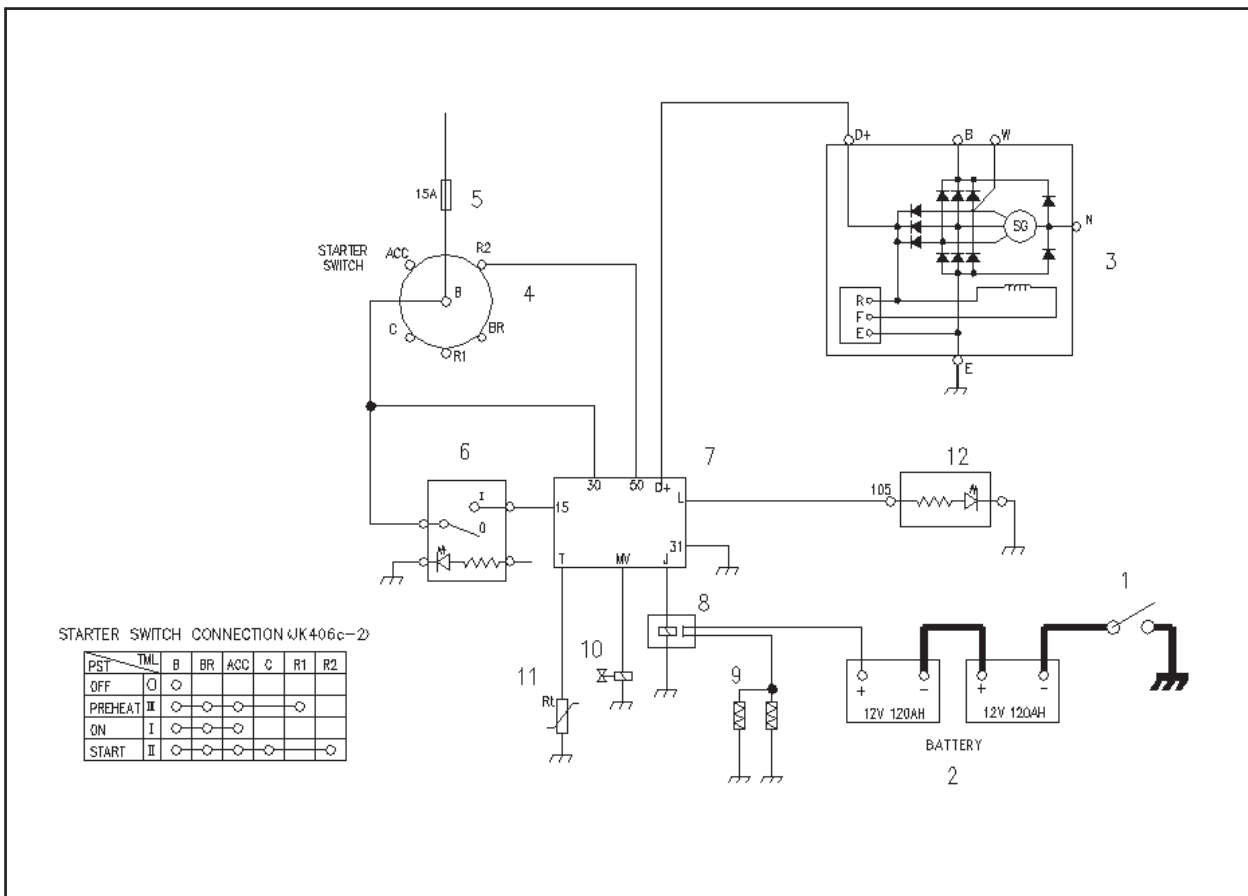


Figure.3 Control circuit of preheating system

| Reference Number | Description | Reference Number | Description |
|------------------|-------------------|------------------|---------------------|
| 1 | Disconnect Switch | 7 | Preheat Controller |
| 2 | Battery | 8 | Preheat Relay |
| 3 | Alternator | 9 | Pre-heater |
| 4 | Starter Switch | 10 | Solenoid Fuel Valve |
| 5 | Fuse | 11 | Water Temp. Sensor |
| 6 | Preheat Switch | 12 | Preheat Indicator |

ENGINE STOP SYSTEM

Engine stopping system is composed of key switch (4), flameout electromagnet (6) and flameout relay (5). There are two kinds of work process: before engine is started and engine flameout.

Operation in engine running mode

When key switch (4) is turned to "ON" gear, its terminal "ACC" and "B" are connected. Electric current goes through security of electrical box (3) through positive pole of storage battery (2) and "B" and "ACC" terminals of key switch, goes through holding coil of flameout electromagnet and earth connected and forms circuit.

Turns key switch to "START" gear, terminals "ACC", "C" and "B" are connected. Electric current goes through insurance of electrical box (3) from positive pole of storage battery (2) and terminals "B" and "C" of key switch, flameout relay (5) coil is power on and works, terminal 15A and 269 are connected, flameout electromagnet (6) terminal 85 is power on, pulls in coil and works, fuel injection pump is opened and lever is closed.

Then key switch will be back to "ON" gear automatically, pulling in coil is broken, while coil is kept to be power on, keep the state of lever closing.

Operation in engine stop mode

Turns key switch (4) to "OFF" gear, its terminals "ACC" and "C" are power off. Electric current going through flameout electromagnet (6) holding circuit and flameout replay (5) coil is cut off. Closing lever of fuel injection pump is reset, fuel supplying is stopped, engine flames out.

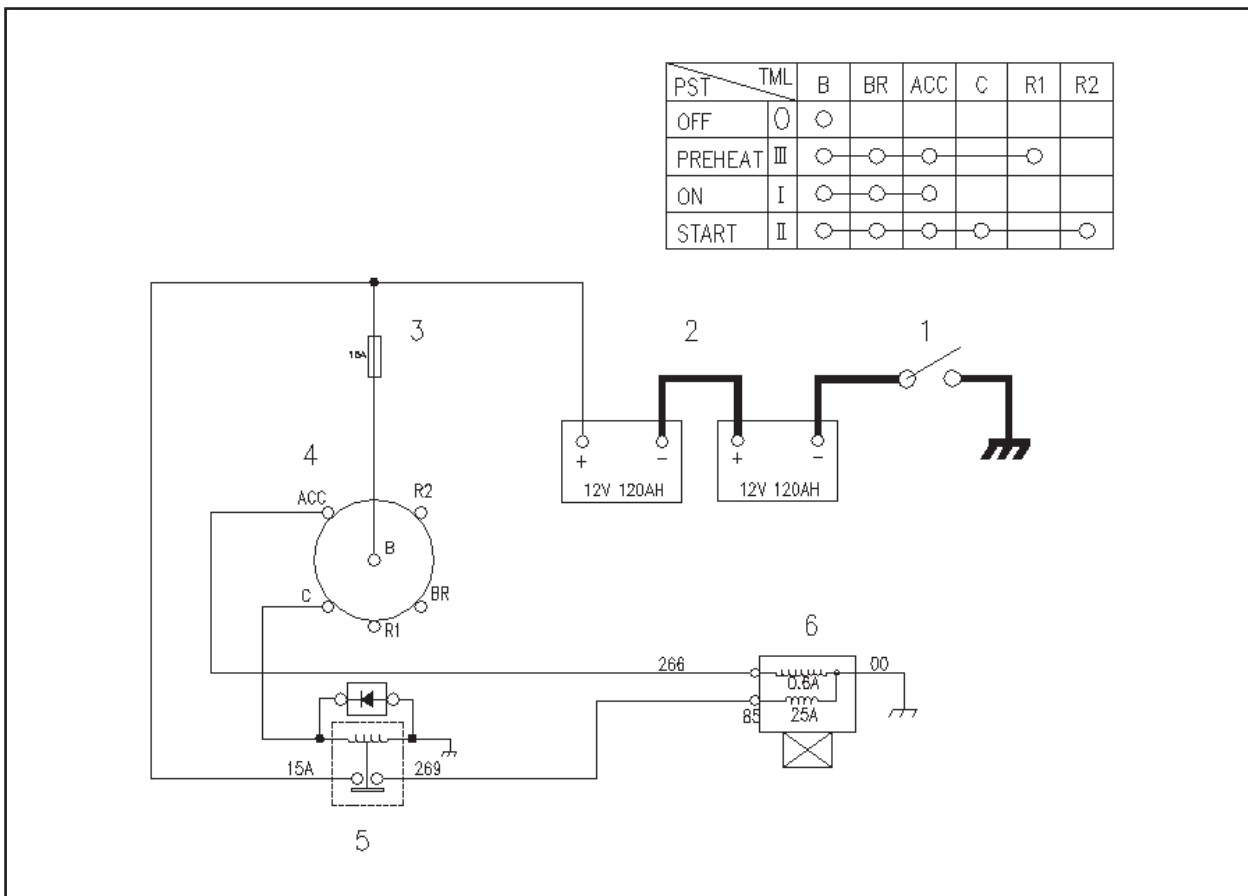


Figure.4 Engine stalling system

| Reference Number | Description | Reference Number | Description |
|------------------|-------------------|------------------|-------------------|
| 1 | Disconnect Switch | 4 | Starter Switch |
| 2 | Battery | 5 | Engine Stop Relay |
| 3 | Fuse | 6 | Engine Stop Motor |

Charging System

Turn key switch (5) to "ON" position, its terminals "BR" and "B" are connected, power relay (6) acts, terminals "02A" and "02" are connected, electric current coming from storage battery (2) goes through fuse box (4), power relay (6), charging indication light (8) and excitation resistance (9) and reaches "D+" terminal of generator (5), earth connected and forms a circuit, charging indication light (8) is on to warn and supplies excitation electric current for generator (5). After engine is started, generator (5) starts charging. Electric current comes from terminal "B+" of generator (5), goes through fuse box (4) and reaches storage battery (2). Charging indication light (8) is off.

Generator (5) also supplies power to other electrical parts through fuse box (4) and power relay (6).

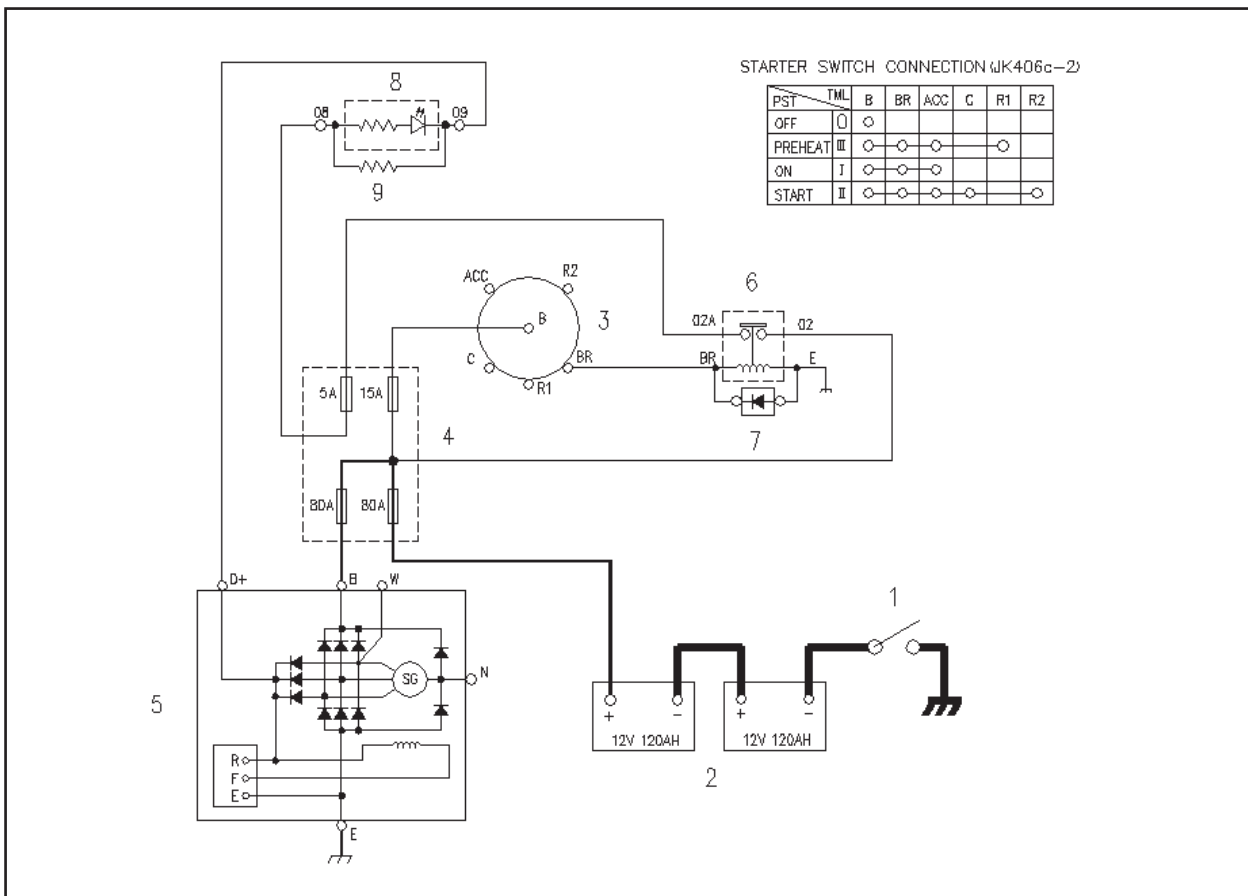


Figure.5 Charging system circuit diagram

| Reference Number | Description | Reference Number | Description |
|------------------|-------------------|------------------|------------------|
| 1 | Disconnect Switch | 6 | Battery Relay |
| 2 | Battery | 7 | Diode |
| 3 | Starter Switch | 8 | Charge Indicator |
| 4 | Fuse Box | 9 | Resistor |
| 5 | Alternator | | |

Monitoring System

Monitoring system of the equipment includes all kinds of oil pressure gauges, oil pressure sensor plug, water temperature gauge, water temperature sensor plug, voltmeter, barometer and low pressure warning device, etc. Four instruments on instrument panel are sensing type, three instruments are directly operated type.

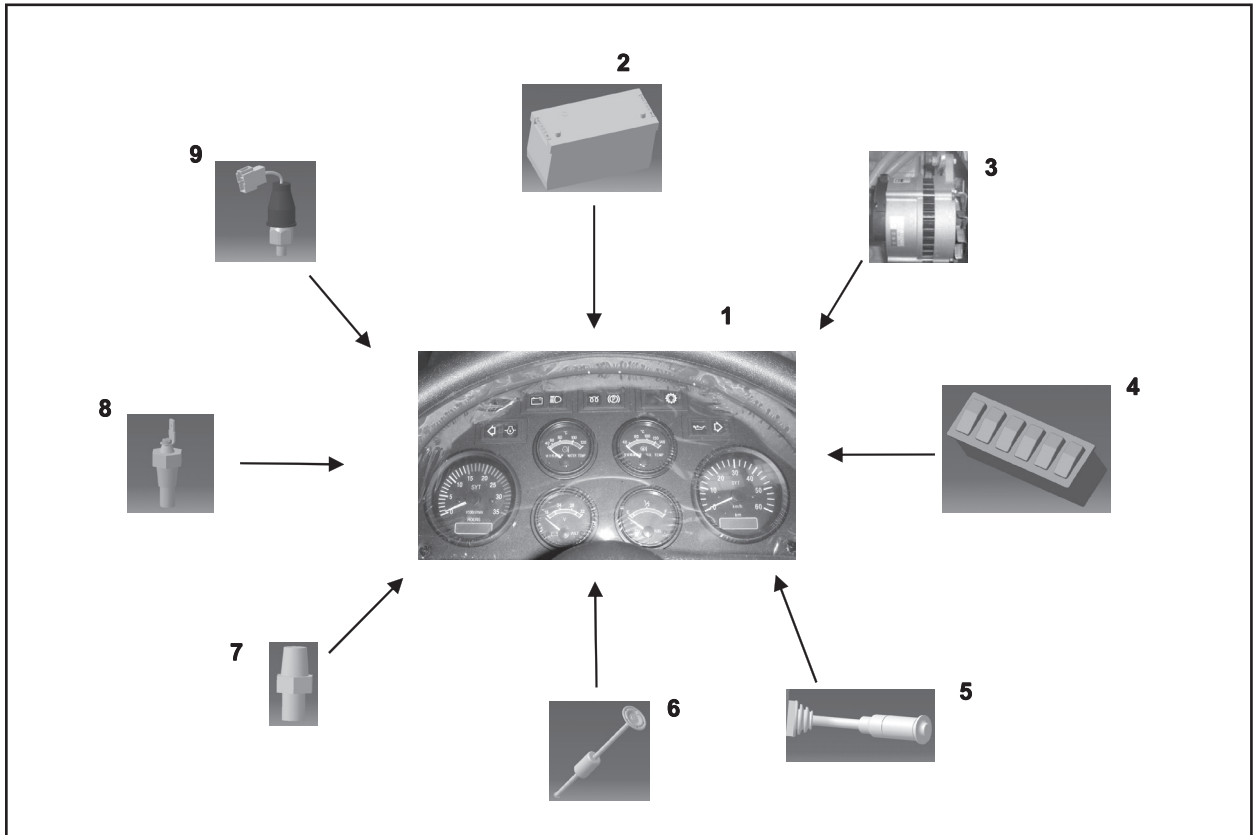


Figure.6 Monitoring system

| Reference Number | Description | Reference Number | Description |
|------------------|---------------|------------------|--------------------------|
| 1 | Gauge Panel | 6 | Fuel Sensor |
| 2 | Battery | 7 | Oil Temperature Sensor |
| 3 | Alternator | 8 | Water Temperature Sensor |
| 4 | Rocker Switch | 9 | Back Buzzer Switch |
| 5 | Switchgroup | | |

Monitoring system will process information collected from all sensors, the instrument panel will indicate all data and warning signals.

Gauge panel

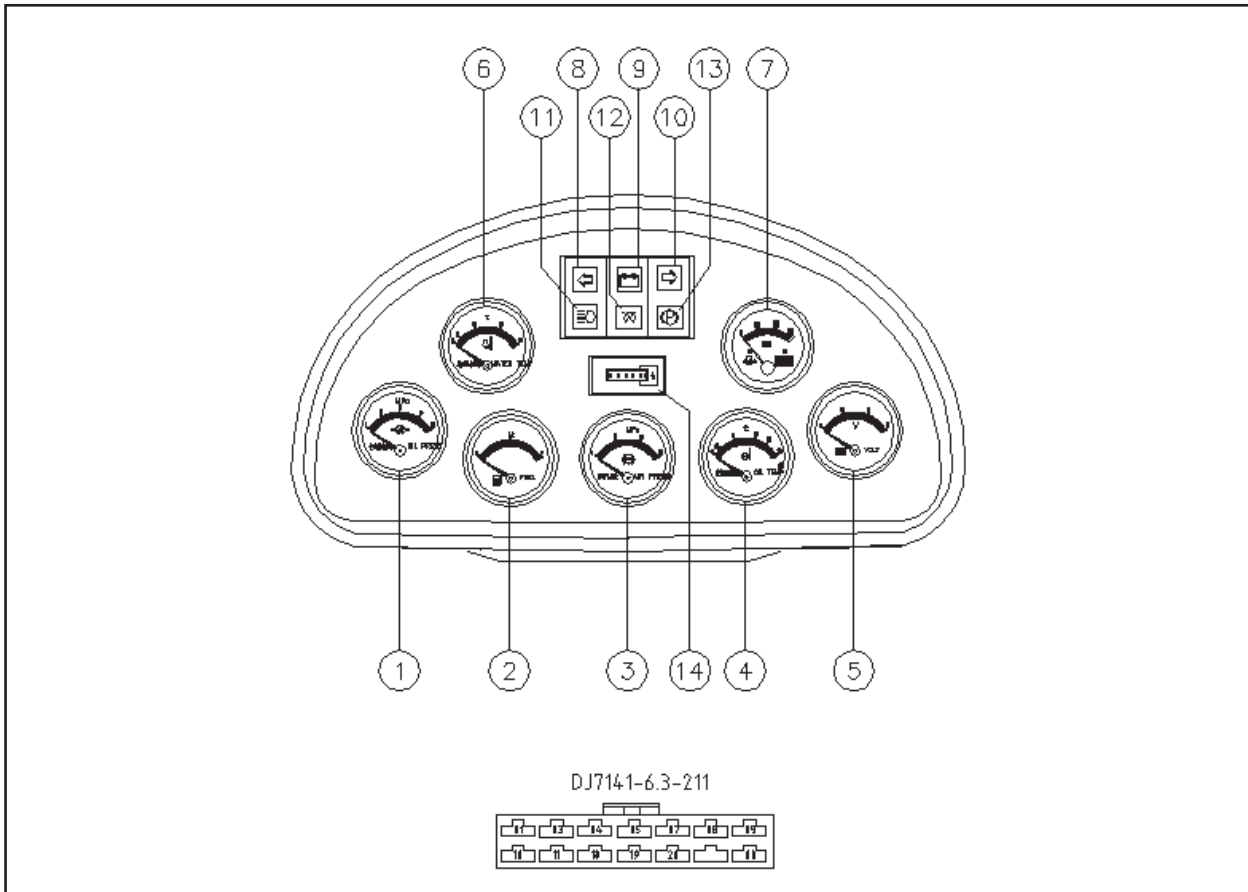
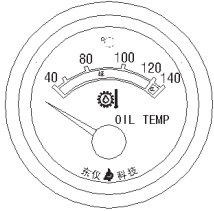
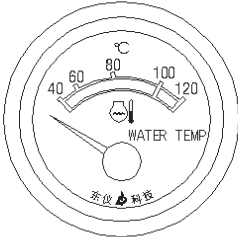
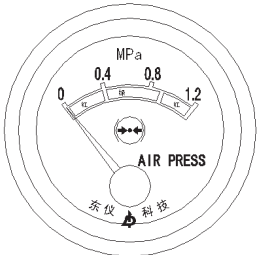
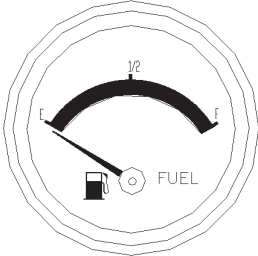
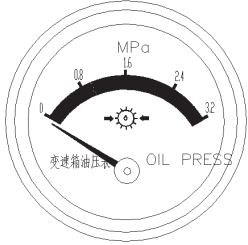
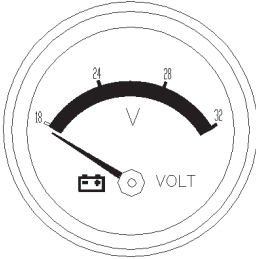
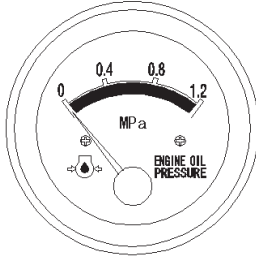
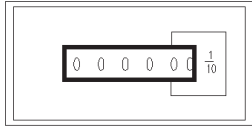
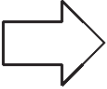
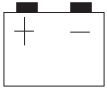
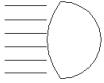


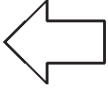


Figure.7 Gauge panel

| Reference Number | Description | Reference Number | Description |
|------------------|--|------------------|-------------------------------|
| 1 | T/M Oil Pressure Meter | 8 | Turn and Hazard Warning Light |
| 2 | Fuel Gauge | 9 | Charging Warning Light |
| 3 | Air Pressure Meter | 10 | Turn and Hazard Warning Light |
| 4 | Torque Converter Oil Temperature Meter | 11 | High Beam Indicator |
| 5 | Voltmeter | 12 | Preheat Indicator |
| 6 | Engine Coolant Temperature Gauge | 13 | Parking Brake Indicator |
| 7 | Engine Oil Pressure Gauge | 14 | Hour Meter |

| Function | Display | Sensor Specification | |
|---|---|------------------------|---|
| | | Input Terminal | Input Specification |
| Oil temperature gauge of torque converter |  | CN-05 | 40°C — More than 180Ω 80°C — 40Ω ~ 60Ω 100°C— 20Ω ~ 40Ω 120°C— less than 20Ω 140°C— more than 10Ω |
| Water temperature gauge of engine |  | CN-03 | 40°C— More than 180Ω 60°C— 80Ω ~ 100Ω 80°C— 40Ω ~ 60Ω 100°C— 20Ω ~ 40Ω 120°C— less than 20Ω |
| Brake barometer |  | Directly operated type | Directly operated type |
| Fuel gauge |  | CN-04 | Empty — more than 80Ω 1/4 — around 46Ω 1/2 — around 32Ω 3/4 — around 22Ω Full — around 8Ω |

| Function | Display | Sensor Specification | |
|-------------------------------|---|------------------------|---------------------|
| | | Input Terminal | Input Specification |
| Oil pressure gauge of gearbox |  A circular gauge with a scale from 0 to 32 MPa. The needle is pointing to approximately 10 MPa. The text '变速箱油压表' (Gearbox Oil Pressure Gauge) and 'OIL PRESS' are visible. | Directly operated type | |
| Voltmeter |  A circular gauge with a scale from 18 to 32 V. The needle is pointing to approximately 24 V. The text 'V' and 'VOLT' are visible. | CN-08 | |
| Fuel pressure gauge of engine |  A circular gauge with a scale from 0 to 1.2 MPa. The needle is pointing to approximately 0.4 MPa. The text 'MPa' and 'ENGINE OIL PRESSURE' are visible. | Directly operated type | |
| Hour meter |  A rectangular digital display showing '000000' and a small '1/10' indicator. | CN-01 | |

| Function | Indication | Input terminal | Operation | Remark |
|---|---|----------------|---|--|
|  | Turn right and dangerous indication light | CN-18 | The light is on when turning right signal or dangerous warning light is turned on (the Max. terminal input is 24V) | |
|  | Charging | CN-08 CN-09 | The light is on when not charging (Generator D + terminal output voltage reduces to 24V) | Under normal condition, light is on when starting, light is off when engine starts working |
|  | Headlights on full beam | CN-20 | The light is on when headlight on full beam is turned on (The Max. terminal input is 24V) | |
|  | Preheat | CN-105 | The light is on when preheating system is working | |
|  | Parking brake | CN-10 | The light is on when brake switch is turned on (pressure switch is off when pressure is more than 0.3Mpa, the Max. input terminal is 24V) | When braking, the light is on before engine is started under any conditions. |
|  | Turn left and dangerous indication light | CN-19 | The light is on when turning left signal or dangerous warning light is turned on (the Max. input terminal is 24V) | |

Schematic diagram of monitoring system

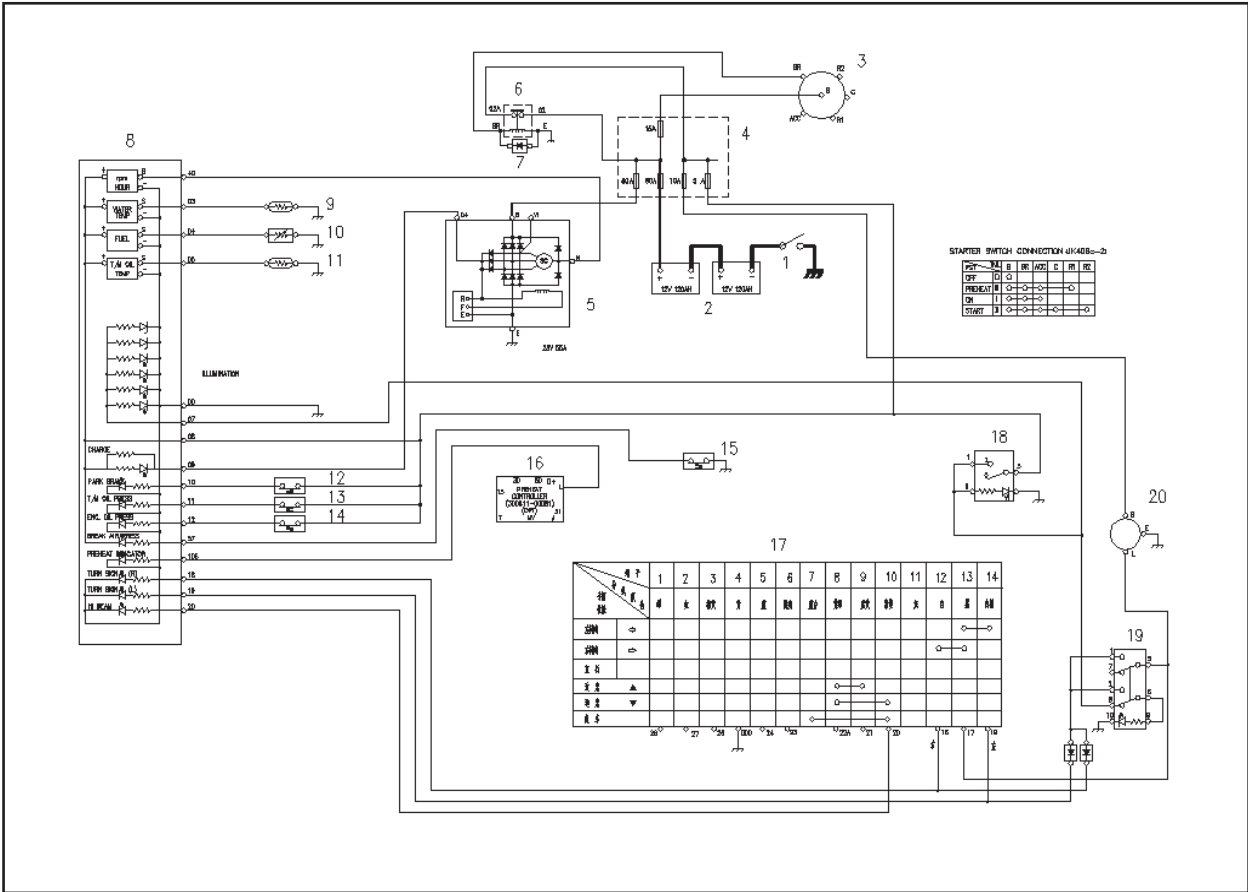


Figure.8 Schematic diagram of monitoring system

| Reference Number | Description | Reference Number | Description |
|------------------|--------------------------|------------------|---------------------------|
| 1 | Disconnect Switch | 11 | Transmission Temp. Sensor |
| 2 | Battery | 12 | T/M Oil Pressure Switch |
| 3 | Starter Switch | 13 | Break Pressure Switch |
| 4 | Fuse Box | 14 | Eng. Oil Pressure Switch |
| 5 | Alternator | 15 | Air Pressure Alarm Switch |
| 6 | Starter Relay | 16 | Preheat Controller |
| 7 | Diode | 17 | Combination Switch |
| 8 | Gauge Panel | 18 | Position Lamp Switch |
| 9 | Water Temperature Sensor | 19 | Hazard Switch |
| 10 | Fuel Sensor | 20 | Blinker Unit |

Windshield Wiper

Windshield wiper can be operated by combination switch (2).

1. Low speed wiper (I gear)

When wiper is running with low speed, electric current comes from fuse box (1), goes through wire inlet terminal and terminal “L” of wiper motor (3), reaches terminal “6” and “4” of combination switch (2)

2. and connects with earth.

When wiper is running with high speed, electric current comes from fuse box (1), goes through wire inlet terminal and terminal “H” of wiper motor (3), reaches terminal “1” and “4” of combination switch (2) and connects with earth.

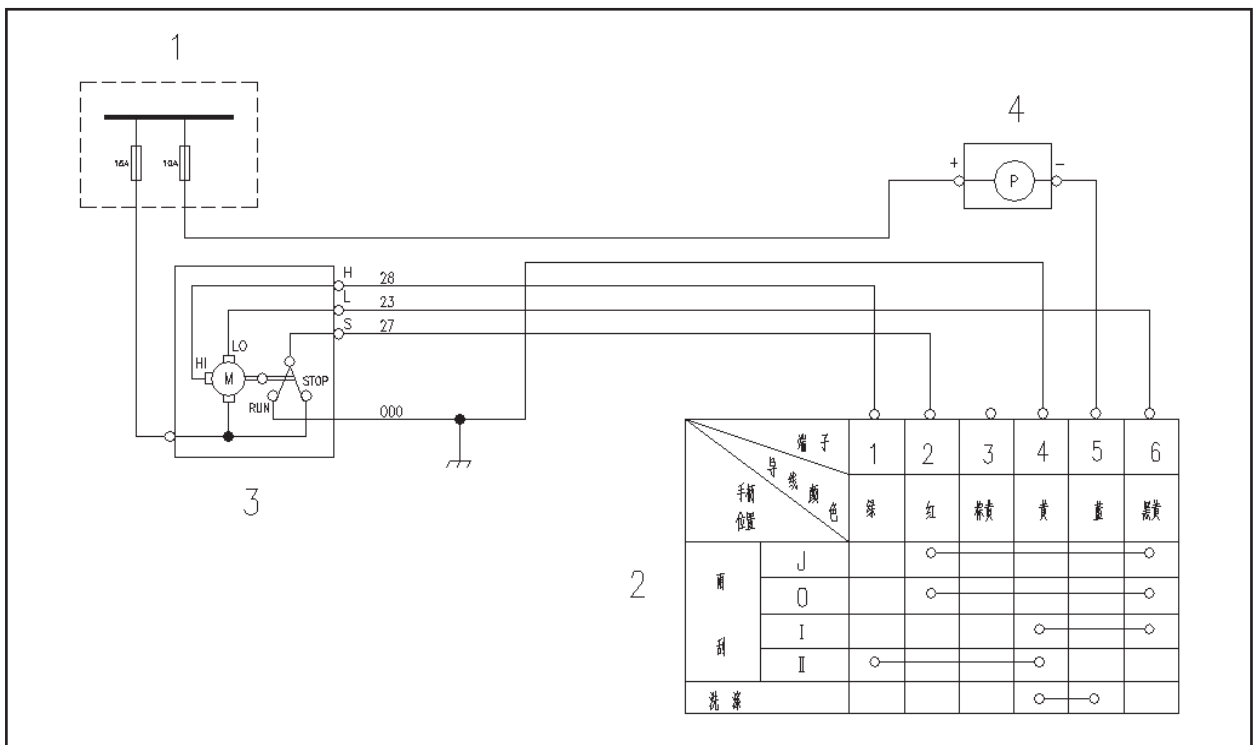


Figure.9 Circuit diagram of front windshield wiper

| Reference Number | Description | Reference Number | |
|------------------|--------------------|------------------|--------|
| 1 | Fuse Box | 3 | Wiper |
| 2 | Combination Switch | 4 | Washer |

Lighting System

Lamping system includes big lamp, position lamp, turning signal lamp, dangerous lamp, parking lamp, working light and switches of all lamps.

1. When indoor lamp (4) is turned on, electric current goes to indoor lamp from fuse box (1), indoor lamp is on.
2. Press front lamp switch (18), combination switch (2) is turned to passing lamp, terminal "8" and "9" are connected, electric current from fuse box (1) is sent to coil terminal "86" of passing lamp relay (6), passing lamp relay (6) works, its terminal "30" and "87" are connected, passing lamp of front lamp(12) and (13) gets power and works.
3. Press front lamp switch (18), combination switch (2) is turned to distance lamp, terminal "8" and "10" are connected, electric current from fuse box (1) is sent to coil terminal "86" of distance lamp relay (5), distance lamp relay (5) works, its terminal "30" and "87" are connected, distance lamp of front lamp (12) and (13) gets power and works.
4. Combination switch (2) is turned to left handed rotation, its terminal "13" and "14" are connected, electric current from fuse box (1) goes through flasher (7), combination switch (2) and reaches left turning lamp of front combination lamp (12) and rear combination lamp (14).
5. Combination switch (2) is turned to right handed rotation, its terminal "13" and "12" are connected, electric current from fuse box (1) goes through flasher (7), combination switch (2) and reaches right turning lamp of front combination lamp (13) and rear combination lamp (15).
6. When brake switch (3) works, electric current from fuse box (1), reaches brake lamp of rear combination lamp (14) and rear combination lamp (15), brake lamp works.
7. When pressing switch of position lamp (17), its terminal "5" and "1" are connected. Electric current from fuse box (1) reaches small lamps of (10), (11), (16), (17), and (18), and front combination lamp (120) and (13), position lamp of rear combination lamp (14) and (15).
8. When pressing switch of working lamp (10), its terminal "5" and "1" are connected. Electric current from fuse box (1) reaches working lamp (9), working lamp is on.
9. When pressing rear lamp switch (11), its terminal "5" and "1" are connected. Electric current from fuse box (1) reaches working lamp (8), rear working lamp is on.
10. When pressing dangerous lamp (16), terminal "5" and "1", "2" and "37" are connected. Electric current from fuse box (1) is sent to turning lamp of front combination lamp (12) and (13), and rear combination lamp (14) and (15).

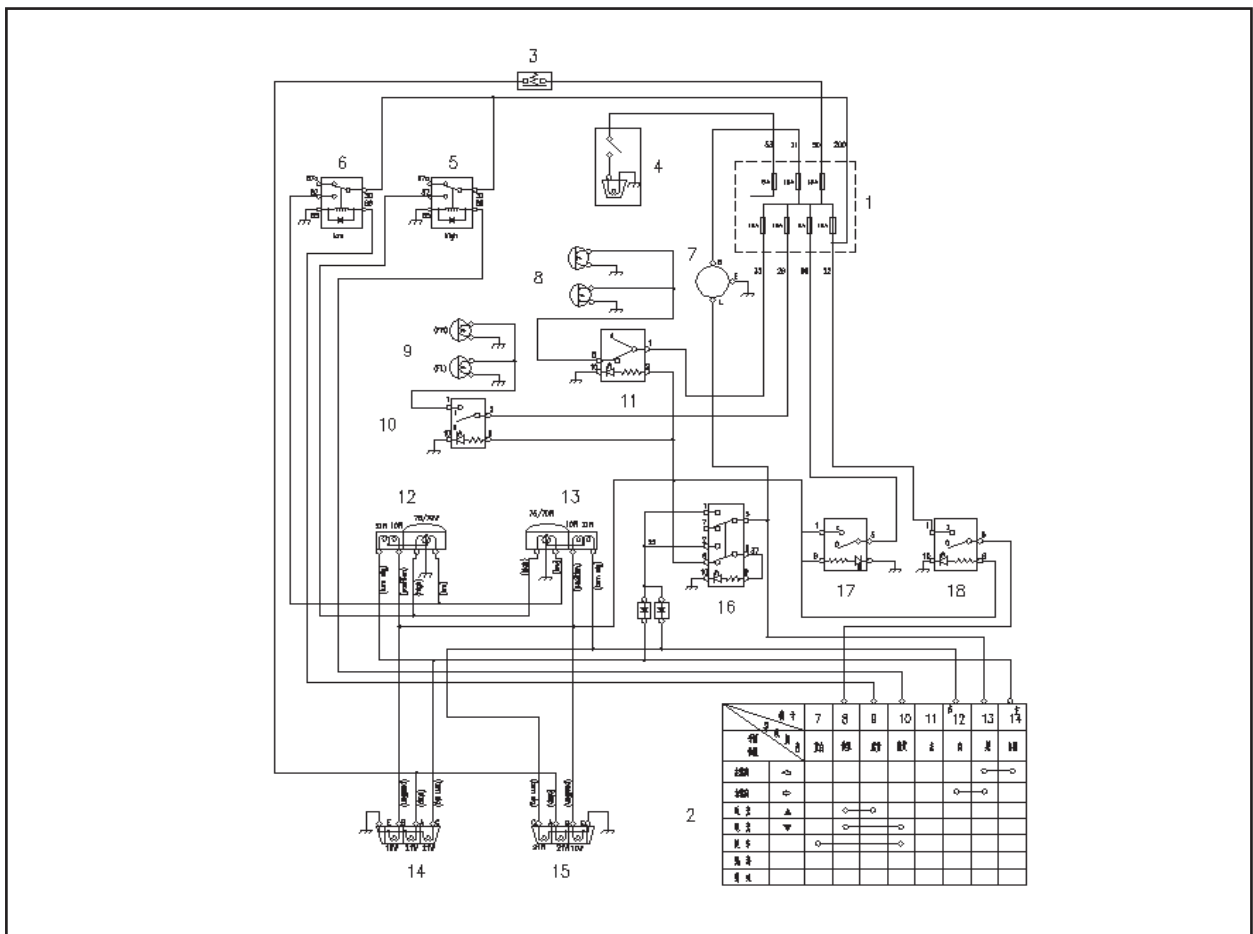


Figure.10 Lighting system circuit diagram

| Reference Number | Description | Reference Number | Description |
|------------------|--------------------|------------------|---------------------------|
| 1 | Fuse Box | 10 | Working Lamp Switch |
| 2 | Combination Switch | 11 | Rear Lamp Switch |
| 3 | Stop Lamp Switch | 12 | Front Combination Lamp(L) |
| 4 | Room Lamp | 13 | Front Combination Lamp(R) |
| 5 | High Lamp Relay | 14 | Rear Combination Lamp(L) |
| 6 | Low Lamp Relay | 15 | Rear Combination Lamp(R) |
| 7 | Blinker Unit | 16 | Hazard Switch |
| 8 | Rear Lamp | 17 | Position Lamp Switch |
| 9 | Working Lamp | 18 | Front Lamp Switch |

Electric Detent System

Electric detent system includes swing arm lifting limitation system and cylinder automatic laid flat system.

Electric circuit

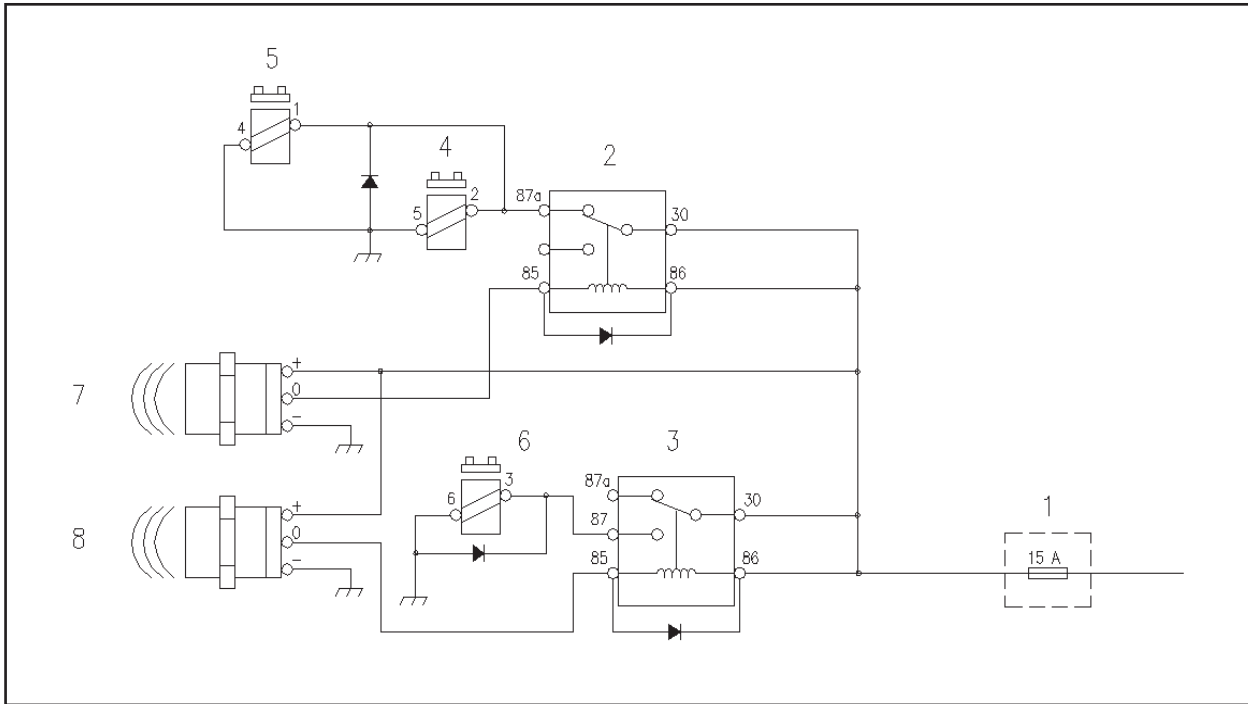


Figure.11 Electric detent system circuit

| Reference Number | Description | Reference Number | Description |
|------------------|---------------------|------------------|----------------------|
| 1 | Fuse Box | 5 | Float Magnet |
| 2 | Raise Relay | 6 | Return to Dig Magnet |
| 3 | Return to Dig Relay | 7 | Proximity Switch 1 |
| 4 | Raise Magnet | 8 | Proximity Switch 2 |

Boom Kick-Out

1.Swing arm lifting limitation

When swing arm operation handle is pulled to the rear limitation position, swing arm operation handle will be gripped by swing arm lifting electromagnet (4) (swing arm operation handle will not return to middle-position after loosening hands), swing arm will keep lifting; when swing arm reaches the limitation, proximity switch (7) works, its terminal “0” and “-” are connected, coil of lifting relay (2) is power on and works, its terminal “30” and “87a” disconnect. Lifting limitation electromagnet (4) and float electromagnet (5) are power off and lose suction ability, swing arm operation handle will return middle-position automatically with the effect of resetting spring, lifting hydraulic circuit of cylinder is cut off, and swing arm does not lift again.

2.Swing arm floating device

When swing arm operation handle is pushed to the limitation, swing arm operation handle will be gripped by swing arm floating electromagnet (5) (swing arm operation handle will not return to middle-position after loosening hands), at this moment, swing arm is at floating state, the swing arm operation handle will return meso position when releasing swing arm floating state. When swing arm descends, it can be pushed to flat position, swing arm will descend with effect of dead weight. At this moment, the driver can operate other items (such as flat bucket) with the right hand, thus working efficiency is improved. Push swing arm operation handle to floating position during slicking, bucket will rise along with rising of ground, and will not damage the road.

RETURN TO DIG

When bucket is at material discharging state, pull bucket operation handle to rear limitation, since proximity switch (8) is at suction state, its terminal “0” and “-” are connected, automatic laid flat relay (3) coil is power on and pulls in, bucket operation handle is gripped by bucket collecting holding electromagnet (6) and keep at the rear limitation position (bucket operation handle will not return to middle-position after loosening hand), bucket will keep rotating backward until reaching limitation, proximity switch (8) acts, its terminal “0” and “-” are disconnected, automatic laid flat replay (3) is power off and disconnect, bucket collecting holding electromagnet loses power and gripping ability, bucket operation handle returns to middle-position with effect of resetting spring, bucket stops rotating, swing arm descends, when bucket reaches to the ground, bucket bottom is flat with the ground.

PROXIMITY SWITCH

Operating distance : 10mm ± 1mm

Operation indication light : Indication light is on when proximity switch is acting.

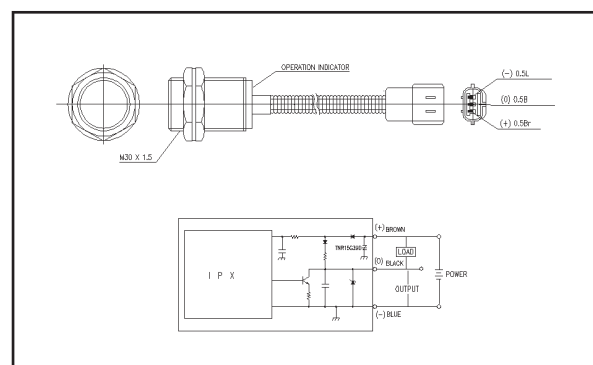


Figure.12 Proximity switch

SCHEMATIC



CAUTION!

Follow all safety recommendations and safe shop practices outlined in the front of this manual or those contained within this section.

Always use tools and equipment that is in good working order.

Use lifting and hoisting equipment capable of safely handling load.

Remember, that ultimately safety is your own personal responsibility.

TABLE OF CONTENTS

GENERAL DESCRIPTION..... 3

General Description

The overlapped edge has been considered for convenient copy, a complete schematic diagram can be formed when they are put together.

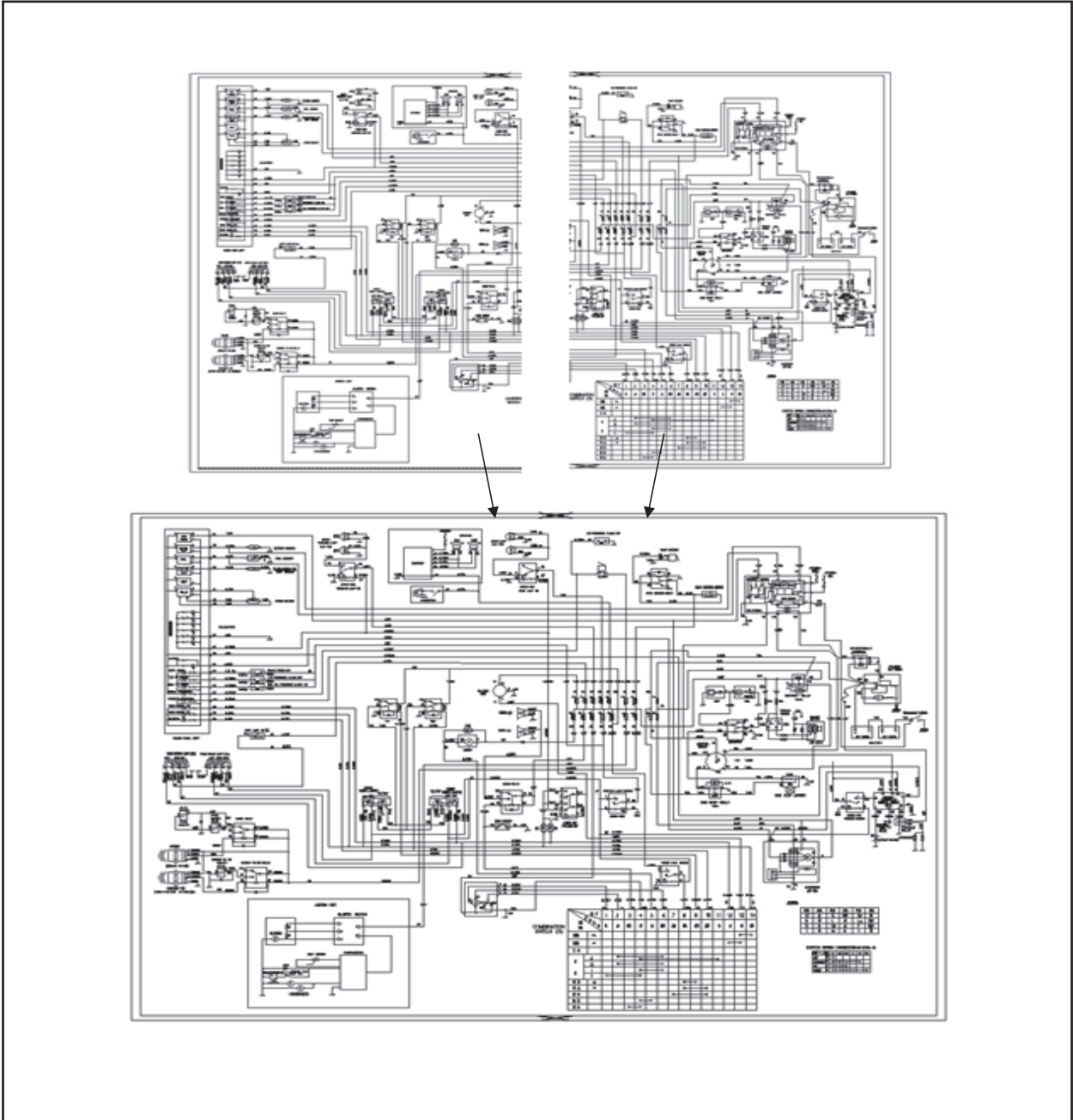


Figure.1

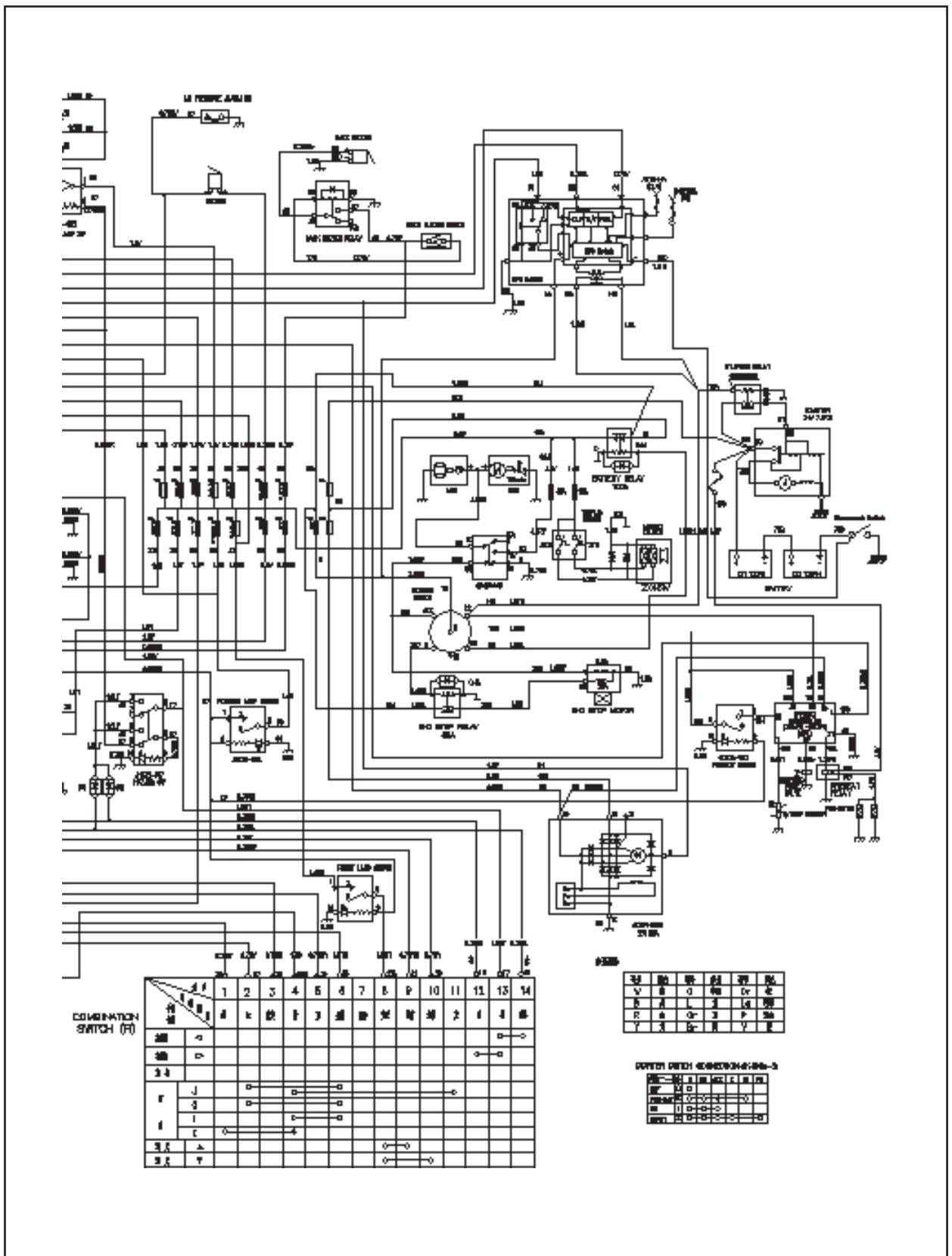


Figure.3

ATTACHMENTS

